



**AUSTRALIAN  
ZIRCONIA LTD**

(A wholly owned subsidiary of Alkane Resources Ltd)

ABN 51 091 489 511

# Dubbo Zirconia Project

## Pink-tailed Worm- lizard Biodiversity Offset Management Plan







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### Document controls

Revision Number	Revision Date	Prepared By	Action	Comments
V1.0	4.08.16	JEB to PJC	Reviewed	
V1.1	5.08.2016	OzArk (PJC)	OzArk to RWC	
V1.2	25.08.2016	OzArk (JEB)	Inclusion of RWC comments	
V1.3	26.08.2016	OzArk (PJC)	Reviewed	
V1.4	31.08.2016	OzArk (JEB)	Comments included	
V2.0	5.09.2016	OzArk (JEB)	Sent to RWC	
V2.1	23.09.2016	OzArk (PJC)	Update to address RWC comments	
V2.2-2.3	25.11.2016 – 2-12.2016	OzArk (PJC & JEB)	Update to address DoEE comments	
V2.4	22.12.2016	RWC (AI)	Submitted to DEE	



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**R.W. CORKERY & CO. PTY. LIMITED**

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## **FOREWORD**

OzArk Environmental & Heritage Management Pty Ltd (OzArk EHM) has prepared this Pink-tailed Worm-lizard (*Aprasia parapulchella*) Biodiversity Offset Management Plan (PTWL BOMP) for the Dubbo Zirconia Project (DZP). The DZP, operated by Australian Zirconia Limited (AZL) a subsidiary of Alkane Resources Ltd, comprises a small scale open cut mine supplying ore containing rare metals (zirconium, niobium, hafnium and tantalum) and rare earth elements (REEs) to a processing plant near the village of Toongi, approximately 25km south of Dubbo (see **Figure 1**). Waste residues produced by the processing operations will be managed in residue storage facilities, designed to contain and encapsulate these residues.

This PTWL BOMP is required by *Condition 4* of EPBC Approval 2012/6625, granted by Commonwealth Department of Environment (DoE) (now Department of Environment and Energy [DEE]) on 24 August 2015.

The aim of the PTWL BOMP is to establish a program that, if implemented, will compensate for the loss of 35.3 hectares of PTWL habitat as a result of implementing the DZP. The program is designed to:

- increase the local population and area of occupancy for remnant populations of PTWL; and
- protect the local population of PTWL in perpetuity.

The PTWL BOMP applies to an area of 224.5ha of Pink-tailed Worm-lizard habitat. This area lies within a larger Biodiversity Offset Area (BOA) of 1 021ha established to satisfy *Condition 3(31)* of SSD-5251 issued by the NSW Planning Assessment Commission (PAC) under the NSW *Environmental Planning & Assessment Act 1979*.

Contribution to the preparation of the PTWL BOMP has been provided by RW Corkery & Co Pty Ltd (RWC) and AZL.

# DECLARATION OF ACCURACY

In making this declaration, I am aware that section 491 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) makes it an offence in certain circumstances to knowingly provide false or misleading information or documents to specified persons who are known to be performing a duty or carrying out a function under the EPBC Act or the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth). The offence is punishable on conviction by imprisonment or a fine, or both. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.

Signed

---

Full name (please print)

---

Organisation (please print)

---

Date

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## 1. INTRODUCTION

The Pink-tailed Worm-lizard (*Aprasia parapulchella*) is a small, legless lizard that occurs in scattered but discrete populations along the western foothills of the Great Dividing Range. The Pink-tailed Worm-lizard (PTWL) is listed as vulnerable under both the NSW *Threatened Species Conservation Act 1995* and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). EPBC Approval 2012/6625 approves the disturbance of up to 35.3ha of PTWL habitat by activities associated with the Dubbo Zirconia Project (DZP) subject to the establishment and management of an offset for this disturbance (the EPBC Offset Area).

The purpose of this Pink-tailed Worm-lizard Biodiversity Offset Management Plan (PTWL BOMP) is to set out a program of management actions to conserve, enhance and protect PTWL habitat within the EPBC Offset Area. The specific requirements of the PTWL BOMP are identified in *Condition 4* of EPBC Approval 2012/6625.

**Table 1** sets out the specific requirements of EPBC Approval 2012/6625 and where each of these are addressed in the PTWL BOMP.

**Table 1**  
**PTWL BOMP Requirements of EPBC 2012/6625 (Condition 4)**

Condition	Section
To compensate for the loss of 35.3 hectares of Pink-tailed Worm-lizard habitat, the approval holder must prepare and submit at least 3 months prior to the commencement of the action, a Biodiversity Offset Management Plan (BOMP) for the proposed EPBC Offset Area, for the Minister's approval. The BOMP must be prepared by a suitably qualified person and:	
a. Identify the land described as the EPBC Offset Areas at Schedule 2 of this notice that is necessary to achieve the outcomes required by the Environmental Offsets Policy 2012. This must include offset attributes, shapefiles, textual descriptions and maps to clearly define the location and boundaries of the EPBC Offset Area(s).	Apps 1 and 2, Sections 2 and 3.
b. Provide a survey and description of the current condition (prior to any management activities) of the EPBC Offset Areas identified in Condition 3a.	2
c. Detail management actions and regeneration and revegetation strategies to be undertaken on the EPBC Offset Areas to improve the ecological quality of these areas, including:	Section 4
i. a description and timeframe of measures that would be implemented to improve the condition of the ecological communities on the site;	Sections 4 and 5
ii. performance and completion criteria for evaluating the management of the EPBC Offset Area, and criteria for triggering remedial action;	Section 4
iii. a program to monitor and report on the effectiveness of these measures, and progress against the performance and completion criteria;	5.1 and 5.2
iv. description of potential risks to the successful implementation of the plan, a description of the measures that will be implemented to mitigate against these risks and a description of the contingency measures that will be implemented if defined triggers arise; and	5.3
v. details of who would be responsible for monitoring, reviewing and implementing the plan.	5.4

The PTWL BOMP applies to an area of 224.5ha of PTWL habitat (all or part of PTWL Habitat Areas (HA) 2, 3, 4, 5, 6, 8 and 10), along with areas linking these mapped areas, within a

larger areas of 1 021ha to be conserved as a Biodiversity Offset Area (BOA) to satisfy *Condition 3(31)* of SSD-5251 issued by the NSW Planning Assessment Commission under the NSW *Environmental Planning & Assessment Act 1979* (EP&A Act) (see **Figure 1**).

The PTWL BOMP supports a Pink-tailed Worm-Lizard Management Plan (PTWL MP), prepared in accordance with *Condition 2* of EPBC Approval 2012/6625 (and *Condition 3(33)(g)* of SSD-5251). In combination, these two plans aim to ensure a viable PTWL population will remain secure in perpetuity and increase its area of occupancy within the local setting.

The PTWL BOMP is prepared in fulfilment of the requirements of **Table 1**. The PTWL BOMP (and PTWL MP) follows from a *Pink-tailed Worm-lizard Plan of Management*, prepared by Biosphere Environmental Consultants P/L (Biosphere 2013), which was appended to the Terrestrial Ecological Assessment prepared to support the application for development consent and Controlled Action Approval for the DZP (OzArk, 2013).

## 2. BASELINE ECOLOGICAL DATA

### 2.1 Species Description and Occurrences

Refer to *Section 2* of the PTWL MP.

### 2.2 Impacts to be Offset

A 25 point habitat quality assessment template was developed to assess, rank and map PTWL habitat according to its quality. **Appendix 1** provides the template used to consider the various habitat features of relevance to the PTWL and assign an area as no, low, moderate or high quality habitat. The relative importance of each habitat feature was weighted based on assessment by ecological, herpetological and entomological professionals with an initial score calculated out of 25. The 25 point score was converted to a score out of 10 point to match EPBC Offsetting criterion. Section 3.2 provides further information on the application of the habitat quality assessment template.

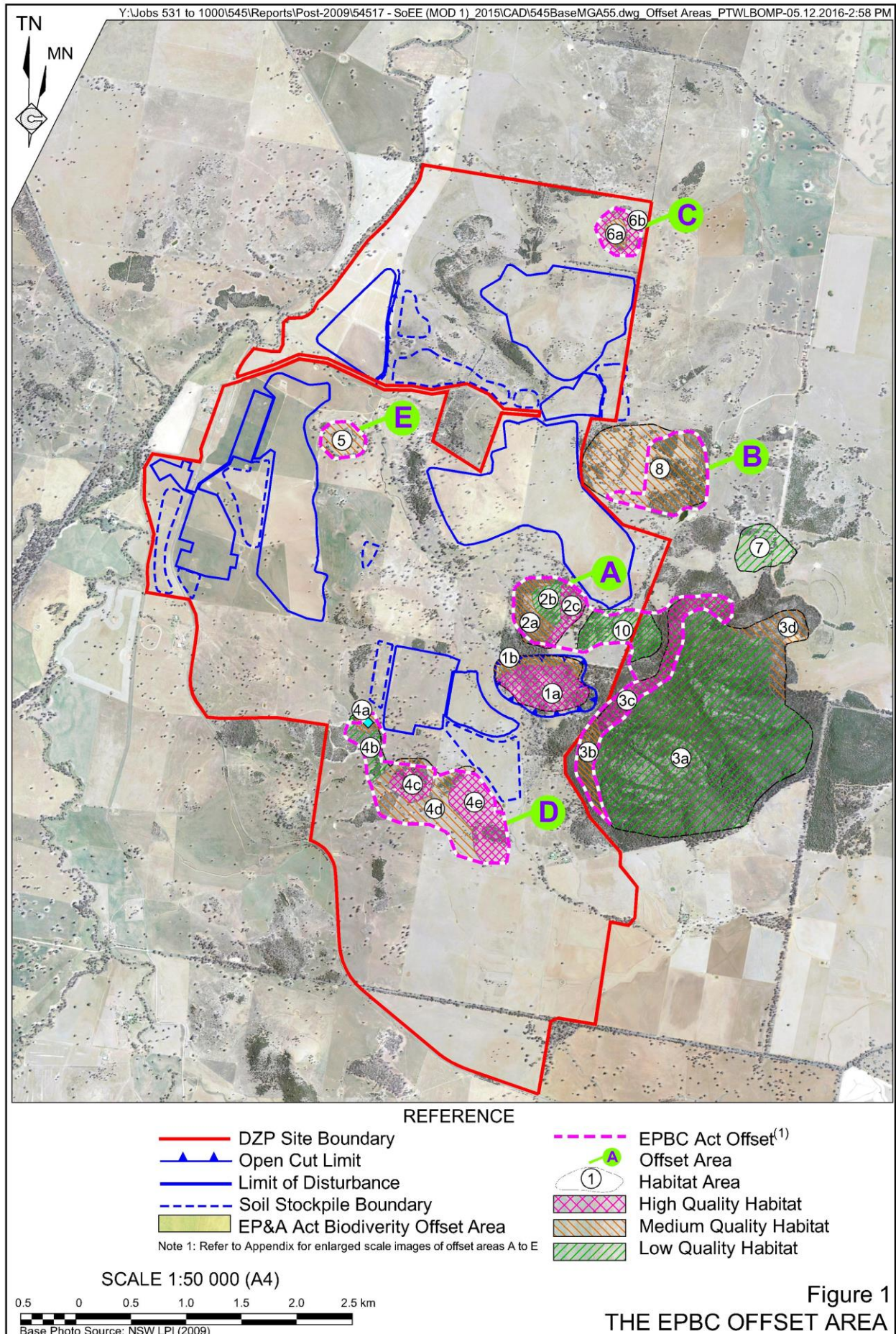
Across the DZP Site, five areas were identified as possessing **low** quality, 10 **moderate** quality and six **high** quality PTWL habitat. **Table 2** provides the results of this habitat assessment identifies these individual areas and scores, along with whether they are to be impacted or included in the EPBC Offset. **Figure 2** identifies these areas over a geological map (to illustrate the importance of base geology to habitat). **Plates 2.1** to **2.5** provide examples of high, moderate and low quality habitat as mapped on the DZP Site.

The ore body targeted for extraction occurs over PTWL HA 1 with disturbance to the following unavoidable.

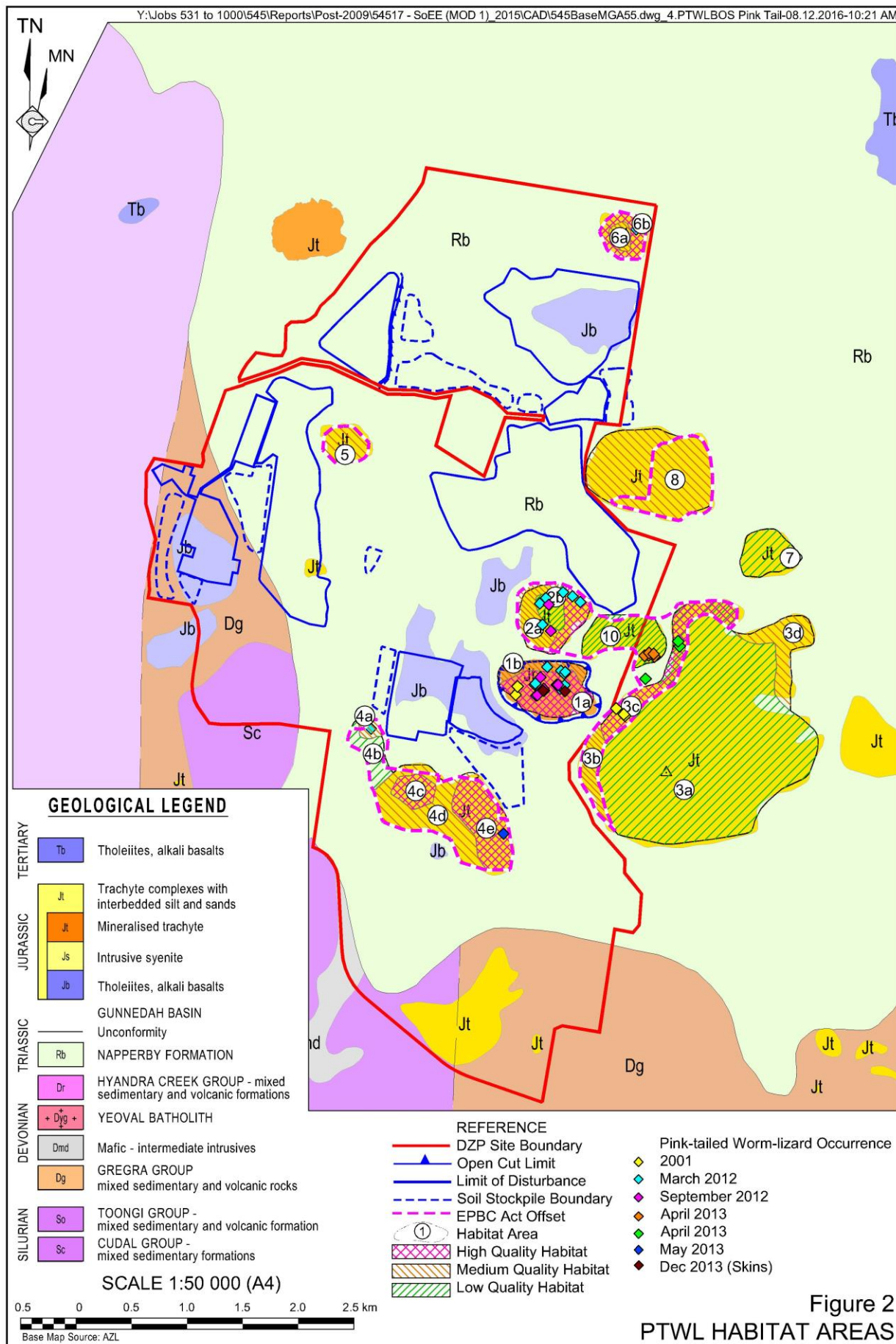
- (a) 25.5ha of high quality habitat.
- (b) 9.8ha of medium quality habitat.

A staged open cut development plan will ensure that approximately 50% of this habitat will remain undisturbed for at least 10 years (refer to Section 4.4.5.2). Based on consideration of PTWL habitat during the DZP planning stage, no further impact to PTWL habitat will occur.









**Table 2**  
**EPBC Offset Attributes**

Habitat Area	Habitat score (/25)	EPBC score (/10)	Quality (Figure 2)	Impact Site (Y/N)	Offset Area
Habitat Area 4b	10/25	4/10	Low Quality Habitat	N	D
Habitat Area 3a	11/25	4/10	Low Quality Habitat	N	Not in EPBC Offset Area
Habitat Area 7	11/25	4/10	Low Quality Habitat	N	A
Habitat Area 9	13/25	5/10	Low Quality Habitat	N	Not in EPBC Offset Area
Habitat Area 10a	13/25	5/10	Low Quality Habitat	N	A
Habitat Area 2b	15/25	6/10	Moderate Quality Habitat	N	A
Habitat Area 3b	15/25	6/10	Moderate Quality Habitat	N	A
Habitat Area 3d	15/25	6/10	Moderate Quality Habitat	N	Not in EPBC Offset Area
Habitat Area 8	15/25	6/10	Moderate Quality Habitat	N	Not in EPBC Offset Area
Habitat Area 5	16/25	6/10	Moderate Quality Habitat	N	E
Habitat Area 4d	17/25	7/10	Moderate Quality Habitat	N	D
Habitat Area 4a	17/25	7/10	Moderate Quality Habitat	N	D
Habitat Area 2a	18/25	7/10	Moderate Quality Habitat	N	A
Habitat Area 1b	19/25	8/10	Moderate Quality Habitat	Y	
Habitat Area 6a	19/25	8/10	Moderate Quality Habitat	N	C
Habitat Area 3c	20/25	8/10	High Quality Habitat	N	A
Habitat Area 4e	20/25	8/10	High Quality Habitat	N	D
Habitat Area 4c	20/25	8/10	High Quality Habitat	N	D
Habitat Area 10b	21/25	8/10	High Quality Habitat	N	Not in EPBC Offset Area
Habitat Area 2c	22/25	9/10	High Quality Habitat	N	A
Habitat Area 1a	23/25	9/10	High Quality Habitat	Y	Not in EPBC Offset Area



**Plate 2.1**  
**PTWL HA 2b (within EPBC Offset Area A) - High Quality PTWL Habitat**

**Plate 2.1** illustrates an area with an open tree canopy, healthy native grass understory and many suitable PTWL habitat rocks. Minimal management actions are needed in this area to maintain and improve PTWL habitat quality.





**Plate 2.2**  
PTWL HA 1b (of the impact footprint) - High Quality PTWL Habitat

**Plate 2.2** shows an ideal PTWL habitat rock.



**Plate 2.3**  
PTWL HA 3b (within EPBC Offset Area A) - Moderate Quality PTWL Habitat

**Plate 2.3** illustrates a dense Cypress Pine Canopy with a low density native grass understory with many suitable PTWL habitat rocks.

Management actions (Cypress Pine thinning) are needed in this area to improve PTWL habitat quality.



**Plate 2.4**  
**PTWL HA 3a (not within the EPBC  
Offset Area) - Low Quality PTWL  
Habitat**

**Plate 2.4** identifies an areas with no soil, hence limited or no ant activity, but has many suitable PTWL habitat rocks.



**Plate 2.5**  
**PTWL HA 10 (within EPBC Offset  
Area A) - Low Quality PTWL  
Habitat**

**Plate 2.5** illustrates an area with suitable soils and a healthy grass layer but no surface no suitable PTWL habitat rocks.

## **2.3 Threats**

A summary of potential threats (risks) to PTWL habitat associated with the approved activity (mine development) and land management more generally have been summarised in **Tables 4 and 5** (referencing the DoE *Environmental Management Plan Guidelines* - Department of the Environment, 2014). Risks to PTWL were considered as an action caused by developing the mine (**Table 4**) and an action caused by managing the EPBC Offset Area (**Table 5**).

**Table 2**  
**DZP Development Related Risks to PTWL Habitat**

Risk	Qualitative measure of likelihood	Qualitative measure of consequences	Risk rating	Trigger Value	Corrective Action
Habitat destruction	Highly likely	Critical	Severe	Impacts to PTWL habitat about 2 years after project construction starts	Passive translocation Physical translocation (as required)
Removal of rock habitat	Highly likely	Critical	Severe	8 weeks prior to clearing the deposit for mining	6 men over 5 days to lift and translocate surface rock into EPBC Offset Areas

**Table 3**  
**Existing Land Management Risks to PTWL Habitat**

Risk	Qualitative measure of likelihood	Qualitative measure of consequences	Risk rating	Trigger Value	Corrective Action
Removal of rock habitat	Unlikely	Minor	Low	Annual monitoring shows habitat rocks are being removed without approval	Investigate cause. Replace destroyed habitat at the same ratio.
Habitat destruction	Unlikely	Minor	Low	Annual monitoring demonstrates habitat destroyed.	Investigate cause. Restore destroyed habitat at the same ratio.
Grazing to reduce fuel loads (where required)	Unlikely	Minor	Low	Annual monitoring demonstrates evidence of livestock destroying PTWL habitat i.e. rocks, man-made habitat or quality or density of grassland vegetation. Grassland has less than 40% cover density or falls below the lower benchmark for the community.	EPBC Offset Area managed for biodiversity. Frequency of vegetation monitoring is increased until issue is resolved. Controlled burns (cool burns) may be used where grazing is an issue.
Fire management	Unlikely	Minor	Low	Annual monitoring demonstrates evidence of fire destroying PTWL habitat.	Livestock maybe used where fire is an issue. Methodology of burns will be reviewed to ensure cool mosaic burns.
Feral animals	Possible	Minor	Low	Feral animals (pigs) destroying habitat	Increase pig control program.
Over abundant native species	Possible	Minor	Low	Grassland has less than 40% cover density or falls below the lower benchmark for the community.	Increase overabundant native species control program.
Weed control	Unlikely	Minor	Low	New populations of weeds are observed in EPBC Offset Areas. Existing weed burdens are increasing (demonstrated via monitoring).	Increase frequency of weed control program until weed occupancy is reduced.
PTWL poaching	Unlikely	Minor	Low	Unauthorised access into EPBC Offset Area	Review of security Review of fencing Review of signs Review of inductions for work crews and visitors



Implementation of the PTWL BOMP will conserve and enhance the population of PTWL by restoring native habitat to a local established benchmark standard. Without active management of feral animals, particularly pigs (which invaded Dowds Hill in 2011), the Toongi population remains at risk of decline.

### 3. Description of the EPBC Offset Area

#### 3.1 Location

**Figure 1** identifies the land to be included within the EPBC Offset Area. **Figure 2** identifies PTWL Habitat Areas (1 to 10). Falling within the larger BOA, the EPBC Offset Area incorporates five individual conservation areas as follows.

1. EPBC Offset Area A: Incorporating PTWL HA 2 and 9, moderate and good condition areas of HA 3 and additional land linking HA 9 to HA 2 (to the west) and HA 3 (to the east).
2. EPBC Offset Area B: Incorporating PTWL HA 8.
3. EPBC Offset Area C: Incorporating PTWL HA 6.
4. EPBC Offset Area D: Incorporating PTWL HA 4.
5. EPBC Offset Area E: Incorporating PTWL HA 5.

The locations and classification of all PTWL Habitat Areas is provided in *Section 2.2.1* of the PTWL MP.

#### 3.2 EPBC Offset Attributes

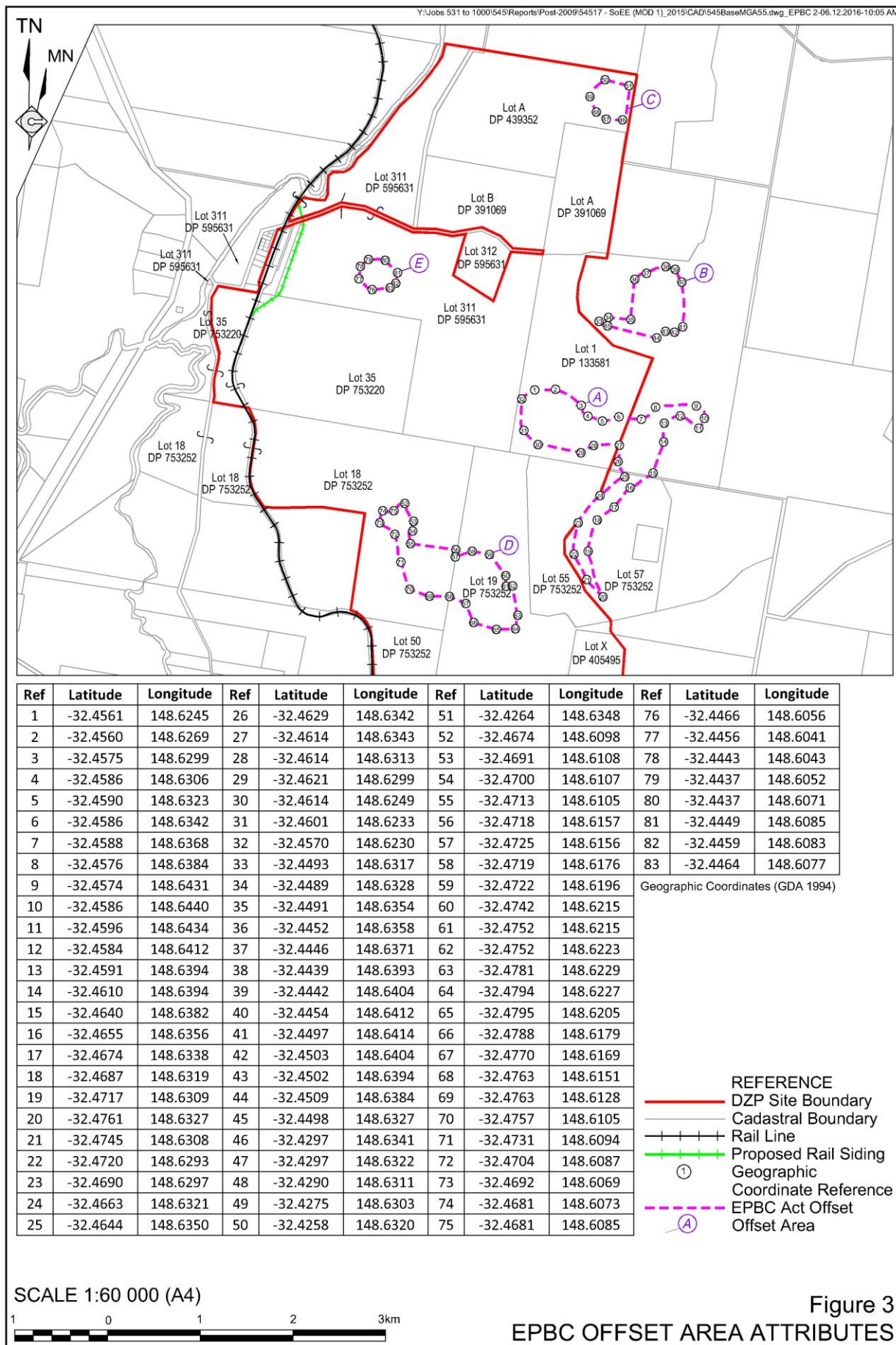
##### 3.2.1 Components

The component attributes of the EPBC Offset Area are detailed in **Table 4** and identified on **Figure 3**.

##### 3.2.2 Habitat Assessment Template

As noted in the PTWL MP (and Section 2.1), various factors are known to influence the quality of PTWL habitat.

To provide a transparent and robust scoring system to measure habitat quality a 25 point scoring system was developed by a team of local and other relevant experts (Mr M. Sutherland - AZL's NSW General Manager; Mr P. Cameron - OzArk Principal Ecologist; Dr A. White - Herpetologist; Dr G. Whyte – Entomologist; and Mr A. Irwin - RWC Senior Environmental Consultant). As identified in **Appendix 1**, the template considers the quality and quantity of critical habitat elements in the study area to measure its current value and indicate a future value with site management.





**Table 4**  
**EPBC Offset Attributes**

EPBC Act reference ID	EPBC 2012/6625		
Site address	Part Lot 311 DP595631, Lot 271 DP593668, Part Lot 35 DP753220, Part Lot 1 DP133581, Part Lot 18 DP753252, Lot A & B DP439352, Lot 19 DP 753252, Part Lot A DP391069, Lot 55 DP753252, Lot B DP391069, Lot X DP405495, Lot 211 DP595631, Lot 1 DP818802, Lot 50 DP753252, Lot 7300 DP1149010 (Licensed for grazing), Unformed 'Paper' Road (Crown Land) separating Lot 311 DP55631 and Lots A & B DP439352, Unformed 'Paper' Road (Dubbo City Council) separating Lot 1 DP818802 and Lot 7300 DP1149010		
Boundary co-ordinates (decimal degrees) <sup>1</sup>	Refer to <b>Figure 3</b> .		
EPBC Protected matters offset site compensated for	Pink-tailed Worm-lizard ( <i>Aprasia parapulchella</i> ).		
Additional EPBC protected matters benefiting from offset	The following EPBC Act listed fauna have been recorded within habitat in the EPBC Offset Area and will benefit from implementation of the PTWL BOMP		
	Scientific Name	Common Name	Legal Status
	<i>Ardea modesta</i>	Eastern Great Egret	Migratory
	<i>Polytelis swainsonii</i>	Superb Parrot	Vulnerable
	<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	Vulnerable
	<i>Miniopterus schreibersii</i>	Common Bentwing-bat	Vulnerable
	<i>Nyctophilus timorensis</i>	Greater Long-eared Bat	Vulnerable
Size of offset site (ha) <sup>1</sup>	Area A: 95ha.	Area D: 73ha.	
	Area B: 35ha.	Area E: 9.2ha.	
Area C: 12.2ha.			
Note 1: Shape files of the EPBC Offset Area are provided with this PTWL BOMP			

The critical habitat features scored (some attributes were weighted higher than others) included:

- previous record(s) / known occurrence of the species;
- occurrence of surface rocks of appropriate dimensions;
- base geology and soil permeability;
- occurrence and quality of native groundcover;
- topography and aspect;
- presence of native vegetation;
- openness of canopy; and
- presence of ants (feed).

Each EPBC Offset Area (A, B, C, D and E) was assessed by two OzArk staff independently and the results were compared. Of the 20 areas assessed only two varied in a quality class and were ground-truthed so an agreed outcome could be achieved. Once this process was complete the results were brought back to the habitat quality assessment (see above) team for discussion and additional fine tuning where required.

### 3.2.3 Application of the EPBC Act Policy

The EPBC Offsets Policy, in conjunction with the offsets assessment guide, details how and what amount of environmental offsets are required to compensate for the residual adverse impacts of an action on the environment. After converting the habitat quality score to 1 out of 10, for direct comparison to the EPBC habitat quality scoring system which is based on a maximum value of 10 (high quality) and lowest score of 1 (limited habitat quality), the EPBC Offset Area will protect and manage in perpetuity for conservation:

- 30ha of low quality habitat (8.2% of all mapped low quality habitat), principally within Offset Areas A and D<sup>1</sup>;
- 113.6ha of moderate quality habitat (63.4% of all mapped medium quality habitat), within all five Offset Areas.
- 80.9ha of good condition habitat (75.0% of all mapped high quality habitat), within Offset Areas A, C and D.

Based on the area to be conserved and the net improvement provided by the management measures of this PTWL BOMP, application of the EPBC Act Offsets Policy credit calculator provides for an offset to the value of greater than 150% of the impact (OzArk, 2013).

### 3.3 Size and Connectivity

The five PTWL EPBC Offset Areas are 224.5ha in total. While isolated by the landform, geological and other factors, the five EPBC Offset Areas are all contained within the broader SSD-5251 BOA and as such connectivity within a protected landscape is provided.

### 3.4 Vegetation

For the purpose of managing the offset areas, the vegetation of the BOA (within which the EPBC Offset is secured) has been categorised into four community types<sup>2</sup> (see **Figure 4**).

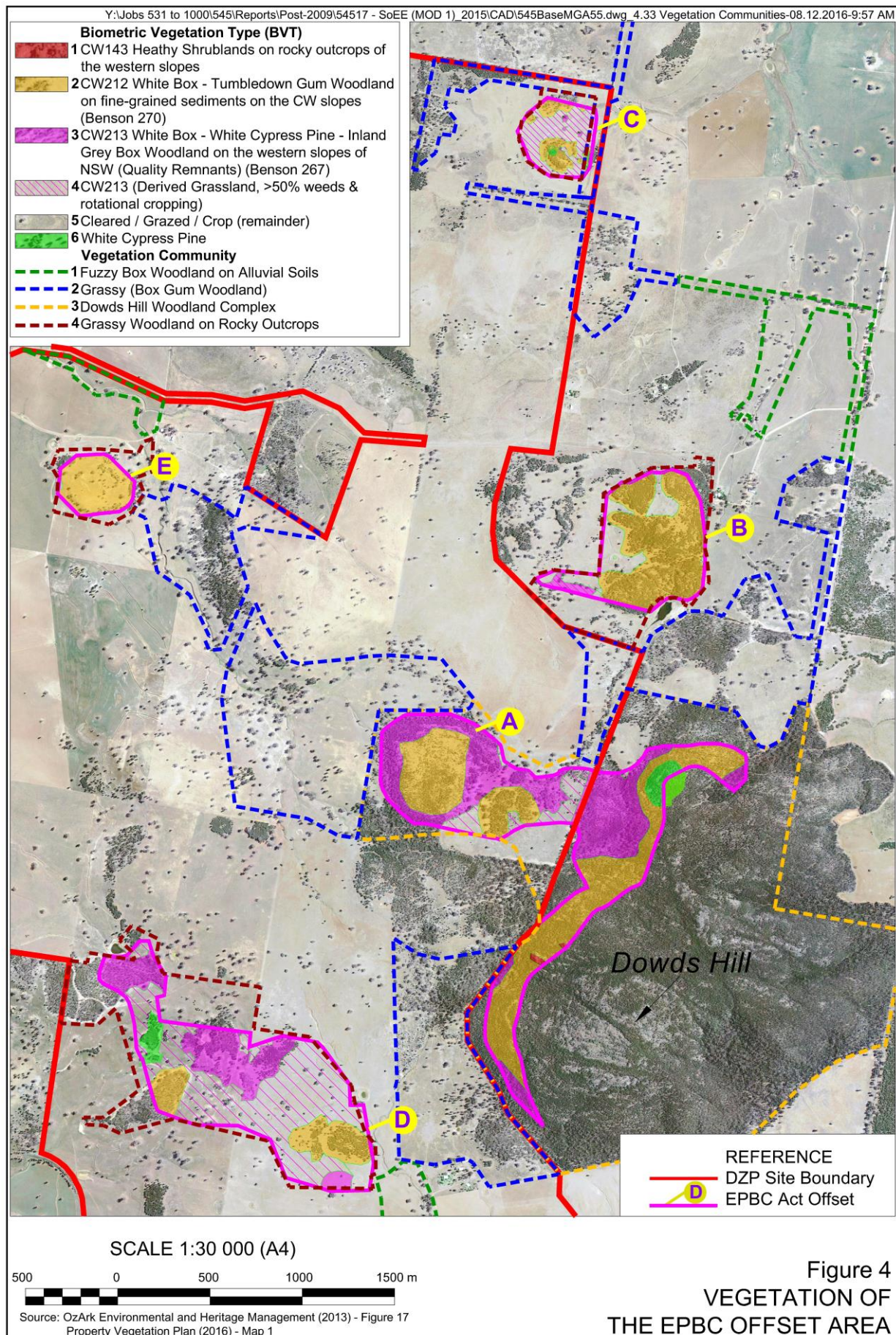
1. Fuzzy Box Woodland on Alluvial Soils (49ha). None of the EPBC Offset Areas occur within this vegetation community.
2. Grassy (Box Gum) Woodland (320ha). None of the EPBC Offset Areas occur within this vegetation community.
3. Dowds Hill Woodland Complex (448ha). EPBC Offset Area A occurs within this vegetation community.
4. Grassy Woodland on Rocky Outcrops (204ha). EPBC Offset Areas B to E occur within this vegetation community.

**Figure 4** also provides the Biometric Vegetation Types (BVT) of the EPBC Offset Areas which have been combined to describe the four vegetation communities.

<sup>1</sup> This includes the areas not currently considered to provide habitat value.

<sup>2</sup> As referenced by Conservation PVP No. 00199 (for security of the BOA and EPBC Offset) as consolidation of Biometric Vegetation Type (BVT) communities originally mapped for the DZP Site.







Communities 3 and 4 generally present a healthy upper stratum with a high density of White Cypress Pine as sub-stratum. The sub-stratum suppresses the mid and lower stratum biodiversity across all areas. Where density of White Cypress Pine was less, there are higher levels of mid-lower stratum biodiversity. Where these communities occur in a derived native grassland formation, an overstorey is generally not present with the understorey dominated by exotic pasture and crop species. Without the presence of suitable surface rock, PTWL habitat within these areas score 5/10 or less. Where a lower density of White Cypress Pine allows for higher levels of biodiversity within the PTWL Habitat Areas of Communities 3 and 4, the EPBC habitat score rises to 6/10 or greater.

### 3.5 Disturbance History

The area identified as PTWL HA 1 (extraction area) has low levels of extensive ground surface disturbance, with one area previously cleared and used for grazing. The remaining habitat areas (PTWL HA 2 to 8 and 10) have low levels of ground surface disturbance as these areas are not suitable for cultivation.

### 3.6 Key Threatening Processes

The only identified Key Threatening Processes (KTP) active over the DZP site to be exacerbated is “Land Clearance” [(Section 6.6 and Appendix 2 of OzArk (2013)].

It is anticipated that, as a result of the BOA and this PTWL BOMP, that this KTP will be prevented within the area of the DZP.

### 3.7 Noxious and Environmental Weeds

The EPBC Offset Areas have very low densities of weeds as these have generally not been subject to ploughing or pasture improvement. In the 30ha of low quality PTWL habitat exotic grasses such as *Bromus* species invade the area from adjacent ploughed paddocks. These areas are the most impacted by the ‘edge effect’. Other noted weed species include environmental (non-noxious) weed species Caltrops (*Emex australis*) and Khaki Weed (*Alternanthera pungens*), as well as noxious weed species African Boxthorn (*Lycium ferocissimum*) and Prickly Pear (*Opuntia stricta*)<sup>3</sup>.

Within the moderate quality PTWL habitat there are fewer species and densities of weeds as these areas are further from ploughed areas and on landforms with poorer and drier soils for exotic species. These areas are not primarily affected by the ‘edge effect’ but were subject to other impacts such as grazing agriculture before AZL destocked the areas. Within the good condition PTWL habitat there are virtually no weeds due to a combination of distance to ploughed areas, landform, soil type and lack of resources for grazing animals.

Weed management within the EPBC Offset Area would be an extension of the weed management applied to the larger SSD-5251 BOA and AZL landholdings more generally. **Table 5** provides an overview of the weed species known or with the potential to occur with the EPBC Offset, status and approach to control.

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<sup>3</sup> Also identified as Weeds of National Significance (WONS)

**Table 5**  
**Weeds of the Offset Area and Control Methods**

Weed			Occurrence within the Offset Area	Control Method
Scientific Name	Common Name	Status		
<i>Emex australis</i>	Caltrops	Environmental / Exotic	Known	Spray
<i>Alternanthera pungens</i>	Khaki Weed		Known	Spray
<i>Bromus diandrus</i>	Ripgut Brome		Known	Spray and graze
<i>Xanthanum spinosum</i>	Bathurst Burr	Noxious (Nx)	Potential	Spray/chip
<i>Carthamus lanatus</i>	Saffron Thistle		Potential	Spray
<i>Silybum marianum</i>	Variegated Thistle		Potential	Spray
<i>Onopordum acanthium</i>	Scotch Thistle		Potential	Spray
<i>Carduus tenuiflorus</i>	Winged Slender Thistle		Potential	Spray
<i>Cirsium vulgare</i>	Black Thistle		Potential	Spray
<i>Proboscidea louisianica</i>	Devil's Claw		Potential	Spray
<i>Datura Ferox</i>	Fierce Thornapple		Potential	Spray
<i>Lycium ferocissimum</i>	African Boxthorn	WoNS / Nx	Known	Spray
<i>Opuntia stricta</i>	Prickly Pear		Known	Spray
<i>Hypericum perforatum</i>	St John's Wort	Nx	Potential	Spray
<i>Conyza bonariensis</i>	Flax-leaf Fleabane		Potential	Spray
<i>Citrullus lanatus</i>	Camel Melon		Potential	Spray
<i>Cucumis myriocarpus</i>	Paddy Melon		Potential	Spray
<i>Echium plantagineum</i>	Patterson's Curse		Potential	Spray and graze
<i>Marrubium vulgare</i>	Horehound		Potential	Spray
<i>Heliotropium amplexicaule</i>	Blue Heliotrope		Potential	Spray
<i>Alternanthera pungens</i>	Khaki Weed		Potential	Spray
<i>Tribulus terrestris</i>	Cat-Head		Potential	Spray
<i>Schlerolaena burchii</i> *	Galvanised Burr		Potential	Spray
<i>Cassia barclayana</i>	Pepper-leaf Senna		Potential	Spray

\*Native species considered a weed by wool producers (formerly *Bassia burchii*)

The scale and frequency of weed control will be identified during vegetation monitoring. The density of weed(s) will be measured using Braun-Blanquette cover density scoring system. If a weed in any EPBC Offset Area within either a 20m x 20m vegetation plots, 20mx50m habitat plots or as a general observation, the species and extent (density) will be reported.

On observation of a weed infestation of one or more of the EPBC Offset Areas, the Farm Manager will modify annual weed spraying campaigns to include the relevant area.

## 4. MANAGEMENT ACTIONS

### 4.1 Management Actions

Management actions for conservation of the PTWL relate to threats and actions identified by the Commonwealth government. AZL will undertake the following activities to ensure the improvement of the Pink-tailed Worm-Lizard “Toongi” population. Recovery efforts will be coordinated and prioritised and include:

- Integrity of habitat will be maintained and/or enhanced.
- Government, land management agencies, Aboriginal community, landholders and other community groups will be invited to work together to conserve and improve the local population.

Time frames associated with these have been provided in Section 5, **Table 7**.

### 4.2 Security and Tenure of the BOA

The EPBC Offset will be secured, as a component of the larger SSD-5251 BOA, through a Conservation Property Vegetation Plan (PVP) under the *Native Vegetation Act 2003* (NV Act) by 24 February 2017 (in accordance with *Condition 5* of EPBC Approval 2102/6625). The Conservation PVP is a legally binding contract between AZL and the Central West Local Land Services which is registered to the land title as an in perpetuity conservation covenant.

The Conservation PVP requires the landowner to manage the land to achieve established land conservation goals. An annual report to the regulator is required to document activities undertaken against the agreed management actions. In a worst-case scenario, if the PVP does not deliver on commitments made, legal action can be taken against the landowner by the regulator for non-compliance. All mining activities are excluded in the EPBC Offset Area, however, bushfire management will be included in the areas. The bushfire management plan in these areas will be consistent with the goals to promote habitat for a self-sustaining locally viable population of PTWL.

A draft Conservation PVP issued by the LLS on 21 November 2016 was reviewed and several amendments requested on 25 November 2016. On issue and acceptance of the Conservation PVP, which provides for the in perpetuity management of 1 021ha of AZL-owned land for conservation purposes, will be appended to the PTWL BOMP.

### 4.3 Fencing, Signage and Stock Management

#### 4.3.1 Fencing and Signage

The larger SSD-5251 BOA will be fenced with stock proof fences to prevent or control access of livestock and people. Existing fencing will be used where possible with barbed wire fencing avoided where practical to limit wildlife injury or death. Where not required, existing fencing will be removed. An additional fence will be erected around Map Unit 4c (Dowds Hill Woodland Complex) of the Conservation PVP (containing EPBC Offset Area A) (see **Figure 4**), with other existing fences retained to allow for time controlled grazing within the BOA.

Gates will be placed to allow fire-fighting and management access to the BOA. Signs will be erected on gates at designated entry points to caution the public or AZL personnel from unauthorised entry into the BOA. These signs will include specific acknowledgement of the

EPBC Offset Areas for PTWL conservation at relevant access points. The signs will be installed within 12 months of commencement of mining activities to delineate PTWL EPBC Offset Areas.

While the individual EPBC Offset Areas will not be fenced, the boundary and internal fencing of the BOA will be sufficient to manage these areas. That is, stock and other access will generally be excluded from the entire BOA, except after assessment of fuel loads and/or native grass diversity levels when stock will be allowed access to selected areas of the BOA for grazing (refer to Section 4.3.2). Internal fencing will ensure that stock are not able to move through the BOA uncontrolled and will exclude all stock from Community 3 (which includes EPBC Offset Area A and the principal habitat enhancement area (refer to Section 4.4). Fencing of the BOA (incorporating the EPBC Offset) will be completed within 24 months of commencement. Redundant fencing within the EPBC Offset Areas will be removed within 24 months of commencement. Additional fencing (to segregate Community 3) will be completed within 3 years of commencement (within existing fencing beyond the limit of Community 3 utilised to exclude livestock from this area until this time)

### **4.3.2 Stock Management**

Grazing within the BOA and EPBC Offset Area will only occur if it can provide a conservation benefit (reduce fire risk or control particular introduced species for the benefit of native species).

Where grazing is used as management activity, it will only be undertaken where this does not impact on the conservation of a self-sustaining locally viable population of PTWL. In summary:

- Grazing will be prohibited from Community 3 (Dowds Hill Woodland Complex) (see **Figure 4**).
- Strategic grazing within the BOA may be utilised to manage / reduce fuel loads, where burning is not practical.
- Grazing may also be undertaken when plants are dormant in order to promote plant vigour and seed and root production during subsequent growth periods.
- Vegetation will be spelled around the time of flowering and seed production (late spring / early summer) in order to allow for continual replacement and maintenance of vegetation cover. This will ensure seed has been produced and allowed to return to the soil seed bank before affected by stock, and to manage the fire risk before hot and dry weather.

Dry Matter (DM) levels will be used as a measure of fuel load objectives, i.e. grazing will be commenced as DM levels approach or exceed the maximum and cease as these approach the minimum within the vegetation communities referenced by the Conservation PVP (see **Figure 4**).

1. Fuzzy Box Woodland on Alluvial Soils
  - Maximum DM – 3 000kg/ha.
  - Minimum DM – 1 400kg/ha.
2. Grassy (Box Gum) Woodland
  - Maximum DM – 3 000kg/ha.
  - Minimum DM – 1 000kg/ha.

3. Dowds Hill Woodland Complex
  - No grazing.
4. Grassy Woodland on Rocky Outcrops
  - Maximum DM – 3 000kg/ha.
  - Minimum DM – 1 400kg/ha.

The effect on strategic grazing to achieve a conservation outcome will be further measured through annual vegetation monitoring at fixed points and compared to local benchmarks for the relevant vegetation community (see **Table 6**). If native vegetation decreases in quality below these benchmark levels, or below that of a relevant analogue site during periods of regional reduction in biodiversity, e.g. drought, bushfire, additional measures to promote biodiversity outcomes will be developed in consultation with a qualified ecologist.

**Table 6**  
**Vegetation Benchmarks**

		Community 1: Fuzzy Box Woodland on Alluvial Soils	Community 2: Grassy (Box Gum) Woodland	Community 3: Dowds Hill Woodland Complex	Community 4: Grassy Woodland on Rocky Outcrops
<b>No. Native Plant Species</b>		25	25	30	25
<b>Native Over Storey Cover</b>	<b>Min %</b>	12	12	8	12
	<b>Max%</b>	35	35	35	35
<b>Native Mid Storey Cover</b>	<b>Min %</b>	1	1	3	1
	<b>Max%</b>	25	25	25	25
<b>Native Ground Cover Grass</b>	<b>Min %</b>	15	15	3	15
	<b>Max%</b>	70	70	25	70
<b>Native Ground Cover Shrubs</b>	<b>Min %</b>	3	3	3	3
	<b>Max%</b>	5	5	25	5
Source: Modified after PVP00199 – Appendix 1					

Controlled grazing may also be undertaken at the instruction of the NSW Rural Fire Service when fuel loads are determined to elevate the risk of bush fire above acceptable levels (although the maintenance of maximum DM levels should manage this risk).

The impact of grazing impact will be monitored during initial grazing periods in order to assess grazing intensity and risks of vegetation degradation.

#### **4.4 Habitat Enhancement (condition improvements reflected in the offset calculations)**

##### **4.4.1 Selection of Habitat Enhancement Areas**

With ideal habitat attributes pre-determined (refer to *Section 2.2* of the PTWL MP), the choice of sites for habitat creation and enhancement needs to be based on four further features.

1. Proximity to known PTWL habitat (see **Figure 1**).
2. Utility in linking PTWL Habitat Areas.



3. Free of impacts associated with the establishment or operation of the DZP.
4. Free of constraints associated with the management of another threatened plant or animal.

Using these criteria, and as noted in *Section 4.2.2.2* of the PTWL MP, the main focus for habitat enhancement within the EPBC Offset Area will take place within PTWL HA 10 and the areas linking this to the higher quality habitat area of PTWL HA 3 to the east and PTWL HA 2 to the west (see **Figure 4**).

PTWL HA 10 possesses the right lithology, meets most of the ideal habitat components (except that it lacks surface shelter rocks) and links apparently isolated groups of PTWLs between PTWL HAs 2 and 3.

PTWL HA 3 will be the next highest priority for habitat enhancement. PTWL HA 3 has all the right ecological components for PTWL (refer to *Section 4.2.2.1*) but requires cypress pine thinning to reinstate a grassy ground layer. PTWL HA 3 once had an extant population of PTWLs (circa 2000) but they have not been recorded since. This area also possesses the existing lowest levels of vegetation biodiversity due to the cypress pine monoculture and is most likely to respond to habitat management quickly.

Habitat creation and enhancement in the noted order of priority would promote the linkage of known sub-populations (PTWL HAs 1 and 2) and therefore serve as a corridor for any displaced PTWLs seeking to move away from the open cut within PTWL HA 1 (whilst the western half of the open cut is developed) to existing and created habitat of PTWL HA 3, 10, 2 and the areas in between.

Cypress Pine thinning in these areas will result in a significant increase in lower and mid stratum biodiversity values within five years of 2017 to 2022. In all management zones at least one condition class improvement will be achieved. All areas mapped as medium quality will improve to good quality within five years however in areas mapped as low quality (i.e. an average score of four), the time to achieve a higher quality class (to an average of eight) may take eight years.

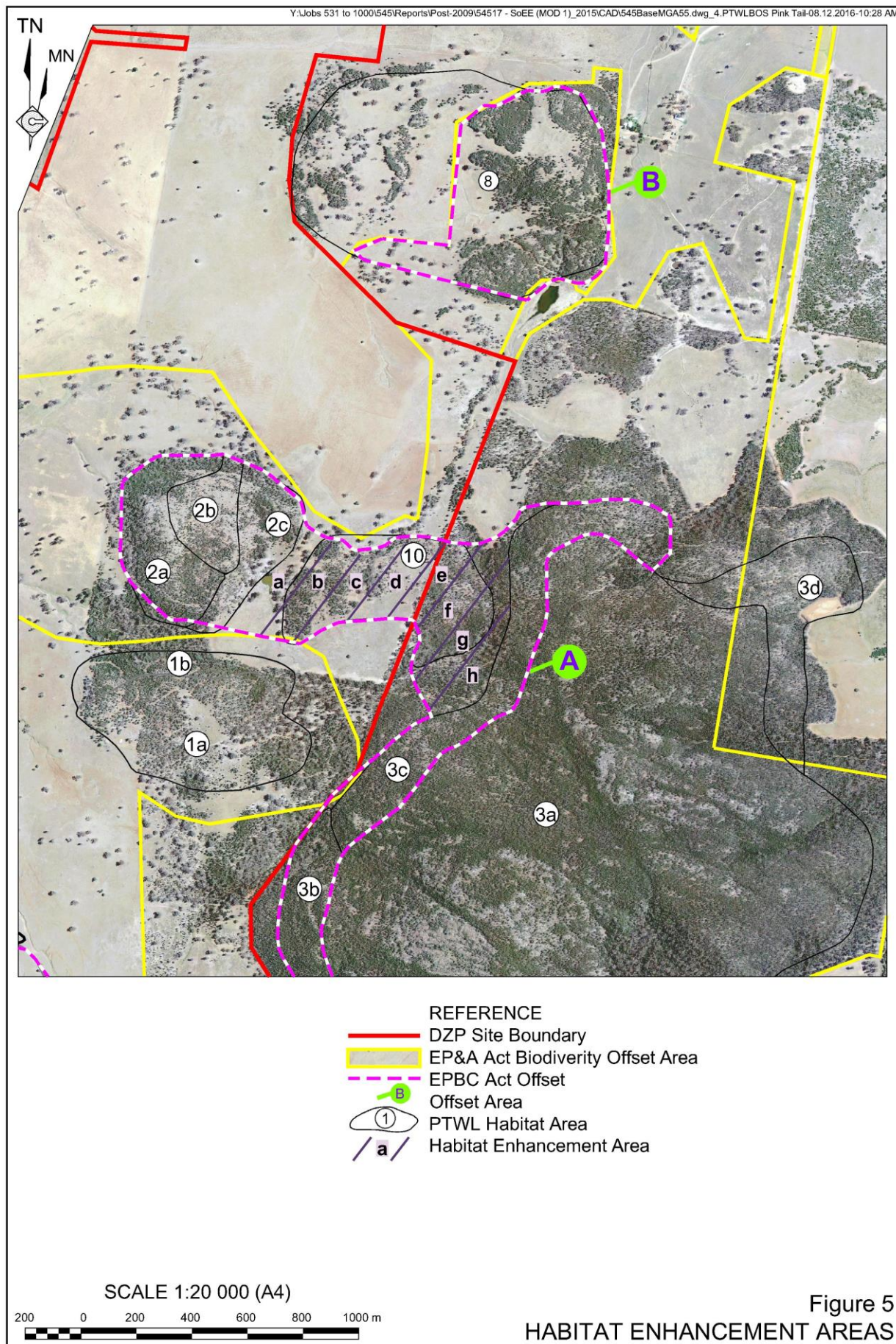
Indicative areas representing 4ha to 6ha identified as (a) to (h) on **Figure 5** will achieve an increase of one quality class within five years. These areas would be the initial focus of habitat enhancement, followed by PTWL HAs 5 and 6 (**Figure 1**).

#### **4.4.2 Management Goals**

**Table 7** has been provided to show the current value of PTWL HAs, and sub-area, records current 25pt/10pt condition, and a 5yr schedule of related activities to achieve the future condition according to the 25/10pt condition system.

#### **4.4.3 Vegetation Thinning**

Habitat enhancement via vegetation thinning will be completed as a priority, within 12 months of commencement of DZP site works. EPBC Offset Area A will receive first treatment, followed by EPBC Offset Areas D, then E, B and C (see **Figure 1**).





Within EPBC Offset Area A, vegetation thinning activities will commence on the skirt of Dowds Hill, i.e. enhancement areas (e) to (h) on **Figure 5**. Target areas within PTWL HA 2 (of EPBC Offset Area A) and PTWL HAs 4 to 8 (EPBC Offset Areas B to E) will be identified and thinning completed in roughly 0.5ha blocks following the completion of thinning within enhancement areas (e) to (h). Currently there are about 2.0m spacing between Cypress Pines, after management this will be altered to have one Cypress Pine per 30 m<sup>2</sup>. This tree density will achieve a functional native grassland layer within five years. Follow-up campaigns of regrowth thinning will occur as required. A minimum area of thinning over the equivalent of 4ha within the EPBC Offset is the immediate (within five years) goal.

Beyond the EPBC Offset Area, areas of unthinned Cypress Pine will remain untouched to provide 'other' values, i.e. shade and refuge for woodland birds.

#### **4.4.4 Native Groundcover**

The objective with respect to native groundcover is to establish stable, sustainable (a viable local population meeting local benchmark standard) coverage meeting regional or local benchmarks to emulate locally occurring grassy woodland communities whilst meeting or exceeding the offset completion criteria for PTWL habitat.

Vegetation monitoring benchmarks have been established within the BOA for SSD-5251. Additional vegetation benchmarks are required within each EPBC Offset Area. Within the EPBC Offset Area one or more vegetation plots scaled on hectares affected as per BBAM (2014) for habitat restoration will be established and monitored annually (in spring or after good summer rains) where a management action will occur and at least one vegetation control plot will be located where management is not planned. Annual monitoring will occur to check progress of habitat restoration (via comparison against vegetation community benchmarks of **Table 6**) against the five-year plan (**Table 7**). The benchmarks for each vegetation community (see **Table 6**) provide upper and lower thresholds (to account for local conditions affecting vegetation, e.g. drought, fire, flood).

Where additional restoration measures are required, i.e. an attribute falls below local benchmark (refer to **Table 6**) then additional management action addressing this shortfall will be required, e.g. additional Cypress Pine thinning or spreading of native grass seed. The effectiveness of this remedial action will be detected at the monitoring interval and measured against the local benchmark (of **Table 6**) again.

**Figure 6** identifies the locations of the 'local benchmark plots', which are located as follows.

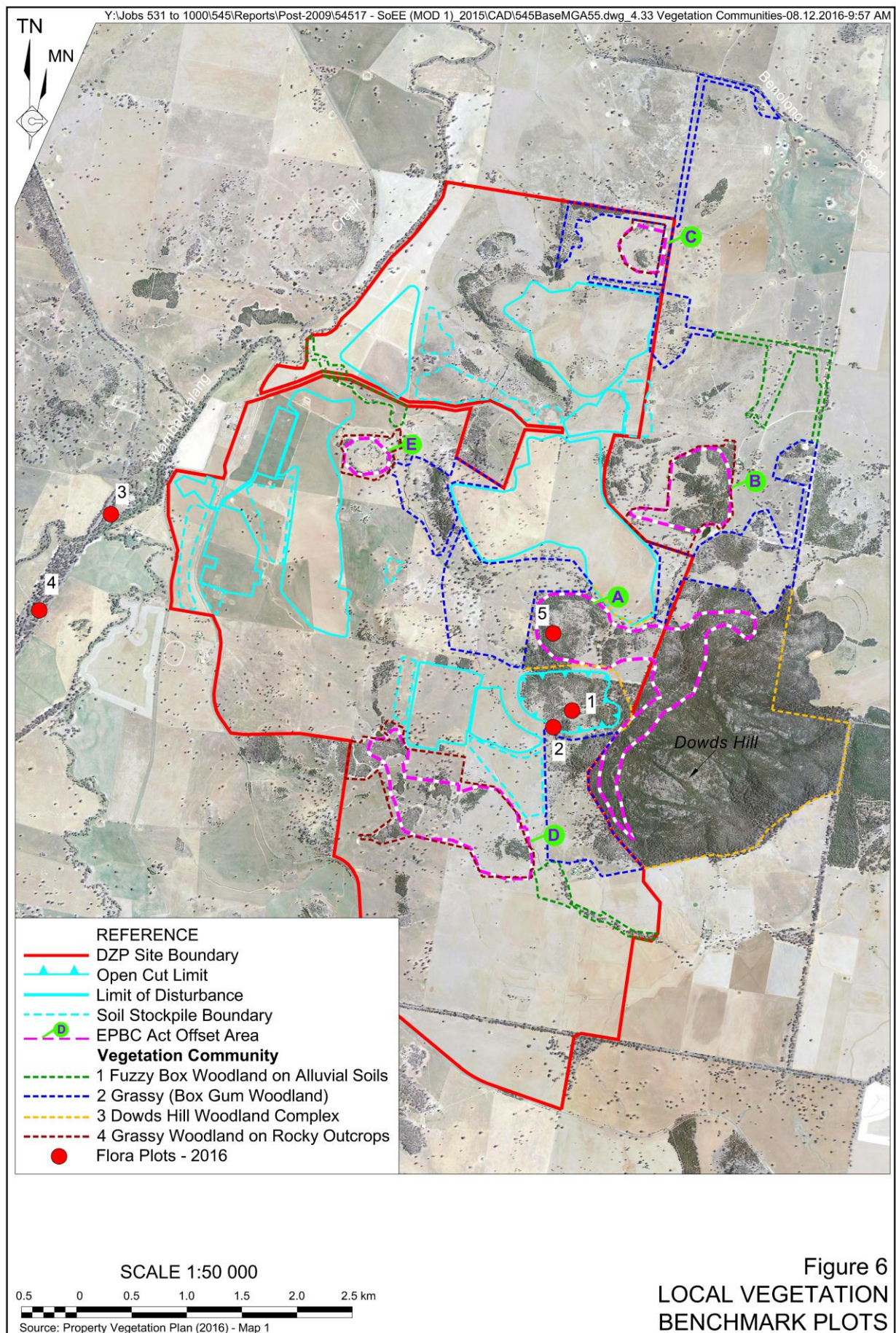
1. White Cypress Pine monoculture (control plot). This area has been mapped as High Quality PTWL habitat (score of 8/10) in EPBC Offset Area D. Additional Cypress Pine thinning is required to achieve a higher score as the grassy layer is being suppressed by the tree canopy.
2. CW213 – White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267). This area has been mapped as High Quality PTWL habitat (score of 8/10) 100 m outside of the deposit impact footprint and is not in an EPBC Offset Area (about 150 m west of Area A). This control plot represents a large area of similar habitat in poorer condition requiring Cypress Pine thinning to achieve a higher quality class. This is the second most represented vegetation community in the EPBC Offset Areas.

**Table 7**  
**Environmental Attributes and Management Goals**

PTWL HA / EPBC Offset Area / Monitoring Location	GDA z55		Depth of Soil (mm)	Underlying Geology	Soil Type (Dubbo Soils map)	Current Mapped Habitat Quality	Proposed Habitat Quality (5 years)	Community	Management Action	5-year completion criteria
	Easting	Northing								
PTWL HA 2b / Offset Area A / Ugothery North Artificial Habitat Monitoring Point	652845	6407800	25	Jurassic - Trachyte complexes with interbedded silt and sands	Bald Hill Euchrozems	Medium (7/10)	High (9/10)	3	Grazing removed. Pig management started.	Vegetation thinning to 1:30m <sup>2</sup> . Monitoring point in managed area. Monitor vegetation community and review data against local benchmark.
PTWL HA 2a / Offset Area A / Ugothery East Lower Artificial Habitat Monitoring Point	652929	6407563	135	Jurassic - Trachyte complexes with interbedded silt and sands	Bald Hill Euchrozems	Low (4/10)	Medium (6/10)	3	Grazing removed. Pig management started.	As above
PTWL HA 2c / Offset Area A / Ugothery East Upper Artificial Habitat Monitoring Point	652836	6407637	160	Jurassic - Trachyte complexes with interbedded silt and sands	Bald Hill Euchrozems	Low (4/10)	Medium (6/10)	3	Grazing removed. Pig management started.	As above
PTWL HA 6a and 6b / Offset Area C / Grandale Artificial Habitat Monitoring Point	653547	6410880	>150	Jurassic - Trachyte complexes with interbedded silt and sands	Ballimore Red-Brown Earths	Medium (7/10)	High (9/10)	4	Grazing reduced.	As above
PTWL HA 3c / Offset Area A / Ugothery Dowds Hill Artificial Habitat Monitoring Point	653525	6406962		Triassic Napperby Formation	Dowd Shallow Soils	Tile location High 8/10	High (10/10)	3	Pig management started.	As above
PTWL HA 1a and 1b / Impact Footprint / Glen Idol Artificial Habitat Monitoring Point	652877	6406944	36	Jurassic - Mineralised trachyte	Belowrie Red Podzolic Soils	High (9/10)	High (10/10)	2	Grazing removed. Pig management started.	As above
PTWL HA 7 / Offset Area B / Ugothery Dam Site Artificial Habitat Monitoring Point	653894	6407990		Triassic Napperby Formation	Belowrie Red Podzolic Soils	Low (4/10)	Medium (6/10)	2	Pig management started.	Monitoring has not occurred in this area to date







3. CW138 – Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201). This vegetation type is not within the EPBC Offset Area. This control plot represents a large area of similar habitat in poorer condition requiring grazing management to achieve a higher quality class.
4. CW145 – Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Benson 76). This vegetation type is not within the EPBC Offset Area. Its value as benchmark relates to possessing a good example of high quality vegetation in the area. No suitable example within the EPBC Offset Area could be found.
5. CW212 – White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270). This area has been mapped as Medium Quality PTWL habitat (score of 6/10). A higher score is unlikely to be achieved as the thin skeletal soils are the only limiting factor. This control plot represents a large area of similar habitat in poorer condition requiring Cypress Pine thinning to achieve a higher quality class. This is the most represented vegetation community in the EPBC Offset Areas.

Additional plots are needed to measure the effectiveness of the management action to achieve a five year increase of quality class outcome as identified in **Table 7**.

Existing vegetation monitoring plots 2 and 5 are most relevant to the establishment of benchmarks for the EPBC Offset as these represent the dominant community type in the EPBC Offset Areas. **Table 8** identifies the benchmarks for the two vegetation communities within which the EPBC Offset Area occur which are required in order for the PTWL habitat quality to equal or exceed 8/10.

**Table 8**  
**EPBC Offset Vegetation Benchmarks**

Benchmark	Community 3: Dowds Hill Woodland Complex (EPBC Offset Area A)	Community 4: Grassy Woodland on Rocky Outcrops (EPBC Offset Areas B to E)
Native Species Richness	30	25
Native Groundcover Grasses (%)	3-25 (>20)	15-70 (>50)
Native Groundcover Shrubs (%)	3-25 (<5)	3-5
Native Overstorey (%)	8-35 (<20)	12-35 (<20)
Native Mid-storey (%)	3-35 (<5)	1-25 (<5)
Note *: The figure in brackets represents the objective within the range provided for the regional benchmark		

Fencing and removal of continuous livestock grazing to allow natural regeneration is the primary strategy for vegetation enhancement (refer to Section 4.3).

Natural regeneration of vegetation will be assisted by placement of seed bearing crowns and branches (of cleared vegetation). Additional seeding or planting will be undertaken in response to benchmarks not being achieved.



#### 4.4.5 Rock and Artificial Habitat Features

##### 4.4.5.1 Surface Rocks

Loose surface rocks suitable for PTWL habitat will be collected when preparation for mining takes place, i.e. removed from the open cut impact footprint. This will occur eight weeks before the area is cleared for mining by six people over five days. Suitable rocks are considered flat rocks, about the size of a dinner plate.

These rocks will be relocated to the habitat enhancement areas within EPBC Offset Area A where surface rocks are lacking in Good Quality (8/10 score) mapped areas (see **Figure 5**). They will be spaced between one and four metres apart over an area about 600 metres long and 100 metres wide (6 ha). The spacing of relocated rocks reflects the existing density of suitable habitat rocks on the deposit (impact footprint). The actual number of suitable rocks is not known but on site logistics for budgeting has calculated the man hours needed to relocate 100's of suitable rocks. There are no surface rocks in the areas to be seeded by rock relocation (see **Figure 5**) but there is high quality grassland, suitable soils and presence of ant feed species. Annual monitoring of artificial habitat use will be expanded to include this area to see if natural rock placed in the area is being used by prey species as well as PTWL.

Additional cover materials such as artificial tiles may be required. 50 tiles currently located within PTWL HA 1 (over the open cut footprint) will be relocated, as well as an additional 50 tiles currently stockpiled on site. As this activity is contained within an approved mine budget the level of confidence to achieve this goal is high. This activity will be completed before the open cut is cleared of native vegetation.

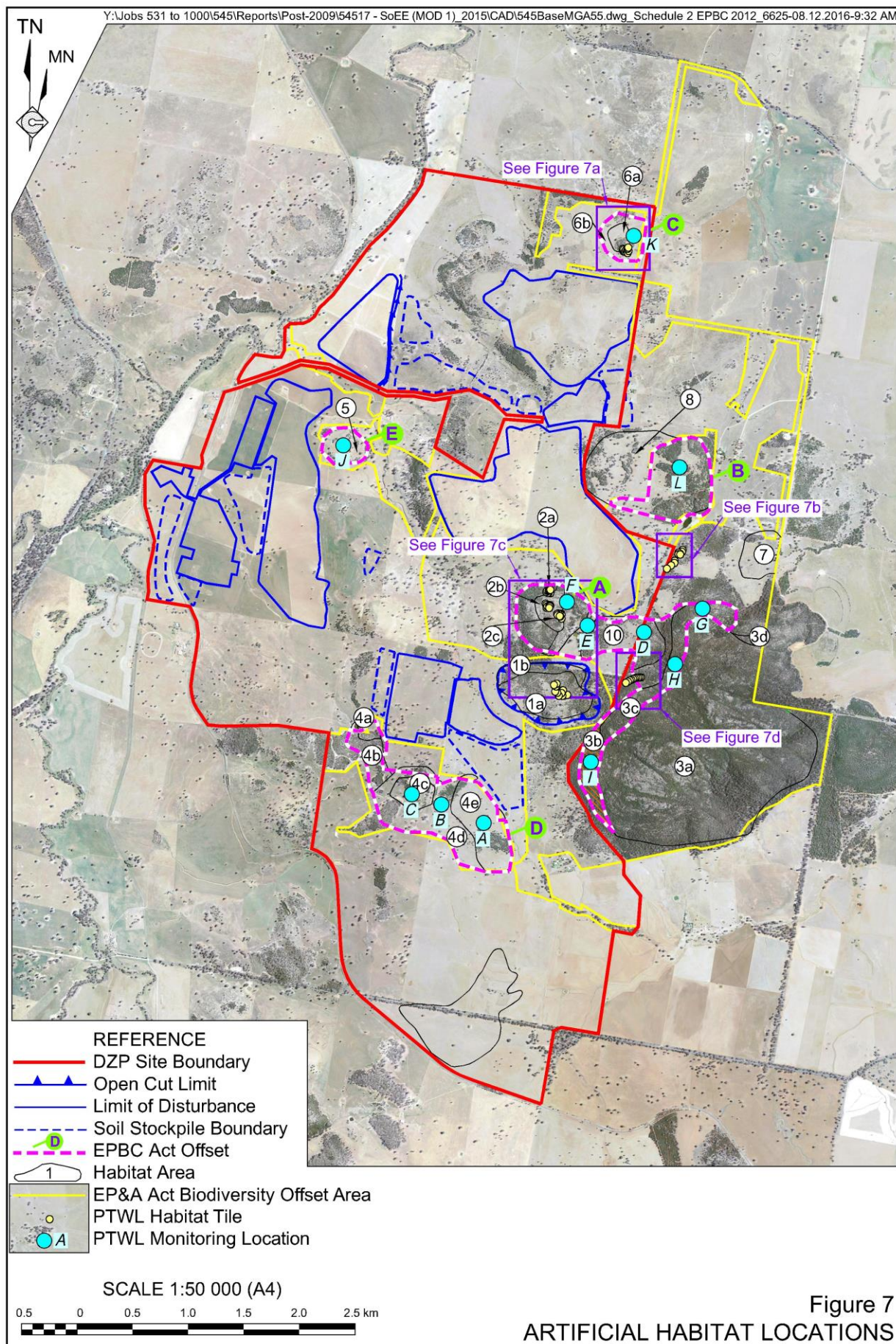
No additional surface rocks will be required at PTWL HAs 3, 4 and 6 (EPBC Offset Areas A, D and C) as there are sufficient rocks but they have an insufficient grassy ground layer. The habitat quality in EPBC Offset Areas B (Medium Quality – 6/10) and E (Medium Quality – 6/10) are known but vegetation monitoring will be required to measure an improvement of at least one PTWL habitat quality class within five years. The vegetation plots will be set up no later than the same year the deposit is cleared for mining.

##### 4.4.5.2 Artificial Habitats – Current Placement

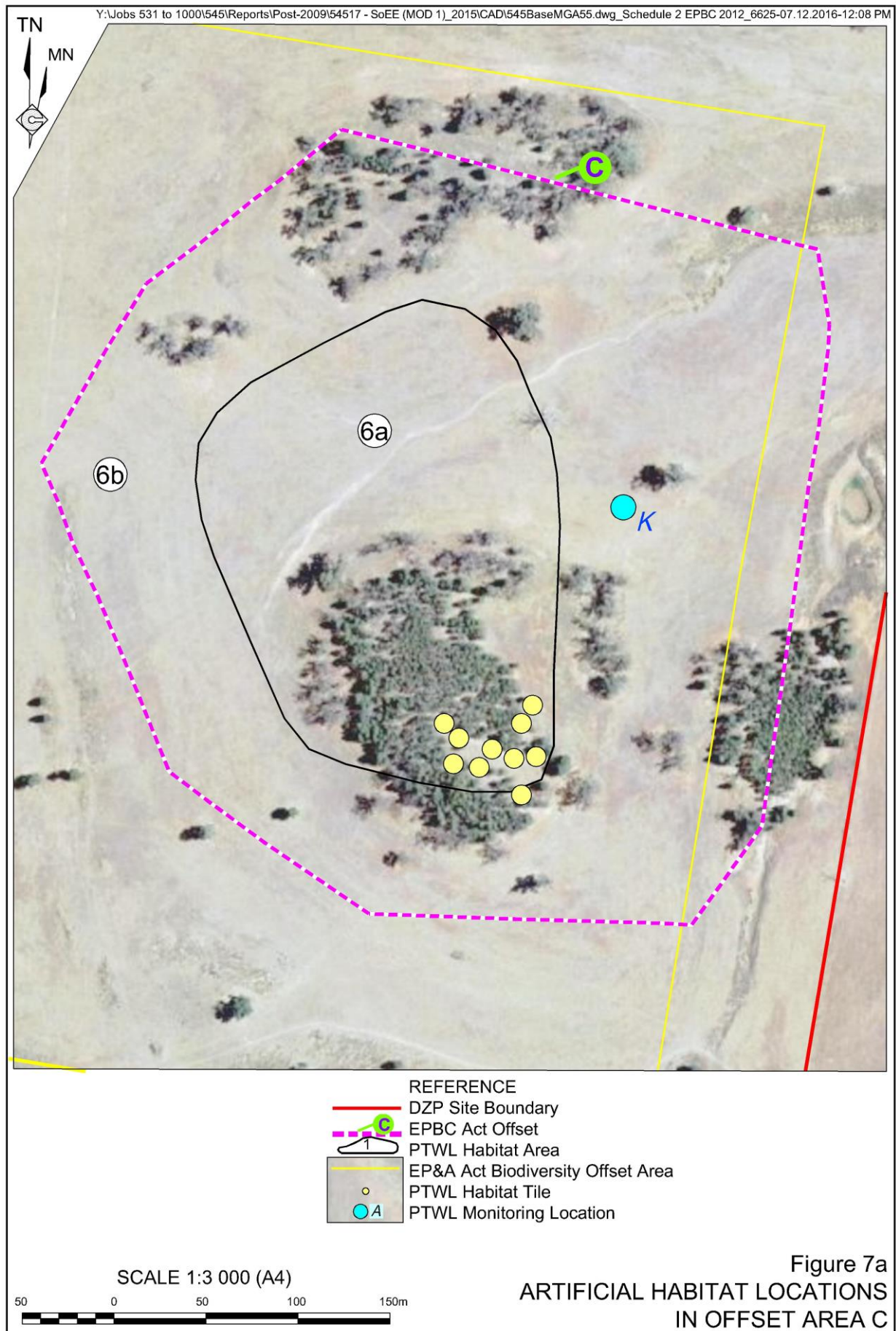
Artificial habitat (roof tiles) have been trialled at DZP since 2014 to see if PTWL use them as habitat. Each 'set' of tiles occurs as 10 sets of four conjoined tiles and one isolated tile (see **Plates 4.1 and 4.2**).

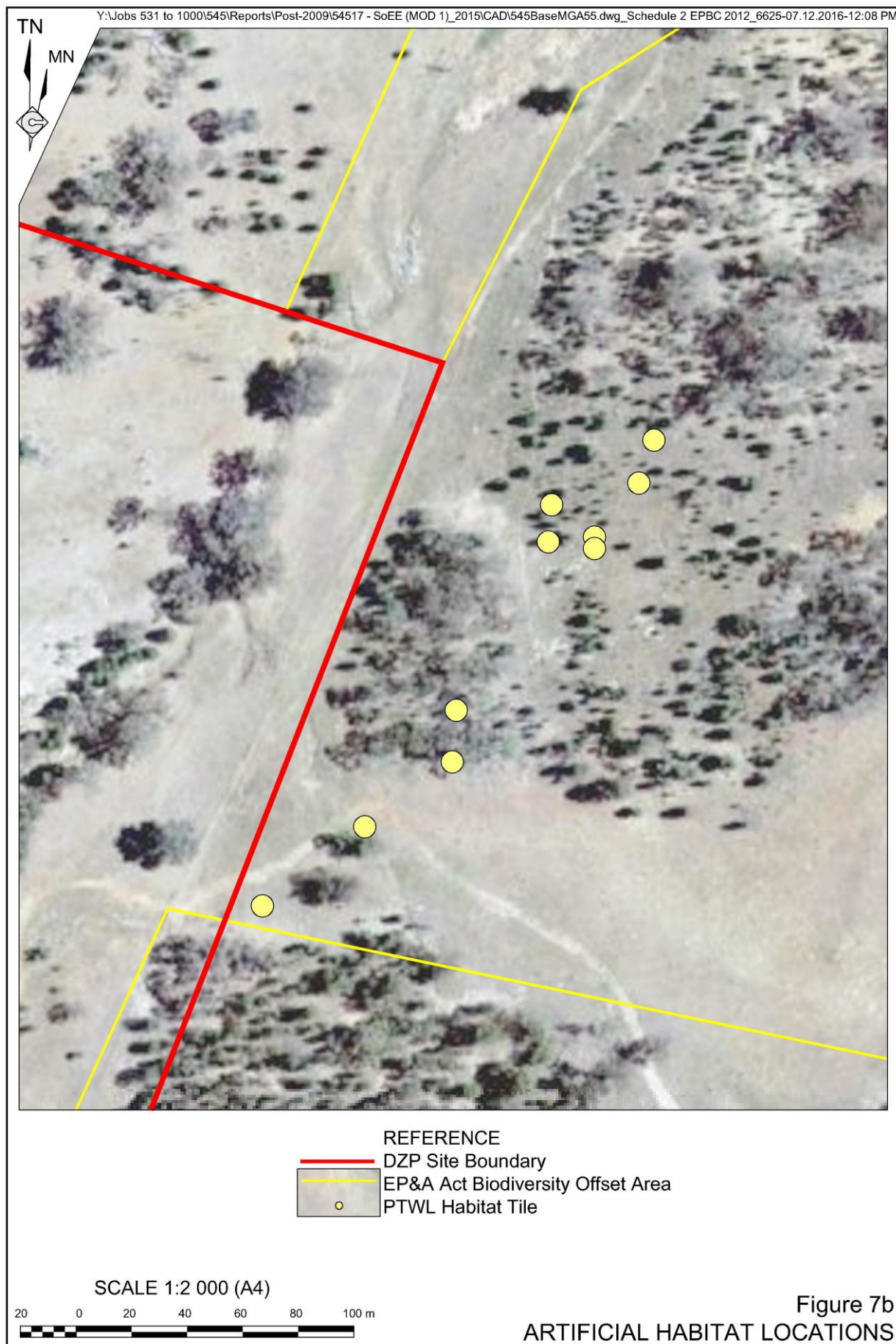
Agricultural livestock was removed from these areas in 2016. Approximately 100 tiles have been laid out in four locations within EPBC Offset Areas A and C (PTWL HAs 2b, 2c, and close to 7 and 8 – see **Figure 7(a to d)** and **Appendix 3**).

- Two sets of tiles in PTWL HA 1 (high quality habitat) on the impact footprint (see **Figure 7a**). These are located in the eastern end (the area to be avoided for mining for 10 years). This area is monitored twice yearly, in autumn and spring in accordance with the EPBC guidelines for detection of the species. The key attributes collected during monitoring include:
  - PTWL presence;
  - presence of ants and their burrows (indicating the abundance if a food supply and burrow habitat);
  - presence of other skinks / lizards and analogues;

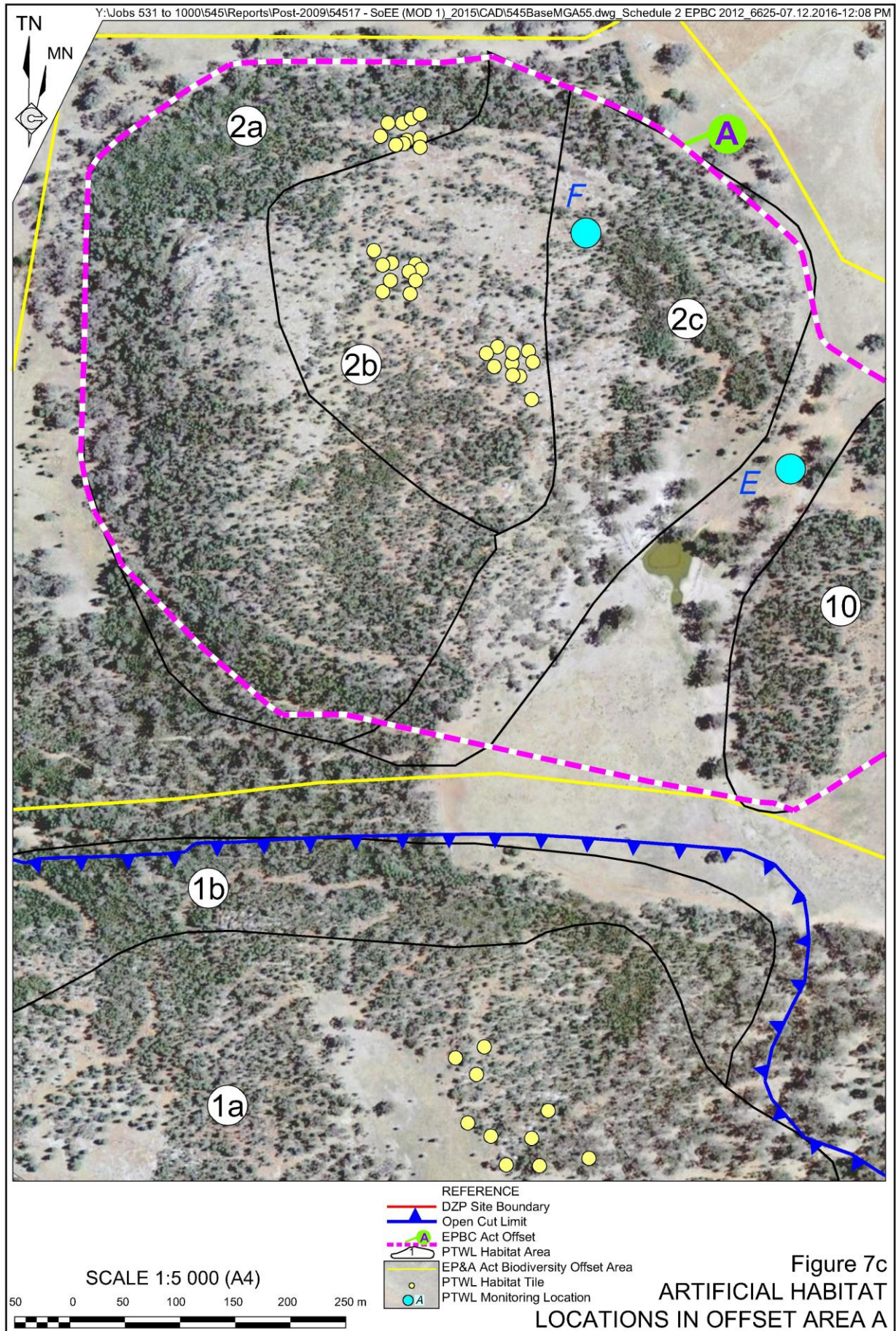




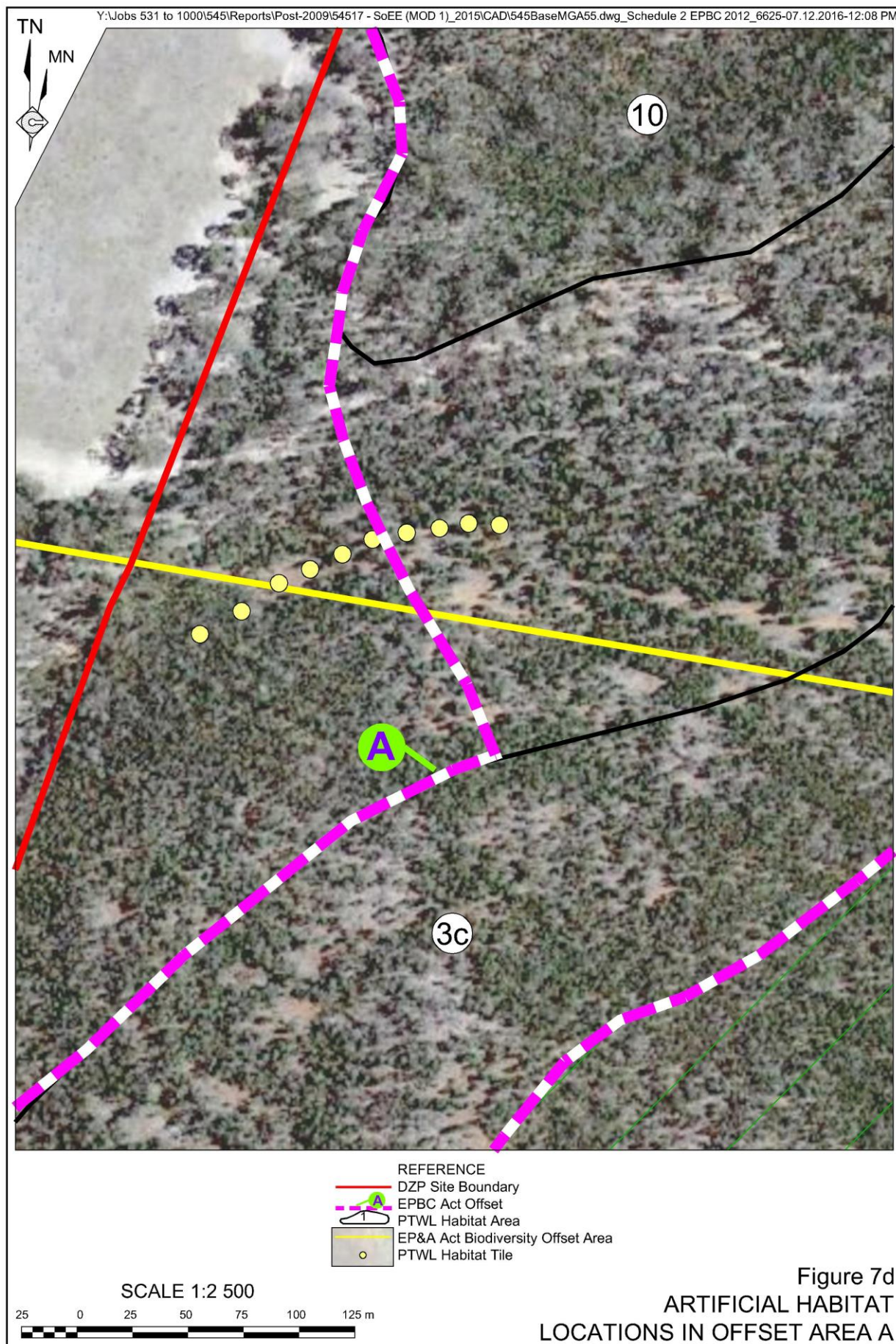
















**Plate 4.1**  
**Typical Artificial Habitat for the  
Pink-tailed Worm-lizard**



**Plate 4.2**  
**Typical Artificial Habitat  
Inspection**

- tile temperature;
- soil moisture (to measure microhabitat); and
- presence of any other suitable indicator species (to indicate a functional micro eco-system in a micro-climate).

This area was chosen as it supports a known population of PTWL in High Quality habitat.

- Three sets in PTWL HA 2 (low, medium and high quality habitat) in EPBC Offset Area A where the same attributes collected as described for PTWL HA 1 are captured (see **Figure 7a**).

Two set of tiles are located in Habitat Area 2c (EPBC Offset Area A) and one is located in Habitat Area 2b (EPBC Offset Area A). These areas will increase one quality class within five years (expect for the high quality area that will maintain this standard).

It is possible that Area 2b will not increase in habitat quality due to the thin skeletal soils, however, the expected gains are expected to be associated with an increased level of ground stratum biodiversity through exclusion of grazing and fire management.

- One set of tiles is located PTWL HA 8 (medium quality habitat) in EPBC Offset Area B (see **Figure 7c**). This area has not been monitored to date but will be monitored once every five years. This frequency of monitoring acknowledges the frequency of monitoring on results has not been established to date.
- Three sets of tiles are located at Habitat Area 6 (high quality habitat) in EPBC Offset Area C (see **Figure 7d**). Two set of tiles are located in Habitat Area 6b and one is located in Habitat Area 6a. This area is only sporadically monitored (once every three events) because it is not known if regularity of tile checks effects detectability of species. These tile areas will be located at least once every three years (six monitoring events).

Two PTWLs have been recorded in the past three years (both with PTWL HA 8 of EPBC Offset Area A). Collectively (the entire artificial tile population), this detection ratio is consistent with expected rates under natural rock (one success for every 300 rocks overturned).

#### 4.4.5.3 Artificial Habitats – Future Placement

In order of priority, artificial habitat will be placed at the following locations within the PTWL Habitat Areas.

- PTWL HA 10 of EPBC Offset Area A (low quality habitat, EPBC score 5/10) – within 6 months of mine infrastructure construction commencement. This is strategically located between three areas of high quality habitat (PTWL HAs 2a / 2b / 2c; 10 and 3c / 3b). It has healthy native grassland with no natural rocks due to agricultural 'rock picking' and no artificial habitat.
- PTWL HAs 5 and 8 (medium quality habitat) and 6 (high quality habitat, EPBC score 6/10) – within 24 months of commencement of construction.

The existing artificial habitat in PTWL HA 1 (impact footprint, EPBC score 9/10) will be removed at the same time as other natural surface rock (Section 4.4.5.1) and relocated to PTWL HA 10. This relocation will occur to other areas in PTWL HA 10 undergo Cypress Pine thinning (Section 4.4.1).

#### 4.5 Translocation of PTWL

The *Policy for the translocation of threatened fauna in NSW* (NPWS 2001) will be followed during PTWL management. Physical translocation is a last resort and focus of management is on passive translocation through habitat quality improvement and removal of surface rock on the impact footprint (refer to the PTWL MP). Passive relocation will occur once this document is approved up to commencement of disturbance. It is anticipated the only PTWL to be physically removed will be those identified during monitoring over the deposit prior to disturbance commencing.

There are three types of translocation processes that may be used either directly or passively at DZP.

- Introducing Pink-tailed Worm-Lizard into an area where it has not previously been found. This is not a desired goal of the program.

- Re-introducing Pink-tailed Worm-Lizard into an area where it used to live but has become locally extinct. This is the joint main focus of the rehabilitation program. Habitat Area 3 is the main relocation site for this activity.
- Supplementing an existing population, by adding new individuals of that species from another area. This is the main joint focus of the rehabilitation program. Habitat Area 2 and Habitat Area 9 is the main relocation site for this activity.

Any PTWL found within the DZP Site during rock relocation will be translocated to Pink-tailed Worm-Lizard Habitat Area 3 and Habitat Area 2. It is important to note that the number of PTWL is expected to be low. Any relocation will be undertaken immediately.

Protocol for translocation following identification within the disturbance footprint is as follows.

- Cease work and contact the Senior Environment Officer (trained in distinguishing PTWL from juvenile brown snake).
- Senior Environment Officer to capture in gloved hands and release under or near a suitable rock.

#### **4.6 Feral and Overabundant Native Species Management**

Feral and overabundant native species control within the EPBC Offset Area will be undertaken as part of a broader pest management program over DZP Site and EP&A Act BOA (refer to the *Biodiversity Management Plan*). The following outlines the strategies to be implemented.

- The feral pig population on Dowd's Hill is estimated to be around 50 animals. AZL has been liaising with LLS on the most efficient and appropriate control methods. A strategy to trap pigs at watering points will be developed and implemented to eliminate pigs from the BOA.
- Increased site security will assist in preventing the re-establishment of pigs by game hunters. Access to the property will be governed by the mines security officers, security fencing, induction processes and on site staff.
- Foxes will be targeted through the burial of 1080 laced baits (as supplied by LLS). Foxes and cats will also be shot by licenced shooters during night spotlighting surveys. Annual monitoring and reporting to LLS will determine the effectiveness of this program.
- Rabbits and hares are relatively uncommon and will be shot on site, and rabbit warrens ripped. Annual monitoring and reporting to LLS will determine the effectiveness of this program.
- Native herbivores will be managed under a NSW OEH Kangaroo Management licence. The NSW Kangaroo Management Program licencing requirements will determine the effectiveness of this program and ensure ethics requirements imbedded within it are adhered to.

## 5. MONITORING AND PERFORMANCE EVALUATION

### 5.1 Monitoring Attainment of PTWL Completion Criteria

PTWL habitat will be monitored for improvement every year against the template developed for the project until the Commonwealth is satisfied that the threat from mining to the local PTWL population is abated. Artificial habitat will consist of tiles to be laid as a group of four spaced between 10m and 25m apart. Not all tiles will be monitored but where recordings will occur, the type and number of animals sheltering, as well as ground temperatures, soil moisture content and presences of ant species and other invertebrates or reptiles will be recorded. Early results in trials to date indicate small vertebrate and invertebrate animals, including ants, spiders, crickets, snails and frogs, are utilising the tiles, especially skinks; and that the microclimate is changed under the tiles.

The monitoring program will involve five key components based on management actions described in **Section 4**. These are:

1. Fencing and signs will be monitored to determine integrity of the structure and compliance with signage policy requirements quarterly.
2. Monitoring of the effectiveness of vegetation (Invasive Native Species - INS) thinning following the Biobanking Assessment Methodology (2014) will take place from Year 2 onwards.
3. Habitat enhancement – native groundcover, mid-storey and upper storey coverage will be measured each year and compared to the local benchmark plots (see **Figure 6**) and regional benchmarks. This will be monitored through 20x20m vegetation plots and 20x50m habitat plots following the Biobanking Assessment Methodology (2014).
4. Habitat enhancement – surface rock and artificial habitat features will be monitored for presence / absence of PTWL, analogue species, ant food species and micro climate data once or twice a year. Monitoring will occur in March and depending on suitable weather conditions as per EPBC detection guidelines for the species, a second round of monitoring will be occurring in October or November. If spring is too hot and dry, then spring monitoring will not occur in October or November. Additional new monitoring sites will be established and maintained over five years, in areas where Cypress Pine thinning will occur (see **Figure 7**). These plots will be established following the Biobanking Assessment Methodology (2014). The number of plots required per vegetation zone managed will follow the Biobanking Assessment Methodology (2014).
5. Feral animal monitoring will occur on an annual basis. These results will inform any future baiting programs. Rabbit populations will be reported on an 'ad hoc' basis, i.e. if the farm staff see a warren or increased rabbit activities during their daily activities. From experience this is more effective than an annual assessment. Similarly, pig populations will be addressed via reports from personnel combined with a regular monitoring program. As the species, may be seasonal in a highly variable seasonal climate then immediate action per sighting is required. More broadly an overarching three-month culling program will be required and the effectiveness of bait uptake will be recorded with site specific sheets. An increase in any population of feral animals will be the trigger for a more intensive response. The first step will be to document the size of the



population (and where), preferred action (and time frame to see an effective result) and what to do if treatment is not effective. The first action will be to contact the LLS to seek further advice.

Monitoring of the local PTWL population is also to be undertaken on at least an annual basis at the locations identified on **Figure 7**. This is described in *Section 5* of the PTWL MP.

## **5.2 Performance Evaluation and adaptive implementation**

A performance evaluation program will be implemented to:

- Improve PTWL habitat quality. Monitoring will be annual until completion criteria is achieved, then at increasingly spaced intervals through to the end of project approval. The monitoring report will include the following.

- A reporting process that evaluates the adequacy of the monitoring program, effectiveness and appropriateness of conservation and enhancement interventions.

This will reflect monitoring requirements against the EPBC detection guidelines for the species and the effectiveness of the monitoring period taking into account climatic factors during the assessment and more broadly over the year.

- A review of timeframes for achieving completion criteria.

This section will focus on achieving vegetation quality benchmarks, what is achievable and within short, medium and long term actions then convert this result into the EPBC score (/10).

- A reviews of risks and implementation of contingency measures.

This section will document what actions on site are a risk to the PTWL population or their habitat and document what has been done about it and how effective it has been.

- Ensure targets for actions and targets for completion and criterion actions as prescribed in this management plan are monitored, evaluated and discussed. Where required additional actions may be proposed or existing actions may be retired.
- Provide completion criteria for the targets for completion and criterion actions.
- Provide details of who will be responsible for implementing and reviewing the actions and monitoring program.

## **5.3 Risk Identification and Management**

A risk identification and management program will be implemented following **Table 9** to ensure risks and triggers are identified and mitigation measures known.

## **5.4 Responsible Parties**

Roles and responsibilities to implement this plan have been provided in **Table 10**.

**Table 9**  
**Performance Targets and Completion Criteria**

Where	Management Action	Management intervention	Due By	Completion Criteria	
BOA	Fencing	Map fencing.	Year 2	Undertake remediation to remove barbed wire	
		Remove redundant fencing.	Year 2	Install security gates and new fences.	
		Gate and fence installation.	Year 3		
		Quarterly fence inspections.	Annual	All quarterly inspections completed and documented.	Any breaches rectified within four weeks.
		Stock management.	Annual	Stock access only following review of DM levels or other benchmarks.	Review monitoring and management protocols.
	Feral and overabundant vertebrate native species	Identify and quantify feral and overabundant native species.	Year 1 and on-going	Feral species eliminated or controlled to satisfaction of LLS.	Implement additional controls in consultation with LLS.
		Feral species baiting and habitat destruction programs implemented.	Year 2, 3 and 6	Overabundant native species numbers controlled to satisfaction of LLS.	
		Feral species shooting and trapping programs.			
		Overabundant native vertebrate species shooting program.			
EPBC Offset Areas	Vegetation thinning and land preparation	Prepare plan for trial.	Year 1	Cypress Pine reduced to density between 1/10m <sup>2</sup> and 1/30m <sup>2</sup> within identified Habitat Enhancement Areas. Retain fauna habitat values provided by Cypress Pine dominated communities. Complete annual monitoring.	Complete additional thinning campaigns.
		Implement phase 1 of thinning trial.	Year 2		
		Extend thinning trial.	Year 3		
		Complete formal Invasive Native Species (INS) Plan.	Year 3		
		Implement Cypress Pine thinning in accordance with INS Plan.	Year 3 (onwards)		
	Native Groundcover	Establish and maintain groundcover, mid-storey and upper storey coverage at benchmark levels.	On-going	Achieve benchmarks nominated in <b>Table 6.</b>	Complete additional / supplementary seeding.
	Pink-tailed Worm-Lizard habitat quality	Improvement of Pink-tailed Worm-Lizard habitat quality.	Annually	Completion of annual monitoring of habitat quality. Demonstration of habitat quality improvement against local or NSW state benchmarks.	Review and update management measures in consultation with DEE, OEH and appropriate experts.
	Surface rock and artificial habitats	Increase the area of occupancy of PTWL.	Year 1 and on-going	Restoring native vegetation to benchmark criteria.	See above.
		Annual/biannual monitoring if weather conditions are suitable.	Annual / biannual	Provision of natural or artificial habitat.	Additional artificial habitat establishment.
	Monitoring and reporting	Prepare and retain annual reports.	Annual	Completion of annual reports.	



**Table 10**  
**Roles and Responsibilities**

<b>Role</b>	<b>Accountability</b>
General Manager NSW	Ensure the resources are available for the implementation of this BOMP. Accountable for the overall environmental performance of the Mine, including the outcomes of this BOMP.
Environment and Community Manager	Ensure that the requirements of this BOMP are effectively implemented. Ensure the results of all monitoring are recorded. Ensure all internal and external reporting requirements are met. Ensure all personnel undertaking works in relation to this management plan are trained and competent. Update the BOMP as required. Undertake/organise, review and analyse all monitoring data.
All Personnel and Contractors	Operate in a manner that minimises risks of incidents to themselves, fellow workers and biodiversity values of the Mine Site. Fully implement the management measures within the BOMP. Report any incidents or events relating to native flora and fauna to the Environment Advisor. Follow any instructions provided by the Environment Advisor regarding biodiversity management.

## 6. CONCLUSION

This document, the PTWL BOMP, has been prepared in accordance with the requirements of *Condition 4* of EPBC 2012/6625 and DoE (2014).

The primary objective for PTWL management will be to achieve and maintain offset condition outcomes. It also describes the actions required to achieve this objective. These actions include:

- The EPBC Offset Area will be protected with a PVP under an in perpetuity on title conservation covenant. This will meet the requirements of both the Commonwealth and State governments.
- Fencing improvements and management.
- Exclusion of stock, contractors, plant and equipment from the EPBC Offset Area except where required for land management and monitoring purposes.
- Habitat enhancement utilising vegetation thinning and land preparation techniques
- Habitat enhancement improving native groundcover.
- Habitat enhancement utilising surface rock and artificial habitat options.
- Translocation of PTWL from impact area to areas with enhanced or artificial habitat
- Management of feral and overabundant native species.
- Monitoring and reporting.

Each of these actions will be evaluated against relevant performance targets and assigned to various parties for implementation. This will ensure long-term conservation of the 'Toongi' population of the PTWL.

## 7. REFERENCES

- Australian Government Department of the Environment. (2014). *Environmental Management Plan Guidelines*. ACT: Australian Government Department of the Environment.
- Biosphere Environmental Consultants P/L. (2013). *Plan of Management for Pink-tailed Worm-lizard Aprasia parapulchella: Dubbo Zirconia Project, Dubbo NSW*. Dubbo: Biosphere.
- GCNRC. (2002a). *Flora study of the Proposed Dubbo Zirconia Application Area, Toongi via Dubbo*. Dubbo: Geoff Cunningham Natural Resources Consultants.
- GCNRC. (2002b). *Flora study of the Proposed Dubbo Zirconia Application Area Railway Reserve, Toongi via Dubbo*. Dubbo: Geoff Cunningham Natural Resources Consultants.
- GCNRC. (2002c). *Flora study of the Proposed Dubbo Zirconia Application Area, Toongi via Dubbo. Proposed Water Pipeline Route*. Dubbo: Geoff Cunningham Natural Resources Consultants.
- NPWS. (2001). *Policy for the translocation of threatened fauna in NSW*. Hurstville: National Parks and Wildlife Service.
- OzArk EHM. (2013). *Terrestrial Ecology Assessment, report prepared for Dubbo Zirconia Project Environmental Impact Statement*. Dubbo: OzArk EHM.

# Appendix 1

## Habitat Scoring Template

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### Pink-tailed Worm-Lizard Habitat Scoring Template

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of <i>A. parapulchella</i> is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. <i>Record of Presence</i> are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
	Well-Draining Soil	Moderate Slope Present = 1	/1
Sandy Loam = 2		/2	
Sandy Clay Loam = 1			
<i>A. parapulchella</i> prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	/3
<40% Canopy Coverage = 2			
<20% Canopy Coverage = 3			
A high diversity and abundance of native grasses such as Kangaroo Grass ( <i>Themeda australis</i> ) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991.	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	/3
>50% Coverage or > 6 grass species (20 x 20 Area) = 2			
>75% Coverage or > 10 grass species (20 x 20 Area) = 3			
Surface rocks are believed to be important for thermoregulation of <i>A. parapulchella</i> (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992).	Loose Surface Rock <sup>1</sup>	No suitable rocks present = 0	/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per 10m <sup>2</sup> ) = 3	
		6-10 suitable rocks present (per 10m <sup>2</sup> ) = 5	
The occurrence of <i>A. parapulchella</i> appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that <i>A. parapulchella</i> is sometimes found where the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils.	Underlying Geology	Alluvial = 0	/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of <i>A. parapulchella</i> consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011).	Presence of ant nests <sup>2</sup>	Ant nests absent = 0	/1
		Ant nests present = 1	
Total			/25
Note 1: Suitable surface rocks are those roughly dinner plate in size which are readily turned over by hand			
Note 2: The importance of ants as a feed source for the <i>A. parapulchella</i> is acknowledged; however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurrence of <i>A. parapulchella</i> are likely to similarly influence the ant species or collection of ant species on which <i>A. parapulchella</i> feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting			

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# Appendix 2

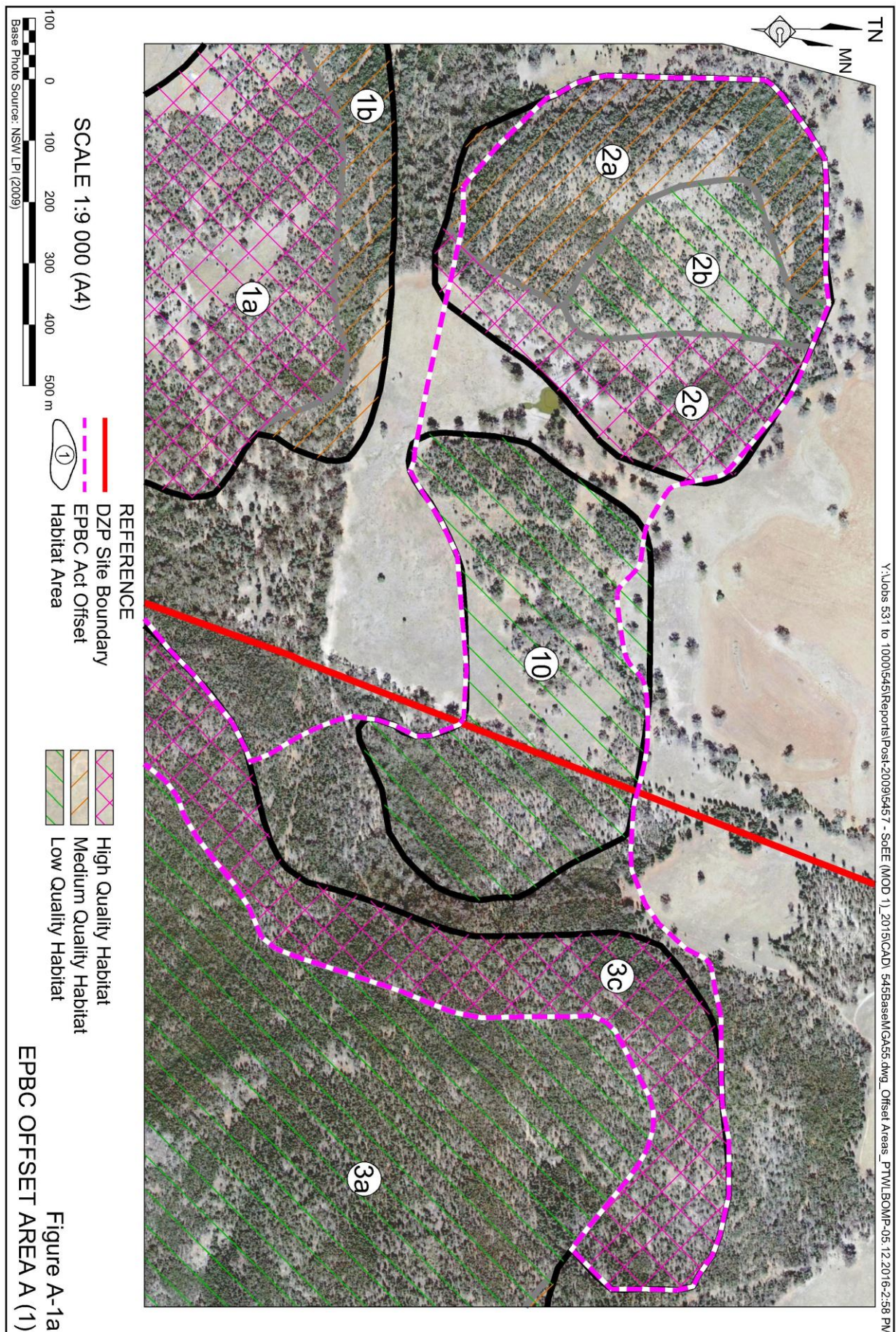
## EPBC Offset Habitat Areas

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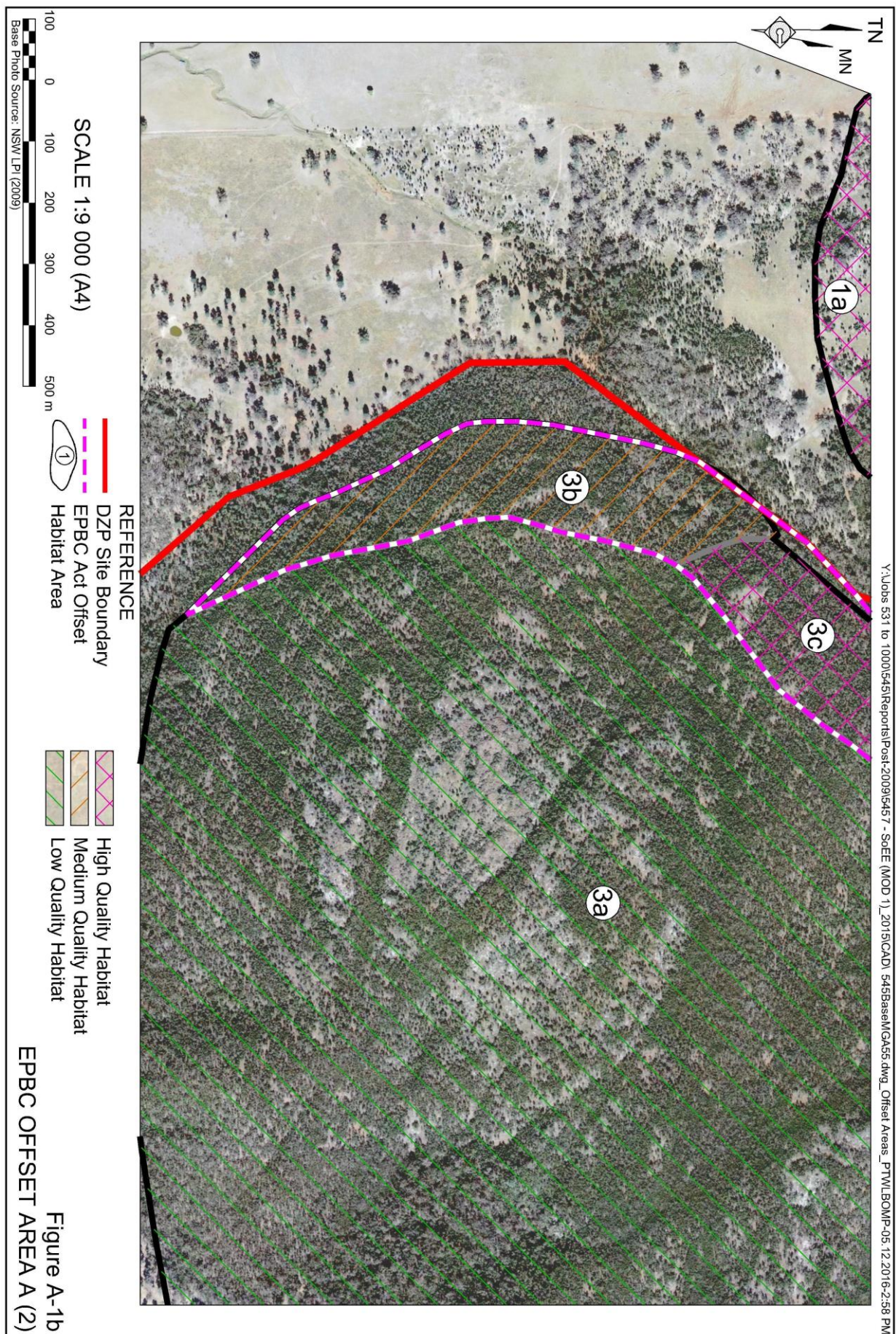
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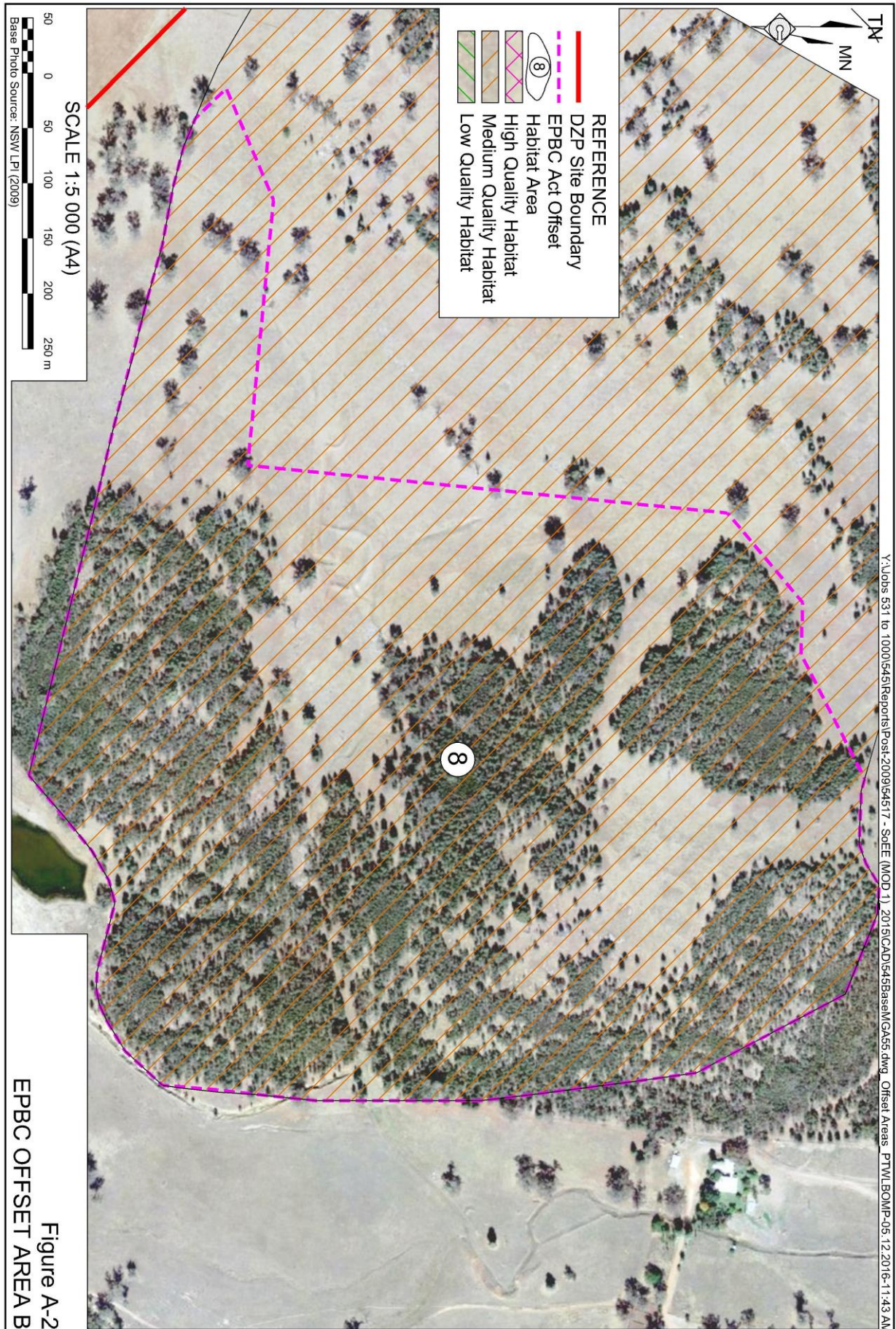




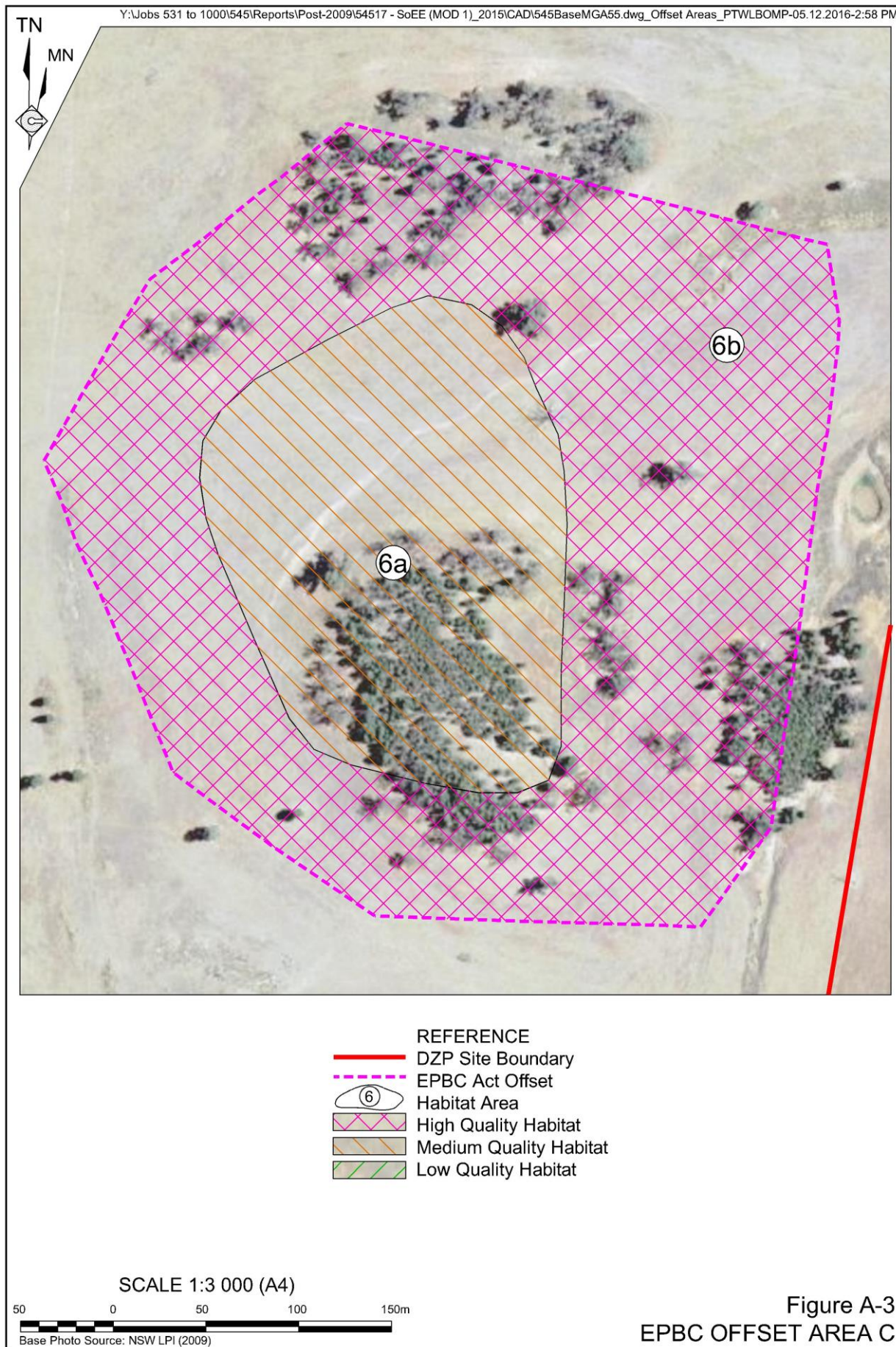




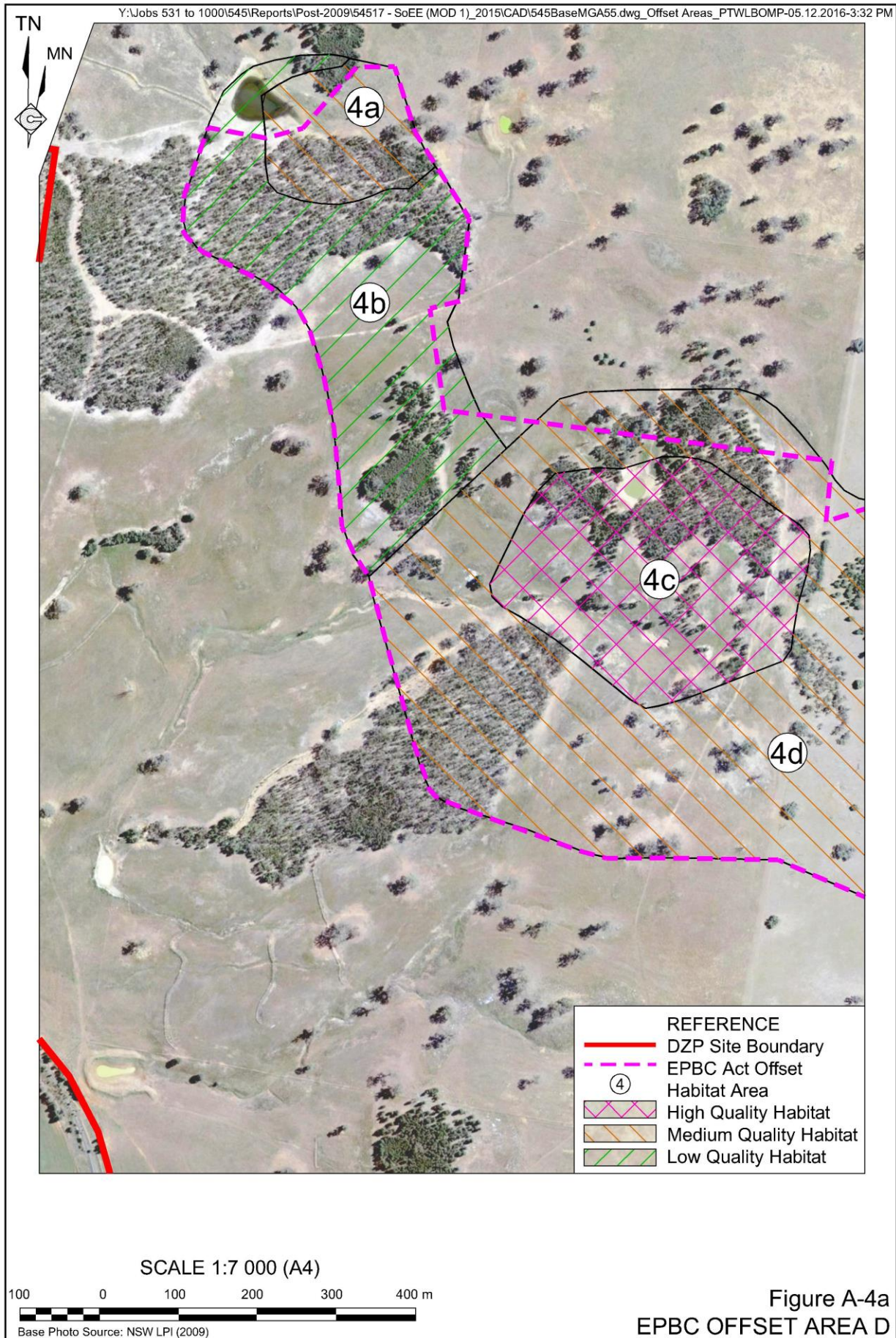




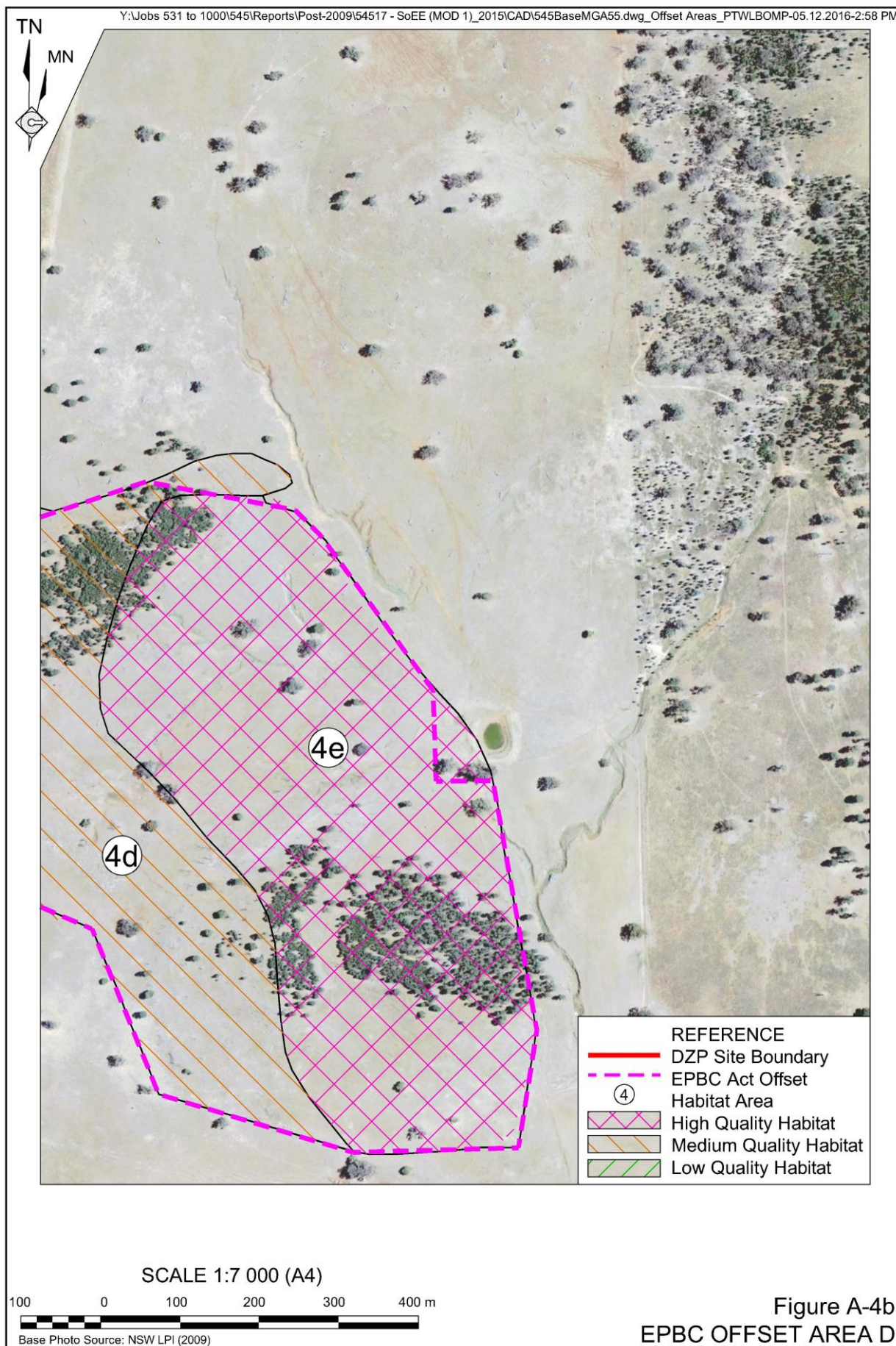




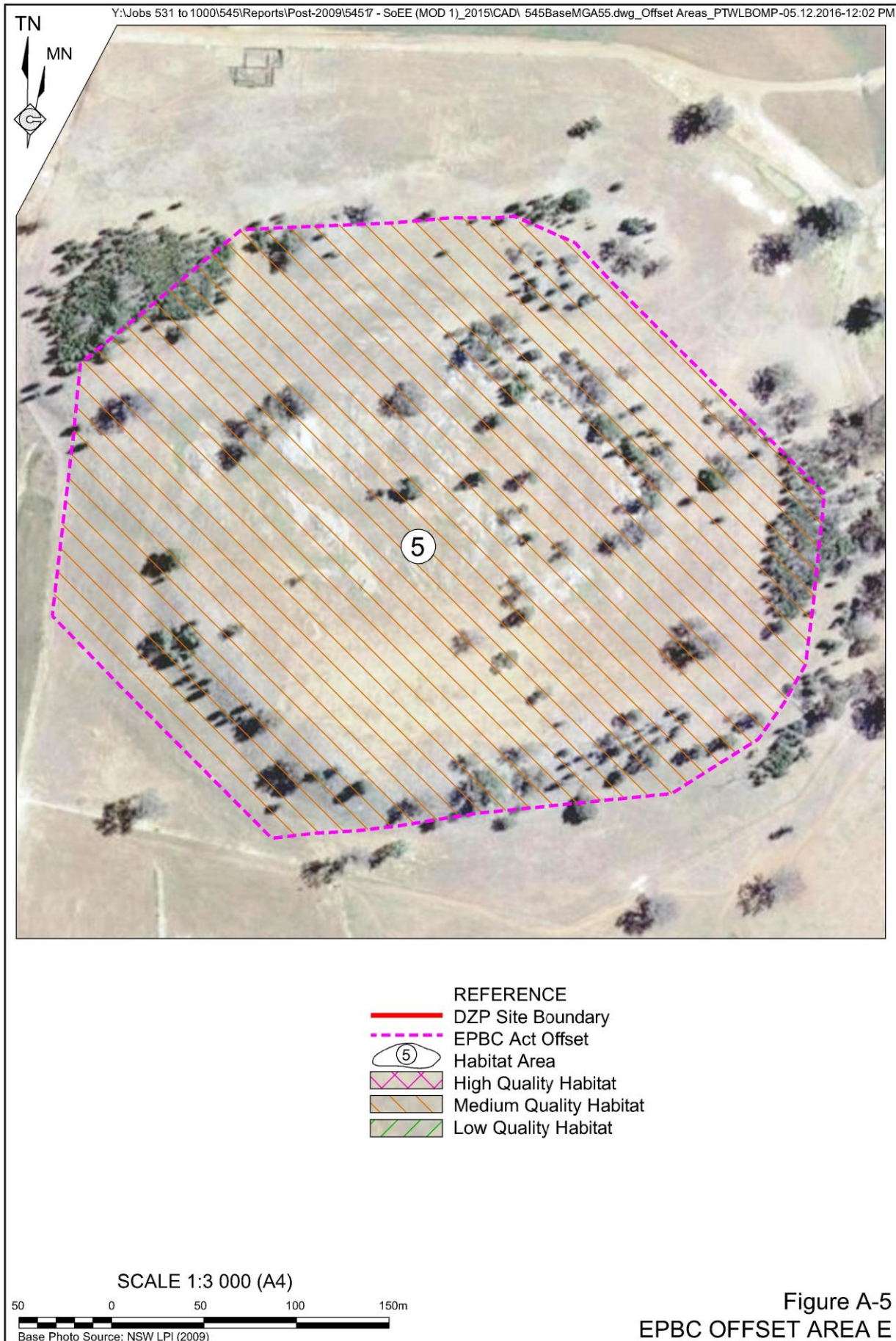












**Figure A-5**  
**EPBC OFFSET AREA E**

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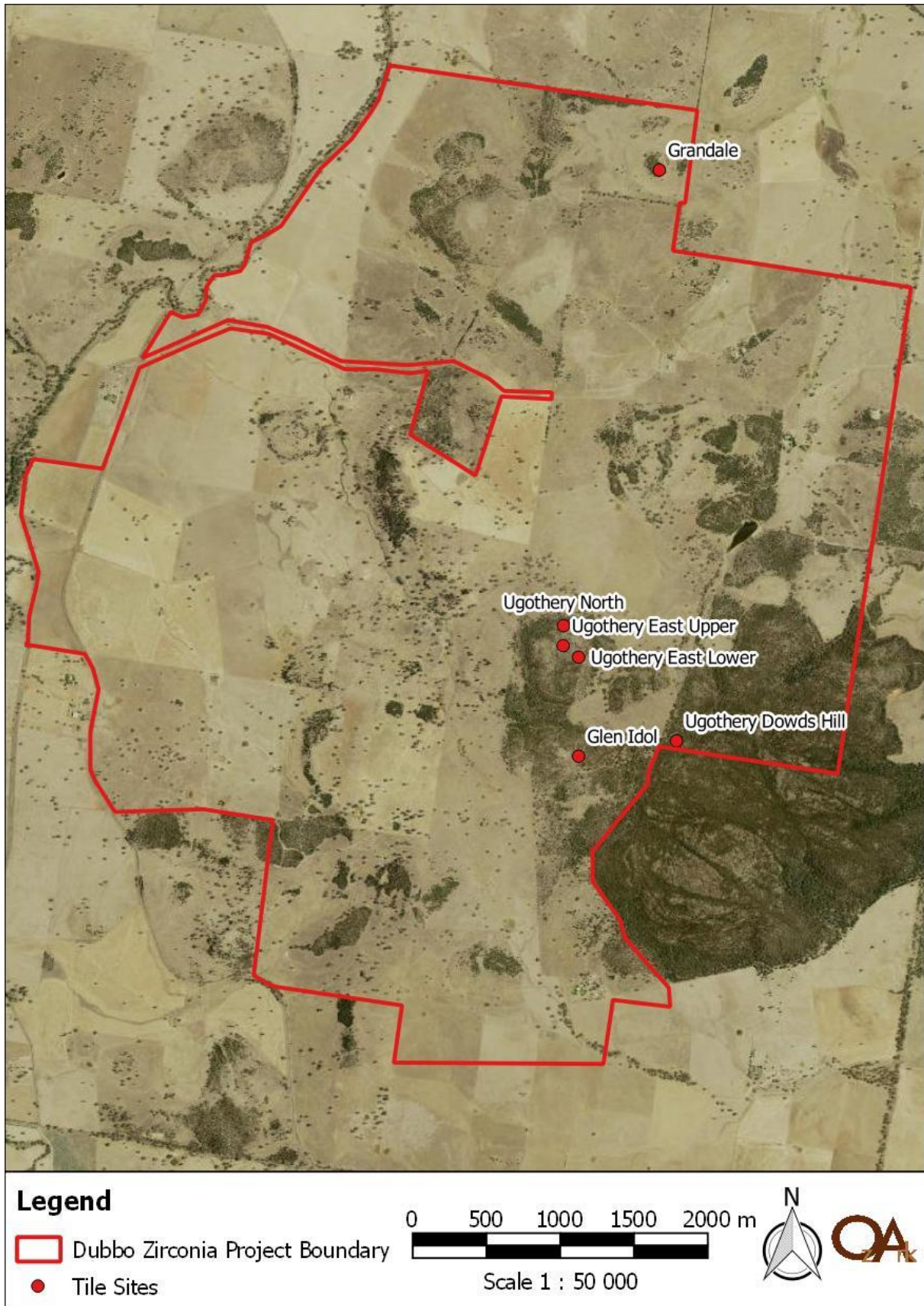


# Appendix 3

## Survey and Tile Site Locations

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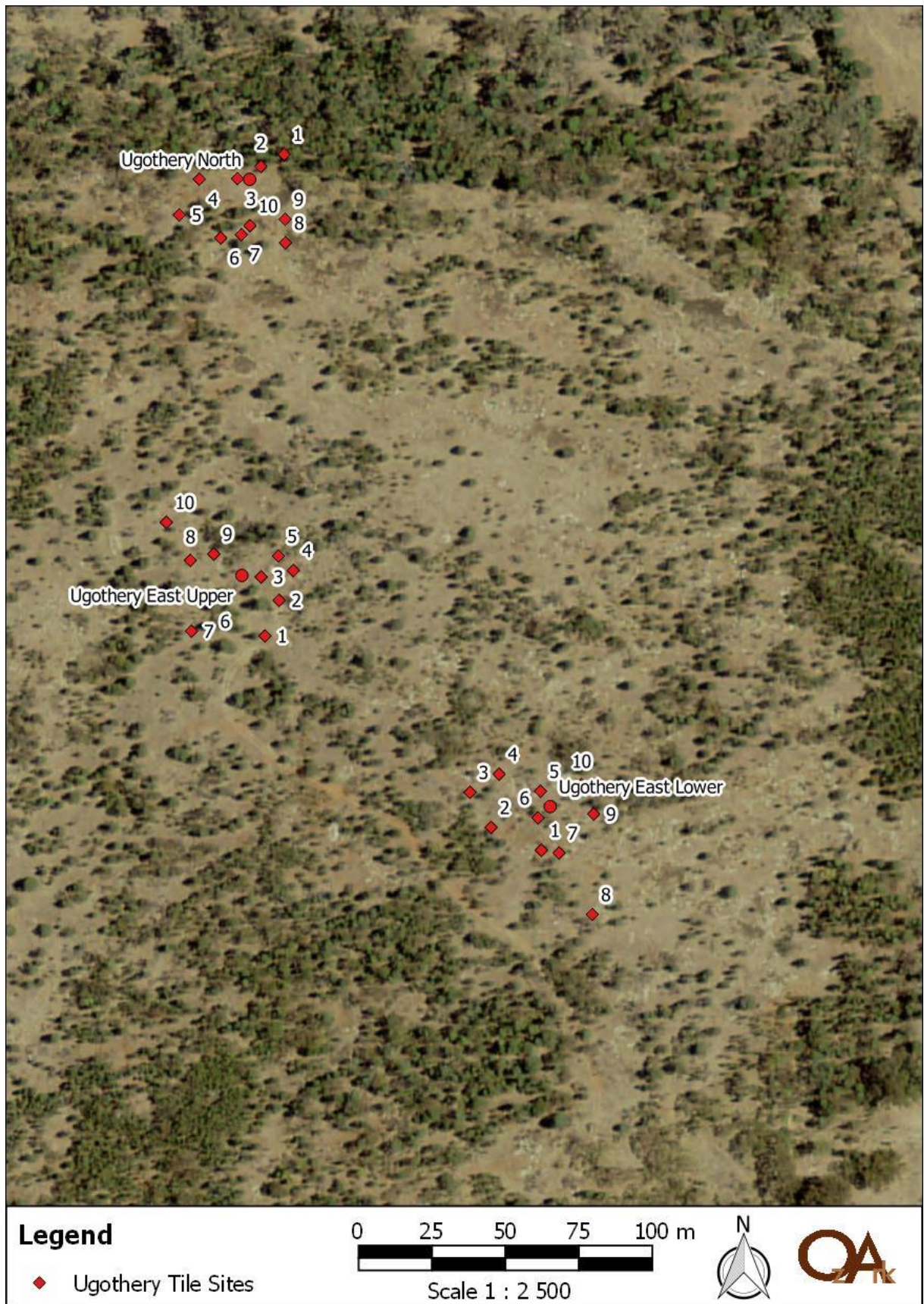














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