



Northparkes Mines
PO Box 995 Parkes NSW 2870 Australia
T +61 2 6861 3000 F +61 2 6861 3101

www.northparkes.com

Thursday 19 July 2018

David Kitto
Executive Director
Department of Planning and Environment
GPO Box 39
SYDNEY NSW 2001

Dear Mr Kitto

Re: Environmental Assessment for Section 75W Modification to Project Approval 11_0060 – Northparkes Mines Proposed Changes to Ore Processing Infrastructure and Administrative Amendments

Northparkes Mines (Northparkes) proposes to modify Project Approval 11_0060 under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to allow for proposed changes to the approved ore processing plant infrastructure and to provide for minor administrative amendments to the Project Approval

This letter has been prepared to detail the proposed modifications and provide an assessment of potential environmental impacts arising from the proposed changes to support the modification to PA11_0060.

1.0 BACKGROUND

Northparkes received project approval for the Northparkes Extension Project on 16 July 2014 (PA11_0060) under Part 3A of the EP&A Act to provide for continued mining at Northparkes, the development of additional underground and open cut mining areas, changes to the approved tailings storage facility along with a range of ancillary infrastructure changes. This project approval has been subsequently modified on three occasions to provide for alternate underground mining methodology (sub level caving), adjustments to the schedule of lands and changes to the mine plan. Each of these modifications has been approved as minor modifications under Section 75W of the EP&A Act.

Underpinning the original project approval, Umwelt (Australia) Pty Limited (Umwelt) prepared a comprehensive Environmental Assessment (EA) that provided a description and assessment of the Northparkes operation through to 2032. The existing approved mining operations are detailed in Section 2.0 of the EA.

The mining philosophy employed by Northparkes is one of 'mill feed' whereby the goal of mining activities is to maintain a constant supply of available ore to put through the processing plant to maintain consistent copper concentration production.

Accordingly, mine planning is refined through further exploration and detailed mine design to maintain the primary feed from the existing E26 and E48 underground mines, and the approved E22 underground mine, whilst being supplemented by additional ore from the approved campaign open cut mining as well as use of existing ore stockpiles for lower grade material.

As a result of this approach, flexibility in mine design is essential, within the constraints of the approved impact from the Northparkes operations as established under the existing project approval.

1. PROPOSED MODIFICATION

The proposed modifications to the Project Approval are detailed below, with the location of the proposed additional ore processing infrastructure shown on **Figure 1**.

Northparkes has completed a review of existing ore processing infrastructure and has identified the need for additional ore processing infrastructure to that currently approved under PA11_0600. The additional infrastructure required includes:

- Construction and operation of an additional ball mill;
- Construction and operation of new secondary crushing building;
- Various upgrades to ore conveyor, hoisting and processing infrastructure;
- Various upgrades and relocations of supporting site infrastructure (i.e. power supply).

The bulk of the additional ore processing infrastructure will be located within the existing approved disturbance footprint for Northparkes. However, approximately 1,400m² of additional disturbance will be required to accommodate the construction of the new secondary crushing building, as shown on **Figure 2**.

The proposed additional ore processing infrastructure will not require changes to the currently approved ore processing rates or approved mine life for Northparkes. **Table 1** provides an overview of the proposed modification relative to the approved operations under PA11_0060.

Table 1 Comparison of Proposed and Approved Mining Operations under PA11_0060

Major Project Components/ Aspects	Approved Operations	Proposed Modifications
Mining Areas	Continued underground caving of the E26 and E48 ore bodies. Development of underground cave mining in the E22 resource (previously subject to open cut mining). Development of open cut mining area in existing mine subsidence zone for E26. Development of four small open cuts to extract ore from E28, E28N, E31 and E31N. All proposed open cut mining areas are located within the existing PA 06_0026 Project Area and existing Mining leases.	No change
Ore Processing	Continuation of processing up to 8.5 Mtpa of ore through the existing processing plant sourced from underground and open cut mining areas.	Continuation of processing up to 8.5 Mtpa of ore through the existing and proposed processing plant
Mine Life	Mining until end of 2032.	No Change
Operating Hours	24 hours per day, seven days per week	No Change
Number of Employees	Approximately 700 full time equivalents	No Change

Mining Methods	Multiple Underground Block Caves and Sub Level Caves Campaign Open cut mining of up to 7 Mtpa for stockpiling and processing as required.	No Change
Infrastructure	Construction and operation of: • TSF augmented to connect existing and approved tailings facilities, through the development of TSF 3 southward from the existing southern embankment of TSF 2. • Establishment of new waste stockpiles to store waste material generated during open cut mining campaigns including a vehicle wash down area. • Continued operation of existing processing plant, site offices, underground access, water supply infrastructure and logistics connections. • Continued road haulage of concentrate to Goonumbra rail siding for transport to Port Kembla. • Closure of the existing site access road through the development of TSF 3. • Provision of an upgraded site access road along a new alignment from McClintocks Lane. • Development of an access control and visitor's car parking at the intersection of the proposed site access and McClintocks Lane. • Upgrade/sealing of McClintocks Lane between the NPM access road and Bogan Road. • Upgrades as required to the intersection of McClintocks Lane and Bogan Road.	Construction and operation of: • an additional ball mill • new secondary crushing building • upgrades to ore conveyor, hoisting and processing infrastructure • upgrade and relocation of supporting site infrastructure (i.e. power supply).
Approved Disturbance Area	As detailed on Figure 5.9 of the EA (and shown in part on Figures 2 and 3). In addition, the detailed design and construction of the approved access control and access road has resulted in this infrastructure being constructed within a smaller footprint (approximately 4ha compared to the approved disturbance of approximately 8ha). The detailed design and minor amendments to the alignment of the approved access road from McClintocks Lane also resulted in the approved access control area being constructed further to the north than as shown in the EA. Given that the overall disturbance area is smaller and Northparkes constructed this infrastructure in areas of cultivated agricultural land as opposed to the approved disturbance to Threatened Ecological Communities and free of other constraints, the impacts are less than that provided in the EA.	Disturbance associated with the construction of the new secondary crusher will result in a minor (1,400m²) extension to the approved disturbance footprint as shown on Figure 2.

2. PROPOSED ADMINISTRATIVE AMENDMENTS

Northparkes also proposes an administrative amendment to Schedule 3, Condition 7 and an update of Appendix 1 (Schedule of Land) of the Project Approval, as detailed below.

2.1.1 Schedule 3, Condition 7 – Blasting Hours

Schedule 3, Condition 7 limits blasting hours as follows:

7. The Proponent shall only carry out blasting on site between 9 am and 5 pm Monday to Saturday inclusive. No blasting is allowed on Sundays, public holidays, or at any other time without the written approval of the Secretary.

Northparkes seeks to amend this condition so that it is clear that the limits on blasting hours relate to surface blasting. As noted in the Environmental Assessment for the Northparkes Mines Expansion Project (Appendix 8), the major sources of blast emissions from the Project emanate from the E26 open-cut operations, with smaller scale campaign blasting undertaken in the E31, E31N, E28 and E28N open-cut operations. Blast emissions from these five open-cut operations form the basis of the blasting impact assessment presented in the Environmental Assessment for the Northparkes Mines Expansion Project.

Northparkes has on occasions monitored underground blasting for noise and vibration, with results indicating no risk of environmental harm at any sensitive receiver, due to the limited size and nature of the underground blasting activities and the distance to the closest sensitive receptors (3.5km for E26 & 3.3km for E22). This is demonstrated by the results of a seven week vibration monitoring program undertaken in 2017 at Adavale located approximately 3 kilometres west of the site. During this period, vibration from all underground blasts readily complied with the Project Approval vibration limit of 5mm/s and was typically in the order of 0.17 – 0.18mm/s.

Additionally, Northparkes has never received a complaint related to underground blasting, nor have any concerns been raised during community engagement forums (including the Community Consultative Committee and neighbours meetings).

It is noted that the blasting hours stipulated in Schedule 3, Condition 23 of the previous Project Approval 06_0026, applied specifically to surface blasting. It is Northparkes understanding of Schedule 3, condition 7 of PA11_0060 that the intent is that it also applies to surface blasting.

Northparkes seeks the following amendment of condition 7 to reflect this intent.

7. The Proponent shall only carry out surface blasting on site between 9 am and 5 pm Monday to Saturday inclusive. No surface blasting is allowed on Sundays, public holidays, or at any other time without the written approval of the Secretary.

2.1.2 Appendix 1 – Schedule of Land

Northparkes seeks to update the schedule of land in the Project Approval to reflect the land ownership changes that have occurred since the issue of the Project Approval. An updated schedule of land is attached in **Attachment 1**.

3. PROPOSED APPROVAL PATH

Northparkes proposes to modify PA11_0060 under Section 75W of the EP&A Act. PA11_0060 was approved by the NSW Minister for Planning under Part 3A of the EP&A Act on 16 July 2014.

Although Part 3A of the EP&A Act has been repealed and the cut-off date for the modification of transitional Part 3A Projects has passed, the transitional arrangements established under Schedule 2 Clause 3BA of the *Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017* provides for the modification of approved projects under section 75W where a request to modify the project was lodged before the cut-off date, being 1 March 2018. The Department of Planning and Environment (DP&E) endorsed the proposed Section 75W approval pathway for the modification in correspondence dated 21 December 2017 and 28 February 2018.

4. ENVIRONMENTAL ASSESSMENT

Northparkes has engaged Umwelt to prepare an environmental assessment for the proposed modifications outlined above in **Section 2**. The environmental aspects considered for the purpose of this environmental assessment are detailed in **Table 2** below, with an assessment of whether the impacts of the proposed modifications are significantly different to the approved impacts for Northparkes.

The proposed additional ore processing infrastructure is intended to improve the efficiency of ore processing in order to better meet the operational requirements of the approved operations into the future. The additional infrastructure will not result in an increase in the approved processing rate for Northparkes of 8.5Mtpa.

The proposed modifications will result in a minor area of additional surface disturbance adjacent to existing surface infrastructure at Northparkes (refer to **Figure 2**). The extent of this additional disturbance is approximately 1,400m² and is located within an area of disturbed grassland.

Table 2 Review of Environmental Impacts

Impact Type	Significant change from approved impacts	Comments
Agricultural Impact	No	The additional disturbance of approximately 1,400m ² of disturbed grassland will not significantly change the approved agricultural impacts of the Northparkes operations.
Air Quality	No	There will be no change to overall production levels or processing methods and the minor additional disturbance associated with the construction of additional infrastructure will not significantly change the approved air quality impacts of the Northparkes operations.
Noise and Blasting	No	A targeted noise impact assessment has been completed in accordance with the methodology described in the NSW Noise Policy for Industry (EPA 2017) to assess the noise impacts of the proposed additional ore processing infrastructure. The targeted assessment involved updating the existing NPM noise model (Umwelt 2013) prepared for PA 11-0060 and is included as Attachment 2 . As outlined in Attachment 2 , the noise modelling results indicate that under the prevailing meteorological

		conditions, the additional ore processing infrastructure will result in an increase of up to 1 dBA in the predicted noise levels at the nearest sensitive receivers. However, all private sensitive receivers will continue to comply with the current noise limits set by PA 11_0060. The proposed administrative change to the condition relating to blasting hours is required to clarify the application of these limits to surface blasting operations and will not result in any change to the approved noise emissions of the existing operation.
Biodiversity	No	The proposed modification will disturb and an additional area of approximately 1,400m² of disturbed grassland outside the existing approved disturbance footprint. As the proposed modification is State Significant Development (SSD), the potential impact of this additional disturbance on biodiversity requires a Biodiversity Assessment Method (BAM) assessment under the <i>Biodiversity Conservation Act 2016</i>. A Biodiversity Development Assessment Report (BDAR) has been prepared by Umwelt and is included as Attachment 3. The BDAR identifies that of the 1,400m² of additional disturbance, approximately 1,160m² consists of non-native vegetation solely comprised of introduced flora species and bare earth. The remaining approximately 240m², while devoid of native woody vegetation, was considered most likely to conform to the native plant community type of disturbed PCT76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions. This vegetation community is heavily disturbed from farming operations, with influences from the adjoining native vegetation. Following the application of appropriate avoidance and mitigation measures, the BAM assessment identifies that one ecosystem credit for disturbed PCT76 is required to offset the impacts of the proposed modification. Northparkes intends to pay into the Biodiversity Conservation Fund to meet this offset obligation.
Water Resources	No	A minor extension to the approved water management system will be required where the construction of the proposed secondary crushing building extends beyond the existing disturbance footprint (refer to Figure 2). This will result in the addition of approximately 1,400 m² to the approved water management system which covers an area of approximately 1,481 hectares. This minor addition to the water management system will not materially change the operation of the water management system. The proposed modification will also not materially change the water demand of the Project therefore no material change to the site water balance is anticipated. No change to the currently approved mine plan is proposed; therefore no change to groundwater related impacts are anticipated. The proposed modifications will

		not result in interception of any groundwater and will therefore not trigger the NSW Aquifer Interference Policy.
Heritage (Aboriginal and European)	No	The proposed modification is located within an area outlined in the Aboriginal Cultural Heritage Assessment (2013) as having zero sensitivity (being identified as an area disturbed by mining and related activities). As such, the proposed additional infrastructure would not result in any significant impact to areas of Aboriginal heritage sensitivity and will not impact any recorded Aboriginal archaeological sites. Previous investigations have identified three historic heritage items within Northparkes project area, however, no previously recorded historical heritage items or areas of archaeological sensitivity are located in the vicinity of the additional infrastructure. As such, the proposed additional infrastructure would not result in any significant impact to areas of historical archaeological sensitivity.
Visual	No	The proposed additional ore processing infrastructure will be located within or adjacent to existing approved surface infrastructure sites and will be consistent in form and height with the existing infrastructure. Therefore, the proposed additional infrastructure is not considered to represent a significant change from the approved visual impacts of the Northparkes operation.
Traffic and Amenities	No	No change to production, product transport or staff levels.
Rehabilitation	No	The proposed modification will not change the rehabilitation objectives or intended final land use for the minor area of additional disturbance or for the Northparkes operations more broadly.
Social and Economic Impacts	No	The proposed additional ore processing infrastructure will enable required operational flexibility as part of ongoing Northparkes operations. The social and economic benefits remain consistent with the EA and are significant in terms of local and regional economy and employment.

5. CONSULTATION

Northparkes formally consulted Parkes Shire Council & Forbes Shire Council, its Wiradjuri Executive Committee (WEC), Neighbours Group and Community Consultative Committee (CCC) about the proposed modification throughout 2018. At these meetings no objections or concerns were raised about the proposed modification. The stakeholders engaged were strongly supportive of the proposed works as they would create a number of employment opportunities during the construction of the proposed infrastructure.

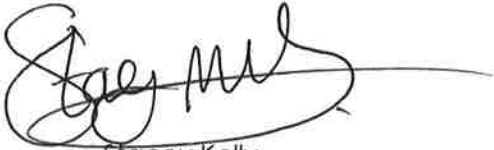
6. JUSTIFICATION AND BENEFITS

As outlined above, the environmental impacts of the proposed modification of PA11_0060 are expected to be minimal and are consistent with the impacts associated with the approved Northparkes operations. The proposed additional ore processing infrastructure will enable Northparkes to more efficiently meet the processing requirements of the operation into the future and provide an appropriate level of operational flexibility as part of ongoing Northparkes operations.

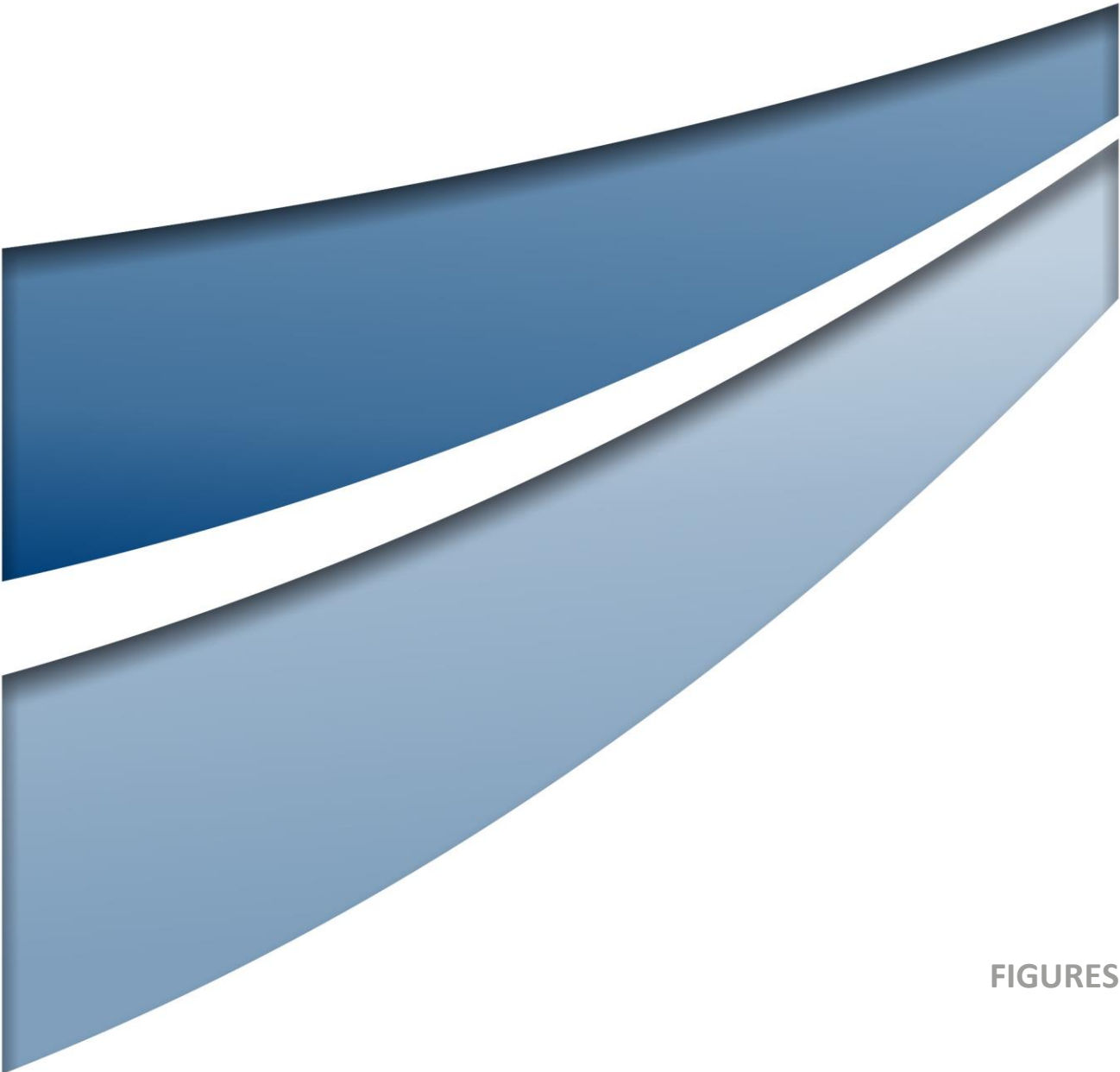
Given that the proposed modification involves limited environmental impacts beyond the current PA11_0060, a minor modification under Section 75W of the EP&A Act is sought to allow for the proposed modifications outlined in this letter.

Your earliest consideration of this matter would be greatly appreciated. If you require any further information, please don't hesitate to contact Chase Dingle on (02) 6861 3264.

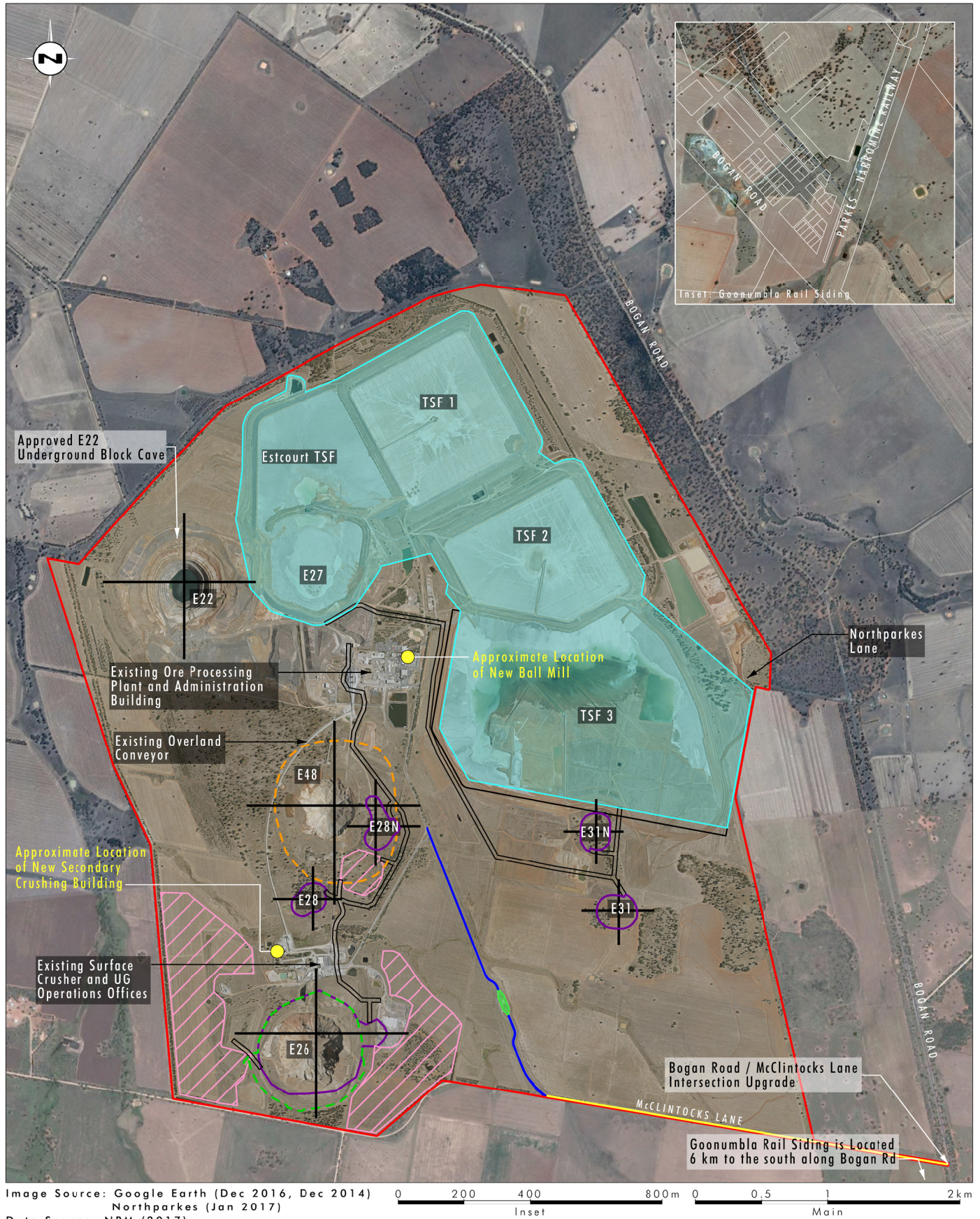
Yours sincerely

A handwritten signature in black ink, appearing to read 'Stacey Kelly', with a long horizontal line extending to the right.

Stacey Kelly
Manager - People, Safety & Environment
CMOC-Northparkes Mines



FIGURES



Legend

- Project Area
- Approved F26 Subsidence Area
- Approved E48 Subsidence Area
- Approved Tailings Storage Facility
- Approved Open Cut Areas
- Approved Upgrade to McClintocks Lane
- Approved Waste Dumps
- Access Control and Visitor Car Park
- Site Access Road
- Approved Haul Road
- Transect

FIGURE 1

Approved Operations and
Location of Proposed Additional
Ore Processing Infrastructure

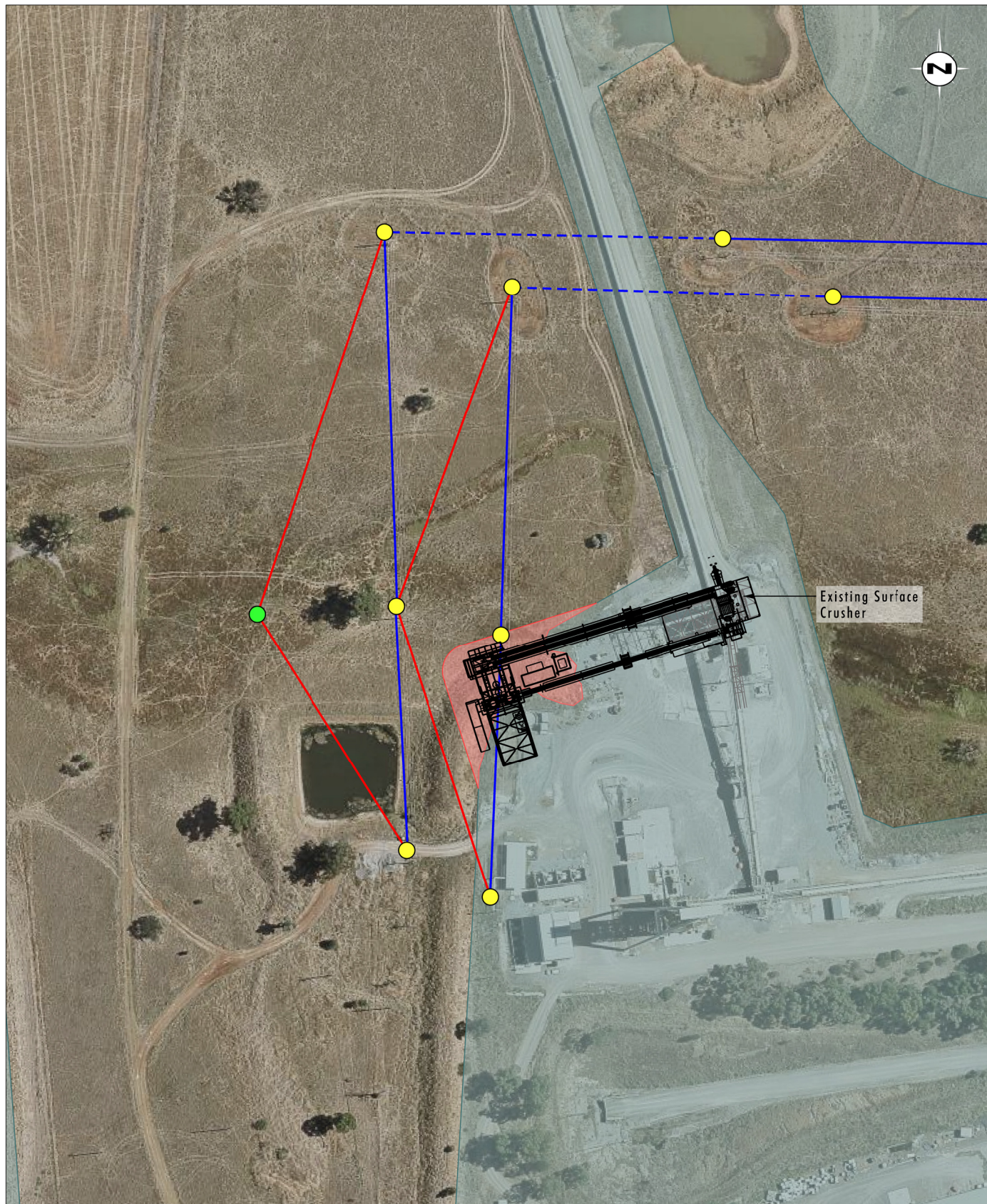


Image Source: Northparkes (Jan 2017)
Data Source: NPM (2017)

0 25 50 100m
1:2000

Legend

- Approved Disturbance Area
- Additional Disturbance Area
- Underground
- Existing Manago Overhead
- Proposed Manago Overhead
- New Power Pole
- Existing Power Pole

FIGURE 2
Proposed Secondary Crusher
Building and Relocated Powerline



Image Source: Northparkes (Jan 2017)
Data Source: NPM (2017)

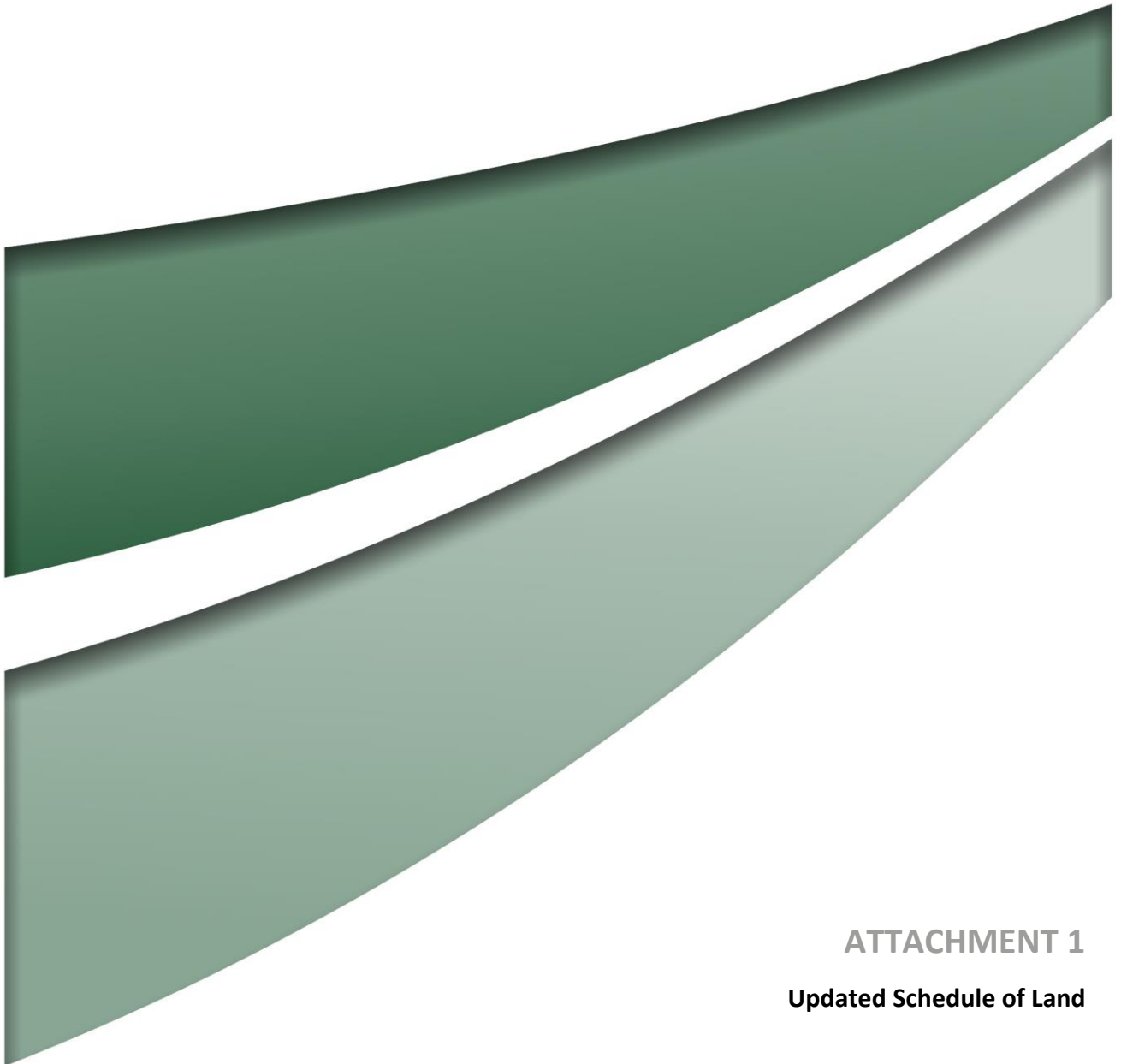
0 25 50 75 m
1:1500

Legend

Approved Disturbance Boundary

FIGURE 3

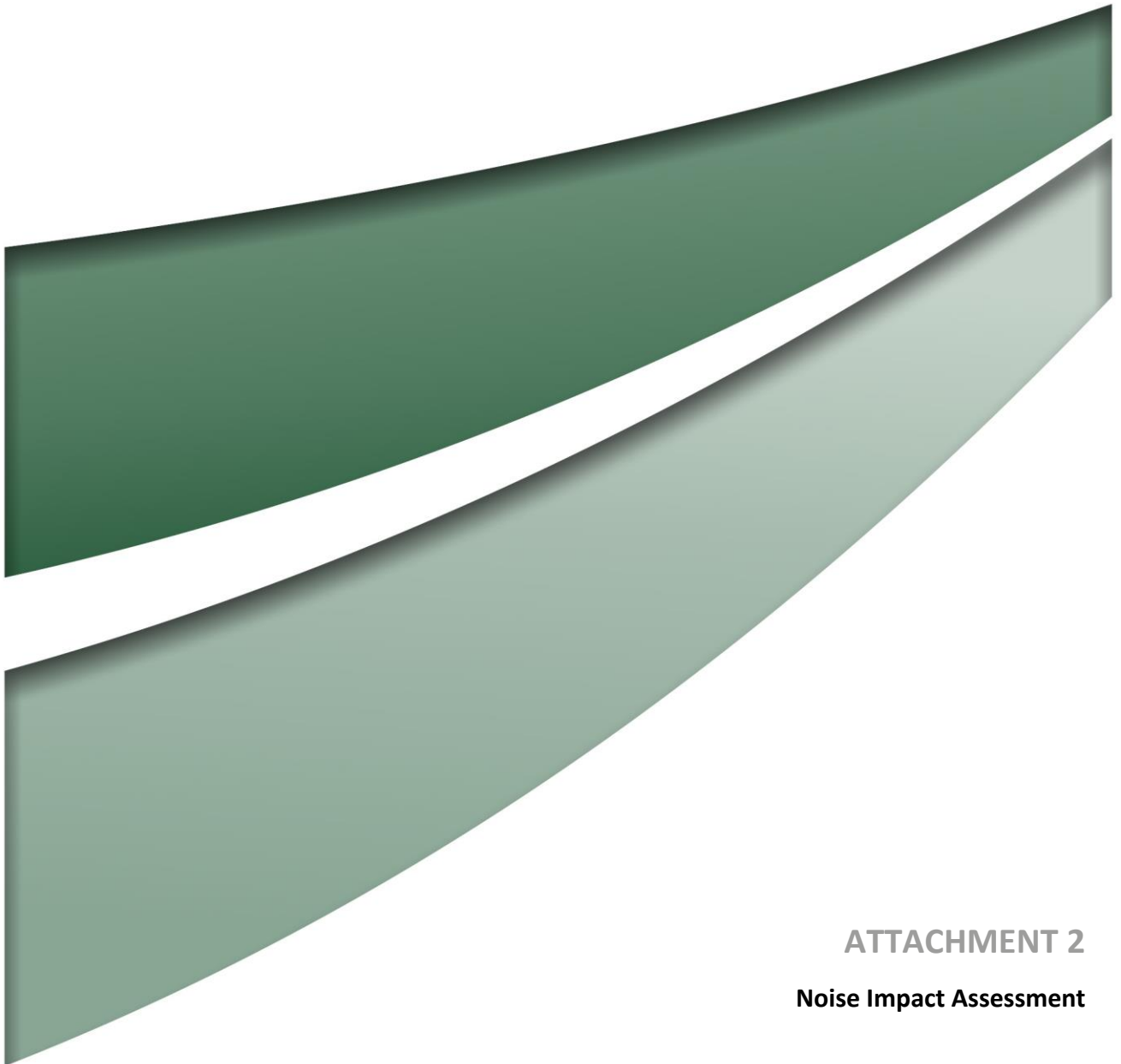
Proposed Ball Mill



ATTACHMENT 1
Updated Schedule of Land

Updated Schedule of Land – PA 11_0060

Lot	DP	PROJECT APPROVAL OWNER	CURRENT OWNER
46	753998	PEKO-WALLSEND OPEATIONS LTD	CMOC MINING PTY LTD
1	818783	NORTH MINING LTD	CMOC MINING PTY LTD
41	753998	PEKO-WALLSEND OPEATIONS LTD	CMOC MINING PTY LTD
49	753998	NORTH MINING LTD	CMOC MINING PTY LTD
14 100	753998 1207194	PEKO-WALLSEND OPEATIONS LTD	CMOC MINING PTY LTD
1	848944	STATE RAIL AUTHORITY OF NSW	
1	952674	STATE RAIL AUTHORITY OF NSW	
7001	1115837	THE STATE OF NSW	
10	1132130	NORTH MINING LTD	CMOC MINING PTY LTD
51	753998	THE STATE OF NSW	
7001	1116929	THE STATE OF NSW	
1	831622	PEKO-WALLSEND OPEATIONS LTD	CMOC MINING PTY LTD
2	830291	PEKO-WALLSEND OPEATIONS LTD	CMOC MINING PTY LTD
3	831119	PEKO-WALLSEND OPEATIONS LTD	CMOC MINING PTY LTD
12	753998	PEKO-WALLSEND OPEATIONS LTD	CMOC MINING PTY LTD
1	830291	PEKO-WALLSEND OPEATIONS LTD	CMOC MINING PTY LTD
1	831119	PEKO-WALLSEND OPEATIONS LTD	CMOC MINING PTY LTD
382	1108642	NORTH MINING LTD	CMOC MINING PTY LTD
381	1108642	CROWN LAND	
43	1120299	NORTH MINING LTD	CMOC MINING PTY LTD
41	1120299	NORTH MINING LTD	CMOC MINING PTY LTD
42	1120299	NORTH MINING LTD	THE STATE OF NSW
3	830291	PEKO-WALLSEND OPEATIONS LTD	CMOC MINING PTY LTD
7002	1116907	THE STATE OF NSW	
Between Lot 3 DP830291 and Lot 49 DP753998		CROWN LAND (CMOC APPLICATION TO PURCHASE REFERENCE #DPI W563265)	



ATTACHMENT 2
Noise Impact Assessment



Our Ref: 4060a_NPM_Dingle_201800615a

15 June 2018

Chase Dingle
Superintendent – Environment, Community and Farms
CMOC - Northparkes Mines

Via email: Chase.Dingle@northparkes.com.au

Dear Chase

Re: Northparkes Mine - Noise Assessment for Proposed Change to Ore Processing Plant Infrastructure

The following document provides an overview of the noise modelling results for a proposed modification to CMOC Northparkes Mines (NPM) Project Approval (PA11_0060) to allow for changes to the approved ore processing plant infrastructure.

A Noise Impact Assessment (NIA) was previously prepared for the NPM Step Change Project EA (Umwelt, 2013). The NIA assessed the potential noise emissions from the mine for 3 operational scenarios. The Scenario 1 noise model represents the existing 7 days per week/24 hours per day operation of NPM, incorporating the process plant (including product loading and dispatch road haulage trucks), underground mining and the associated equipment supporting the underground mining activities. A targeted noise assessment has been undertaken to assess the potential noise impacts from an updated Scenario 1 noise model. The updated noise model for Scenario 1 includes all noise sources previously presented in the NIA (Umwelt, 2013) and includes 2 additional noise sources, a new Secondary Crusher and a new Ball Mill.

The noise modelling results indicate that under the prevailing meteorological conditions the Proposed Modification will result in an increase of up to 1 dBA in the predicted noise levels. Therefore, as a result of the Proposed Modification there is a small (up to 1 dBA) increase in noise levels relative to the predicted noise levels associated with Scenario 1. This will not have any additional impacts relative to the current approved operations, and NPM will continue to implement the relevant mitigation and management measures as required under PA11_0060.

1.0 Introduction

NPM proposes to modify Project Approval 11_0060 to allow for changes to the approved ore processing plant infrastructure (Proposed Modification). The proposed changes include:

- Construction and operation of an additional ball mill;
- Construction and operation of new secondary crushing building;

Inspired People.
Dedicated Team.
Quality Outcomes.

Newcastle

75 York Street
Teralba NSW 2284
Ph. 02 4950 5322

Perth

PO Box 783
West Perth WA 6872
First Floor
7 Havelock Street
West Perth WA 6005
Ph. 1300 793 267

Canberra

PO Box 6135
56 Bluebell Street
O'Connor ACT 2602
Ph. 02 6262 9484

Sydney

Level 3
50 York Street
Sydney NSW 2000
Ph. 1300 793 267

Brisbane

Level 11
500 Queen Street
Brisbane QLD 4000
Ph. 1300 793 267

www.umwelt.com.au

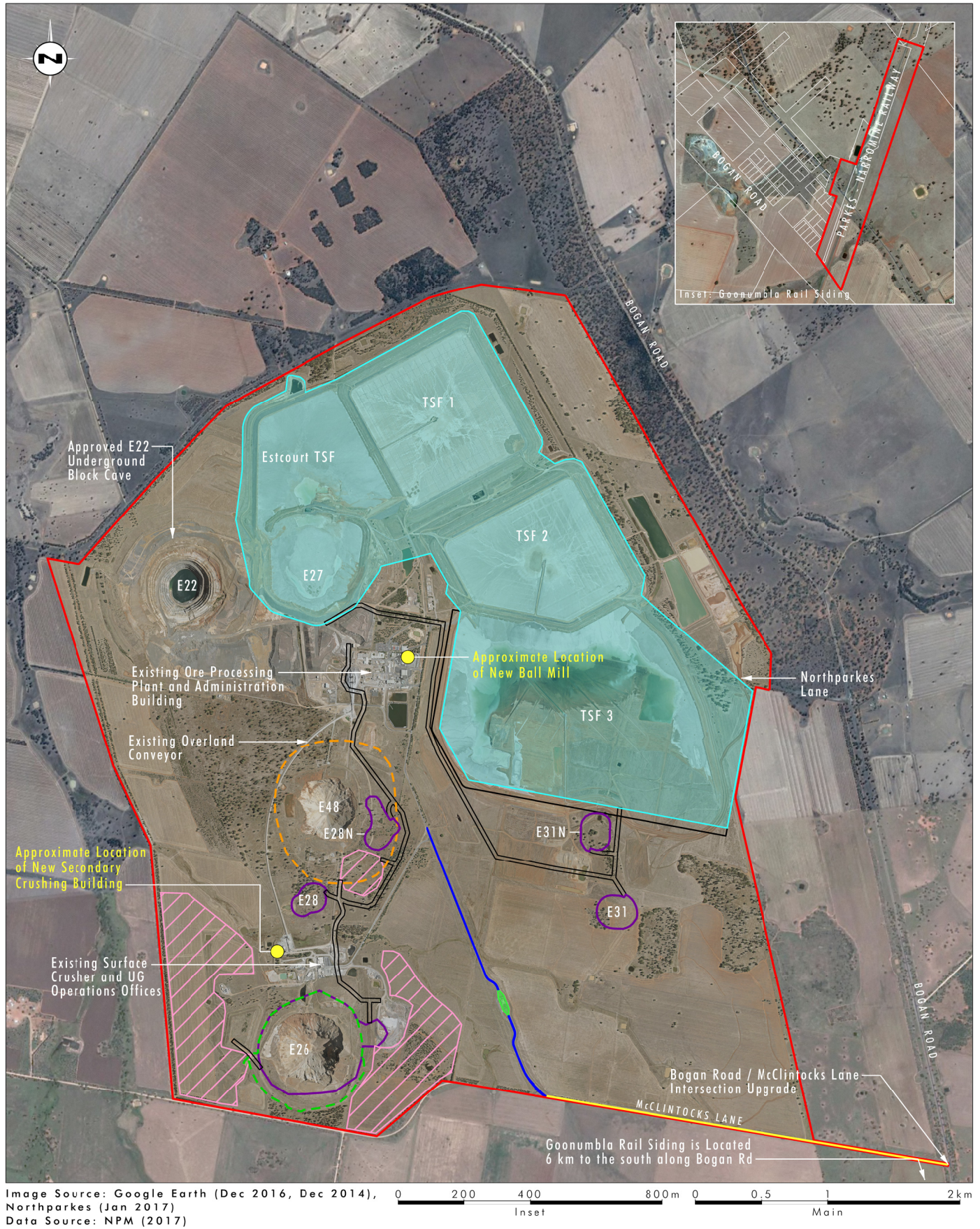
- Various upgrades to ore conveyor, hoisting and processing infrastructure; and
- Various upgrades and relocations of supporting site infrastructure (i.e. power supply).

Umwelt (Australia) Pty Limited (Umwelt) has been engaged to prepare a targeted Noise Impact Assessment (NIA) for the Proposed Modification. The NIA has been undertaken in accordance with the NSW Environment Protection Authority (EPA) Noise Policy for Industry (NPfI, 2017) and other current and relevant guidelines and policies relating to environmental noise resulting from the Proposed Modification.

This assessment presents the results of the investigation of potential noise impacts from the Proposed Modification. A targeted noise assessment was completed for Scenario 1 from the previous Noise Impact Assessment (NIA) (Umwelt, 2013) for the mine including two additional noise sources, being a new Secondary Crusher and a new Ball Mill. The locations of the new plant items are presented in **Figure 1.1**.

In the original EA, Scenario 1 included the continuation of the existing approved operation of the ore processing plant, underground mining and supporting activities, which represents the majority of the approved continued mining operations under PA11_0060. The additional Scenarios 2 and 3 modelled in the EA included a combination of other approved activities including the construction of Tailings Storage Facilities (TSF) and campaign open cut mining, which had the potential to increase noise impacts from the approved operations during specific times. The maximum noise levels for approved operations are predicted to occur during these potential worse case operational scenarios, with a range of mitigation and management measures to be implemented in accordance with the requirements of PA11_0060 and associated management plans. On this basis this targeted noise assessment was undertaken as an update of Scenario 1.

The noise modelling methodology is discussed in **Section 3** and the modelling results are presented in **Section 4**.



Legend

- Project Area
- Approved E26 Subsidence Area
- Approved E48 Subsidence Area
- Approved Tailings Storage Facility
- Approved Open Cut Areas
- Approved Upgrade to McClintocks Lane
- Approved Waste Dumps
- Access Control and Visitor Car Park
- Site Access Road
- Approved Haul Road

FIGURE 1.1

Approved Operations and Location of Proposed Additional Ore Processing Infrastructure

2.0 Project Noise Level Criteria and Surrounding Receivers

As stated in PA11_0060, the applicable noise level criterion at all sensitive receivers for the project is 35 dB(A) LAeq,15minute for the day-time, evening and night-time periods.

The Single Point Calculation module of ENM (Environmental Noise Model) was used to predict the noise impacts of the Project at 22 receiver locations surrounding the project area, the location of which are shown on **Figure 2.1** and in **Table 1**.

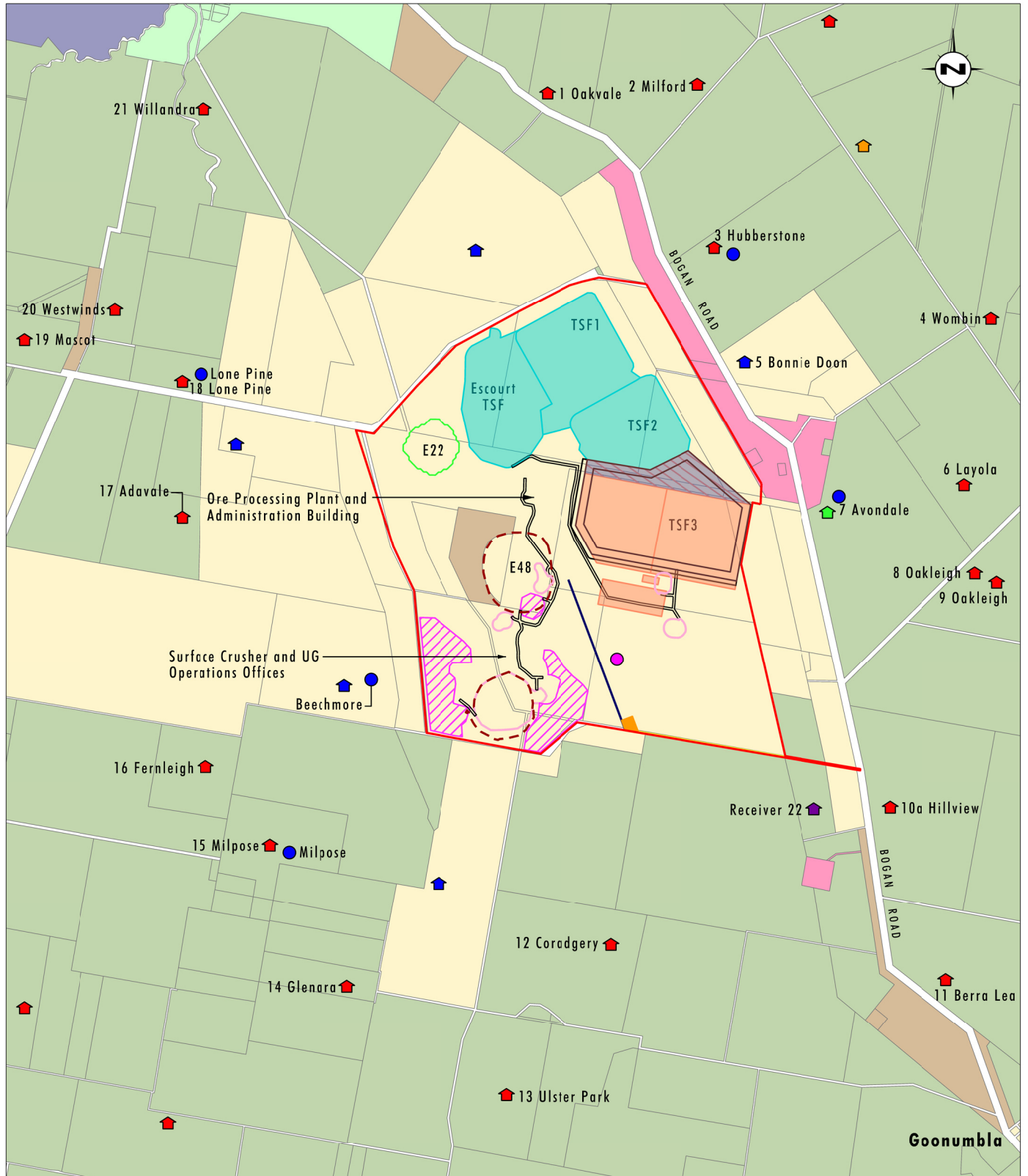
NPM has a commercial agreement in place with one of the residential receiver locations shown on **Figure 2.1**, Receiver 7 (Avondale), which is in place over the life of the Project. A number of the residential properties shown on **Figure 2.1** are located on land owned by NPM and have not been included in this assessment.

Table 1 – Receiver Locations

Property Name	Eastings	Northing
1 – Oakvale	598557	6362984
2 – Milford	600589	6363101
3 – Hubberstone	600814	6360898
4 – Wombin	604555	6359935
6 – Layola	604193	6357678
7 – Avondale ¹	602348	6357307
8 – Oakleigh A	604337	6356484
9 – Oakleigh B	604631	6356359
10a - Hillview	603191	6353317
11 – Berra_Lea	603945	6350990
12 – Coradgery	599419	6351462
13 – Ulster_Park	598005	6349433
14 – Glenara	595848	6350900
15 – Milpose	594806	6352805
16 – Fernleigh	593937	6353872
17 – Adavale	593619	6357241
18 – Lone Pine	593619	6359081
19 – Mascot	591483	6359646
20 – Westwinds	592714	6360056
21 – Willandra	593910	6362770
22 – unnamed ²	602163	6353295

Note: 1. Commercial agreement in place with resident over life of Project.

2. Approximate location of approved dwelling yet to be constructed



Source: NPM (2013), LPMA (2011)

0 1 2 4 km
1:75 000

Legend

- | | | |
|---|---|--|
| Project Area | ■ Approved Private Residence (yet to be constructed) | Approved Upgrade to McClintocks Lane |
| State Forest of NSW | ■ Derelict Residence | Approved Access Control and Visitor Car Park |
| Mine Owned | ● Noise Monitoring Location | Approved Waste Dumps |
| Parkes Shire Council | ● Meteorological Station | Approved Site Access Road |
| Private | Approved Tailings Storage Facility (Rosedale) | Approved Haul Road |
| Department of Lands - Crown | Approved Subsidence Management Areas | |
| State of NSW | Approved Tailings Storage Facility | |
| State Rail Authority of NSW | Approved Tailings Storage Facility Extension | |
| ■ Private Residence | Approved TSF3 | |
| ■ Agreement Residence | Approved Underground Block Cave Mining Area | |
| ■ Mine Owned Residence | Approved Open Cut Areas | |

FIGURE 2.1

Sensitive Receiver Locations

3.0 Modelling Methodology

3.1 Predictive Noise Model

In accordance with Section 3.3 of the NPfl (EPA 2017) the prediction of noise levels takes into account all possible noise sources that may reasonably be expected when the Proposed Modification is fully operational. The objective of the noise modelling is to provide an accurate prediction of the noise impacts from the Proposed Modification for comparison against the Project Approval noise limits.

The computer-based modelling software package Environmental Noise Model (ENM), developed by RTA Technology Pty Ltd, was used to predict the noise levels produced by the Proposed Modification within the surrounding environment. ENM is recognised and accepted by the EPA as a computer modelling program suited to predicting noise impacts from industrial noise sources.

The ENM noise modelling of the Proposed Modification was based on the production schedules and mine plans presented in the NIA (Umwelt, 2013). The Scenario 1 noise model represents the existing seven days per week 24 hours per day operation of NPM, incorporating the process plant (including product loading and dispatch road haulage trucks), underground mining and the associated equipment supporting the underground mining activities. The updated noise model for Scenario 1 includes the addition of two new noise sources being the new Secondary Crusher and new Ball Mill.

3.2 Operational Noise Sources Levels

The sound power levels used in the updated Scenario 1 noise model are identical to those previously adopted in the NIA (Umwelt, 2013) and are presented in **Table 2**.

Table 2 – Modelled Sound Power Levels, dBA

Equipment ¹	SWL, dBA
300t excavator (Liebherr R9350)	116
120t Excavator (Hitachi EX1200)	113
Drill Rig (Tamrock Pantera 1500)	108
Mining Truck (Cat 785)	103 to 114
Water Cart (Cat 773)	111
Bulldozer (Cat D10) (Forward/Reverse)	112/122
Large Wheel Loader (Cat 998)	112
Medium Wheel Loader (Cat 950)	111
Grader (Cat 16G)	108
18t Roller	110
90t Excavator	95
22t Excavator	91
Medium Compactor (Cat 815)	110
Large Compactor (Cat 825)	111
Articulated Truck (Cat 740)	102
Articulated Water Cart (Cat 740)	102
Conveyor (dB(A)/m)	80

Equipment ¹	SWL, dBA
Transfer Tower	109
Rill Tower	93
Underground Ventilation Fan	108
Primary Jaw Crusher	114
Secondary Jaw Crusher	112
NPM Processing Plant (combined SWL)	118
New Secondary Jaw Crusher	112
New Ball Mill	108

Source: Umwelt SWL Library and field survey of NPM.

Note 1: Equipment make and model are listed for size comparison purposes only.

3.3 Meteorological Conditions

The NPfI (EPA 2017) notes that there are two approaches for the assessment of meteorological effects, including gradient winds and temperature inversions, on propagating noise from the source to the receiver. The simple method is to use default conditions outlined in the NPfI (EPA 2017). Alternatively, the local meteorological data can be used to determine weather conditions that would be expected to occur at a particular site for a significant period of time.

The previous noise modelling presented in the NIA (Umwelt, 2013) was based on the following dominant meteorological conditions:

- neutral (to very unstable) conditions with calm wind conditions;
- neutral (to very unstable) conditions with a 3 m/s wind from the south-south-east associated with autumn evening and night-time periods; and
- F class stability with a 2 m/s southerly drainage flow.

Meteorological data for the period 1 January 2017 to 1 January 2018 was sourced from the NPM weather station. The location of the NPM weather station is shown on **Figure 2.1**. This data was analysed to determine the prevailing wind directions and frequency of temperature inversions. The detailed analysis of the meteorological data from the NPM weather station is presented in **Appendix A**. This more recent meteorological data confirms validity of the conditions previously modelled. The analysis also indicates an additional dominant wind condition that requires modelling. Therefore the following meteorological conditions have been incorporated into the noise model.

- neutral (to very unstable) conditions with calm wind conditions;
- neutral (to very unstable) conditions with a 3 m/s wind from the south-south-east;
- neutral (to very unstable) conditions with a 3 m/s wind from the south-east; and
- F class stability with a 2 m/s southerly drainage flow.

4.0 Predicted Noise Levels

ENM's Single Point calculation feature was used to determine noise levels from NPM at the nearest residential receiver locations identified in **Section 2.1**, under the meteorological conditions described in **Section 3.3**.

Table 3 presents the predicted noise impacts for operational Scenario 1, the existing seven days per week 24 hours per day operation of the NPM incorporating the process plant, underground mining and the associated equipment supporting the underground mining activities. The most stringent noise criteria that the mining operation will need to achieve at all residential receivers is a Project Specific Noise Level (PSNL) of 35 dB(A) during the day, evening and night-time periods.

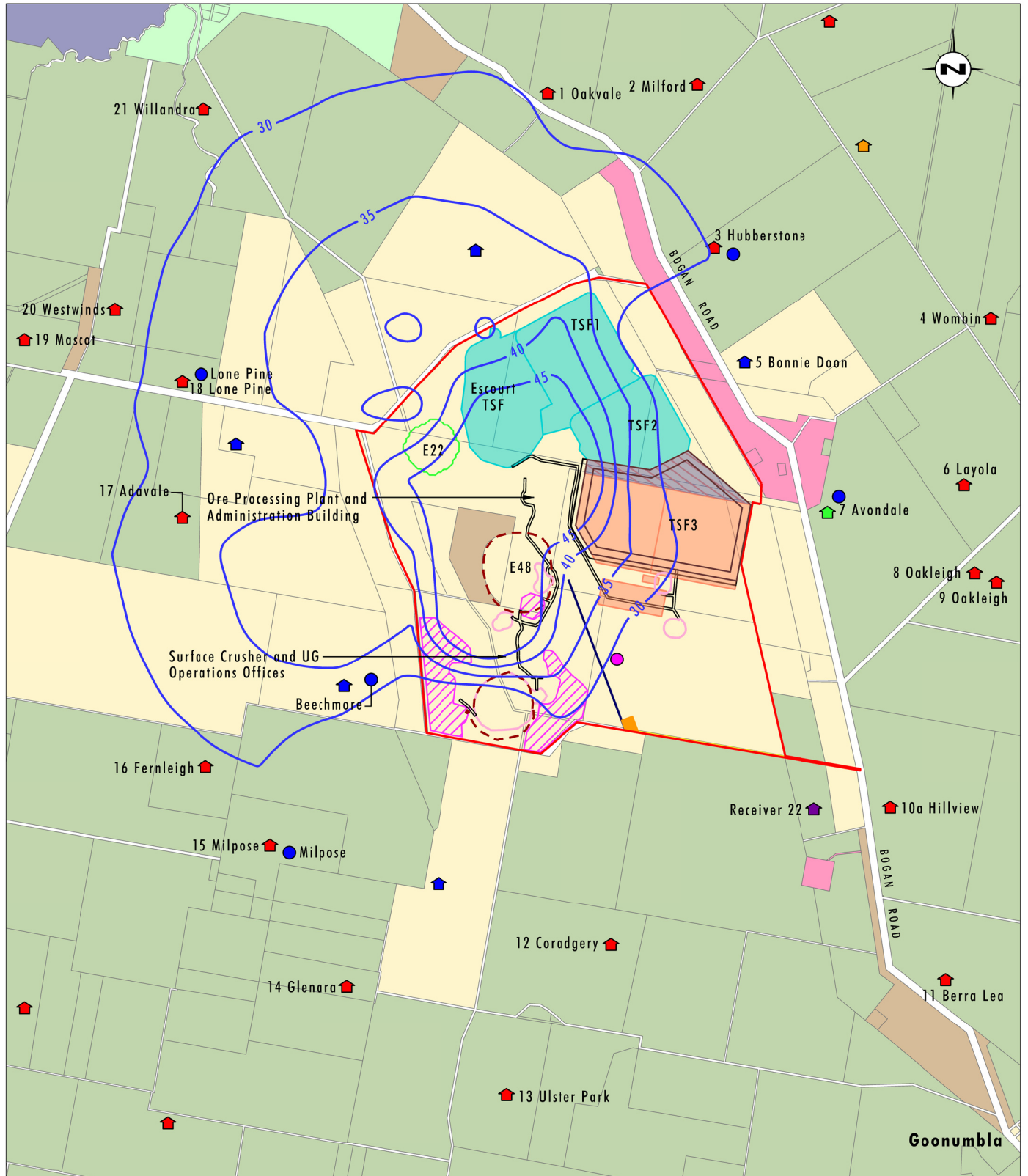
Contour calculations of the predicted noise impacts for Scenario 1 are provided in **Figures 4.1 to 4.4** for each of the worst case meteorological conditions modelled.

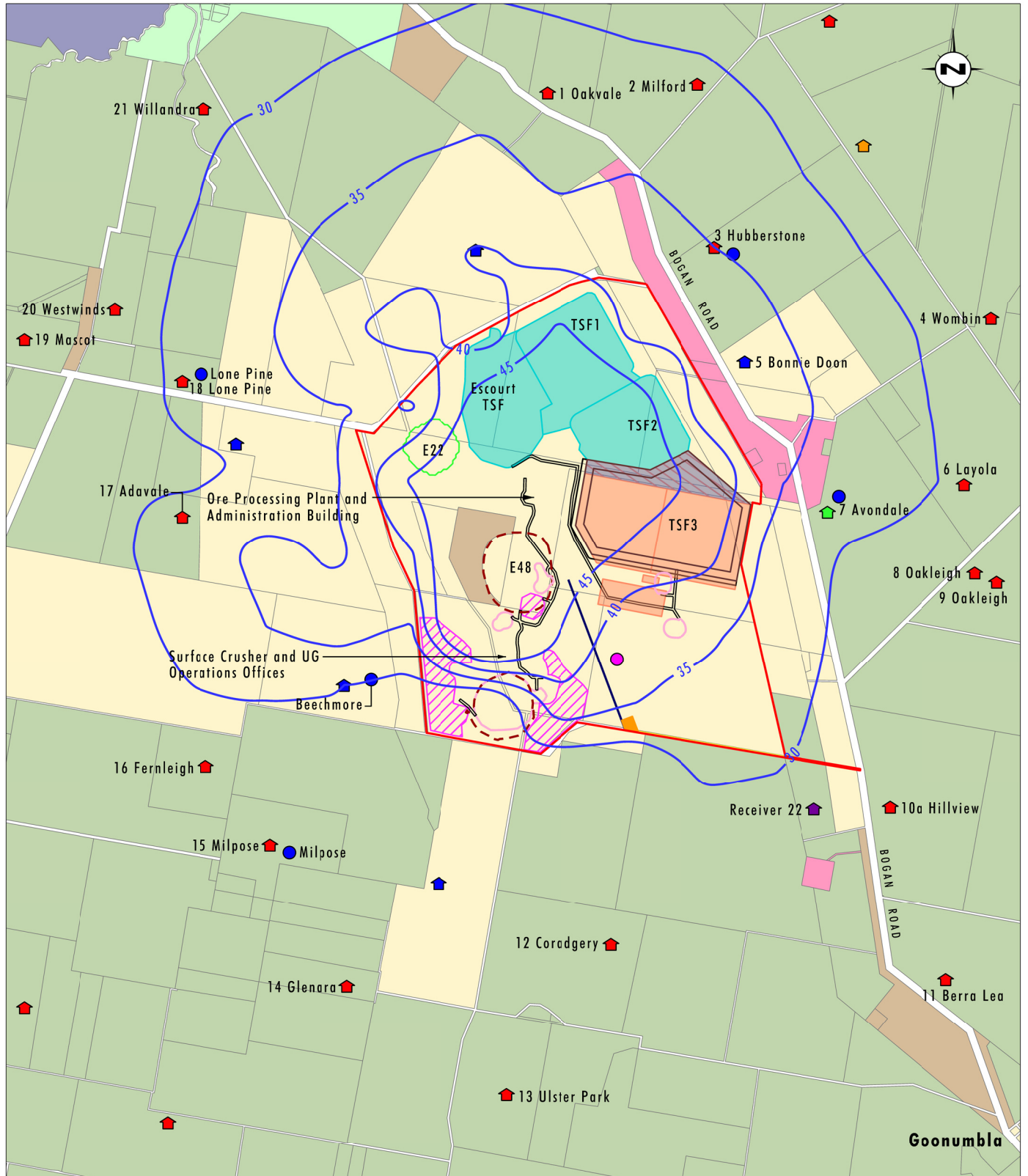
Table 3 – Predicted Noise Levels, dBA – Scenario 1 – NPM Operation Including New Secondary Crusher and Ball Mill

Property Name	Project Noise Limit	24 hour Operation	Evening and Night		
		Calm Neutral	3m/s South-south-east Wind	3m/s South-east Wind	F Class Stability 2m/s Southerly Drainage Flow
1 – Oakvale	35	17	31	29	29
2 – Milford	35	16	29	27	27
3 – Hubberstone	35	19	32	30	30
4 – Wombin	35	14	19	11	11
6 – Layola	35	16	14	12	12
7 – Avondale ¹	35	19	17	16	16
8 – Oakleigh A	35	14	11	10	10
9 – Oakleigh B	35	14	11	9	9
10a - Hillview	35	20	16	15	15
11 – Berra_Lea	35	10	6	5	5
12 – Coradgery	35	19	15	15	15
13 – Ulster_Park	35	18	14	14	14
14 – Glenara	35	17	14	15	15
15 – Milpose	35	19	16	19	19
16 – Fernleigh	35	19	19	29	29
17 – Adavale	35	21	31	34	34
18 – Lone Pine	35	17	30	31	31
19 – Mascot	35	12	24	26	26
20 – Westwinds	35	14	27	28	28
21 – Willandra	35	15	29	29	29
22 – unnamed ²	35	22	19	18	18

Notes: 1. Commercial agreement in place with resident over life of Project.

2 Approved dwelling yet to be constructed





Source: NPM (2013), LPMA (2011)

0 1 2 4 km
1:75 000

Legend

- | | | |
|---|---|--|
| Project Area | ■ Approved Private Residence (yet to be constructed) | Approved Access Control and Visitor Car Park |
| State Forest of NSW | ■ Derelict Residence | Approved Waste Dumps |
| Mine Owned | ● Noise Monitoring Location | — Approved Site Access Road |
| Parkes Shire Council | ● Meteorological Station | — Approved Haul Road |
| Private | Approved Tailings Storage Facility (Rosedale) | |
| Department of Lands - Crown | Approved Subsidence Management Areas | |
| State of NSW | Approved Tailings Storage Facility | |
| — State Rail Authority of NSW | Approved Tailings Storage Facility Extension | |
| ■ Private Residence | Approved TSF3 | |
| ■ Agreement Residence | Approved Underground Block Cave Mining Area | |
| ■ Mine Owned Residence | Approved Open Cut Areas | |
| | — Approved Upgrade to McClintocks Lane | |

File Name (A4): R05/4060_028.dgn
20180530 10.50

FIGURE 4.4

Predicted Noise Impacts for Continued Existing Operations (Scenario 1) Under Southerly Drainage Flow and F Class Stability Conditions

The predicted noise levels presented in **Table 3** indicate that the addition of the new Secondary Crusher and Ball Mill to the existing operations, comply with the project noise limit of 35 dBA under the calm and worst case conditions. A comparison of the predicted noise levels with those previously presented in the NIA (Umwelt, 2013), indicates that an increase of up to a 1dBA is predicted at the nearest sensitive receivers due to the additional plant.

5.0 Compliance Noise Monitoring

NPM undertakes compliance noise monitoring in the form of quarterly attended assessments and long-term unattended noise monitoring at 4 locations. The attended noise monitoring assessment reports for Q2, Q3 and Q4 in 2017 indicate the current NPM operations comply with the project noise limits at the nominated measurement locations.

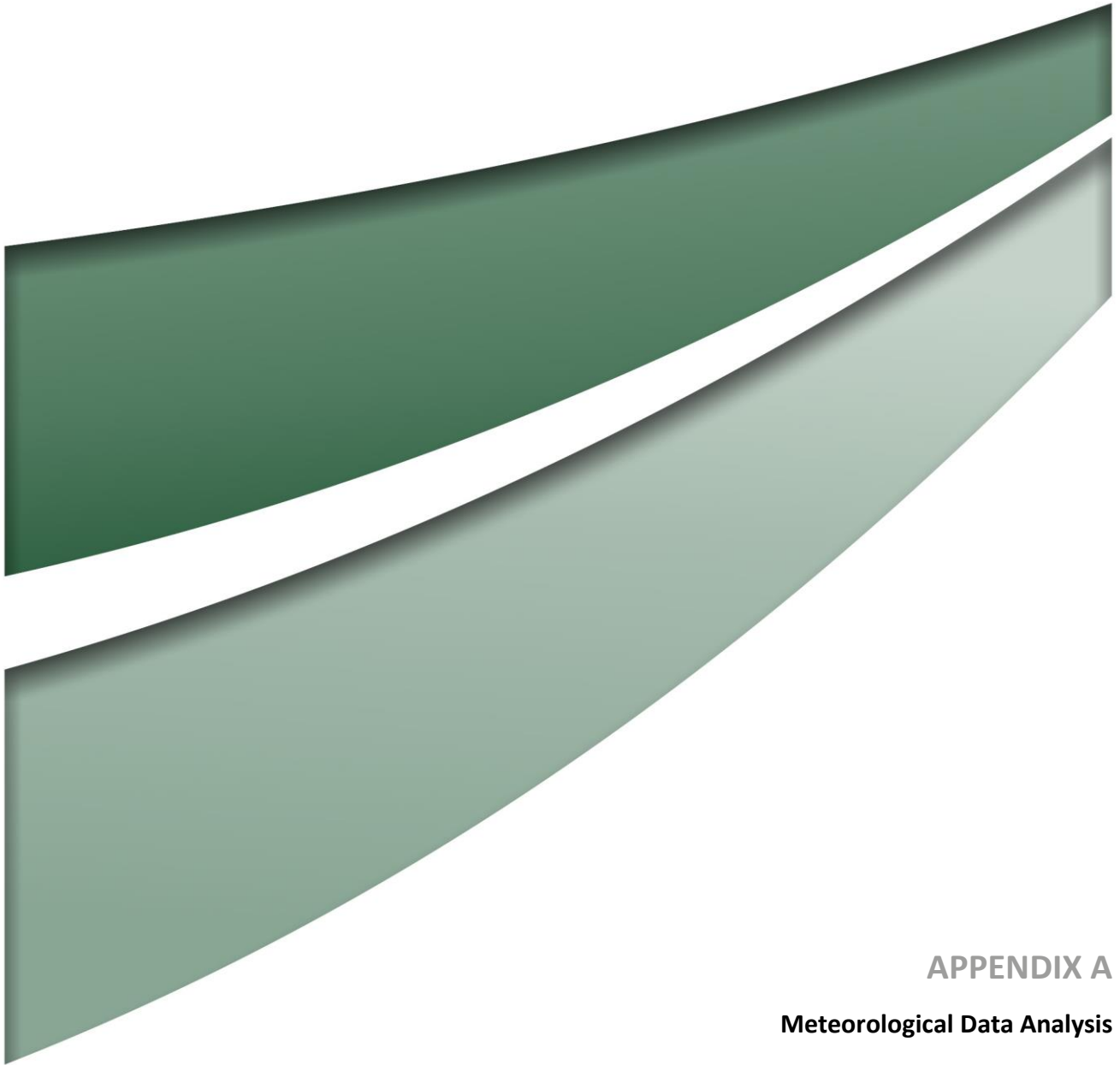
6.0 Conclusion

Umwelt has undertaken a targeted NIA of the Proposed Modification in accordance with the methodology described in the NPfI (EPA, 2017) and assessed against the project noise criteria as outlined in the Northparkes Mines Project Approval (PA11_0060). An updated noise model has been developed for Scenario 1 as presented in the previous noise assessment (Umwelt, 2013) including a new Secondary Crusher and Ball Mill. The Scenario 1 noise model represents the existing 7 days per week/24 hours per day operation of NPM, incorporating the process plant (including product loading and dispatch road haulage trucks operating within the Northparkes site), underground mining and the associated equipment supporting the underground mining activities. The noise modelling results indicate that under the prevailing meteorological conditions, the Proposed Modification will result in a small increase of up to 1 dBA in the predicted noise levels relative to the predicted noise levels associated with current approved operations. Noise levels from NPM are predicted to continue to comply with the project noise limits set by PA 11_0060 with the Proposed Modification, and the implementation of the existing noise mitigation and management measures will continue to be appropriate for the Proposed Modification.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Stephen Lyons', with a stylized flourish at the end.

Stephen Lyons
Senior Acoustics Engineer



APPENDIX A

Meteorological Data Analysis

The collated meteorological data for the period January 2017 to December 2017 (inclusive) period are provided in **Tables A1.1 to A1.4**. The meteorological data was analysed to determine prevailing wind conditions likely to influence the propagation of noise from the Proposed Modification.

Table A1.1 –Prevailing Wind Analysis, Summer

Direction	Criteria	Day	Evening	Night	All Periods
N	3 m/s	7.3%	12.7%	19.3%	12.7%
NNE	3 m/s	6.5%	12.2%	20.9%	12.9%
NE	3 m/s	5.2%	12.3%	20.1%	12.0%
ENE	3 m/s	4.1%	9.7%	14.7%	9.0%
E	3 m/s	4.0%	9.8%	12.2%	8.1%
ESE	3 m/s	4.6%	15.2%	19.4%	12.0%
SE	3 m/s	5.1%	18.5%	24.2%	14.5%
SSE	3 m/s	5.7%	19.6%	24.7%	15.2%
S	3 m/s	5.9%	16.6%	20.7%	13.2%
SSW	3 m/s	5.7%	11.1%	11.2%	8.7%
SW	3 m/s	5.6%	6.0%	4.3%	5.2%
WSW	3 m/s	5.7%	3.3%	2.1%	3.9%
W	3 m/s	5.9%	3.5%	1.8%	4.0%
WNW	3 m/s	6.5%	3.9%	2.6%	4.6%
NW	3 m/s	7.2%	5.5%	5.2%	6.1%
NNW	3 m/s	7.5%	10.0%	12.9%	10.0%

Table A1.2 –Prevailing Wind Analysis, Autumn

Direction	Criteria	Day	Evening	Night	All Periods
N	3 m/s	11.0%	13.8%	15.6%	13.2%
NNE	3 m/s	10.4%	18.9%	18.1%	14.7%
NE	3 m/s	9.7%	22.5%	20.0%	15.7%
ENE	3 m/s	8.8%	23.1%	19.2%	15.1%
E	3 m/s	8.4%	24.5%	20.1%	15.5%
ESE	3 m/s	11.3%	30.0%	32.4%	22.3%
SE	3 m/s	13.9%	32.5%	36.4%	25.4%
SSE	3 m/s	13.9%	31.8%	34.0%	24.4%
S	3 m/s	12.5%	24.4%	26.1%	19.6%
SSW	3 m/s	8.7%	12.9%	10.9%	10.2%
SW	3 m/s	5.1%	6.3%	4.5%	5.0%
WSW	3 m/s	3.7%	3.0%	3.1%	3.3%
W	3 m/s	4.1%	2.4%	3.0%	3.4%
WNW	3 m/s	5.8%	2.5%	3.3%	4.3%
NW	3 m/s	7.6%	3.3%	3.8%	5.4%
NNW	3 m/s	9.6%	6.4%	8.5%	8.7%

Table A1.3 –Prevailing Wind Analysis, Winter

Direction	Criteria	Day	Evening	Night	All Periods
N	3 m/s	9.4%	11.6%	15.7%	12.1%
NNE	3 m/s	8.9%	12.3%	15.6%	12.0%
NE	3 m/s	6.6%	10.4%	13.0%	9.6%
ENE	3 m/s	5.9%	9.1%	9.6%	7.8%
E	3 m/s	7.8%	17.9%	15.4%	12.4%
ESE	3 m/s	13.9%	36.9%	32.9%	24.8%
SE	3 m/s	18.3%	44.5%	39.7%	30.7%
SSE	3 m/s	20.6%	46.2%	40.3%	32.3%
S	3 m/s	19.9%	37.1%	32.6%	27.5%
SSW	3 m/s	14.0%	17.9%	13.8%	14.6%
SW	3 m/s	9.5%	9.4%	5.4%	7.9%
WSW	3 m/s	6.8%	4.8%	3.2%	5.1%
W	3 m/s	5.9%	3.9%	3.1%	4.6%
WNW	3 m/s	6.5%	3.6%	4.6%	5.3%
NW	3 m/s	8.8%	6.1%	8.2%	8.1%
NNW	3 m/s	9.7%	9.7%	13.2%	2.8%

Table A1.3 –Prevailing Wind Analysis, Spring

Direction	Criteria	Day	Evening	Night	All Periods
N	3 m/s	11.8%	14.8%	17.2%	14.6%
NNE	3 m/s	11.1%	17.4%	19.1%	15.5%
NE	3 m/s	9.4%	16.7%	19.0%	14.6%
ENE	3 m/s	7.6%	13.7%	14.1%	11.3%
E	3 m/s	6.7%	15.6%	12.5%	10.6%
ESE	3 m/s	7.0%	20.0%	18.0%	13.8%
SE	3 m/s	7.9%	23.1%	20.7%	15.9%
SSE	3 m/s	7.7%	26.6%	21.6%	16.8%
S	3 m/s	7.0%	21.0%	18.6%	14.2%
SSW	3 m/s	6.0%	13.3%	12.0%	9.8%
SW	3 m/s	4.5%	9.8%	8.5%	7.1%
WSW	3 m/s	4.1%	5.7%	5.2%	4.8%
W	3 m/s	4.4%	5.2%	3.9%	4.4%
WNW	3 m/s	5.9%	5.9%	3.2%	4.8%
NW	3 m/s	8.2%	6.9%	3.9%	6.2%
NNW	3 m/s	10.2%	10.3%	10.9%	10.5%

Wind speed analysis of the prevailing winds has also been conducted and is summarised in the following **Figures A.1 to A.4**.

Figure A.1 – Wind Speed Analysis, Summer

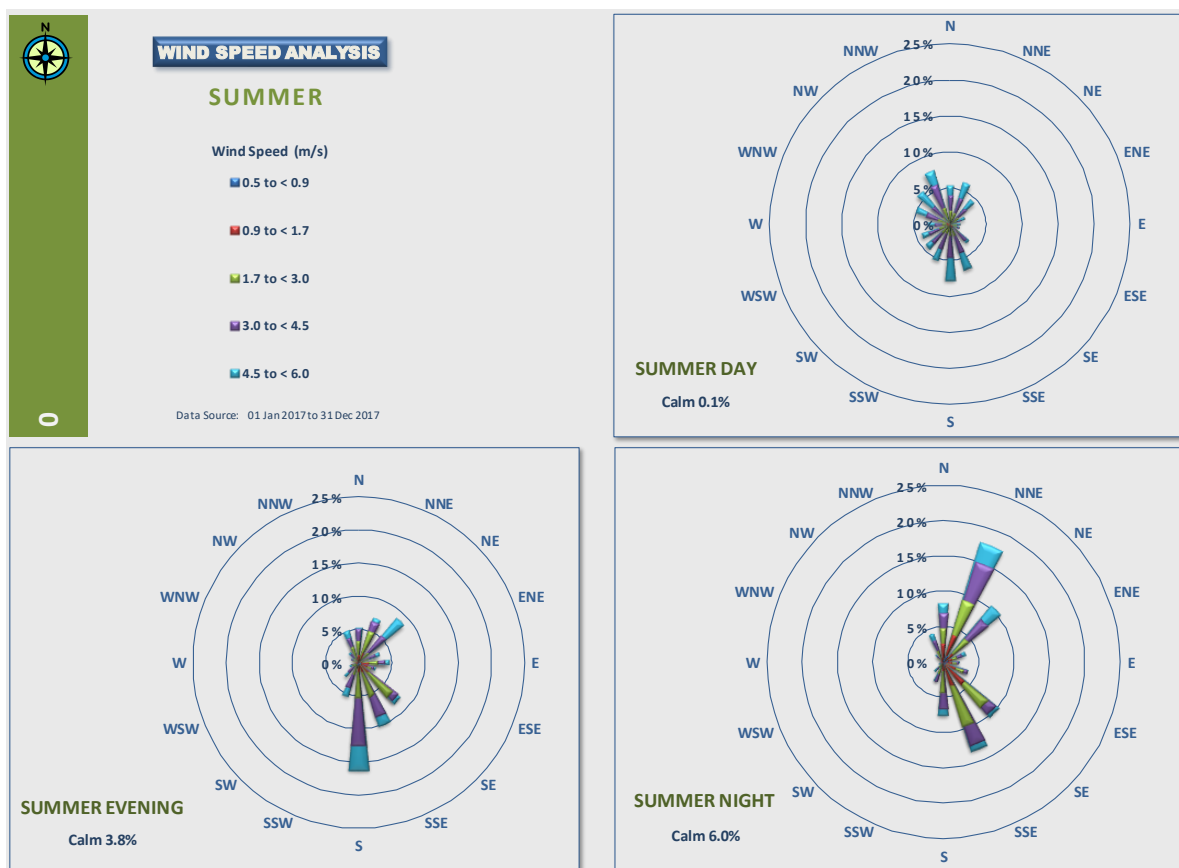


Figure A.2 – Wind Speed Analysis, Autumn

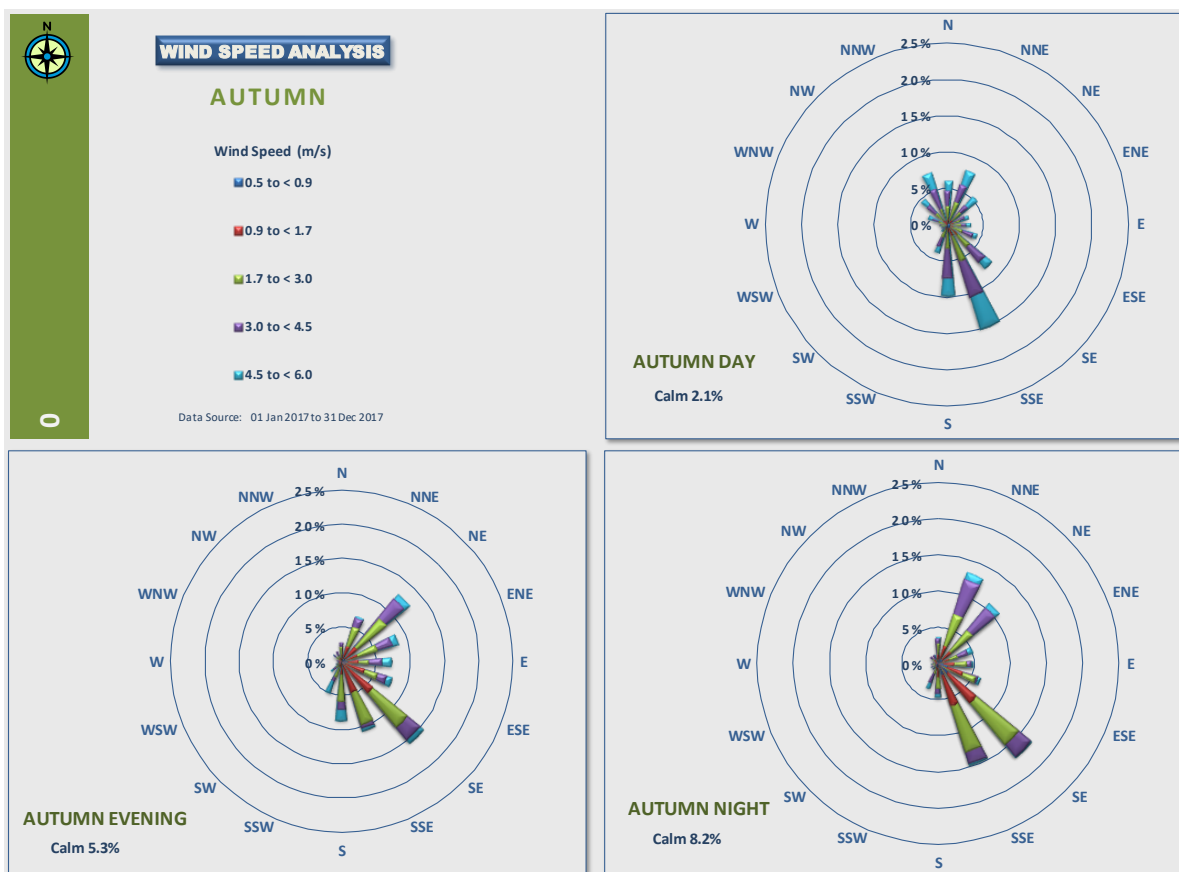


Figure A.3 – Wind Speed Analysis, Winter

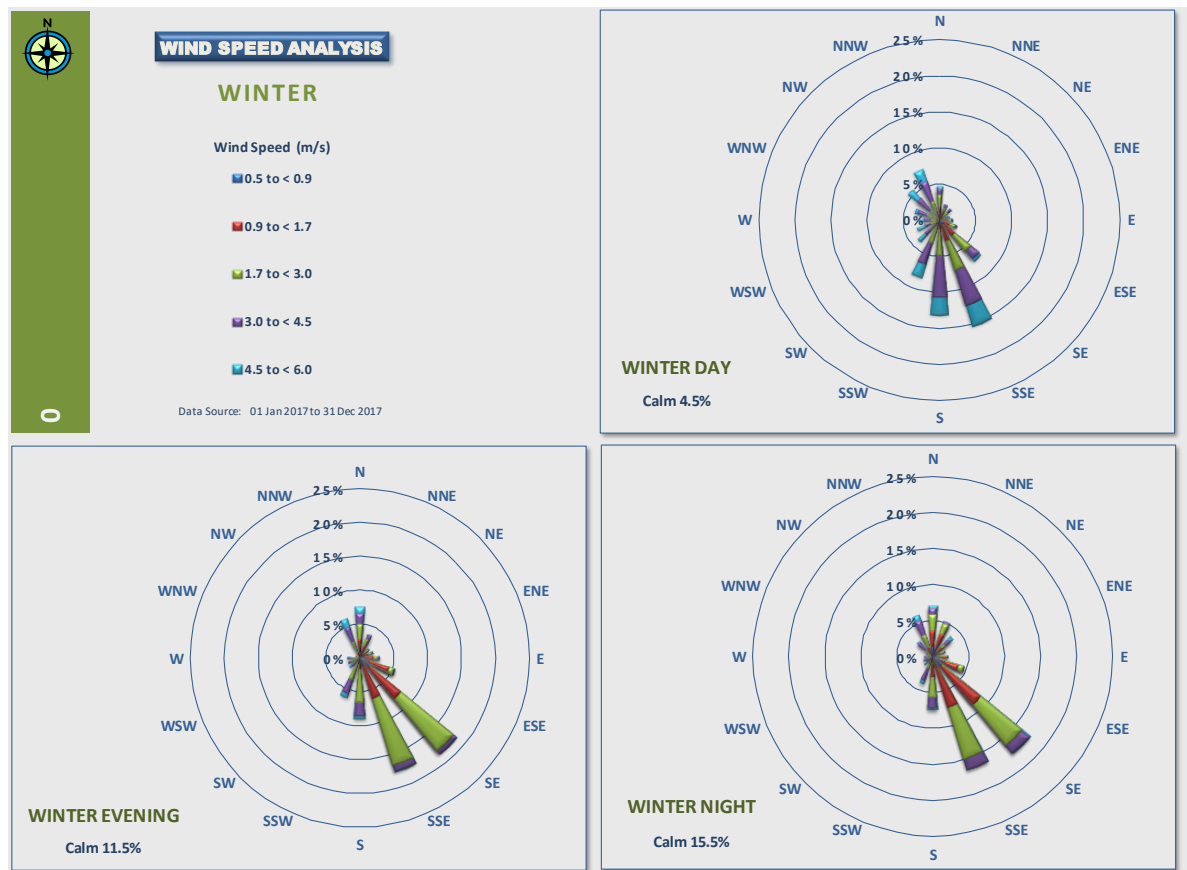
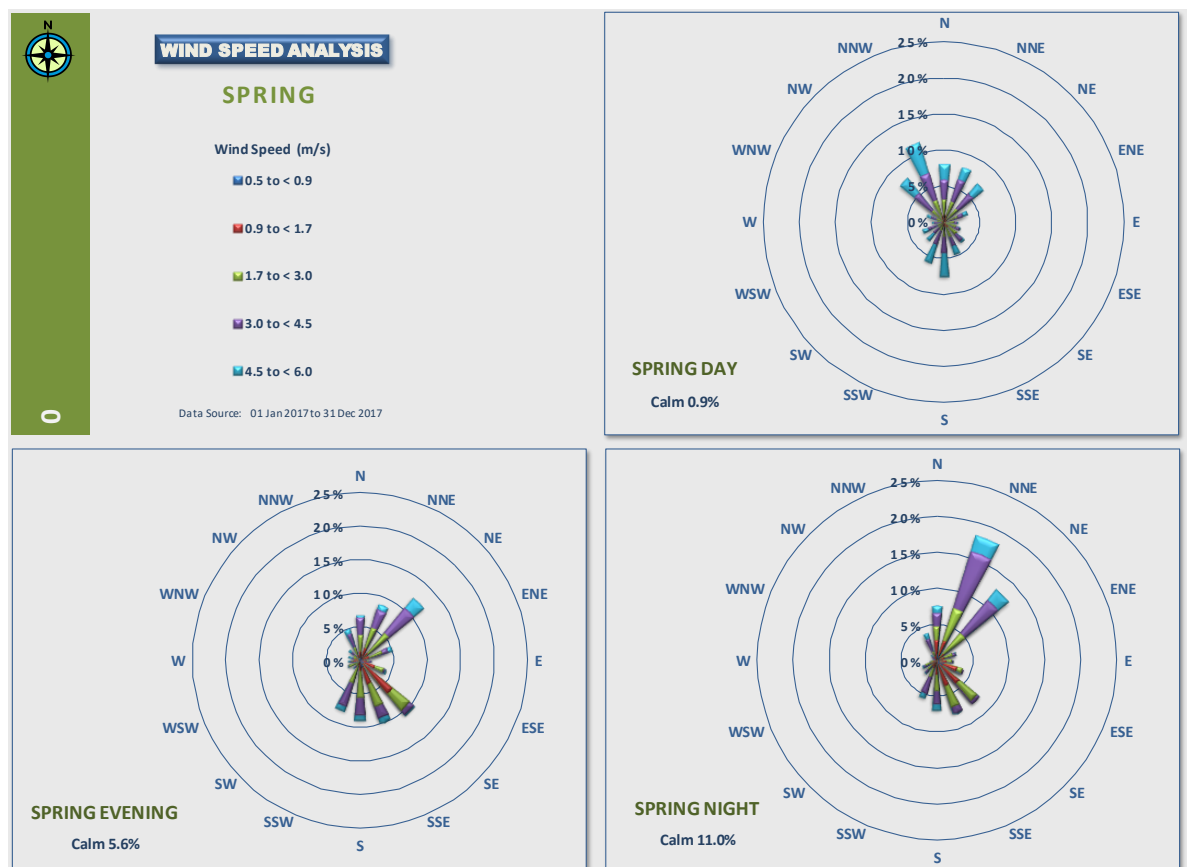
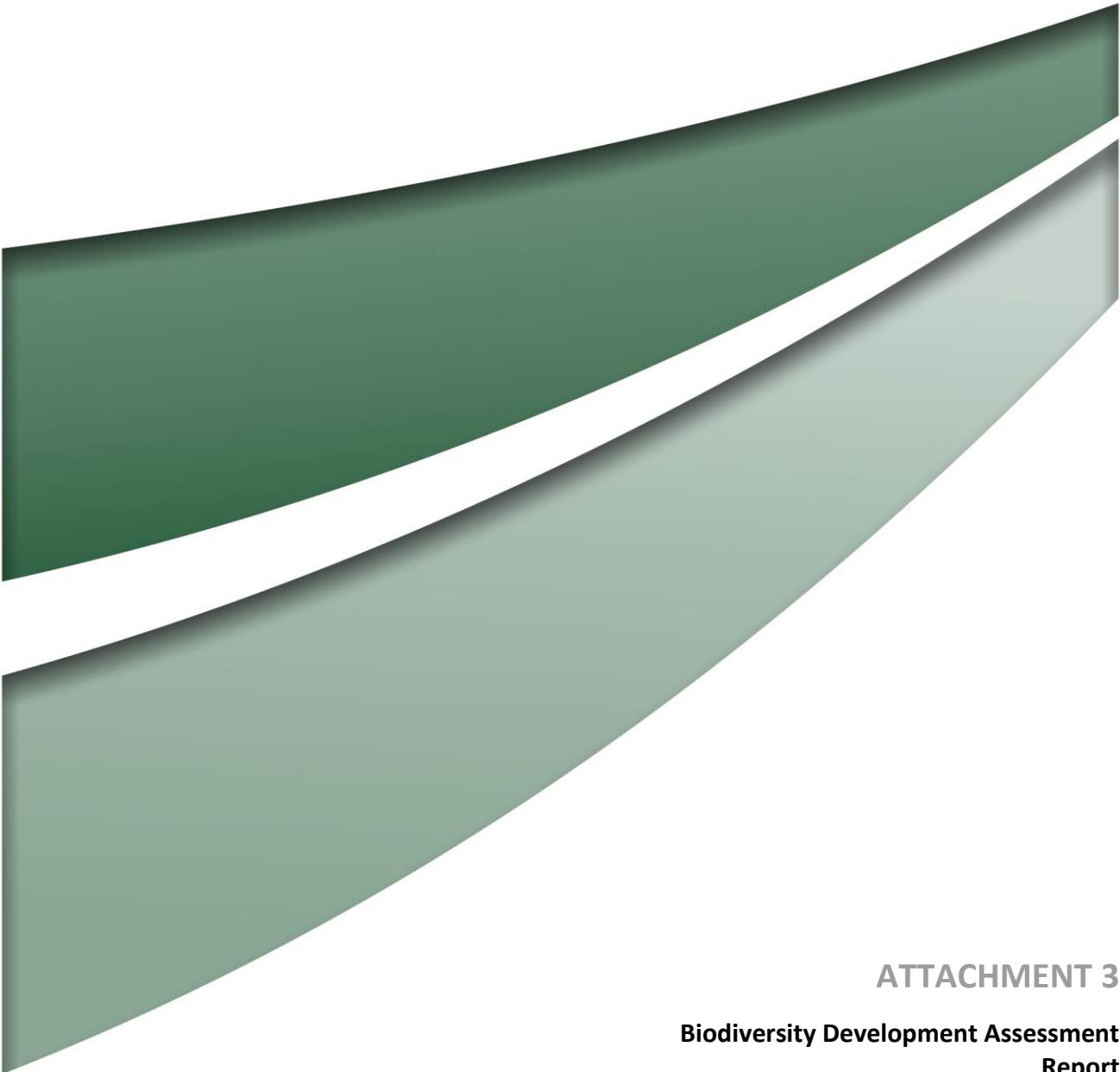


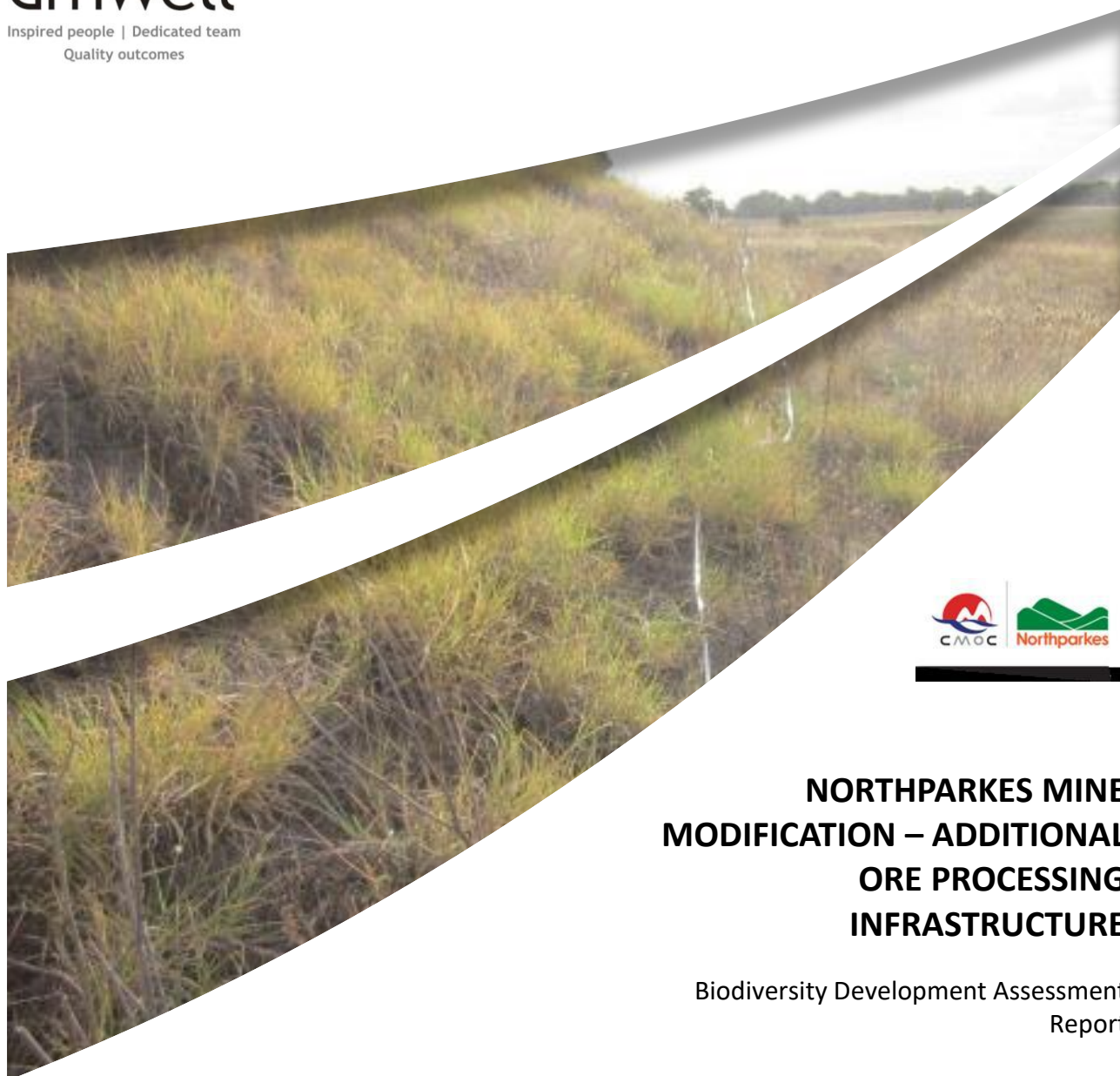
Figure A.4 – Wind Speed Analysis, Spring





ATTACHMENT 3

**Biodiversity Development Assessment
Report**



NORTHPARKES MINE MODIFICATION – ADDITIONAL ORE PROCESSING INFRASTRUCTURE

Biodiversity Development Assessment
Report

FINAL

May 2018



NORTHPARKES MINE MODIFICATION – ADDITIONAL ORE PROCESSING INFRASTRUCTURE

Biodiversity Development Assessment Report

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Northparkes Mine

Project Director: Barbara Crossley
Project Manager: Gabrielle Allan
Technical Director: Allison Riley
Technical Manager: Ryan Parsons
Report No. 4060A/R04/V2
Date: May 2018



Newcastle

75 York Street
Teralba NSW 2284

Ph. 02 4950 5322

www.umwelt.com.au



Quality
ISO 9001

This report was prepared using
Umwelt's ISO 9001 certified
Quality Management System.

Disclaimer

This document has been prepared for the sole use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that for which it was supplied by Umwelt (Australia) Pty Ltd (Umwelt). No other party should rely on this document without the prior written consent of Umwelt.

Umwelt undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document. Umwelt assumes no liability to a third party for any inaccuracies in or omissions to that information. Where this document indicates that information has been provided by third parties, Umwelt has made no independent verification of this information except as expressly stated.

©Umwelt (Australia) Pty Ltd

Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
V1	Allison Riley	28/03/2018	Gabrielle Allan	28/03/2018
V2	Ryan Parsons	23/05/2018	Gabrielle Allan	23/05/2018

Executive Summary



Northparkes is a copper-gold mine located approximately 27 kilometres (km) north-west of Parkes in central New South Wales (NSW). Northparkes Mines (Northparkes) proposes to modify its existing Project Approval 11_0060 under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to allow for changes to the approved ore processing plant infrastructure.

The modification (the Project) will involve construction of additional ore processing infrastructure including:

- Construction and operation of an additional ball mill;
- Construction and operation of a new secondary crushing building;
- Various upgrades to ore conveyor, hoisting and processing infrastructure; and
- Various upgrades and relocations of supporting site infrastructure (i.e. power supply).

The bulk of the additional ore processing infrastructure will be located within the existing approved disturbance footprint for Northparkes. However, an additional approximately 1,400m² of disturbance will be required to accommodate the construction of the new secondary crushing building. This additional disturbance area is located primarily within non-native vegetation.

As the Project is a State Significant Development (SSD) it requires a Biodiversity Assessment Method (BAM) assessment under the *Biodiversity Conservation Act 2016* (BC Act). This Biodiversity Development Assessment Report (BDAR) has been prepared by Umwelt (Australia) Pty Limited (Umwelt) on behalf of Northparkes to assess the potential biodiversity impacts of the Project in accordance with the BAM.

The Development Footprint is situated at the existing Northparkes mine site, approximately 27 km north-west of Parkes, within the Parkes Shire LGA. The existing land use within the Development Site has been primarily associated with mining activities since operations commenced in 1993. In the broader local area, land use is dominated by large agricultural land holdings cultivated primarily for cropping and pastoral practices. The Development Footprint is devoid of native woody vegetation and comprises disturbed grasslands.

The biodiversity assessment involved literature and database reviews, site reconnaissance surveys, BAM floristic and vegetation integrity surveys and habitat assessments. The vegetation zone within the Development Footprint is heavily disturbed from operations of the processing plant, with influences from the adjoining native vegetation.

Following the application of appropriate avoidance and mitigation measures, the BAM assessment identified the following biodiversity credits required to offset the impacts of the Proposed Modification:

- 1 ecosystem credit for disturbed PCT76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions within the Development Footprint.

Northparkes intend to pay into the Biodiversity Conservation Fund to meet their offset obligation.

Glossary

BDAR	Biodiversity Development Assessment Report
BAM	Biodiversity Assessment Methodology
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
CEEC	Critically Endangered Ecological Community
Development Footprint	The total impact zone associated with the Project. The Proposed Disturbance Area is referred to throughout this report as the Development Footprint in accordance with the BAM.
DoEE	Commonwealth Department of the Environment and Energy
DNG	Derived Native Grasslands
Ecosystem credit	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a development site and the gain in biodiversity values at an offset site.
EEC	Endangered Ecological Community
EP	Endangered Population
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
GDEs	Groundwater-dependent Ecosystems
GIS	Geographical Information System
IBRA	Interim Biogeographic Regionalisation for Australia (Version 7)
LGA	Local Government Area
MGA	Map Grid of Australia
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
PMST	Protected Matters Search Tool
SEARs	Secretary of the Department of Planning and Environment
Species credit	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Species Profile Database.
Strahler Stream Order	Classification system that gives a waterway an 'order' according to the number of tributaries associated with it.
TEC	Threatened Ecological Community
TBDC	Threatened Biodiversity Data Collection
VIS	Vegetation Information System

Table of Contents

Executive Summary	i
Glossary	
1.0 Introduction	1
1.1 The Project	1
1.2 Purpose and Scope of this Report	3
1.3 Development Site Information	6
1.3.1 Local Ecological Context	6
1.4 Report Preparation	9
2.0 Methods	10
3.0 Results	12
3.1 Landscape Value	12
3.1.1 Landscape Features	12
3.2 Native Vegetation within the Development Footprint	12
3.2.1 Plant Community Types and Vegetation Zones	12
3.2.2 Threatened Ecological Communities	16
3.2.3 Vegetation Integrity Score	16
3.3 Threatened Species within the Development Footprint	17
3.3.1 Ecosystem-credit Species Predicted to Occur	17
3.3.2 Species-credit Species Predicted to Occur	24
4.0 Avoidance and Minimisation of Impacts	30
4.1 Avoidance and Minimisation	30
4.1.1 Avoidance of Native Vegetation and Habitat	30
4.1.2 Minimisation Measures	30
5.0 Assessment of Impacts	32
5.1 Impacts on Native Vegetation and Habitat	32
5.1.1 Direct Impacts	32
5.1.2 Indirect Impacts	34
5.2 Prescribed Impacts	35
5.2.1 Uncertain Prescribed Impacts	35
5.3 Serious and Irreversible Impacts	35
6.0 Biodiversity Credit Impact Summary	36
6.1 Impacts Not Requiring Assessment	36
6.2 Impacts Not Requiring Offset	36
6.3 Impacts Requiring Offset	36

7.0	Biodiversity Credit Report	38
8.0	References	39

Figures

Figure 1.1	Locality Plan	4
Figure 1.2	The Project - Overview	5
Figure 1.3	Location Map – IBRA Regions/Subregions and Local Government Area	8
Figure 2.1	Survey Effort	11
Figure 3.1	Vegetative Zone in the Development Footprint	14
Figure 3.2	Threatened Species	23
Figure 4.1	Areas of Avoidance	31
Figure 5.1	Final Project Footprint	33

Tables

Table 1.1	Comparison of Proposed and Approved Mining Operations under PA11_0060	2
Table 1.2	Accredited BAM Assessors and their Role on this Project	9
Table 3.1	Landscape Features in the Development Footprint	12
Table 3.2	Vegetation Zone Vegetation Integrity Scores	16
Table 3.3	Ecosystem-credit Species	17
Table 3.4	Predicted Species-credit Species	24
Table 5.1	Direct Impacts of the Proposed Modification on Biodiversity Features	32
Table 6.1	Impacts Requiring Offset	36
Table 6.2	Offsetting Price Within the Biodiversity Conservation Fund	37
Table 7.1	Credits Required to Offset the Project	38

Appendices

Appendix A	Assessment Methods
Appendix B	Flora Species List
Appendix C	Threatened Ecological Community Assessments
Appendix D	Vegetation Integrity Data
Appendix E	Biodiversity Credit Report

1.0 Introduction

Northparkes Mines (Northparkes), is an existing copper-gold mine located approximately 27 kilometres (km) north-west of Parkes (refer to **Figure 1.1**) in the central west region of New South Wales.

Northparkes received project approval for the Northparkes Extension Project on 16 July 2014 (PA11_0060) under Part 3A of the EP&A Act to provide for continued mining at Northparkes, the development of additional underground and open cut mining areas, changes to the approved tailings storage facility along with a range of ancillary infrastructure changes. This project approval has been subsequently modified on three occasions.

Northparkes proposes to modify PA 11_0060 under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to allow for proposed changes to the approved ore processing plant infrastructure (the Project).

As the Project is a State Significant Development (SSD) it requires a Biodiversity Assessment Method (BAM) assessment under the *Biodiversity Conservation Act 2016* (BC Act). The Minister for Planning (or delegate) is the consent authority for the Project.

This Biodiversity Development Assessment Report (BDAR) has been prepared by Umwelt (Australia) Pty Limited (Umwelt) on behalf of Northparkes to assess the potential biodiversity impacts of the Project in accordance with the BAM as detailed in **Section 1.2**.

1.1 The Project

The proposed modification (the Project) will involve construction of additional ore processing infrastructure including:

- Construction and operation of an additional ball mill;
- Construction and operation of a new secondary crushing building;
- Various upgrades to ore conveyor, hoisting and processing infrastructure; and
- Various upgrades and relocations of supporting site infrastructure (i.e. power supply).

The bulk of the additional ore processing infrastructure will be located within the existing approved disturbance footprint for Northparkes. However, a minor amendment to the disturbance footprint will be required to accommodate the construction of the new secondary crushing building, as shown on **Figure 1.1**.

The Project site is located at the existing Northparkes mine site in the Parkes Shire Local Government Area (LGA). It covers an area of approximately 1,400m² and is located to the west of Bogan Road and north of McClintocks Lane (refer to **Figure 1.2**).

Table 1.1 provides an overview of the proposed modification relative to the approved operations under PA11_0060.

Table 1.1 Comparison of Proposed and Approved Mining Operations under PA11_0060

Major Project Components/ Aspects	Approved Operations	Proposed Modification
Mining Areas	Continued underground caving of the E26 and E48 ore bodies. Development of underground cave mining in the E22 resource (previously subject to open cut mining). Development of open cut mining area in existing mine subsidence zone for E26. Development of four small open cuts to extract ore from E28, E28N, E31 and E31N. All proposed open cut mining areas are located within the existing PA 06_0026 Project Area and existing Mining leases.	No change
Ore Processing	Continuation of processing up to 8.5 Mtpa of ore through the existing processing plant sourced from underground and open cut mining areas.	Continuation of processing up to 8.5 Mtpa of ore through the existing and proposed processing plant
Mine Life	Mining until end of 2032.	No Change
Operating Hours	24 hours per day, seven days per week	No Change
Number of Employees	Approximately 700 full time equivalents	No Change
Mining Methods	Multiple Underground Block Caves and Sub Level Caves Campaign Open cut mining of up to 7 Mtpa for stockpiling and processing as required.	No Change
Infrastructure	Construction and operation of: • TSF augmented to connect existing and approved tailings facilities, through the development of TSF 3 southward from the existing southern embankment of TSF 2. • Establishment of new waste stockpiles to store waste material generated during open cut mining campaigns including a vehicle wash down area. • Continued operation of existing processing plant, site offices, underground access, water supply infrastructure and logistics connections. • Continued road haulage of concentrate to Goonumbla rail siding for transport to Port Kembla. • Closure of the existing site access road through the development of TSF 3. • Provision of an upgraded site access road along a new alignment from McClintocks Lane. • Development of an access control and visitor's car parking at the intersection of the proposed site access and McClintocks Lane. • Upgrade/sealing of McClintocks Lane between the NPM access road and Bogan Road. Upgrades as required to the intersection of McClintocks Lane and Bogan Road.	Construction and operation of: • an additional ball mill • new secondary crushing building • upgrades to ore conveyor, hoisting and processing infrastructure • upgrades and relocations of supporting site infrastructure (i.e. power supply).

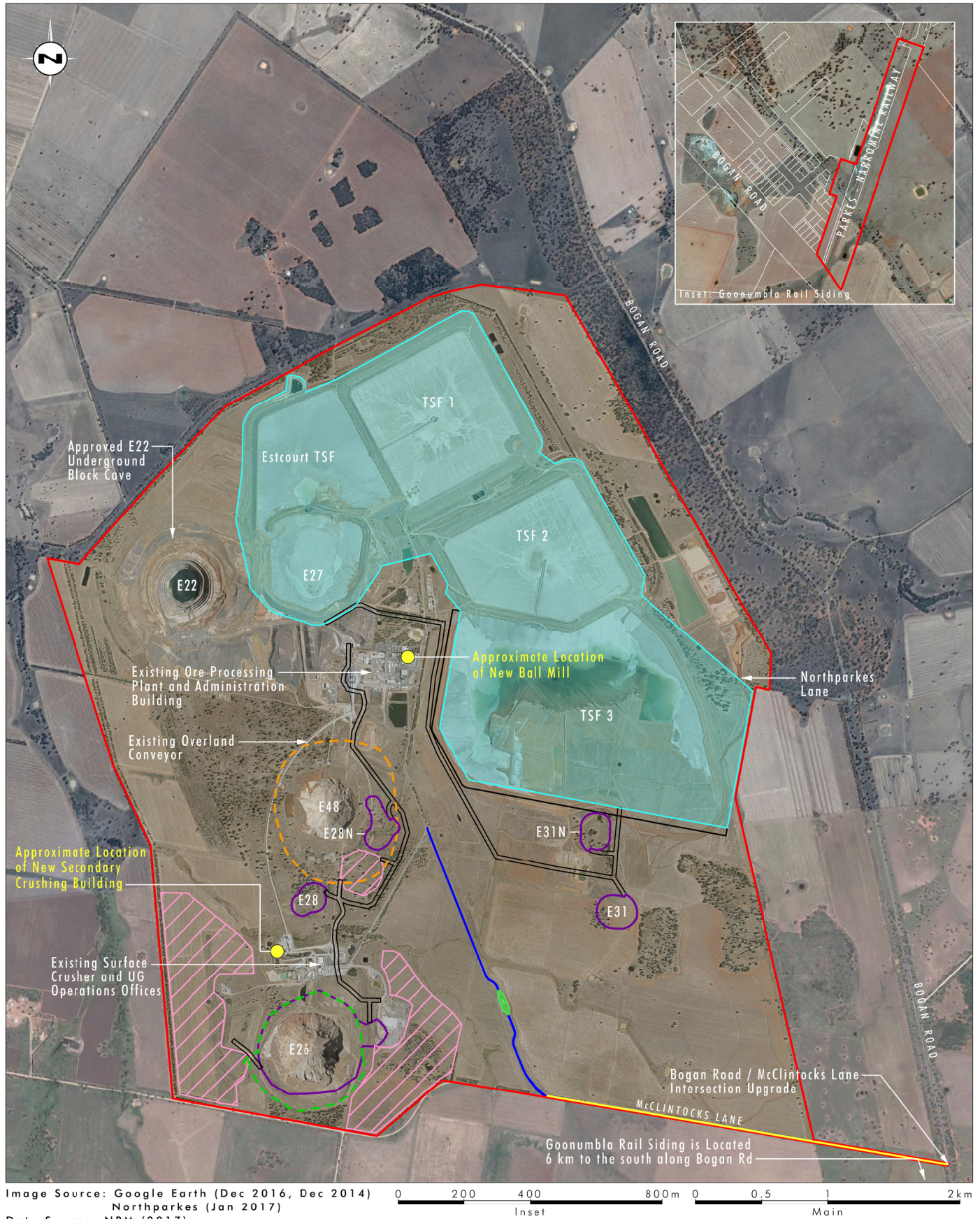
Major Project Components/ Aspects	Approved Operations	Proposed Modification
Approved Disturbance Area	As detailed on Figure 5.9 of the EA (and shown in part on Figure 1.2). In addition, as shown on Figure 1.2 , the detailed design and construction of the approved access control and access road has resulted in this infrastructure being constructed within a smaller footprint (approximately 4ha compared to the approved disturbance of approximately 8ha). The detailed design and minor amendments to the alignment of the approved access road from McClintocks Lane also resulted in the approved access control area being constructed further to the north than as shown in the EA. Given that the overall disturbance area is smaller and Northparkes constructed this infrastructure in areas of cultivated agricultural land as opposed to the approved disturbance to Threatened Ecological Communities and free of other constraints, the impacts are less than that provided in the EA.	Disturbance associated with the construction of the new secondary crusher will result in a minor extension to the approved disturbance footprint as shown on Figure 1.2 .

1.2 Purpose and Scope of this Report

This report provides the findings of the Biodiversity Assessment of the Project. It addresses the specific requirements of the BAM (OEH 2017).

The structure of the report is outlined below as per the requirements of Appendix 10 of the BAM (OEH 2017):

- **Stage 1 Biodiversity Assessment:**
 - Section 1 – provides the introduction to the report
 - Section 2 – outlines the methods used in the assessment
 - Section 3 - outlines the results of the field surveys and BAM credit calculator application
- **Stage 2 Impact Assessment:**
 - Section 4 – describes the avoidance measures implemented and minimisation of impacts as part of the Project
 - Section 5 – provides an assessment of the impacts in accordance with the BAM
 - Section 6 – summarises the credit requirements for the Project
 - Section 7 – outlines the results of the Biodiversity Credit Report
- **Other sections:**
 - Section 8 - provides a list of references used throughout the report and assessment.



Legend

- Project Area
- Approved E26 Subsidence Area
- Approved E48 Subsidence Area
- Approved Tailings Storage Facility
- Approved Open Cut Areas
- Approved Upgrade to McClintocks Lane
- Approved Waste Dumps
- Access Control and Visitor Car Park
- Site Access Road
- Approved Haul Road

FIGURE 1.1
Locality Plan

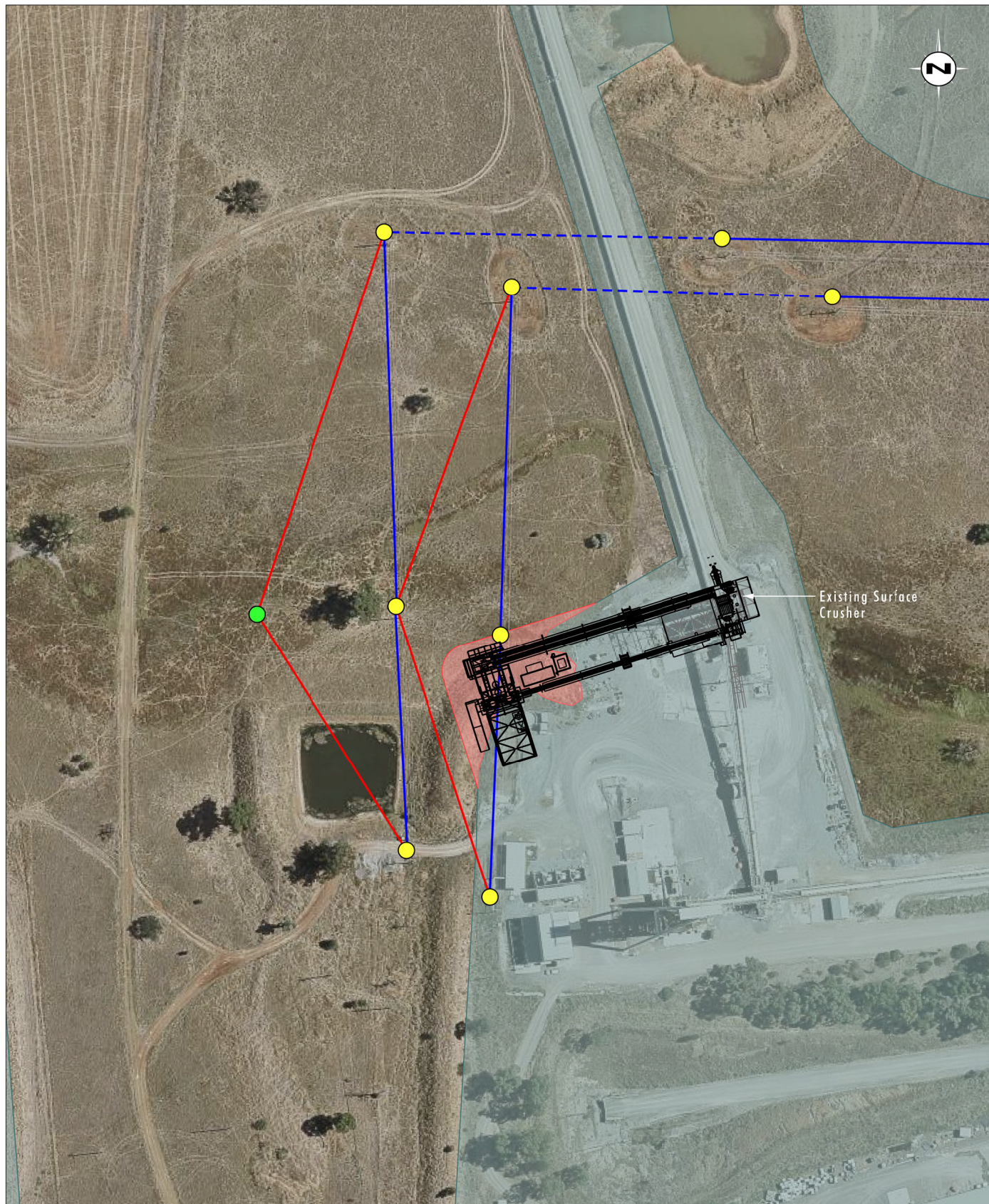


Image Source: Northparkes (Jan 2017)
Data Source: NPM (2017)

0 25 50 100m
1:2000

Legend

- Approved Disturbance Area
- Additional Disturbance Area
- Underground
- Existing Mango Overhead
- Proposed Mango Overhead
- New Power Pole
- Existing Power Pole

File Name (A4): R04/4060_016.dgn
20180320 15.47

FIGURE 1.2

The Project - Overview

1.3 Development Site Information

The Development Site comprises the broader Northparkes mine site. The Development Footprint comprises the portion of the Development Site that will be subject to permanent impact by the Project, and that is located outside the current approved disturbance footprint. The Development Site covers an area of approximately 1400m². The Development Site and Footprint is shown on **Figure 1.3**.

The land uses surrounding the Project site include large agricultural land holdings cultivated primarily for cropping and pastoral practices. The Development Footprint includes highly degraded and disturbed grassland immediately adjacent to the existing operations of the Northparkes mine.

1.3.1 Local Ecological Context

The Development Footprint is located in the northern extent of the NSW South Western Slopes Bioregions, and the lower slopes subregion, characterised by undulating and hilly ranges and isolated peaks set in wide valleys at the apices of the Riverina alluvial flats.

The wide valleys of the region are dominated by extensively-cleared tracts of land utilised for broad-acre agriculture, which commenced in the region in the mid 1800's. Remnant vegetation is primarily located on the hilly ranges though also occurs, usually in linear strips, along drainage lines and roads within the cleared agricultural landscapes.

The existing land use within the Development Site has been primarily associated with mining activities since operations commenced onsite in 1993. Since initial development, operations at the NPM site have expanded to include open cut and underground mining activities. Prior to the establishment of mining operations, the primary land use in the Development Site was agriculture, which has a substantial history in the area, with an emphasis on cultivation activities typical of the established agricultural land uses within the surrounding area.

In the broader local area, land use is dominated by large agricultural land holdings cultivated primarily for cropping and pastoral practices. The surrounding locality and region consists of mostly cleared agricultural land with patches of remnant vegetation primarily associated with road reserves, travelling stock routes and State Forests. The closest townships to the Project Area are Peak Hill (approximately 25 km north-east) and Parkes (approximately 27 km south-east).

NPM owns approximately 6481 hectares (ha) of land surrounding existing operations. NPM operates these landholdings as a commercial farm with cropping for wheat and canola being the most common agricultural land uses. In addition, NPM have completed revegetation works within their landholdings which occur in linear strips along roadways and fence lines as well as in blocks adjacent to remnant vegetation.

The Development Footprint is located in an area immediately surrounded by current mining disturbances; however remnant native vegetation occurs in the wider locality, supporting a range of ecological communities, flora and fauna species. The majority of remnant vegetation is confined to creek lines and road reserves.

Where there is remnant native vegetation in the locality, a number of Threatened Ecological Communities (TECs) are known to occur including:

- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions EEC (BC Act);
- White Box Yellow Box Blakely's Red Gum Woodland EEC (BC Act);

- Grey Box (*Euclyptus microcarpa*) Grassy Woodlands and Derived Native Grassland of South-eastern Australia EEC (EPBC Act); and
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (EPBC Act).

Two threatened flora species are known to occur in the locality, being the silky swainson-pea (*Swainsona sericea*) and pine donkey orchid (*Diuris tricolor*) (OEH 2018a). Records of 15 threatened fauna species occur around the locality. These include:

- sloanes froglet (*Crinia sloanei*)
- grey falcon (*Falco hypoleucos*)
- black falcon (*Falco subniger*)
- spotted harrier (*Circus assimilis*)
- little eagle (*Hieraaetus morphnoides*)
- brolga (*Grus rubiunda*)
- bush stone-curlew (*Burhinus grallarius*)
- superb parrot (*Polytelis swainsonii*)
- masked owl (*Tyto novaehollandiae*)
- brown treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*)
- painted honeyeater (*Grantiella picta*)
- grey-crowned babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*)
- eastern bentwing-bat (*Miniopterus schreibersii oceanensis*)
- little pied bat (*Chalinolobus picatus*)

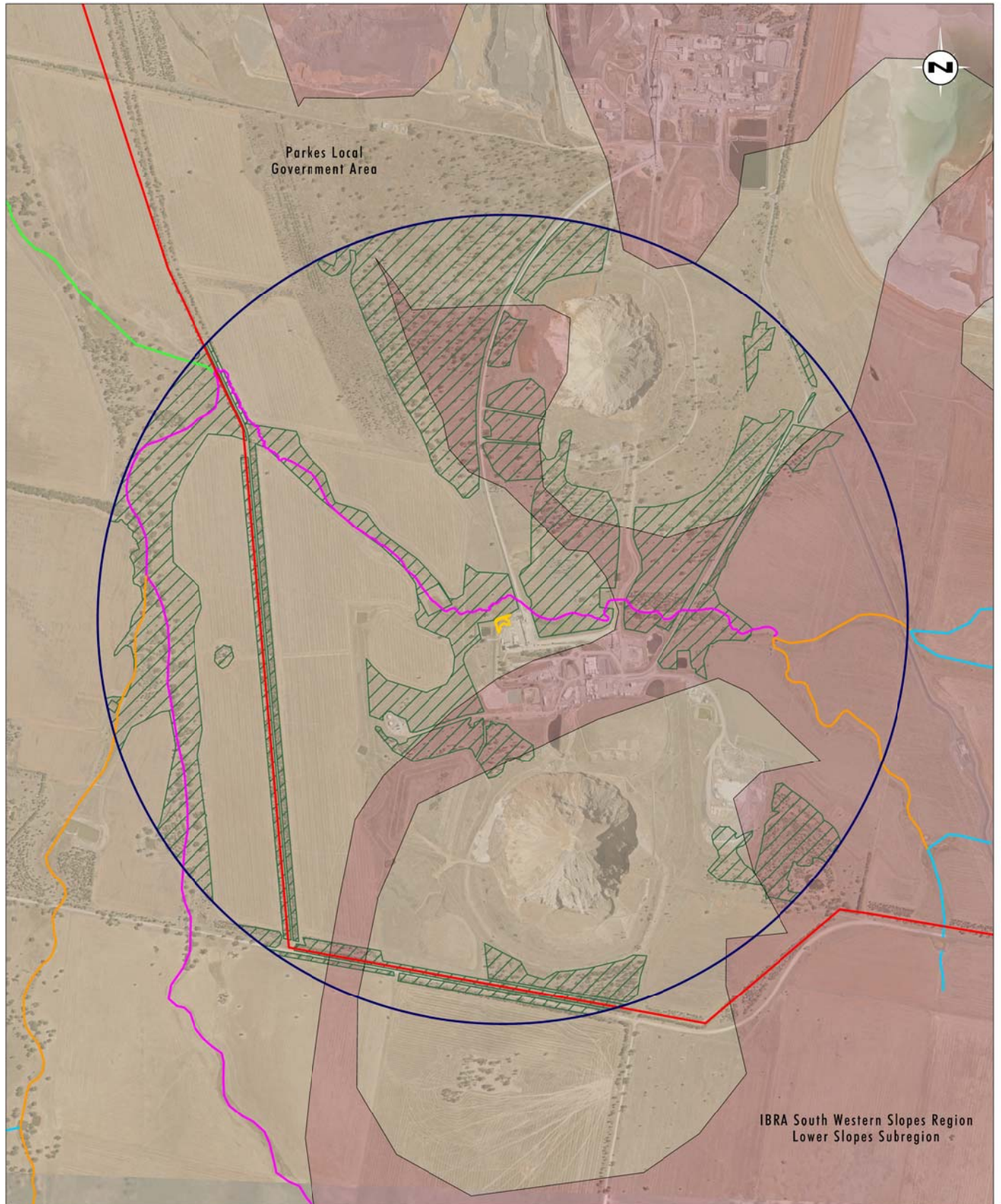


Image Source: Google Earth (Dec 2016, Dec 2014), Northparkes (Jan 2017)
Data Source: NPM (2017)

0 0.25 0.5 1.0 km
1:20 000

Legend

- | | |
|-----------------------|------------------|
| Development Footprint | Coonumbra Hills |
| Development Site | Stream Order: |
| 1500 metre Buffer | 1st Order Stream |
| Native Vegetation | 2nd Order Stream |
| Mitchell Landscapes | 3rd Order Stream |
| Bogan Alluvial Plains | 4th Order Stream |

File Name (A4): R04/4060_018.dgn
20180522 15.17

FIGURE 1.3

Location map - IBRA Regions/Subregions
and Local Government Area

1.4 Report Preparation

This BDAR was prepared by Bill Wallach (Senior Ecologist) and Ryan Parsons (Senior Ecologist), with review and technical direction from Allison Riley (Principal Ecologist). Field surveys were undertaken by Bill Wallach (Senior Ecologist). All of these personnel are Accredited BAM Assessors under the BC Act.

Table 1.2 below outlines the details of the Accredited BAM Assessors involved in the survey, calculations and reporting for the Project.

Table 1.2 Accredited BAM Assessors and their Role on this Project

Name	Assessor ID	Role
Allison Riley <i>Principal Ecologist</i>	BAAS17042	Review and technical direction
Bill Wallach <i>Senior Ecologist</i>	BAAS17068	BDAR preparation BAM calculator application Field surveys
Ryan Parsons <i>Senior Ecologist – Botanist</i>	BAAS17048	BDAR preparation

2.0 Methods

In summary, the methods undertaken as part of this assessment included:

- Landscape features were identified in the 1500 metre buffer around the Development Footprint according to the BAM (OEH 2017);
- Site Context was calculated by assessing the native vegetation cover and patch size according to the BAM (OEH 2017);
- Field surveys were completed in February 2018, comprising one floristic and vegetation integrity plot, completed according to Section 5 of the BAM (OEH 2017) within the Development Footprint, and habitat assessment and surveys for candidate threatened species (refer to **Figure 2.1**); and
- Mapping of the vegetation zones within the Development Footprint according to the BAM (OEH 2017).

For further detailed information on the methods used refer to **Appendix A**.



Image Source: Northparkes (Jan 2017)
Data Source: NPM (2017)

0 10 25 50 m
1:1000

Legend

- Development Footprint
- Floristic Plot/Transect
- Survey Track

FIGURE 2.1
Survey Effort

3.0 Results

3.1 Landscape Value

3.1.1 Landscape Features

The 1500m buffer area surrounding the Development Footprint contains a range of landscape features typical of the landscapes of the NSW South Western Slopes. These landscape features are shown on **Figure 1.3** and outlined in relation to the Development Footprint in **Table 3.1** below.

Table 3.1 Landscape Features in the Development Footprint

Landscape Features	
IBRA Bioregion	NSW South Western Slopes
IBRA Subregion	Lower Slopes
Mitchell Landscape	Goonumbla Hills
Rivers, Streams, Estuaries	No ordered streams or creeks within the Development Footprint or surrounding land.
Wetlands (within, adjacent to and downstream)	Nil
Native Vegetation Extent	198.79 hectares in the 1500m buffer area (724.67 hectares), approximately 27 %
Connectivity Features	The Development Footprint is not an important link for any fauna movement and has not been identified in connectivity mapping based on the disturbed nature of the habitat, surrounding environment and size of the Development Footprint.
Areas of Geological Significance	None identified
Soil Hazard Features	None identified

3.2 Native Vegetation within the Development Footprint

3.2.1 Plant Community Types and Vegetation Zones

Surveys of the Development Footprint identified an area comprising Non-native Vegetation (refer to **Figure 3.1**), solely comprised of introduced flora species and bare earth associated with the existing processing plant. The surveys also identified one Plant Community Type (PCT) of a single condition class (refer to **Figure 3.1**) within the Development Footprint, covering an area of approximately 241m²:

- PCT76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Disturbed Land.

It is acknowledged that the disturbed condition of the vegetation on the site is unlikely to be a suitable match for any native PCTs. PCTs are aligned with types described as part of the VIS Classification Database (OEH 2018c) based on the number of plant species conforming to PCT descriptions. For the purposes of undertaking the BAM assessment and application of the BAM calculator, a PCT was assigned that was most likely to conform to the previous vegetation prior to the disturbances of the site. This was done to determine whether the condition of this disturbed vegetation on the site met the minimum offset threshold under the BAM.

The Non-native Vegetation shown on **Figure 3.1** has not been assessed further in this BDAR.

A description of the vegetation zone of the one PCT present is outlined in **Section 3.2.1.1** below and a flora species list for the surveyed plot is included in **Appendix B**.



Image Source: Northparkes (Jan 2017)
Data Source: NPM (2017)

0 10 25 50m
1:1000

Legend

- Development Footprint
- Zone 1 - PCT76 - Western Grey Box Tall Grassy Woodland on Alluvial loam and Clay Soils in the NSW South Western Slopes and Riverina Bioregions - Disturbed Land
- Non-native Vegetation

FIGURE 3.1

Vegetation Zones in the Development Footprint

3.2.1.1 Zone 1 – PCT76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Disturbed Land

PCT Name	Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	
Condition	Disturbed Land	
Formation	Grassy Woodlands	
Class	Floodplain Transition Woodlands	
Percent cleared	92	
Area (ha)	0.02	
Patch Size (ha)	101	
Benson Community (2010)	ID76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	
General Description	This disturbed vegetation zone is located on the steep north facing slope of an artificial earth bund separating the operational area of a processing facility and the adjoining Derived Native Grasslands. The vegetation zone is heavily disturbed from operations of the processing plant but also has influences from the adjoining native vegetation.	
Canopy Description	Not present, however a single inland grey box (<i>Eucalyptus microcarpa</i>) occurs to the west of the Development Footprint in the adjoining patch of Derived Native Grassland.	
Mid-storey Description	No mid-storey is present in this vegetation zone.	

PCT Name	Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Condition	Disturbed Land
Ground Cover Description	This vegetation zone is characterised by a mid dense ground layer less than 1 m in height and dominated by a mixture of introduced and native grass and forb species. The dominant natives include hairy panic (<i>Panicum effusum</i>), ringed wallaby grass (<i>Rytidosperma caespitosum</i>) and tall sedge (<i>Carex appressa</i>). Dominant introduced species included paspalum (<i>Paspalum dilatatum</i>), saffron thistle (<i>Carthamus lanatus</i>), wild oats (<i>Avena fatua</i>), Rhodes grass (<i>Chloris gayana</i>), prickly sowthistle (<i>Sonchus asper</i>) and foxtail millet (<i>Setaria italica</i>). A number of the introduced species within this community are identified as high threat weeds under the BAM. These are species that if not controlled will invade and outcompete native plant species, which is evident on this site. These are identified in the flora species list in Appendix B.
PCT Allocation	It is acknowledged that the disturbed condition of the vegetation on the site is unlikely to be a suitable match for any native PCTs. PCTs are aligned with types described as part of the VIS Classification Database (OEI 2018c) based on the number of plant species conforming to PCT descriptions. For the purposes of undertaking the BAM assessment and application of the BAM calculator, a PCT was assigned to this area that was most likely to conform to the previous vegetation prior to the disturbances of the site. This was done to determine whether the condition of this disturbed vegetation on the site met the minimum offset threshold under the BAM.
BC Act Status	This vegetation zone is not consistent with any threatened ecological community listed under the BC Act.
EPBC Act Status	This vegetation zone is not consistent with any threatened ecological community listed under the EPBC Act.

3.2.2 Threatened Ecological Communities

No threatened ecological communities were recorded within the Development Footprint. Refer to **Appendix C** for assessment against relevant threatened ecological communities listings under the BC Act and EPBC Act.

3.2.3 Vegetation Integrity Score

Table 3.2 below details the vegetation integrity score for the vegetation zone in the Development Footprint. The vegetation integrity data of the vegetation zone is provided in **Appendix D**.

Table 3.2 Vegetation Zone Vegetation Integrity Scores

Veg Zone	PCT Name	Composition	Structure	Function	Current Vegetation Integrity Score
1	PCT176 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions <i>Disturbed Land</i>	25.9	40.8	14.8	25

3.3 Threatened Species within the Development Footprint

3.3.1 Ecosystem-credit Species Predicted to Occur

Table 3.3 below outlines the predicted ecosystem-credit species predicted to occur by the BAM Calculator and/or the literature review and whether they are considered likely to occur in the vegetation zones within the Development Footprint based on habitat requirements. Threatened species records are shown on **Figure 3.2**.

Table 3.3 Ecosystem-credit Species

Species	BC Act	EPBC Act	Suitable Habitat Present/Absent	Justification
dusky woodswallow <i>Artamus cyanopterus cyanopterus</i>	V	-	Absent	This species has not been recorded within the Development Footprint and no suitable habitat (foraging or breeding) occurs. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
glossy black-cockatoo (foraging) <i>Calyptorhynchus lathami</i>	V	-	Absent	This species has not been recorded within the Development Footprint and no suitable habitat (foraging) occurs. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
little pied bat <i>Chalinolobus picatus</i>	V	-	Absent	This species has not been recorded within the Development Footprint and no suitable habitat (foraging or breeding) occurs. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
speckled warbler <i>Chthonicola sagittata</i>	V	-	Absent	This species has not been recorded within the Development Footprint and no suitable habitat (foraging or breeding) occurs. Furthermore, the nearest known record of this species is approximately 4 km north east of the Development Footprint. It is highly unlikely that this species would be impacted by the Project.

Species	BC Act	EPBC Act	Suitable Habitat Present/Absent	Justification
brown treecreeper (eastern subspecies) <i>Climacteris picumnus victoriae</i>	V	-	Absent	This species has not been recorded within the Development Footprint and no suitable habitat (foraging or breeding) occurs. Furthermore, the nearest known record of this species is approximately 4 km north east of the Development Footprint. The information provided in the BAM Calculator suggests that the brown treecreeper in this locality is likely to be the western subspecies and therefore is not a threatened species.
varied sittella <i>Daphoenositta chrysoptera</i>	V	-	Absent	This species has not been recorded within the Development Footprint and no suitable habitat (foraging or breeding) occurs. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
grey falcon <i>Falco hypoleucos</i>	E	-	Absent	This species has not been recorded within the Development Footprint. There is no suitable breeding habitat and but there is some foraging habitat. This species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
painted honeyeater <i>Grantiella picta</i>	V	V	Absent	This species has not been recorded within the Development Footprint and no suitable habitat (foraging or breeding) occurs. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
white-bellied sea-eagle (foraging) <i>Haliaeetus leucogaster</i>	V	-	Absent	This species has not been recorded within the Development Footprint or wider locality. Although there is some foraging habitat, it is highly unlikely that this species would be impacted by the Project.

Species	BC Act	EPBC Act	Suitable Habitat Present/Absent	Justification
little eagle (foraging) <i>Hieraaetus morphnoides</i>	V	-	Present	This species has not been recorded within the Development Footprint but there is some foraging habitat. There is a known record of this species approximately 4 km north east of the Development Footprint. However, it is highly unlikely that this species would be impacted by the Project.
swift parrot (foraging) <i>Lathamus discolor</i>	E	CE	Absent	This species has not been recorded within the Development Footprint and no suitable habitat (foraging) occurs. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
Major Mitchell's cockatoo (foraging) <i>Lophochroa leadbeateri</i>	V	-	Absent	This species has not been recorded within the Development Footprint and no suitable habitat (foraging) occurs. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
Square-tailed kite (foraging) <i>Lophoictinia isura</i>	V	-	Present	This species has not been recorded within the Development Footprint or wider locality. Although there is some foraging habitat, it is highly unlikely that this species would be impacted by the Project.
hooded robin (south-eastern form) <i>Melanodryas cucullata cucullata</i>	V	-	Absent	This species has not been recorded within the Development Footprint and no suitable habitat (foraging or breeding) occurs. Furthermore, the nearest known record of this species is approximately 4 km north east of the Development Footprint. It is highly unlikely that this species would be impacted by the Project.
black-chinned honeyeater (eastern subspecies) <i>Melithreptus gularis gularis</i>	V	-	Absent	This species has not been recorded within the Development Footprint and no suitable habitat (foraging or breeding) occurs. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.

Species	BC Act	EPBC Act	Suitable Habitat Present/Absent	Justification
turquoise parrot <i>Neophema pulchella</i>	V	-	Absent	This species has not been recorded within the Development Footprint and no suitable habitat (foraging or breeding) occurs. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
barking owl (foraging) <i>Ninox connivens</i>	V	-	Absent	This species has not been recorded within the Development Footprint and no suitable habitat (foraging) occurs. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
scarlet robin <i>Petroica boodang</i>	V	-	Absent	This species has not been recorded within the Development Footprint and no suitable habitat (foraging and breeding) occurs. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
flame robin <i>Petroica phoenicea</i>	V	-	Absent	This species has not been recorded within the Development Footprint and no suitable habitat (foraging and breeding) occurs. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
koala (foraging) <i>Phascolarctos cinereus</i>	V	V	Absent	This species has not been recorded within the Development Footprint and no suitable habitat (foraging) occurs. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.

Species	BC Act	EPBC Act	Suitable Habitat Present/Absent	Justification
superb parrot (foraging) <i>Polytelis swainsonii</i>	V	V	Present	This species has not been recorded within the Development Footprint. However we acknowledge there are two records of this species approximately 2 km to the north of the Development Footprint. The Development Footprint has minimal foraging habitat for this species. Based on the disturbed nature of the vegetation within the Development Footprint, including lack of canopy and mid-storey vegetation, it is highly unlikely that this species would be impacted by the Project.
grey-crowned babbler (eastern subspecies) <i>Pomatostomus temporalis temporalis</i>	V	-	Absent	This species has not been recorded within the Development Footprint and no suitable habitat (foraging or breeding) occurs. There are a number of known records of this species around the Development Footprint, the closest being 1 km to the north. Despite the number of records in proximity to the Development Footprint, it is highly unlikely that this species would be impacted by the Project.
grey-headed flying fox (foraging) <i>Pteropus poliocephalus</i>	V	V	Absent	This species has not been recorded within the Development Footprint and no suitable habitat (foraging) occurs. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
yellow-bellied sheath-tail-bat <i>Saccolaimus flaviventris</i>	V	-	Absent	This species has not been recorded within the Development Footprint and no suitable habitat (foraging or breeding) occurs. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
diamond firetail <i>Stagonopleura guttata</i>	V	-	Present	This species has not been recorded within the Development Footprint but there is some foraging habitat. There is also a known record of this species approximately 4 kms north east of the Development Footprint. However, it is highly unlikely that this species would be impacted by the Project.

Species	BC Act	EPBC Act	Suitable Habitat Present/Absent	Justification
masked owl (foraging) <i>Tyto novaehollandiae</i>	V	-	Absent	This species has not been recorded within the Development Footprint and no suitable habitat (foraging) occurs. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.

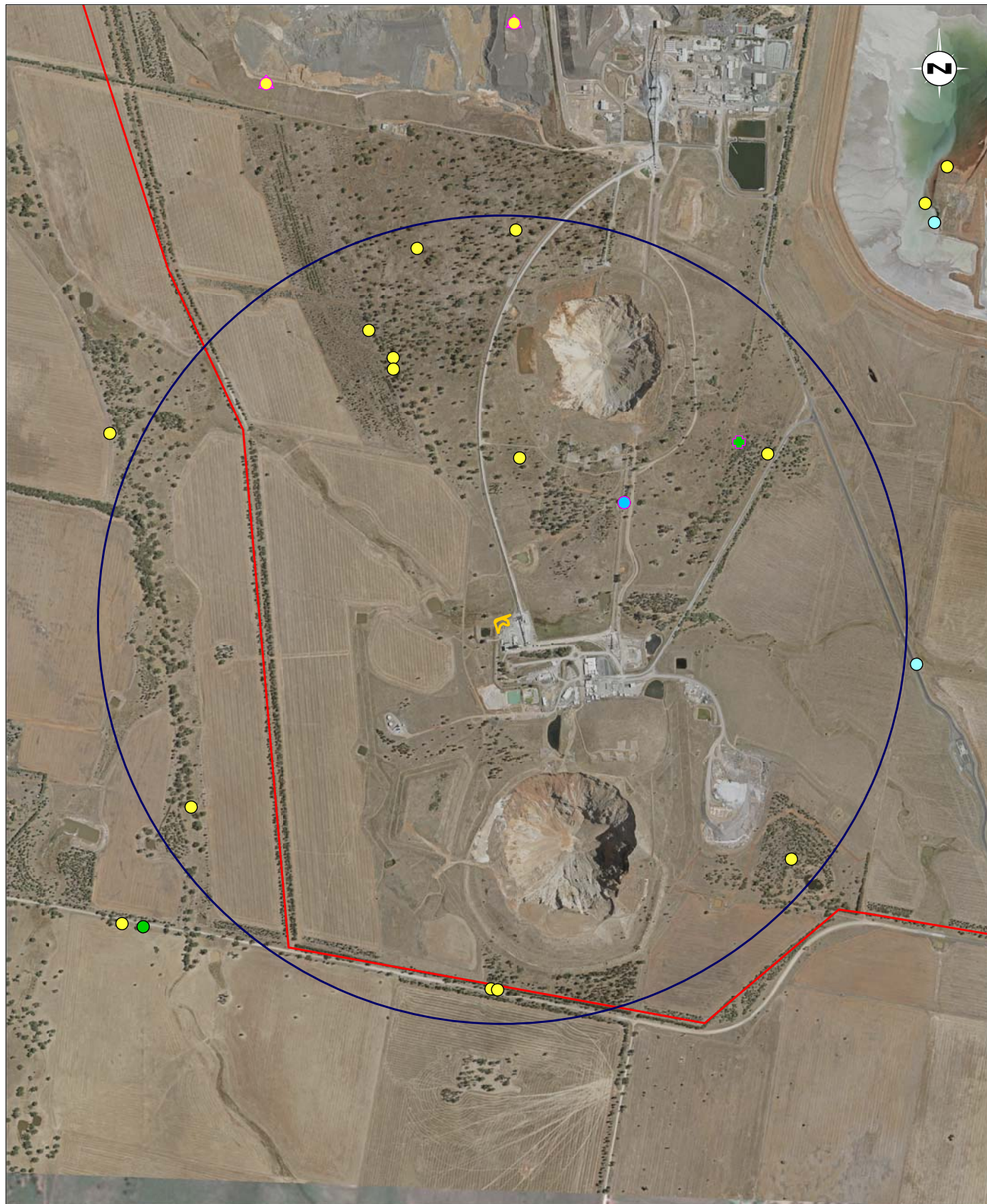


Image Source: Google Earth (Dec 2016, Dec 2014), Northparkes (Jan 2017)
Data Source: NPM (2017)

0 0.25 0.5 1.0 km
1:20 000

Legend

- Development Footprint
- Development Site
- 1500 metre Buffer
- Atlas (Species Credit):
- *Diuris tricolor*
- *Swainsona sericea*

- Umwelt (Species Credit):
- Sloane's Froglet
- Atlas (Ecosystem Credit):
- Grey-crowned Babbler
- Umwelt (Ecosystem Credit):
- Spotted Harrier
- Grey-crowned Babbler

- Atlas (Species/Ecosystem Credit):
- ▲ Superb Parrot

FIGURE 3.2

Threatened Species

3.3.2 Species-credit Species Predicted to Occur

Table 3.4 below outlines the species-credit species predicted to occur by the BAM Calculator and/or the literature review and whether they are considered likely to occur in the Development Footprint.

Table 3.4 Predicted Species-credit Species

Species	BC Act	EPBC Act	Presence/ Absence	Justification
a spear-grass <i>Austrostipa wakoolica</i>	E	E	Absent	Development Footprint is outside of the geographic limitations for this species. This species has not been recorded within the Development Footprint. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
mossgiel daisy <i>Brachyscome papillosa</i>	V	E	Absent	Development Footprint is outside of the geographic limitations for this species. This species has not been recorded within the Development Footprint. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
bush stone-curlew <i>Burhinus grallarius</i>	E	-	Absent	Development Footprint does not have the necessary habitat constraints, comprising fallen/standing dead timber including logs according to the Threatened Biodiversity Data Collection. This species has not been recorded within the Development Footprint. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
sand-hill spider orchid <i>Caladenia arenaria</i>	E	E	Absent	Development Footprint is outside of the geographic limitations for this species. This species has not been recorded within the Development Footprint. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.

Species	BC Act	EPBC Act	Presence/Absence	Justification
glossy black-cockatoo (breeding) <i>Calyptorhynchus lathami</i>	V	-	Absent	No suitable habitat (breeding) within the Development Footprint for this species. This species has not been recorded within the Development Footprint. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
glossy black-cockatoo endangered population, Riverina population <i>Calyptorhynchus lathami</i>	EP	-	Absent	Development Footprint is outside of the geographic limitations for this population. This population has not been recorded within the Development Footprint. Furthermore, the population has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
Sloane's froglet <i>Crinia sloanei</i>	V	-	Absent	Development Footprint does not have the necessary habitat constraints, comprising semi-permanent/ephemeral wet areas, swamps or waterbodies according to the Threatened Biodiversity Data Collection. This species has not been recorded within the Development Footprint. However, this species has been recorded more than a kilometre to the south west of the Development Footprint. It is highly unlikely that this species would be impacted by the Project.
pine donkey orchid <i>Diuris tricolor</i>	V	-	Absent	A population of this species occurs approximately 1 km north east of the Development Footprint and another two approximately 5 km to the north. The Development Footprint however is unlikely to provide suitable habitat for this species given the disturbed nature of the site. It is highly unlikely that this species would be impacted by the Project.

Species	BC Act	EPBC Act	Presence/ Absence	Justification
Spike-rush <i>Eleocharis obicis</i>	V	V	Absent	Development Footprint does not have the necessary habitat constraints, comprising semi-permanent/ephemeral wet areas according to the Threatened Biodiversity Data Collection. This species has not been recorded within the Development Footprint. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
white-bellied sea-eagle (breeding) <i>Haliaeetus leucogaster</i>	V	-	Absent	Development Footprint does not have suitable habitat (breeding) for this species. This species has not been recorded within the Development Footprint. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
little eagle (breeding) <i>Hieraaetus morphnoides</i>	V	-	Absent	Development Footprint does not have suitable habitat (breeding) for this species. This species has not been recorded within the Development Footprint. Furthermore, the nearest known record of this species is approximately 4 km north east of the Development Footprint. It is highly unlikely that this species would be impacted by the Project.
swift parrot (breeding) <i>Lathamus discolor</i>	E	CE	Absent	Development Footprint does not have suitable habitat (breeding) for this species. This species has not been recorded within the Development Footprint. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.

Species	BC Act	EPBC Act	Presence/ Absence	Justification
spiny peppercress <i>Lepidium aschersonii</i>	V	V	Absent	Development Footprint does not have the necessary habitat constraints, comprising ridges of gilgai clays according to the Threatened Biodiversity Data Collection. This species has not been recorded within the Development Footprint. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
Major Mitchell's cockatoo (breeding) <i>Lophochroa leadbeateri</i>	V	-	Absent	Development Footprint does not have suitable habitat (breeding) for this species. This species has not been recorded within the Development Footprint. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
square-tailed kite (breeding) <i>Lophoictinia isura</i>	V	-	Absent	Development Footprint does not have suitable habitat (breeding) for this species. This species has not been recorded within the Development Footprint. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
barking owl (breeding) <i>Ninox connivens</i>	V	-	Absent	Development Footprint does not have suitable habitat (breeding) for this species. This species has not been recorded within the Development Footprint. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.

Species	BC Act	EPBC Act	Presence/ Absence	Justification
squirrel glider <i>Petaurus norfolcensis</i>	V	-	Absent	Development Footprint does not have suitable habitat for this species, comprising woodland and forest vegetation. This species has not been recorded within the Development Footprint. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
koala (breeding) <i>Phascolarctos cinereus</i>	V	V	Absent	Development Footprint does not have suitable habitat (breeding) for this species. This species has not been recorded within the Development Footprint. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
superb parrot (breeding) <i>Polytelis swainsonii</i>	V	V	Absent	Development Footprint does not have suitable habitat (breeding) for this species. This species has not been recorded within the Development Footprint. Two records of this species occur approximately 2 km to the north of the Development Footprint. Based on the disturbed nature of the vegetation within the Development Footprint, including lack of canopy and mid-storey vegetation, it is highly unlikely that this species would be impacted by the Project.
grey-headed flying fox (breeding) <i>Pteropus poliocephalus</i>	V	V	Absent	Development Footprint does not have suitable habitat (breeding) for this species. This species has not been recorded within the Development Footprint. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.

Species	BC Act	EPBC Act	Presence/ Absence	Justification
slender darling-pea <i>Swainsona murrayana</i>	V	V	Absent	Development Footprint does not have the necessary habitat constraints. This species has not been recorded within the Development Footprint. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
small purple-pea <i>Swainsona recta</i>	E	E	Absent	The Development Footprint is unlikely to provide suitable habitat for this species given the disturbed nature of the site. This species has not been recorded within the Development Footprint. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
silky swainson-pea <i>Swainsona sericea</i>	V	-	Absent	No suitable habitat (within the Development Footprint) for this species due to the disturbed nature of the site. A record of this species occurs within 1 km north east of the Development Footprint. It is highly unlikely that this species would be impacted by the Project.
masked owl (breeding) <i>Tyto novaehollandiae</i>	V	-	Absent	Development Footprint does not have suitable habitat (breeding) for this species. This species has not been recorded within the Development Footprint. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.

3.3.2.1 Biodiversity Risk Weighting

No species-credit species have been determined likely to occur within the Development Footprint and therefore no biodiversity risk weighting scores are relevant to the final credit calculations.

3.3.2.2 Species Habitat Polygons

As no species-credit species have been determined likely to occur within the Development Footprint no species habitat polygons have been mapped.

4.0 Avoidance and Minimisation of Impacts

4.1 Avoidance and Minimisation

4.1.1 Avoidance of Native Vegetation and Habitat

Northparkes have sought to avoid and minimise the potential impacts on the ecological values of the Project primarily through the careful selection of the location of the disturbance area. All components of the Project have been carefully located in areas of very low biodiversity value and no native PCTs are proposed to be impacted as a result of the Project. The Development Footprint occurs on the edge of an existing artificial bund adjacent to the Northparkes surface crusher. No prescribed impacts under the BC Regulation are associated with the Project.

It is acknowledged that while the Development Footprint is located in primarily disturbed landscapes, due consideration is required for the surrounding lands and key biodiversity features to ensure that direct and indirect impacts are avoided and minimised, where possible. The Development Footprint directly adjoins an area of derived native grasslands derived from PCT76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions. This patch of vegetation is less disturbed than the Development Footprint and conforms with *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions* EEC under the BC Act and *Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia* EEC under the EPBC Act. Northparkes have avoided this vegetation through careful planning and design of the Project and Development Footprint (Refer to **Figure 4.1**).

Specific avoidance measures included the targeted avoidance of adjoining native vegetation communities through locating all impacts in already disturbed and exotic-dominated land. The Project has sought to avoid all areas containing any biodiversity values and target impacts on where the land is in poorest condition.

However, the Project has been unable to locate all impacts within areas where the vegetation and habitat condition is of such poor quality that biodiversity credits are not required to be offset and habitat features are low. Therefore, the impacts associated with the Project will require offsetting which is discussed further in **Section 6**.

4.1.2 Minimisation Measures

Northparkes undertakes a variety of minimisation measures to mitigate the unavoidable impacts associated with its operation. The following specific existing control measures outlined in the Northparkes Rehabilitation Management Plan and Flora and Fauna Management Plan are considered to be integral to the minimisation of impacts on the biodiversity features of the Development Footprint and its surrounds:

- feral animal and noxious weed control consistent with existing practices at the Northparkes Mine.

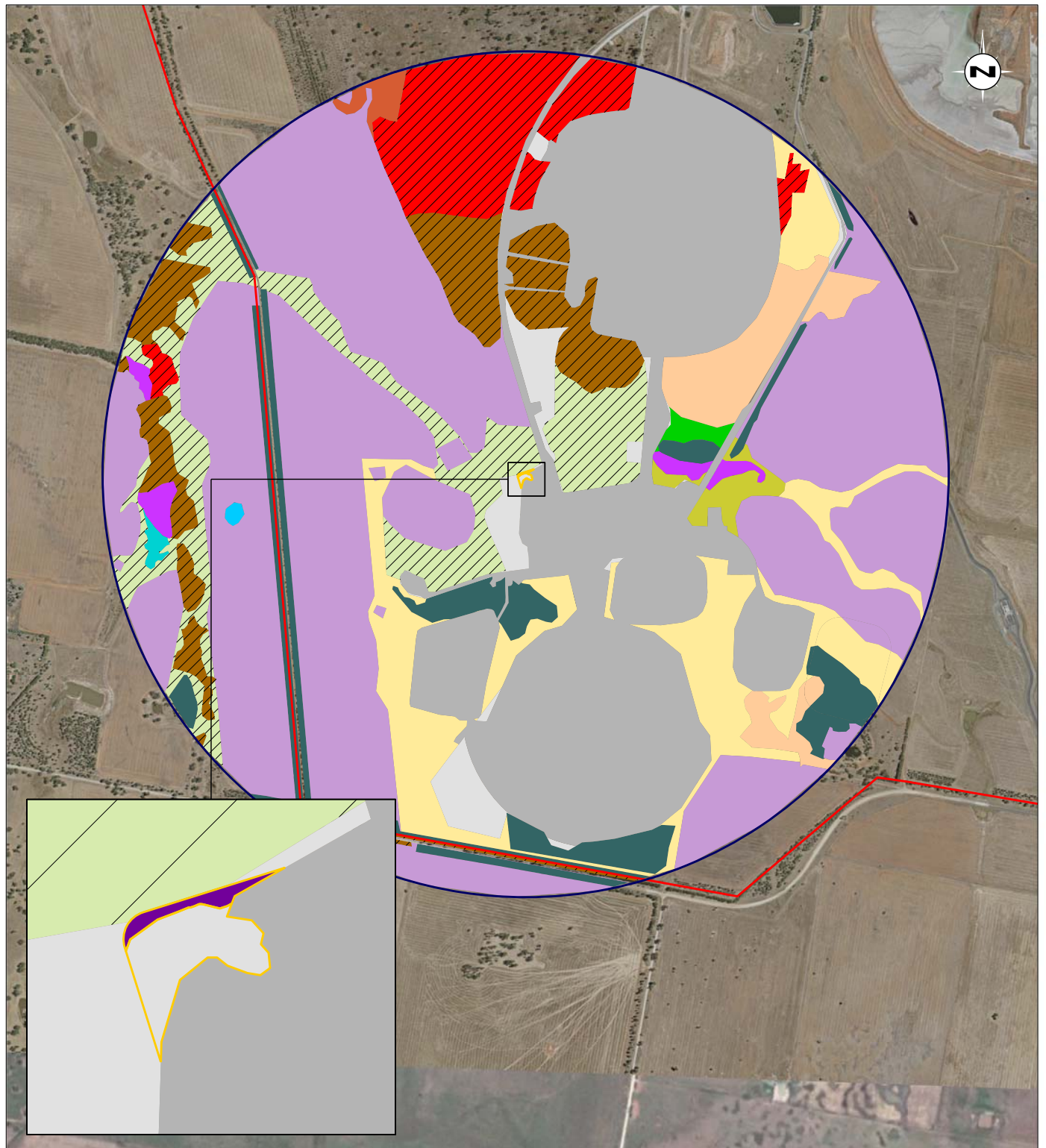


Image Source: Google Earth (Dec 2016, Dec 2014), Northparkes (Jan 2017)
Data Source: NPM (2017)

0 0.25 0.5 1.0 km
1:20 000

Legend

- Development Footprint
- Development Site
- 1500 Metre Buffer
- Zone 1 - PCT76 - Western Grey Box Tall Grassy Woodland on Alluvial Loam and Clay Soils in the NSW South Western Slopes and Riverina Bioregions - Disturbed Land
- Bimble Box-White Cypress Pine Woodland
- Bimble Box-White Cypress Pine Woodland-Exotic Understorey
- Disturbed Land
- Exotic Grassland
- Grey Box Grassy Woodland (EEC - TSC Act/EEC - EPBC Act)
- Grey Box Grassy Woodland-DNG (EEC - TSC Act/EEC - EPBC Act)
- Grey Box Grassy Woodland-Exotic Understorey
- River Red Gum Woodland

- River Red Gum Woodland-Regrowth
- River Red Gum Woodland-DNG
- Plantation
- White Box-Yellow Box-Blakely's Red Gum Woodland (EEC - TSC Act/CEEC - EPBC Act)
- White Cypress Pine Woodland-Exotic Understorey
- Yarran Woodland-Regrowth
- Yellow Box Woodland-Exotic Understorey
- Cultivated Agricultural Land

FIGURE 4.1

Areas of Avoidance

5.0 Assessment of Impacts

5.1 Impacts on Native Vegetation and Habitat

5.1.1 Direct Impacts

The Project will result in direct impacts on very minor biodiversity values within the Development Footprint. Direct impacts include the loss of vegetation and marginal fauna habitats as a result of clearance works and subsequent facility operations. The current condition of the vegetation and habitat in the Development Footprint is entirely disturbed vegetation occurring on fill, adjoined by an existing processing plant to the south and derived native grasslands to the north.

No species-credit species habitat has been identified within the Development Footprint. The site contains very few habitat features, with no canopy or mid-storey, hollow-bearing trees, or fallen logs, minimal vegetation cover and moderate exotic vegetation cover. No potentially-occurring species-credit species habitat will be directly impacted by the Project.

Table 5.1 below outlines the direct impacts on native vegetation, which totals approximately 0.024 ha. The final Project footprint is shown in **Figure 5.1**.

Table 5.1 Direct Impacts of the Proposed Modification on Biodiversity Features

Species	Area within the Development Footprint (ha)
Plant Community Type	
Zone 1 PCT76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Disturbed Land	0.024
Species-credit Species Habitats	
None identified	N/A



Image Source: Northparkes (Jan 2017)
Data Source: NPM (2017)

0 10 25 50m
1:1000

Legend

- Development Footprint
- Zone 1 - PCT76 - Western Grey Box Tall Grassy Woodland on Alluvial loam and Clay Soils in the NSW South Western Slopes and Riverina Bioregions - Disturbed Land
- Non-native Vegetation

FIGURE 5.1

Final Project Footprint

5.1.2 Indirect Impacts

The Project is not expected to result in any substantial indirect impacts on the biodiversity values of surrounding lands. Minor indirect impacts associated with noise, dust, weeds and feral animals may occur during the construction and operation of the Project. These are discussed below.

No indirect impact zones have been identified for this Project.

5.1.2.1 Noise Impacts

Noise impacts have the potential to adversely impact native species. Potential impacts include:

- noise disturbing the roosting and foraging behaviour of fauna species; and
- noise reducing the occupancy of areas of suitable habitat.

Details of the noise controls that are currently being implemented as part of the Project are outlined in the Environmental Assessment (EA) for the Northparkes Mines Step Change Project (Umwelt 2013b).

In regard to potential impacts on biodiversity, there will be no substantial change to noise impacts given that the proposed modification is adjacent to existing operations with existing impacts. Any additional impacts resulting from noise emissions are not expected to be significant in relation to threatened species, populations and communities.

5.1.2.2 Dust Impacts

Dust impacts have the potential to adversely impact native species during ground disturbing works and operation of processing infrastructure. Potential impacts include dust covering vegetation thereby potentially reducing vegetation health and growth. The design of the Project will include inherent measures to minimise the potential for adverse dust impacts. These include a range of dust control measures as discussed in the EA for the Northparkes Mines Step Change Project (Umwelt 2013b).

In regard to potential impacts on biodiversity, there will be no substantial change to dust impacts given that the Project is part of and is adjacent to an already existing operation with existing impacts. Any additional impacts resulting from dust are not expected to be significant in relation to threatened species, populations and communities.

5.1.2.3 Weed and Feral Animal Encroachment

Weed species could be inadvertently brought into the Development Footprint with imported materials, or could invade naturally through removal of native vegetation. The presence of weed species within the Development Footprint has the potential to decrease the value of extant vegetation to native species. Mitigation measures outlined in **Section 4.0** will be implemented to minimise the potential for weed encroachment into areas surrounding the Development Footprint.

Populations of feral fauna species such as foxes, rabbits and cats can increase and quickly populate new areas as a result of disturbance. Clearing, thinning of vegetation and the creation of tracks have the ability to assist the establishment and spread of feral fauna species. Mitigation measures outlined in **Section 4.0** will minimise the potential for feral animal spread and impacts into surrounding areas around the Development Footprint.

There will be no substantial change to impacts from weeds or feral animals, given that the proposed modification is part of, and adjacent to, an existing operation with existing impacts. Any additional impacts resulting from weeds or feral animals are not expected to be significant in relation to threatened species, populations and communities.

5.2 Prescribed Impacts

Biodiversity values not considered through the application of the BAM calculator are listed, none of which are expected to be impacted by the Project:

- impacts on the habitat of threatened species or ecological communities associated with karst, caves, crevices, cliffs and other geological features of significance, rocks, human-made structures or non-native vegetation;
- impacts on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range;
- impacts on movement of threatened species that maintains their life cycle;
- impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities;
- impacts of wind turbine strikes on protected animals; and
- impacts of vehicle strikes on threatened species or on animals that are part of a TEC.

5.2.1 Uncertain Prescribed Impacts

Uncertain impacts are those that are unable to be reliably predicted during the assessment process or are infrequent in nature. These usually refer to impacts associated with caves, cliffs, mine subsidence and wind turbine strikes and increased vehicle strikes. Indirect impacts associated with the interruption of ecosystem processes are also complex and difficult to quantify.

The Project is unlikely to result in any uncertain prescribed impacts.

5.3 Serious and Irreversible Impacts

No species or ecological communities listed as serious and irreversible impact (SAIL) entities are likely to occur within the Development Footprint and no further assessment of SAIL is required.

6.0 Biodiversity Credit Impact Summary

6.1 Impacts Not Requiring Assessment

Impacts not requiring further assessment under the BAM include areas of land without native vegetation. As noted in **Section 3.2**, an area comprising Non-native Vegetation was identified within the Development Footprint (refer to **Figure 3.1**). This area solely comprised of introduced flora species and bare earth associated with the existing processing plant. The area of Non-native Vegetation was approximately 1150m². This area does not require further assessment under the BAM.

The remaining approximately 241m² of the Development Footprint requires assessment given that it contains native vegetation.

6.2 Impacts Not Requiring Offset

Impacts on native vegetation not requiring offsets under the BAM include native vegetation that has a vegetation integrity score of less than 20 (where it is not associated with ecosystem-credit species habitat or a TEC), less than 17 (where it is associated with ecosystem-credit habitat or a VEC) or less than 15 (where it is representative of a EEC or CEEC).

The vegetation zone identified within the Development Footprint have vegetation integrity scores higher than the minimum thresholds and requiring offsetting, as detailed in **Section 6.3** below.

No species-credit habitat was recorded or is likely to occur within the Development Footprint and therefore, none of the habitats on the site require offsetting in relation to species-credits.

6.3 Impacts Requiring Offset

Although vegetation within the Development Footprint is highly disturbed and degraded, the vegetation integrity score indicates that the vegetation and habitats are required to be offset in accordance with Section 10.3 of the BAM (OEH 2017).

No species-credit habitat was recorded or is likely to occur within the Development Footprint and therefore, none of the habitats on the site require offsetting in relation to species-credits.

Table 6.1 summarises this outcome.

Table 6.1 Impacts Requiring Offset

Veg Zone	PCT/Species-credit	Vegetation Integrity Score			Credits Required
		Current	Future	Change	
1	PCT76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Disturbed Land	25	0	-25	1
-	Species-credit Species Habitat	-	-	-	0

Table 6.2 identifies the cost associated with offsetting the 1 required credit of PCT76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Disturbed Land through payment to the Biodiversity Conservation Fund.

Table 6.2 Offsetting Price Within the Biodiversity Conservation Fund

PCT/Species-credit	Number of Ecosystem Credits	Final Credit Price
PCT76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Disturbed Land	1	\$1,690.36
Total		\$1,690.36

7.0 Biodiversity Credit Report

A full Biodiversity Credit Report is included in **Appendix E**. A summary of the key outcomes is provided in **Table 7.1**.

Table 7.1 Credits Required to Offset the Project

PCT/Species-credit	Credits Required
Ecosystem Credits	
PCT76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Disturbed Land	1
Total	1

8.0 References

Benson, J.S., Richards, P.G., Waller, S and Allen, C.B. (2010). *New South Wales Vegetation Classification and Assessment: Part 3 Plant Communities of the NSW Brigalow Belt south, Nandewar and West New England Bioregions and Update of NSW Western Plains and South-western Slopes Plant Communities*, Version 3 of the NSWVCA Database.

Botanic Gardens Trust, (2018) *PlantNET* – The Plant Information Network System of Botanic Gardens Trust, Sydney, Australia (version 2.0). <<http://plantnet.rbgsyd.nsw.gov.au>> accessed March 2018.

Cronquist, A, (1981) *An Integrated System of Classification of Flowering Plants*. Columbia University Press, New York. Department of the Environment (2013) *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance*.

Department of Environment and Conservation (DEC) (2004) *Threatened Species Survey and Assessment: Guidelines for development and activities (working draft)*, November 2004.

Department of the Environment and Energy (DoEE) (2018) Protected Matters Search Tool
<http://www.environment.gov.au/webgis-framework/apps/pmst/pmst.jsf>

Department of the Environment and Energy (DoEE) (2010). *Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-east Australia Approved Listing Advice*. Canberra, ACT.

Harden, G, J, editor, (1992) *Flora of New South Wales. Volume 3*. Royal Botanic Gardens Sydney & New South Wales University Press, Sydney.

Harden, G, J, editor, (1993) *Flora of New South Wales. Volume 4*. Royal Botanic Gardens Sydney & New South Wales University Press, Sydney.

Harden, G, J, editor, (2000) *Flora of New South Wales. Volume 1*. 2nd edition. New South Wales University Press and Royal Botanic Gardens, Sydney.

Harden, G, J, editor, (2002) *Flora of New South Wales. Volume 2*. Revised edition. Royal Botanic Gardens Sydney & New South Wales University Press, Sydney.

NSW Scientific Committee (2007) *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penneplain, Nandewar and Brigalow Belt South Bioregions – Endangered Ecological Community Listing*. Electronic resource accessed March 2018:
<http://www.environment.nsw.gov.au/determinations/EucalyptusMicrocarpaEndCom.htm>

Office of Environment and Heritage (OEH) (2015) *Central West and Lacklan Regional Native Vegetation Mapping*.

Office of Environment and Heritage (OEH) (2016) *NSW Guide to Surveying Threatened Plants*, February 2016

Office of Environment and Heritage (OEH) (2017) *Biodiversity Assessment Method*, August 2017.

Office of Environment and Heritage (OEH) (2018a) *BioNet Atlas of NSW Wildlife*, accessed March 2018.

Office of Environment and Heritage (OEH) (2018b) *Threatened Biodiversity Data Collection (TBDC)*, accessed March 2018

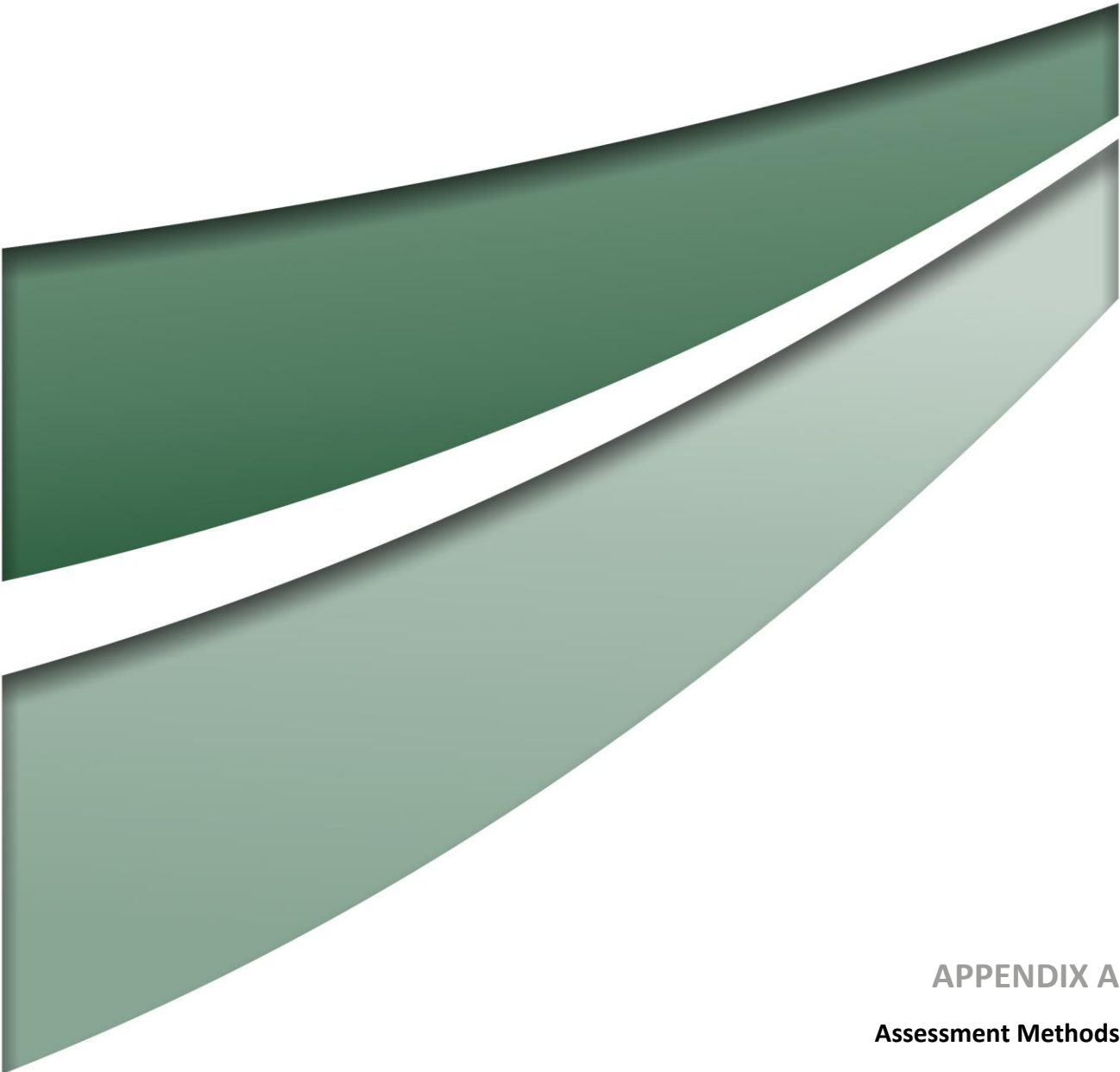
Office of Environment and Heritage (OEH) (2018c) Vegetation Information System (VIS) accessed January 2018.

Strahler, A. N., (1952) Hypsometric (area-altitude) analysis of erosional topography, *Geological Society of America Bulletin* 63 (11): 1117-1142.

Umwelt (Australia) Pty Limited (2013a). *Flora and Fauna Assessment – Northparkes Mines Step Change Project*.

Umwelt (Australia) Pty Limited (2013b). *Environmental Assessment – Northparkes Mines Step Change Project*.

Wheeler D, J, B, Jacobs S, W, L, and Whalley R, D, B, (2002) *Grasses of New South Wales*, 3rd Edition. The University of New England, Armidale.



APPENDIX A
Assessment Methods

Landscape Features

Identifying Landscape Features

Landscape features within the Development Footprint and the 1500 metre (m) buffer area were determined through reviewing relevant mapping products, aerial photography and GIS layers. Landscape features that were reviewed included:

- IBRA bioregions, IBRA subregions and NSW Mitchell Landscape regions
- Native vegetation extent in the buffer area
- Cleared areas
- Rivers, streams and estuaries (using the Strahler (1952) ordering system)
- Wetlands
- Connectivity features and fauna movement
- Areas of geological significance (including karst, caves, crevices and cliffs) and soil hazard features

Determining Site Context

Determining the 'Site Context' of the Development Footprint is calculated by assessing the native vegetation cover and patch size as outlined below.

Native Vegetation Cover

'Native Vegetation Cover' is determined by the percent native vegetation cover in the 1500 m buffer area for woody and non-woody vegetation relative to the approximate benchmarks for the PCT. The presence of native over-storey vegetation is used to determine the percent cover in woody vegetation types (e.g. grassy woodland formation), and native ground cover is used to assess cover in non-woody vegetation types (e.g. grassland formation). Native vegetation cover is assigned to a class, being 0–10%, >10–30%, >30–70% and >70% for the development and is used to assess the habitat suitability of the subject land for threatened species.

All areas of native vegetation cover on the Development Footprint and within the 1500 m buffer area surrounding the Development Footprint was mapped onto digital aerial photography using the best available imagery of the area available to Umwelt, which in this case was dated December 2016.

Patch Size

A 'Patch' is an area of native vegetation that:

- occurs on the Development Site, and
- includes native vegetation that has a gap of less than 100 m from the next area of moderate to good condition native vegetation (or ≤ 30 m for non-woody vegetation).

The patch size is determined for each vegetation zone and is assigned to a range class being <5 hectares (ha), 5–24 ha, 25–100 ha or ≥ 100 ha. The patch size is used to assess the habitat suitability of the subject land for threatened species.

Native Vegetation Assessment

Literature and Database Review

A review of previous documents and reports relevant to the Project was undertaken. This included regional and vegetation mapping reports, site-specific surveys, ecological surveys undertaken in the vicinity of the Development Footprint and also relevant ecological database searches. The information obtained was used to inform survey design, and was also used to assist in the assessment of potentially occurring threatened and migratory species, endangered populations (EPs) and TECs.

Relevant documents included:

- Flora and Fauna Assessment – Northparkes Mines Step Change Project, July 2013. (Umwelt 2013a)
- NSW Vegetation Classification and Assessment: Part 3 Plant Communities of the NSW Brigalow Belt South, Nandewar and West New England Bioregions and Update of NSW Western Plains and South-Western Slopes Plant Communities, Version 3 of the NSWVCA Database (Benson *et al.* 2010)
- Central West and Lachlan Regional Native Vegetation Mapping (OEH 2015)
- VIS Classification Database (OEH 2018c), accessed March 2018
- Threatened Biodiversity Data Collection (OEH 2018b) reporting for known/predicted threatened communities in the NSW South Western Slopes IBRA subregion
- DoEE Protected Matters Search Tool for known/predicted EPBC Act-listed TECs, accessed March 2018.

Digital Aerial Photograph Interpretation

Digital imagery (aerial photographs) of the Development Footprint was viewed prior to and after vegetation survey to identify spatial patterns in vegetation, land use and landscape features. These informed field survey design and implementation, ecological assessment and vegetation community mapping of the Development Footprint.

Vegetation communities in the Development Footprint were mapped on-screen overlaying the January 2017 high resolution aerial photographs provided by Northparkes. Mapping was undertaken using the Manifold System 8.0 Enterprise Edition GIS in a 32 bit mode. Use of GIS allowed zooming to a relatively large scale.

Floristic and Vegetation Integrity Survey

The Floristic and Vegetation Integrity Survey confirmed that the Development Footprint is highly modified and disturbed. It occurs on an artificial bund along the edge of an active mining/processing area. The bunding comprises secondary fill. Threatened species habitat across the site is very limited. Vegetation within the site is dominated by exotic species, with a small number of locally common native flora species occurring in the transitional boundary between the disturbed area and the adjoining derived native grasslands. It was confirmed that the Development Footprint, did not comprise a naturally-occurring plant community type (PCT).

As a result, one floristic plot and vegetation integrity survey was undertaken within the Development Footprint (refer to **Figure 2.1**) to determine whether the vegetation meets the minimum vegetation integrity threshold for the BAM. The exotic vegetation on the site was assigned to the PCT most likely to have occurred in the Development Footprint prior to the disturbance of the site.

Data Collected

A single floristic and vegetation integrity plot was completed, in which data was recorded according to Section 5 of the BAM (OEH 2017). This involved setting out a 20 x 50 m, a 20 x 20 m and five 1 x 1m plots. The location of the plot was recorded using a hand-held GPS with accuracy of ± 5 m. The Map Grid of Australia (MGA) coordinate system was used.

Roughly 45 - 60 minutes was spent searching for all vascular flora species present within the 20 x 20 m plot. Searches of the 20 x 20 m plot was generally undertaken through general meandering transects through the plot rather than the typical parallel transects due to the location of the Development Footprint on a steep and unstable artificial bund. There was no shrub, mid-storey, canopy or emergent layers identified within the plot therefore all survey effort was targeted towards the groundcover.

For each flora species recorded in the plot, the following data was collected in accordance with Table 2 of the BAM (OEH 2017):

- stratum/layer in which the species occurs
- growth form
- scientific name and common name
- cover and
- abundance.

To determine the vegetation zone of the plot, the following attributes were recorded in accordance with the BAM (OEH 2017):

- **Composition** - native plant species richness by growth form (within the 20 x 20 m plot)
- **Structure** – estimate foliage cover of native and exotic species by growth form (within the 20 x 20 m plot)
- **Function** (within the 20 x 50 m plot):
 - Number of large trees
 - Presence or otherwise of tree stem size classes
 - Presence or otherwise of canopy species regeneration
 - Length of fallen logs
 - Percentage cover for litter as recorded from five 1 x 1 m plots
 - Number of trees with hollows
 - High threat exotic cover

Meandering Transects

Meandering transects were walked across much of the Development Footprint. Opportunistic sampling of vegetation was undertaken along these transects, particularly searches for threatened and otherwise significant species, endangered populations and TECs. Meandering transects enable floristic sampling across a much larger area than plot-based survey, especially where the number of plots is limited. Records along transects supplemented floristic sampling carried out in plots, however, the data collected are in the form of presence records, rather than semi-quantitative cover abundance scores.

Plant Identification and Nomenclature Standards

All vascular plants recorded or collected within plots and on meandering transects were identified using keys and nomenclature in Harden (1992, 1993, 2000 and 2002). Where known, changes to nomenclature and classification have been incorporated into the results. Updated taxonomy has been derived from PlantNET (Botanic Gardens Trust 2018).

Common names used follow Harden (1992, 1993, 2000 and 2002) where available, and draw on other sources such as local names where these references do not provide a common name.

Vegetation Mapping

Vegetation mapping was undertaken using best-practice techniques to delineate vegetation communities across the Development Footprint. Vegetation mapping involved the following key steps:

- preliminary review of digital airborne imagery to explore vegetation distribution patterns as dictated by change in canopy texture, tone and colour, as well as topography
- predicting the distribution of particular vegetation communities based on understanding the distribution of PCTs (OEH 2018) and Plant Communities of the NSW Brigalow Belt south, Nandewar and West New England Bioregions and Update of NSW Western Plains and South-western Slopes (Benson *et al.* 2010).
- ground-truthing of the vegetation map based on survey effort
- revision of vegetation community floristic delineations based on plot data, and
- revision of the vegetation map based on ground-truthing.

Vegetation communities were delineated through the identification of repeating patterns of plant species assemblages in each of the identified strata.

Threatened Ecological Community Delineation Techniques

Where applicable, vegetation communities identified in the Development Footprint were compared to TECs listed under the Commonwealth EPBC Act and NSW BC Act and an assessment of similarity with the NSW Scientific Committee Final Determinations and the Commonwealth Threatened Species Scientific Committee Listing and Conservation Advice. The following approach was used:

- full-floristic plot assessment and meandering survey to determine floristic composition and structure of each ecological community
- comparison with published species lists, including lists of ‘important species’ as identified on the listing advice provided by the NSW Scientific Committee and/or Commonwealth Threatened Species Scientific Committee

- comparison with habitat descriptions and distributions for listed TECs
- assessment using guidelines and recovery plans published by the Commonwealth DoEE and the NSW OEH
- comparison with other assessments of TECs in the region.

Plant Community Type (PCT) Allocation

The vegetation community described within the Development Footprint was aligned with an equivalent PCT as detailed in the VIS Classification Database (OEH 2018c). For the vegetation community described in the Development Footprint, the dominant and characteristic species were entered into the online plant community identification tab and an initial list of PCTs was generated. The profiles for each of the possible PCTs were then interrogated and the most appropriate match assigned based on floristic, structure, soil, landform and distribution details.

Further detail regarding this allocation for individual PCT is outlined in **Section 3.2.1**.

Threatened Species

Literature and Database Review

A review of previous documents and reports relevant to the Project was undertaken. This included ecological reports, previous ecological surveys undertaken in the vicinity of the Development Footprint and also relevant ecological database searches. The information obtained was used to inform survey design where required, and was also used to assist in the assessment of potentially occurring ecosystem-credit and species-credit species. Relevant documents and resources included:

- OEH BioNet Atlas of NSW Wildlife database and mapping tool (OEH 2018a), accessed February 2018
- OEH Threatened Biodiversity Data Collection (OEH 2018b) for known/predicted threatened species in the Goonumbla Hills IBRA subregion, accessed March 2018
- PlantNET (Botanic Gardens Trust) database search for threatened plants within a 10 km radius search from the Development Site, accessed February 2018
- DoEE Protected Matters Search Tool (DoEE 2018) for known/predicted EPBC Act-listed species within a 10 km radius search from the Development Site, accessed March 2018.

Ecosystem-credit Species

Ecosystem-credit species are those threatened species that can be predicted by vegetation surrogates and landscape features. Ecosystem-credit species are not required to be specifically targeted during field surveys, however an assessment of the suitability of habitat in the Development Footprint is undertaken to determine the species presence or otherwise in the vegetation zones identified.

Table A1 below outlines the ecosystem credit species predicted by the BAM calculator or identified in the literature review. **Section 3.3.1** identifies those ecosystem credit species that have potential and do not have potential to occur.

Table A1 Predicted Ecosystem-credit Species

Species	BC Act	EPBC Act	Sensitivity to Gain
dusky woodswallow <i>Artamus cyanopterus cyanopterus</i>	V	-	Moderate
glossy black-cockatoo (foraging) <i>Calyptorhynchus lathami</i>	V	-	High
little pied bat <i>Chalinolobus picatus</i>	V	-	High
speckled warbler <i>Chthonicola sagittata</i>	V	-	High
brown treecreeper (eastern subspecies) <i>Climacteris picumnus victoriae</i>	V	-	High
varied sittella <i>Daphoenositta chrysoptera</i>	V	-	Moderate
grey falcon <i>Falco hypoleucos</i>	E	-	Moderate

Species	BC Act	EPBC Act	Sensitivity to Gain
painted honeyeater <i>Grantiella picta</i>	V	V	Moderate
white-bellied sea-eagle (foraging) <i>Haliaeetus leucogaster</i>	V	-	High
little eagle (foraging) <i>Hieraaetus morphnoides</i>	V	-	Moderate
swift parrot (foraging) <i>Lathamus discolor</i>	E	CE	Moderate
Major Mitchell's cockatoo (foraging) <i>Lophochroa leadbeateri</i>	V	-	Moderate
square-tailed kite (foraging) <i>Lophoictinia isura</i>	V	-	Moderate
hooded robin (south-eastern form) <i>Melanodryas cucullata cucullata</i>	V	-	Moderate
black-chinned honeyeater (eastern subspecies) <i>Melithreptus gularis gularis</i>	V	-	Moderate
turquoise parrot <i>Neophema pulchella</i>	V	-	High
barking owl (foraging) <i>Ninox connivens</i>	V	-	High
scarlet robin <i>Petroica boodang</i>	V	-	Moderate
flame robin <i>Petroica phoenicea</i>	V	-	Moderate
koala (foraging) <i>Phascolarctos cinereus</i>	V	V	High
superb parrot (foraging) <i>Polytelis swainsonii</i>	V	V	Moderate
grey-crowned babbler (eastern subspecies) <i>Pomatostomus temporalis temporalis</i>	V	-	Moderate
grey-headed flying fox (foraging) <i>Pteropus poliocephalus</i>	V	V	High
yellow-bellied sheath-tail-bat <i>Saccolaimus flaviventris</i>	V	-	High
diamond firetail <i>Stagonopleura guttata</i>	V	-	Moderate
masked owl (foraging) <i>Tyto novaehollandiae</i>	V	-	Moderate

Species-Credit Species

Species-credit species are those threatened species that cannot be confidently predicted by vegetation surrogates and landscape features and therefore requires specific habitat assessment and/or surveys to determine presence or absence.

Due to the highly disturbed nature and very small size of the Development Footprint, it was determined that opportunistic species-credit species observations would be suitable for assessing the applicability of species-credit species that could be impacted by the Project. These were undertaken over a single day on 8 February 2018.

Tracks are shown on **Figure 2.1**.

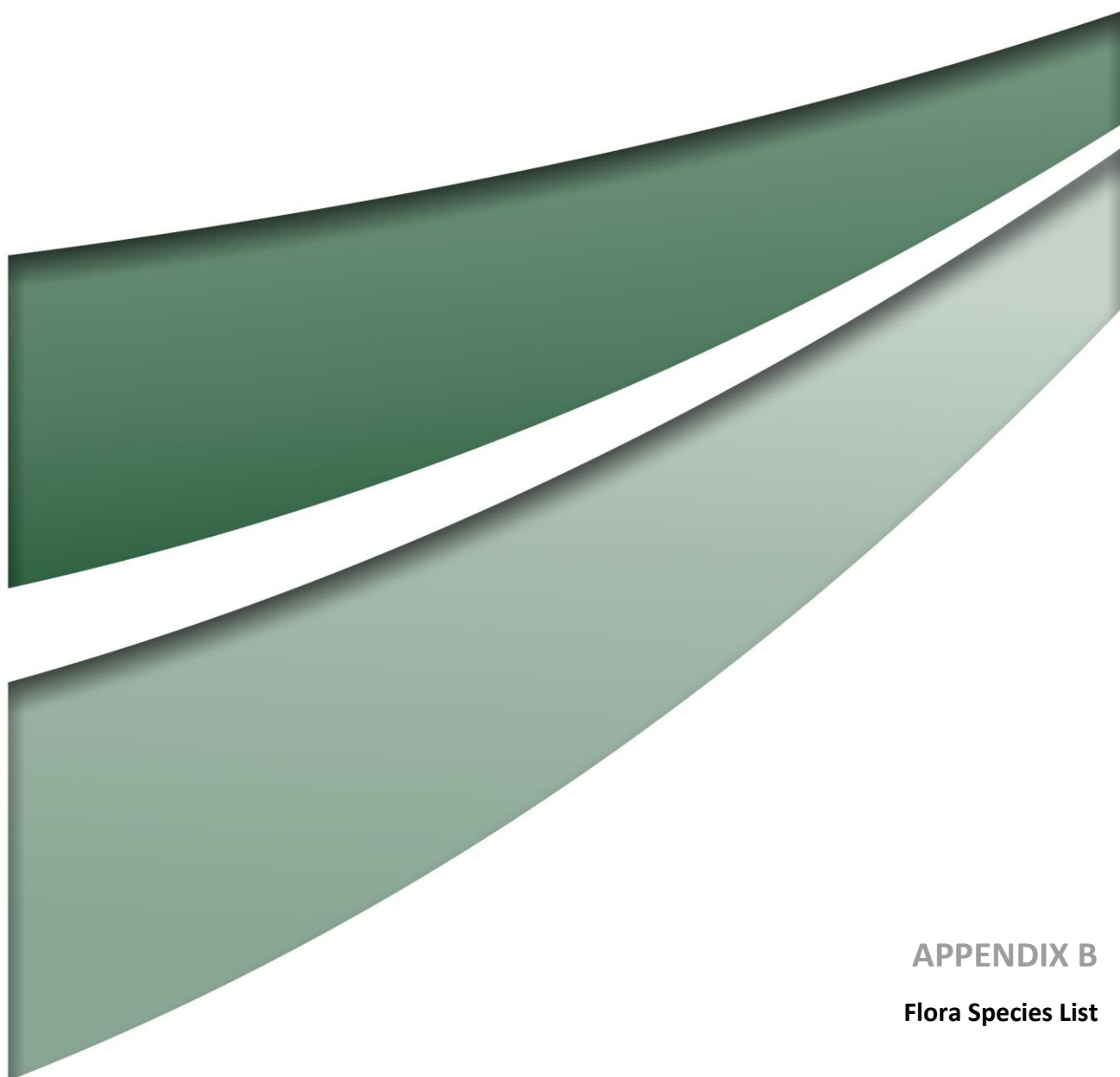
Table A2 identifies the candidate species-credit species predicted by the BAM calculator or identified in the literature review and that are determined to potentially occur in the Development Site.

Table A2 Candidate Species-credit Species

Species	BC Act	EPBC Act	Sensitivity to Gain	Habitat Constraint	Survey Method
a spear-grass <i>Austrostipa wakoolica</i>	E	E	Moderate	-	No survey required – outside of geographic limitations for the species.
mossgiel daisy <i>Brachyscome papillosa</i>	V	E	High	-	No survey required – outside of geographic limitations for the species.
bush stone-curlew <i>Burhinus grallarius</i>	E	-	High	Fallen/standing dead timber including logs	No survey required – absence of necessary habitat constraints.
sand-hill spider orchid <i>Caladenia arenaria</i>	E	E	High	-	No survey required – outside of the geographic limitations for the species.
glossy black-cockatoo (breeding) <i>Calyptorhynchus lathami</i>	V	-	High	-	No survey required – no suitable habitat (breeding) within the Development Footprint for this species.
glossy black-cockatoo endangered population, Riverina population <i>Calyptorhynchus lathami</i>	EP	-	High	-	No survey required – outside of the geographic limitations for this population.

Species	BC Act	EPBC Act	Sensitivity to Gain	Habitat Constraint	Survey Method
Sloane's froglet <i>Crinia sloanei</i>	V	-	Moderate	Semi-permanent/ ephemeral wet areas. Containing relatively shallow sections with submergent and emergent vegetation, or within 500 m of wet areas/swamps. Within 500 m of swamps/waterbodies. Within 500 m of waterbody.	No survey required – absence of necessary habitat constraints.
pine donkey orchid <i>Diuris tricolor</i>	V	-	Moderate	-	No survey required – no suitable habitat within the Development Footprint for this species due to its disturbed nature.
Spike-rush <i>Eleocharis obicis</i>	V	V	High	Semi-permanent/ ephemeral wet areas. Periodically waterlogged sites (including table drains and farm dams)	No survey required – absence of necessary habitat constraints.
white-bellied sea-eagle (breeding) <i>Haliaeetus leucogaster</i>	V	-	high	-	No survey required – no suitable habitat (breeding) within the Development Footprint for this species.
little eagle (breeding) <i>Hieraaetus morphnoides</i>	V	-	Moderate	-	No survey required – no suitable habitat (breeding) within the Development Footprint for this species.
swift parrot (breeding) <i>Lathamus discolor</i>	E	CE	Moderate	-	No survey required – no suitable habitat (breeding) within the Development Footprint for this species.
spiny peppercress <i>Lepidium aschersonii</i>	V	V	High	On ridges of gilgai clays.	No survey required – absence of necessary habitat constraints.
Major Mitchell's cockatoo (breeding) <i>Lophochroa leadbeateri</i>	V	-	High	-	No survey required – no suitable habitat (breeding) within the Development Footprint for this species.
square-tailed kite (breeding) <i>Lophoictinia isura</i>	V	-	Moderate	-	No survey required – no suitable habitat (breeding) within the Development Footprint for this species.

Species	BC Act	EPBC Act	Sensitivity to Gain	Habitat Constraint	Survey Method
barking owl (breeding) <i>Ninox connivens</i>	V	-	High	-	No survey required – no suitable habitat (breeding) within the Development Footprint for this species.
squirrel glider <i>Petaurus norfolcensis</i>	V	-	High	-	No survey required – no suitable habitat (foraging or breeding) within the Development Footprint for this species.
koala (breeding) <i>Phascolarctos cinereus</i>	V	V	High	-	No survey required – no suitable habitat (breeding) within the Development Footprint for this species.
superb parrot (breeding) <i>Polytelis swainsonii</i>	V	V	High	-	No survey required – no suitable habitat (breeding) within the Development Footprint for this species.
grey-headed flying fox (breeding) <i>Pteropus poliocephalus</i>	V	V	High	-	No survey required – no suitable habitat (breeding) within the Development Footprint for this species.
slender darling-pea <i>Swainsona murrayana</i>	V	V	Moderate	-	Floristic plot and general meandering transects within the Development Footprint within a month specified for the species.
small purple-pea <i>Swainsona recta</i>	E	E	N/A	-	No survey required – no suitable habitat within the Development Footprint for this species due to the disturbed nature of the site.
silky swainson-pea <i>Swainsona sericea</i>	V	-	High	-	Floristic plot and general meandering transects within the Development Footprint within a month specified for the species.
masked owl (breeding) <i>Tyto novaehollandiae</i>	V	-	High	-	No survey required – no suitable habitat (breeding) within the Development Footprint for this species.



APPENDIX B

Flora Species List

Flora Species List

The following list was developed from the floristic plot/transect surveys of the Development Footprint. It includes all species of vascular plants observed during these surveys. It is acknowledged that the list is not comprehensive, as not all species are readily detected at any one time of the year. Many species flower only during restricted periods of the year, and some flower only once in several years. In the absence of flowering material, many of these species cannot be identified, or even detected.

Names of classes and families follow a modified Cronquist (1981) System.

Any species that could not be identified to the lowest taxonomic level are denoted in the following manner:

sp. specimens that are identified to genus level only.

The following abbreviations or symbols are used in the list:

AR denotes abundance rating according to BAM

C cover measure according to BAM

asterisk (*) denotes species non-native species

double asterisk (**) denotes High Threat Weed species under the BAM

subsp. subspecies and

var. variety.

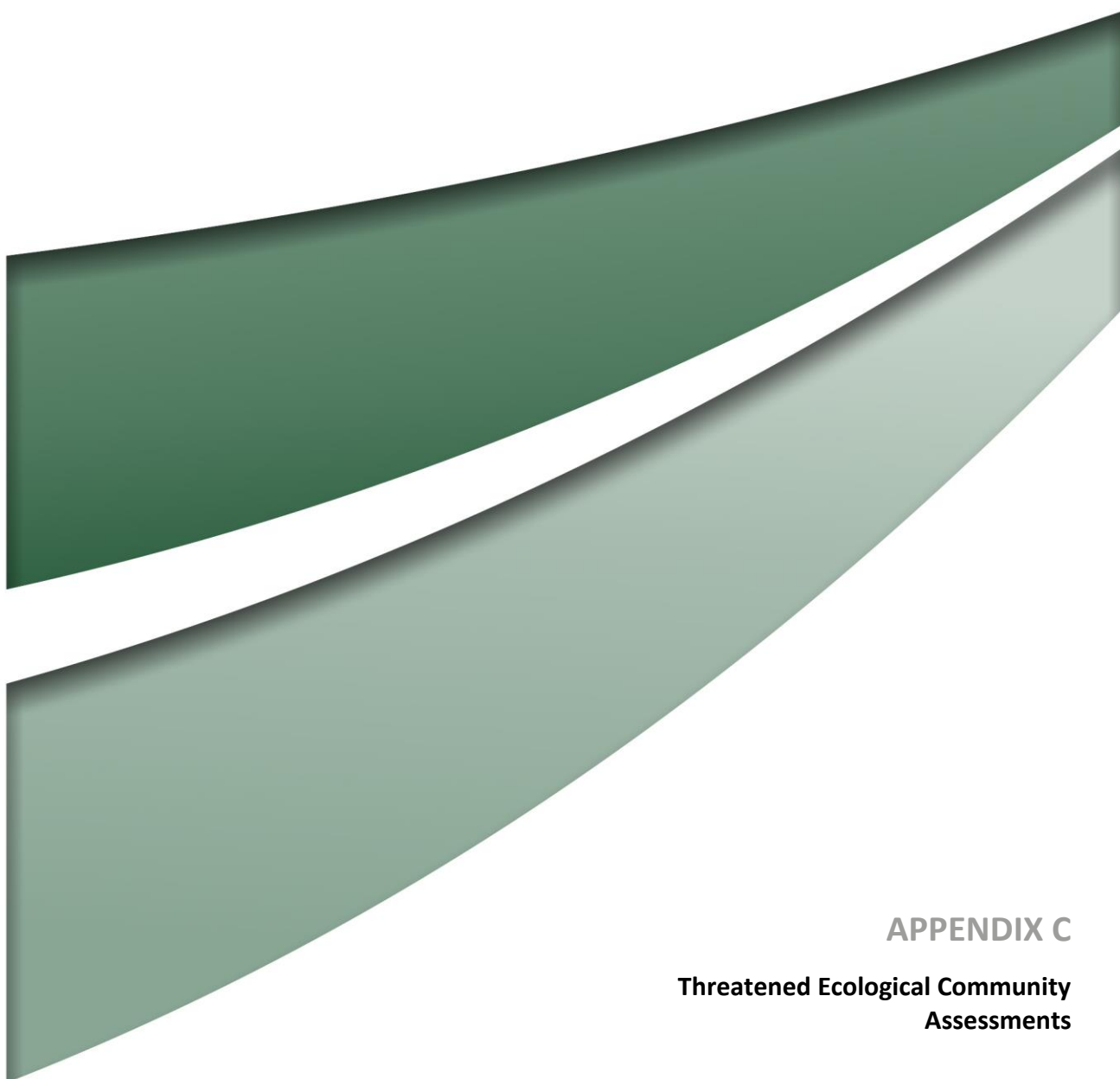
All vascular plants recorded or collected were identified using keys and nomenclature in Harden (1992, 1993, 2000 and 2002) and Wheeler *et al.* (2002). Where known, changes to nomenclature and classification have been incorporated into the results, as derived from PlantNET (Botanic Gardens Trust 2018), the on-line plant name database maintained by the National Herbarium of New South Wales.

Common names used follow Harden (1992, 1993, 2000 and 2002) where available, and draw on other sources such as local names where these references do not provide a common name.

Table B1 Flora Species List

Family Name	Scientific Name	Common Name	P01	
			AR	C
Magnoliopsida – Liliidae (monocots)				
Cyperaceae	<i>Carex appressa</i>	tall sedge	50	10
Juncaceae	<i>Juncus</i> sp.	a rush	10	1
Poaceae	<i>Austrostipa bigeniculata</i>	yanganbil	6	0.8
Poaceae	* <i>Avena fatua</i>	wild oats	50	15
Poaceae	** <i>Chloris gayana</i>	rhodes grass	50	20
Poaceae	<i>Panicum effusum</i>	hairy panic	100	20
Poaceae	** <i>Paspalum dilatatum</i>	paspalum	100	15
Poaceae	<i>Rytidosperma caespitosum</i>	ringed wallaby grass	100	10
Poaceae	* <i>Setaria italica</i>	foxtail millet	50	25

Family Name	Scientific Name	Common Name	P01	
			AR	C
Magnoliopsida – Magnoliidae (dicots)				
Apiaceae	<i>*Daucus carota</i>	wild carrot	20	1
Asteraceae	<i>*Bidens pilosa</i>	cobbler's pegs	50	6
Asteraceae	<i>**Carthamus lanatus</i>	saffron thistle	10	7
Asteraceae	<i>*Cirsium vulgare</i>	spear thistle	10	3
Asteraceae	<i>*Conyza bonariensis</i>	flaxleaf fleabane	2	0.4
Asteraceae	<i>*Sonchus asper</i>	prickly sowthistle	20	3
Chenopodiaceae	<i>Einadia nutans</i> subsp. <i>nutans</i>	climbing saltbush	5	0.4
Chenopodiaceae	<i>Sclerolaena muricata</i> var. <i>muricata</i>	black rolypoly	3	0.4
Cucurbitaceae	<i>*Cucumis myriocarpus</i> subsp. <i>leptodermis</i>	paddy melon	5	2
Fabaceae	<i>*Vicia sativa</i>	common vetch	20	3
Geraniaceae	<i>*Erodium botrys</i>	long storksbill	50	1
Malvaceae	<i>Sida corrugata</i>	corrugated sida	3	0.4
Polygonaceae	<i>*Rumex conglomeratus</i>	clustered dock	20	1
Scrophulariaceae	<i>*Verbascum virgatum</i>	twiggy mullein	10	1



APPENDIX C
Threatened Ecological Community
Assessments

***Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalor Belt South Bioregions* EEC under the BC Act**

Zone 1 PCT76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions present in the Development Footprint is not likely to conform to the *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalor Belt South Bioregions* EEC. Although the location of the EEC, and some of the supplementary descriptors, presented in the Final Determination are inclusive of the EEC's presence (NSW Scientific Committee 2007), the EEC can be ruled considering the following:

Zone 1 PCT76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions present in the Development Footprint is an artificial vegetation zone occurring on secondary fill along an artificial bund. The soil therefore is not of natural tertiary or quaternary alluvial origin required for the EEC. The native species that do occur in the Development Footprint have colonised from the adjoining patch of derived native grassland that occurs on natural soil that is likely to be of tertiary or quaternary alluvial origin and therefore would conform to the EEC.

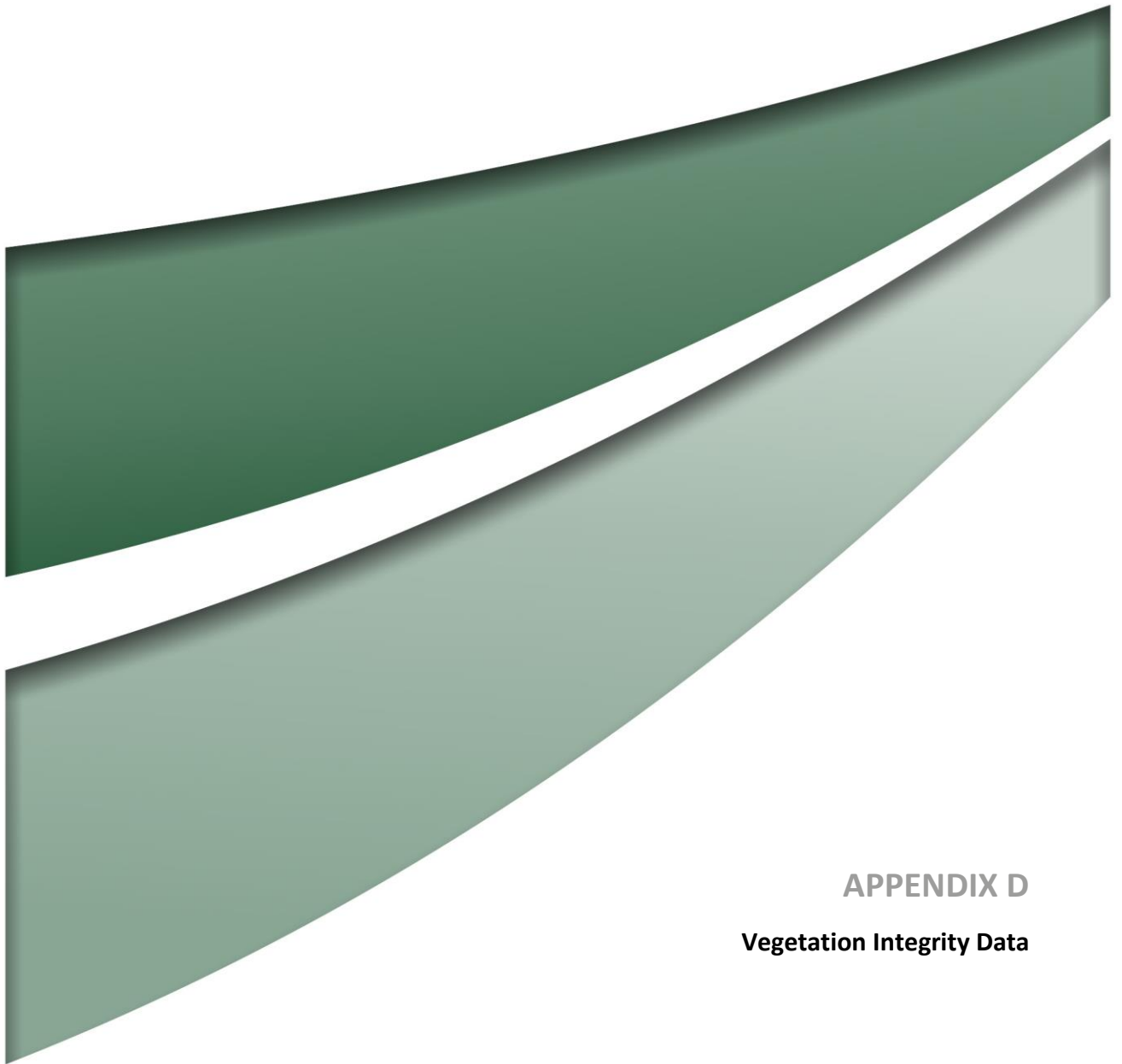
Furthermore, the very restricted number of species listed in the Final Determination are present in the Development Footprint. Of the 74 species that are identified in the Final Determination, just 4 (5%) were recorded within the Development Footprint, namely ringed wallaby grass (*Rytidosperma caespitosum*), black roly-poly (*Sclerolaena muricata*), climbing saltbush (*Einadia nutans*) and corrugated sida (*Sida corrugata*). Although derived native grasslands are covered by the EEC in cases where the previous land use has removed the canopy and mid storey, we do not believe the condition of this disturbed grassland is suitable to meet the Final Determination for the EEC.

***Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia* EEC under the EPBC Act**

Zone 1 PCT76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions present in the Development Footprint is not likely to conform to the *Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia* EEC.

Consistent with above, Zone 1 PCT76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions present in the Development Footprint is an artificial vegetation zone occurring on secondary fill along an artificial bund. The soil therefore is not of natural tertiary or quaternary alluvial origin as is the case for the EEC. Due to the secondary nature of the substrate of the Development Footprint, there is also a distinct absence of soil crust that is common in this EEC. As described above, the native species present in this vegetation zone have colonised from adjoining derived native grassland that is likely to conform with the EEC.

Furthermore, the very restricted number of species listed in the Listing Advice that are present in the Development Footprint. Of the 167 species that are identified for the EEC in the NSW North West Slopes IBRA bioregion in the Final Determination, just 5 (3%) were recorded within the Development Footprint, namely ringed wallaby grass (*Rytidosperma caespitosum*), *Austrostipa bigeniculata*, tall sedge (*Carex appressa*), climbing saltbush (*Einadia nutans*) and corrugated sida (*Sida corrugata*). Although disturbed grasslands are covered by the EEC in cases where the previous land use has removed the canopy and mid storey, we do not believe the condition of this disturbed grassland is suitable to meet the Listing Advice for the EEC.



APPENDIX D

Vegetation Integrity Data

Vegetation Integrity Data

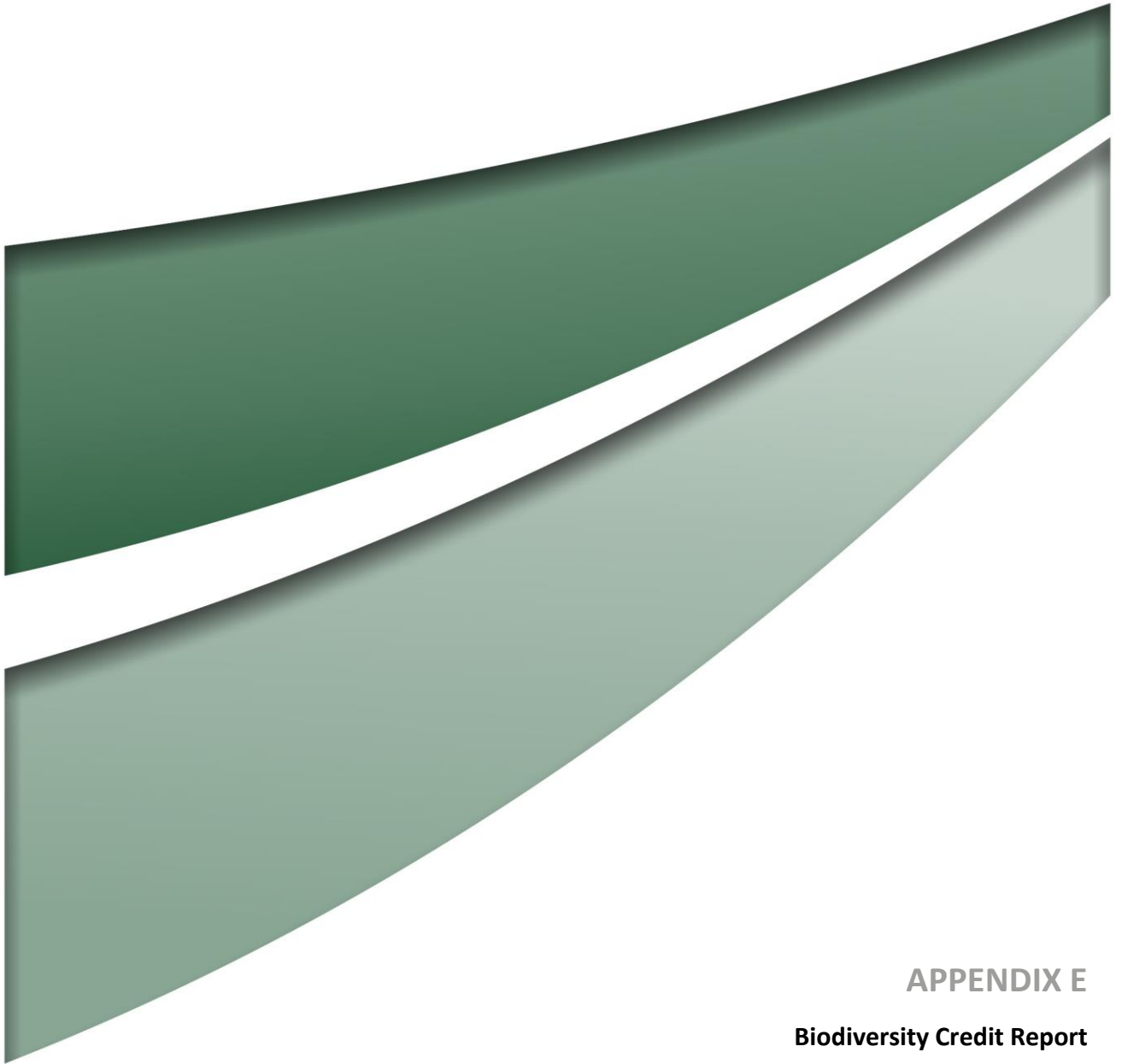
The following vegetation integrity data was collected from surveys of the Development Footprint. It includes the composition, structure and function attributes that are recorded in each BAM plot. This data is assessed against benchmark data for PCTs and entered into the BAM Calculator to assess the condition of each PCT in the Development Footprint.

The following abbreviations are used in the table below:

Tr	Tree (growth form)
Sh	Shrub (growth form)
Gr	Grass (growth form)
Fb	Forb (growth form)
Fn	Fern (growth form)
Ot	Other (growth form)

Table D1 Vegetation Integrity Data

	COMPOSITION						STRUCTURE						FUNCTION											
	Tr	Sh	Gr	Fb	Fn	Ot	Tr	Sh	Gr	Fb	Fn	Ot	Regen	Stem Classes (cm)						No. Large Trees	No. Hollow Trees	Litter (%)	Fallen Logs (m)	High Threat Weeds
													>5	5-10	10-20	20-30	30-50	50-80						
Zone 1 PCT76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions																								
Disturbed Land																								
P01	0	1	5	2	0	0	0	0.4	41.8	0.8	0	0	0	0	0	0	0	0	0	0	59	0	42	



APPENDIX E

Biodiversity Credit Report



BAM Credit Summary Report

Assessment Id	Proposal Name	Report Created
00010055/BAAS17068/18/00010056	Northparkes	19/03/2018
Assessor Name	Assessor Number	
Bill Wallach	0	

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Candidate SAI	Ecosystem credits
Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions								
1	76_Disturbed-Land	25.0	0.0	0.25	High Sensitivity to Potential Gain	2.50		1
							Subtotal	1
							Total	1

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Candidate SAI	Species credits
----------------------	------------------------	-----------------------------	----------	-----------------------------	---------------	-----------------

**Newcastle**

75 York Street
Teralba NSW 2284

Ph. 02 4950 5322

Perth

PO Box 783
West Perth WA 6872
7 Havelock Street
West Perth WA 6005

Ph. 1300 793 267

Canberra

PO Box 6135
56 Bluebell Street
O'Connor ACT 2602

Ph. 02 6262 9484

Sydney

50 York Street
Sydney NSW 2000

Ph. 1300 793 267

Brisbane

Level 11
500 Queen Street
Brisbane QLD 4000

Ph. 1300 793 267

www.umwelt.com.au