

Section 1 – Project Details

Project Name Provide existing project name	Bootu Creek Exploration Project
Authorisation Number Insert existing authorisation number	0629-01
Operator Name ASIC-ABR registered name	OM (Manganese) Ltd , (abbreviated as OMM in this report), ABN:60 097 091 506 ACN:097 091 506
Location and Access Details Include brief description of the location, access details, and distance to nearest town or community	<p>EL31665 located adjacent to Bootu Creek mine site and accessed from OMM Haul Road, east off Stuart Highway, 110km north of Tennant Creek.</p> <p>EL28041 and EL28604 located 15km to west of the Renner Springs Roadhouse, and accessed by gas pipeline access track, west off Stuart Highway, 1km north of Helen Springs access road and 140km north of Tennant Creek (<i>see figure 1</i>).</p>
Target Commodity Details	Manganese
Mining Activities Summarise the mining activities (exploration)	Planned exploration activity for 2021 include repair of access tracks, RC exploration drilling, a self-audit of past rehabilitation, a Heritage Survey and project evaluation.
Proposed Schedule Include start and finish dates of ground disturbing work	Commence proposed work plan in April 2021 and complete planned program by October 2021. Subject to no protracted site access or travel restrictions imposed by Covid-19 lockouts.

Mining Interest and Land Ownership

Title Number	Title Holder	Expiry Date	Property Name or Land Holder
EL28041	OM Manganese Ltd	08/12/2022*	Helen Springs
EL28604	OM Manganese Ltd	26/09/2022	Helen Springs
EL31665	OM Manganese Ltd	02/08/2023	Banka-Banka West

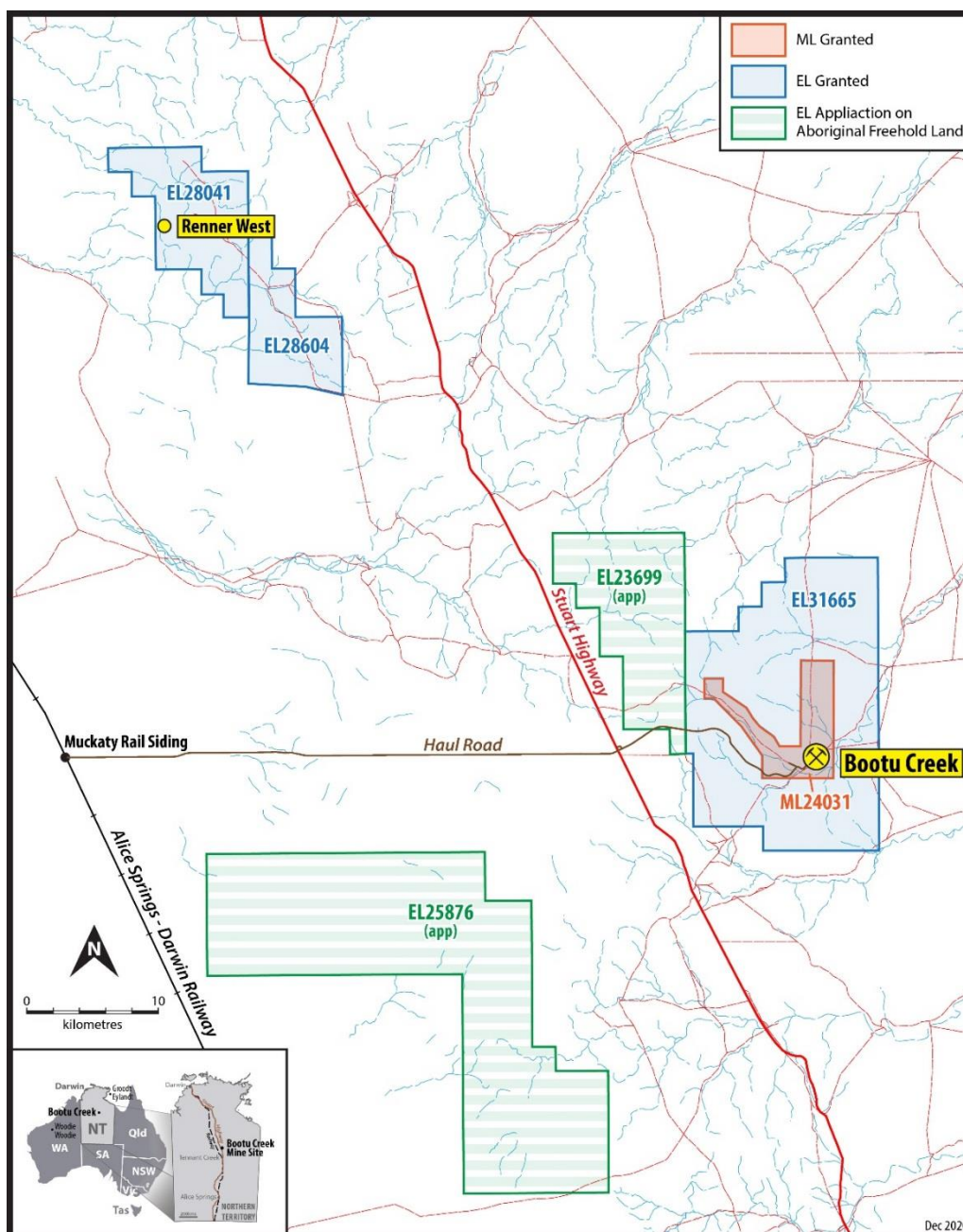


Figure 1 OMM Tenement Location Plan for 31 December 2020

Organisational Structure

Position Title	Name
Managing Director	Mr Fanie Van Jaarsveld
General Manager	Mr Trevor Cook
Exploration Manager	Mr Craig Reddell
Senior Geologist	Mr Jordan Abbott-Wightman
Mine Manager	Mr Riaan Van Jaarsveld
Administration Manager	Mr Andre de Villiers
HSEC Superintendent	Mr Paul McHugh

Section 2 – Operator Self-Assessment of Environmental Risk

Environmental considerations

OMM EMP_2018 was submitted in October 2018 and approved on 23 Dec 2019. It is the current version and is attached as Appendix 8.10 – Environmental Management Plan. Sections 7.4 and 7.5 deal with Flora and Fauna management respectively.

A Terrestrial Ecology survey covering prospective areas on EL28041 and EL28604 was conducted by SLR Consulting Australia Pty Ltd (SLR) in September 2020, and the final report forwarded to OMM in November 2020. The survey did not identify any threatened flora or fauna species, or any prescribed matters of national environmental significance in the study area. No declared weeds were identified as being present within the study area. The SLR report titled “Bootu Creek Exploration Area – Terrestrial Ecology Technical Report” is attached as Appendix 8.11 .

ASSESSMENT ASPECT	YES or NO	ACTIONS REQUIRED (if answered YES)	APPENDED INFORMATION (Evidence of consultation with DENR and/or management plan)
<p>Step 1:</p> <p>Are there any threatened FLORA species or habitats of significance that may occur in the proposed work area?</p>	<p>NO</p>	<p>No EPBC Act or TPWC Act listed threatened flora species were identified as potentially occurring within 50 km of the study area during desktop assessments. Additionally, no threatened flora species were identified to occur within the study area during baseline flora assessments. Therefore, it is considered unlikely that any Commonwealth or Territory listed threatened flora species will be significantly impacted by activities within the study area.</p> <p>Riparian vegetation is considered significant and sensitive in the NT as identified by the NT Land Clearing Guidelines (2020b); however, these guidelines do not apply to land clearing controlled under the Mine Management Act yet provides a framework to assessing potential impacts on sensitive areas. Riparian vegetation should not be cleared, and appropriate native vegetation buffers should be retained to reduce impacts of land clearing on these systems.</p>	<p>There are 291 flora species which have been recorded in the region which could occur within the exploration project area.</p> <p>Inclusive of the Terrestrial Ecology Technical Report, a search of matters protected by <i>Environmental Protection and Biodiversity Conservation Act</i> was conducted on 20 October 2020 using the protected matters search tool provided by Commonwealth Department of Agriculture, Water and the Environment.</p>

<p>Step 1: cont.</p> <p>Are there any threatened FAUNA species or habitats of significance that may occur in the proposed work area?</p>	<p>NO</p>	<p>The Terrestrial Ecology survey reported no EPBC Act or TPWC Act listed threatened significant fauna species were identified to occur within the study area during baseline assessments.</p> <p>Desktop assessments identified 13 Commonwealth and/or Territory listed threatened fauna species as potentially occurring within the study area. Of these 13 species, three were considered to have a moderate likelihood of occurring within the study area based on the presence of local records and potentially suitable habitat.</p> <table border="1" data-bbox="478 526 1197 940"> <thead> <tr> <th>Species</th> <th>Classification</th> <th>Location</th> </tr> </thead> <tbody> <tr> <td>Grey Falcon (<i>Falco hypoleucos</i>)</td> <td>Vulnerable</td> <td>Moderate likelihood of occurring within project area.</td> </tr> <tr> <td>Greater Bilby (<i>Macrotis lagotis</i>)</td> <td>Vulnerable</td> <td>Potential to occur within project area.</td> </tr> <tr> <td>Yellow-spotted Monitor (<i>Varanus panoptes</i>)</td> <td>Vulnerable</td> <td>Moderate likelihood of occurring within project area.</td> </tr> </tbody> </table> <p>The remaining 10 species were considered to have a low likelihood of occurring within the study area and are therefore unlikely to be significantly impacted by activities within the study area.</p>	Species	Classification	Location	Grey Falcon (<i>Falco hypoleucos</i>)	Vulnerable	Moderate likelihood of occurring within project area.	Greater Bilby (<i>Macrotis lagotis</i>)	Vulnerable	Potential to occur within project area.	Yellow-spotted Monitor (<i>Varanus panoptes</i>)	Vulnerable	Moderate likelihood of occurring within project area.	<p>Inclusive of the Terrestrial Ecology Technical Report, a search of matters protected by <i>Environmental Protection and Biodiversity Conservation Act</i> was conducted on 20 October 2020 using the protected matters search tool provided by Commonwealth Department of Agriculture, Water and the Environment.</p>
Species	Classification	Location													
Grey Falcon (<i>Falco hypoleucos</i>)	Vulnerable	Moderate likelihood of occurring within project area.													
Greater Bilby (<i>Macrotis lagotis</i>)	Vulnerable	Potential to occur within project area.													
Yellow-spotted Monitor (<i>Varanus panoptes</i>)	Vulnerable	Moderate likelihood of occurring within project area.													

Mining Management Plan Exploration Activities

<p>Step 2:</p> <p>Are there any known declared weeds within the proposed work area?</p>	<p>YES</p>	<p>No weeds of national significance or weeds declared under the NT WM Act were identified within the Terrestrial Ecology survey area during baseline assessments. However, two introduced flora species were identified within the study area, including Stylo (<i>Stylosanthes scabra</i>) and Buffel Grass (<i>Cenchrus ciliaris</i>). Although Buffel Grass is not declared under the WM Act, the species is considered as highly invasive within the Barkly weed management region.</p> <p>Several Stylo plants were found along the watercourse dissecting the Carruthers South targeted disturbance area and Buffel grass was found to occur occasionally along the central north-south access track connecting the targeted disturbance areas. Both these species are generally considered as environmental weeds due to their potential to impact native ecosystems.</p> <p>In addition to these species there were two significant weed species recorded during a survey of the Bootu Creek Mine, two of which are declared under the Weeds Management Act 2001:</p> <p>Rubber Bush (<i>Calotropis procera</i>) and Hyptis (<i>Hyptis suaveolens</i>).</p> <p>Good vehicle hygiene practices will be employed to ensure that seeds of these species will not be transported onto or off the mine lease area. Any sightings of these species in the exploration project area will be reported to the OM Manganese Environmental Officer for immediate eradication.</p>	<p>The report generated by the Protected Matters Search tool identifies the following flora species which are introduced and considered a significant threat to biodiversity.</p>
<p>Step 3:</p> <p>Will you be using water from bores or other sources for the operation?</p>	<p>YES</p>	<p>All water required for drilling and drinking will be sourced from the mine site at Bootu Creek and transported to drill sites from the Bootu Creek Operation. Any water extracted from pastoral bores will only be done so if authorised by the Station Manager.</p> <p>No diamond drilling is planned for this work program and water usage for RC drilling will be minimal. Water extraction from bores or other sources at Bootu Creek Operation is already licenced.</p>	
<p>Step 4:</p> <p>Is your project likely to have a significant impact on the environment?</p>	<p>NO</p>	<p>The proposed exploration work plans will have no significant environment impact.</p> <p>The total proposed exploration clearing for 2021 is 0.548 Ha. Clearing will be undertaken with a blade up approach and significant riparian vegetation will be avoided.</p>	

Mining Management Plan Exploration Activities

<p>Step 5:</p> <p>Are there Aboriginal sacred sites in the Project area?</p>	<p>YES</p>	<p>All active exploration areas are covered by existing Aboriginal Areas Protection Authority (AAPA) - Authority Certificates which clearly define the location of sacred sites and the associated Restricted Work Areas (RWA) around the sacred sites.</p> <p>The areas covered by the proposed exploration activities do not encroach on, nor are they located in proximity to any defined RWA's.</p> <p>All relevant AAPA Authority Certificates are unchanged, and copies were attached to previous Exploration MMP's.</p>	
<p>Step 6:</p> <p>Are there archaeological and heritage sites in the Project area?</p>	<p>NO</p>	<p>There are no current archaeological or heritage sites registered on EL28041, EL28604 or EL31665.</p> <p>All areas will be inspected for stone artifact scatters, outcrops with rock art and for stone quarries prior to clearing.</p> <p>If any significant sites are found, the AAPA and Heritage, Libraries and Sport Division of the Department of Tourism, Sport and Culture will be notified.</p> <p>Refer to Appendix</p>	

Section 3 – Amendments

As per Section 41(3) of the *Mining Management Act*, an MMP reviewed and amended under Section 41(1)(a) is to clearly identify amendments made.

Section	Amendment
Section 1.0 – Land Ownership	EL28604 was reduced in area to 19 blocks, following the partial cancellation of 10 blocks on 26/09/2020.
Section 1.0 – Land Ownership	EL28604 term was extended for a further period of 2 years on 13 November 2020.
Section 1.0 – Land Ownership	EL28041 was reduced in area to 24 blocks, following the partial cancellation of 10 blocks on 08/12/2020
Section 1.0 – Land Ownership	EL28041 term was extended for a further period of 2 years on 9 February 2021.
Section 1.0 – Land Ownership	An updated Land Access Agreement (LAA) with the Pastoral Lease holder of Helen Springs Station was not finalised until 15 February 2021. The Agreement covers EL28041 and EL28604.
Section 2.0 – Environmental Risk	A Biodiversity Survey was conducted by SLR Consulting Australia Pty Ltd over prospective areas of EL28041 and EL28604. The SLR report received by OMM in November 2020 is included as Appendix 8.11
Section 2.0 – Archaeological Risk	A Heritage Survey of the Renner Springs project areas was requested by the DITT in 2020. SLR Consulting Australia Pty Ltd subcontracted this survey to inDepth Archaeology in September 2020, but they have since been unable to conduct the survey due to the ill health of their principal Archaeologist. SLR, in conjunction with inDepth, proposed a desktop assessment be submitted with this MMP, and a field survey be conducted at the start of the Dry Season prior to commencement of any proposed exploration field activities. See Appendix 8.13

Variation of Authorisation 0629-01 and Mining Management Plan Approval was forwarded to OMM on 10/10/2019 and is attached as Appendix 8.9 .

Note 1: The MMP for 2020 was not approved and no physical exploration activity was undertaken. This MMP for 2021 is intended to replace the 2020 MMP submission.

Note 2: Ground Disturbing activity on EL28041 and EL28604 will require Cultural Heritage Clearance prior to the planned exploration activities commencing.

Section 4 – Activities Proposed for 2021

Mining Interests	EL28041	EL28604	EL31665
Number and type of proposed drill holes		RC 24	RC 0
Maximum depth of proposed holes (m)		72	0
Number and size of drill pads to be cleared (Length:10m x Width:8m)		24	0
Total area of drill pads to be cleared (ha)		0.192	0
Is drilling likely to encounter groundwater. (Y, N, unsure)		Y	
Number of costeans (#) (Length:15m x Width:4m x Depth:3m) (ha)		0 0	0
Number of bulk sample pits		0	0
Total bulk sample (tonnes) (Length: m x Width: m x Depth: m)		0	0
Bulk sample pits approved under <i>Mineral Titles Act?</i> (Y or N)		0	0
Length of line/track clearing (km) (Length: km x Width: 4m) (ha)		0.400 0.160	0 0
Camp area to be cleared (ha)		-	-
Camp Infrastructure (i.e. demountable, tents)		-	-
Previous disturbance yet to be remediated on title (ha)	7.800	1.048	2.000
Proposed area to be cleared (ha)		0.352	0.000
Total area disturbed under this proposal (ha)	7.800	1.400	2.000

Note * 12 proposed RC holes on EL28041 (deferred from 2019) already covered by 2019 bond, see Appendix 8.14 for deferred "Authorised" drill program on EL28041.

Section 5 – Previous Disturbance (existing Authorisations)

Mining Interests (i.e. titles)	EL28041	EL28604	EL31665
Number/type of holes drilled	RC/DD 400/3	RC 63	RC 127
Maximum depth of holes drilled (m)	105/28	114	119
Number of holes remediated (plugged)	313/0	57	127
Number and size of drill pads cleared (Length:10m x Width: 8m)	403	63	127
Total area of drill pads cleared (ha)	3.224	0.504	0.136
Total area of drill pads remediated (ha)	2.504	0.456	0.136
Was groundwater encountered (Y or N)	Y	Y	Y
Length of line/track cleared (km) (Length: km x Width:4m)	17.70 7.080	2.500 1.000	5.000 2.000
Length of line/track remediated. (Length: km x Width: 4 m)	0	0	0
Number of costeans excavated (#) (Length:50m x Width:5m x Depth:2m) (ha)	0 0	1 0.025	0 0
Number of costeans remediated	0	1	0
Total bulk sample pits excavated. (Length: m x Width: m x Depth: m)	0	0	0
Total bulk sample pits remediated	0	0	0
Camp area/s cleared (ha)	-	-	-
Camp area/s remediated (ha)	-	-	-
Total area disturbed (ha)	10.304	1.529	2.136
Total area remediated (ha)	2.504	0.481	0.136

See Appendix 8.

Section 6 – Environmental Management

By checking these boxes, you are agreeing to implement the following minimum environmental management standards on the project area. Where boxes have been left unchecked, justification is required.

6.1	✓	Blade-up approach for clearing will be used (i.e. no windrows, leave root stock and topsoil)
6.2	✓	Significant vegetation will be avoided during clearing (i.e. large trees, specimens providing habitat or food sources, riparian vegetation, and threatened species)
6.3	✓	Vegetation clearing during, and immediately after rainfall events, will be avoided
6.4	✓	Vegetation clearing will be kept to the minimum required to safely traverse vehicles and drill rigs along tracks and drill pads
6.5	✓	Where blade-up techniques cannot be employed, topsoil and vegetation will be stockpiled appropriately for remediation purposes
6.6	✓	All employees and contractors will be trained and inducted in relation to the management of environmental risks in the work area, including weeds, waterways, threatened species, soil erosion, sacred sites and heritage areas
6.7	✓	Sumps will be lined or tanks of appropriate size to contain water, sediment and drilling fluids encountered during drilling, will be used
6.8	✓	Sumps, drill holes, and fuel stores will be located away from environmentally significant areas and water courses
6.9	✓	Excavations (sumps, costeans and pits) will be appropriately ramped to allow fauna egress
6.10	✓	Drill holes will be securely capped immediately after drilling
6.11	✓	Vehicle hygiene measures will be employed to prevent the introduction and spread of invasive species and pathogens when mobilising vehicles and equipment from one location to another
6.12	✓	Hydrocarbon spills will be minimised using liners and drip trays under machinery, and appropriately sized spill-kits available in the event of a spill
6.13	✓	Hazardous substances (including hydrocarbons) will be stored and handled in accordance with relevant Australian Standards
6.14	✓	Hydrocarbons will be stored in lined and bunded areas
6.15	✓	Waste will be stored securely while on-site to minimise windblown rubbish and access by feral animals
6.16	✓	Waste will be removed off-site and disposed of at an appropriate waste management facility
6.17	✓	All environmental incidents will be reported to the Department in accordance with Section 29 of the <i>Mining Management Act</i> .

OMM EMP_2018 was submitted in October 2018 and approved on 23 Dec 2019.

It is the current version and attached as Appendix 8.10 – Environmental Management Plan. Sections 7.4 and 7.5 deal with Flora and Fauna Management respectively.

Section 7 – Remediation and Closure

By checking these boxes, you are agreeing to implement the following minimum remediation standards on the project area. Where boxes have been left unchecked, justification is required.

7.1	✓	Drill holes plugged below ground level at a minimum depth of 0.4 metres and soil mounded to prevent subsidence, within 6 months of completion of drilling
7.2	✓	Drill samples/spoil returned down drill holes, buried in sumps, or removed from site
7.3	✓	All drill hole and access markers including flagging tape, wooden markers and star pickets will be removed from site
7.4	✓	Re-contouring of cut and fill drill pads will be consistent with the surrounding terrain
7.5	✓	Ripping/scarifying of drill pads, and compacted areas along the contour (on sloping ground) and cross-ripping (zigzag) along tracks
7.6	✓	Tracks will be remediated, including pushing in all windrows
7.7	✓	Appropriate erosion and sediment controls will be installed where erosion is evident or likely to occur
7.8	✓	All tracks will be remediated unless otherwise agreed in writing by the land holder or appropriate third party
7.9	✓	Access through watercourses will be removed and banks restored
7.10	✓	No erosion is occurring in disturbed areas, on tracks and in remediated areas
7.11	✓	All excavations backfilled within 6 months of completion of drilling
7.12	✓	All water bores decommissioned unless otherwise agreed in writing by the land holder or appropriate third party. The bore must comply with the Minimum Construction Requirements for Water Bores in Australia and may require permits or licenses under the <i>Water Act</i>
7.13	✓	All rubbish and infrastructure will be removed from site
7.14	✓	Replacement of topsoil and vegetation
7.15	✓	Contaminated soils (e.g. hydrocarbon or hazardous chemicals) will be remediated or removed from site
7.16	✓	Monitoring will be undertaken following the wet season or a significant rainfall event

Justification and alternative management measures:

Section 8 – Required Attachments

8.1	✓	Security Calculation Spreadsheet
8.2	X	Not Applicable (Title Holder is the Operator).
8.3	✓	Spreadsheet with coordinates of proposed drill holes or polygons of target areas
8.4	✓	Google Earth KML/shape files/track logs of proposed tracks and camp sites
8.5	✓	A map of the work area(s) showing: <ol style="list-style-type: none"> 1. title boundaries and title numbers 2. current and proposed drill holes, or polygons of target areas 3. current and proposed tracks 4. remediated areas 5. camp sites 6. sacred/heritage sites 7. environmental constraints
8.6	✓	Remediation Register (for existing Authorisations)
8.7	X	Photographs of remediation work
8.8	X	AAPA Authorisation Certificates covering exploration project areas.
8.9	✓	Variation of Authorisation 0629-01 and Mining Plan Approval dated 19/03/2018
8.10	✓	Current OMM Environmental Management Plan
8.11	✓	“Bootu Creek Exploration Area – Terrestrial Ecology Technical Report” by SLR Consulting Australia Pty Ltd, November 2020
8.12	✓	“Land Access Agreement with Helen Springs Pastoral Station, January 2021” confidential
8.13	✓	“2021 Cultural Heritage desktop assessment” by Karin Martin-Stone 4 March 2021.
8.14	✓	Disturbance Tracking for Exploration Projects

Appendix 8.1 – Security Calculation Spreadsheet for 2021

A summary of af7-014 Exploration Security Calculation for the Bootu Creek 2019 MMP Authorisation 0620-01 is shown below.

Note: No plastic samples bags used in recent drill programs and none remain on site.

Security Calculation Summary

Domains	Calculated Cost
Site Infrastructure	\$0.00
Exploration	\$3,884.80
Post Closure Management	\$88.00
Sub-Total - All Domains	\$3,972.80
CONTINGENCY @15%	\$595.92
TOTAL COST	\$4,568.72

Departmental Assessment (to nearest \$)	\$4,569
10% Discount	\$457
Amended amount	\$4,112
1% levy	\$41

- Copy of complete spreadsheet attached as –
“Appendix 8.1 - OMM af7-014-exploration-security-calculation 2021-v2.xlsx”

0629-01	OMM Existing Exploration Bond (Oct-2019)	\$ 100,110
	Net Additional Security required for 2021 program	\$ 4,153*

Note * excludes bond already paid for deferred 2019 RC drill program on EL28041.

Appendix 8.3 – Proposed OMM Drill Program for 2021

A summary of the proposed OMM 2021 Bootu Creek Exploration drill program.

No ground disturbing activity will be conducted until a Heritage Survey Clearance has been received.

The Renner Central Drill Program, deferred from the 2020 program, consist of approximately 12 RC holes with a maximum depth of 30m. The Renner Central drill polygon is defined by the following co-ordinates:

EL28041 NW corner 7971750 N and 361575 E
NE corner 7971750 N and 361800 E
SW corner 7971650 N and 361575 E
SE corner 7971650 N and 361800 E

The 2021 Carruthers North Drill Program, a follow up of the 6 RC reconnaissance holes drilled in 2019, consists of approximately 24 RC drill holes with a maximum depth of 72m. The Carruthers North drill polygon is defined by the following co-ordinates:

EL28604 NW corner 7966050 N and 366000 E
NE corner 7966050 N and 366300 E
SW corner 7965650 N and 366000 E
SE corner 7965650 N and 366300 E

Grid: GDA94/MGA zone 3

Appendix 8.4 – Google Earth KML/shape files/track logs

Appendix attached as zip file (no change from 2020) –

“Appendix 8.4 RS 2020 Track KML file”

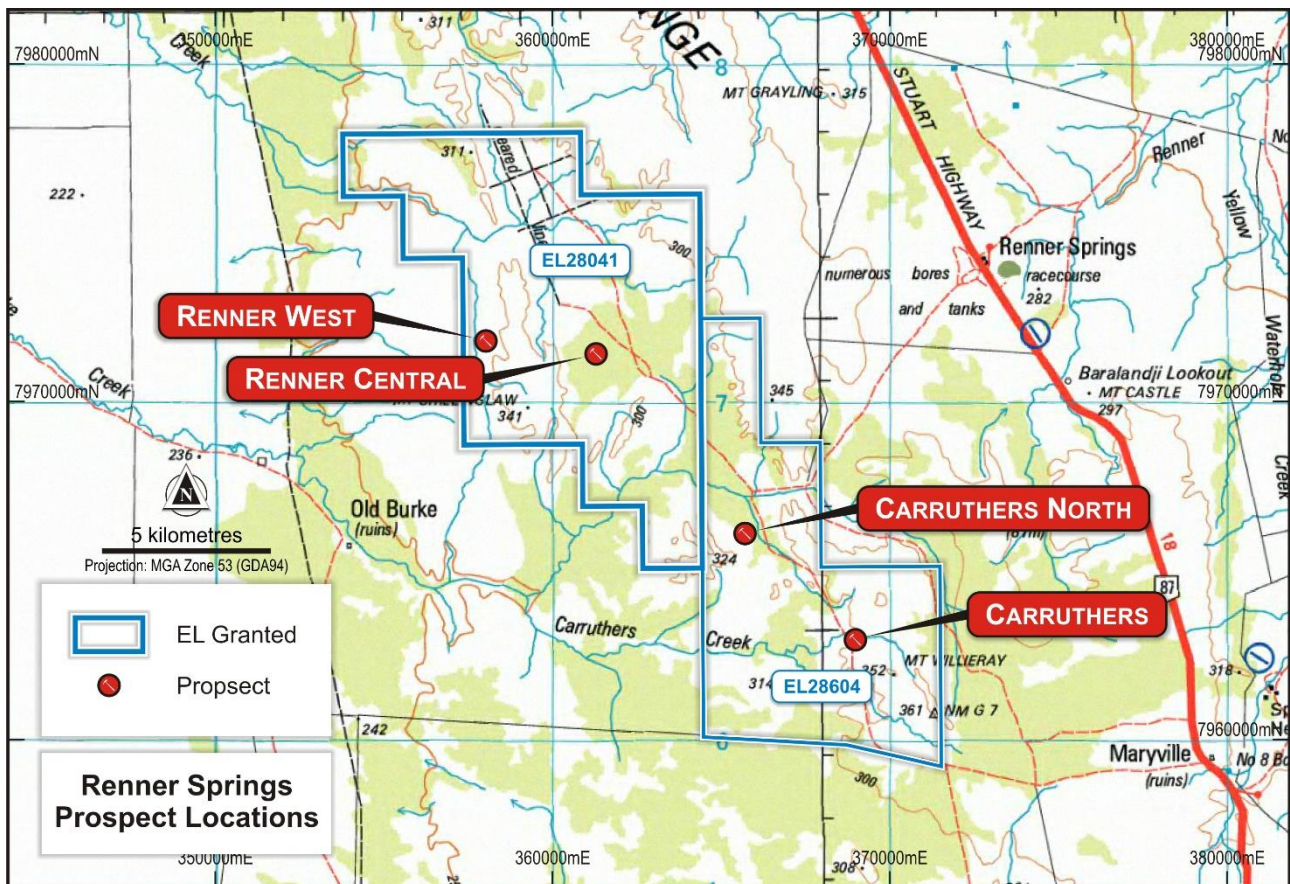
Appendix 8.5 - Maps of Work Areas

Maps of work areas showing -

- Title boundaries and title numbers
- Current and proposed drill holes (or polygons of target areas)
- Current and proposed tracks
- Remediated areas
- Sacred sites (AAPA Authority Certificates attached as Appendix 8.8)

Plan of 4 main prospects located within the Renner Project Area

Proposed activity for 2021 MMP is on the Renner Central and Carruthers North prospects.



PDF copies of attached maps are –

- Appendix 8.5 (i) Renner Central planned drill location
- Appendix 8.5 (ii) Carruthers North planned drill location
- Appendix 8.5 (iii) Carruthers North inset of planned drill location
- Appendix 8.5 (iv) RS EL28041 Rehab Status (A3)
- Appendix 8.5 (v) RS EL28604 Rehab Status (A3)
- Appendix 8.5 (vi) BC EL31665 North Rehab Status (A3)
- Appendix 8.5 (vii) BC EL31665 West Rehab Status (A3)

Appendix 8.6 – Remediation Register for Authorisation 0629-01

The attached summary spreadsheet lists the status following the 2014 rehabilitation self-audit of drill collars and drill pads. Exploration drilling on Bootu Creek Exploration Licences since the 2014 self-audit is limited to the 2019 program consisting of 3 diamond holes drilled at Renner West deposit on EL28041 and 6 RC holes drilled at Carruthers North prospect on EL28604.

A follow up of the 2014 self-audit is budgeted for 2021.

- Copy of the full spreadsheet (no change from 2020) attached as –
“Appendix 8.6 - Drilling Rehab Location 2020.xlsx”

Appendix 8.7 – Photographs of remedial work

A total of 490 located drill holes, showing drill collars and drill pads, were taken during the 2014 rehabilitation self-audit. Dates listed as 01/01/2012 were taken in July/August 2014.

- Copy of all photos for EL28041, EL28604 and EL31665 from the 2014 self-audit were forwarded directly to the DPIR in October 2019.

Appendix 8.8 – AAPA Authorisation Certificates

Consultation with the local Aboriginal Groups and Traditional Owners is conducted through the NLC. The Exploration Agreement covering Banka-Banka, Northern Territory between Neil Scriven and the Local Aboriginal Groups and Bootu Creek Resources Pty Ltd (OMM) and the Northern Land Council (NLC) dates from 18th September 2001 and still applies over the Exploration Licences.

Authorisation Certificates are sought and obtained from the Aboriginal Areas Protection Authority (AAPA) for specified project areas before commencing ground disturbing activity. AAPA Authorisation Certificates covering the full extent of OMM exploration activity are listed below.

- | | | | |
|--------------|------------------|--------------|-------------------------|
| • C2006/132a | Carruthers Creek | EL28604 (E) | nee EL23459 (E) |
| • C2008/217 | Looa Bore | EL31665 (N) | nee EL10412 (N) |
| • C2009/164 | Gap Bore | EL31665 (S) | nee EL10412 (S) |
| • C2009/287 | Renner Springs | EL28041 (SE) | nee EL23624 (SE) |
| • C2009/319 | Carmilly Bore | EL31665 (N) | nee EL22428 (N) |
| • C2010/005 | Carruthers Creek | EL28604 (W) | nee EL23459 (W) |
| • C2010/180 | Renner Springs | EL28041 (S) | nee EL9998 |
| • C2011/122 | Sliver | EL31665 (W) | nee EL22940 & EL28046 |
| • C2011/123 | Bootu Extended | EL31665 | nee ML27445 application |
| • C2011/145 | Renner Springs | EL28041 (N) | nee EL9975 |
- Copies of Authorisation Certificates were attached with the 2019 Bootu Creek Exploration Licences MMP.

The AAPA authority certificates should be regarded as “confidential”.

Appendix 8.9 – Variation of Authorisation 0629-01 and Mining Management Approval dated 10/10/2019, Renewal of EL28604 dated 13/11/2020, and Renewal of EL28041 dated 09/02/2021

Copies attached as –

“Appendix 8.9 (i) – Variation of Authorisation 0629-01.pdf”

“Appendix 8.9 (ii) – Renewal of EL28604.pdf”

“Appendix 8.9 (iii) – Renewal of EL28041.pdf”

Appendix 8.10 – OMM Environmental Management Plan

OMM EMP_2018 was submitted in to the DPIR October 2018 and approved on 23 Dec 2019. It is the current approved document.

Sections 7.4 and 7.5 deal with Flora and Fauna management respectively.

Appendix 8.11 – “Bootu Creek Exploration Area – Terrestrial Ecology Technical Report” by SLR Consulting Australia Pty Ltd, November 2020

The attached report was surveyed and prepared in response to a DITT request for a Biodiversity study of current and proposed OMM exploration areas.

This report should be regarded as “confidential”.

Appendix 8.12 – Land Access Agreement with Helen Springs Pastoral Station, January 2021

The executed OMM-Kidman Access Agreement (CP-CN-TEN 20210215) is attached as electronic file “OMM Kidman Land Access Agreement 20210215”.

This agreement should be regarded as “confidential”.

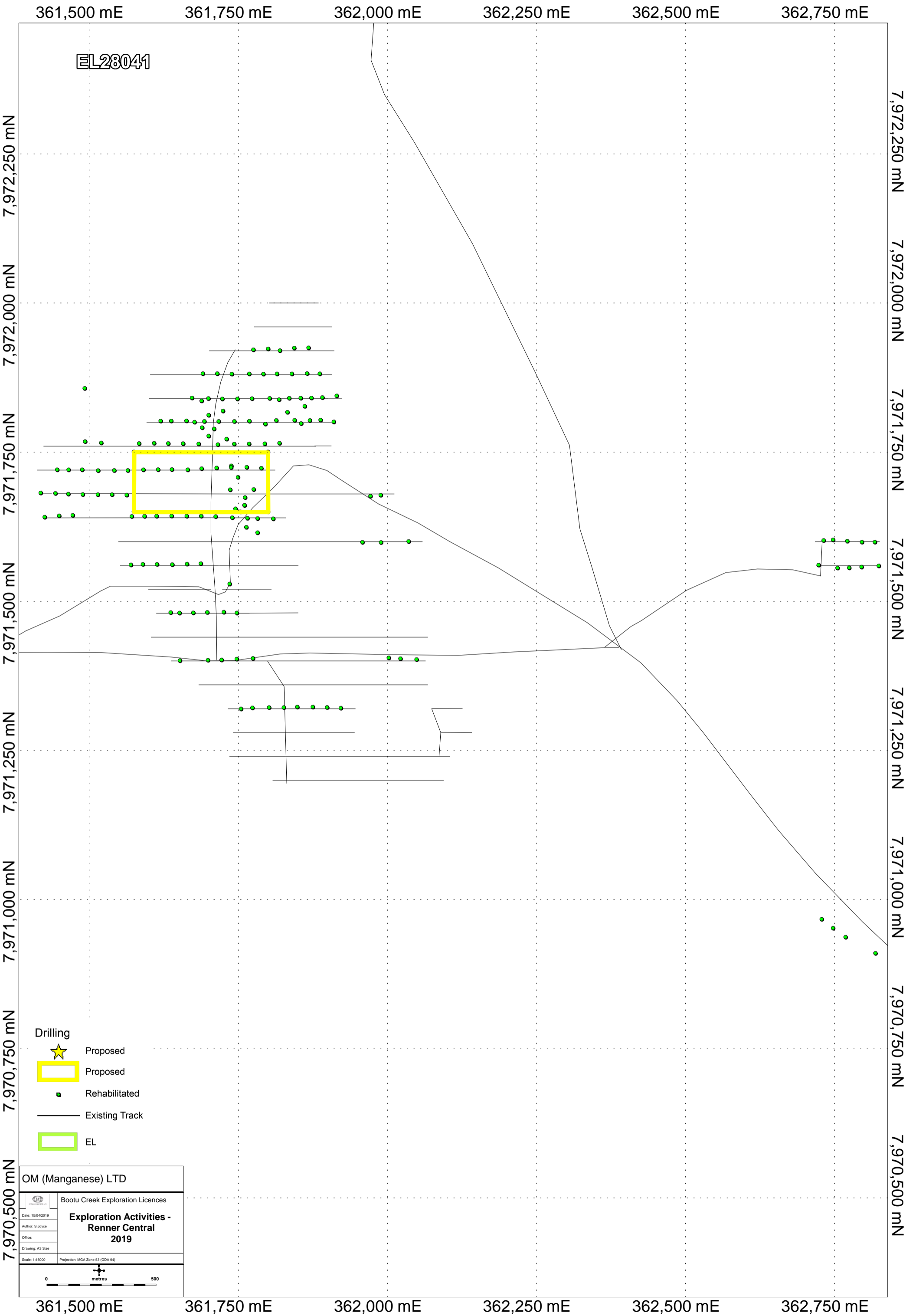
Appendix 8.13 – “ A Desktop Assessment of the Archaeological Potential on OMM’s Exploration Projects” by Karen Martin-Stone.

The attached document was prepared by Karen Martin-Stone of ‘In-Depth Archaeology’ in March 2021.






Note: Planned ground disturbing exploration activity on EL28041 and EL28604 for 2012 will require a Cultural Heritage ground survey clearance prior to proceeding.


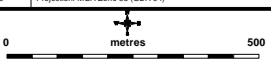
Appendix 8.13 – “Disturbance Tracking for Exploration Project”

Deferred drill program from 2019 for 10 RC holes on EL28041.



EL28041

- Drilling**
-  Proposed
 -  Proposed
 -  Rehabilitated
 -  Existing Track
 -  EL

OM (Manganese) LTD	
	Bootu Creek Exploration Licences
Date: 15/04/2019	Exploration Activities - Renner Central 2019
Author: S. Joyce	
Office:	
Drawing: A3 Size	
Scale: 1:15000	Projection: MGA Zone 53 (GDA 94)
	

365000.000E

366000.000E

367000.000E

368000.000E




EL28604

Renner Springs Roadhouse

Inset

Willieray Bore

Drilling

-  Proposed
-  Track
-  EL

OM (Manganese) LTD



Bootu Creek Exploration Licences

Exploration Activities - Carruthers North (EL28604) 2020

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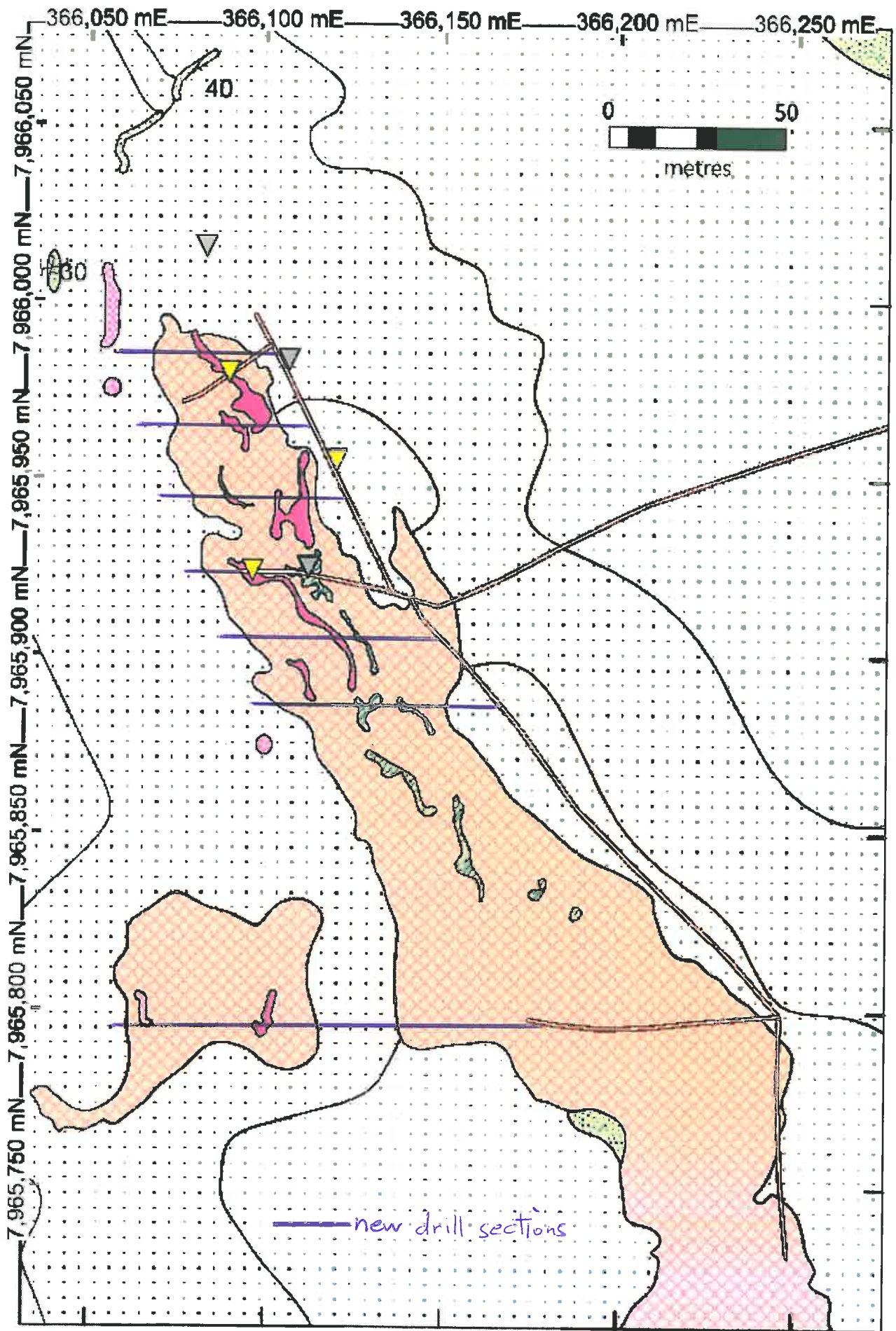
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OM (MANGANESE) LTD

Bootu Creek Manganese Mine Environmental Management Plan



OM (Manganese) LTD
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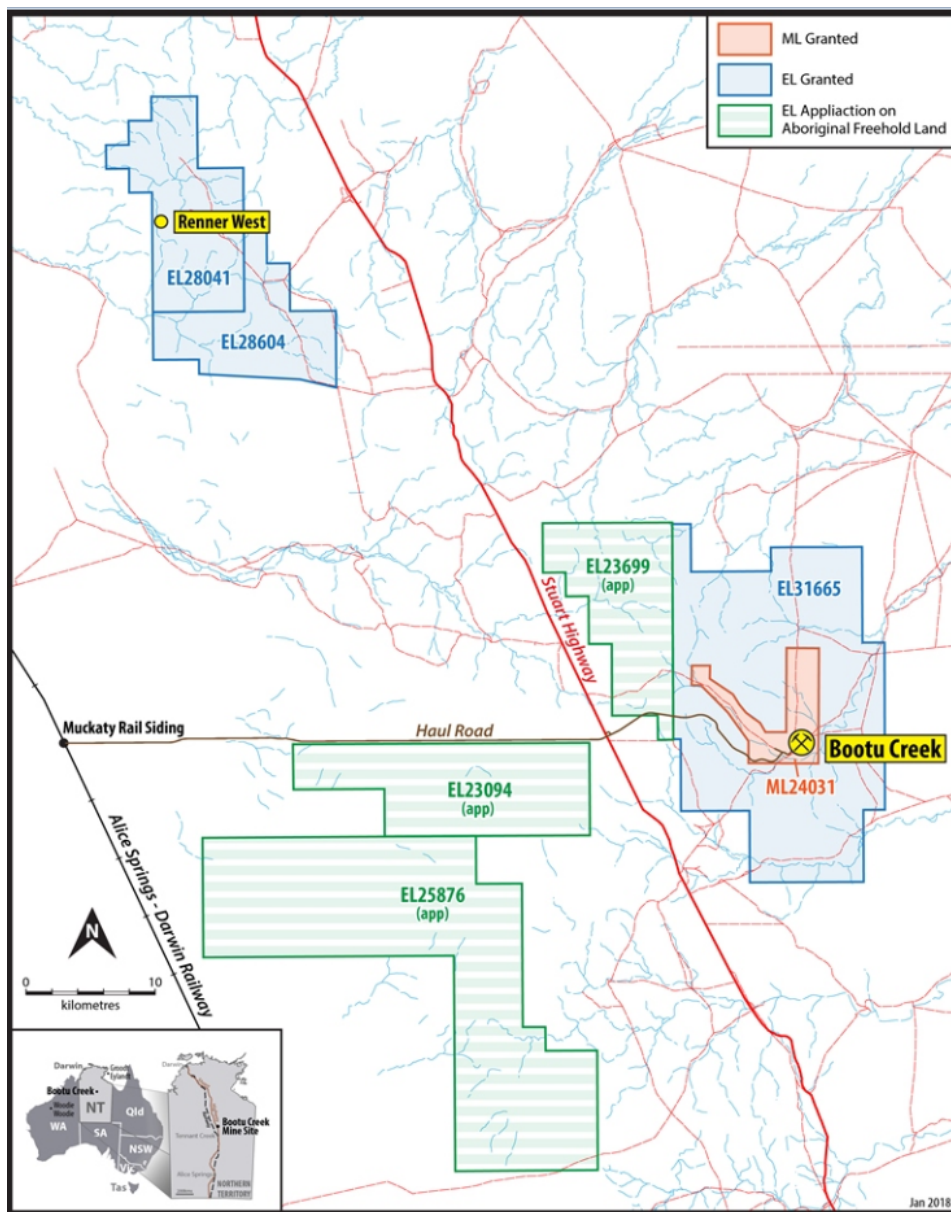
1. Introduction

This Environmental Management Plan (EMP) outlines the environmental risks and management strategies applicable to OM (Manganese) LTD (OMM) operations at the Bootu Creek Manganese Mine (BCMM). The purpose of this plan is to ensure that the environmental management system is established to effectively prevent and or minimise the risk of environmental harm resulting from operations.

1.1. Mine Location

The BCMM is located on Mining Lease 24031, situated within the Banka Banka pastoral station, approximately 900 kilometres south of Darwin, 120 kilometres north of Tennant Creek and 15 kilometres east of the Stuart Highway (Figure 1). Access to the site is via a two lane bitumen access/haul road off the Stuart Highway which culminates at the administration offices. All mining operations are conducted within Mining Lease 24031.

Figure 1: Bootu Creek Mine Site Layout



2. Project History

Bootu Creek Resources submitted a Notice of Intent (NOI) document to the then Department of Business, Industry, and Resource Development on 20 November 2003. The project was considered by a Project Review Committee in April 2004, and subsequently it was determined that the project warranted assessment using the Public Environmental Report (PER) process. The PER was submitted in July 2004 and placed on public display for three weeks. An Authorisation under the *Mining Management Act* was granted to develop a number of open cut pits and processing facility to and process mine manganese ore.

Construction commenced in October 2004 and was finalised by 31 October 2005. Mining commenced in November 2005 and has continued with several pits being constructed along the Eastern and Western limbs of the ore body within the granted ML24031. Ore is extracted through blasting and excavation. The excavated material is processed in a heavy media separation plant before being loaded onto trucks and transported to the Muckaty railway siding, which is located approximately 60 kilometres to the west of the operational area. Lump and fine manganese product is loaded into railway wagons and transported to the East Arm Wharf in Darwin for export.

Greater detail of the sequential mining process is provided below:

1. Removal of Vegetation and Topsoil. Vegetation and topsoil is cleared prior to pit and waste rock dump development. Cleared material is stockpiled for later use in rehabilitation works. Clearing is kept to the minimum required to safely conduct mining operations.

2. Removal and stockpiling of Waste. Waste is the material that comprises the overburden layer above the mineralized zone and the non-mineralized material surrounding the ore body. Waste rock is progressively stripped along the length of the ore body to expose the ore for removal. Waste material has been previously transported to engineered dumps adjacent to the open pits. All waste material mined since 2015 continues to be placed in pit as backfill.

3. Pit Dewatering. The primary aquifers in the mining area are the ore bodies. Groundwater is extracted throughout the mining process to ensure a dry pit floor and safe working areas. Groundwater is removed from operational areas via a network of dewatering bores and in pit sumps. All water is delivered to either the process water ponds for use in the processing circuit, pits identified for water storage, the Zulu pit for process water return or the two Chugga designated storage dams.

4. Mining. Extraction is carried out using a hydraulic excavator(s) and a fleet of trucks. Blasting of overburden and ore is generally required to fracture the material and allow easy excavation. Ore is transported to the main Run of Mine (ROM) stockpile adjacent to the processing plant.

5. Processing. The manganese ore is beneficiated in the processing circuit in a two stage process:

(i) Ore is blended, crushed, screened and washed.

(ii) Ore feed is beneficiated in a heavy media separation plant to produce lump manganese product via a drum separator and fines manganese product via a cyclone. The only chemical required in the process is Ferro-Silicon which is added to the processing water to create the heavy media. Ferro-Silicon is benign and recovered from the product and waste streams to the greatest extent possible.

6. Transport: Haulage road trains are used to transport lump and fine product to stockpiles at the Muckaty railway siding. The lump and fine product is loaded into rail wagons and transported to Darwin for export.

7. Tailings Produced. Waste material from the processing of the manganese ore (tailings) is discharged into the completed Zulu pit located nearby the plant. Tailings material was formerly discharged into a three cell above ground tailings storage facility and then into the expired Xhosa pit. The above ground facility was filled to capacity in 2012 and is now closed. The Xhosa facility was completed at the end of 2014. Coarse waste material rejected by the heavy media plants is stockpiled adjacent to the plant and if not processed will be rehabilitated in the same manner as waste rock dumps elsewhere on site.

8. Rehabilitation. Progressive rehabilitation of disturbed areas is ongoing during the life of the operation and will continue into the closure phase until areas are demonstrated as stable and sustainable. Stockpiled topsoil is spread over waste landforms and is seeded using locally collected seed as part of the rehabilitation process. The tailings storage facilities (TSF) will be rehabilitated following the closure of the processing plant operations.

3. Environmental Management System

OMM has developed an Environmental Management System (EMS) in accordance with Section 16 of the *Mining Management Act 2012*. The EMS provides a framework for managing environmental risks at the BCMM. The EMS ensures that the operation maintains high levels of environmental performance and minimises environmental harm. The EMS includes the following main components:

- **Approval Documents & Policy** - Mining Authorisation, Mining Management Plan, and OMM Environmental Policy.
- **Management Plans** - Mining Management Plan, Environmental Management Plan, Mine Closure Plan, Water Management Plan, Weed Management Plan, Erosion and Sediment Control Plan, Hydrocarbon Management Plan and the TSF Operations Manual.
- **Operational Control** - Procedures, work instructions, and environmental monitoring requirements.
- **Reporting** - Communicating performance outcomes and evaluating compliance; and
- **Continuous Improvement** - Reviewing practices and auditing compliance.

The EMS is non-static and will be reviewed during the life of mine to meet the needs of the Company and stakeholders. The EMS consists specifically of the nine elements shown in Table 1.

Table 1 - EMS Elements

	Element	Description	Documents
1	Environmental Policy	Details OMM's commitment to environmental management and provides objectives for the conduct of all employees and contractors.	EMP Appendix 1
2	Legislative Obligations and Commitments	Statutory requirements set the standard for minimum compliance by OMM, employees and contractors. Compliance to Company commitments for audits and inspections.	Compliance Register
3	Key Responsibilities	Key responsibilities and authorities are defined and documented within Management Plans, Procedures and Forms to facilitate effective implementation of the EMS.	MMP EMP
4	Education and Training	OMM will ensure appropriate training is provided for all personnel on site to meet its EMS requirements. All personnel are required to attend an induction prior to commencing work on site.	Induction EMP
5	Environmental Issues and Risks	Environmental risks associated with OMM's activities are identified, evaluated and managed. Environmental hazards identified by personnel are entered into a combined register with Occupational Health and Safety hazards for tracking and correction.	MMP EMP
6	Operational Control	OMM will ensure that Company standards, management plans, procedures, work permits and forms are effectively implemented to achieve environmental objectives associated with all aspects of its operations. Monitoring systems and procedures form the basis of measuring OMM's compliance with statutory requirements and performance with the EMS. OMM has an established inspection programme to ensure performance of contractors is consistent with EMS requirements.	MMP EMP Water Management Plan TSF Operations Manual Weed Management Plan MCP ESCP

	Element	Description	Documents
7	Audits and Review	<p>Audits, inspections and reviews allow for improvements to be integrated into the site's management plans and procedures.</p> <p>OMM site environmentalist will review the EMS annually to ensure it remains effective. The review will take into account:</p> <ul style="list-style-type: none"> • Statutory requirements to review EMS components such as the MMP. • Monitoring and audit results. • Input from Stakeholders. 	<p>MMP EMP ESCP MCP</p>
8	Communication	OMM will regularly consult with internal and external stakeholders.	MMP
9	Reporting	OMM will prepare internal and external reports on its activities.	<p>MMP EMP</p>

4. Environmental Management Plan

4.1. Objective

This Environmental Management Plan (EMP) describes the strategies implemented at the BCMM to mitigate actual and potential environmental risks resulting from site operations.

This EMP and the strategies contained are implemented to maintain compliance with the OMM Environmental Policy, statutory requirements, and agreements with the Northern Land Council. Further these strategies aim to ensure that operational activities are strictly limited to that which is necessary for the commencement, continued operations, and closure of the site.

4.2. Structure

The management strategies outlined in this EMP apply to all components of the project. All OMM project employees and contractors are expected to comply with the requirements of this EMP.

This EMP is presented in two (2) sections. The first section outlines the administrative components which support the EMP and forms the basis for effective implementation of the EMS. These administrative components include:

- The OMM Environmental Policy;
- Environmental performance objectives;
- Establishment of EMP Sub-Plans for specific areas of management;
- Environmental responsibilities;
- Consultation and reporting commitments;
- Auditing and reviewing processes;
- Resources; and
- Contingency planning and incident management.

The second section of the EMP details the BCMM's operational risks to environmental aspects and outlines the specific management strategies to achieve environmental objectives. Environmental management at the BCMM is divided into the following aspects:

- Emergency Preparedness and Response;
- Environmental Training;
- Soil and Land Management;
- Vegetation Management;
- Fauna Management;
- Waste and Hazardous Waste Management;
- Groundwater and Surface Water Management.
- Air Quality Management.
- Noise and Vibration Management.
- Cultural Heritage Management.
- Socio-Economic Management.
- Aesthetic and Visual Management.
- Rehabilitation and Closure management.

This EMP was developed in accordance with the *Template for the preparation of a Mining Management Plan* prepared by Department of Primary Industry and Resources and guidelines for the preparation and revision of environmental management plans developed and published by other Australian regulatory bodies and industry organisations.

5. Administration of the EMP

5.1. OM (Manganese) Ltd Policy

OM (Manganese) LTD believes that the protection of the environment is one of the key responsibilities of the company. Environmental management is an integral part of all activities at the Bootu Creek manganese mine.

The complete Environmental Policy is included in Appendix 1.

5.2. Performance Objectives

OMM have made the following environmental performance commitments:

- Effectively manage hazardous materials so as to prevent and control any uncontrolled release to the environment;
- Store and monitor tailings material generated by the processing operations within a suitably engineered facility to prevent egress to the environment;
- Regularly monitor water management infrastructure to ensure that water contained in ponds, dams, and the TSF does not escape from the mining lease and or impact environmental values;
- Manage and use topsoil appropriately to avoid loss of condition and viability in order to enhance rehabilitation outcomes;
- Rehabilitate disturbed areas as soon as practical to reduce the total disturbance footprint and to allow time for monitoring and improvement;
- Rehabilitate waste rock landforms to minimise erosion and landform instability, reduce visual impacts and maximise regrowth;
- Monitor and control the distribution of declared weed species;
Continuously monitor environmental condition and identify risks to inform corrective action and improvement.

5.3. EMP Sub-Plans

Effective environmental management relies on the implementation of plans and procedures to guide operational activities that are high risk. This EMP provides a general overview of all environmental management at the BCMM. Specific information and details is included in the relevant environmental management sub-plans listed below:

- Emergency Preparedness and Response Plan (OHS);
- Mine Closure Plan;
- Water Management Plan;
- Weed Management Plan;
- Erosion and Sediment Control Plan;
- Hydrocarbon Management Plan; and
- Tailings Storage Facility (TSF) Operation Manual.

5.4. Organisation and Environmental Responsibility

Compliance with the EMP is the responsibility of all personnel working at the BCMM. This is communicated through the environmental induction provided to new employees and contractors. Line management is responsible for ensuring staff and contractors, within their areas of responsibility, are aware of their requirements, under the EMP, and for ensuring that their specific activities are conducted compliantly. Accountability for the implementation of the EMP lies with the site

environmentalist. Additional technical environmental advice is provided by external resources where required. Engagement and provision of adequate resources for external support is the responsibility of the Resident Manager.

The site environmentalist reports to the Administration Manager who oversees site administrative activities and the Health and Safety, Environmental and Community (HSEC) roles. The Administration Manager is responsible to the General Manager and assesses and reviews the performance of the site environmentalist.

The site environmentalist is appointed to:

- Ensure that all activities at BCMM are undertaken in compliance with this EMP and all applicable environmental regulations;
- Provide environmental expertise to the management team and, with support of the General Manager, coordinate environmental management activities;
- Advise regulatory authorities in a timely fashion of significant environmental incidents or non-compliance with applicable regulatory standards are exceeded;
- Ensure environmental monitoring programs are undertaken per annual schedule and meet quality objectives;
- Ensure environmental data is appropriately managed, reviewed and, if necessary, implement corrective action;
- Conduct routine site inspections/audits to assess the proper functioning of the environmental management system and compliance with the EMP;
- Prepare environmental reports as required;
- Ensure environmental training is provided to employees and contractors; and
- Ensure that disturbed areas are rehabilitated as soon as practicable.

The General Manager's has accountability to :

- Ensure that activities at the BCMM are conducted in a manner that is compliant with the EMP and all applicable environmental regulations;
- Ensure outcomes of external audits are addressed to improve the functioning of the environmental management system;
- Establish and maintain dialogue with appropriate regulatory authorities and the Northern Land Council regarding environmental management at the BCMM;
- Ensure adequate resources are made available for achieving the objectives of the EMP; and
- Ensure the emergency response team is prepared to respond to environmental emergencies.

5.5. Emergency Preparedness and Response

Personnel have been designated and trained to activate and implement the Bootu Creek Emergency Preparedness and Response Plan in reaction to onsite and offsite accidental releases, or major environmental emergencies that may occur. Additional information regarding the Emergency Preparedness and Response Plan is detailed in Section 7.1.

5.6. Consultation

At a local level, OMM will ensure that periodic meetings with key stakeholders are held as necessary throughout the project to discuss and address environmental and other issues.

OMM will meet with Government agencies as required. At these meetings it is expected that environmental issues will be discussed and decisions made regarding specific follow-up and/or corrective actions.

5.7. Environmental Reporting

The site environmentalist at the BCMM prepares and distributes the reports described below to maintain compliance with the regulatory and stakeholder commitments.

5.7.1. Internal

Weekly and monthly reports are prepared and distributed to heads of departments, senior management, and the board of directors. These reports update senior personnel on the progress of projects, the completion of routine environmental management activities, details of any environmental incidents, and the implementation of respective corrective actions.

5.7.2. External

An annual report detailing environmental management and monitoring activities undertaken over the previous 12 months is distributed to the Department of Primary Industry and Resources (DPIR), the Northern Land Council (NLC), the Manungurra Aboriginal Corporation (MAC), the owners of the underlying stations and the Darwin Port Authority. These reports outline performance against the statutory requirements and commitments made during the pre-operational review.

A National Pollutant Inventory (NPI) report is submitted to the NT Environmental Protection Agency through an online reporting tool on an annual basis for each of the registered facilities.

A National Greenhouse and Energy Report (NGER) is submitted to the National Clean Energy Regulator on an annual basis for each of the registered facilities.

5.8. Environmental Audits and Review

5.8.1. Annual Audits

On an annual basis during the operations phase, OMM will conduct an internal compliance audit of all its facilities. If possible the audit will be timed so that it coincides with regular monitoring activities to facilitate the observation and review of the related methodologies and procedure. The scope of the audit will review a range of aspects including:

- Compliance with legislation, Australian Standards, and internal approval documentations;
- Compliance with the MMP, EMPs and regulatory requirements;
- Environmental monitoring practices, data, and records;
- Reports and reporting processes;
- Inspection records and associated corrective actions implemented;
- Auditing and improvement processes;
- Information or management gaps; and
- Issues relating to environmental resourcing.

The results of the audit will be included in the Annual Environment Report (AER) and distributed to the regulatory authorities, the Northern Land Council, the Manungurra Aboriginal Corporation and other important stakeholders. The next internal audit is scheduled to be undertaken prior to 31 March 2019.

The DPIR also undertake external compliance audits to assess environmental management against the various plans and commitments. The last external audit was completed in July 2018.

5.8.2. Internal Inspections

Inspections of all work areas and discrete operational areas are undertaken monthly by each work area supervisor using a standard template. The site environmentalist reviews these records and coordinates corrective action as required. The site environmentalist maintains general oversight of all areas and completes a formal all of site inspection at a minimum of every 6 months.

5.8.3. Environmental Management Plan Review

The EMP shall be reviewed annually, in conjunction with the development of the annual update of the Mining Management Plan (MMP). The review process will ensure that the key environmental strategies adopted by OMM to manage the project are adequate to achieve the objectives of the company's Environmental Policy, statutory environmental requirements and the Deed between the Northern Land Council and OMM.

5.9. EMP Resourcing

A number of resources are required to implement the management strategies of the EMP. The list below summaries the key resources necessary to undertake works related to each of the management aspects, however additional resources may be required on occasion.

Table 2 - EMP Key Resources

Management Aspect	Resources
Emergency Preparedness and Response	<ul style="list-style-type: none"> • Fire-fighting equipment including water cart; and • Emergency spill response material (i.e. absorbent pads/material)
Soil, Land and Vegetation Management	<ul style="list-style-type: none"> • Earth moving machinery (i.e. dozer, grader, excavator); • Culverts • Weed control equipment (i.e. herbicide and spray kits); and • Bio-remediation equipment and product.
Fauna Management	<ul style="list-style-type: none"> • Feral animal traps; • Fencing equipment and materials; and • Landholder assistance/support for larger eradication programs.
Air Quality Management	<ul style="list-style-type: none"> • Water Truck (dust suppression); • Air Monitoring Equipment/external resourcing/laboratory analysis/filters • PPE
Noise and Vibration Management	<ul style="list-style-type: none"> • Noise monitoring equipment/external resourcing
Groundwater and Surface water Management	<ul style="list-style-type: none"> • Maintained bores • Water quality monitoring device • Water sampling pole • Standing Water Level monitoring device and consumables (i.e. sensor probes and calibration solution); • Laboratory analysis and sampling consumables (i.e. filters/syringes) • Water Treatment System infrastructure, filters and disinfectant (potable supply) • Flow meters on pumps and processing plants
Waste and Hazardous Materials Management	<ul style="list-style-type: none"> • Secondary containment pallets; • Spill kits; and • Bins (i.e. general and recycling).
Rehabilitation and Closure Management	<ul style="list-style-type: none"> • Native seed and external resources for spreading; and • Earth moving equipment (i.e. dozer)

6. Environmental Aspects and Impacts

An overarching environmental risk assessment is maintained as the Environmental Aspects and Impacts Register. Environmental aspects and potential impacts resulting from operations at the BCMM have been previously assessed, across the whole of site, with information being drawn from experienced personnel, available guidance notes and literature, and operational observations.

Significant environmental aspects and the potential impacts relevant to the BCMM are summarised within the table below. The formal risk assessment has been included in Appendix 2.

Table 3 - Identification of Aspects and Impacts

Environmental Aspect	Operational Activity	Potential Environmental Impact
Air	<ul style="list-style-type: none"> • Operation of mobile plant and equipment • Operation of fixed plant and generators • Ground disturbance and vegetation clearing 	<ul style="list-style-type: none"> • Exhaust emissions • Generation of dust • Generation of noxious vapours • Point source particle emissions
Surface and Ground Water	<ul style="list-style-type: none"> • Storage of hazardous materials • Servicing and refuelling of equipment • Pit dewatering • Dust suppression • Watercourse diversions • Pit water containment • Ore body oxidation impacts on pit water • Landform erosion to storm water • Groundwater use for consumption 	<ul style="list-style-type: none"> • Unplanned release/escape/discharge resulting in Toxicity or stress to aquatic habitats and or livestock • Diffuse runoff resulting in toxicity to aquatic habitats and or livestock • Contamination of surface water resource • Contamination of groundwater resource • Depletion of groundwater resource • Alteration of surface water flow regimes
Land	<ul style="list-style-type: none"> • Storage of hazardous materials • Servicing and refuelling of equipment • Ground disturbance and vegetation clearing • Stockpiling topsoil • Stockpiling waste rock/waste rock dump construction 	<ul style="list-style-type: none"> • Accidental spill or soil contamination • Erosion • Unapproved clearing • Topsoil sterilisation • Spreading weeds • Impacts to successful rehabilitation
Flora	<ul style="list-style-type: none"> • Ground disturbance and vegetation clearing • Operation of mobile plant and equipment 	<ul style="list-style-type: none"> • Weed introduction • Alteration of habitat • Alteration of water flow regimes • Alteration of fire regimes • Vegetation die back
Fauna	<ul style="list-style-type: none"> • Ground disturbance and vegetation clearing • Operation of mobile plant and equipment • Tailings storage 	<ul style="list-style-type: none"> • Pest introduction • Weed spread • Alteration of habitat • Alteration of water flow regimes • Alteration of fire regimes • Fauna mortality
Energy and Resource use	<ul style="list-style-type: none"> • Operation of mobile plant and equipment • Pit Dewatering 	<ul style="list-style-type: none"> • Generation of greenhouse emissions • Depletion of groundwater resource

Waste	<ul style="list-style-type: none"> • Catering operations • Machinery servicing 	<ul style="list-style-type: none"> • Generation of food wastes • Increase in rodent and feral animal populations • Fauna mortality • Generation of inert wastes • Generation of waste hydrocarbons • Generation of waste tyres
Heritage	<ul style="list-style-type: none"> • Mining Operations 	<ul style="list-style-type: none"> • Damage to significant habitat • Damage to sacred sites • Damage to heritage areas • Restriction of access to significant sites

7. EMP Implementation

This EMP presents the overarching BCMM environmental management strategies relevant to each environmental aspect within this section in tabular format. Each subsection contains the following details:

- The likely operational issue, scenario, or impacts affecting the environmental aspect;
- Specific management objectives and targets to address each issue/impact;
- Responsibilities and accountabilities;
- Detailed management strategies;
- Monitoring and reporting requirements;
- Contingency planning; and
- Associated operational documentation.

7.1. Emergency Preparedness and Response

Emergency Preparedness and Response	
Potential Issues or Impacts	Natural disasters and operational emergencies beyond routine operational control that threaten life, property and/or the environment.
Objectives	<p>OMM objectives for Emergency Preparedness and Response are to ensure:</p> <ul style="list-style-type: none"> • A safe environment for all employees, contractors and visitors. • The identification and management of all significant environmental risks. • The existence of a system for managing emergencies and an appropriate degree of emergency preparedness. • Response to emergencies is based primarily on the preservation of human life and the safety of emergency response personnel. • Containment of emergencies and their effects within the project boundaries. • Cooperation with external emergency response organisations. • A safe return to normal operations.
Targets	To develop and implement an Emergency Preparedness and Response Plan (EPRP) incorporating the measures below to the satisfaction of DPIR.
Responsible persons	<ul style="list-style-type: none"> • Development and implementation of the EPRP will be the responsibility of the Chief Operating Officer. • Development of the environmental components of the EPRP will be the responsibility of the site environmentalist in consultation with the Heads of Department. • The scope and content of information required to be included within the EPRP is detailed below.
Management Strategies	<p>As a minimum, in support of the EPRP the following management measures shall be implemented during site operations where appropriate.</p> <p><i>Offsite Chemical and/or Fuel Spill:</i></p> <p>The simple nature of the OMM's operation is reflected in its limited hazardous substances (diesel, lubricants, and explosives), which are delivered to the remote site via trucks. This poses a risk along the entire transportation route due to the possibility of traffic accidents and the associated potential for a spill.</p> <p>To ensure preparedness for and response to an offsite chemical and/or fuel spill OMM will:</p> <ul style="list-style-type: none"> • Purchase chemicals and hydrocarbons from reliable suppliers who use well-qualified, experienced transport contractors. • Engage only reputable transport contractors that have sound emergency procedures in place, throughout the handling chain. • Require that all drivers be trained in emergency response and that the transport trucks carry appropriate spill containment and neutralising agents

Emergency Preparedness and Response

where necessary

Onsite Chemical and/or Fuel Spill:

To ensure preparedness for and response to an onsite chemical and/or fuel spill OMM will:

- Ensure that all chemicals and hydrocarbons in liquid form are stored in appropriate storage tanks that meet applicable standards or regulations.
- Ensure that all storage tanks are placed within secondary containment meeting the following requirements:
 - Secondary containment is impermeable.
 - Able to contain greater than 110% of the volume of the largest storage vessel or inter-connected system, and at least 25% of the total volume stored.
 - Graded or include a sump to allow recovery of liquid or equipped with filtered drainage systems.
 - Chemically resistant to the substances stored.
 - Include in the containment all valves, pumps and meters associated with transfer operations. Otherwise the equipment will be adequately protected (e.g. bollards) and contained in an area designated to permit recovery following accidents or vandalism.
 - Designed such that jetting from any storage vessel or fitting is captured within the bounded area.
 - Be designed such that chemicals that may react dangerously if they come into contact are to be stored in separate compounds.
 - Be controlled such that the capacity of the secondary containment is maintained at all times.
- In the event that a major onsite chemical and/or fuel spill occurs and offsite impacts are anticipated:
 - Notify regulatory authorities.
 - Implement containment, recovery and remediation actions.
 - Investigate underlying cause/s of the spill, and develop and implement measures to minimise the possibility of recurrence.

Tailings Pipeline Rupture:

To ensure preparedness for and response to a tailings pipeline rupture OMM has addressed response to a tailings pipeline rupture in the TSF Operations Manual.

Catastrophic Failure of Tailings Storage Facility:

To ensure preparedness for and response to a catastrophic failure of its TSF OMM will:

- Ensure that, as a minimum, it designs, constructs, operates, monitors and maintains its TSF and manages it as set out in the TSF Operations Manual and in accordance with the Australian National Committee on the Operation of Large Dams (ANCOLD) Guidelines.
- In the event of a catastrophic failure of its TSF:
 - Notify regulatory authorities.
 - If tailings are still being pumped to the TSF, shut down the pumps.
 - Use earth-moving equipment to construct berms across drainage channels to capture tailings solids and liquids to the degree possible.
 - To the extent practical, use onsite earth-moving equipment and local materials to reduce/eliminate further loss of tailings from the TSF.
 - Use excavators and trucks to pick up the spilled tailings and return them to the TSF.
 - Monitor water quality within the impacted areas until impacts are reduced to levels determined by Government authorities to be protective of public health and the environment.

Emergency Preparedness and Response	
	<ul style="list-style-type: none"> ○ If practicable, undertake treatment of tailings-impacted water. ○ Once the emergency has been resolved, notify, in conjunction with the regulatory authorities, downstream water users of the "All Clear". ○ Implement remediation of tailing-impacted areas. ○ Investigate basic cause(s) of the failure, and develop and implement measures to minimise the possibility of recurrence. <ul style="list-style-type: none"> ● Address response to the catastrophic failure of its TSF in its EPRP. <p><i>Extreme Precipitation:</i> To ensure preparedness for and response to extreme precipitation OMM will:</p> <ul style="list-style-type: none"> ● Undertake all of the actions indicated in the preceding Section entitled "Catastrophic Failure of TSF". ● Ensure that the TSF is designed, constructed, operated and maintained such that it is capable of containing all rainfall during/following the occurrence of a 72-hour precipitation event having a return period greater than 1 in 100 years. ● Ensure that a notification system is developed and implemented to ensure use of the site access road is controlled in high surface water flow periods. ● Ensure all drains and diversion structures are regularly maintained and no blockages exist prior to the wet season commencement. ● Ensure sufficient supplies are present on site to allow continuation of power generation and use of the camp. <p><i>Site and Bush Fires:</i> To ensure preparedness for and response to site and bush fires, OMM will:</p> <ul style="list-style-type: none"> ● Maintain adequate supplies of water onsite at all times to meet anticipated fire suppression requirements. ● Establish and maintain firebreaks around key infrastructure where necessary. ● Maintain fire-fighting equipment and water supplies available in good working order. ● Address response to site and bush fire in its EPRP. ● Develop and implement a hot work permit system to minimise the risk of fires being started as a result of OMM Activities. <p><i>EPRP Management:</i> Implementation of the EPRP will involve:</p> <ul style="list-style-type: none"> ● Distributing copies to individuals designated by the Operations Manager, placing others at strategic locations, and ensuring that all copies are updated. ● Training individuals with responsibilities for its implementation. ● Training all employees' in general emergency notification and evacuation procedures at the time of their employment. ● Organising and training an emergency response team in accordance with applicable regulations and codes. ● Conducting onsite and offsite emergency response training drills as necessary to ensure an effective response capability. ● Maintaining all emergency equipment, materials and supplies available and in good working order.
Monitoring Requirements	Details of EPRP training and equipment maintenance shall be recorded.
Reporting Requirements	<p>OMM shall conform with the following reporting requirements:</p> <ul style="list-style-type: none"> ● The status and effectiveness of the EPRP shall be recorded within the annual Environmental Report. Details on training shall also be included. ● Environmental incidents will be reported to the DPIR. ● Environmental incidents shall be recorded and a summary reported within the

Emergency Preparedness and Response	
	Annual Environmental Report.

7.2. Environmental Training

Environmental Training	
Potential Issues or Impacts	Increased environmental risk as a result of lack of awareness, or understanding, of the appropriate management practices required to minimise impacts to the environment.
Objectives	OMM objectives for environmental training are to raise OMM employee and contractor awareness of relevant project environmental issues and their environmental responsibilities. OMM will undertake specific training courses to ensure that all employees and contractors are aware of the control measures to be employed at the BCMM to manage environmental impacts.
Targets	To develop and implement an Environmental Training Program to ensure an appropriate level of environmental awareness amongst the workforce.
Responsible Persons	The development and implementation of the Environmental Training Program at OMM is the responsibility of the site environmentalist. The site trainers are responsible for scheduling training hours and ensuring attendance of employees and contractors.
Management Strategies	The development and implementation of the Environmental Training Program for the operations phase will involve: <ul style="list-style-type: none"> Continued delivery of a general site environmental awareness module for its employees and contractors that address their general responsibilities pursuant to this EMP. The module is delivered to employees and contractors at the commencement of their work as part of the induction process. Identify additional environmental training needs that may be required for people involved in specific functions such as emergency preparedness and response. Prepare and deliver additional training as identified. Review environmental procedures for contractors, such as the ore haulage contractors, and external service providers, such as the bulk fuel delivery contractors, to ensure personnel are adequately trained to address environmental incidents.
Monitoring Requirements	Annually review the implementation of the operation management measures. Annually review the environmental training program and materials to ensure that it remains current.
Reporting Requirements	<ul style="list-style-type: none"> Prepare a summary report on the implementation of the operation management measures and the review of the training materials for incorporation into the Annual Environmental Report.

7.3. Soil and Land Management

Soil and Land Management	
Potential Issues or Impacts	<p>Potential land and soil management issues include:</p> <ul style="list-style-type: none"> • Lack of appropriate topsoil suitable for plant growth on waste landforms, the TSF and other disturbed infrastructure areas. • Compaction of topsoil surfaces by vehicles and mining equipment. • Erosion of rehabilitated surfaces particularly slopes of waste landforms or the TSF and the consequent impacts on revegetation success. • Possible contamination of soils by hydrocarbons and other substances. • Spreading of noxious weeds as a result of mining operations and transport of ore product to the rail siding. • Scouring of ephemeral creek beds as a result of discharge of excess water from mine dewatering operations.
Objectives	<p>OMM objectives for soil and land management are to:</p> <ul style="list-style-type: none"> • Minimise land disturbance including disturbance to soil, vegetation and watercourses. • Conserve soil to assist in the long-term rehabilitation of the site. • Minimise wind and water erosion on disturbed and constructed surfaces. • Prevent contamination of land surfaces as a result of mining activities. • Maximise use of contained seeds and microbes in topsoil. • Prevent or minimise introduction of soil borne diseases and weeds. • Minimise adverse impacts on adjacent pastoral activities.
Targets	Compliance with all management measures to achieve the objectives.
Responsible Persons	Overall responsibility for land and soil management rests with the site environmentalist. Contractors are responsible for implementing appropriate management practices and maintaining pollution control devices within their area.
Management Strategies	<p><i>Internal Ground Disturbance Permit:</i> A Ground Disturbance Permit will be completed to ensure all land clearing activities are undertaken in accordance with internal procedures and regulatory requirements. A copy of the Ground Disturbance Permit is contained in Appendix 3.</p> <p><i>Topsoil Management:</i></p> <ul style="list-style-type: none"> • All areas of proposed development will be stripped of topsoil to an average depth of about 0.5m. • Topsoil will be stripped and replaced directly on areas reshaped as part of the rehabilitation process wherever possible. This will ensure the seed bank and microbes contained in the topsoil assist in rapid revegetation. Where this is not possible, topsoil will be stockpiled for later use in the rehabilitation process. • Topsoil stripping and stockpiling will be undertaken in dry, preferably relatively still wind conditions to minimise dust generation and compaction of the topsoil when stockpiling. • Topsoil stockpiles will not exceed a height of two metres to ensure topsoil viability is maximised. <p><i>Rehabilitation:</i></p> <ul style="list-style-type: none"> • Rehabilitation will be undertaken progressively to minimise the disturbed area and minimise the topsoil stockpile storage period. • Slope gradients are controlled to minimise erosion and soil loss. • Rehabilitation areas are ripped on the contour after placing of topsoil to remove compaction, improve soil structure and improve infiltration capacity. <p><i>Vehicle Management:</i></p> <ul style="list-style-type: none"> • Vehicle movement is restricted to existing tracks wherever possible.

Soil and Land Management	
	<ul style="list-style-type: none"> • Where vehicles are to be used in undisturbed areas for the purpose of work (eg. exploration activities) and access tracks or other clearing is required, the site environmentalist will facilitate approval and record the areas cleared. • Vehicles and mobile equipment are to be parked only in designated parking areas. Vegetated areas will not be used for parking. • Vehicle access on rehabilitated surfaces will be prohibited except for management and monitoring purposes. <p><i>Erosion Control:</i></p> <ul style="list-style-type: none"> • Slope gradients on waste landforms and TSF embankments are controlled to minimise erosion and soil loss. • The site is routinely inspected as part of the actions identified in the Water Management Plan and the Erosion and Sediment Control Plan. If soil erosion is observed, appropriate remediation measures will be implemented. • That all water courses are monitored for levels of sediment load and turbidity and that strategies are implemented to control excessive sediment transportation into the Bootu Creek. • Scour protection measures are implemented at water discharge points to prevent scouring.
Monitoring Requirements	<p>The following monitoring requirements are applicable:</p> <ul style="list-style-type: none"> • The area of land clearing and land rehabilitated is accurately recorded. • The site is routinely inspected as part of the actions identified in the Water Management Plan. If soil erosion is observed, appropriate remediation measures will be implemented.
Reporting requirements	<p>OMM shall conform with the following reporting requirements:</p> <ul style="list-style-type: none"> • The area of land clearing and land rehabilitated will be accurately recorded and reported in the Annual Environmental Report. • Monitoring requirements contained with management plans will be reported in line with those plans.

7.4. Flora Management

Vegetation Management	
Potential Issues or Impacts	<p>Mining and processing of manganese ore at Bootu Creek poses the following issues:</p> <ul style="list-style-type: none"> Local surface disturbance will reduce the total area of vegetation communities and thus habitat areas in the immediate project area. Vegetation communities and species found in the Bootu Creek area are widespread regionally with no recognised rare or threatened species recorded. Spreading of noxious weeds as a result of mining operations and transport of ore product to the Muckaty rail siding.
Objectives	The objective of OMM is to minimise loss of habitat, species diversity and abundance, and re-establish appropriate habitat through rehabilitation. OMM will also endeavour to manage and control the spread of weed and pest species as a result of their operations.
Targets	Compliance with all management measures to achieve the objectives.
Responsible Persons	Overall responsibility for vegetation management rests with the site environmentalist.
Management Strategies	<p>Management and mitigation measures during operations to achieve the objective include:</p> <p><i>Internal Ground Disturbance Permit:</i></p> <p>The Ground Disturbance Permit (Appendix 3) is used to ensure all land clearing activities are undertaken in accordance with internal procedures and regulatory requirements.</p> <p><i>Weed Control:</i></p> <ul style="list-style-type: none"> Weeds will be controlled through prevention, monitoring and early eradication. A Weed Management Plan has been prepared and implemented. Earthmoving equipment entering the project area is required to have been thoroughly cleaned of all dirt and plant material prior to entering the site. <p><i>Revegetation:</i></p> <ul style="list-style-type: none"> Revegetation of disturbed areas is undertaken using locally sourced native seed at an application rate of five kilograms per hectare. The effectiveness of rehabilitation programs will be assessed annually.
Monitoring Requirements	<p>OMM will conform with the following monitoring requirements:</p> <ul style="list-style-type: none"> The area of vegetation clearance will be recorded and tracked through use of the Ground Disturbance Permit process. The Environmental team will undertake riparian vegetation monitoring at locations downstream of the operations to assess the potential impact of mining activities on local vegetation. The effectiveness of rehabilitation programs will be assessed annually.
Reporting Requirements	<p>OMM shall conform with the following reporting requirements:</p> <ul style="list-style-type: none"> Areas of disturbance shall be reported in the Annual Environmental Report. Results of the vegetation assessment at excess water discharge points shall be reported in the Annual Environmental Report. The effectiveness of rehabilitation programs will be assessed and reported annually.

7.5. Fauna Management

Fauna Management	
Potential Issues or Impacts	<p>Mining and processing of manganese ore at Bootu Creek poses the following issues:</p> <ul style="list-style-type: none"> • Removal of native fauna habitats as a result of vegetation clearance. • Potential adverse impacts on species of conservation significance likely to occur within the regional area. • Attraction of feral animals such as donkeys and cats. • Attraction of migratory and water birds and feral animals to freestanding water. • Death of animals on mine roads and the ore product transport road. • Creation of mosquito breeding habitat, particularly where freestanding water is allowed to exist for more than a five-day period. <p>Fauna found in the Bootu Creek area is widespread regionally with no recognised rare or threatened species recorded. Local surface disturbance will remove habitat in the immediate project area. Overall the impact will be minimal with loss of faunal habitat locally significant, but regionally minor. Re-colonisation of disturbed areas will occur as vegetation is progressively re-established and as the site is decommissioned on cessation of activities.</p>
Objectives	OMM objective is to minimise loss of species diversity and abundance, and re-establish appropriate habitat through rehabilitation.
Targets	Compliance with all management measures to achieve the objectives.
Responsible Persons	Overall responsibility for fauna management rests with the site environmentalist.
Management Strategies	<p>Management and mitigation measures during operations to achieve the objective include:</p> <ul style="list-style-type: none"> • No domestic animals or firearms are allowed on site. • Haulage routes will have speed restrictions in place to minimise fauna death on roads. The use of signage to restrict speed on main roads will also help reduce fauna deaths on project roads. • Minimisation of freestanding water on the TSF using the management practices detailed within the TSF Operating Manual will make it less attractive for migratory water birds. • Regular burial of waste at the site landfill will minimise the attraction of feral animals to the project area. • Drains will be regularly maintained and operational areas graded to minimise the risk of water ponding after runoff events. • All plumbing infrastructure will be regularly maintained to minimise leaks and potential ponding; • Sewage effluent will be disposed of in a manner that is compliant with NT Code of Practice to prevent attraction of feral animals and or ponding.
Monitoring Requirements	<p>OMM shall conform with the following monitoring requirements:</p> <ul style="list-style-type: none"> • All water storage dams, including the TSF, will be observed on a regular basis for fauna mortalities. • The duration of standing water in operational areas will be recorded.
Reporting Requirements	<p>OMM shall conform with the following reporting requirements:</p> <ul style="list-style-type: none"> • Mortalities of species of conservation significance will be reported to the Parks and Wildlife Commission and the DPIR and documented in the Annual Environmental Report. • Animal mortalities attributed to the project shall be documented in the Annual Environmental Report.

7.6. Air Quality Management

Air Quality Management	
Potential Issues or Impacts	<p>Potential impacts from air emissions associated with the project are expected to be minimal. The remote location of the project and the absence of nearby residential facilities also limits any adverse impact that air emissions are expected to have on the local or regional environment or human health.</p> <p>Potential air quality issues include:</p> <ul style="list-style-type: none"> • Generation of dust from stripping and replacement of topsoil and overburden, excavation of ore and vehicle movement on unsealed roads. • Generation of dust during transport of product ore from the mine site to the railway siding. • Wind erosion of product ore during stockpiling at the siding. • Wind erosion of tailings from dry TSF surfaces. • Generation of dust whilst loading product ore from stockpiles into rail containers. • Gaseous emissions from engine exhausts of earth moving equipment and mine vehicles. This includes carbon monoxide, carbon dioxide and nitrous oxides.
Objectives	<p>OMM objectives for air quality are to minimise point and fugitive emissions and, thereby, ensure optimal onsite and offsite air quality.</p>
Targets	<p>Compliance with all management measures to achieve the objectives.</p>
Responsible persons	<p>Overall responsibility for air quality management rests with the Chief Operating Officer. OMM managers are responsible for implementing appropriate management practices and maintaining pollution control devices within their area.</p>
Management Strategies	<p>OMM will take reasonable and practicable measures to prevent or minimise the generation of dust from all mining, materials handling operations, stockpiles, open areas and transport activities.</p> <p>Management and mitigation measures outlined in the following sections will minimise potential risks to the environment.</p> <p><i>Point Sources:</i></p> <p>The primary point sources during operations have been identified as:</p> <ul style="list-style-type: none"> • Ore crushing and conveying facilities. • Ore processing facilities. • Principal electrical generation facilities. <p>To minimise its point source emissions OMM will ensure:</p> <ul style="list-style-type: none"> • Emission control equipment is installed for activities that could generate emission levels of concern, including, but not limited to dust and exhaust emissions from diesel combustion engines. • Diesel combustion engines in stationary and mobile equipment and diesel-powered electric generators will be operated and maintained to minimise emissions of combustion gases. • Pollution control devices, such as dust extractors and sprinklers installed at point sources will be maintained and operated in good working order. <p><i>Fugitive Sources:</i></p> <p>The primary fugitive sources during operations have been identified as:</p> <ul style="list-style-type: none"> • Blasting and haulage. • Onsite vehicle traffic. • Waste rock storage areas. • Other earthwork and construction activities. • Dry product stockpiles. <p>To minimise its fugitive emissions OMM will implement the following:</p> <ul style="list-style-type: none"> • Water trucks are used to control fugitive dust on all active mine areas, haul roads and parking areas.

Air Quality Management	
	<ul style="list-style-type: none"> • The movement of mobile equipment and vehicles is limited to established routes (such as haul roads and tracks) or areas where dust control methods can be used. • The speed of vehicles on the site is controlled with appropriate signage, for safety and also to minimise the generation of excessive dust. • Vehicle and equipment will be regularly maintained to manufacturer's specifications to minimise exhaust emissions. • Equipment operators will remain in enclosed, air conditioned cabins to minimise exposure to dust emissions.
Monitoring Requirements	OMM undertake routine occupational hygiene monitoring of all work groups at the BCMM. Monitoring of personnel exposure to the inhalable and respirable size fractions of airborne dust and occupational noise is assessed annually.
Reporting Requirements	Air quality reporting is completed annually in accordance with National Pollutant Inventory (NPI) and National Greenhouse Emissions Reporting (NGER) requirements. A précis of these reports is presented in the Annual Environmental Report and is distributed to stakeholders.

7.7. Noise and Vibration Management

Noise and Vibration Management	
Potential Issues or Impacts	Potential impacts on the local environment or human health from noise and vibration are expected to be minimal due to the remote location of the mine and the absence of nearby community residential facilities.
Objectives	OMM objectives for noise and vibration are to minimise sources resulting in onsite and offsite impacts.
Targets	Compliance with all management measures to achieve the objectives.
Responsible Persons	Overall responsibility for the noise and vibration management rests with the Chief Operating Officer. Managers are responsible for implementing appropriate management practices and maintaining pollution control devices within their area.
Management Strategies	<p>The primary sources of noise and/or vibration during operations have been identified as:</p> <ul style="list-style-type: none"> • Mine blasting. • Ore processing and ancillary facilities (e.g. rail car loading). • Electric power generators. • Aircraft and vehicular traffic. • Equipment maintenance activities i.e. compressed air rattle guns. <p>Management and mitigation measures outlined below will minimise potential risks to the environment.</p> <ul style="list-style-type: none"> • Using engineered controls where justified. For example: <ul style="list-style-type: none"> ○ Reducing the noise from equipment by the installation of soundproofing around and on primary sources of noise such as the power generators and portable generators. ○ Reducing the vibration from equipment by the installation of shock-absorbing devices or materials around the primary sources of vibration such as the ore processing equipment. • Controlling blast intensities with the use of blasting delays. • Ensuring that hearing protection equipment is available and utilised in onsite areas with high noise sources.
Monitoring Requirements	OMM undertake routine occupational hygiene monitoring of all work groups at the Bootu Creek Manganese Mine. Monitoring of personnel exposure to the inhalable and respirable size fractions of airborne dust and occupational noise is assessed bi-annually.
Reporting Requirements	No specific noise and vibration reporting requirements are necessary.

7.8. Groundwater Management

Groundwater Management	
Potential Issues or Impacts	<p>Groundwater is the principal source of water at the Bootu Creek Manganese Mine and is used for mining, processing, dust suppression, fire water, consumption and domestic uses. Water only requires treatment for domestic uses. Water is extracted from production bores located along the ore body in addition to recovery from pit storage areas. This allows the water table to be locally lowered to allow mining within the pits below the normal water table. Discharges and other releases to the local groundwater regime could include domestic sewage effluent infiltrated via a leaching bed, seepage from the tailings storage facility and accidental releases of chemicals or fuels.</p> <p>Potential groundwater issues include:</p> <ul style="list-style-type: none"> • Lowering of localised groundwater levels as a result of mine dewatering. • Seepage of water from the TSF causing formation of a groundwater mound beneath the TSF. • Discharge of water from mine dewatering causing localised recharge of groundwater. • Adverse impacts on groundwater quality as a result of accidental releases of chemicals or fuels, seepage from the TSF and interaction with mine pits and waste landforms.
Objectives	The objective of groundwater management at the Bootu Creek Manganese Mine is to minimise the impact to regional aquifers and prevent the contamination of groundwater via chemical or hydrocarbon infiltration.
Targets	To implement the Water Management Plan incorporating the measures outlined.
Responsible Persons	Groundwater monitoring is the responsibility of the site environmentalist. Appropriate usage is the responsibility of line managers.
Operation Management Measures	<ul style="list-style-type: none"> • Extraction of groundwater is undertaken to the extent that is necessary to maintain dry and safe mining conditions. • Water extracted from in pit sumps, pit storage, and dewatering bores is retained on site and not permitted to discharge into local drainage channels and or be released off the mining lease without an approved Waste Discharge Permit. • Investigate potential longer-term impacts on groundwater that may result from the interaction of groundwater and surface rainfall stored within the open pits.
Monitoring Requirements	<p>To ensure that negative impacts to groundwater quality and level are not occurring, a comprehensive program for monitoring groundwater is undertaken. The monitoring program is described in the Water Management Plan.</p> <p>Key features of the groundwater water monitoring program include:</p> <ul style="list-style-type: none"> • Designation of water level and water quality sampling locations, including locations monitored for internal control purposes. The purpose, monitoring frequency, analytical parameters, trigger levels and compliance standards will be documented for each location. • Use of standardised water level monitoring and water sample collection, storage and dispatch procedures to minimise risk of sample contamination. • Use of a NATA or similar accredited laboratory for sample analysis. • Regular review of data generated by the ground water monitoring program by the Environmental Team. • In the event that review of monitoring data indicates that trigger levels are exceeded or abnormal results are received, additional samples will be collected to confirm the data and action plans developed to address the issue. • Annual review of the Water Management Plan to ensure it continues to meet the needs of the operations, regulatory authorities and other stakeholders.
Reporting Requirements	The reporting of monitoring results shall conform to the annual reporting requirements described within the Water Management Plan.

7.9. Surface Water Management

Surface Water Management	
Potential Issues or Impacts	<p>The proposed mining and processing operations pose the following issues:</p> <ul style="list-style-type: none"> • Erosion of ephemeral watercourse banks and beds as a result of diversion of flows/ or alterations. • Contamination of surface water as a result of release of pollutants associated with earthmoving, excavation and ore processing. Potential contaminants include sediment, manganese and hydrocarbons. • Increased water flow to select ephemeral streams as a result of interception and diversion of 'clean' water around operational areas. • Contamination of surface water runoff and soils as a result of flow over areas containing manganese spilt during loading of ore product from the siding stockpile into rail containers. • Contamination of surface waters due to release of sewage. • Overflow of the TSF. • Flooding of operational areas including the ore product haul road.
Objectives	The objective of surface water management at the Bootu Creek Mine is to prevent or minimise any deterioration of surface water quality through changes in pH, sediment load, salinity, chemicals and hydrocarbons and to minimise potential adverse effect of excess mine dewatering on natural drainage systems.
Targets	Implement the Water Management Plan incorporating the strategies below.
Responsible Persons	The development of the Water Management Plan will be the responsibility of the site environmentalist.
Management Strategies	During operations review the Water Management Plan annually in conjunction with the development of the Mining Management Plan to ensure that it continues to address the potential issues or impacts to surface water arising from operational activities.
Monitoring Requirements	<p>To ensure that negative impacts to surface water quality are not occurring, a comprehensive program for monitoring is undertaken. The monitoring program is described in the Water Management Plan.</p> <p>Key features of the surface water monitoring program include:</p> <ul style="list-style-type: none"> • Designation of water sampling locations. • Use of standardised water sample collection, storage and dispatch procedures to minimise risk of sample contamination. • Use of a NATA or similar accredited laboratory for sample analysis. • Regular review of data generated by the ground water monitoring program by the Environmental team. • In the event that review of monitoring data indicates that trigger levels are exceeded or abnormal results are received, additional samples will be collected to confirm the data and action plans developed to address the issue. • The annual review of the Water Management Plan to ensure it continues to meet the needs of the operations, regulatory authorities and other stakeholders.
Reporting Requirements	The reporting of monitoring results shall conform to the annual reporting requirements described within the Water Management Plan.

7.10. Waste and Hazardous Materials Management

Waste and Hazardous Materials Management	
Potential Issues or Impacts	<p>Bulk hazardous substances to be used within the operation will be limited to diesel, lubricants, explosives and a process reagent. Diesel storage tanks are located adjacent to the heavy vehicle workshop to allow refuelling of mining equipment. Explosives are stored in a purpose built magazine located on the south eastern side of the GoGo waste landform. Ferrosilicon is the only bulk processing reagent required to be used in the heavy media separation plant and is non-harmful.</p> <p>Given the relatively low volume, type and nature of the materials stored, operations at the Bootu Creek Mine pose the following issues:</p> <ul style="list-style-type: none"> • Spillage to the environment of hydrocarbons and hazardous chemicals used in the mining or associated activities. • Disposal of hazardous wastes generated during construction and operations including tyres, waste oil, grease and industrial waste. • Spillage of manganese ore product during transport to the railway siding. • Disposal of potentially acid generating waste rock. • Storage of explosives.
Objectives	<p>The objective of waste and hazardous materials management at the Bootu Creek Mine is to ensure:</p> <ul style="list-style-type: none"> • The safe transport, storage and use of all potentially hazardous materials. • Potential for accidental releases is minimised. • Accidental releases that do occur are mitigated as soon as practicable. • Waste generation is minimised and recycling of materials is maximised to the practical extent possible. • The long-term stability of onsite wastes.
Targets	Compliance with all management measures to achieve the objectives.
Responsible Persons	Overall responsibility for waste and hazardous materials management rests with the site environmentalist.
Management Strategies	<p>Management and mitigation measures that are implemented to achieve the objective include:</p> <ul style="list-style-type: none"> • Safety Data Sheets (SDS) are available and accessible within an internal database stored on the Intranet and at all work places where hazardous materials are used. • The design of chemical and hydrocarbon product storage tanks and secondary containment in accordance with <i>AS1940 Storage and Handling of Flammable and Combustible Liquids</i>. • Refilling of chemical and hydrocarbon product storage tanks is conducted by trained personnel. • Processing activities are conducted in areas where surface drainage can be captured to ensure overflows, spillages or leaks can be contained. • The introduction and use of new hazardous materials are evaluated and approved by the Environmental Superintendent and Health, Safety and Training Manager. • Hazardous materials are brought to the site in bulk packaging wherever possible. This practice is employed to minimise the number of containers and reduce the risk of spillage. • All mobile equipment and light vehicle servicing activities including wash down are conducted on impermeable surfaces. • The heavy vehicle workshop facility contains a purpose built wash down facility incorporating a hydrocarbon removal system. • An explosives magazine as been constructed and is operated in accordance with regulatory requirements. <p><i>Landfill:</i></p>

Waste and Hazardous Materials Management	
	<ul style="list-style-type: none"> • A solid non-hazardous waste landfill is operated onsite that only receives solid wastes that are classified as non-hazardous. • The design, construction, operation and closure of the onsite landfill conforms to all applicable regulations. • Domestic waste from the accommodation camps and offices is disposed in the onsite landfill. <p><i>Offsite Disposal:</i></p> <ul style="list-style-type: none"> • Hazardous waste generated by the operation is transported offsite to licensed waste disposal facilities where appropriate. • Solids removed from sewage treatment systems is treated as primary sewage and is disposed of in accordance with relevant health guidelines. <p><i>Incineration:</i></p> <ul style="list-style-type: none"> • Hydrocarbon contaminated materials such as oily rags, oil filters, grease drums etc. are incinerated using an electric powered turbo burner. Ash residue is transported to the site landfill. <p><i>Waste Rock:</i></p> <ul style="list-style-type: none"> • The waste landforms are designed, constructed and closed in conformance with all applicable regulations and are both physically and geochemically stable (i.e. not generating poor-quality run-off or seepage). • Progressive revegetation of waste rock landforms minimises slope erosion and maximises the quality of surface run-off. • Erosion that occurs on the slopes of waste landforms is repaired. <p><i>Tailings:</i></p> <ul style="list-style-type: none"> • Tailings deposition into the completed Zulu pit is ongoing. • A minimum operational freeboard of 0.35 metres will be maintained in the TSF. • A minimum total freeboard of 750 millimetres will be maintained in the TSF. • The Water Management Plan will address seepage from the TSF.
Monitoring Requirements	<p>OMM shall conform with the following monitoring requirements:</p> <ul style="list-style-type: none"> • Hydrocarbon inventories will be maintained at a sufficient level to ascertain losses to the system. • A register of all hazardous materials imported to the site or generated as a result of activities undertaken at the site is in use. An internal SDS register enables the documentation of the hazardous materials name, location, and storage method. • An inventory system for the management of bulk diesel is maintained by stores personnel. • Regular inspections will be conducted to ensure that waste landforms are being constructed in conformance with the approved design, in particular design slopes and drainage works. • Monitoring of the TSF as defined in the Water Management Plan. • Rehabilitation of contaminated sites will be undertaken in accordance with Australian Standards.
Reporting Requirements	<p>The reporting of monitoring results shall conform to the reporting requirements listed in Section 5.7.</p>

7.11. Cultural Heritage Management

Ethnographical and Archaeological Management	
Potential Issues or Impacts	<p>There are seven Sacred Sites identified within the mining lease. All of these sites have been identified via coordinates provided by the Aboriginal Area Protection Authority (AAPA). The boundaries of these sites are demarcated by a wire fence and are treated as exclusion zones for all personnel. No sites of European heritage significance have been identified during desktop and site surveys.</p> <p>Conducting mining activities and infrastructure development poses the following potential issues or impacts:</p> <ul style="list-style-type: none"> • Damage to Sacred Site by operational activities. • Causing offence via unauthorised personnel access or use of identified areas. • Damage to Sacred Site via unplanned movement or destabilisation of ground conditions.
Objectives	OMM's objective is to avoid damage to any identified ethnographical or archaeological site.
Targets	Compliance with all management measures to achieve the objectives.
Responsible Persons	Overall responsibility for ethnographical and archaeological management strategies rests with the Chief Operating Officer.
Operation Management Measures	<p>Management and mitigation measures during operations to achieve the objectives include:</p> <ul style="list-style-type: none"> • The general site induction includes information regarding the importance of cultural sensitivity, respect for land and protection of items of heritage significance. All employees and contractors participate in the induction prior to commencing work. • All identified sites have been fenced in accordance with AAPA certificate conditions and are exclusion zones for all personnel. • Ground Disturbance process is in place to ensure that new development and work activities within the mining lease is undertaken with full cognisance of site locations and exclusion zones. • If other significant Aboriginal artefacts are identified during mining operations these will be protected to avoid disturbance. Formal assessment of these areas will be undertaken by the relevant authorities, and protective measures applied, prior to any work occurring in the area.
Monitoring Requirements	OMM shall ensure that ground disturbance activities do not disturb ethnographical and archaeological sites.
Reporting Requirements	All employees and contractors will stop work in the immediate area and advise their Supervisor upon identifying any items of potential Aboriginal or heritage significance. AAPA and NLC will be contacted immediately in the event of items of potential Aboriginal significance being discovered during mining.

7.12. Socio-Economic Management

Socio-Economic Management	
Potential Issues or Impacts	<p>Potential social and economic impacts include:</p> <ul style="list-style-type: none"> • Increased local employment and business opportunities in the Tennant Creek area. • Increased use of Alice Springs-Darwin Railway. • Increased use of Darwin port. • Increased traffic movements as material is imported and exported from the project area. • Increased contribution to the Northern Territory and Federal economies as a result of royalties and payroll taxes. • Increased pressure on Tennant Creek accommodation and medical services. • Temporary change of land use from pastoral to mining.
Objectives	The OMM socio-economic objective is to minimise negative socio-economic impacts and enhance positive ones.
Targets	Compliance with all management measures to achieve the objectives.
Responsible Persons	Overall responsibility for socio-economic management rests with the Chief Operating Officer.
Management Strategies	<p>Management and mitigation measures during operations to achieve the objectives include:</p> <ul style="list-style-type: none"> • Ore transportation will not be undertaken on the Stuart Highway. • On completion of mining activities, infrastructure will be removed and the site rehabilitated to allow the pre mining land use to recommence. Infrastructure will not be decommissioned where agreement has been reached for post mining land users to take responsibility for infrastructure of value to them (eg: access road, water bores). • Employment opportunities will be advised to the Northern Land Council Tennant Creek Office. • Supply of goods and services will be preferentially sourced through local businesses where practicable. • Accommodation for employees and subcontractors will be provided on site. • First aid facilities will be established onsite for the duration of the project. These facilities will be manned by appropriately qualified employees. A relationship will be established between onsite Emergency Response and First Aid personnel and providers of equivalent services in Tennant Creek.
Reporting Requirements	<ul style="list-style-type: none"> • No specific socio – economic reporting requirements are necessary.

7.13. Aesthetic and Visual Management

Aesthetic and Visual Management	
Potential Issues or Impacts	The project is located in an area that is sparsely populated and the main operations will not be visible from the Stuart Highway. Consequently there will be negligible impact on public visual amenity and will mostly only affect future landholders. The main visible components of the project during operations consist of the process plant, waste landforms and TSF, open cut pit voids, and support infrastructure. Where practicable the mine voids will be partially backfilled with waste rock. The ore product transport road will cross the Stuart Highway via a purpose built underpass.
Objectives	The OMM aesthetic and visual management objective is to minimise the impact of the project site on the visual amenity.
Targets	Compliance with all management measures to achieve the objectives.
Responsible Persons	Overall responsibility for aesthetic and visual management measures rests with the Chief Operating Officer.
Management Strategies	<p>The following management and mitigation measures will be implemented to minimise visual impact:</p> <ul style="list-style-type: none"> • Access to the project site will be limited to employees and authorised visitors. • Permanent features that will remain after closure of the operation i.e. waste landforms and the TSF will be contoured and rehabilitated to blend in with the natural topography. • Areas of disturbance will be progressively rehabilitated with local provenance species. • Infrastructure which has not been identified as being desirable by the underlying land owners will be removed from site. • OMM will implement the Decommissioning and Closure Plan prior to the completion of mining activities.
Reporting Requirements	<ul style="list-style-type: none"> • No specific visual impact reporting requirements are necessary.

7.14. Rehabilitation and Closure Management

Rehabilitation	
Potential Issues or Impacts	<p>OMM has developed a Mine Closure Plan (MCP) for the Bootu Creek Mine. The MCP is reviewed annually to ensure that it accurately reflects the nature and extent of disturbance and the status of progressive rehabilitation activities.</p> <p>Potential issues or impacts associated with the rehabilitation of site disturbance include:</p> <ul style="list-style-type: none"> • Failure to rehabilitate the mine site to the satisfaction of regulatory authorities and thereby obtain a certificate of closure. • Incomplete or ineffective rehabilitation activities leading to environmental legacy issues. • Long term environmental damage as a result of mining and ancillary operations.
Objectives	<p>The primary objectives of OMM's Mine Closure Plan:</p> <ul style="list-style-type: none"> • To ensure the physical and geochemical stabilisation of all project components in the short and long term. • To conduct progressive rehabilitation of disturbed areas and habitat using local, native species. • The protection of the public, domestic animals and wildlife from injuries. • To provide safe stable landforms at the conclusion of operations. • To allow the pre mining land use (pastoral) to be restored once full decommissioning has been completed.
Targets	Compliance with all management measures to achieve the objectives.
Responsible Persons	Implementation and review of the Mine Closure Plan is the responsibility of the site environmentalist with the assistance of the Chief Operating Officer and relevant heads of department.
Management Strategies	<p>Management and mitigation measures during operations to achieve the objectives include:</p> <ul style="list-style-type: none"> • Ensure that areas disturbed are rehabilitated and revegetated as soon as possible to minimise erosion by water and wind. • Progressively revegetate portions of the waste landforms. • Assess the success of rehabilitation programs on an annual to biennial basis. • Where monitoring demonstrates that establishment of vegetation on areas rehabilitated is not satisfactory after two years, conduct necessary follow up work to enhance vegetation success. • Use local provenance species for rehabilitation of disturbed areas. <p><i>Temporary Closure:</i></p> <p>OMM will submit a Care and Maintenance Plan, as soon as possible, in the event of a temporary or short term closure. The Plan will cover all aspects required to minimise risk of personal injury, property damage, and environmental impacts, as far as practical, whilst the project is inactive. Specific temporary closure activities that will be performed by OMM include:</p> <ul style="list-style-type: none"> • Prior to the shutdown of the process facilities for Care and Maintenance, all ore on the Run-of-Mine ore storage pad will be processed. • Restricting access to buildings, open pit ramps, and other structures at the project site. • Securing electrical systems and de-energising circuits that are not required. • Removing surplus fuels, lubricants, chemicals and explosives and securing storage areas. • Maintaining drainage structures free of debris and sediments. <p><i>Waste Landforms:</i></p> <ul style="list-style-type: none"> • Waste landforms developed adjacent to each pit will be shaped so that they form stable landforms. • Waste rock landforms which are constructed abutting a natural ridge line will have

Rehabilitation

the constructed face battered to an angle of approximately 18 to 21 degrees.

- Freestanding waste rock landforms height will be limited to a maximum of 30 metres constructed in lifts of 10 metres. The final shaped profile will be gentle slopes (18 - 21 degrees) separated by a back sloping 10 metre wide berm (two degrees fall) to maximise water retention.
- The top surfaces of all rehabilitated waste rock landforms will be shaped as a concave surface to promote water infiltration rather than water shedding.
- Stripped topsoil will be directly applied to re-contoured areas where possible to maximise success of vegetation establishment.
- Stockpiled vegetation will be respread on re-contoured surfaces.
- Low bunds at the crest of each batter will be constructed to assist with surface water control on batters.
- Ripping along the contour will be conducted to assist with water infiltration and minimisation of erosion.
- Shaped landforms will be seeded using local provenance native seeds at an application rate of 5kg per hectare.

Open Pits:

- Prior to closure, evaluate pit wall stability in accordance with Government requirements.
- Construct abandonment bunds around remaining pit voids in accordance with Government requirements.
- Progressively placing waste rock within each pit to the greatest extent practicable as part of the final mining pass.
- Partially flooding each pit with groundwater as active groundwater abstraction ceases.
- Construction of a safety bund to prevent inadvertent vehicle and personnel entry to mined areas.

Tailings Storage Facility:

On closure of the facility, the tailings will be allowed to dry out and consolidate prior to rehabilitation of the top surface. The final TSF will comprise a gently undulating to level landform. Rehabilitation of the TSF will involve:

- Removal of tailings distribution and decant infrastructure for proper salvage and/or disposal.
- Allowing the tailings to dry out and consolidate prior to rehabilitation of the top surface.
- Covering the upper tailings storage facility surface with inert waste rock.
- Shaping the upper tailings surface to divert run-off from the structure in a controlled manner. Where necessary, permanent drains will be rock armoured to maximise long-term stability.
- Spreading topsoil on the shaped upper tailings surface.
- Scarify to 300 millimetres the shaped upper tailings surface to provide a friable seed bed and assist with surface water control.
- Applying seed to the scarified surface.

Infrastructure:

Remove infrastructure from the site. This will include the accommodation village, administrative offices, workshops, fuel storage tanks, generators, water diversion structures, power lines and water pipes. In implementing its Closure Plan OMM will:

- Prior to shutdown, clean up the process facilities and process any materials, including the run-of-mine ore storage pad.
- Identify and prepare a list of all equipment that can be donated to neighbouring communities, sold or recycled.
- Identify and remove for disposal, in an appropriate manner, hazardous material

Rehabilitation	
	<p>components of buildings, machinery and equipment.</p> <ul style="list-style-type: none"> • Demolish remaining buildings and other infrastructure, and dispose of the resultant demolition waste and any other non-hazardous materials that cannot be reused or recycled in an onsite landfill • Disturbed surfaces will be rehabilitated after removal of infrastructure. This will involve: • Removal of infrastructure from the site as it becomes redundant. • Treatment of localised contamination i.e. hydrocarbon spillages. Depending on the contaminant type and concentration, contaminated material may be removed or treated in situ. • Spreading of topsoil on reshaped surfaces. • Deep ripping of compacted surfaces. • Applying seed to ripped surfaces. <p><i>Water Supply Bores and Pipeline:</i></p> <ul style="list-style-type: none"> • Salvage pumps and other equipment not identified as being required and purchased by landowners. • Cap bores to allow for future use by landowners. <p><i>Landfill:</i></p> <ul style="list-style-type: none"> • Once the landfill is no longer required, ensure that it is closed in conformance with applicable regulations. Currently it is anticipated that the closure of the landfill will involve capping with a low permeability cover and revegetating. <p><i>Site Roads:</i></p> <ul style="list-style-type: none"> • Decommission non-essential roads including the re-establishment of natural drainage, via the removal of culverts, fill material and revegetating. <p><i>Site Revegetation:</i></p> <ul style="list-style-type: none"> • Revegetate areas that have been disturbed as a consequence of the project as soon as the related facilities have been decommissioned.
Monitoring Requirements	<p>Short, medium and long term monitoring requirements are detailed within the Mine Closure Plan. A security bond is held by the DPIR against the unlikely unplanned closure of the mine. A review of the security calculation and costing of closure activities is undertaken during the annual review of Mining Management Plan to ensure it remains consistent with the level of disturbance caused by the project at any specific time. As a minimum, the following monitoring measures will be implemented where appropriate.</p> <p><i>Groundwater:</i> Post closure groundwater monitoring will be conducted in accordance with the requirements of the DME until it can be shown by OMM that there will be no long-term impacts from the operation.</p> <p><i>Surface Water:</i> Post closure surface water monitoring will be conducted in accordance with the requirements of the DME until it can be shown by OMM that there will be no long-term impacts from the operation.</p> <p><i>Vegetation:</i> Annually inspect revegetated areas until the regulatory authority agrees that rehabilitation objectives have been achieved. Inspections will determine additional actions necessary to achieve the objectives such as providing water, fertiliser, reseeding, replanting and/or protecting (e.g. by fencing).</p> <p><i>Physical Stability:</i> Annually assess the following and, as appropriate and necessary, take corrective action:</p>

Rehabilitation	
	<ul style="list-style-type: none"> • The integrity of the TSF cover. • Ditches and spillways for signs of excessive erosion. • The integrity of waste landform rehabilitation, particularly the slopes. • The stability of the embankments of the TSF. <p><i>Relinquishment or Long Term Care and Maintenance:</i> Once it is established that the closure criteria have been achieved, OMM will negotiate the complete relinquishment of the lease to DOR. Prior to any negotiation to relinquish the lease and obtain bond money, OMM shall consult with and obtain approval from the Northern Land Council. As appropriate, the relinquishment will occur either in stages for portions of the lease or at one time for the entire property.</p>
Reporting Requirements	<p>OMM shall conform with the following reporting requirements:</p> <ul style="list-style-type: none"> • Report any rehabilitation research and field-testing within the Annual Environmental Report. • Report any rehabilitation undertaken within the Annual Environmental Report and in the Mining Management Plan. • Update the security calculation annually to reflect changes to disturbance footprint.

8. References

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Strategic Framework for Mine Closure, 2000. Australian and New Zealand Minerals and Energy Council and Minerals Council of Australia.

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URS, 2010. Bootu Creek Mine, Surface Water Monitoring Review.

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URS, May 2008. Bootu Creek Mine – Process Water Supply Augmentation.

Appendix 1: OM Manganese Environmental Policy



Environmental Policy

OM Manganese believes that protection of the environment is one of the key responsibilities of the company. We recognize that environmental management is an integral part of all activities, from exploration and mining to processing and exporting.

Maintaining high levels of environmental performances at our operations will benefit all stakeholders, including shareholders, employees, traditional land owners and the broader community.

To achieve and maintain high environmental standards, all employees at OM Manganese will specifically:

- Comply with applicable environmental laws, regulations and standards;
- Implement systems to identify, control and monitor environmental risks arising from operations;
- Co-operate with authorities and stakeholders in the development of standards aimed at further improving the protection of the environment and the community;
- Implement methods and strategies to prevent pollution, minimise wastes and conserve natural resources;
- Ensure that all company employees and contractors are aware of their environmental responsibilities and conduct activities with a high level of competence;
- Promote cross-cultural awareness and protect all identified sites of cultural and heritage significance;
- Have timely and effective communications with traditional land owners and others who may be directly affected by the company's operations;
- Communicate the intentions of the policy with employees, suppliers and contractors; and,
- Seek continuous improvement in the way that OM Manganese looks after the environment.

Fanie van Jaarsveld
Managing Director

September 2016

Appendix 2: Risk Assessment



OM (MANGANESE) LTD

Table 4 BCMM Environmental Risk Assessment

Potential Incident/ Unwanted Event	Environmental Impact	Initial Risk	Priority	Cause	Current Control	Resultant Risk	Priority
Open Pit							
Pit wall failure	Destabilisation and disturbance of immediate surrounds	M	17	Poor geotechnical understanding and pit development	Geotechnical investigations and engineered pit design	L	24
Overtopping / uncontrolled discharge	Aquatic habitat impacts from sediments, some toxicity from water quality	H	13	Insufficient storage capacity during extreme weather events	Water Balance Model and inventory monitoring Negative water balance	L	21
Loss of topsoil during pit development.	Insufficient topsoil available for rehabilitation.	H	13	Topsoil not stockpiled. Topsoil used for other applications. Topsoil covered by other material.	Stockpiling of topsoil for rehabilitation. Register of stockpile location, source, and duration of storage maintained.	L	21
Contamination of topsoil during pit development.	Topsoil rendered unavailable for rehabilitation or requires further treatment.	L	21	Spills and leaks. Weeds.	Stockpiles located to avoid disturbance and contamination. Weeds routinely assessed and eradicated.	L	24
Dewatering impacts on regional aquifer during pit development.	Decrease in groundwater level which may impact on vegetation in the area.	M	17	Dewatering.	Monitoring of SWL's throughout mine life. Surface water diversions into pit voids may be considered	L	24

Potential Incident/ Unwanted Event	Environmental Impact	Initial Risk	Priority	Cause	Current Control	Resultant Risk	Priority
	Change in regional water quality.				during decommissionion process.		
Impact on environment over time after pit closure.	Change in groundwater levels and quality (primarily salinity and eutrophication). Impact to stock. Attraction of feral animals to water source. Fauna trap.	H	14	Change in catchment features and groundwater recharge/discharge. Evaporative concentration. Pit filling up with water.	Bores in place to monitor any changes in groundwater levels and quality over time. Long term pit water quality modelling undertaken during life of mine. Possible stream diversions into pits.	L	22
Waste Dumps							
Saline drainage	Toxicity and stress to aquatic habitats	H	15	Poor waste rock characterisation subsequent and lack of suitable controls	Separation of ores from waste rock and isolation of this material from catchment	L	24
Changes in surface hydrology	Localised death in creeks or from ponding	M	18	Poor planning of waste dumping	Assessment of catchments and WRD locations	L	22
Placement and visual impact of waste landform on the surrounding landscape.	Aesthetics.	H	15	Inappropriate siting and design of waste dumps.	Limit of 30m high, 18 ^o batter slopes. Revegetation of waste landform.	L	24
Erosion of battered faces on waste landform.	Build up of sediment in stormwater drains and surface water systems. Windblown dust.	M	18	Insufficient revegetation of slopes to help stabilise batter. Surface water runoff. Wind erosion.	Progressive rehabilitation. Designed with concave surfaces, Inward sloping berm surfaces, rock armouring at water discharge points.	L	22

Potential Incident/ Unwanted Event	Environmental Impact	Initial Risk	Priority	Cause	Current Control	Resultant Risk	Priority
	Lack of rehabilitation. Visual impact.			General surface instability.			
Processing Plant							
Loss of reagent to the environment	Smothering of vegetation. Inhalable particulate generation	L	23	Loss of ferro silicon from mixing tanks, piping, and transfer pumps.	Processing circuit design. Containment of tailings transfer pipes. Recovery of ferro silicon within circuit.	L	23
Loss of product	Localised smothering of habitat	L	21	Poor erosion and sediment controls	Install and maintain erosion and sediment controls. Isolate ore dump catchment	L	23
Hydrocarbon spill	Contamination of soil, groundwater, and surface water.	L	21	Servicing and refuelling of mobile plant and equipment.	Service vehicle equipped with spill response materials. Refuelling of vehicles within bunded area. Storage of hydrocarbons on bunded pallet.	L	23
Tailings Storage Facility							
Structural damage to tailings wall.	Contamination of soil, groundwater and surface water.	H	16	Structural damage under extreme circumstances.	Implement remedial works if erosion occurs. TSF Design.	L	23

Potential Incident/ Unwanted Event	Environmental Impact	Initial Risk	Priority	Cause	Current Control	Resultant Risk	Priority
Overflowing of tailings dam.	Contamination of soil, groundwater and surface water. Loss of vegetation. Change in hydrology.	M	17	Extreme rainfall events. Cyclones. Human error.	Maintain freeboard as defined in the TSF Operations Manual. Earth bund around top of retaining wall to retain pipe failure.	L	23
Tailings seepage.	Contamination of soil, groundwater and surface water. Loss of vegetation. Change of hydrology. Change in groundwater levels and quality.	M	19	Inappropriate design of tailings dam.	Monitoring bores Toe drain and return sump to collect surplus water.	L	23
Air emissions from TSF.	Dust.	M	19	Dry surface.	Surface is constantly wet.	L	23
Explosives Management							
Emulsion spill	Nitrification of surface waters leading to flora/fauna mortality Infiltration of soil leading to groundwater contamination	H	17	Extreme rainfall events Containment structure failure	Emulsion is stored in self banded, aluminium clad steel tank. Spill kits available to prevent escape of inadvertant spills while loading. Established drainage preventing water ingress to facility.	L	21
Booster solution spill	Nitrification of surface waters leading to flora/fauna mortality Infiltration of soil leading to	H	17	Extreme rainfall events Containment structure failure	Emulsion is stored in self banded, aluminium clad steel tank. Spill kits available to prevent escape	L	21

Potential Incident/ Unwanted Event	Environmental Impact	Initial Risk	Priority	Cause	Current Control	Resultant Risk	Priority
	groundwater contamination				of inadvertant spills while loading. Established drainage preventing water ingress to facility.		
Discharge of Ammonium Nitrate	Nitrification of surface waters leading to flora/fauna mortality Infiltration of soil leading to groundwater contamination	H	17	Extreme rainfall events Containment structure failure	Ammonium Nitrate prill stored in secure sealed facility. Daily checks of storage area for security purposes and to assess for damage Shed constructed on elevated concrete pad to prevent water ingress	L	21
Power station							
Leakage of hydrocarbons from storage areas/pipelines (including underground pipelines).	Contamination of soil, groundwater and surface water.	L	22	Ruptured tank. Damaged pipelines. Damaged flanges/valves. Failing of automatic shutdown valves on tanks.	Self bunded diesel fuel tanks. Regular maintenance of automatic shutdown valves.	L	22
Workshop Facilities							
Spillage of hydrocarbons during bulk transport to site.	Contamination of soil, groundwater and surface water.	H	16	Vehicle accident causing ruptured or damaged containers on vehicles.	Emergency response procedures activated. Contain and collect spilled / contaminated area.	L	23

Potential Incident/ Unwanted Event	Environmental Impact	Initial Risk	Priority	Cause	Current Control	Resultant Risk	Priority
Hydrocarbon contamination while onsite.	Loss of resources. Contamination of soil, groundwater and surface water. Loss of resources.	L	22	Ruptured or damaged containers. Spillage while transferring, using or transporting hydrocarbons onsite.	All hydrocarbons spilled in workshops collected and put in contaminated dirt containers and sent of site. 44 gallon drums containing hydrocarbons and old batteries are within an earth bunded area. Main storage facilities located greater than 1 kilometre from nearest water course.	L	23
Hazardous material spills.	Contamination of soil, groundwater and surface water.	L	22	Transfer from one container to another. Damaged containers. Damaged hoses (if applicable).	Materials storage and recycling facilities at all workshops. Earth bund for batteries at all workshop facilities.	L	23
Waste Management							
General waste management, including landfill site.	Windblown litter. Leachate. Dust. Odour. Attracts vermin.	L	22	Inappropriate siting, design and operation of landfill site.	Burial in active face of waste landform immediately.	L	23
Disposal of sewage wastes	Environmental health risk. Attracts vermin.	M	21	Inappropriate siting, design and operation of septage disposal site.	Disposal sites selected and operated in accordance with measures stipulated in <i>Public Health Act</i> and Regulations and in	M	8

Potential Incident/ Unwanted Event	Environmental Impact	Initial Risk	Priority	Cause	Current Control	Resultant Risk	Priority
	Leachate. Odour.				the Code of Practice for onsite sewage and sullage treatment systems. Outlets are inspected weekly.		
Aboriginal, Historical, and Heritage sites.							
Damage to identified Aboriginal Sacred Sites	Destruction of sacred site. Prevention of access to sacred site. Loss of visual amenity around sacred site	M	17	operational activities impinging on identified sacred site areas.	Authority Certificate obtained from the AAPA. Stipulations made in certification documents adhered to. Exclusion fencing erected. Site locations recorded on survey plans and maps.	L	22
Damage to previously unmarked heritage sites	Destruction of site of significance. Loss of historical record	L	22	Operational activities inadvertently altering or destroying unmarked heritage areas/	Site wide survey for heritage areas prior to operations commencing. Personnel training in procedures to be followed upon discovery of heritage site.	L	23
Rehabilitation							
Ineffectual seeding.	Loss of vegetation. Slow growth rates.	M	18	Limit of topsoil or poor management. Lack of rain. Cyclone. Use of inappropriate species.	Research into appropriate species and times of the year when seeding is optimum.	L	23

Potential Incident/ Unwanted Event	Environmental Impact	Initial Risk	Priority	Cause	Current Control	Resultant Risk	Priority
Impacts on soils and degree of erosion.	Sediment build up in surface water and other drainage systems so water will find alternative route causing erosion and flooding of areas.	M	18	Lack of stormwater diversion systems.	Routine maintenance of drainage and sump systems.	L	23
Impacts of feral animals on rehabilitation.	Native and feral animals grazing rehabilitation and trampling slopes.	M	18	Feral animals on property. Stock from nearby stations coming onto site.	Fencing of rehabilitated waste dumps if grazing impacts rehabilitated waste landforms.	L	23



OM (MANGANESE) LTD

Appendix 3: Ground Disturbance Permit



Ground Disturbance Permit

Permit No.

GROUND DISTURBANCE PERMIT

GENERAL

The purpose of this Permit is to regulate the undertaking of all ground disturbance activities occurring within the Bootu Creek Mining Lease.

- Final approval must be granted by the Environmental Officer prior to any ground disturbance activities commencing;
- Each Department is required to complete the relevant section and provide signature; and
- All activities must be undertaken in manner that minimises the extent of disturbance as far as reasonably practicable and complies with all controls identified.

SECTION 1

(Applicant to Complete)

GDP APPLICATION

APPLICANT NAME:			
DATE OF APPLICATION:			
DISTURBANCE ACTIVITY (tick all relevant boxes)	<input type="checkbox"/> VEGETATION FELLING <input type="checkbox"/> TOPSOIL STRIPPING <input type="checkbox"/> VEGETATION PRUNING/SPRAYING	<input type="checkbox"/> EXCAVATION <input type="checkbox"/> DRAINAGE/EROSION <input type="checkbox"/> EARTHWORKS/ REHAB	<input type="checkbox"/> DRILLING <input type="checkbox"/> DIVERSIONS <input type="checkbox"/> OTHER
ACTIVITY PURPOSE/DESCRIPTION:			
ACTIVITY DETAILS:	LOCATION:		
	START DATE:		FINISH DATE:
	DISTURBANCE AREA (m²):		MACHINERY TYPE/S:
	STRUCTURAL DIMENSIONS: (if relevant)		UTILITIES PRESENT:
PLANS ATTACHED:			
WORK METHOD/SCHEDULE:			
DATE APPROVAL REQUIRED BY:			
OTHER COMMENTS:			

Prepared By	Reviewed By	Approved By	Issue Date	Rev Date	Rev No.	Page 1 of 4
Sarah Joyce	Andre de Villiers	Andre de Villiers	May 2018	May 2019	4	

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Ground Disturbance Permit

SECTION 2A (Environmental Officer)		ENVIRONMENTAL MANAGEMENT	
INSPECTION DATE:			
RISKS/HAZARDS IDENTIFIED:	<input type="checkbox"/> HABITAT <input type="checkbox"/> TOPSOIL <input type="checkbox"/> DIVERSIONS <input type="checkbox"/> WASTE <input type="checkbox"/> SURFACE WATER	<input type="checkbox"/> FAUNA <input type="checkbox"/> REHAB <input type="checkbox"/> SEDIMENTATION <input type="checkbox"/> SPILLS <input type="checkbox"/> GROUNDWATER	<input type="checkbox"/> WEEDS <input type="checkbox"/> CREEKS <input type="checkbox"/> EROSION <input type="checkbox"/> HERITAGE <input type="checkbox"/> OTHER
RISK DESCRIPTION:			
SPECIFIC CONTROLS:			
GENERAL CONTROLS:	<ul style="list-style-type: none"> Do not commence clearing of areas greater than 10 x 10 m without survey mark up. Where practicable minimise the area to be disturbed. Ensure equipment/machinery utilised is free from weed/seed prior to undertaking new disturbance. Manage all spills in accordance with site procedures i.e. control the spill, clean the spill and report. Report all spills. Spills greater than 20L will be classified as an incident. Do not leave any general waste/rubbish in the work area. Only conduct activities in approved areas. Notify the environmental officer if any wildlife is observed during the undertaking of this activity. Preserve all topsoil cleared in stockpiles (<2m in height) in area nominated by the Environmental Officer. Implement controls as advised, to minimise erosion/sediment runoff. 		
SECTION 2B (Environmental Officer)		ENVIRONMENTAL REVIEW	
REVIEW DATE:			
REVIEW CRITERIA:	HAVE ALL AVOIDABLE IMPACTS BEEN MINIMISED?	<input type="checkbox"/> YES	<input type="checkbox"/> NO
	HAS THE ACTIVITY BEEN UNDERTAKEN IN ACCORDANCE WITH SPECIFIED CONTROLS?	<input type="checkbox"/> YES	<input type="checkbox"/> NO
	WERE ALL NECESSARY CONTROLS IDENTIFIED AND IMPLEMENTED?	<input type="checkbox"/> YES	<input type="checkbox"/> NO
	IF ANSWERED NO, PROVIDE DETAILS:		

Prepared By	Reviewed By	Approved By	Issue Date	Rev Date	Rev No.	Page 2 of 4
Sarah Joyce	Andre de Villiers	Andre de Villiers	May 2018	May 2019	4	

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Ground Disturbance Permit

SECTION 3 (Utilities Personnel)		UTILITIES APPROVAL	
ELECTRICAL CLEARANCE:	WILL THE ACTIVITY INTERFERE WITH ANY ELECTRICAL INFRASTRUCTURE?	<input type="checkbox"/> YES	<input type="checkbox"/> NO
	IF YES, LIST DETAILS AND CONTROLS REQUIRED:		
CABLE/FIBRE OPTIC CLEARANCE:	WILL THE ACTIVITY INTERFERE WITH ANY CABLE/FIBRE OPTIC INFRASTRUCTURE?	<input type="checkbox"/> YES	<input type="checkbox"/> NO
	IF YES, LIST DETAILS AND CONTROLS REQUIRED:		
WATER/TAILINGS/SEWER CLEARANCE:	WILL THE ACTIVITY INTERFERE WITH ANY WATER INFRASTRUCTURE?	<input type="checkbox"/> YES	<input type="checkbox"/> NO
	IF YES, LIST DETAILS AND CONTROLS REQUIRED:		
OTHER:	ARE ANY OTHER ISSUES PRESENT?	<input type="checkbox"/> YES	<input type="checkbox"/> NO
	IF YES, LIST DETAILS AND CONTROLS REQUIRED:		
AUTHORISED BY:			
DATE:			
SIGNATURE:			

SECTION 4 (Health and Safety Dept.)		HEALTH AND SAFETY APPROVAL	
PERMITS:	ARE ANY OTHER PERMITS REQUIRED?	<input type="checkbox"/> YES	<input type="checkbox"/> NO
	IF YES, PROVIDE DETAILS:		
RISK ASSESSMENT:	HAS A RISK ASSESSMENT BEEN COMPLETED, IF REQUIRED?	<input type="checkbox"/> YES	<input type="checkbox"/> NO
	IF YES, PROVIDE DETAILS:		
OTHER COMMENTS:			
AUTHORISED BY:			
DATE:			
SIGNATURE:			

Prepared By	Reviewed By	Approved By	Issue Date	Rev Date	Rev No.	Page 3 of 4
Sarah Joyce	Andre de Villiers	Andre de Villiers	May 2018	May 2019	4	

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Ground Disturbance Permit

SECTION 5 (Environmental Officer)	PERMIT APPROVAL	
COMMENCE ACTIVITY:	APPROVAL GRANTED	<input type="checkbox"/> YES
DATE:		
APPROVED BY:		
SIGNATURE:		

SECTION 6 (Environmental Officer)	CLOSE-OUT APPROVAL	
ENVIRONMENTAL REVIEW:	ENVIRONMENTAL REVIEW COMPLETED	<input type="checkbox"/> YES
CORRECTIVE ACTIONS:	ALL CORRECTIVE/REHABILITATIVE ACTIONS IMPLEMENTED	<input type="checkbox"/> YES
CLOSE-OUT:	FINAL CLOSE-OUT GRANTED	<input type="checkbox"/> YES
DATE:		
APPROVED BY:		
SIGNATURE:		

PLEASE ATTACH ALL RELEVANT PLANS/MAPS ETC. HERE

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OM MANGANESE

Bootu Creek Exploration Area Terrestrial Ecology Technical Report

Prepared for:

OM (Manganese) Ltd
PO Box 279
WEST PERTH WA 6872

SLR Ref: 680.30027.00000-R01
Version No: -v1.0
November 2020

SLR 

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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with OM (Manganese) Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
680.30027.00000-R01-v1.0	9 November 2020	Matthew McIntosh	Sarah Smith	Sarah Smith

EXECUTIVE SUMMARY

SLR Consulting Australia Pty Ltd (SLR) was commissioned by OM (Manganese) Ltd (OMM) to undertake a baseline flora and fauna study within exploration leases (ELs) EL28041 and EL28604 to support the development of a mining management plan (MMP). The study area for this assessment included several exploration focus areas (Renner North, Renner Central, Carruthers North and Carruthers South) and was conducted over to 23 to 28 September 2020. A key focus of this baseline assessment was to identify the presence/absence of Commonwealth and Territory listed threatened fauna and flora species and other matters of relevant biodiversity and conservation significance within the study area.

Desktop assessments identified several Commonwealth and Territory listed threatened species as potentially occurring within the study area. However, ground-truthing assessments did not identify any threatened flora or fauna species, or prescribed matters of national environmental significance (MNES), within the study area. One significant and sensitive vegetation community (riparian vegetation), as identified within the Northern Territory (NT) *Planning Act*, was ground-truthed within the study area. No declared weeds were identified to be present within the study area, however several introduced flora and fauna species were identified, including Buffel Grass (*Cenchrus ciliaris*), Stylo (*Stylosanthes scabra*), and Cattle (*Bos taurus*).

Assessments of significant impacts to federally listed MNES and Northern Territory biodiversity and conservation matters identified that small to moderate scale development of the study area is not likely to result in a significant impact to any relevant matters. However, it is recommended that potential impacts to significant and sensitive riparian vegetation along watercourses and drainage lines within the study area is, in order of preference, avoided, minimised, or mitigated. Additionally, it is recommended that the general duties of owners and occupiers of land, identified within the *Weeds Management Act*, are adhered to for the life of the project.

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Appendix C	Ground-truthed Vegetation Communities
Appendix D	Flora Species List
Appendix E	Fauna Species List
Appendix F	Microbat Call Identification Report

CONTENTS

ABBREVIATIONS

ALA	Atlas of Living Australia
DAWE	Department of Agriculture, Water and the Environment
DBCA	Department of Biodiversity, Conservation and Attractions
DEE	Department of the Environment and Energy
DENR	Department of Environment and Natural Resources
DEPWS	Department of Environment, Parks and Water Security
EL	Exploration lease
EP Act	<i>Environment Protection Act 2019</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
MM Act	<i>Mining Management Act 2001</i>
MNES	Matters of national environmental significance
NVIS	National Vegetation Information System
NR Maps	Natural Resource (NR) interactive mapping tool
NT	Northern Territory
OMM	OM (Manganese) Ltd
PMST	Protected Matters Search Tool
SLR	SLR Consulting Australia Pty Ltd
TPWC Act	<i>Territory Parks and Wildlife Act 1976</i>
TEC	Threatened ecological community

1 Introduction

1.1 Project background

OMM hold ELs EL28041 and EL28604, which are located ~9 km west of Renner Springs and ~55 km north west of Bootu Creek mine, which is also operated by OMM (**Figure 1**). SLR was commissioned by OMM to undertake a baseline flora and fauna study within EL28041 and EL28604 in support of MMP application processes.

1.2 Study area description

The study area for the field survey encompassed several exploration focus areas within EL28041 and EL28604, including Renner West, Renner Central, Carruthers North, and Carruthers South (**Figure 2**). Due to the poor condition of access tracks, the Renner North exploration area was inaccessible during the September 2020 baseline assessment and has therefore been excluded from the study area in this report. Incidental observations of fauna, flora and notable habitat features were also undertaken along main access tracks to, and within, EL28041 and EL28604. Specifically, these incidental observations occurred along the north – south access track between Renner West and Carruthers South, and the east – west track used to access the study area. This east-west access track originated ~2km to the south of Renner Springs along the Stuart Highway and adjoined the north – south access track within the central regions of EL28041 and EL28604.

1.3 Purpose and objectives

The objective of this report is to describe current biodiversity values and relevant prescribed MNES and NT listed threatened species, in accordance with current NT and Commonwealth legislation (see **Section 1.4**), that occur within the study area. Additionally, this report describes the current occurrence and impacts of pest flora and fauna within the study area, and water sources and sensitive vegetation within the study areas as defined under the NT *Planning Act*. This is achieved by assessing results of field assessments undertaken to determine the presence/absence, extent and significance of biodiversity matters relevant to approvals for exploration and development of the study area.

The above was achieved through a desktop and field assessment examining:

- The occurrence of NT listed threatened species and MNES in accordance with current NT and Commonwealth legislation;
- The terrestrial flora and fauna biodiversity values within the study area; and
- The presence and status of species and communities identified to occur within the study area based on ground-truthing field assessments.

This is the first known terrestrial flora and fauna assessment conducted specifically to inform environmental approvals for development of the study area.




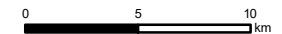
OM (MANGANESE) LTD FLORA AND FAUNA SURVEY

Site Location

FIGURE 1

LEGEND

 Exploration Lease Boundary



Coordinate System: GDA 1994 MGA Zone 52

Scale: 1:334,418 at A4

Project Number: 680.30027

Date: 10-Nov-2020

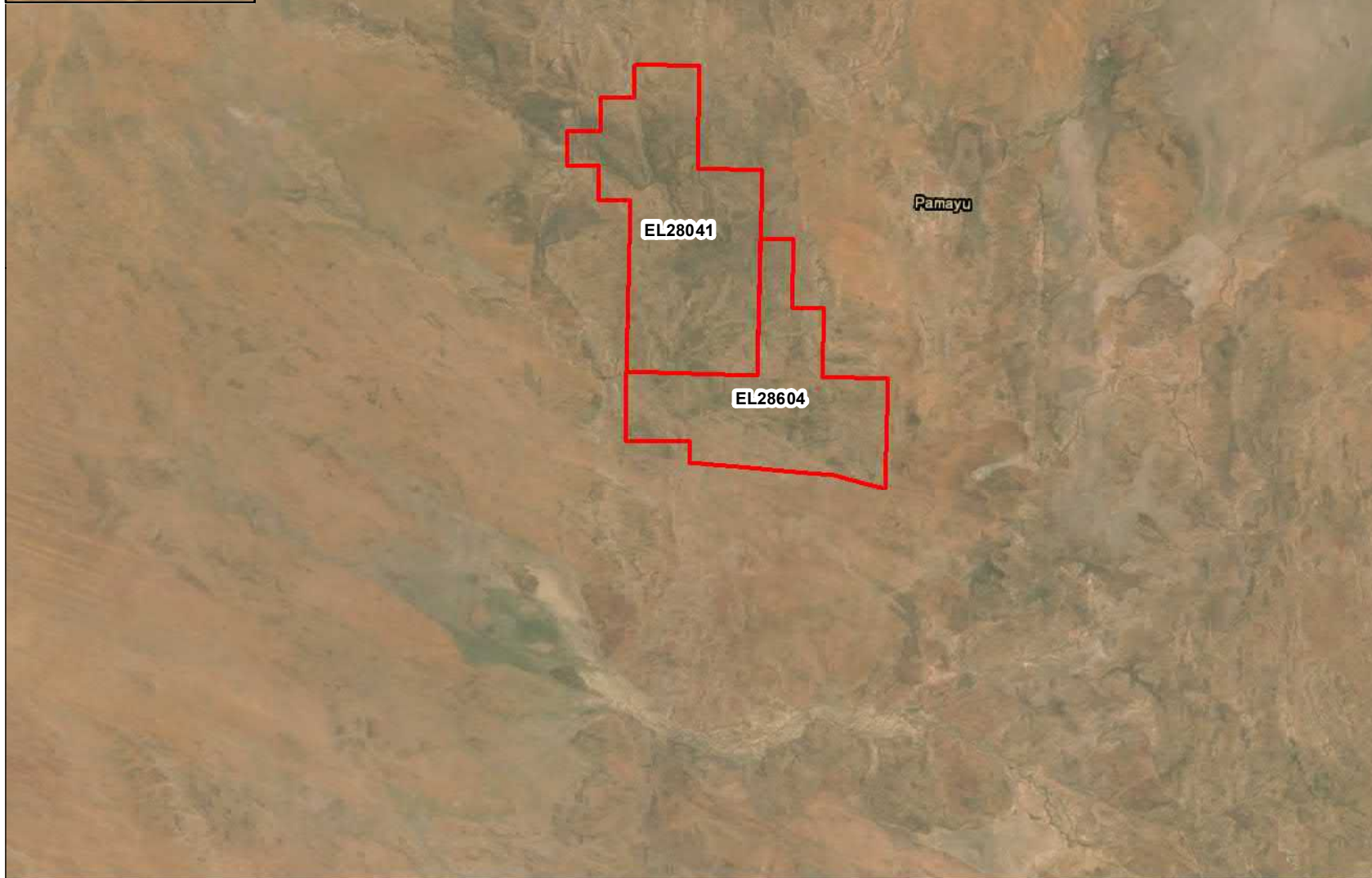
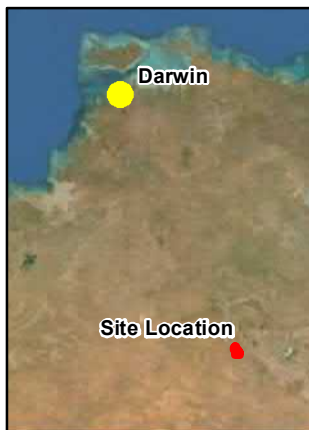
Drawn by: PW

Reviewed by: PW

Data Source:
Department of Environment, Parks and
Water Security - Natural Resource Maps (NR Maps)
ESRI Basemaps Imagery



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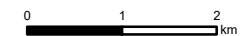
OM (MANGANESE) LTD FLORA AND FAUNA SURVEY

Survey Areas

FIGURE 2

LEGEND

-  Focus Area Boundary
-  Ecology Study Area
-  Exploration Lease Boundary

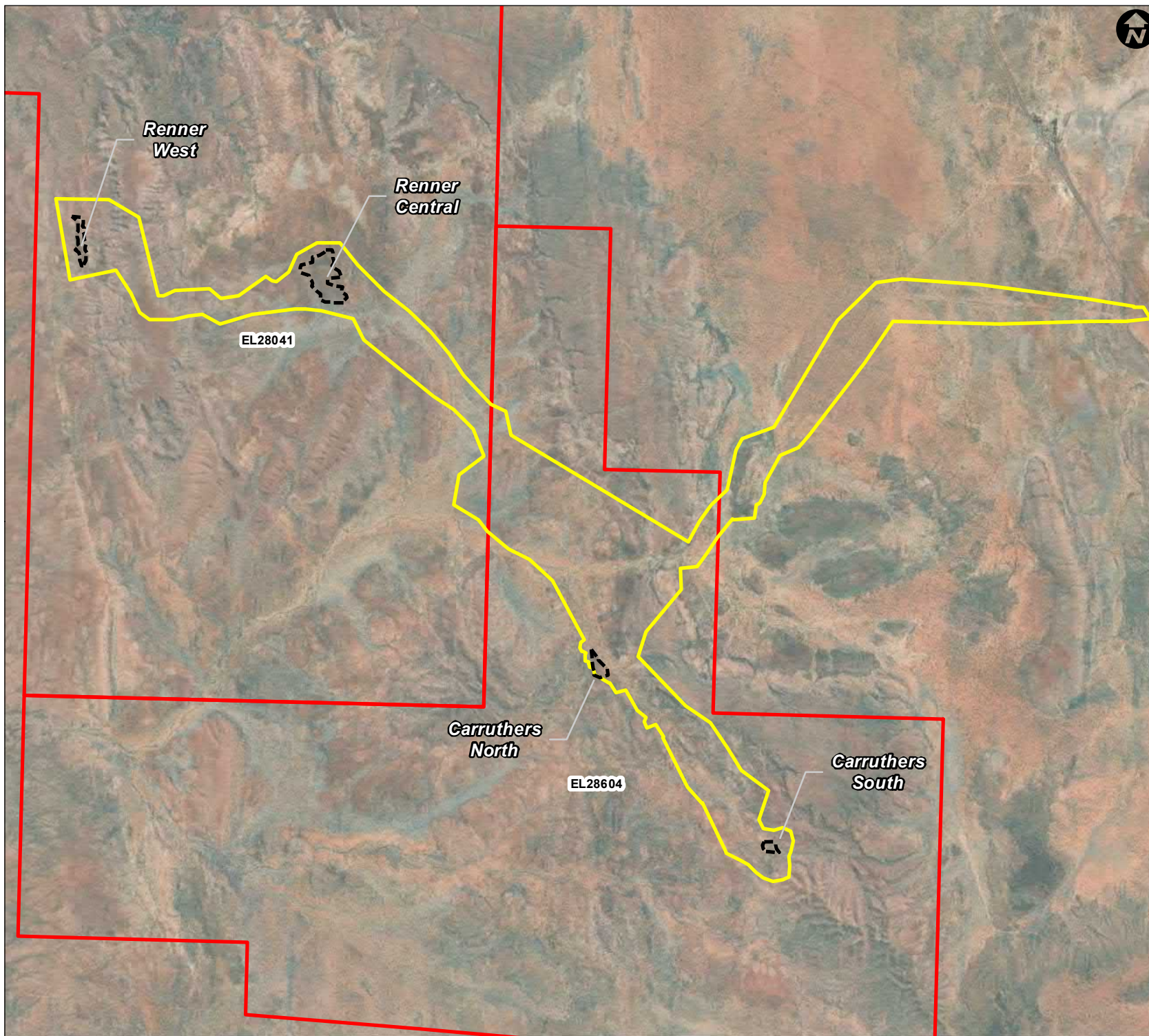


Coordinate System:	GDA 1994 MGA Zone 52
Scale:	1:80,000 at A4
Project Number:	680.30027
Date:	11-Nov-2020
Drawn by:	PW
Reviewed by:	PW

Data Source:
Fauna Survey, and Ecology Study Area datasets:
SLR Consulting (2020).
ESRI Basemaps Imagery



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1.4 Regulatory framework

1.4.1 Commonwealth legislation

1.4.1.1 Environment Protection and Biodiversity Conservation Act

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is administered by the Australian Government Department of Agriculture, Water and the Environment (DAWE). The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the EPBC Act as MNES. The MNES listed in the EPBC Act that are relevant to this report are:

- Ramsar wetlands of international importance
- Nationally threatened species and ecological communities
- Migratory species.

Database searches and field assessments should be conducted as part of any flora and fauna impact assessment. The results of these assessments can be used to determine the presence or likelihood of the presence of any MNES within the study area. If any species or communities listed under the EPBC Act are present or likely to be present, an assessment of significance is required. If the proposed action may have a significant impact on a MNES, it must be referred to DAWE for assessment. If DAWE determines that the proposed action is likely to have significant impacts despite any suggested mitigation strategies, the project will be considered as a controlled action and will require formal assessment and approval. If the proposed action is not likely to be significant, approval is not required if the action is taken in accordance with the referral. Consequently, the action can proceed, subject to any state or local government requirements.

1.4.2 Territory legislation

1.4.2.1 Territory Parks and Wildlife Act

The *Territory Parks and Wildlife Act 1976* (TPWC Act) is administered by the NT Department of Environment, Parks and Water Security (DEPWS). The TPWC Act makes provisions for the establishment of Territory Parks and other Parks and Reserves and promotes the study, protection, conservation and sustainable utilisation of wildlife. This Act also covers the classification and management of wildlife, classification and control of feral animals, permits for taking wildlife, and designation and management of protected areas and private sanctuaries.

Wildlife management

The management of wildlife under this Act is to be carried out in a manner that promotes:

- The survival of wildlife in its natural habitat
- The conservation of biological diversity within the NT
- The management of identified areas of habitat, vegetation, ecosystem or landscape to ensure the survival of populations of wildlife within those areas
- The control or prohibition of:
 - The introduction or release of prohibited entrants into the NT; and

- Any other act, omission or thing that adversely affects, or will or is likely to adversely affect, the capacity of wildlife to sustain its natural processes
- The sustainable use of wildlife and its habitat

Feral animals are to be managed in a manner that reduces their population and the extent of their distribution within the NT and controls any detrimental effect they have on wildlife and the land.

Protected wildlife

Protected wildlife includes all wildlife that:

- Is in a park, reserve, sanctuary, wilderness zone or area of essential habitat; or
- Is a vertebrate that is indigenous to Australia.

The TPWC Act uses the International Union for the Conservation of Nature (IUCN) criteria to classify species. IUCN criteria classify wildlife into conservation categories as follows:

- Threatened categories:
 - Extinct (Ex)
 - Extinct in the Wild (EW)
 - Critically Endangered (CE)
 - Endangered (E)
 - Vulnerable (V)

Threatened wildlife is automatically given protected wildlife status.

1.4.2.2 Environment Protection Act

The *Environment Protection Act 2019* (EP Act) is administered by DEPWS. The EP Act and subordinate regulation (EP Regulation 2020) legislate the environmental impact assessment and approval process for the NT. The objectives of the act are to:

- Protect the environment of the NT
- Promote ecologically sustainable development so that the wellbeing of the people the NT is maintained or improved without adverse impact on the environment
- Recognise the role of environment impact assessment and environmental approval in prompting the protection and management of the environment
- Provide for broad community involvement during the process of environmental impact assessment and approval
- Recognise the role that Aboriginal people have as stewards of their country as conferred under their traditions and recognised in law, and the importance of participation by Aboriginal people and communities in environmental decision-making processes.

Additionally, the EP Act identifies activity- and location-based triggers, which may result in the referral of an action to the NT Environmental Protection Agency (EPA) for assessment in accordance with the EP Regulation. An activity-based referral trigger includes actions that the Minister considers are likely to have a significant impact on the environment. A location-based referral trigger includes areas that the Minister considers are (a) of significance because of a feature of the natural or cultural environment and (b) likely to be subject to significant impact by actions.

1.4.2.3 Mining Management Act

The *Mining Management Act 2001* (MM Act) provides for:

- The authorisation of mining activities
- The management of mining sites
- The protection of the environment on mining sites
- The provision of economic and social benefits to communities affected by mining activities, and for related purposes.

The MM Act ensures the development of the NT's mineral resources in accordance with environmental standards consistent with best practice in the mining industry and protects the environment. Any company that would cause substantial disturbance is required to have an Authorisation through the MM Act. Authorisation of operational activities on mining tenements is granted through the Mining Environmental Complicate Group in the NT Department of Primary Industry and Resources. Remediation of mines and ensuring operators comply with approved mining management plans is also controlled by this group.

Mining projects require an Authorisation under the MM Act, which is granted through the approval of an MMP. once the Environmental Assessment process (where required) has been completed.

1.4.2.4 Weeds Management Act

The *Weeds Management Act 2001* (WM Act) is administered by DEPWS and legislates the declared and potential weeds of the NT and their management. The purpose of the WM Act is to:

- Prevent the spread of weeds in, into and out of the NT and to ensure that the management of weeds is an integral component of land management in accordance with the NT Weeds Management Strategy 1996 – 2005 or any other strategy adopted to control weeds in the NT
- Ensure there is community consultation in the creation of weed management plans
- Ensure that there is community responsibility in implementing weed management plans

General duties for the owners and occupiers of land identified within the WM Act include, but are not limited to, the requirement for owners and occupiers to:

- Take all reasonable measures to prevent the land being infested with a declared weed
- Take all reasonable measures to prevent a declared weed or potential weed on the land spreading to other land
- Within 14 days after first becoming aware of a declared weed that has not previously been, or known to have been, present on the land, notify an officer of the presence of the declared weed

- Comply with weed management plans relating to declared or potential weeds that are present on the land
- Dispose of a potential weed on land which the potential weed is already present or at a designated weed disposal area.

1.4.2.5 Soil Conservation and Land Utilisation Act

The *Soil Conservation and Land Utilisation Act 1969* (SCLU Act) is administered by DEPWS and provisions for the prevention of soil erosion and for the conservation and reclamation of soil.

1.4.2.6 Planning Act

Clearing of native vegetation for development is controlled by the NT *Planning Act 1999* and the Land clearing guidelines (Department of Natural Resources, Environment, the Arts and Sport [NRETAS], 2010) establish standards for native vegetation clearing under the Act. Clearing of vegetation for mining activities falls under the MM Act, and the Land Clearing guidelines do not apply. However, the guidelines they provide useful information on managing the clearing of native vegetation in the most beneficial way, recognising that clearing of native vegetation leads to a decrease in landscape function.

2 Flora and fauna assessment methodology

2.1 Overall assessment methodology

SLR employed a joint approach of desktop analysis and field surveys in this study. The study team implemented best practice recommendations from sources such as:

- NT Guidelines and Field Methodology for vegetation Survey and Mapping (Brocklehurst *et al.*, 2007)
- Guidelines for Assessment of Impacts on Terrestrial Biodiversity (NT EPA, 2013)

The methodology encompassed two phases – scoping and field survey. The scoping phase encompassed:

- Project planning and definition of objectives
- Assignment of qualified ecologists
- Detailed desktop studies
- Review of previous studies
- Collation of existing records
- Literature review of species and potential threats and impacts

The field surveys phase encompassed:

- Systematic, targeted and incidental flora surveys
- Vegetation community mapping and assessments
- Systematic, targeted and incidental fauna surveys

The survey work involved in this report was conducted under SLRs permit to interfere with wildlife for commercial purposes (permit number 65326), granted by the NT Parks and Wildlife Commission.

2.2 Desktop analysis

2.2.1 Database searches

The DAWE Protected Matters Search Tool (PMST) (DAWE, 2020a) and the Natural Resource (NR) interactive mapping tool (NR Maps) (DEPWS, 2020) were utilised to determine species, communities and areas of conservation significance with potential relevance to the study area. Both searches included a 50km buffer around a central co-ordinate within the study area (-18.38079° S, 133.73025° E), which includes the entire study area and a large buffer incorporating similar habitat in the surrounding landscape.

The results of database searches and their relevance to the study area are discussed in the Results section of this report. SLR has developed an approach for ranking threatened species and communities recorded from the desktop searches in terms of their likelihood of occurring within the study area. The approach is based on the presence of local records and the habitat requirements for each species. Details of the criteria used to assess the likelihood of occurrence for threatened species are provided in **Table 1**. The potential impacts to threatened species that may occur within the study area are discussed in Section 5 of this report.

It is possible that some locally occurring threatened species may not be recorded in the Territory and Commonwealth databases. The field survey component of this assessment is therefore an important aspect of the assessment process, to determine the presence of any threatened species that have not been previously recorded in the local area.

Table 1 Key assessment criteria for likelihood of occurrence of threatened and near threatened species

Likelihood of occurring	Key criteria	Definition
Present	Present during survey or historical records in the study area	Species was recorded during field surveys or a historical record of the species was located in the study area
High	Known records (<50km) or within species known range AND Suitable habitat of high quality is present	Historical records of the species occur within a 50km radius of the study area or the study area is within the species known range Suitable habitat of high quality exists with the study area
Moderate	Known records (<50km) or within species known range AND Suitable habitat is present, but degraded	Historical records of the species occur within a 50km radius of the study area or the study area is within the species known range Suitable habitat is present but is significantly degraded or fragmented
Low	No records (<50km) and not within species known range OR Habitat present is unsuitable, absent, or highly degraded	No historical records of this species occur within a 50km radius of the study area and/or the study area is not within the known range for this species OR The habitat within the study area is not suitable and/or is in extremely poor condition, or is absent for the species

2.2.2 Mapping

The following mapping resources were reviewed as part of the desktop analysis:

- NR Maps (DEPWS, 2020)
- Atlas of Living Australia (ALA) species occurrence maps (ALA, 2020)
- NT Flora Atlas (provided by DEPWS, 2020)
- NT Fauna Atlas (provided by DEPWS, 2020)
- NT weeds database (provided by DEPWS, 2020)
- NVIS Version 3.1 National Vegetation Information System, NT Data Compilation (DENR, 2000)
- PMST interactive mapping tool (DAWE, 2020b)

2.2.3 Nomenclature and taxonomy

Apart from technical descriptions and tables, all flora and fauna species are referred to by their common names throughout this report, with their scientific names given in brackets after the first reference. Scientific names for flora species within this report follow the Checklist of the Vascular Plants of the NT species list (DENR, 2020a). Scientific names for fauna species within this report follow the Checklist of the Animals of the NT species lists (DENR, 2019). Where no common name is provided in reference texts, a search was conducted for other accepted common names and, if none were found, only the scientific name was used. An asterisk is used to denote species that are not native to Australia. The taxonomic sequence of birds within **Appendix E**, is structured in accordance with Gill and Donsker (2015).

2.3 Flora survey methodology

2.3.1 Overall methodology

Techniques described in the Guidelines and Field methodology for Vegetation Survey and Mapping (Brocklehurst *et al.*, 2007) were used to collect sufficient data during the field vegetation assessments to validate the vegetation communities identified during baseline assessments within the study area. The key features recorded in the field relevant to this report are:

- Vegetation structure including height of each stratum and cover density
- Key species within each stratum
- Geology, landform and other land unit characteristics.

Vegetation surveys were conducted during the dry season, from 23 to 28 September 2020. The purpose of flora surveys was to:

- Determine the extent of vegetation communities throughout the study area
- Perform targeted searches for threatened flora species identified during desktop analyses, including 'meander' searches
- Compile a flora species inventory for the study area.

2.3.2 Vegetation assessment sites

Site selection

Ground-truthing of vegetation associations within the study area involved assessments of the floristic structure and composition at various locations. Assessment sites were located where they would provide representative data for the vegetation association that was the subject of the assessment. Focus was given to areas located within the disturbance footprints of the proposed activities.

The location of the assessment sites and the survey techniques employed were selected to achieve the following:

- Accurately determine of the extent of each vegetation community within the study area
- Provide data on the vegetation community condition
- Target threatened flora species identified during desktop assessments and their habitat

- Compile a species inventory for the entire study area.

Survey techniques

Three vegetation assessment plots (50 x 10m) were established within different land units within the study area. Within these transects, a combination of quantitative and qualitative techniques were employed. The vegetation survey techniques employed, and attributes recorded during the assessments are detailed in **Table 2**. Quantitative measurements, such as basal area (using the Bitterlich stick methodology; Grosenbaugh, 1952) and canopy height and cover, were used to describe the structural form of each community based on the structural formation classes.

Twenty-two rapid assessments were conducted to validate the vegetation community mapping and to capture any variability in the structure and composition of vegetation communities. Data collected during rapid assessments included all location, environmental and structural information for the dominant and conspicuous species in each layer. In general, focus was given to the dominant species, crown cover and median height of the ecologically dominant layer, which is used to define each community. Vegetation and/or land unit characteristic notes were also undertaken at an additional 32 locations during the baseline assessment period.

Various parts of the study area were traversed using the random meander technique documented by Cropper (1993). This technique was applied to supplement other survey techniques and to:

- Locate and record any flora species not identified in vegetation assessment plots or rapid assessments
- Target threatened flora species
- Validate vegetation community mapping
- Determine the presence and extent of pest species.

Table 2 Vegetation attributes measures at secondary assessment sites

Survey area	Attributes measured
Survey plot (50 x 10m)	Key species of each stratum Median height of each stratum Complete species list Land zone characteristics Central coordinate Basal area of woody stems
Along 50m transect	Percentage cover of each stratum Stem density measures of abundance
Greater area encompassing the present vegetation association	Incidental species observed Additional relevant notes

2.3.3 Vegetation mapping

Mapping of vegetation associations was performed using a combination of vegetation traverses and aerial imagery. Using the information gained at each of the vegetation assessment sites, and observations made when traversing the study area, the boundaries of vegetation associations were recorded using handheld GPS devices.

2.4 Fauna survey methodology


2.4.1 Survey timing and environmental conditions




The timing of fauna surveys incorporated survey timing and effort recommendations outlined in the *Environmental Assessment Guidelines for the Northern Territory: Terrestrial Fauna Survey* (NRETAS, 2011). Surveys were conducted between 23 and 28 September 2020. The timing of surveys was suited to the detection of most faunal groups as it coincided with an increase in temperatures and the onset of rainfall, which are important triggers for peak faunal activity periods.

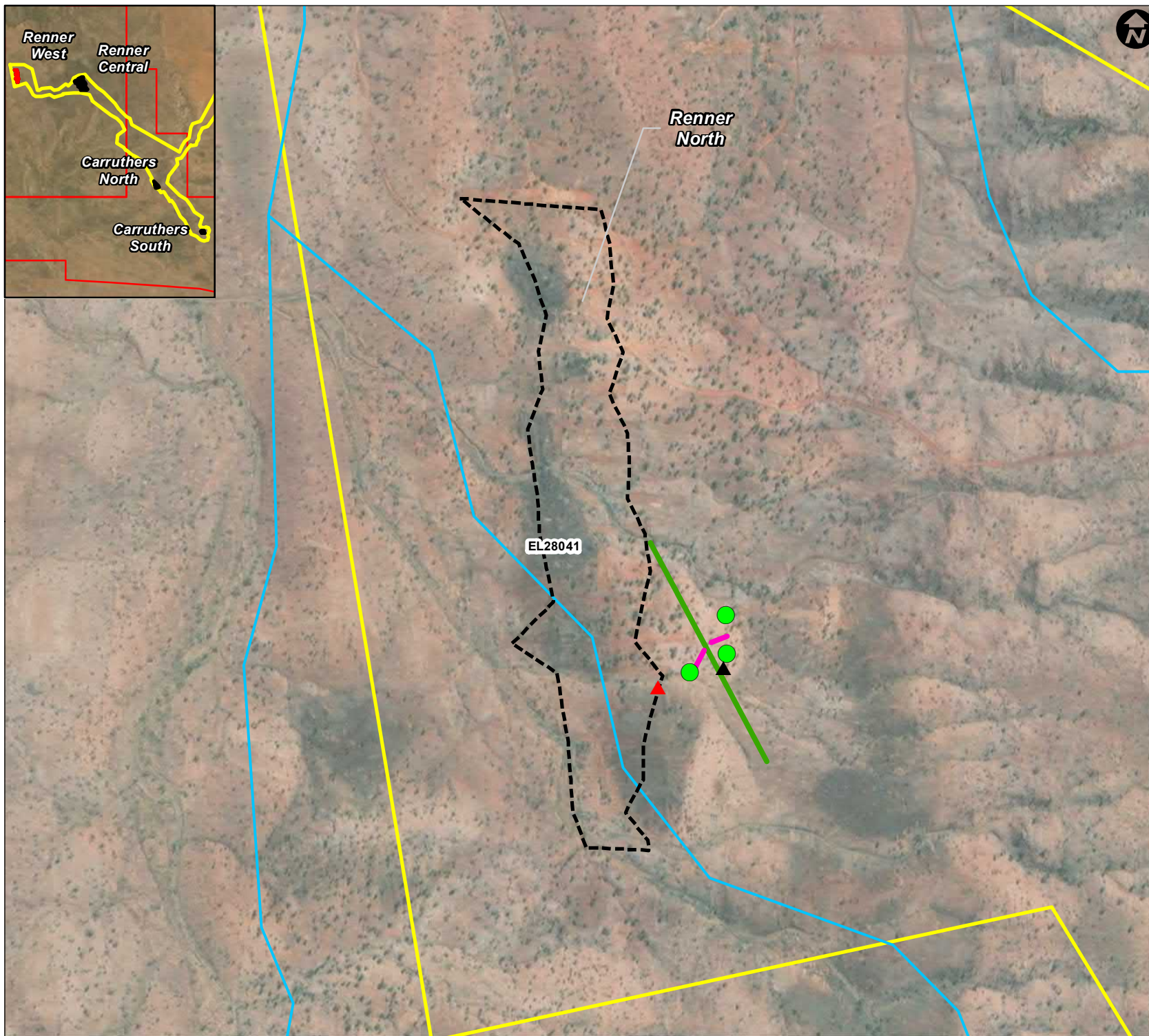
2.4.2 Systematic survey sites

During the survey period one systematic survey site was established in each targeted disturbance area and an array of fauna trapping and survey techniques were employed at each site. The systematic survey sites were positioned to provide an appropriate spatial distribution within the study area while encompassing different habitat types and/or areas where project related disturbance was proposed. A description of the habitat present at each systematic survey site is provided in **Table 3**. In addition to the systematic survey sites, several other areas of interest were identified and used as additional locations for camera trapping and bat detectors. The location of each survey site is depicted in the fauna survey map (**Figure 3**).

Table 3 Systematic fauna survey sites and corresponding habitat

Site number and location	Habitat description	Representative photograph
Site 1 - Renner West	Low open <i>Eucalyptus leucophloia</i> woodland on low sedimentary stony hills.	

Site number and location	Habitat description	Representative photograph
<p>Site 2 - Renner Central</p>	<p>Low open woodland on clay loam soils dominated by <i>Corymbia terminalis</i> and <i>Eucalyptus pruinosa</i>. Areas of small manganese outcropping and stony ground sparsely dominated by <i>E. leucophloia</i>.</p>	
<p>Site 3 - Carruthers North</p>	<p>Low open woodland on clay loam soils dominated by <i>C. terminalis</i> and <i>E. pruinosa</i>. Low stony hills dominated by <i>E. leucophloia</i> to the east and ephemeral watercourse sparsely dominated by <i>Eucalyptus camaldulensis</i> to the west of the site.</p>	
<p>Site 4 - Carruthers South</p>	<p>Low open <i>E. leucophloia</i> dominated woodland on low, stony slopes of surrounding sedimentary hills. <i>E. camaldulensis</i> dominated ephemeral stony watercourse dissecting the site.</p>	




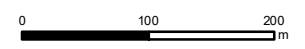
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**Fauna Survey Locations -
Renner West**

FIGURE 3

LEGEND

-  Bat Detector
-  Camera Trap
-  Cage Traps
-  Drift Line
-  Elliot Line
-  Watercourse
-  Focus Area Boundary
-  Ecology Study Area



Coordinate System:	GDA 1994 MGA Zone 52
Scale:	1:6,000 at A4
Project Number:	680.30027
Date:	11-Nov-2020
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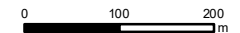
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Fauna Survey Locations - Renner Central

FIGURE 4

LEGEND

-  Bat Detector
-  Camera Trap
-  Cage Traps
-  Drift Line
-  Elliot Line
-  Watercourse
-  Focus Area Boundary
-  Ecology Study Area

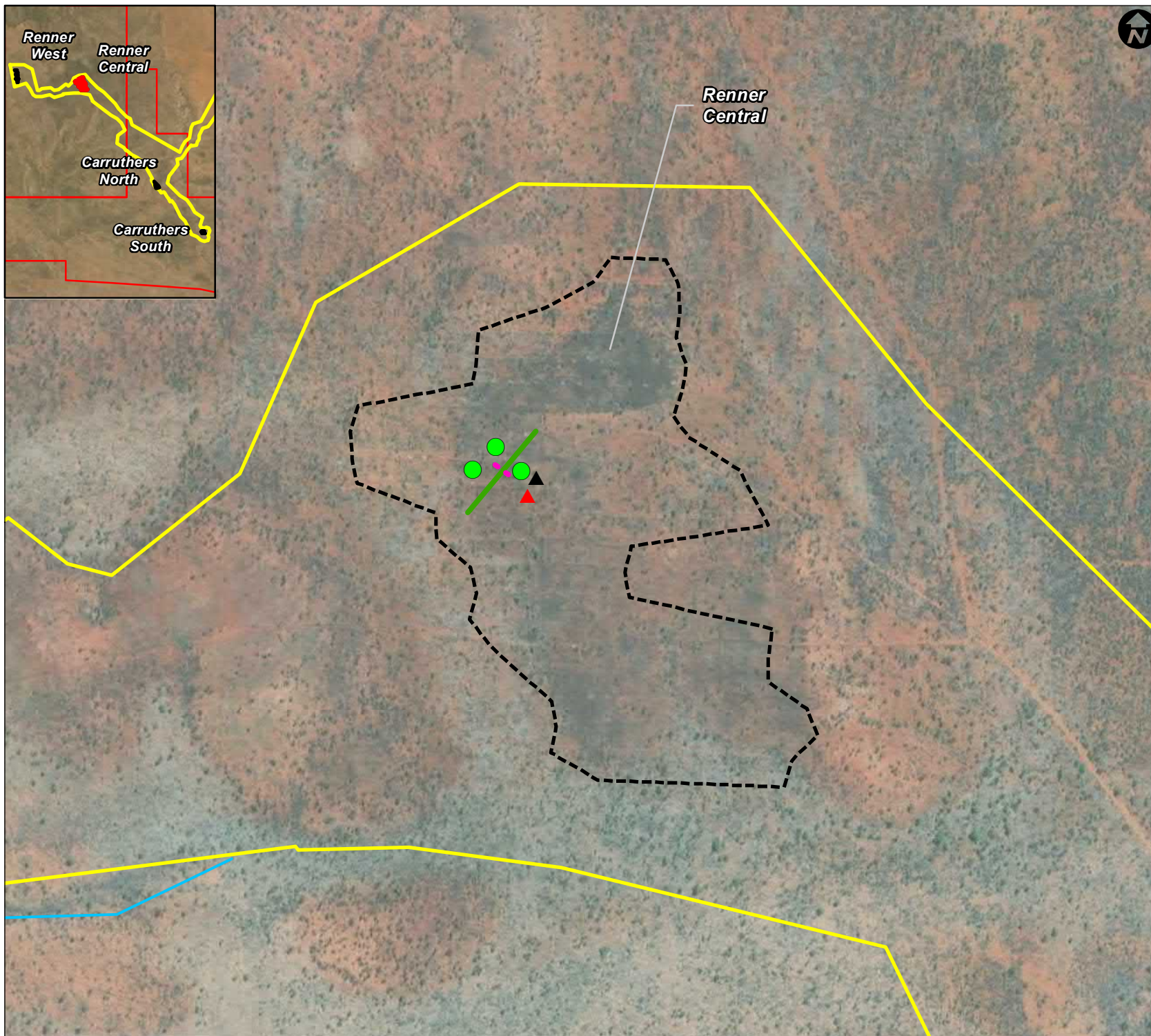


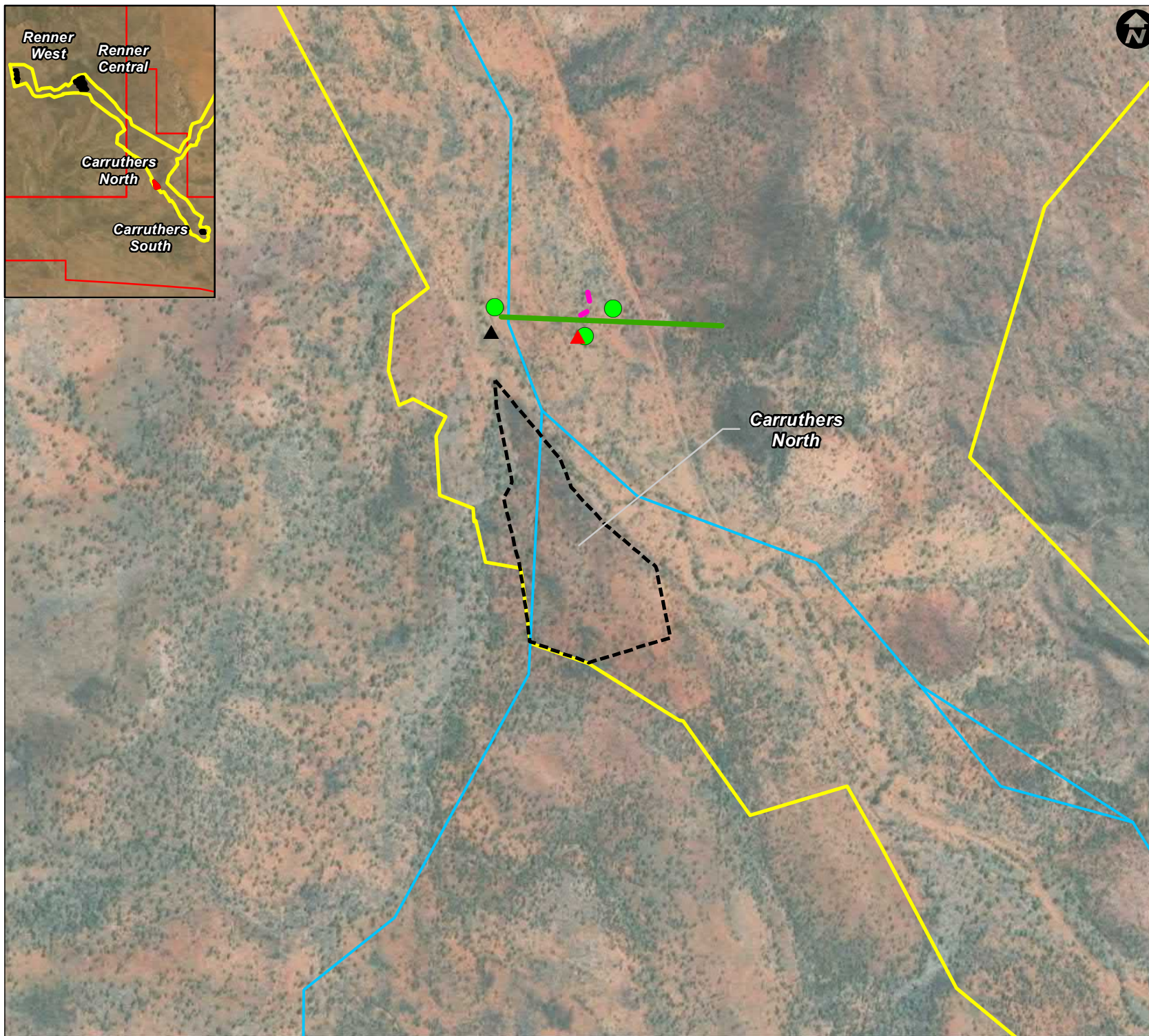
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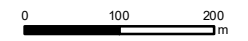
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**Fauna Survey Locations -
Carruthers North**

FIGURE 5

LEGEND

-  Bat Detector
-  Camera Trap
-  Cage Traps
-  Drift Line
-  Elliot Line
-  Watercourse
-  Focus Area Boundary
-  Ecology Study Area

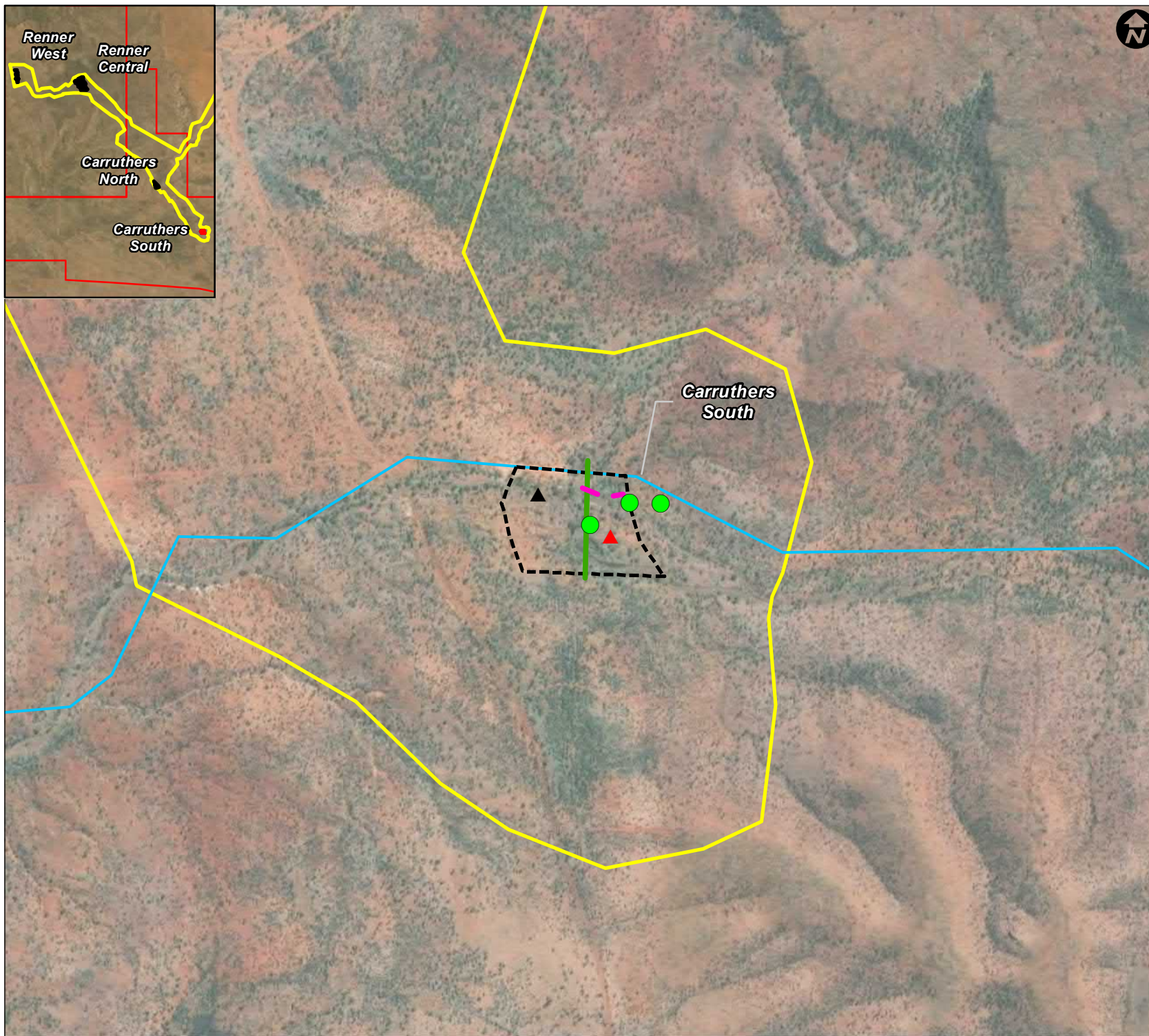


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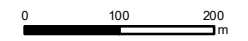
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**Fauna Survey Locations -
Carruthers South**

FIGURE 6

LEGEND

-  Bat Detector
-  Camera Trap
-  Cage Traps
-  Drift Line
-  Elliot Line
-  Watercourse
-  Focus Area Boundary
-  Ecology Study Area



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2.4.3 Survey techniques

The survey techniques employed at the systematic survey sites and additional areas of interest are detailed in **Table 4**.

Table 4 Fauna survey methods employed throughout the study area

Survey method	Description
Elliott traps	At each trapping site, type-A Elliott style traps were placed on the ground approximately 5–10m apart in a straight line for four nights at each site. Twenty traps were deployed at sites 1, 2 and 4, and 19 traps were deployed at site 3. All traps were baited with a mixture of rolled oats, peanut butter and honey.
Pitfall and funnel traps	Drift fence lines incorporating pitfall and funnel traps were established for four nights at each site. Two drift fences (each ~15m long) were established at each site and one pitfall trap (20L bucket) was deployed at each drift fence. Pitfalls were buried flush with the ground surface with the drift fence intersecting the centre of each bucket. Four funnel traps were located along each drift fence at each of these sites.
Cage traps	Four cage traps were placed at each site and were baited with a mixture of rolled oats, peanut butter and honey in addition to a variety of different meats.
Bat detectors	An Anabat SM4 bat call detector was deployed for one night at systematic site to identify the presence/absence of cave dependent microbat species. The bat detector was also deployed for one night at an additional area of interest.
Active diurnal searches	Active diurnal searches were undertaken concurrently with vegetation assessments throughout the study area. This technique involved intensive investigation of ground layer habitat features (such as under logs, rocks and leaf litter), low vegetation (under bark and tree stumps) for cryptic fauna, particularly reptiles. Searches were focussed during times of the day when reptile activity was likely to be at its peak.
Diurnal bird surveys	Birds were surveyed within each systematic fauna site for a total of at least one hour at multiple periods throughout the day, but with a particular focus during peak activity in the morning and around waterbodies. Incidental observations made whilst conducting other survey techniques were also recorded. Birds were identified from either direct observation or by their calls.
Nocturnal surveys	High-powered spotlights were used to survey nocturnal mammals (flying, arboreal and terrestrial), birds (active nocturnal species, and roosting diurnal species), reptiles and frogs in areas identified as suitable for nocturnal threatened species.
Camera trapping	Camera traps (motion-sensing infrared cameras) were utilised at each systematic fauna survey site within the study area to target fauna that may be too cryptic to be detected by other trapping and survey techniques. Four camera traps were also set up at additional areas of interest. Camera traps were baited with a mixture of rolled oats, peanut butter and honey in addition to canned tuna.

Targeted survey techniques

Targeted survey techniques were used to increase the likelihood of detecting conservation significant species and/or their habitat. Specifically, targeted survey techniques were employed for the Greater Bilby (*Macrotis lagotis*). Surveys were primarily focussed on habitat assessments to determine the presence/absence of potentially suitable habitat for the Greater Bilby within the study area. Should evidence of this species be identified, then additional targeted survey methods for the Greater Bilby outlined within the *Survey guidelines for Australia's Threatened Mammals* (DSEWPC, 2011) would be undertaken.

Four targeted habitat assessments for the Greater Bilby were undertaken in accordance with the 2 ha sign plot technique administered by the Western Australian Department of Biodiversity, Conservation and Attractions (DBCA) (DBCA, 2017). This technique was employed as there are currently no prescribed survey techniques for the Greater Bilby within the NT.

2.4.4 Survey effort

The survey effort employed for each of the fauna survey techniques is outlined in **Table 5**. However, it should be noted that fauna species were continually observed throughout the survey period and incidental records were frequently obtained throughout the survey. Any notable observations, tracks, scats or other signs of fauna were recorded with reference to the location and habitat type.

Table 5 Fauna survey effort for each technique

Method	Site survey effort	Total survey effort
Elliott traps	Sites 1, 2 and 4 – (20 traps x 4 nights x 3 sites) – 240 trap nights Site 3 – (19 traps x 4 nights x 1 sites) – 76 trap nights	316 trap nights
Pitfall traps	All sites – (2 traps x 4 nights x 4 sites)	32 trap nights
Funnel traps	All sites – (8 traps x 4 nights x 4 sites)	128 trap nights
Cage traps	All sites – (4 traps x 4 nights x 4 sites)	64 trap nights
Bat detectors	1 detector x 5 nights	5 detector nights
Diurnal active search	2 person-hours x 2 people x 4 days	16 person-hours
Diurnal bird survey	20 person-minutes x 2 people x 4 days	2.7 person-hours
Spotlight/ nocturnal searches	1.5-hour search x 2 people x 4 sites	12 person-hours
Camera trapping	(4 cameras x 4 nights) + (4 cameras x 2 nights)	24 trap nights

3 Desktop analysis results

3.1 Database searches

The EPBC Act PMST (DAWE, 2020a, see **Appendix A**) and NR Map (DEPWS, 2020) searches identified no threatened flora species, 12 threatened fauna species and 11 migratory fauna species as potentially occurring within the study area.

3.1.1 NVIS vegetation communities

NR Map (DEPWS, 2020) searches identified one vegetation community described under the NVIS within the study area. **Table 6** provides a description of this community.

Table 6 NVIS communities identified to occur within the study area on NR Maps (DEPWS, 2020)

Veg. ID	NVIS L4	Community description	Environment description
1021	<i>Corymbia</i> low open woodland/ <i>Acacia</i> tall sparse shrubland/ <i>Triodia</i> low hummock grassland	U+ <i>Corymbia dichromophloia</i> +/- <i>Hakea chordophylla</i> , <i>Eucalyptus odontocarpa</i> ^tree\6\r; M <i>Acacia lycopodiifolia</i> , <i>Acacia coriacea</i> , <i>Acacia dictyophleba</i> ^shrub\4\r; G <i>Triodia pungens</i> +/- <i>Setaria apiculata</i> + \- <i>Digitaria brownii</i> ^hummock grass, tussock grass\1\c	Shallow gravelly sands

3.1.2 Wetlands of international importance

The EPBC Act PMST report (DAWE, 2020a) did not identify any Ramsar wetlands of international importance within 50km of the study area. The nearest Ramsar wetland is in the Kakadu National Park, which is >400km to the north of the study area (**Figure 7**).

3.1.3 Sites of conservation significance

One recognised NT site of conservation significance (Lake Woods) is located within 50 km of the study area (DEPWS, 2020). Several other recognised NT sites of conservation significance are located ~90 to 190 km to the east of the study area, which include Eva Downs Swamp, Tarrabool Lake and lake Sylvester (DEPWS, 2020; Ward and Harrison, 2009) (**Figure 7**).

3.1.4 Threatened ecological communities

No threatened ecological communities (TECs), as defined under the EPBC Act, were identified as potentially occurring within the PMST within a 50 km radius of the study area (**Figure 7**).

3.1.5 Threatened flora species

PMST (DAWE, 2020a; see **Appendix A**) and NT Flora Atlas (DEPWS, 2020) database searches did not identify any threatened flora species as potentially occurring within a 50km radius of the study area.










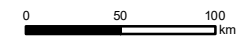
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Wetlands, TEC & Sites of Conservation Significance

FIGURE 7

LEGEND

-  Kakadu National Park
-  Arnhem Plateau Sandstone Shrubland Complex (TEC)
- Sites of Conservation Significance**
-  Eva Downs Swamp
-  Lake Sylvester system
-  Lake Woods
-  Tarrabool Lake
-  Exploration Lease Boundary

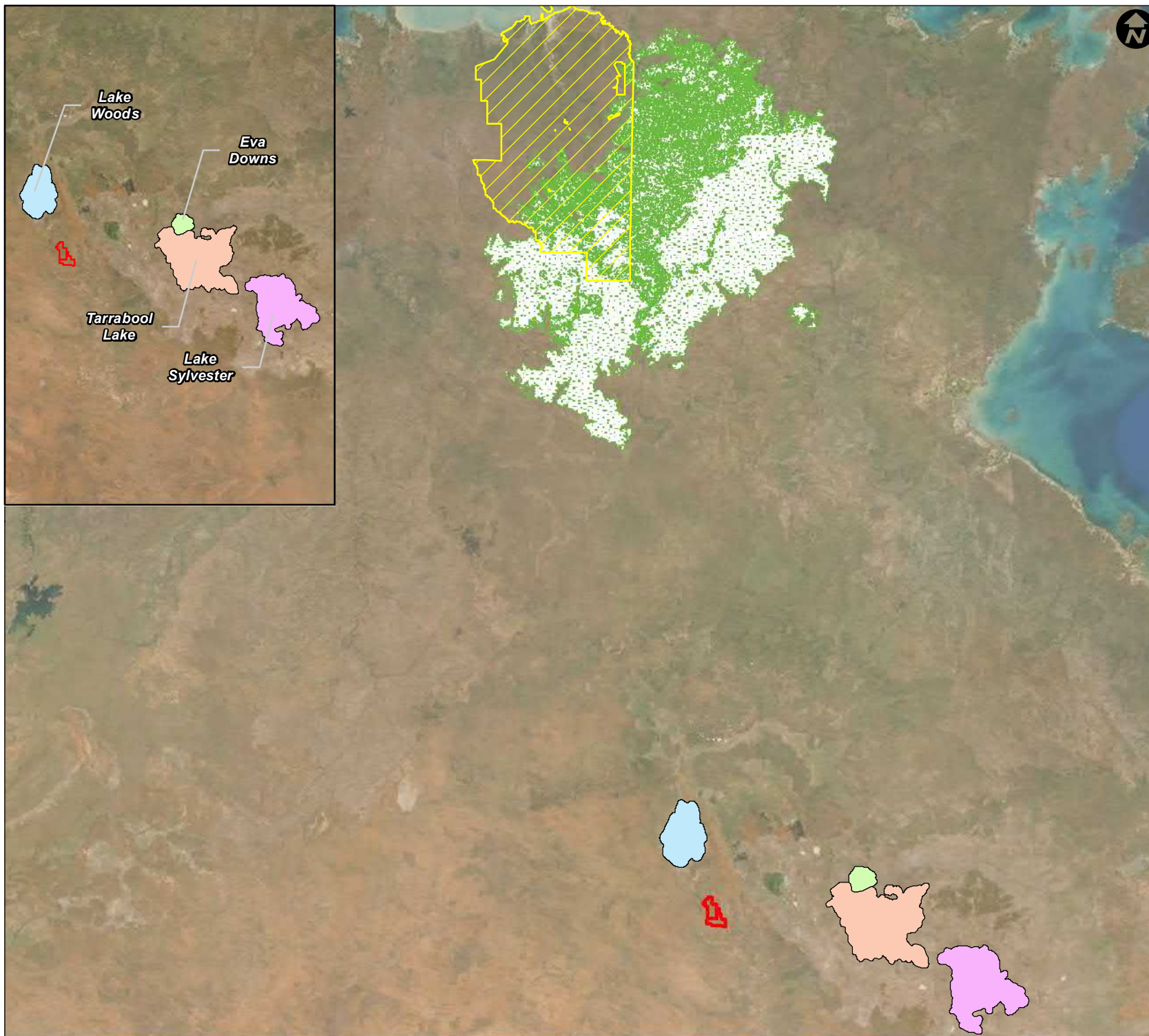


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3.1.6 Threatened fauna species

A total of 13 threatened fauna species were returned from the database searches as potentially occurring within 50 km of the study area. These included 11 species from the PMST (DAWE, 2020a, see **Appendix A**) and six species from NT Fauna Atlas searches (DEPWS, 2020) (**Appendix B**). The results of these searches have been combined in **Table 7**, which also provides an assessment of the potential likelihood for each of these species to occur within the study area. **Appendix B** provides justification for how the potential likelihood of occurrence was determined for each species.

3.1.7 Migratory species

The EPBC Act PMST identified 11 migratory terrestrial species with potential to occur within 50 km of the study area (**Table 8**) (**Appendix B**). All of these were deemed to have a low likelihood of occurring within in the study area. **Appendix B** provides justification for how the potential likelihood of occurrence was determined for each species.

3.2 Available literature

No previous literature pertaining to flora and fauna assessments from within the study area were available for review.

Table 7 Threatened fauna species identified from database searches

Status		Family	Scientific name	Common name	Source	Local records	Likelihood of occurrence
TPWC Act	EPBC Act						
BIRDS							
VU	V	Accipitridae	<i>Erythrotriorchis radiatus</i>	Red Goshawk	PMST	0	Low
VU	E	Estrilidae	<i>Erythrura gouldiae</i>	Gouldian Finch	PMST	0	Low
VU	V	Falconidae	<i>Falco hypoleucos</i>	Grey Falcon	PMST / NR Maps	4	Moderate
VU	V	Meliphagidae	<i>Grantiella picta</i>	Painted Honeyeater	PMST	0	Low
VU	E	Rostratulidae	<i>Rostratula australis</i>	Australian Painted Snipe	PMST / NR Maps	3	Low
VU	CE, M, Ma	Scolopacidae	<i>Calidris ferruginea</i>	Curlew Sandpiper	PMST / NR Maps	1	Low
VU	V	Tytonidae	<i>Tyto novaehollandiae kimberli</i>	Masked Owl (Northern)	PMST	0	Low
CE	E	Psittacidae	<i>Pezoporus occidentalis</i>	Night Parrot	PMST	0	Low
VU	V	Psittacidae	<i>Polytelis alexandrae</i>	Princess Parrot	PMST	0	Low
MAMMALS							
VU	V	Thylacomyidae	<i>Macrotis lagotis</i>	Greater Bilby	PMST / NR Maps	22	Moderate
REPTILES							
VU	V	Elapidae	<i>Acanthophis hawkei</i>	Plains Death Adder	PMST	0	Low
VU	-	Varanidae	<i>Varanus panoptes</i>	Yellow-spotted Monitor	NR Maps	2	Moderate
INVERTEBRATES							
EN	E	Camaenidae	<i>Semotrachia euzyga</i>	Alice Springs Squat Snail	NR Maps	2	Low

Table 8 Migratory terrestrial fauna species identified from database searches

Status		Family	Scientific name	Common name	Source	Local records	Likelihood of occurrence
TPWC Act	EPBC Act						
LC	M, Ma	Apodidae	<i>Apus pacificus</i>	Fork-tailed Swift	PMST / NR Maps	5	Low
LC	M, Ma	Charadriidae	<i>Charadrius veredus</i>	Oriental Plover	PMST	0	Low
LC	M, Ma	Glareolidae	<i>Glareola maldivarum</i>	Oriental Pratincole	PMST / NR Maps	6	Low
NE	M, Ma	Hirundinidae	<i>Hirundo rustica</i>	Barn Swallow	PMST	0	Low
NE	M	Motacillidae	<i>Motacilla cinerea</i>	Grey Wagtail	PMST	0	Low
NE	M, Ma	Motacillidae	<i>Motacilla tschutschensis</i> ¹	Eastern Yellow Wagtail	PMST	0	Low
LC	M, Ma	Scolopacidae	<i>Actitis hypoleucos</i>	Common Sandpiper	PMST / NR Maps	22	Low
LC	M, Ma	Scolopacidae	<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	PMST / NR Maps	5	Low
VU	CE, M, Ma	Scolopacidae	<i>Calidris ferruginea</i>	Curlew Sandpiper	PMST / NR Maps	1	Low
DD	M, Ma	Scolopacidae	<i>Calidris melanotos</i>	Pectoral Sandpiper	PMST	0	Low
LC	M, Ma	Scolopacidae	<i>Tringa nebularia</i>	Common Greenshank	PMST	0	Low

¹ Synonymous with Yellow wagtail (*Motacilla flava*), which is identified within the EPBC Act PMST report.

4 Field Survey Results

4.1 Environmental conditions

Overall, weather conditions during the survey period were considered favourable for detecting most vertebrate fauna groups. Several storm cells deposited sufficient rainfall to leave surface water pools within the study area over the study period, which encouraged several local amphibian species to become active at night. Activity levels of most fauna were high throughout the day despite warm to hot temperatures. Reptile activity was highest during the warmest parts of the day and birds were most active in the mornings. Night temperatures were favourable for most reptiles.

4.2 Flora survey results

4.2.1 Vegetation communities

Three vegetation communities were ground-truthed within the study area. These communities included Snappy Gum (*Eucalyptus leucophloia*) on low hills, Silver Box (*Eucalyptus pruinosa*) and Desert Bloodwood (*Corymbia terminalis*) on plains, and River Red Gum (*Eucalyptus camaldulensis*) along watercourses, which occurred as single vegetation units (**Figure 8**). Ground-truthed descriptions of these communities are provided below and floristic composition and structure information is provided in **Appendix C**.

Conditions leading up to the survey were generally dry and most groundcover flora species showed signs of extreme stress and desiccation from the dry conditions. Additionally, dry conditions leading up to the baseline flora assessment resulted in few annual flora species being present during the survey. Overall, groundcover flora species diversity was low during the baseline assessment due to the dry conditions. Therefore, groundcover flora species diversity results from the current survey may not be reflective of the true diversity within the study area. Minor to moderate impacts from cattle grazing and mining exploration activities were observed in all vegetation communities. Descriptions of these impacts are provided below.

4.2.1.1 Snappy Gum on low hills

The Snappy Gum on low hills community was widespread throughout the study area. A characteristic attribute of this community was its occurrence on low, stony hills or extending partially into lowland plains where stony substrates were present. This was the dominant community within the Renner west and Carruthers South focus areas, however isolated fragments of this community were also present within the Renner Central and Carruthers North focus areas.

Within the study area this vegetation community is dominated by a low, open canopy of Snappy Gum, with other tree species, such as Silver Box and Desert Bloodwood, being sparsely scattered throughout the community (see **Appendix C**). A low tree layer is sometimes present and is generally dominated by Snappy Gum. Shrubs are generally absent, however where present, were generally comprised of Snappy Gum recruits and *Acacia spp.* Groundcover vegetation is dominated by a sparse to mid-dense coverage of Soft Spinifex (*Triodia pungens*).

4.2.1.2 Silver Box and Desert Bloodwood on plains

The Silver Box and Desert Bloodwood on clay loam plains community dominated low lying areas within the study area. This was the dominant community within the Renner Central focus area and around the Carruthers North focus area.

This community is the most floristically diverse of the three vegetation communities ground-truthed within the study area. Silver Box and Desert Bloodwood are the dominant tree species within this community, and several tree species which were not identified in other communities were found within this community (**Appendix D**). Shrub diversity is highest within this community compared to others; however, is generally very sparse to sparse. Groundcover within this community is also generally very sparse to sparse, however a moderate diversity of species was identified.

4.2.1.3 River Red Gum along watercourses

River Red Gum occurred as dominant along first, second, and third order watercourses along Carruthers Creek and its associated tributaries within the southern and central portions of the study area. This community is restricted to the bed and immediate banks of these watercourses with surrounding vegetation communities abutting the outer banks of watercourses associated with this community. The dominant tree layer is generally very sparse to sparse with localised areas of increased density where water is retained for prolonged periods. This community dissects (east to west) the Carruthers South targeted disturbance area and also runs along the western edge of the Carruthers North targeted disturbance area. This community is also noted to dissect, or run parallel to, the central north – south access track within the study area.



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Ground Truthed Vegetation

FIGURE 8

LEGEND

- Vegetation Survey Sites
- Rapid Vegetation Assessment Sites
- Desert Rough Leaved Bloodwood on Sandy Soil
- River Red Gum Watercourses
- Silver Box and Desert Bloodwood on Clay Plains
- Snappy Gum on Stony Hills and Rises
- Watercourse
- Focus Area Boundary
- Exploration Lease Boundary



Coordinate System: GDA 1994 MGA Zone 52

Scale: 1:60,000 at A4

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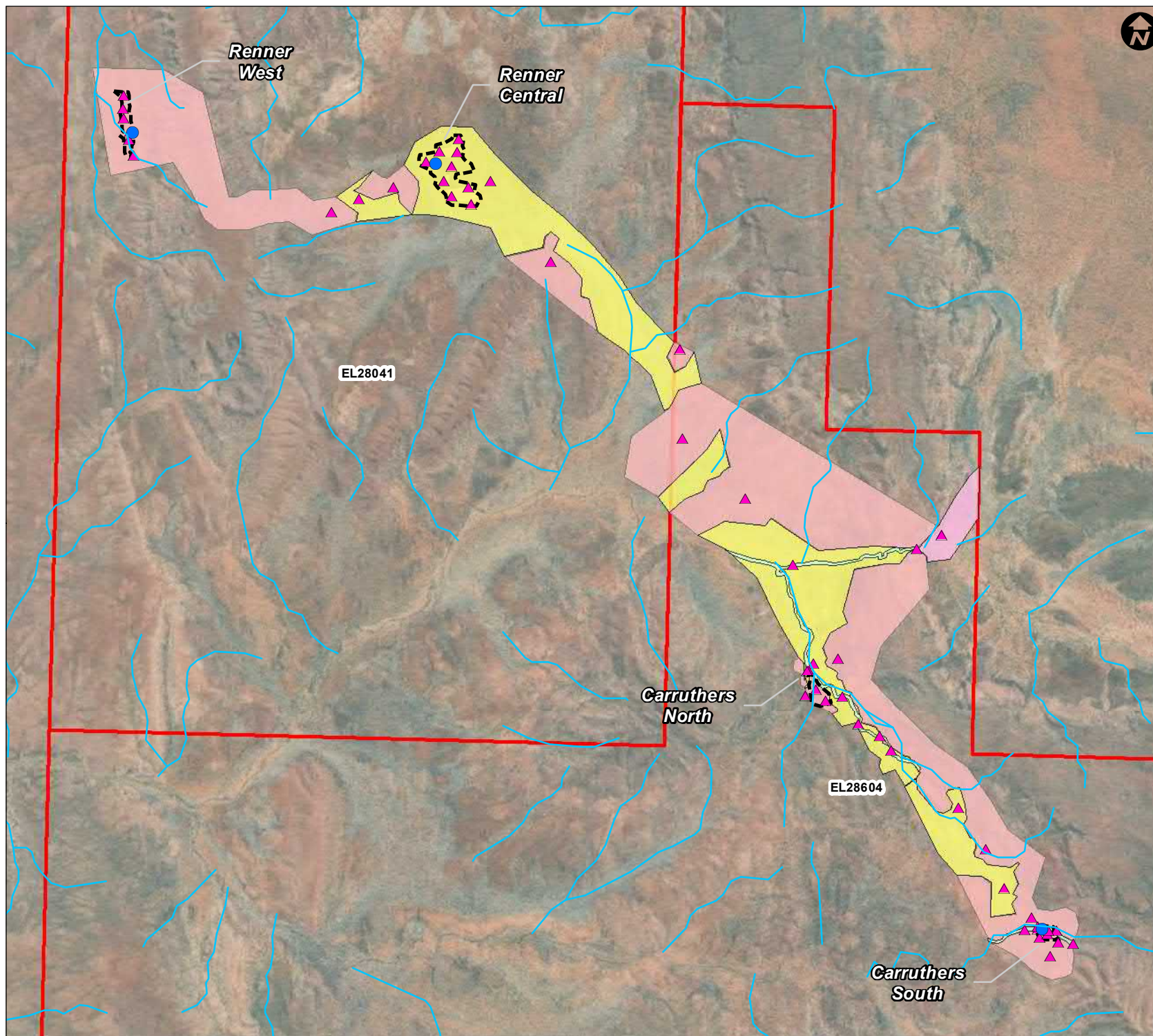
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4.2.2 EPBC Act TECs

No vegetation communities consistent with EPBC Act TECs were ground-truthed to occur within the study area.

4.2.3 Flora species

A total of 80 flora species were identified during the baseline flora survey within the study area (**Appendix D**). Most of these species are common and widespread throughout the region in eucalypt woodland communities. No threatened flora species or critical habitats for flora species were identified to occur within the study area during baseline assessments. Floristic composition was generally similar throughout most of the study area, however some minor variation occurred due to changes in geology and topography.

4.2.4 Pest flora species

No weeds of national significance or weeds declared under the NT WM Act were identified within the study area during baseline assessments. However, two introduced flora species were identified within the study area, including Stylo (*Stylosanthes scabra*) and Buffel Grass (*Cenchrus ciliaris*). Although Buffel Grass is not declared under the WM Act, the species is considered as highly invasive within the Barkly weed management region.

Several Stylo plants were found along the watercourse dissecting the Carruthers South targeted disturbance area and Buffel grass was found to occur occasionally along the central north-south access track connecting the targeted disturbance areas. Both these species are generally considered as environmental weeds due to their potential to impact native ecosystems.

4.3 Fauna survey results

4.3.1 Fauna habitat features

The study area includes a variety of habitat features for local fauna to occupy or utilise. However, no critical habitats or important congregation sites were identified within the study area. Habitat features can generally be separated and described by the three vegetation communities present within the study area (**Section 4.2.1**). Common characteristics between these communities include the presence of dominant Myrtaceae and a varied degree of leaf litter, large woody debris, and groundcover vegetation, which provide shelter, roosting, nesting, and foraging resources for local fauna. However, the prevalence of these features is strongly influenced by fire history within the study area as these features were absent from some locations due to fire impacts. Few large trees were observed within the study area and many showed signs of coppicing after fire impacts. Subsequently, a very low abundance of notable hollows was identified within dominant trees.

Low stony hills and rises dominated by Snappy Gum generally provided the fewest habitat features for terrestrial fauna. Within the study area, these habitats were dominant within the Renner North and Carruthers South proposed disturbance areas. These habitats were generally sparsely vegetated and showed signs of fire impacts, which contributed to a sparse to very sparse groundcover. Old, mature spinifex hummocks were only present in few locations throughout the study area where topographic protection from fire was afforded or where these habitats occurred within the vicinity of watercourses. Several rock outcroppings were observed within these habitats outside of the focus areas, which likely afford unique habitat features for fauna within the local area. Several small outcroppings are located within the targeted fauna survey sites (Renner North and Renner Central) and larger outcroppings were observed outside of the targeted survey areas. The Renner North focus area had the lowest fauna species diversity within the study area (11 species, see **Section 4.3.2**). Conversely, Carruthers South had the highest faunal diversity (30 species). The higher diversity at this site is likely attributed to older, more mature spinifex hummocks providing protection for small terrestrial fauna species and small surface water pools (from recent rainfall) being present within Carruthers Creek, which dissects the Carruthers South focus area.

Several first to third order watercourses, and their associated drainage features, were identified within the study area through desktop assessments (DEPWS, 2020) and ground-truthing surveys. These features within the study area are highly ephemeral and are not likely to retain water for extended periods after rainfall. Therefore, they are not likely to provide perennial habitat values for local aquatic ecosystems or terrestrial fauna. A small cattle dam was identified to occur outside of the focus areas that may provide prolonged accessibility to water for local fauna during prolonged dry periods. Despite the temporal availability of water resources within the study area many local fauna are adapted to an intermittent availability of surface water within a landscape. Therefore, when surface water is present within watercourses, drainage features, and areas of low topography or impeded drainage within the study area, these areas provide important temporal features for many faunal groups. The presence of surface water pools within the Carruthers South focus area likely contributed to this site achieving the highest faunal diversity during the baseline assessment.

Clay loam plains dominated by Silver Box and Desert Bloodwood within the study area provide substrate for fossorial fauna to burrow and shelter in. Within a sparse landscape of limited structural complexity that is subject to temperature extremes and other natural impacts, such as fire and predators, sheltering habitat is valuable. This habitat feature was present within the Renner Central and Carruthers North focus areas, both of which had similarly high faunal diversity (24 and 22 species, respectively). A variety of fauna species were identified at these sites, including several fossorial species, or species known to burrow, were identified at these sites that were not identified in other habitat types within the study area. Therefore, it is likely that clay loam plains within the study area provide important habitat features for local fauna.

4.3.2 Greater Bilby surveys

A total of four targeted Greater Bilby surveys were undertaken over the baseline assessment period; one in each of the four focus areas. Surveys were undertaken in accordance with the 2 ha sign plot technique and associated datasheets, as prescribed within, and published by, DBCA (2017). No evidence of any locally occurring Greater Bilbies were identified to occur within the focus areas. Additionally, incidental observations for the presence of the Greater Bilby undertaken throughout the remainder of the study area did not identify signs of any locally occurring individuals or populations of the Greater Bilby within the study area.

4.3.3 Fauna species

A total of 68 fauna species from 40 families were positively identified within the study area using a variety of different observation and trapping techniques. No threatened fauna species were identified to occur within the study area during baseline assessments. All native fauna recorded within the study area are common and/widespread within the local and broader region. One introduced fauna species, Cattle (*Bos taurus*), was identified to occur within the study area.

A combined list of all fauna species identified during the baseline assessment is included in **Appendix E**. The following sections provide a brief discussion of the species observed for each taxonomic group. Potential impacts to fauna are discussed in the latter sections of this report, with a focus on listed threatened species.

4.3.3.1 Birds

A total of 38 bird species were identified within the study area during baseline assessments. No TPWC or EPBC Act threatened birds, or EPBC Act migratory avifauna, were identified to occur within the study area during the baseline assessment. All bird species identified within the study area have a least concern or near threatened status under the TPWC Act and are common and widespread within similar habitats throughout the local and broader region.

4.3.3.2 Mammals

A total of 10 mammal species were positively identified within the study area during baseline assessments. Nine of these species are considered as least concern under the TPWC Act and the remaining species, Cattle, is introduced. No mammal species identified within the study area are listed as threatened or migratory under the EPBC Act.

At least nine and possibly 11 microbat species were detected within the study area. All positively identified or unresolved microbat species recorded within the study area via echolocation detection techniques represent species considered as least concern under the TPWC Act and not of conservation significance under the EPBC Act. The microbat call identification report completed by Balance! Environmental is provided in **Appendix F**. This report provides an overview of positively identified and unresolved microbat species detected within the study area during the baseline assessment.

4.3.3.3 Reptiles

A total of 17 reptile species were identified within the study area during baseline assessments. The status of two of these species, the Centralian Earless Dragon (*Tympanocryptis centralis*) and Northern Shovel-nosed Snake (*Brachyuropsis roperi*), has not been evaluated under the TPWC Act. However, both species have a broad distribution within the NT that also extends to other Australian States (Wilson and Swan, 2017). All remaining species are considered to have a least concern status under the TPWC Act, and no identified species are listed as threatened or migratory under the EPBC Act.

The most diverse group of reptiles detected within the study area included geckos (six species) from the Diplodactylidae and Gekkonidae families, however dragons (four species) from the Agamidae family were also comparatively diverse compared to other reptile taxa. The richness of all other reptile families identified to be present within the study area consisted of one to three species.

4.3.3.4 Amphibians

Three amphibian species were identified within the study area during baseline assessments. These included the Giant Frog (*Cyclorana australis*), Green Tree Frog (*Litoria caerulea*) and Red Tree Frog (*Litoria rubella*), all of which are considered to be least concern under the TPWC Act and are not listed as threatened or migratory under the EPBC Act.

The highest proportions of amphibian species within the study area was noted within the Carruthers South focus area. This is due to several pools retaining surface water within Carruthers Creek, which dissects Carruthers South. Several small surface water pools were also identified within Carruthers Creek in the northern portion of Carruthers North, however these pools were observed to rapidly dry over the survey period and few amphibian individuals were observed within this area. Diurnal calls of Green Tree Frogs were also incidentally identified in several other areas within the study area where surface water from recent rainfall was retained.

4.3.3.5 Introduced fauna species

Cattle were the only introduced fauna species identified within the study area during baseline assessments. The study area overlays the Helen Springs pastoral lease, and is known to be used for Cattle grazing; therefore, the presence of Cattle within the study area is expected. No notable Cattle impacts, with the exception of tracks and scats, were identified within the study area and Cattle were only observed on one occasion in small numbers along the east-west access track within the eastern portion of the study area.

5 Significant environmental matters

5.1 Vegetation regarded as sensitive to disturbance

Significant and sensitive vegetation in the NT is identified in the NT Land Clearing Guidelines (DENR, 2020b), these guidelines do not apply to clearing controlled under the MM act, however they provide a useful framework for assessing potential impacts on significant and sensitive vegetation.

Sensitive vegetation is a term, applied to ecosystems easily impacted by neighbouring or adjacent land uses or management. Significant vegetation also includes spatially restricted habitat types that are important to a relatively large number of wildlife species, including rainforest, monsoon vine forest or vine thicket; sandsheet heath; riparian vegetation; mangroves; and vegetation containing large trees with hollows suitable for fauna. Most of these significant vegetation types are also sensitive (DENR, 2020b).

Riparian vegetation which is regarded as significant and sensitive to disturbance was ground-truthed within the study area.

5.1.1 Riparian vegetation

Native vegetation within and immediately surrounding a waterway is known as riparian vegetation. Riparian vegetation plays a critical role in the maintenance of instream ecological processes as well as providing physical stability to the waterway, ameliorating water quality and providing critical habitat or resources for a range of plant and animal species often not available elsewhere within a landscape. Clearing of riparian vegetation and drainage depressions has the potential to not only result in the direct removal of sensitive/significant vegetation and impact on the values associated with this habitat, but also to negatively impact receiving environments immediately adjacent and downstream of developmental impacts (DENR, 2020b).

Riparian vegetation should not be cleared, and appropriate native vegetation buffers should be retained to reduce impacts of land clearing on these systems. Table 9 provides the recommended widths for riparian buffers proposed within the Land Clearing Guidelines (DENR, 2020b).

Table 9 Recommended widths of riparian buffers within the Land Clearing Guidelines (DENR, 2020b)

Riparian class	Stream order	Minimum buffer width (m)	Measured from
Drainage depression	N/A	25	The outer edge of the drainage depression, which is the extent of the associated poorly drained soils and associated vegetation.
Intermittent streams	First	25	The outer edge of the riparian vegetation or levee (whichever is the greater). If braided channels are present, the edge of the outer most stream channel.
Intermittent streams	Second	50	As above.
Creeks	Third and fourth	100	As above.
Rivers	Fifth or higher	250	As above.

The study area contains several first and second order intermittent streams and third order creeks (DEPWS, 2020), which are dominated by components of the surrounding vegetation community and/or a distinct River Red Gum dominated community. A second order intermittent stream (Carruthers Creek), dominated by River Red Gum, dissects the Carruthers South focus area. Similarly, a first order intermittent stream with River Red Gum within the dominant layer occurs within the eastern portion of the Carruthers North focus area. Several small drainage lines were ground-truthed to occur within the Renner North focus area, however no distinct change in vegetation community was noted to be associated with these features. No notable streams, creeks or drainage lines were ground-truthed to occur within the immediate vicinity of the Renner Central focus area.

5.2 Sites of Conservation Significance

One site of conservation significance was identified to within 50 km of the study area during desktop assessments. This included Lake Woods, which occurs ~40 km to the north of the study area. Three additional sites of conservation significance were also identified to occur ~90 to 190 km to the east of the study area during desktop assessments; Eva Downs Swamp, Tarrabool Lake and lake Sylvester (DEPWS, 2020; Ward and Harrison, 2009). As all sites of conservation significance relevant to the study area are \geq ~40 km from the study area it is considered that development within the study area will have a direct or indirect significant impact on these sites.

No other sites of conservation significance were identified to occur within the vicinity of, or be relevant to, the study area.

5.3 Matters of National Environmental Significance

The following sections detail the presence of MNES and potential impacts to these matters as assessed with reference to the *MNES – Significant Impact Guidelines 1.1* (Department of the Environment and Energy (DEE), 2013). Further details regarding the potential occurrence of conservation significant flora and fauna species are provided in **Sections 5.5** and **5.6**, respectively.

5.3.1 TECs

There are no TECs mapped (DAWE, 2020a) or ground-truthed to occur within the study area or the broader locality. The only TEC known to occur in the NT is the Arnhem Plateau Sandstone Shrubland Complex TEC. This community is restricted to the Arnhem Plateau and surrounding outcrops, and the study area and broader locality does not support suitable habitat for this ecological community. The community is therefore unlikely to be significantly impacted by activities within the study area.

5.3.2 Listed migratory species

PMST desktop assessments (DAWE, 2020a) identified 11 listed migratory bird species that have the potential to occur within 50km of the study area. Of these 11 species, none were considered as likely to occur within the study area. Most of these species are known to inhabit lakes, intertidal mudflats, or other areas where water is present for extended periods of time. Features within the local region that likely represent suitable habitat for most listed migratory bird species include several nationally important wetlands, several of which are also identified as sites of conservation significance (Lake Woods, Eva Downs Swamp, Tarrabool Lake and Lake Sylvester) (DEPWS, 2020; DEPWS, 2020). These features are ~40 to ~190 km to the north and east of the study area and include Lake Woods, Eva Downs Swamp, Tarrabool Lake, Corella Lake, Lake de Burgh and Lake Sylvester.

Similar suitable features and/or habitat for these listed migratory species are distinctly absent from the study area. Therefore, it is considered that there is a low likelihood of these migratory species occurring within the study area. Subsequently, it is considered that no significant impacts to these migratory species or their habitat will occur due to activities within the study area.

5.3.3 Wetlands of international importance

No wetlands of international importance (Ramsar wetlands) are located within the study area or nearby areas. The wetlands in Kakadu National Park are the nearest wetlands of international importance to the study area (>400 km to the north) and are unlikely to be impacted by activities within the study area.

5.4 Listed threatened flora species

No EPBC Act or TPWC Act listed threatened flora species were identified as potentially occurring within 50 km of the study area during desktop assessments. Additionally, no threatened flora species were identified to occur within the study area during baseline flora assessments. Therefore, it is considered unlikely that any Commonwealth or Territory listed threatened flora species will be significantly impacted by activities within the study area.

5.5 Listed threatened fauna species

No EPBC Act or TPWC Act listed threatened significant fauna species were identified to occur within the study area during baseline assessments. Desktop assessments identified 13 Commonwealth and/or Territory listed threatened fauna species as potentially occurring within the study area. Of these 13 species, three were considered to have a moderate likelihood of occurring within the study area based on the presence of local records and potentially suitable habitat. The remaining 10 species were considered to have a low likelihood of occurring within the study area and are therefore unlikely to be significantly impacted by activities within the study area. Potential impacts to, and management of, species with a moderate likelihood of occurring within the study area are discussed below.

Two of the species identified as moderately likely to occur within the study area include the Grey Falcon and Greater Bilby. Both these species are considered to be vulnerable under the EPBC Act. An action is likely to have a significant impact on an EPBC Act listed vulnerable species if there is a real chance or possibility that it will (DEE, 2013):

- Lead to a long-term decrease in the size of an important population of a species
- Reduce the area of occupancy of an important population
- Fragment an existing important population into two or more populations
- Adversely affect habitat critical to the survival of a species
- Disrupt the breeding cycle of an important population
- Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
- Introduce disease that may cause the species to decline, or
- Interfere substantially with the recovery of the species.

5.5.1 Grey Falcon

This species is listed as vulnerable under both the EPBC and TPWC Acts. NR Map searches revealed four local records of this species within 50 km of the study area (DENR, 2020) and this species was considered to have a moderate likelihood of occurring within the study area based on key assessment criteria in **Table 1**. Ground-truthing assessments did not identify this species to be present within the study area. However, as this species has a moderate likelihood of occurring within the study area, likely or potential project related impacts and management strategies for this species are detailed below.

The Grey Falcon (*Falco hypoleucos*) has been recorded in all states and territories but occurs at very low densities throughout Australia (there are thought to be fewer than 1000 mature individuals of this species). Records of the species in the NT are widespread but are most dense in the southwest of the state. Within the vicinity of the study area, records of this species are moderately sparse (ALA, 2020). This species inhabits lightly timbered habitats and lowland plains, including low *Acacia* spp. shrublands, tussock grasslands, in arid and semi-arid areas where rainfall is typically below 500mm a year (Marchant and Higgins, 1993). Favoured habitats are typically crossed by timbered watercourses, where the species nests in large trees such as River Red Gum, utilising the large nests of corvids and other raptor species (Marchant and Higgins, 1993). Threats to the species include predation by Feral Cats (due to the birds' habit of roosting on the ground), low population size and associated risks of stochastic events, livestock grazing, land clearing in the arid zone, disturbance by birdwatchers, collision with traffic, fences and powerlines and climate change (Schoenjahn, 2018; Garnett *et al.*, 2011).

The broader region around the study area is within the known range of this species, and sparse records occur in the area. Therefore, it is likely that this species occurs within the region. River Red Gums are present within the study area along watercourses. However, River Red Gums within the study area are not 'large' and riverine woodland is not substantial. Therefore, it is unlikely that the study area provides suitable breeding or 'favoured' habitat for this species. However, due to the presence of local records within 50 km of the study area, there is a possibility that individuals may use the study area for foraging.

This species is uncommon and very sparsely distributed across a very broad distribution within Australia and was not observed within the study area during baseline assessments. Potentially suitable foraging habitat for this species within the study area is also common within the broader region and it is unlikely that the study area provides suitable or 'favoured' breeding habitat for this species. Therefore, no unique habitat values for this species occur within the study area that are not widely represented within the broader region. As this species is sparsely distributed within the vicinity of the study area it is not likely that the study area supports an important population (as defined in DEE (2013)) of this species. It is not likely that small to moderate scale development within the study area will adversely affect habitat critical to the survival of this species, impact habitat to the extent that this species is likely to decline, introduce invasive species or disease likely to impact this species, or interfere substantially with the recovery of this species. Therefore, it is considered that no individuals or populations of this species will be significantly impacted by small to moderate scale development within the study area.

5.5.2 Greater Bilby

The Greater Bilby is a distinctive medium-sized nocturnal burrowing mammal that occupies the central deserts of Australia (DSEWPC, 2017). The former distribution of this species covered up to 70% of the arid and semi-arid environments within Australia. However, the current distribution of this species is ~20% of its former range, being restricted to only the most arid parts of the former distribution. Across Australia, the current distribution of this species includes parts of the Tanami Desert, a small area north-east of Alice Springs, the Gibson Desert, northern Great Sandy Desert, the inland Pilbara, the southern Kimberley, and a small area in the channel country in south-western Queensland (DEWSP, 2017 and references therein). Key impacts contributing to a decline in the population and subsequent range contraction of this species is suggested to be predation by Feral Cats and Foxes. However, competition with introduced herbivores such as European Rabbits and livestock and modified fire regimes are also suggested to have contributed to the decline of this species (DEPWS, 2017 and references therein).

Within the NT this species occurs in the central and western parts of the Tanami bioregion, the southern Sturt Plateau bioregion and the northern Great Sandy Desert bioregion. However, populations of this species are highly fragmented within these areas and are contracting northwards. The study area occurs within the vicinity of some of the most north-eastern (post 1970) known locations of this species within the NT (DENR, 2006a). Greater Bilbies within the NT are documented as being nomadic and undergo large population fluctuations in response to food availability. Therefore, no sites are known in the NT that are considered to permanently hold colonies of Bilbies and depending on rainfall and food availability, very few records of this species may be reported during one time period, but this can change quickly. As a result, natural variation must be taken into account when considering the likelihood of this species occurring within the study area (DENR, 2006a).

Across Australia, this species is noted to occur in habitats ranging from Acacia scrubland and hummock grasslands to clay stony downs in channel country (DEPWSP, 2017). Habitat for this species within the NT is characterised by sandy landscapes dominated by hummock grasslands covered predominantly by spinifex, a low, shrubby overstory of *Acacia* and *Melaleuca* species, and including rocky outcrops, laterite rises, and low-lying drainage systems. However, broad-scale surveys of the Greater Bilby in the NT in the 1990's indicated that laterite and drainage line land systems were occupied more frequently than sand plain and dune systems. Within these areas, densities of 12-16 individuals/km² may be reached under optimal conditions, however densities of 1-2 individuals/km² is more typical. The home range movements of individuals have been recorded up to 5km in a night and individuals within a population may have overlapping home ranges. Within a home range, an individual may have over a dozen regularly used burrows (DENR, 2006a).

The study area is primarily comprised of low stony rises and clay loam plains and is bordered by nearby sandy landscapes to the east and west. Additionally, records of the Greater Bilby occur within 50km of the study area, several shrubs known to contain root dwelling larvae predated upon by Bilbies were identified within the study area, and several locations within the study area showed signs of likely being burnt within the previous 3 years. Overall, in accordance with descriptions and results from previous studies provided within DEPWS (2017) and DENR (2006a), it is determined that the study area likely supports potentially suitable habitat for this species.

2 ha sign plot surveys (DBCA, 2017) were undertaken within the study focus areas in an attempt to detect evidence of the presence of this species. Additionally, searches for potential Bilby tracks, scats, and other signs of occurrence were undertaken continuously and concurrently with other survey techniques during baseline assessments. However, despite the implementation of targeted and incidental survey techniques to detect signs of this species, no evidence of this species was identified within the study focus areas. Additionally, no incidental likely or potential evidence of this species was observed within other parts of the study area.

Due to the low densities that this species may occur within an area and the nomadic tendency of individuals and populations within the NT, there is the potential that individuals of this species may/may have utilise(d) suitable habitat within the study area over time. However, current survey results indicate no evidence of this species within the study area, particularly within the proposed areas of disturbance and it is not likely that the study area supports an important population of this species. It is not expected that small scale development within the focus areas will be adversely affect habitat critical to the survival of this species, impact habitat to the extent that this species is likely to decline, introduce invasive species or disease likely to impact this species, or interfere substantially with the recovery of this species. Therefore, it is considered that no individuals or populations of this species will be significantly impacted by small to moderate scale development within the study area.

5.5.3 Yellow-spotted Monitor

The Yellow-spotted Monitor (*Varanus panoptes*) is listed as vulnerable under the TPWC Act and is not listed as threatened or migratory under the EPBC Act. This species was determined to have a moderate likelihood of occurring within the study area based on the presence of local records within 50km of the study area (DEPWS, 2020) and potentially suitable habitat for this species occurs within the study area. However, despite this, the species was not identified to occur within the study area during the baseline assessment.

This species has a broad geographic range across the far North of Australia from the Kimberly to Cape York Peninsula, and southwards through most of QLD. In the NT, it has been recorded across most of the Top End and the Gulf Region (South to Katherine, Judbarra/Gregory National Park and the Gulf hinterland). This species occupies a variety of habitats including coastal beaches, floodplains, grasslands and woodlands. The study area occurs outside of the core distribution of this species within the NT and on the southernmost boundary of the modelled distribution of this species within the central region of the NT (DENR, 2012b).

The key threatening process to this species is the advance of Cane Toads (*Rhinella marina*) throughout the landscape as this species has a propensity to predate upon Cane Toads and is highly susceptible to Cane Toad toxins (DENR, 2012b). Few records of Cane Toads exist within the local area (ALA, 2020). However, bore-fed dams and other artificial water sources function as stepping-stones allowing Cane Toads to invade semi-arid areas of tropical Australia where perennial water sources are otherwise absent. Therefore, the development of open artificial water sources for the proposed project may increase the prevalence of Cane Toads within the study area and facilitate a potential impact to any locally occurring individuals of Yellow-spotted Monitor. However, in the absence of the construction of these open artificial water sources, it is unlikely that disturbance within the study area will contribute any notable impacts to local populations of Yellow-spotted Monitor as no other key threats are identified for this species.

5.6 Pest species

Two introduced flora and one fauna species were identified within the study area during the baseline assessment, which included Buffel Grass, Stylo, and Cattle. Neither flora species are considered as declared weeds under the WM Act and the surrounding land use of the study area is noted to be for cattle grazing.

The study area occurs within the region included within the Barkly Regional Weed Management Plan (2015-2020) (DLRM, 2015). Within DLRM (2015) Buffel Grass is identified as a significant threat and a highly invasive introduced species. However, due to the value of this introduced species to pastoralists, and that it is not a declared weed, the management of this species is contentious (DLRM, 2015). Management resources for this introduced species need to be targeted to areas of greatest need and/or where potential for successful management is highest (DLRM, 2015). As this species was ground-truthed to occur in low densities within the study area (sparsely along access tracks) it may be feasible for this species to be managed within the study area.

6 Conclusions and recommendations

The study area contains moderate faunal and floral biodiversity values in the context of the local region. All fauna and flora species identified within the study area are generally common within similar habitats within the local and broader region. No conservation significant flora or fauna species under Commonwealth or Territory legislation were identified to occur within the study area, despite several being identified as having the potential to occur during desktop assessments. One significant and sensitive vegetation type, riparian vegetation, was identified to occur within the study area as defined within the Land Clearing Guidelines (DENR, 2020b). The ground-truthed extent of this vegetation occurs within the relevant stream order buffer widths identified in **Table 9**. Riparian vegetation should not be cleared and appropriate native vegetation buffers should be retained to reduce impacts of land clearing on these systems. No other Commonwealth of Territory listed prescribed environmental matters were ground-truthed to occur within the study area or determined as likely to be impacted by small to moderate scale development within the study area. Two introduced flora species (Buffel Grass and Stylo) were ground-truthed within the study area. Neither of these species are declared weeds within the NT, however both are likely to be 'potential weeds'. It is recommended that the relevant 'general duties' within the WM Act pertaining to potential weeds are adhered to and that targeted Buffel Grass management, as identified within DLRM (2015), is followed.

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APPENDIX A

EPBC Act Protected Matters Report



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 20/10/20 11:40:04

[Summary](#)

[Details](#)

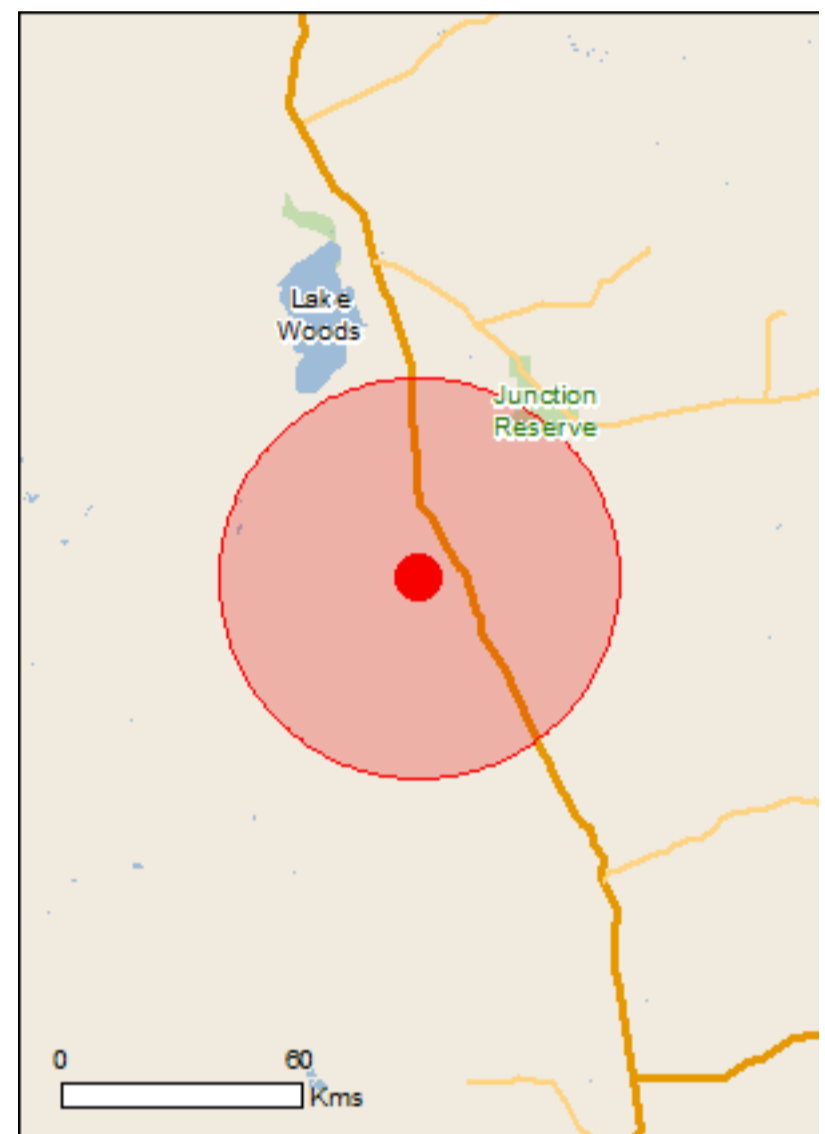
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)



This map may contain data which are
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[Coordinates](#)

Buffer: 50.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	11
Listed Migratory Species:	11

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	17
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	1
Regional Forest Agreements:	None
Invasive Species:	14
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species [\[Resource Information \]](#)

Name	Status	Type of Presence
------	--------	------------------

Birds

Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
---	-----------------------	--

Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat may occur within area
--	------------	--

Erythrura gouldiae Gouldian Finch [413]	Endangered	Species or species habitat may occur within area
--	------------	--

Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
---	------------	--

Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
--	------------	--

Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
--	------------	--

Polytelis alexandrae Princess Parrot, Alexandra's Parrot [758]	Vulnerable	Species or species habitat may occur within area
---	------------	--

Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
--	------------	--

Tyto novaehollandiae kimberli Masked Owl (northern) [26048]	Vulnerable	Species or species habitat may occur within area
--	------------	--

Mammals

Macrotis lagotis Greater Bilby [282]	Vulnerable	Species or species habitat may occur within area
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Reptiles

Acanthophis hawkei Plains Death Adder [83821]	Vulnerable	Species or species habitat likely to occur within area
--	------------	--

Listed Migratory Species [\[Resource Information \]](#)

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
------	------------	------------------

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species

Name	Threatened	Type of Presence
Calidris acuminata Sharp-tailed Sandpiper [874]		habitat may occur within area Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat may occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves [\[Resource Information \]](#)

Name	State
Lake Woods	NT

Invasive Species [\[Resource Information \]](#)

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Name	Status	Type of Presence
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Birds

Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
--	--	--

Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
--	--	--

Mammals

Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
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Camelus dromedarius Dromedary, Camel [7]		Species or species habitat likely to occur within area
---	--	--

Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
--	--	--

Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
--	--	--

Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
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Plants

Acacia nilotica subsp. indica Prickly Acacia [6196]		Species or species habitat may occur within area
--	--	--

Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
---	--	--

Jatropha gossypifolia Cotton-leaved Physic-Nut, Bellyache Bush, Cotton-leaf Physic Nut, Cotton-leaf Jatropha, Black Physic Nut [7507]		Species or species habitat likely to occur within area
--	--	--

Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
---	--	--

Prosopis spp. Mesquite, Algaroba [68407]		Species or species habitat likely to occur within area
---	--	--

Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area
--	--	--

Reptiles

Name	Status	Type of Presence
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-18.38079 133.73025

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- [-Natural history museums of Australia](#)
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
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- [-CSIRO](#)
- [-Australian Tropical Herbarium, Cairns](#)
- [-eBird Australia](#)
- [-Australian Government – Australian Antarctic Data Centre](#)
- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- [-Other groups and individuals](#)

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

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APPENDIX B

Potential Occurrence of Threatened Species

Table B1 Likelihood of occurrence assessments for threatened fauna identified in the PMST and NR Map searches in a 50km radius of the study area

Status		Family	Scientific name	Common name	Source	Local records	Ecology	Potential to occur within the study area
TPWC Act	EPBC Act							
BIRDS								
V	V	Accipitridae	<i>Erythroriorchis radiatus</i>	Red Goshawk	PMST	0	This species prefers open forests and woodland with a mosaic of vegetation types, particularly near riverine systems and permanent water where there is an abundance of prey species (DAWE, 2020c and references therein). The home range in northern Australia has been reported up to 200km ² , with indications it may be even larger (Aumann and Baker-Gabb, 1991).	Low – There are no records of this species within 50km of the study area (DEPWS, 2020). The ALA (2020) shows two records of this species from 2016 and 2018 ~150km south of the study area within the vicinity of Tennant Creek. All other records of this species are >250km to the north of the study area or >450km to the south of the study area (ALA, 2020). No riverine systems or areas of permanent water occur within the study area. Therefore, it is considered that the study area represents unsuitable, absent, or highly degraded habitat for this species. For the above reasons it is considered that this species has a low likelihood of occurring within the study area.
V	E	Estrilidae	<i>Erythrura gouldiae</i>	Gouldian Finch	PMST	0	Sparsely distributed across northern Australia from the Kimberley region to central north Queensland. This species inhabits open woodlands dominated by <i>Eucalyptus</i> trees with ground cover of Sorghum grasses. Gouldian finch also occur in thickets of vegetation along streams and gorges and the margins of mangroves. This species requires daily access to fresh water and becomes restricted to rock outcrops with permanent pools during the dry season (DAWE, 2020c and references therein). This species inhabits open tropical woodlands with a dominant ground cover of tall native grasses (Morcombe 2003). Within the NT, few records of this species occur south of Daly Waters (ALA, 2020).	Low – There are no records of this species within 50km of the study area (DEPWS, 2020). The ALA (2020) shows three records between ~66 and ~125km from the study area, however all other records of this species are >200km to the north of the study area. The study area comprises of a gently to steeply undulating landscape where water is generally not withheld for extended periods. Therefore, it is unlikely that the study area will provide daily access to fresh water for this species for prolonged periods. Due to the sparsity of records within the region and no local records of this species within 50km of the study area, along with habitat that is unsuitable, absent, or highly degraded for this species, it is considered that this species has a low likelihood of occurring within the study area.
V	V	Falconidae	<i>Falco hypoleucos</i>	Grey Falcon	PMST / NR Maps	4	This species is sparsely distributed around inland drainage systems—it is usually restricted to shrubland, grassland and wooded water courses and occasionally found in open woodlands near the coast (Garnett <i>et al.</i> , 2011). Often found on stony plains and <i>Acacia</i> shrublands (Morcombe, 2003).	Moderate – There are several local records of this species within 50km of the study area (DEPWS, 2020). Several wooded watercourses and other potentially suitable, however degraded, habitat for this species occurs within the study area. Because of this, and the presence of local records, it is determined that this species has a moderate likelihood of occurring within the study area.
V	V	Meliphagidae	<i>Grantiella picta</i>	Painted Honeyeater	PMST	0	This species is sparsely distributed across the eastern Northern Territory, north-western Queensland and south-eastern Australia. Habitat includes dry open woodlands and forests where fruiting mistletoe and flowering eucalypts are present (DES, 2020) as these resources form the main component of its diet (DAWE, 2020c and references therein). Associated vegetation includes Ironbark, Box, Yellow Gum, River Red Gum, <i>Melaleuca</i> , <i>Acacia</i> , <i>Casuarina</i> and <i>Callitris</i> , with broad areas of mature trees preferred due to their increased ability to host mistletoe (DAWE, 2020c and references therein). The Painted Honeyeater is considered to have a single population with seasonal migration, closely following available fruiting mistletoe over spring/summer and dispersing to semi-arid inland areas after breeding in November to February, which predominantly occurs at established nest sites between Roma in Queensland and the Victorian Grampians (DAWE, 2020c and references therein).	Low – There are no records of this species within 50km of the study area (DEPWS, 2020) and the study area occurs adjacent to the southern boundary of this species distribution (Menkhorst <i>et al.</i> , 2017). Mistletoe was not abundant within the study area and only few, scattered individuals were observed during baseline assessments. Therefore, it is considered that the study area does not support notable foraging resources for this species. Due to the study area occurring on the outer periphery of the known distribution of this species and foraging resources for this species within the study area being limited, it is considered that there is a low likelihood of this species occurring within the study area.

Status		Family	Scientific name	Common name	Source	Local records	Ecology	Potential to occur within the study area
TPWC Act	EPBC Act							
VU	E	Rostratulidae	<i>Rostratula australis</i>	Australian Painted Snipe	PMST / NR Maps	3	This species has been recorded at wetland sites throughout much of Australia but is most common in the eastern states. The Australian painted snipe is a distinct species but can be hard to detect due to its cryptic and crepuscular behaviour. This species typically occurs in shallow freshwater wetlands and other permanently or temporarily inundated areas, particularly where rank tussocks of grasses, sedges, rushes or reeds are present (DAWE, 2020c; Morcombe, 2003).	<p>Low – There are three records of this species within 50km of the study area identified within DEPWS (2020) search results.</p> <p>No shallow freshwater wetlands and other permanently or temporarily inundated areas where rank tussocks of grasses, sedges, rushes or reeds were identified to be present within the study area. A single, small cattle dam was present; however, this feature showed impacts from cattle and did not afford suitable shelter vegetation for this species. Several nationally important wetlands (DAWE, 2020b) occur to the north and east of the study area, which likely provide more suitable habitat for this species.</p> <p>Overall, it is considered that this species has a low likelihood of occurring within the study area as the study area provides unsuitable, absent, or highly degraded habitat for this species.</p>
VU	CE, M, Ma	Scolopacidae	<i>Calidris ferruginea</i>	Curlew Sandpiper	PMST / NR Maps	1	This species occurs around the coasts of Australia with a non-core distribution extending from eastern Australia into central inland Australia around the Alice Springs area (Menkhorst <i>et al.</i> , 2017). This species mainly occurs on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets, lagoons and also around non-tidal swamps, lakes, and lagoons near the coast, foraging on mudflats and nearby shallow water (DAWE, 2020c and references therein).	<p>Low – There is one local records of this species within 50km of the study area identified within DEPWS (2020) search results.</p> <p>No shallow freshwater wetlands and other permanently or temporarily inundated areas that this species may utilise for foraging occur within the study area. Several nationally important wetlands (DAWE, 2020b) occur to the north and east of the study area, which likely provide more suitable habitat for this species.</p> <p>Overall, it is considered that this species has a low likelihood of occurring within the study area as the study area provides unsuitable, absent, or highly degraded habitat for this species.</p>
VU	VU	Tytonidae	<i>Tyto novaehollandiae kimberli</i>	Masked Owl (northern)	PMST	0	Within the NT the core distribution of this species extends from the north—western coast down and across to the Vanderlin Island area in a south easterly direction (ALA, 2020; Menkhorst <i>et al.</i> , 2017). This species is generally elusive, occurring at low densities and roosts in tree hollows, dense foliage or caves (Menkhorst <i>et al.</i> , 2017). The species has been recorded in a variety of habitats including riverside forests, rainforest, open forest and paperbark swamps and is known to occupy home-ranges of over 1,000ha in the non-breeding season (DAWE, 2020c). However, the occurrence of this species is provisional on the presence of large, old trees with hollows, or broken old trunks, for nesting (Menkhorst <i>et al.</i> , 2017).	<p>Low – There are no local records of this species within 50km of the study area and the study area occurs to the south of the known distribution of this species (Menkhorst <i>et al.</i>, 2017).</p> <p>Few large, hollow bearing trees were identified within the study area during baseline assessments. Therefore, it is unlikely that suitable nesting habitat for this species is present within the study area.</p> <p>Due to the study area occurring outside of the known distribution of this species and the study area providing unsuitable, absent, or highly degraded habitat for this species, it is considered that this species has a low likelihood of occurring within the study area.</p>
CE	E	Psittacidae	<i>Pezoporus occidentalis</i>	Night Parrot	PMST	0	<p>Prior to the 1880s this species was historically recorded throughout arid and semi-arid Australia, however since this period sightings of this species sharply declined. This species possibly still occurs in low density throughout its former range but the current distribution of this species is not known (Garnett <i>et al.</i>, 2011 and references therein) Potential sightings of this species within the NT between 1950 and 2005 are from Harts Range, Stirling Station, Muckaty Station, Keep River national Park, Kildurk Station and the Tanami Desert (DENR, 2006b). Additionally, audio recordings of this species were obtained within the 'southern NT' in 2017.</p> <p>This species is predominantly recorded to occupy spinifex hummock grassland or chenopod shrublands. However, it has occasionally reported to occupy Mitchell grassland and sparse Acacia shrubland. There are also unconfirmed reports of this species occurring within mallee shrubland and open Eucalyptus woodland with a grassy understory known (Garnett <i>et al.</i>, 2011 and references therein). This species is likely to be highly nomadic, moving in response to food and water (DENR, 2006b).</p>	<p>Low – There are no local records of this species within 50km of the study area. The nearest records of this species are >140km to the south west of the study area from the 1980s (ALA, 2020). Muckaty Station, where a potential sighting of this species is located, is located ~30km south of the southern portion of the study area. However, this report is unconfirmed.</p> <p>Spinifex grassland within the study area supported few old, dense hummocks for this species to shelter within. Additionally, Few other potentially suitable shelter locations for this ground-dwelling species were identified within the study area.</p> <p>Due to there being no local records of this species within 50km of the study area and the study area likely providing unsuitable, absent, or highly degraded habitat for this species, it is considered that this species has a low likelihood of occurring within the study area.</p>

Status		Family	Scientific name	Common name	Source	Local records	Ecology	Potential to occur within the study area
TPWC Act	EPBC Act							
VU	VU	Psittacidae	<i>Polytelis alexandrae</i>	Princess Parrot	PMST	0	This species occurs irregularly across the arid regions of Australia from near Oodnadatta in South Australia, wet to near Coolgardie and the east Murchison River in Western Australia, and north to near the Fitzroy River in Western Australia and to Howell Ponds in the NT. It may be concentrated within the central deserts of Australia and in the central ranges. Occurrence records from the periphery of the distribution of this species in south-west and north-west Western Australia, the northern NT, and northern South Australia have become less frequent since the 1950s. This species typically occurs in shrublands and savanna woodlands in swale between sand dunes with spinifex and a variety of shrubs and scattered emergent trees. However, it has occasionally been recorded to occur in vegetated riverine or littoral areas (Garnett <i>et al.</i> , 2011 and references therein).	Low – There are no local records of this species within 50km of the study area. Additionally, the study area occurs outside of the core distribution of the species on the north eastern boundary of an area where this species is considered to occur irregularly following good rain (Menkhorst <i>et al.</i> , 2017). This species is identified to prefer sand dune country with scattered trees and good cover of shrubs and <i>Triodia spp.</i> These features were absent from the study area; therefore, it is considered that the study area supports unsuitable, absent, or highly degraded habitat for this species. Overall, it is considered that this species has a low likelihood of occurring within the study area.
MAMMALS								
VU	VU	Thylacomyidae	<i>Macrotis lagotis</i>	Greater Bilby	PMST / NR Maps	22	This species' original distribution encompassed arid and semi-arid regions of Australia which has now been reduced to areas in western Northern Territory and into northern parts of Western Australia, as well as a small area near the Diamantina River in western Queensland (Menkhorst and Knight, 2011). Its habitat mostly consists of sandy deserts, hummock grasslands and <i>Acacia</i> shrublands (Menkhorst and Knight, 2011). However, broad-scale surveys of the Greater Bilby in the NT in the 1990's indicated that laterite and drainage line land systems were occupied more frequently than sand plain and dune systems (DENR, 2006a).	Moderate – There are 22 local records of this species within 50km of the study area. Suitable habitat for this species is likely to be present within the study area. However, it is considered that this habitat is degraded and more suitable habitat for this species is present outside of the study area due to incidental observations outside of the study area during baseline assessments. Overall, it is considered that this species has a moderate likelihood of occurring within the study area.
REPTILES								
VU	VU	Elapidae	<i>Acanthophis hawkei</i>	Plains Death Adder	PMST	0	The exact distribution of this species is poorly known, but fragmented populations of the plains death adder are known to occur in the Mitchell Grass Downs of western Queensland, the Barkly Tableland on the Northern Territory/Queensland border and on the floodplains of the Adelaide, Mary, and Alligator Rivers east of Darwin in the Northern Territory (DENR, 2012a). Suitable habitat for this species consists of flat, treeless, cracking-soil riverine floodplains (Cogger, 2000).	Low – There are no local records of this species within 50km of the study area. Additionally, the study area does not support flat, treeless, cracking-soil riverine floodplains that are considered suitable habitat for this species. Overall, it is considered that this species has a low likelihood of occurring within the study area due to an absence of local records and the study area containing unsuitable, absent, or highly degraded habitat for this species.
VU	-	Varanidae	<i>Varanus panoptes</i>	Yellow-spotted Monitor	NR Maps	2	In the Northern Territory this species as been recorded across most of the Top End and the Gulf Region. The Yellow-spotted Monitor is found in coastal beaches, floodplains, grasslands, and woodlands (DENR, 2012b).	Moderate – There are two local records of this species within 50km of the study area identified within DEPWS (2020) search results. However, according to distribution maps presented within Wilson and Swan (2017) the study area occurs just outside of the known distribution of this species. It is possible that local records may be attributed to a similar varanid species, namely the Sand monitor (<i>Varanus gouldii</i>), which was identified within the study area during baseline assessments. The study area supports open woodland communities which may provide suitable habitat for this species. Due to the presence of potential local records of this species and potentially suitable woodland habitat for this species within the study area it is considered that this species has a moderate likelihood of occurring within the study area.
INVERTEBRATES								
E	E	Camaenidae	<i>Semotrachia euzyga</i>	Alice Springs Squat Snail	NR Maps	2	This species has a highly restricted range within the Alice Springs area, however recent museum collections have extended its known range to disjunct populations to the north of Tennant Creek. This species has specific habitat requirements and is restricted to areas around fig trees where individuals occupy rocky litter under figs and adults aestivate sealed to rocks (DENR, 2006c).	Low - There are two records of this species within 50 km of the study area. However, no species of fig were identified to occur within the study area. Therefore, it is considered that habitat for this species within the study area is unsuitable, absent, or highly degraded. Overall, it is considered that this species has a low likelihood of occurring within the study area due to its specific habitat requirements.

Status: VU = Vulnerable, E = Endangered, CE = Critically Endangered, M = Migratory, Ma = Marine.

TPWC Act = Territory Parks and Wildlife Conservation Act 1976, EPBC = Environment Protection and Biodiversity Conservation Act 1999

Table B2 Likelihood of occurrence assessments for terrestrial migratory fauna identified in the PMST and NR Map searches in a 50 km radius of the study area

Status		Family	Scientific name	Common name	Source	Local records	Ecology	Potential to occur within the study area
TPWC Act	EPBC Act							
LC	M, Ma	Apodidae	<i>Apus pacificus</i>	Fork-tailed Swift	PMST / NR Maps	5	The Fork-tailed Swift is a non-breeding visitor to all states and territories of Australia. This species is known to utilise cliffs and beaches and to hunt above various habitat types including rainforest and open forests ahead of storm fronts (Higgins, 1999). Swifts are hardly ever seen to land except at nest, and when they do they cling to vertical surfaces rather than perching upright like swallows (Menkhorst <i>et al.</i> , 2017). This species has been noted to forage in high-flying flocks 100s of meters above the ground or canopy (Menkhorst <i>et al.</i> , 2017).	Low – There are five local records of this species within 50km of the study area. The occurrence of this species within the vicinity of the study area is likely to correspond with the presence of storm fronts travelling across the landscape. During these instances, it is likely that this species will only occupy the air space above the study area for short periods of time as this species rarely lands except to nest, which does not occur within Australia. Overall, it is considered that terrestrial habitats relevant to the study area and proposed disturbance constitute unsuitable habitat for this species.
LC	M, Ma	Charadriidae	<i>Charadrius veredus</i>	Oriental Plover	PMST	0	The Oriental Plover arrives in northern Australia between Exmouth and Derby in Western Australia and some records along the coast of the Top End and Gulf of Carpentaria (DAWE, 2020c). Inland records of this species occur on blacksoil plains of northern Western Australia, Northern Territory and north western Queensland. Inland habitats can also include freshwater systems as well as flat, open, semi-arid or arid grasslands. They have also been recorded in recently burned areas (DAWE, 2020c).	Low – There are no local records of this species within 50km of the study area and preferred habitat for this species within the study area is considered to be degraded or absent as freshwater systems are ephemeral and grasslands are not present within the study area. Overall, it is considered that this species has a low likelihood of occurring within the study area
LC	M, Ma	Glareolidae	<i>Glareola maldivarum</i>	Oriental Pratincole	PMST / NR Maps	6	Widespread along coastlines in northern Australia. It is widespread but scattered inland. Inland habitats include open plains, floodplains or short grasslands. They often occur near terrestrial wetlands (DAWE, 2020c).	Low – There are six local records of this species within 50km of the study area. It is suggested that nearby lakes that occur outside of the study area provide suitable and more preferred habitat for this species and account for the presence of local records. Overall, it is considered that suitable habitat for this species within the study area is absent or degraded and therefore it has a low likelihood of occurring within the study area.
NE	M, Ma	Hirundinidae	<i>Hirundo rustica</i>	Barn Swallow	PMST	0	This species is typically found patchily along the north coast of the mainland, typically found open country in coastal lowland utilising a wide variety of habitats (DES and references therein, 2020).	Low – There are no local records of this species within 50km of the study area and the study area is outside of the modelled distribution of this species within Australia. Therefore, it is considered that this species has a low likelihood of occurring within the study area.
NE	M	Motacillidae	<i>Motacilla cinerea</i>	Grey Wagtail	PMST	0	An uncommon but regular migrant to Australia, this species is rarely recorded in the It prefers montane forests and forested areas associated with watercourses. During migration, this species can be found close to beaches and rock pools (Menkhorst <i>et al.</i> , 2017).	Low – There are no local records of this species within 50km of the study area and preferred habitat for this species is not present within the study area. Overall, it is considered that this species has a low likelihood of occurring within the study area.
NE	M, Ma	Motacillidae	<i>Motacilla flava</i>	Yellow Wagtail	PMST	0	This species is a rare but regular migrant to coastal areas within Australia. It typically inhabits open habitats, often near water and occasionally on drier inland plains and edges of mangroves (Morcombe, 2003).	Low – There are no local records of this species within 50km of the study area. It is considered that habitat for this species within the study area is degraded or absent as water bodies are scarce within the study area and inland plains within the study area support no unique features for this species. Overall, it is considered that this species has a low likelihood of occurring within the study area.
LC	M, Ma	Scolopacidae	<i>Actitis hypoleucos</i>	Common Sandpiper	PMST / NR Maps	22	Widespread but patchy distribution along all coastlines of Australia. Found in coastal wetlands and inland wetlands with varying levels of salinity (DAWE, 2020c and references therein). Most commonly found in muddy or rocky shores of estuaries, deltas of streams, banks upstream, lakes, pools, billabongs, reservoirs, and dams.	Low – There are 22 local records of this species within 50km of the study area. Preferred habitat for this species is not present within the study area. Therefore, despite the presence of local records, it is considered that this species has a low likelihood of occurring within the study area.
LC	M, Ma	Scolopacidae	<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	PMST / NR Maps	5	This species occurs around the entire coast of Australia outside its breeding season, where it is found in a broad range of permanent or ephemeral water bodies, primarily brackish (DAWE, 2020c and references therein). It prefers muddy edges of shallow fresh or brackish wetlands, and use flooded paddocks, sedge lands and other ephemeral wetlands.	Low - There are five local records of this species within 50km of the study area. Preferred habitat for this species is not present within the study area. Therefore, despite the presence of local records, it is considered that this species has a low likelihood of occurring within the study area.

Status		Family	Scientific name	Common name	Source	Local records	Ecology	Potential to occur within the study area
TPWC Act	EPBC Act							
VU	CE, M, Ma	Scolopacidae	<i>Calidris ferruginea</i>	Curlew Sandpiper	PMST / NR Maps	1	This species occurs around the coasts of Australia with a non-core distribution extending from eastern Australia into central inland Australia around the Alice Springs area (Menkhorst <i>et al.</i> , 2017). This species mainly occurs on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets, lagoons and also around non-tidal swamps, lakes, and lagoons near the coast, foraging on mudflats and nearby shallow water (DAWE, 2020c and references therein).	Low – There is one local records of this species within 50km of the study area. Preferred habitat for this species is not present within the study area. Therefore, despite the presence of local records, it is considered that this species has a low likelihood of occurring within the study area.
DD	M, Ma	Scolopacidae	<i>Calidris melanotos</i>	Pectoral Sandpiper	PMST	0	Most records of this species are around the coasts of Australia or within south-eastern Australia (ALA, 2020). Inland records of this species are sparse and scattered, with most occurring around the Alice Springs area (ALA, 2020). This species prefers shallow wetlands (fresh to marine) and tending not to utilise small or ephemeral water bodies (Menkhorst <i>et al.</i> , 2017).	Low – There are local records of this species within 50km of the study area and preferred habitat for this species is not present within the study area. Overall, it is considered that this species has a low likelihood of occurring within the study area.
LC	M, Ma	Scolopacidae	<i>Tringa nebularia</i>	Common Greenshank	PMST	0	This species is a non-breeding migrant that is widespread within the coastal regions of Australia and also within most of inland Australia. This species can be found in a variety of coastal to freshwater habitats with open mudflats or still shallow water (Menkhorst <i>et al.</i> , 2017).	Low – There are no local records of this species within 50km of the study area and preferred habitat for this species is not present within the study area. Overall, it is considered that this species has a low likelihood of occurring within the study area.

Status: NE = Not Evaluated, DD = Data Deficient, LC = Least Concern, VU = Vulnerable, CE = Critically Endangered, M = Migratory, Ma = Marine.


TPWC Act = Territory Parks and Wildlife Conservation Act 1976, EPBC = Environment Protection and Biodiversity Conservation Act 1999

APPENDIX C

Ground-truthed Vegetation Communities

Table C1 Floristic composition and structure of ground-truthed vegetation associations within the study area based on the NVIS information hierarchy (Brocklehurst et al., 2007)

Land unit	Ground-truthed floristic compositions and structure	Representative photograph
<p>Low rises</p> <p>Low stony rises with isolated areas of outcropping</p>	<p>U+ <i>Eucalyptus leucophloia</i>, <i>Corymbia terminalis</i>, <i>Eucalyptus pruinosa</i> tree;</p> <p>M <i>E. leucophloia</i>, <i>Acacia</i> spp. shrub;</p> <p>G <i>Triodia pungens</i>, <i>Eriachne ciliata</i>, <i>Schizachyrium fragile</i> tussock grass.</p>	
<p>Plains</p> <p>Red-brown clay loam plains</p>	<p>U+ <i>E. pruinosa</i>, <i>C. terminalis</i>, <i>Capparis</i> sp., <i>Grevillea striata</i>, <i>Acacia</i> sp. tree;</p> <p>M <i>Acacia lysiphloia</i>, <i>Ventilago viminalis</i>, <i>Atalaya hemiglauca</i>, <i>E. pruinosa</i> shrub;</p> <p>G – Desiccated, no living matter in standard surveys</p>	

Land unit	Ground-truthed floristic compositions and structure	Representative photograph
<p>Watercourses</p> <p>Rocky watercourses.</p>	<p>U+ <i>Eucalyptus camaldulensis</i>, <i>Terminalia canescens</i> ^tree\6\c;</p> <p>M <i>E. camaldulensis</i>, <i>T. canescens</i> ^shrub\3,4\bi;</p> <p>G – No living matter within standard surveys.</p>	

APPENDIX D

Flora Species List

Table D1 Flora species recorded within the study area

Status			Family	Scientific name	Common name	Vegetation community		
TPWC Act	EPBC Act	NON-NATIVE				Snappy gum woodland on low rocky hills	Silver box and Desert bloodwood on clay plains	River red gum along watercourse
LC	-		Amaranthaceae	<i>Gomphrena canescens</i>	Pink Everlasting		X	
LC	-		Amaranthaceae	<i>Ptilotus calostachyus</i>	-	X	X	
LC	-		Amaranthaceae	<i>Ptilotus fusiformis</i>	Pom-pom Bottlebrush		X	
LC	-		Amaranthaceae	<i>Ptilotus nobilis subsp. nobilis</i>	Yellow Tails	X		
LC	-		Apocynaceae	<i>Carissa lanceolata</i>	Conkerberry		X	
LC	-		Apocynaceae	<i>Marsdenia sp.</i>	-		X	
LC	-		Asteraceae	<i>Streptoglossa odora</i>	Mintbush	X		
LC	-		Boraginaceae	<i>Heliotropium glabellum</i>	-		X	
LC	-		Boraginaceae	<i>Heliotropium pachyphyllum</i>	Thick-leaved heliotrope		X	
LC	-		Boraginaceae	<i>Trichodesma zeylanicum</i>	Camel Bush	X	X	
LC	-		Capparaceae	<i>Capparis lasiantha</i>	Wait-a-while		X	
LC	-		Capparaceae	<i>Capparis sp.</i>	-		X	
LC	-		Cleomaceae	<i>Cleome viscosa</i>	Tickweed	X	X	X
LC	-		Combretaceae	<i>Terminalia canescens</i>	Winged-nut Tree			X
LC	-		Convolvulaceae	<i>Bonamia media</i>	Common Bonamia		X	
LC	-		Convolvulaceae	<i>Evolvulus alsinoides</i>	Tropical Speedwell	X	X	
LC	-		Convolvulaceae	<i>Ipomoea sp.</i>	-	X		
INFRA	-		Cucurbitaceae	<i>Cucumis melo</i>	Muskmelon	X		
LC	-		Euphorbiaceae	<i>Euphorbia tannensis</i>	-		X	
LC	-		Goodeniaceae	<i>Goodenia sp.</i>	-	X		
LC	-		Goodeniaceae	<i>Goodenia vilmorinae</i>	Purple Hand Flower		X	
LC	-		Goodeniaceae	<i>Scaevola laciniata</i>	-		X	
LC	-		Fabaceae	<i>Acacia acradenia</i>	Silky Wattle	X		
LC	-		Fabaceae	<i>Acacia adsurgens</i>	Sugar Brother		X	
LC	-		Fabaceae	<i>Acacia bivenosa</i>	Nerved Wattle		X	
LC	-		Fabaceae	<i>Acacia elachantha</i>	-		X	
LC	-		Fabaceae	<i>Acacia hilliana</i>	Flying-saucer Bush	X		
LC	-		Fabaceae	<i>Acacia lysiphloia</i>	Turpentine Wattle		X	
LC	-		Fabaceae	<i>Acacia monticola</i>	Red Wattle	X		
LC	-		Fabaceae	<i>Acacia orthocarpa</i>	Needle-leaf Wattle	X		
LC	-		Fabaceae	<i>Acacia perryi</i>	-	X		
LC	-		Fabaceae	<i>Acacia retivenea subsp. retivenea</i>	Net-veined Wattle	X		

Status			Family	Scientific name	Common name	Vegetation community		
TPWC Act	EPBC Act	NON-NATIVE				Snappy gum woodland on low rocky hills	Silver box and Desert bloodwood on clay plains	River red gum along watercourse
LC	-		Fabaceae	<i>Acacia victoriae</i>	Bardi bush		X	
LC	-		Fabaceae	<i>Indigofera linifolia</i>	Narrow-leaf Indigo	X		
LC	-		Fabaceae	<i>Jacksonia vernicosa</i>	-	X		
LC	-		Fabaceae	<i>Petalostylis cassioides</i>	Cassia butterfly bush		X	
LC	-		Fabaceae	<i>Senna artemisioides</i>	Wormwood Senna	X		
LC	-		Fabaceae	<i>Senna notabilis</i>	Cockroach Bush	X		
LC	-		Fabaceae	<i>Senna planitiicola</i>	-		X	
NE	-	*	Fabaceae	<i>Stylosanthes scabra</i>	Stylo			X
LC	-		Loranthaceae	<i>Lysiana sp.</i>	-	X		
LC	-		Malvaceae	<i>Abutilon sp.</i>	-			X
LC	-		Malvaceae	<i>Gossypium australe</i>	Cotton		X	
LC	-		Malvaceae	<i>Melhania oblongifolia</i>	Melhania	X	X	X
LC	-		Malvaceae	<i>Sida hackettiana</i>	Spiked Sida			X
LC	-		Malvaceae	<i>Sida sp.</i>	-			X
LC	-		Menispermaceae	<i>Tinospora smilacina</i>	Snake vine	X	X	
LC	-		Myrtaceae	<i>Corymbia setosa</i>	Rough-leaved Bloodwood	X		
LC	-		Myrtaceae	<i>Corymbia terminalis</i>	Desert bloodwood	X	X	
LC	-		Myrtaceae	<i>Eucalyptus camaldulensis</i>	River Red Gum			X
LC	-		Myrtaceae	<i>Eucalyptus leucophloia</i>	Snappy Gum	X	X	X
LC	-		Myrtaceae	<i>Eucalyptus pruinosus</i>	Silver Box	X	X	
LC	-		Myrtaceae	<i>Melaleuca nervosa</i>	Fibre bark		X	
LC	-		Myrtaceae	<i>Melaleuca viridiflora</i>	Broad-leaved Paperbark		X	
LC	-		Orobanchaceae	<i>Buchnera linearis</i>	-	X	X	X
LC	-		Picrodendraceae	<i>Petalostigma pubescens</i>	Quinine Tree		X	
LC	-		Poaceae	<i>Aristida hygrometrica</i>	Northern Kerosene Grass		X	
LC	-		Poaceae	<i>Aristida sp.</i>	-	X	X	
NE	-	*	Poaceae	<i>Cenchrus ciliaris</i>	Buffel Grass		X	
LC	-		Poaceae	<i>Cymbopogon bombycinus</i>	Lemon-scented Grass	X	X	X
LC	-		Poaceae	<i>Dichanthium fecundum</i>	Bundle-bundle		X	X
LC	-		Poaceae	<i>Enneapogon sp.</i>	-			X
LC	-		Poaceae	<i>Eriachne ciliata</i>	Slender Wandarrie Grass	X		
LC	-		Poaceae	<i>Eriachne sp.</i>	-			X
LC	-		Poaceae	<i>Schizachyrium fragile</i>	Fire Grass	X	X	X

Status			Family	Scientific name	Common name	Vegetation community		
TPWC Act	EPBC Act	NON-NATIVE				Snappy gum woodland on low rocky hills	Silver box and Desert bloodwood on clay plains	River red gum along watercourse
LC	-		Poaceae	<i>Setaria surgens</i>	-			X
LC	-		Poaceae	<i>Sporobolus caroli</i>	Fairy Grass		X	
LC	-		Poaceae	<i>Themeda triandra</i>	Kangaroo Grass		X	X
LC	-		Poaceae	<i>Triodia pungens</i>	Soft Spinifex	X	X	X
LC	-		Poaceae	<i>Triodia sp.</i>	Spinifex	X		
LC	-		Proteaceae	<i>Grevillea sp.</i>	-	X		
LC	-		Proteaceae	<i>Grevillea striata</i>	Beefwood		X	
LC	-		Proteaceae	<i>Grevillea wickhamii</i>	Holly Grevillia	X	X	
LC	-		Proteaceae	<i>Hakea arborescens</i>	Yellow Hakea		X	
LC	-		Proteaceae	<i>Hakea chordophylla</i>	Bootlace Oak		X	
LC	-		Rhamnaceae	<i>Ventilago viminalis</i>	Supplejack		X	
LC	-		Santalaceae	<i>Santalum lanceolatum</i>	Desert Quandong		X	
LC	-		Sapindaceae	<i>Atalaya hemiglauca</i>	White Wood		X	
LC	-		Sapindaceae	<i>Dodonaea lanceolata</i>	Hop Bush	X		
LC	-		Solanaceae	<i>Solanum sp.</i>	-	X		

Status: NE = Not Evaluated, LC = Least Concern, INFRA = infraspecific
TPWC Act = Territory Parks and Wildlife Conservation Act 1976, EPBC = Environment Protection and Biodiversity Conservation Act 1999
*indicates a species that is non-native to Australia.

APPENDIX E

Fauna Species List

Table E1 Fauna species recorded within the study area

Status		Family	Scientific name	Common name	Survey site				
TPWC Act	EPBC Act				(1) Renner North	(2) Renner Central	(3) Carruthers North	(4) Carruthers South	Incidental
BIRDS									
LC	-	Anatidae	<i>Dendrocygna eytoni</i>	Plumed Whistling-duck		X			
LC	-	Phasianidae	<i>Coturnix pectoralis</i>	Stubble Quail					X
LC	-	Phasianidae	<i>Coturnix ypsilophora</i>	Brown Quail					X
LC	-	Accipitridae	<i>Milvus migrans</i>	Black Kite	X			X	X
NT	-	Otididae	<i>Ardeotis australis</i>	Australian Bustard					X
LC	-	Turnicidae	<i>Turnix pyrrhothorax</i>	Red-chested Button-quail		X			
LC	-	Columbidae	<i>Ocyphaps lophotes</i>	Crested Pigeon					X
LC	-	Columbidae	<i>Geophaps plumifera</i>	Spinifex Pigeon					X
LC	-	Columbidae	<i>Geopelia cuneata</i>	Diamond Dove	X	X	X	X	X
LC	-	Strigidae	<i>Ninox boobook</i>	Australian Boobook		X	X	X	
LC	-	Podargidae	<i>Podargus strigoides</i>	Tawny Frogmouth		X			
LC	-	Eurostopodidae	<i>Eurostopodus argus</i>	Spotted Nightjar	X	X	X	X	X
LC	-	Halcyonidae	<i>Todiramphus pyrrhopygius</i>	Red-backed Kingfisher	X				X
LC	Ma	Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater				X	X
LC	-	Falconidae	<i>Falco berigora</i>	Brown Falcon		X			X
LC	-	Cacatuidae	<i>Eolophus roseicapillus</i>	Galah		X			
LC	-	Cacatuidae	<i>Cacatua sanguinea</i>	Little Corella			X		
LC	-	Psittacidae	<i>Barnardius zonarius</i>	Australian Ringneck		X			X
LC	-	Psittacidae	<i>Melopsittacus undulatus</i>	Budgerigar	X	X	X	X	X
LC	-	Maluridae	<i>Malurus melanocephalus</i>	Red-backed Fairy-wren		X			X
LC	-	Meliphagidae	<i>Conopophila rufogularis</i>	Rufous-throated Honeyeater		X			
LC	-	Meliphagidae	<i>Lichenostomus keartlandi</i>	Grey-headed Honeyeater			X	X	
LC	-	Acanthizidae	<i>Smicronis brevirostris</i>	Weebill	X				
LC	-	Pomatostomidae	<i>Pomatostomus temporalis</i>	Grey-crowned Babbler		X		X	X
LC	-	Artamidae	<i>Artamus personatus</i>	Masked Woodswallow			X		
LC	-	Artamidae	<i>Artamus cinereus</i>	Black-faced Woodswallow		X			
LC	-	Artamidae	<i>Artamus minor</i>	Little Woodswallow				X	X
LC	-	Artamidae	<i>Gymnorhina tibicen</i>	Australian Magpie				X	
LC	-	Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike					X
LC	-	Campephagidae	<i>Lalage tricolor</i>	White-winged Triller					X
LC	-	Pachycephalidae	<i>Oreoica gutturalis</i>	Crested Bellbird			X		
LC	-	Pachycephalidae	<i>Pachycephala rufiventris</i>	Rufous Whistler			X	X	
LC	-	Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark	X			X	X
LC	-	Corvidae	<i>Corvus coronoides</i>	Australian Raven				X	
LC	-	Hirundinidae	<i>Petrochelidon ariel</i>	Fairy Martin				X	

Status		Family	Scientific name	Common name	Survey site				
TPWC Act	EPBC Act				(1) Renner North	(2) Renner Central	(3) Carruthers North	(4) Carruthers South	Incidental
LC	-	Estrildidae	<i>Emblema pictum</i>	Painted Finch				X	
LC	-	Estrildidae	<i>Taeniopygia guttata</i>	Zebra Finch	X	X			X
LC	-	Motacillidae	<i>Anthus novaeseelandiae</i>	Australian Pipit					
MAMMALS									
(Int)	-	Bovidae	<i>Bos taurus</i>	Cattle					X
LC	-	Canidae	<i>Canis familiaris dingo</i>	Dingo					X
LC	-	Emballonuridae	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tailed Bat	X	X	X	X	X
LC	-	Molossidae	<i>Chaerephon jobensis</i>	Greater Northern Free-tailed Bat			X		
LC	-	Molossidae	<i>Ozimops petersi</i>	Inland Free-tailed Bat			X	X	X
LC	-	Muridae	<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse		X			
LC	-	Vespertilionidae	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat			X	X	X
LC	-	Vespertilionidae	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat			X	X	X
LC	-	Vespertilionidae	<i>Scotorepens balstoni</i>	Inland Broad-nosed Bat			X	X	X
LC	-	Vespertilionidae	<i>Vespadelus baverstocki</i>	Inland Forest Bat	X		X	X	X
REPTILES									
LC	-	Agamidae	<i>Ctenophorus isolepis</i>	Central Military Dragon					X
LC	-	Agamidae	<i>Ctenophorus nuchalis</i>	Central Netted Dragon					X
LC	-	Agamidae	<i>Diporiphora lalliae</i>	Lally's Two-lined Dragon		X		X	X
NE	-	Agamidae	<i>Tympanocryptis centralis</i>	Centralian Earless Dragon			X		X
LC	-	Boidae	<i>Aspidites melanocephalus</i>	Black-headed Python					X
LC	-	Diplodactylidae	<i>Diplodactylus conspicillatus</i>	Variable Fat-tailed Gecko		X	X		
LC	-	Diplodactylidae	<i>Lucasium immaculatum</i>	Pale-striped Ground Gecko		X	X	X	
LC	-	Diplodactylidae	<i>Rhynchodeura ornata</i>	Western Beaked Gecko			X		
LC	-	Diplodactylidae	<i>Strophurus ciliaris</i>	Northern Spiny-tailed Gecko		X			
LC	-	Diplodactylidae	<i>Strophurus jeanae</i>	Southern Phasmid Gecko					X
NE	-	Elapidae	<i>Brachyurophis roperi</i>	Northern Shovel-nosed Snake		X			
LC	-	Gekkonidae	<i>Gehyra minuta</i>	Dwarf Dtella	X	X	X	X	
LC	-	Gekkonidae	<i>Heteronotia binoei</i>	Bynoe's Gecko				X	
LC	-	Scincidae	<i>Carlia munda</i>	Shaded-litter Rainbow-skink					X
LC	-	Scincidae	<i>Ctenotus robustus</i>	Eastern Striped Ctenotus				X	
LC	-	Scincidae	<i>Ctenotus saxatilis</i>	Rock Ctenotus		X		X	
LC	-	Varanidae	<i>Varanus gouldii</i>	Sand Goanna		X			X
AMPHIBIANS									
LC	-	Hylidae	<i>Cyclorana australis</i>	Giant Frog			X	X	
LC	-	Hylidae	<i>Litoria caerulea</i>	Green Tree Frog				X	X
LC	-	Hylidae	<i>Litoria rubella</i>	Red Tree Frog				X	

Status: NE = Not Evaluated, LC = Least Concern, NT = Near Threatened, Ma = Marine, (int) = non-native to Australia

TPWC Act = Territory Parks and Wildlife Conservation Act 1976, EPBC = Environment Protection and Biodiversity Conservation Act 1999

APPENDIX F

Microbat Call Identification Report



Microbat Call Identification Report

Prepared for (“Client”):	SLR Consulting
Survey location/project name:	Renner Springs, NT
Survey dates:	23-27 September 2020
Client project reference:	680.30027.00000.
Job no.:	SLR-2007
Report date:	27 October 2020

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Methods

Data received

Balance! Environmental received 1894 full-spectrum audio files (WAV files), recorded over five consecutive nights (23rd – 27th September 2020) using a Song Meter SM4BAT detector (Wildlife Acoustics, Maynard MA, USA).

Bat-call analysis

The data were processed in three steps using *Anabat Insight* (Version 1.9.50; Titley Scientific, Brisbane):

1. All WAV files were scanned with a 'noise' filter to separate files containing only non-bat background noise from those with potentially identifiable calls.
2. WAV files that passed the 'noise' filter (*i.e.* contained bat calls) were then processed through a Decision Tree analysis to group calls with similar pulse characteristics (e.g. characteristic frequency, slope, duration) and apply tentative species labels.
3. Each "species" group was reviewed manually to verify and/or correct species labels by comparing call spectrograms and derived metrics with those of regionally relevant reference calls and published call descriptions (e.g. Reinhold *et al.* 2001; Milne 2002).

Species identification was also guided by considering probability of occurrence based on published distributional information (Churchill 2008; van Dyck *et al.* 2013) and/or records held in Atlas of Living Australia (<http://www.ala.org.au>).

Reporting standard

The format and content of this report follows Australasian Bat Society standards for the interpretation and reporting of bat call data (Reardon 2003), available on-line at <http://www.ausbats.org.au/>.

Species nomenclature follows Jackson & Groves (2015).

Results & Discussion

The noise filtration process excluded 1667 WAV files from further analysis. The remaining 227 WAV files contained 231 identifiable bat calls. Detection rates ranged from seven calls per detector-night on 24th September to 97 calls per detector-night on 27th September (see **Table 1**).

At least nine and possibly 11 species were detected. More than half (128) of the calls were positively identified to seven distinct species (**Table 1**, upper portion); and another two calls were positively attributed to the *Taphozous* genus. The latter call type could represent either *T. georgianus* or *T. hilli*.

The other 101 "unresolved" calls could not be reliably identified and were allocated to one of three multi-species groups (see bottom section of **Table 1**). Two of those groups represented three species that were otherwise positively identified: *Chalinolobus gouldii*; *Scotorepens balstoni*; and *Ozimops petersi*. The third group, consisting of 77 calls, represented at least one and probably two additional species: *Chalinolobus nigrogriseus*; and/or *Scotorepens greyii*.

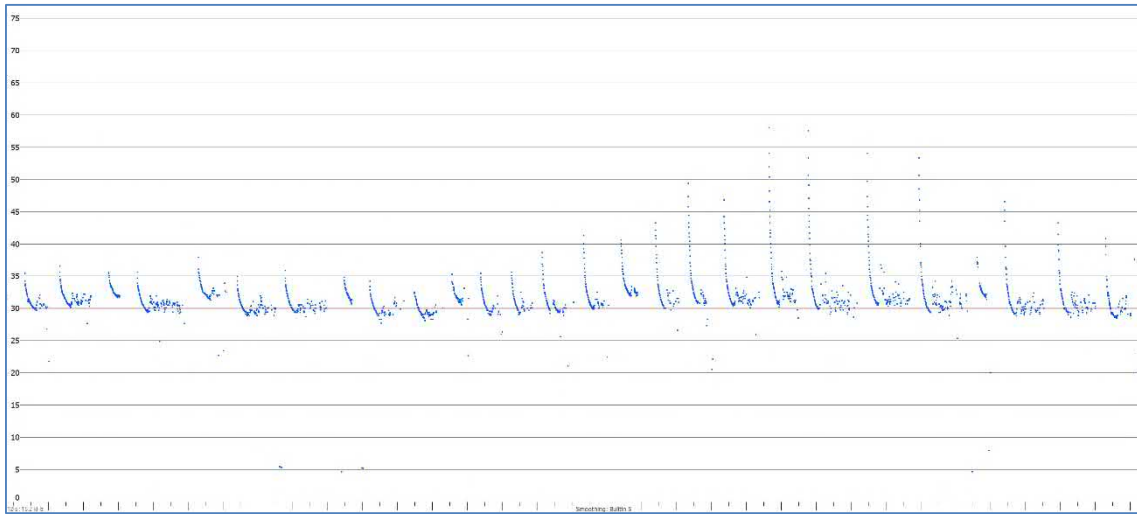
Table 1 Microbat species recorded during the Renner Springs survey, 23-27 September 2020. Number of calls allocated per night to each species or “unresolved” species group

Night:	23/9	24/9	25/9	26/9	27/9	Species Total
Positively identified calls						
<i>Chalinolobus gouldii</i>			1	6	9	16
<i>Nyctophilus geoffroyi</i>			1	6	1	8
<i>Scotorepens balstoni</i>			1	1	2	4
<i>Vespadelus baverstocki</i>	1		1	5	4	11
<i>Chaerephon jobensis</i>			1			1
<i>Ozimops petersi</i>			3	10	3	16
<i>Saccolaimus flaviventris</i>	47	7	6	10	2	72
<i>Taphozous hilli</i> / <i>T. georgianus</i>				2		2
Unresolved calls						
<i>C. gouldii</i> / <i>O. petersi</i>			2	15	6	23
<i>C. gouldii</i> / <i>S. balstoni</i>				1		1
<i>Chalinolobus nigrogriseus</i> / <i>Scotorepens greyii</i>	1		3	3	70	77
Detector-night Total	49	7	19	59	97	231

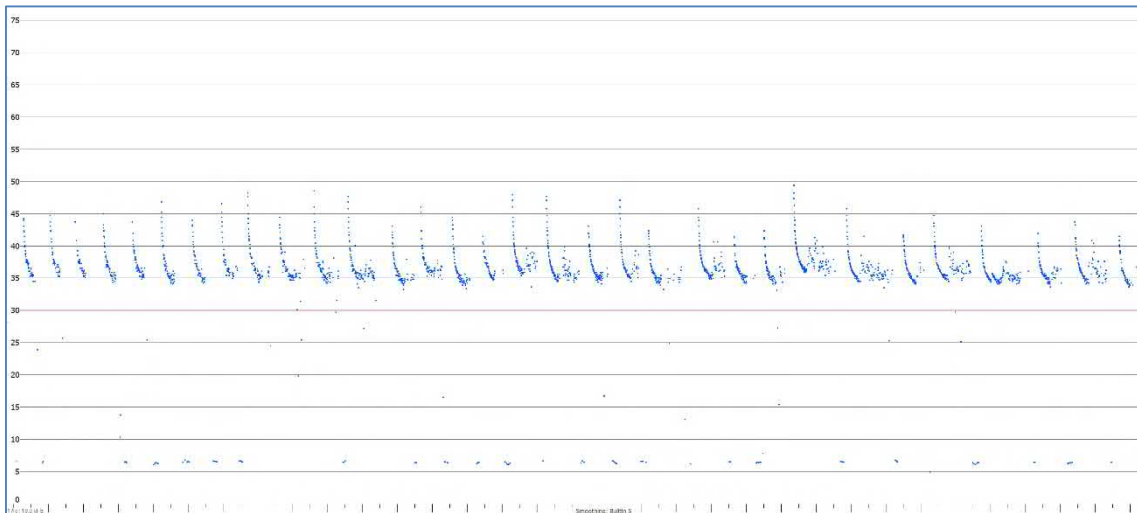
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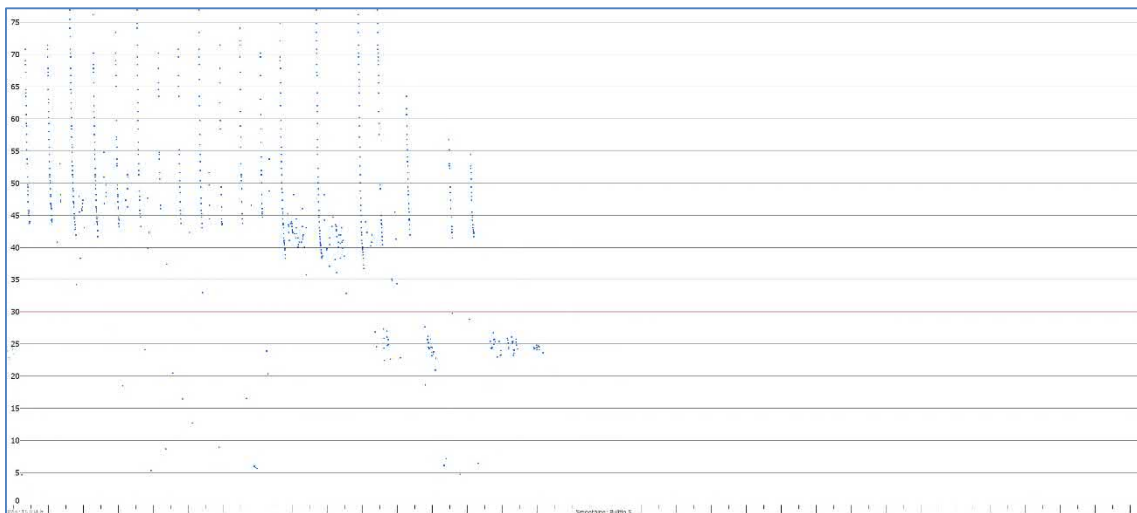
Appendix 1 Representative call sequences recorded at Renner Springs, 23-37 September 2020.
x-axis = 50 ms per tick-mark; true-time display (i.e. time between pulses NOT compressed)



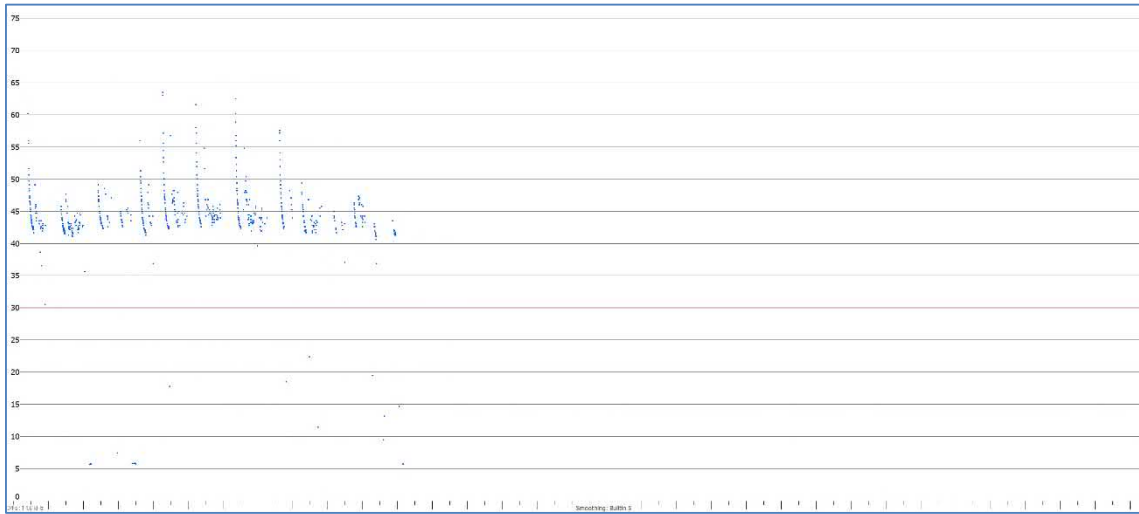
Chalinolobus gouldii



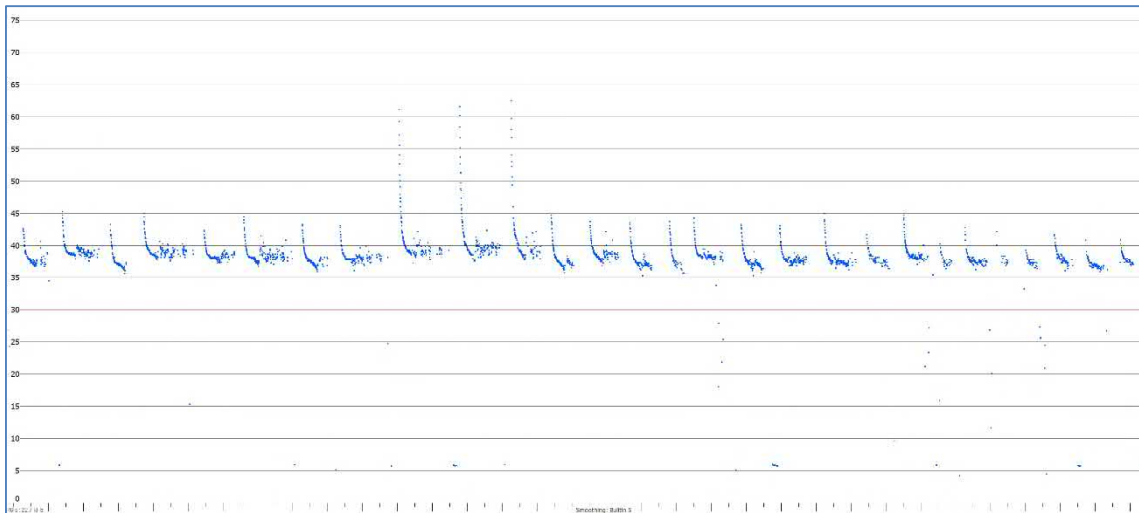
Scotorepens balstoni



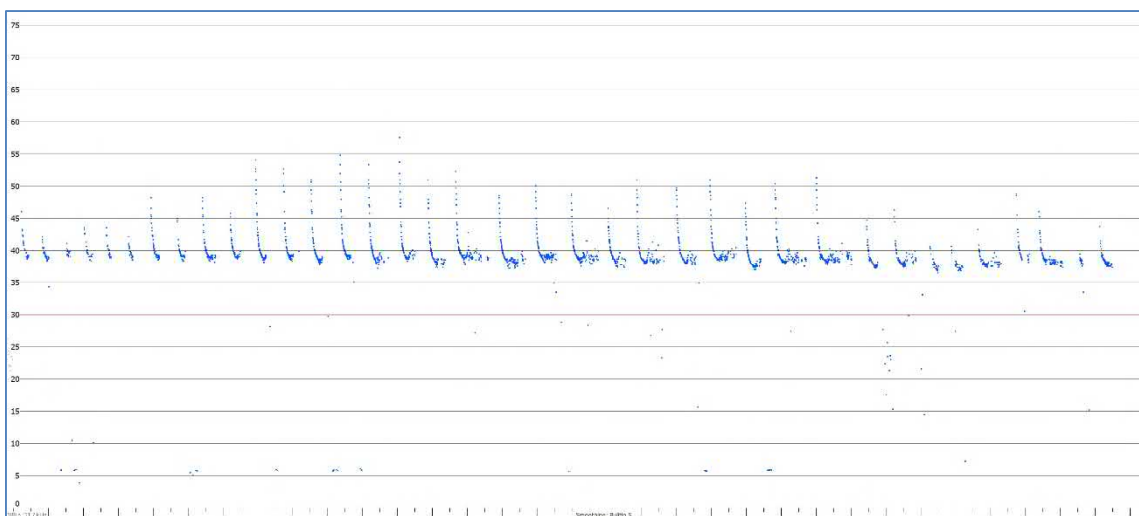
Nyctophilus geoffroyi



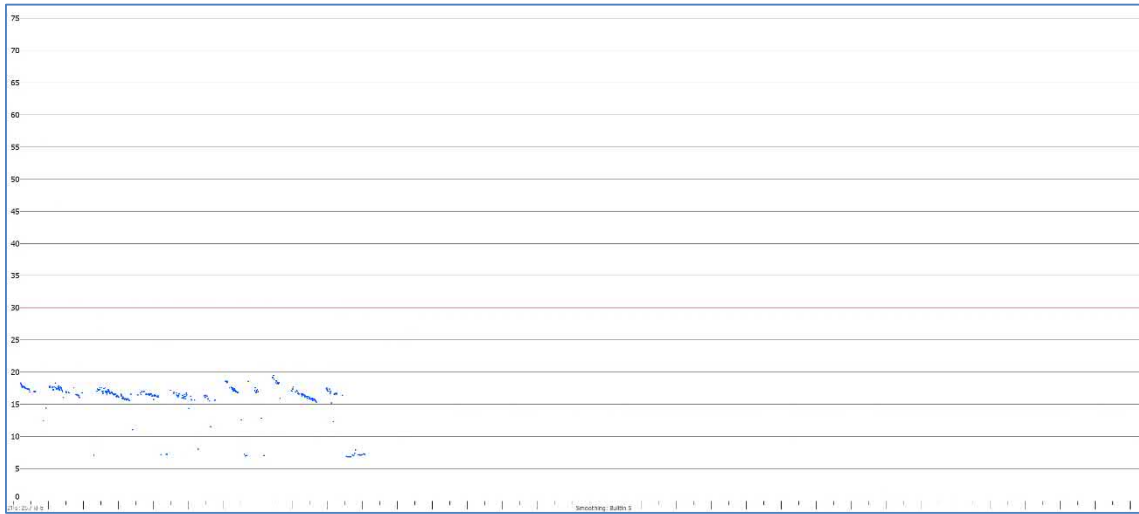
Vespadelus baverstocki



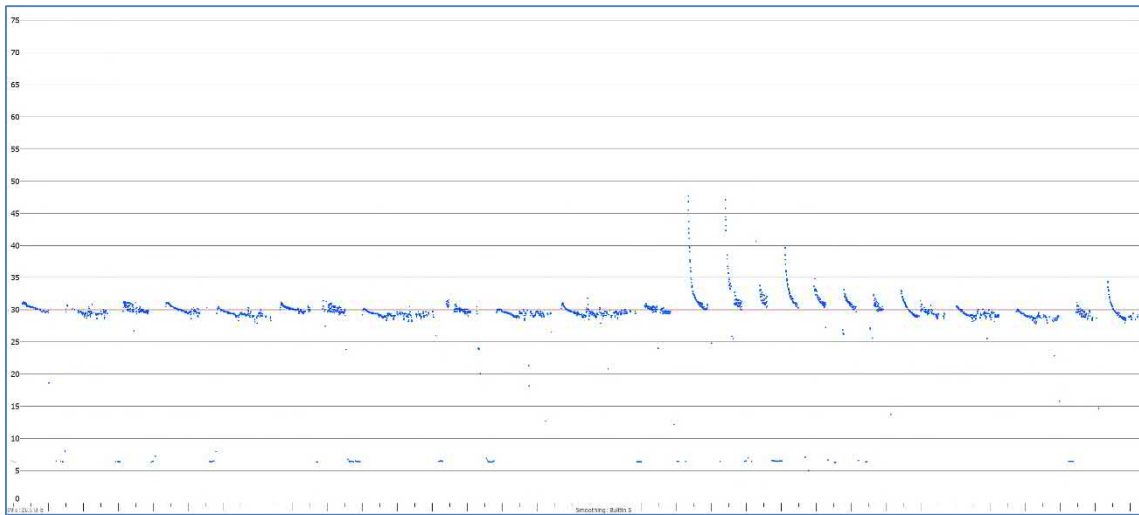
Chalinolobus nigrogriseus or *Scotorepens greyii*



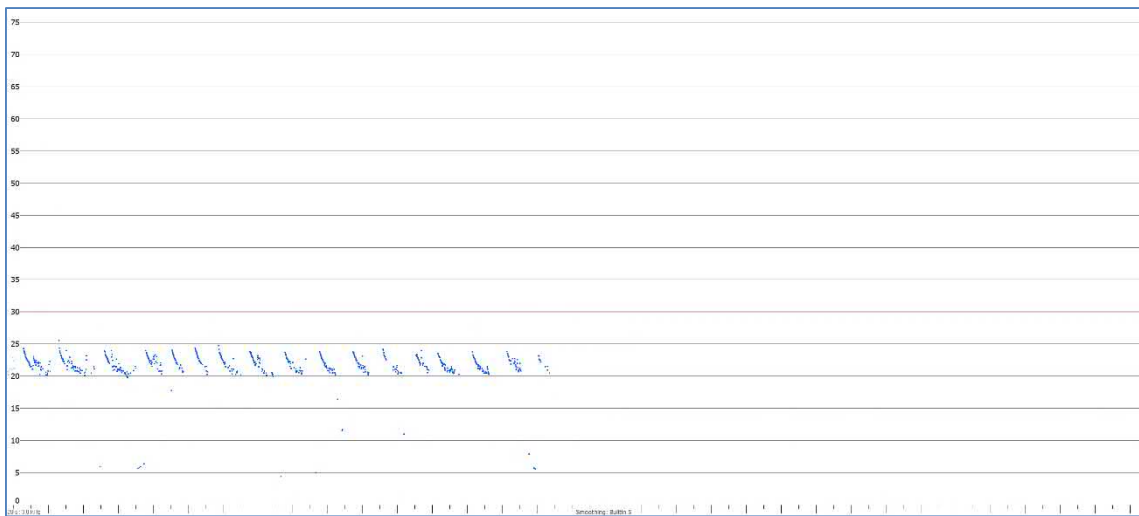
Chalinolobus nigrogriseus or *Scotorepens greyii*



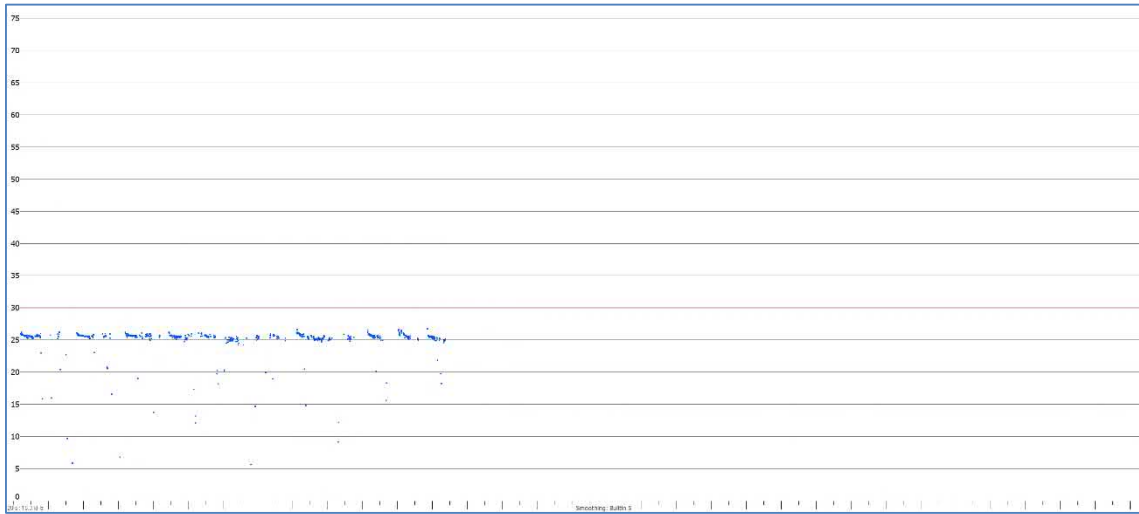
Chaerephon jobensis



Ozimops petersi



Saccolaimus flaviventris



Taphozous georgianus or *T. hilli*

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Tracks											Camp						Bulk Sample pits						Costeans						Total disturbed area created by tracks, camp, bulk sample pits and costeans (ha)				
Tenement	Major/Minor as per security calculation description	Length (km)	Width (m)	Area (ha)	Authorised Date	Disturbance Created Date	Actual track created Spatial data Date provided	Rehabilitated Date	Rehabilitation approved by DITT Date	Evidence provided that land owner is taking over responsibility of the entire track length Yes/No/NA	Comments	Tenement	Area (ha)	Authorised Date	Disturbance Created Date	Rehabilitated Date	Rehabilitation approved by DITT Date	Comments	Tenement	Area (ha)	Authorised Date	Disturbance Created Date	Rehabilitated Date	Rehabilitation approved by DITT Date	Comments	Tenement	Area (ha)	Authorised Date		Disturbance Created Date	Rehabilitated Date	Rehabilitation approved by DITT Date	Comments
EL5678	Minor	10.00	0.00	0.003	01/07/2016	08/09/2017		NA	NA	Yes	Example	EL5678	1.00	01/07/2016	08/09/2017	NA	NA	Example	EL5678	2.00	01/07/2016	08/09/2017	NA	NA	Example	EL5678	0.50	01/07/2017	08/09/2017	NA	NA	Example	3.50
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