

FEBRUARY 2019



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**ADVANCED ENERGY RESOURCES
PORT GREGORY WIND AND SOLAR FARM PROJECT
CLEARING PERMIT APPLICATION**

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TABLE OF CONTENTS

1	RELEVANT FORMS	VII
1.1	APPLICATION FORM.....	VII
1.2	LETTERS OF AUTHORITY	VIII
1.3	FORM C3 (CREDIT CARD PAYMENT)	IX
1.4	CLEARING APPLICATION CHECKLIST	X
2	INTRODUCTION.....	1
2.1	OWNERSHIP	1
2.2	LOCATION	2
3	DESCRIPTION OF PROPOSED ACTIVITIES	7
4	SITE SURVEY.....	9
5	EXISTING ENVIRONMENT	9
5.1	CLIMATE	9
5.2	IBRA 7 BIOGEOGRAPHIC SUBREGIONS	10
5.3	GEOLOGY AND SOILS	10
5.4	SURFACE AND GROUNDWATER.....	11
5.5	LAND USE.....	11
6	VEGETATION AND FLORA	14
6.1	PRE-EUROPEAN VEGETATION	14
6.2	VEGETATION ASSOCIATIONS AND MAPPING	16
6.3	FLORA OF CONSERVATION SIGNIFICANCE	20
6.4	INTRODUCED PLANT SPECIES.....	21
7	FAUNA AND FAUNA HABITATS	23
7.1	FAUNA HABITATS.....	23
7.2	FAUNA OF CONSERVATION SIGNIFICANCE.....	23
8	ENVIRONMENTAL MANAGEMENT AND IMPACTS.....	24
9	STATEMENT ADDRESSING THE TEN CLEARING PRINCIPLES.....	26
10	REFERENCES.....	30

TABLES

Table 2.1	Proponent details.....	2
Table 2.2	Property Details	2
Table 3.1	Project summary	7
Table 6.1	Shepherd vegetation associations at the clearing envelope.....	14

Table 6.2 Mapped vegetation units	16
Table 6.3 Mapped vegetation units and areas	17
Table 6.4 Threatened flora recorded within 20 kms of the clearing envelope	20
Table 7.1 Relevant fauna of conservation significance recorded within 20 kms of the clearing envelope	23
Table 8.1 Indicative vegetation types to be cleared	24

FIGURES

Figure 2-1 Regional Location.....	3
Figure 2-2 Study Area.....	4
Figure 2-3 Clearing Envelope	5
Figure 2-4 Remnant Vegetation	6
Figure 3-1 Indicative clearing footprint.....	8
Figure 5-1 Rainfall and temperature data for Kalbarri BOM weather station.....	9
Figure 5-2 IBRA 7 subregions	12
Figure 5-3 Soil units of the study area	13
Figure 6-1 Pre-European vegetation.....	15
Figure 6-2 Site Vegetation Mapping	18
Figure 6-3 Vegetation Condition Mapping	19
Figure 6-4 Locations of Threatened flora	22

Acronyms and Definitions

AHD	Australian Height Datum
ARI	Average Recurrence Interval
ARR	Australian Rainfall and Runoff
BAM Act	<i>Biosecurity and Agriculture Management Act 2007</i>
BC Act	<i>Biodiversity Conservation Act 2016</i>
bgl	Below ground level
BIF	Banded Ironstone Formation
BOM	Bureau of Meteorology
CALM	Department of Conservation and Land Management (now DBCA)
CAMBA	China–Australia Migratory Bird Agreement
Clearing Envelope	The outer extent of the area within which proposed clearing is to take place.
cm	Centimetre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAFWA	Department of Agriculture and Food Western Australia
DBCA	Department of Biodiversity, Conservation and Attractions
DCM	Dumped cubic metres
DEC	Department of Environment and Conservation (now DBCA)
DWER	Department of Water and Environmental Regulation (previous DER and DoW)
Disturbed	Area where vegetation has been cleared and/or topsoil (surface cover) removed
DMIRS	Department of Mines, Industry, Regulation and Safety
DMP	Department of Mines and Petroleum (now DMIRS)
DoEE	Department of the Environment and Energy (Previously DoE and DSEWPaC)
DoW	Department of Water (now DWER)
DPaW	Department of Parks and Wildlife (now DBCA)
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities (now DoEE)
EC	Electrical Conductivity
Environmental impact	Any change to the environment wholly or partially resulting from a proponent's activities
EP Act	<i>Environment Protection Act 1986</i>
EPA	Environment Protection Authority
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ESA	Environmentally Sensitive Area

ESCAVI	Executive Steering Committee for Australian Vegetation Information
GDE	Groundwater-Dependant Ecosystem
gm	Micrometres
ha	Hectare
IA	International Agreement
IBRA	Interim Biogeographic Regionalisation for Australia
ICE	Incidence-based Coverage Estimators
IFD	Intensity-Frequency-Duration
IUCN	International Union for Conservation of Nature
JAMBA	Japan–Australia Migratory Bird Agreement
km	Kilometres
L	Litres
LOM	Life of Mine
m	Metres
mm	Millimetres
MRF	Mining Rehabilitation Fund
mRL	Metres relative level
Mt	Million tonnes
Mtpa	Million tonnes per annum
NVCP	Native Vegetation Clearing Permit
NVIS	National Vegetation Information System
PEC	Priority Ecological Community
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
PMST	Protected Matters Search Tool
RIFM	Regional Index Flood Frequency Method
RL	Relative level. Vertical distance between a survey point and the adopted level datum, usually mean sea level
ROKAMBA	Republic of Korea–Australia Migratory Bird Agreement
ROM	Run of Mine pad
SAC	Species accumulation curve
SRE	Short-range Endemic
t	Tonnes
TDS	Total Dissolved Solids
TEC	Threatened Ecological Community
The Project	Port Gregory Wind and Solar Farm Project
TP List	Threatened and Priority Flora List

tpa	Tonnes per annum
TPFL	Threatened and Priority Flora database
TPFR	Threatened and Priority Flora Report form
WA	Western Australia
WAHERB	Western Australian Herbarium Specimen Database
WAOL	Western Australian Organism List
WC Act	<i>Wildlife Conservation Act 1950</i>
WONS	Weeds of National Significance
WRL	Waste Rock Landform

1 RELEVANT FORMS

1.1 APPLICATION FORM

1.2 LETTERS OF AUTHORITY

1.3 FORM C3 (CREDIT CARD PAYMENT)

2 INTRODUCTION

Advanced Energy Resources Pty Ltd (AER) was founded in 2006 as part of the Castelli Group. AER is a customer-focused electricity generator and retailer providing fit-for-purpose electricity retail products to large and small use customers, as well as power generation infrastructure. AER owns and operates a portfolio of renewable energy generators including the 2.4 Megawatt Mt Barker wind farm.

AER is planning to construct an \$8 million, 3 Megawatt wind and solar farm at Port Gregory (the project), approximately 42 km south of Kalbarri, for GMA Garnet Group (GMA) (Figure 2-1).

GMA began mining sand for garnet near Port Gregory 30 years ago and have since developed the project into the most advanced garnet mining and processing operation in the world. Garnet is used as an abrasive in sand paper, sand-blasting and water cutting.

The project will be the first grid-connected wind and solar farm with battery storage in Western Australia and will supply almost 70 per cent of the mine's electricity requirements, allowing GMA Garnet to reduce its carbon footprint by about 5,000 tonnes of carbon dioxide a year.

Construction of the wind and solar farm itself will not require clearing of native vegetation. However, approximately 2.7 km of the powerline from the wind and solar farm to the GMA mine traverses farmland that includes patches of native vegetation.

This document has been prepared by *ecologia* Environmental Consultants (*ecologia*) on behalf of AER for the project. The purpose of this report is to act as a supporting document for a Clearing Permit Application to gain approval for the clearing of approximately 2.7 ha of native vegetation to allow for the construction of a powerline from the wind and solar farm to the GMA minesite, and an area to construct a battery complex at the minesite where the powerline terminates (Figure 2-2).

An application for a new Clearing Permit (Purpose Permit) is hereby submitted to the Department of Water and Environmental Regulation (DWER) by AER for the Port Gregory Wind and Solar Farm Project in conformance with the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (clearing regulations) under the *Environmental Protection Act 1986* (EP Act).

The clearing envelope (Figure 2-3) considered consists of rural agricultural land of approximately 69.4 ha in size. The majority of this area consists of farmland of exotic pasture grasses and scattered Acacias and is therefore not considered native vegetation. However, patches of remnant native vegetation occur within the clearing envelope totalling 31.3 ha as well as rehabilitated area of 5.8 ha (Figure 2-4).

Key terms used within this document are:

- Clearing Envelope: The outer extent of the area (69.4 ha) within which the proposed clearing is to take place (Figure 2-3). Also equates to an 'application area'.
- Indicative Clearing Footprint: Proposed footprint of 4.81 ha, of which 2.73 ha consists of native vegetation that requires clearing. That is, the plan showing the indicative location of the proposed powerline and battery complex and the associated likely clearing required (Figure 3-1).

2.1 OWNERSHIP

The proponent of the Port Gregory wind and solar farm project is Advanced Energy Resources Pty Ltd, a subsidiary of the Castelli Group. Proponent details are provided in Table 2.1.

Table 2.1 Proponent details

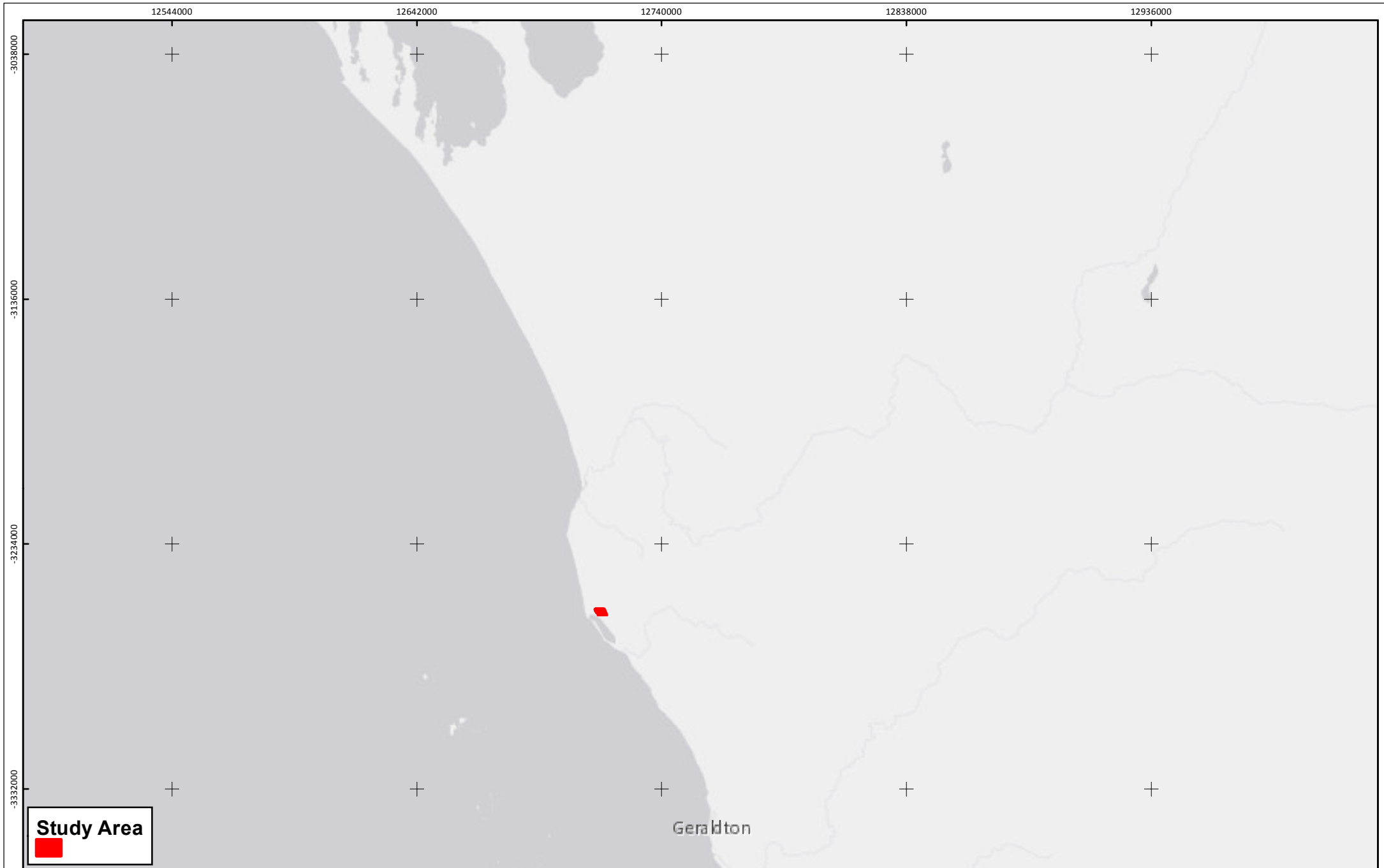
Proponent Details	
Company Name:	Advanced Energy Resources Pty Ltd (AER)
ABN:	93 115 008 869
Address:	88 Tweeddale Rd, Applecross Western Australia 6153
Postal Address:	88 Tweeddale Rd, Applecross Western Australia 6153
Key Contact:	Luca Castelli Director Advanced Energy Resources Pty Ltd (AER) 88 Tweeddale Rd, Applecross Western Australia 6153 9364 0400 lucacastelli@castelligroup.com.au

2.2 LOCATION

The Project is located to the east of George Grey Drive 10 km north of Port Gregory and 42 km south of Kalbarri within the Shire of Northampton (Figure 2-1). The study area (and clearing envelope) is located on just one freehold property (Victoria Location 6687 and Portion of Victoria Location 6882) (Figure 2-2) (Table 2.2) that also includes the GMA mine.

Table 2.2 Property Details

Property Details	
Victoria Location 6687 and portion of Victoria Location 6882	2085.76 ha



Study Area



ecologia
ENVIRONMENT

Drawn: XX Project ID: XXXX
Date: XX Month 20## A4



0 15 30
Kilometers
Scale: 1:1,927,966
MGA94 (Zone 50)

Regional Location

Figure:

2.1


-3264000



Cadastre

Study Area



 Clearing Envelope

ecologia
ENVIRONMENT

Drawn: XX Project ID: XXXX
Date: XX Month 20## A4



0 0.15 0.3
Kilometers
Scale: 1:17,368
MGA94 (Zone 50)

Clearing Envelope

Figure:

2.3



ecologia
ENVIRONMENT

Drawn: XX Project ID: XXXX
Date: XX Month 20## A4



0 0.1 0.2
Kilometers
Scale: 1:10,487
MGA94 (Zone 50)

Remnant Vegetation within the Clearing Envelope

Figure:

2.4

3 DESCRIPTION OF PROPOSED ACTIVITIES

A Project summary is supplied as Table 3.1. AER is planning to construct a 3-megawatt wind and solar farm at Port Gregory for the GMA minesite. The project will supply almost 70 per cent of the mine's electricity requirements, allowing GMA Garnet to reduce its carbon footprint by about 5,000 tonnes of carbon dioxide a year.

Construction of the wind and solar farm itself will not require clearing of native vegetation. However, approximately 2.7 km of the powerline from the wind and solar farm to the GMA Port Gregory Mine traverses farmland that includes patches of native vegetation as does an area to construct a battery complex at the minesite. An indicative clearing footprint indicative is provided as Figure 3-1. Up to 2.8 ha of native vegetation requires clearing, to support an access track, with a maximum width of 12 m, and an area to construct a battery complex. Clearing of native vegetation incorporates approximately 2.1 ha of native vegetation and 0.73 ha of rehabilitated land.

Table 3.1 Project summary

Project Details	
Project Descriptor:	Port Gregory Wind and Solar Farm Project
Native vegetation clearing	Clearing of up to 2.8 ha of native vegetation
Description:	Construction of: <ul style="list-style-type: none"> • overhead powerlines; • access track; and • battery complex
Project Commencement Date:	March 2019
Estimated Completion Date:	December 2019

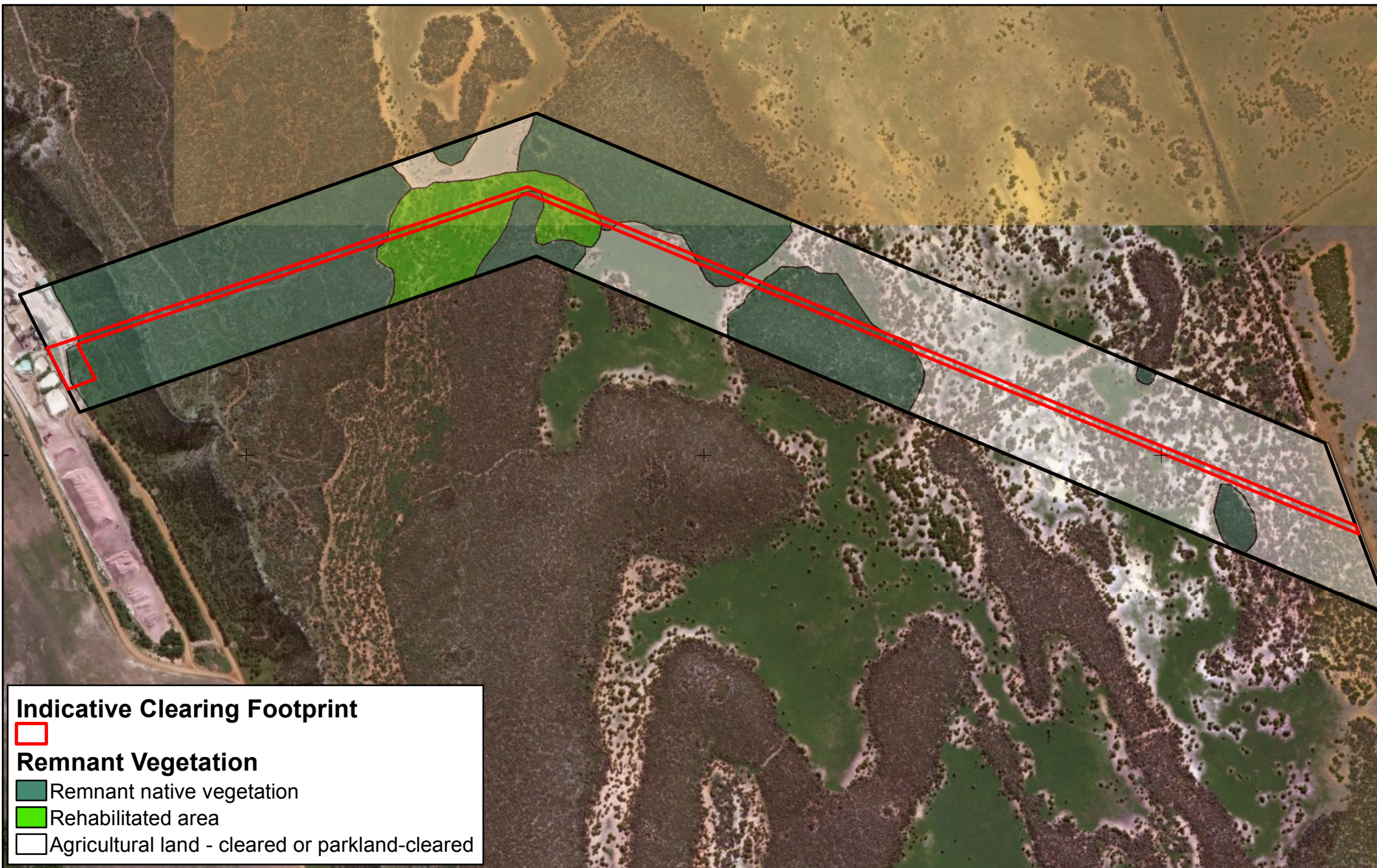
12715000

12716000

12717000

-3261000


-3262000



Indicative Clearing Footprint



Remnant Vegetation

 Remnant native vegetation

 Rehabilitated area

 Agricultural land - cleared or parkland-cleared

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ENVIRONMENT



0 0.1 0.2
Kilometers
Scale: 1:10,733
MGA94 (Zone 50)

Drawn: XX Project ID: XXXX
Date: XX Month 20## A4

Indicative Clearing Footprint

Figure:

3.1

4 SITE SURVEY

A reconnaissance site survey of the clearing envelope was undertaken by *ecologia* Principal Scientist Shaun Grein on 17th October 2017. A survey of an adjacent area of 29 ha was undertaken by GHD (2016) to support a native vegetation clearing permit application (Purpose Permit) that was granted to GMA Garnet Pty Ltd in January 2017 (DMP 2017).

Prior to the site survey a review of background environmental information for the study area was conducted including previous flora, vegetation, and fauna surveys, climate (BoM), biogeography (IBRA 7) (DSEWPaC 2013), soils (Northcote *et al.* 1960-1968), and pre-European vegetation (Shepherd *et al.* 2001).

A search and review of all available relevant reports in the vicinity of the study area was undertaken, as well as searches of mapping resources and databases to determine conservation significant species and/or communities previously recorded within the clearing envelope or vicinity.

- DBCA NatureMap records for flora and fauna including species of conservation significance
- DBCA Threatened and Priority flora Database
- Threatened and Priority flora List (TPList)
- EPBC Act Protected Matters Database

All results were reviewed on the basis of the likelihood of occurrence of relevant conservation significant species occurring within the clearing envelope with consideration given to previous records, habitat requirements, and landform.

5 EXISTING ENVIRONMENT

5.1 CLIMATE

Based on data from the nearest BOM weather station at Kalbarri (Station No. 8251) (BOM 2017), the clearing envelope experiences a dry Mediterranean climate with a hot dry period from December to March and a mild winter from June to August (Figure 5-1). Average annual precipitation is 347 mm.

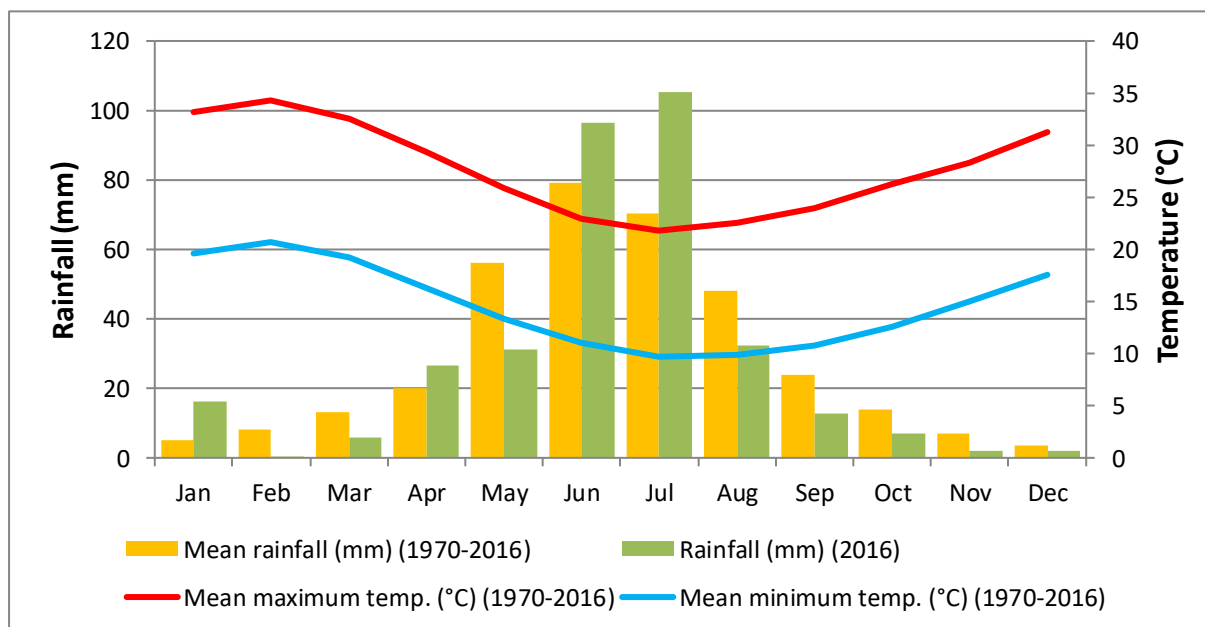


Figure 5-1 Rainfall and temperature data for Kalbarri BOM weather station

5.2 IBRA 7 BIOGEOGRAPHIC SUBREGIONS

The Interim Biogeographic Regionalisation for Australia (IBRA) (Version 7) classifies the Australian continent into regions (bioregions) of similar geology, landform, vegetation, fauna and climate characteristics, and has currently 89 recognised regions (DSEWPaC 2012). The clearing envelope is located within the Geraldton Sandplains bioregion which is comprised of two subregions: GES01 (Geraldton Hills) and GES02 (Lesueur Sandplain). The study area and clearing envelope fall entirely within GES01: Geraldton Hills (Figure 5-2).

The Geraldton Hills subregion incorporates the southern end of the Carnarvon Basin and the northern end of the Perth Basin, and experiences a warm semi-arid to Mediterranean climate (Desmond and Chant 2003). The vegetation of the Geraldton Hills is described broadly by Desmond and Chant (2003) (p. 265) as “sand heaths with emergent *Banksia* and *Actinostrobus*; York Gum woodlands on alluvial plains; proteaceous heath and *Acacia* scrubs on limestones (depending on depth of the coastal-sand mantle); and low closed forest of *Acacia rostellifera* on alluvial plains.”.

5.3 GEOLOGY AND SOILS

Geologically, the Geraldton Hills subregion comprises exposed areas of Permian/Silurian siltstone and Jurassic sandstones, mostly overlain by sand plains, alluvial plains and coastal limestones. Sandy earths of an extensive, undulating, lateritic sandplain mantling Permian to Cretaceous strata, underlain by Phanerozoic sediments also occur in the region (Desmond and Chant 2003).

The clearing envelope is located on the Tamala Limestone Unit which overlies the Tumblagooda Sandstone Unit of the Perth Basin (Playford *et al.* 1976). The landforms of the application area are part of the Tamala North 1 subsystem described as undulating rises and swales associated with coastal parabolic dunes, featuring some limestone outcrop. The site comprises an undulating sandplain in the east with a steep slope and exposed limestone outcropping in the west.



Plate 5-1: Undulating sandplain in the east (left) and steep slope with exposed limestone outcropping (right) in the west (looking east from the GMA Garnet Minesite)

The clearing envelope lies within the Kalbarri Sandplain zone of the Carnarvon soil-landscape province described by Tille (2006). The sandplain soils consist of dissected sandplains of Pale, Yellow, and Red deep sands, and some Pale shallow sands and exposed rock (Tille 2006). Two soil units have been mapped within the clearing envelope using the Digital Atlas of Australian Soils (Northcote *et al.* 1960-1968). Ca28 encompasses the vast majority of the clearing envelope with a minor proportion of in the B26 in the southeast corner (Figure 5-3):

- Ca28: Gently undulating sand plain with occasional low lateritic residuals. Chief soils are leached sands (Uc2.21) and yellow siliceous sands (Uc1.22).
- B26: Undulating dune landscape underlain by aeolianite which is exposed in places. Chief soils are siliceous sands (Uc1.22) with some shallow grey-brown sandy soils (Uc6.11). Other (Uc) soils such as (Uc4.22) are also likely.

5.4 SURFACE AND GROUNDWATER

There are no drainage channels, watercourses or wetlands within the clearing envelope, however, the Hutt Lagoon located approximately 2.5 south of the clearing envelope is a nationally important wetland (DoEE 2017). Surface drainage to the west and is seasonal, with highly variable flows, generally peaking during July-August (BoM 2017).

The clearing envelope is not located within a Public Drinking Water Source Area (PDWSA). Depth to groundwater at the site is unknown due to a lack of suitable bores or piezometers, but groundwater salinity of the vicinity is between 1,000 - 3,000 milligrams per litre TDS.

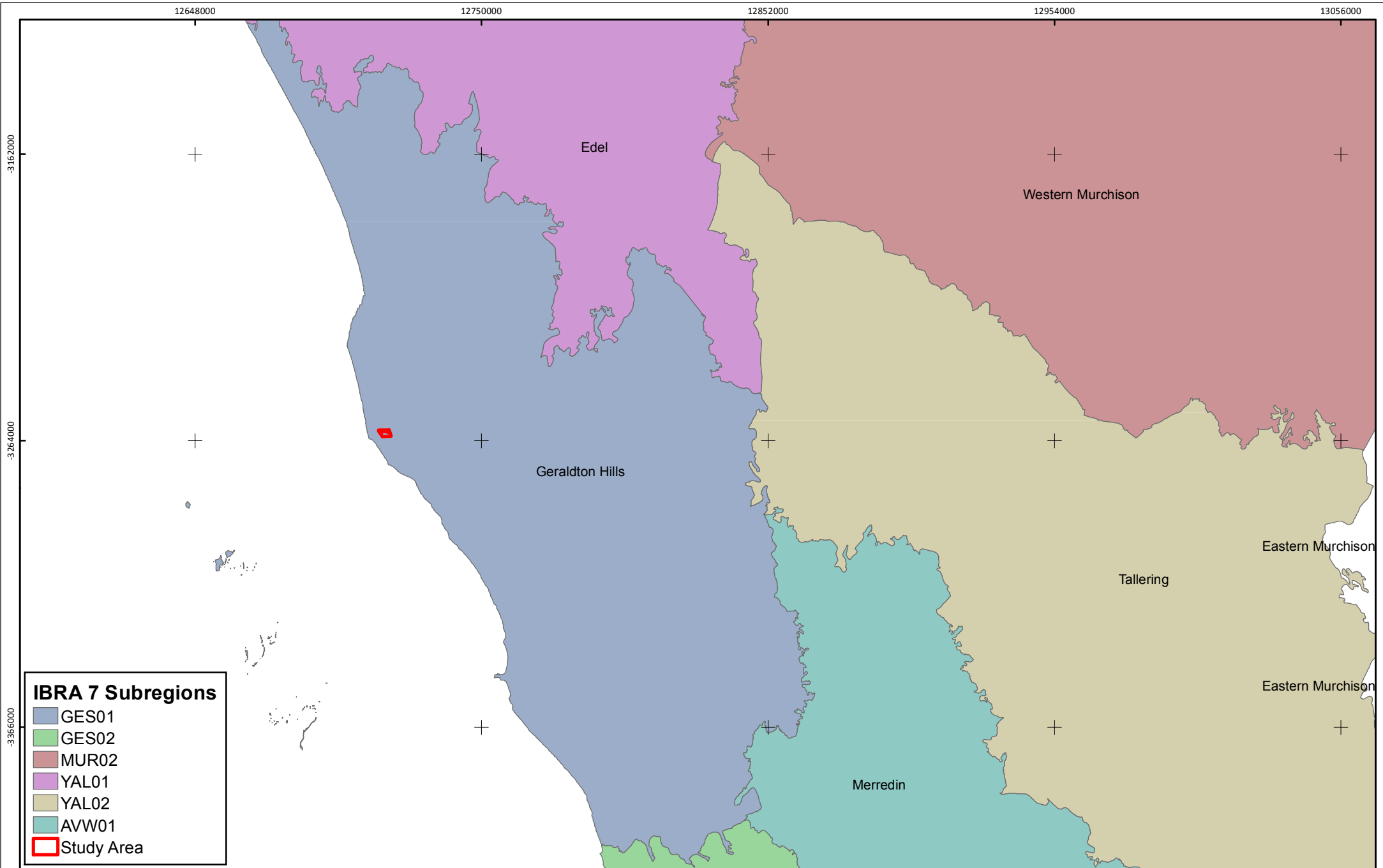
The average rainfall for the closest BOM station at Kalbarri is 350 mm (Section 5.1), and the average annual evaporation rate is 2,600 millimetres (BoM 2017). The sandy soils within the clearing envelope (B26 and Ca28) (Section 5.3) have high infiltration rates so there is likely to be little surface runoff into lower lying areas west of the clearing envelope.

5.5 LAND USE

The clearing envelope is located on predominantly agricultural land to the east of George Grey Drive between Port Gregory and Kalbarri. The clearing envelope is located across approximately 69.5 ha of agricultural land, incorporating 32.2 ha of agricultural pastured land, 31.3 ha of remnant vegetation and 5.8 ha of revegetated agricultural lands.

Apart from the adjacent GMA Port Gregory garnet mine, the major land-use in the area includes grazing and cropping (dry land agricultural).

The Hutt Lagoon (Pink Lake), approximately 2.5 km to the south (Figure 2-2), is a nationally important wetland (DoEE 2017), and becoming an increasingly popular tourist destination. The Utcha Well Nature Reserve is located 800 m to the west on the other side of George Grey Drive.



IBRA 7 Subregions

- GES01
- GES02
- MUR02
- YAL01
- YAL02
- AVW01
- Study Area

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ENVIRONMENT

Drawn: XX Project ID: XXXX
Date: XX Month 20## A4

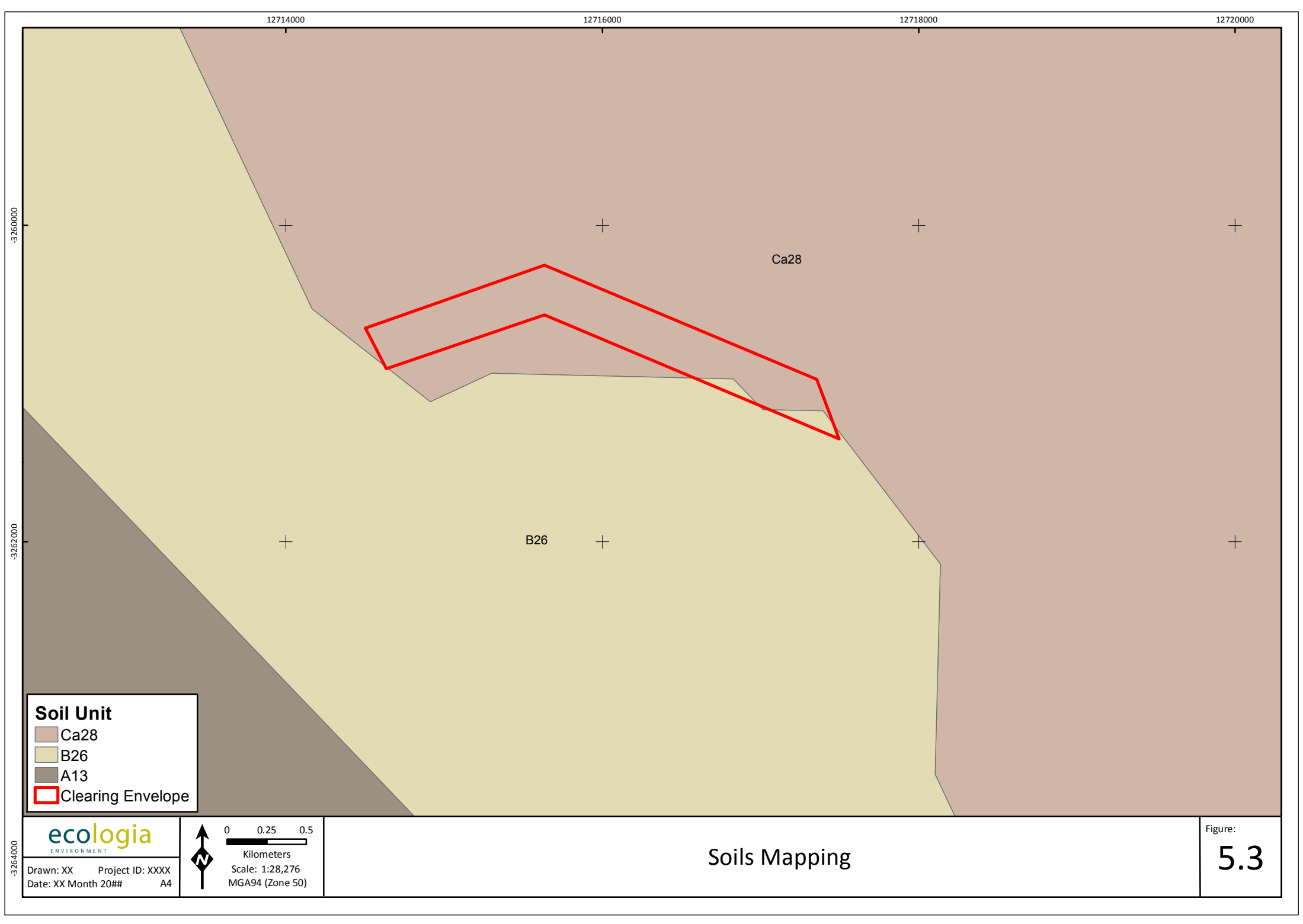


0 15 30
Kilometers
Scale: 1:1,716,046
MGA94 (Zone 50)

IBRA Subregions

Figure:

5.2



Soil Unit

- Ca28
- B26
- A13
- Clearing Envelope

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ENVIRONMENT

Drawn: XX Project ID: XXXX
Date: XX Month 20## A4



0 0.25 0.5
Kilometers
Scale: 1:28,276
MGA94 (Zone 50)

Soils Mapping

Figure:
5.3

6 VEGETATION AND FLORA

'Native vegetation' is defined in subsection 3(1) and 51A of the EP Act and Regulations as:

Indigenous aquatic or terrestrial vegetation, and includes dead vegetation unless that dead vegetation is of a class declared by regulation to be excluded from this definition but does not include vegetation in a plantation.

Over 32% of the clearing envelope consists of farmland of exotic pasture grasses and scattered or parkland-cleared wattle (*Acacia rostellifera*) and is not considered native vegetation, and therefore does not require authority to clear.

However, patches of native vegetation are present within the clearing envelope, with 31 ha of remnant vegetation and a 5.8 ha of rehabilitated areas.

6.1 PRE-EUROPEAN VEGETATION

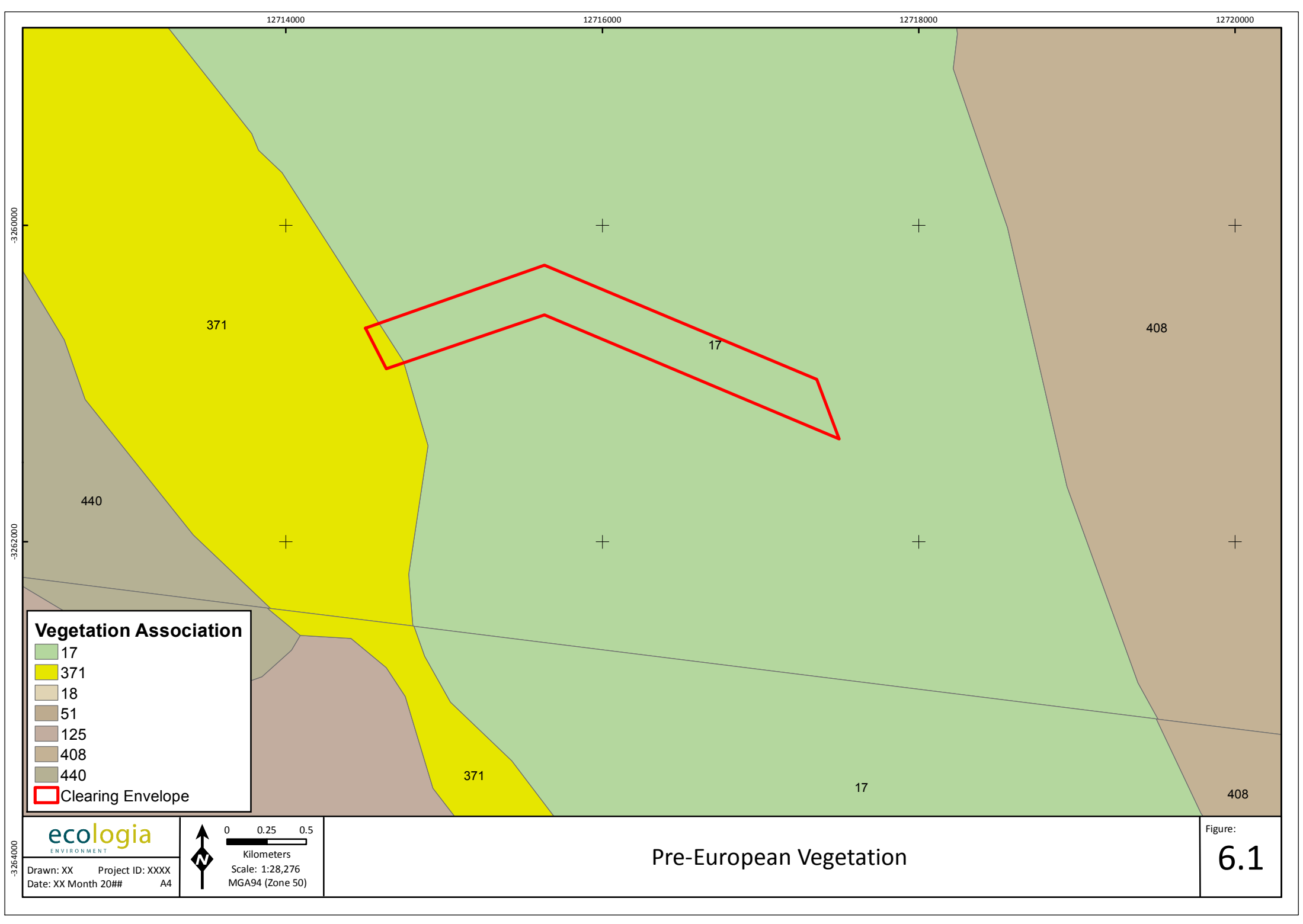
The pre-European vegetation of Western Australia was mapped at the 1:1,000,000 scale by Beard (1976), and was subsequently reinterpreted and updated to reflect the National Vegetation Information System (NVIS) standards (Shepherd *et al.* 2001). Two vegetation associations of Beard (1976) have been mapped within the clearing envelope (Table 6.1). The vast majority is Vegetation Association 17, with the small area of Vegetation Association 371 within the clearing envelope comprising the area required for the battery complex at the GMA Port Gregory Minesite (Figure 6-1, Table 6.1). Just 0.46 ha of Vegetation Association 371 occurs within the indicative footprint (Table 6.1).

Table 6.1 Shepherd vegetation associations at the clearing envelope

Vegetation Association	Structure	Description	Clearing Envelope (ha)	Indicative Footprint (ha)
17	Thicket	Shrublands; <i>Acacia rostellifera</i> thicket.	29.7	1.62
371	Low forest	Low forest; <i>Acacia rostellifera</i>	1.6	0.49
NA		Rehabilitated Lands	5.8	0.60
NA		Agricultural land - cleared or parkland-cleared	32.2	2.10
Totals			69.3	4.81

According to the Statewide Vegetation Statistics of DPaW (2017) approximately 88% of Vegetation Association 17 remains at a State level, approximately 84% at a bioregional level and approximately 85% at a subregional level. This is well above the 30% threshold below which species loss appears to accelerate exponentially (EPA 2000) (with associations below 30% within a bioregion classed as being critical assets).

Approximately 10.7% of the mapped Vegetation Association 371 remains at State and bioregional levels (DPaW 2017), below the 30% threshold of EPA (2000). The clearing of just 0.49 ha of Vegetation Association 371 will have a negligible affect and will maintain the current conservation status of this association as 'Vulnerable' (below the 10% threshold would be considered 'Endangered').



6.2 VEGETATION ASSOCIATIONS AND MAPPING

Vegetation mapping of the clearing envelope is presented as Figure 6-2, and vegetation condition based on Keighery (1994) and (EPA and DPaW 2015) presented in Figure 6-3.

The clearing envelope of 69.4 ha consists of 31.3 ha of remnant vegetation, 5.8 ha of rehabilitated land, and 32.2 ha of agricultural land in a cleared or parkland-cleared state. Therefore 'native vegetation' consists of 37.2 ha (31.3 ha of remnant vegetation and 5.8 ha of rehabilitated land).

Nine vegetation units have been mapped over the clearing envelope (Table 6.2); six of which are considered native vegetation (Table 6.3).

Table 6.2 Mapped vegetation units

Unit	Description
<i>Acacia rostellifera</i> Low Forest	Low Woodland to Open Forest of <i>Acacia rostellifera</i> over Scattered Shrubs of <i>Rhagodia preissii</i> subsp. <i>obovata</i> , <i>Stylobasium spathulatum</i> , <i>Pimelea microcephala</i> with <i>Commicarpus australis</i> , <i>Zygophyllum fruticulosum</i> , <i>Tetragonia implexicoma</i> over Open Tussock Grassland of <i>*Bromus diandrus</i> , <i>*Avena barbata</i> , <i>*Ehrharta longiflora</i> over Mixed Herbs of <i>Urospermum picroides</i> , <i>Sonchus oleraceus</i> , <i>*Lysimachia arvensis</i> , <i>Arctotheca calendula</i> , <i>*Trifolium</i> spp. on sandy soils.
<i>Acacia rostellifera</i> Tall Open Shrubland	Tall Open Shrubland of <i>Acacia rostellifera</i> over Scattered Shrubs of <i>Rhagodia preissii</i> subsp. <i>obovata</i> , with <i>Commicarpus australis</i> , <i>Enchylaena tomentosa</i> , <i>Tetragonia implexicoma</i> , <i>*Solanum nigrum</i> over Open Tussock Grassland of <i>*Bromus diandrus</i> , <i>*Avena barbata</i> , <i>*Ehrharta longiflora</i> over Mixed Herbs of <i>Urospermum picroides</i> , <i>Sonchus oleraceus</i> , <i>*Lysimachia arvensis</i> , <i>*Arctotheca calendula</i> , <i>*Trifolium</i> spp. on sandy soils.
<i>Acacia rostellifera</i> Low Shrubland on Shallow Soils	Shrubland of <i>Acacia rostellifera</i> over Low Open Shrubland of <i>Scaevola tomentosa</i> , <i>Enchylaena tomentosa</i> , <i>Rhagodia</i> spp., with <i>Acanthocarpus preissii</i> , <i>Pimelea microcephala</i> over Open Tussock Grassland of <i>*Bromus diandrus</i> , <i>*Avena barbata</i> , <i>*Ehrharta longiflora</i> over Mixed Herbs of <i>Urospermum picroides</i> , <i>Sonchus oleraceus</i> , <i>*Lysimachia arvensis</i> , <i>Arctotheca calendula</i> , <i>Hypochaeris glabra</i> on shallow sandy and limestone soils.
Mixed Low Closed Shrubland	Mixed Low Closed Shrubland of <i>Acacia rostellifera</i> , <i>Melaleuca concreta</i> , <i>Pimelea microcephala</i> , <i>Scaevola spinescens</i> and <i>Zygophyllum fruticulosum</i> with scattered Tussock Grassland of <i>*Bromus diandrus</i> and <i>*Avena barbata</i> on shallow sandy soils
<i>Melaleuca radula</i> Low Open Shrubland	<i>Melaleuca radula</i> Low Open Shrubland on exposed limestone slope
Rehabilitated area (<i>Acacia rostellifera</i>)	Rehabilitated area of <i>Acacia rostellifera</i> Low Shrubland
Parkland cleared agricultural land (<i>Acacia rostellifera</i>)	Parkland cleared paddocks of <i>Acacia rostellifera</i> tall shrubland over *pasture grasses and weeds.
Cleared agricultural land	Cleared paddocks with scattered regrowth of <i>Acacia rostellifera</i> , *pasture grasses and weeds.
Devoid of vegetation	Cleared mining area

Clearing required for the project is associated with an access track up to 12 m wide required for the construction of an overhead powerline and an area to construct a battery complex at the minesite. Up to 2.8 ha of native vegetation requires clearing (Figure 3-1, Table 6.3):

- ~ 1.4 ha of *Acacia rostellifera* woodland and shrubland communities
- ~ 0.6 ha of rehabilitated area of *Acacia rostellifera*
- ~ 0.2 ha of mixed low closed shrubland
- ~ 0.5 ha of *Melaleuca radula* Low Open Shrubland

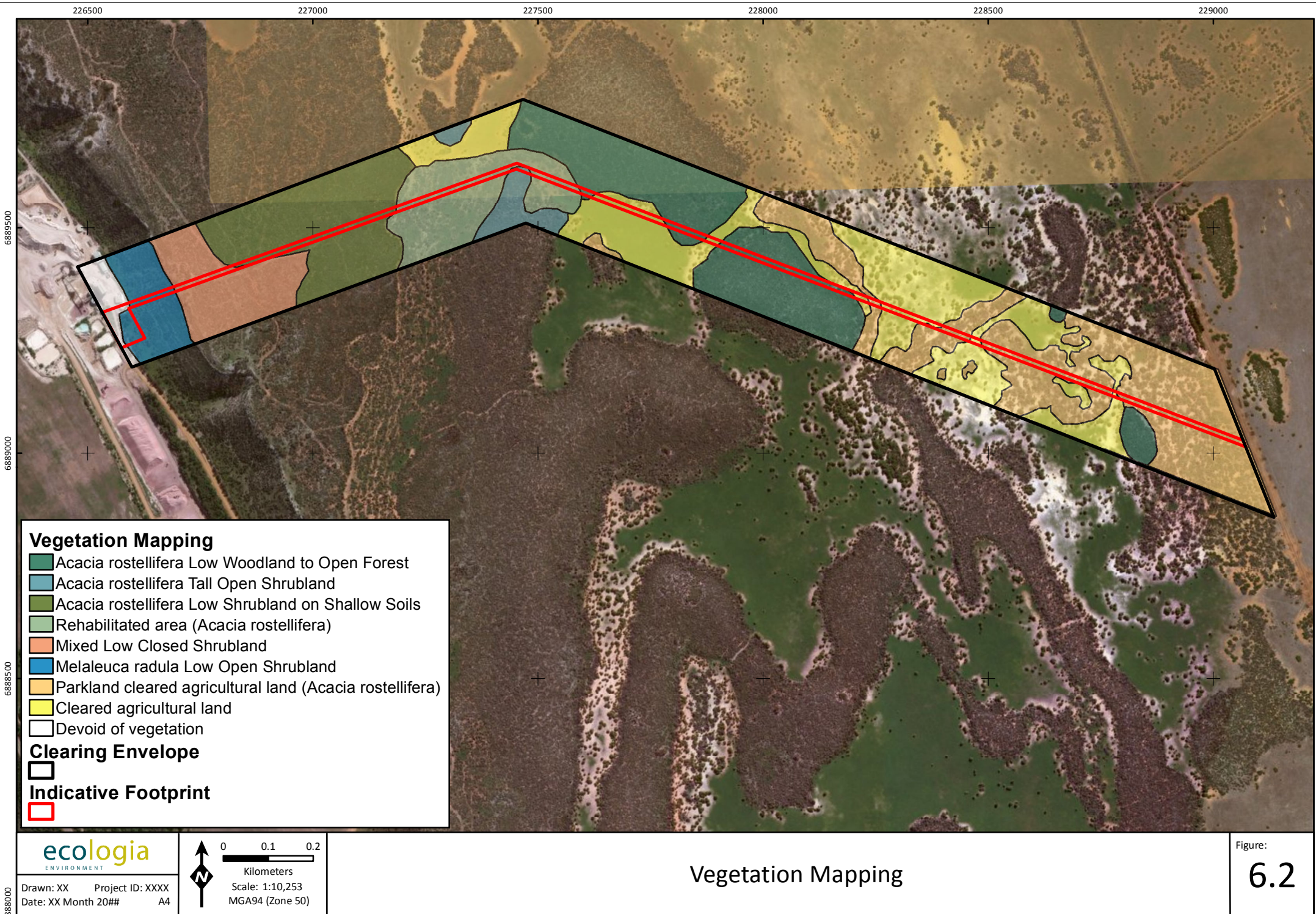
Table 6.3 Mapped vegetation units and areas

Vegetation unit	Native vegetation?	Clearing envelope (ha)	Indicative footprint (ha)	Condition
<i>Acacia rostellifera</i> Low Woodland to Open Forest	Yes	13.0	0.71	Good
<i>Acacia rostellifera</i> Tall Open Shrubland	Yes	1.6	0.57	Very good
<i>Acacia rostellifera</i> Low Shrubland on Shallow Soils	Yes	8.7	0.05	Excellent
Rehabilitated area (<i>Acacia rostellifera</i>)	Yes	5.8	0.64	Poor
Mixed Low Closed Shrubland	Yes	4.9	0.24	Excellent
<i>Melaleuca radula</i> Low Open Shrubland	Yes	3.0	0.51	Very good
Parkland cleared agricultural land (<i>Acacia rostellifera</i>)	No	15.5	1.14	Degraded
Cleared agricultural land	No	15.6	0.65	Completely degraded
Devoid of vegetation	No	1.0	0.29	Completely degraded
Total (all)		69.3	4.81	
Total (Native Vegetation)		37.2	2.73	

Condition of the native vegetation to be cleared ranged from Poor (rehabilitated areas) to excellent (mixed low closed shrubland, and *Acacia rostellifera* low shrubland) (Figure 6-2, Table 6.3). The clearing envelope has been grazed in the past and weeds were common in the understorey, particularly the grasses **Bromus diandrus*, **Avena barbata*, and **Ehrharta longiflora*, as well as **Arctotheca calendula*.

None of the vegetation units described are of particular ecological significance. No Threatened Ecological Communities (TECs) or Environmentally Sensitive Areas (ESAs) occur within the clearing envelope, and none were identified in the region by the DoEE protected matters database search (DoEE 2017). Three PECs occur over 9 kms east (Kalbarri ironstone community at Yerina Springs) and south-west of the clearing envelope (DBCA 2017).

The Hutt Lagoon (Pink Lake), approximately 2.5 km to the south (Figure 2-2), is a nationally important wetland (DoEE 2017), and the Utcha Well Nature Reserve is located 800 m to the west on the other side of George Grey Drive.



- Vegetation Mapping**
- Acacia rostellifera Low Woodland to Open Forest
 - Acacia rostellifera Tall Open Shrubland
 - Acacia rostellifera Low Shrubland on Shallow Soils
 - Rehabilitated area (Acacia rostellifera)
 - Mixed Low Closed Shrubland
 - Melaleuca radula Low Open Shrubland
 - Parkland cleared agricultural land (Acacia rostellifera)
 - Cleared agricultural land
 - Devoid of vegetation
- Clearing Envelope**
- Indicative Footprint**

ecologia
ENVIRONMENT



0 0.1 0.2
Kilometers
Scale: 1:10,253
MGA94 (Zone 50)

Vegetation Mapping



Vegetation Condition

Dark Green	Excellent
Light Green	Very Good
Yellow-Green	Good
Orange	Poor
Light Grey	Degraded
White	Completely Degraded



Drawn: XX Project ID: XXXX
Date: XX Month 20## A4



0 0.075 0.15
Kilometers
Scale: 1:9,760
MGA94 (Zone 50)

Vegetation Condition
(EPA 2016)

6.3 FLORA OF CONSERVATION SIGNIFICANCE

According to available databases no vascular plant taxa of conservation significance have been recorded within the clearing footprint. A flora survey of a 29 ha area approximately 2.5 km to the north of the application area by GHD (2016) did not record any Threatened flora (DMP 2017). Similarly, a survey of the nearby Utcha Well Nature Reserve by *ecologia* did not record any Threatened or Priority Flora (*ecologia* 1995; DMP 2010).

Searches of several DBCA databases were conducted within a 20km radius of the area. These included:

- (1) the Department's Threatened (Declared Rare) and Priority Flora database (for results, see "TPFL" – coordinates are GDA94);
- (2) the Western Australian Herbarium Specimen database for Threatened and Priority flora species opportunistically collected in the area of interest; and
- (3) the Department's Threatened and Priority Flora List.

A total of 95 vascular plant taxa of conservation significance have been recorded within 20 km of the clearing footprint (DBCA 2017 (Figure 6-4), including nine Threatened flora species (Table 6.4). The majority occur over 9 kms to the east on different landforms. However, *Caladenia elegans* has been recorded approximately 2 km south of the application area, *Pterostylis sinuata*, *Diuris drummondii* and *Hypocalymma angustifolium* subsp. Hutt River (S. Patrick 2982) approximately 10km to the east, *Caladenia bryceana* subsp. *cracens* approximately 18 kms to the north and *Diuris concolor* approximately 12km to the southeast (DBCA 2017) (Figure 6-4).

Table 6.4 Threatened flora recorded within 20 kms of the clearing envelope

Species Name	Status
<i>Caladenia elegans</i>	T
<i>Pterostylis sinuata</i>	T
<i>Caladenia bryceana</i> subsp. <i>cracens</i>	T
<i>Caladenia hoffmanii</i>	T
<i>Drakaea concolor</i>	T
<i>Diuris drummondii</i>	T
<i>Hypocalymma angustifolium</i> subsp. Hutt River (S. Patrick 2982)	T
<i>Hypocalymma longifolium</i>	T
<i>Wurmbea tubulosa</i>	T

The database searches and literature review resulted in an inventory of Threatened flora were assessed as potentially occurring within the application area. The assessment criteria outlined in Table 6.5 applied to determine the likelihood of Threatened species occurring within the application area on the basis of suitable habitats and landforms of each of the species and the occurrence of these habitats and landforms within the application area (Table 6.6). By applying the criteria two species, *Caladenia bryceana* subsp. *cracens* and *Drakaea concolor*, were considered to possibly occur within the application area.

Table 6.5 – Criteria used to assess the likelihood of occurrence of significant fauna, flora and vegetation

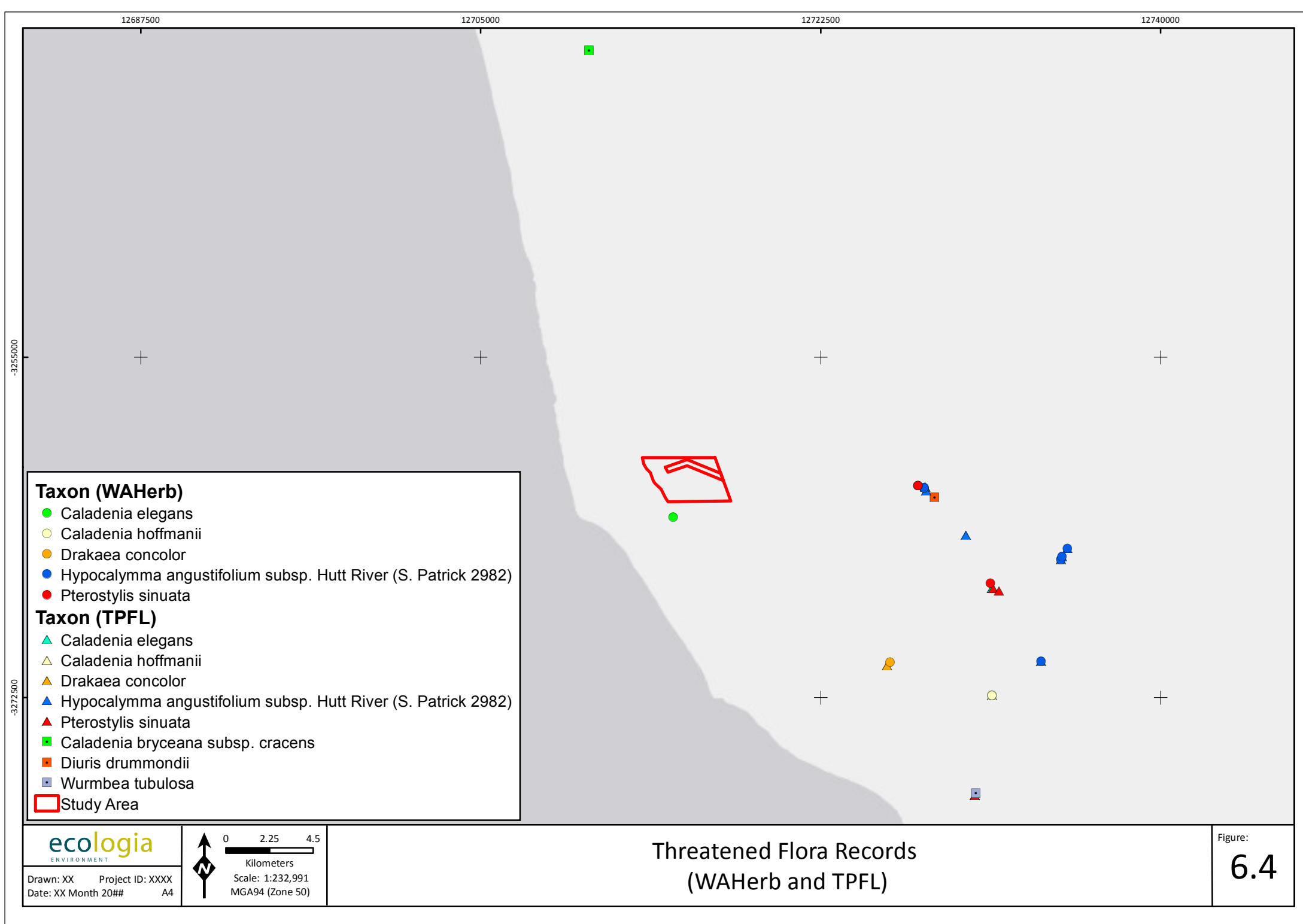
Rating	Criteria (significant flora and fauna)
Recorded	The taxon has previously been recorded in the study area.
Possible (1)	The habitat preference of the taxon is well defined or broadly defined and this habitat likely occurs within the study area, and there are previous records in the vicinity of the study area.
Possible (2)	The habitat preference of the taxon is broadly defined or undefined and suitable habitat possibly occurs at the study area, but there are no records in the vicinity of the study area; or there is otherwise insufficient information available to exclude the possibility of occurrence at the study area.
Unlikely (3)	The habitat preference of the taxon is well defined and suitable habitat is considered unlikely to be present within the study area.

Table 6.6 – Threatened records from database searches

Status	Taxon	Description and Habitat	Flowering Time	Recorded within the study area
T	<i>Caladenia elegans</i>	Tuberous, perennial, herb, 0.2-0.3 m high. Fl. yellow,. Clayey loam. Winter-wet clay flats.	Jul to Aug	Unlikely
T	<i>Pterostylis sinuata</i>	Seasonally-wet clay soil with open <i>Melaleuca uncinata</i> and <i>Hakea recurva</i> low scrub over low heath in winter-wet clay soils over laterite	Jul to Aug	Unlikely
T	<i>Caladenia bryceana</i> subsp. <i>cracens</i>	Tuberous, perennial, herb, 0.03-0.08 m high. Fl. green-yellow); sand over limestone. South of Kalbarri in low heath on limestone hills; north in winter-moist flats.	Aug to Sep	Possible
T	<i>Caladenia hoffmanii</i>	Tuberous, perennial, herb, 0.13-0.3 m high. Fl. green & yellow & red, Clay, loam, laterite, granite. Rocky outcrops and hillsides, ridges, swamps and gullies	Aug to Oct.	Unlikely
T	<i>Drakaea concolor</i>	Tuberous, perennial, herb, 0.25-0.3 m high. Fl. red & yellow growing in sandy open clearings amongst shrubs and sedges	Aug to Sep	Possible
T	<i>Diuris drummondii</i>	Tuberous, perennial, herb, 0.5-1.05 m high. Fl. yellow,. Low-lying depressions, swamps.	Nov to Dec or Jan	Unlikely
T	<i>Hypocalymma angustifolium</i> subsp. Hutt River (S. Patrick 2982)	Black wet organic loam. Small amount of sand, strongly associated with sedges and <i>Grevillea leucopteris</i> .	-	Unlikely
T	<i>Hypocalymma longifolium</i>	Open shrub, to 1 m high. Fl. white/cream,. Grey sand or clay, sandstone. Rocky breakaways, swampland	Aug to Sep	Unlikely
T	<i>Wurmbea tubulosa</i>	Cormous, perennial, herb, 0.01-0.03 m high, dioecious or sometimes andromonoecious. Fl. white-pink. Clay, loam. River banks, seasonally-wet places	Jun to Aug	Unlikely

6.4 INTRODUCED PLANT SPECIES

The clearing envelope consists of agricultural land and formwery grazed remnant vegetation. A number of introduced plant species are present including: *Arctotheca calendula* (Cape Weed), *Avena barbata* (Wild Oats), *Bromus diandrus* (Great Brome), *Ehrharta longiflora* (Annual Veldt Grass), and *Trifolium sp* (Clover).



7 FAUNA AND FAUNA HABITATS

7.1 FAUNA HABITATS

Based on the vegetation mapping the following fauna habitats are present over the clearing envelope:

- Parkland cleared agricultural land
- Tall *Acacia rostellifera* shrubland
- Low shrublands of *Acacia* and *Melaleuca*

None of the fauna habitats are considered restricted and all are common and widespread in the region.

7.2 FAUNA OF CONSERVATION SIGNIFICANCE

Seven native mammals, 145 birds, 30 reptiles and four frogs have been recorded from within 20 km of the clearing footprint DBCA (2017).

Database search results (DBCA 2017; DoEE 2017) revealed large numbers of fauna species of conservation significance within 20 km of the clearing envelope. However, due to the proximity of coastal, estuarine, marine and oceanic habitats, a large number of species have no relevance to the study area. These species include whales, sea-lions, sharks, marine turtles, albatrosses, petrels, shearwaters, egrets and terns, as well as many wetland and saltmarsh migratory birds species from the families Scolopacidae, Charadriidae, and Ardeidae. Habitats to support these species are not present and these species have no potential to occur over the clearing envelope. The remaining species are presented in Table 7.1 below.

Table 7.1 Relevant fauna of conservation significance recorded within 20 kms of the clearing envelope

Mammals	
<i>Dasyurus geoffroii</i> (Chuditch)	T
<i>Macropus eugenii</i> subsp. <i>derbianus</i> (Tamar Wallaby)	P4
Birds	
<i>Calyptorhynchus latirostris</i> (Carnaby's Black-Cockatoo)	T
<i>Falco peregrinus</i> (Peregrine Falcon)	OS
<i>Apus pacificus</i> (Fork-tailed Swift)	IA
<i>Merops ornatus</i> (Rainbow Bee-eater)	IA
<i>Ardea modesta</i> (Great egret)	IA

The Chuditch and Tamar Wallaby records represent reintroductions to Kalbarri National Park and are therefore unlikely to occur.

Carnaby's Black-Cockatoo (T) occurs in the region, however, no foraging (e.g. proteaceous heath/pine plantations) or breeding habitat (large eucalypts) occurs over the clearing envelope.

The Peregrine (OS) is widespread in Australia. Breeding habitat of cliffs, rocky outcrops, or large trees is not present over the clearing envelope, however, the species has the potential to overfly the area.

Similarly the Fork-tailed Swift (IA) is a migratory, almost exclusively aerial species that, in its non-breeding area in Australia, is independent of terrestrial habitats and has the potential to overfly the area without specifically utilising any particular habitat present.

The Rainbow Bee-eater was removed from the list of migratory species under section 209 of the EPBC Act on 9th June 2016, however, still appears on Schedule 5 of the WC Act as 'Migratory birds protected under an international agreement'. In Western Australia the Rainbow Bee-eater can occur

as a resident, breeding visitor, post-nuptial nomad, passage migrant or summer visitor. Numerous records of the species have been made in the vicinity and it is likely to be present.

8 ENVIRONMENTAL MANAGEMENT AND IMPACTS

The Project will require the erection of approximately 2.7 km of overhead powerline from the AER wind and solar farm to the GMA Port Gregory Mine. The overhead powerline traverses farmland that includes patches of native vegetation and an access track of up to 12 m will be required to construct the powerline. In reality the 12 m nominal width for the access track is unlikely to be required but is included as a contingency.

The Project will require the clearing of up to 2.8 ha of native vegetation across the entire footprint (Table 8.1). None of the vegetation units are of particular ecological significance.

Table 8.1 Indicative vegetation types to be cleared

Unit	Condition	Area Required	
		ha	%
<i>Acacia rostellifera</i> woodland and shrubland communities	Very Good	~1.33 ha	58 %
Rehabilitated area of <i>Acacia rostellifera</i>	Poor	~0.64 ha	26 %
Mixed low closed shrubland	Excellent	~0.24 ha	11 %
<i>Melaleuca radula</i> Low Open Shrubland	Very Good	~0.51 ha	5 %
Total		Up to 2.8 ha	

All ground disturbance (clearing) activities will be carried out in accordance with the approved Regulatory Clearing Permit, and consistent with the AER land disturbance procedure.

Flora of conservation significance

A targeted survey for any threatened or priority flora species will be undertaken prior to the installation of the overhead powerline. The 275 m wide clearing envelope will allow enough flexibility to avoid any identified populations.

Vegetation of significance

No vegetation of particular ecological significance is present and no specific management prescriptions are required.

Habitat and threatened fauna

No fauna habitat of particular ecological significance is present and no specific management prescriptions are required.

Groundwater and surface Water

No impacts to groundwater will occur as a consequence of clearing minimal native vegetation (less than 3 ha). No surface water expressions occur and clearing is not close to any Environmental Sensitive Areas (ESA's) or wetlands. Specific erosion prevention measures will be implemented to manage surface runoff and erosion events, including:

- Covering and stabilising exposed soil surfaces subject to an erosion risk; and
- Installing sediment basins to prevent any downslope siltation of vegetation.

Salinity and land degradation

The limited extent clearing (less than 3 ha) will not lead to any increases in salinity or nutrient export, nor any significant increases in soil acidity, erosion, waterlogging or any other form of land degradation.

Dieback and weeds

Dieback disease (*Phytophthora* spp.) has the potential to impact predominantly proteaceous vegetation which is not common over the clearing envelope. Nevertheless, controls will be implemented to prevent contaminated soil and/or water impacting areas adjacent to clearing. These actions will also prevent the introduction and/or spread of weeds.

- All earth-moving machinery will be cleaned of soil and vegetation prior to entering and leaving areas to be cleared.
- Clearing will only be undertaken during dry conditions.
- No dieback or weed-affected materials (soil, mulch, fill) will be brought into the area to be cleared.

9 STATEMENT ADDRESSING THE TEN CLEARING PRINCIPLES

Clearing Principle A

Native vegetation should not be cleared if it compromises a high level of biological diversity.

The proposed clearing envelope does not comprise a high level of biological diversity. The clearing envelope occurs within the Geraldton Hills subregion of the Geraldton Sandplains IBRA region. At the broad scale vegetation can be described as sand heaths with emergent *Banksia* and *Actinostrobus*, York Gum woodlands on limestones, depending on the depth of coastal-sand mantle, with low closed forest of *Acacia rostellifera* (now cleared on alluvial plains of Greenough and Irwin River behind the beach dune system south of Geraldton) (Desmond and Chant 2003).

Clearing of up to 2.8 ha is required of which 0.64 ha (23%) is a rehabilitated area. The majority of the clearing envelope consists of *Acacia rostellifera* with an understorey comprised of weed species, and is not considered to represent an area of high floristic diversity. No Threatened or Priority flora species have been recorded (DBCA 2017; DoEE 2017), and given the habitat and landforms occurring only three Threatened species, *Caladenia bryceana* subsp. *cracens*, *Drakaea concolor* and *Eucalyptus beardiana* were assessed as possibly occurring within the application area.

Clearing of parkland-cleared farmland will not impact on areas of high biological diversity and the native vegetation communities to be cleared are not considered to hold any conservation value due to their low biological diversity. Therefore the proposed clearing is not likely to be at variance with this principle.

Clearing Principle B

Native vegetation should not be cleared if it compromises the whole or part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.

Habitat in the clearing envelope largely comprises cleared or modified agricultural lands with remnant patches and elements of native vegetation. Three key habitat types were identified within the clearing footprint:

- Parkland cleared agricultural land
- Tall *Acacia rostellifera* shrubland
- Low shrublands of *Acacia* and *Melaleuca*

None of the fauna habitats associated with the clearing envelope are considered restricted and all are common and widespread in the region.

Carnaby's Black-Cockatoo (T), the Peregrine Falcon (OS), and Rainbow Bee-eater (IA) are likely to occur in the region, at least intermittently. It is possible that the Rainbow Bee-eater could breed within sandy habitats of the clearing envelope, however, this species is relatively common in the region. The small amount of clearing required in predominantly degraded vegetation would not have a significant impact on the continued existence of any of these species.

Of particular note is that foraging and breeding habitat for Carnaby's Black-Cockatoo is not likely to occur and, similarly, breeding habitat for the Peregrine Falcon is not likely to occur.

The small amount of vegetation proposed to be cleared does not compromise a part of, nor is it necessary for the maintenance of, any significant habitat. Therefore the proposed clearing is not likely to be at variance with this principle.

Clearing Principle C

Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.

Rare flora refers to flora that is threatened under section 5(1) of the BC Act. According to available databases (DBCA 2017; DoEE 2017) no species of conservation significance have been recorded within the clearing footprint, and a flora survey of an adjacent area by GHD (2016) did not record any species listed as Threatened (DMP 2017).

However, nine Threatened flora species have been recorded within 20 kms including *Caladenia elegans*, which has been recorded approximately 2 km to the south, *Pterostylis sinuata*, *Diuris drummondii* and *Hypocalymma angustifolium* subsp. Hutt River (S. Patrick 2982) approximately 10km to the east, *Caladenia bryceana* subsp. *cracens* approximately 18 kms to the north and *Drakea concolor* occurs approximately 12km to the southeast. *Caladenia elegans* occurs in low heath (in winter-wet depressions) which is not present in the clearing envelope and suitable habitat is unlikely to be present. *Caladenia bryceana* subsp. *cracens* occurs in sand over limestone on low heath and may possibly occur within the application area, while *Drakea concolor* grows in sandy open clearings amongst shrubs and sedges, and may also possibly occur within the application area.

Given the lack of records over the clearing envelope, the very small area that requires clearing, the proposal is not likely to be at variance with this principle.

Clearing Principle D

Native vegetation should not be cleared if it comprises the whole or part of, or is necessary for the maintenance of a significant ecological community.

No TECS occur within 20 kms of the clearing envelope (DBCA 2017; DoEE 2017), however, three PECs occur within 20 kms but at over 9 kms distant (DBCA 2017).

The proposed clearing is therefore unlikely to impact on the conservation values of any TEC's, or any other significant habitats, and is not likely to be at variance to this Principle.

Clearing Principle E

Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

The clearing envelope is not located within an area that has been extensively cleared. The majority of clearing (60%) occurs in the Beard Vegetation Association that still occurs over ~88% of its former area at the State level, ~84% at a bioregional level and ~85% at the subregional level. This is way above the 30% threshold below which species loss appears to accelerate exponentially (EPA 2000) (with associations below 30% within a bioregion classed as being critical assets).

Just 0.49 ha of Beard Vegetation Association 371 is proposed to be cleared. Approximately 10.7% of Vegetation Association 371 remains at State and bioregional levels (DPaW 2017). However, the clearing of under half a hectare will have a negligible affect and will maintain the current conservation status of this association as 'Vulnerable'. (Below the 10% threshold would be considered 'Endangered'.)

The native vegetation proposed to be cleared is not considered to be significant as a remnant of native vegetation, and the clearing of up to 2.8 ha of native vegetation is therefore not considered to be at variance to this Principle.

Clearing Principle F

Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

Under this principle, vegetation dependent on seasonally or intermittently waterlogged soils is considered to be part of a wetland, watercourse or buffer.

No creeklines or wetlands occur over the clearing envelope. Proposed clearing will therefore not result in any impact to any riparian vegetation and the minor disturbance proposed is considered not likely to lead to significant impact from erosion. The clearing of native vegetation under this application is therefore not likely to be at variance to this Principle.

Clearing Principle G

Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

The soils of the study area include deep sands (Section 5.3). Sandy soils are characterised by poor soil strength, and as a result sandy soils within the clearing envelope are considered susceptible to wind erosion should the vegetative material be removed. However, the clearing of under 3 ha of native vegetation is not expected to result in a significantly increased erosion risk.

The area experiences average annual rainfall of 350 mm (BOM 2017). Given the porosity of the deep sandy soils (Tille 2006) it is likely that majority of rainfall that occurs on site will infiltrate the soil or evaporate. The limited amount of overland flows within or adjacent to the clearing envelope will minimise the risk of water erosion. Proposed clearing will be linear and narrow across the length of the proposed footprint and unlikely to significantly increase infiltration, which may otherwise lead to a rise in groundwater and soil salinity.

It is considered that the clearing of up to 2.8 ha of native vegetation as part of the Project will not cause appreciable land degradation and therefore, the proposed clearing is not likely to be at variance to this Principle.

Clearing Principle H

Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

The clearing envelope is not located within a DBCA managed conservation area. The Hutt Lagoon (Pink Lake) is located approximately 2.5 km to the south of the clearing envelope and is listed within the Directory of Important Wetlands in Australia (DoEE 2017). The Utcha Well Nature Reserve is located 800 m to the west, on the other side of George Grey Drive.

No conservation reserves will be directly impacted by the Project. The proposed clearing at under 3 ha is unlikely to impact on the conservation values of any conservation assets, or any other significant habitats, and is therefore not likely to be at variance to this Principle.

Clearing Principle I

Native vegetation should not be cleared if the clearing of vegetation is likely to cause deterioration in the quality of surface or underground water.

The clearing envelope does not include any permanent surface water sources such as wetlands or creeklines. The area experiences average annual rainfall of ~350 mm (BOM 2017). Soil within and adjacent to the clearing envelope predominately comprise deep sandy soils (Tille 2006). Given the combination of low rainfall and porous soils, the clearing envelope is most likely to experience

minimal surface water flow during normal seasonal rainfall events. As a result, the proposed clearing is not likely to cause deterioration in the quality of any surface water in the local area. Erosion prevention measures will be implemented to manage surface runoff and erosion events, including:

- Covering and stabilising exposed soil surfaces subject to an erosion risk; and
- Installing sediment basins to prevent any downslope siltation of vegetation.

Given the relatively low annual rainfall of the region, the soils characterisation, the limited surface water flow, and controls implemented it is considered that the clearing of less than 3 ha of native vegetation will not cause a deterioration in the quality of surface or underground water. The Project is therefore not likely to be at variance to this Principle.

Clearing Principle J

Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.

The topography of the clearing envelope is of undulating sandplain of moderate elevation, predominantly running in an east-west direction.

The area experiences average annual rainfalls of ~350 mm, with evaporation rates over 7 times the annual average rainfall (BOM 2017), with little surface flow during normal season rains. Soils within the application area are predominately deep sandy soils, which are characterised by high porosity levels that facilitate high infiltration rates with little surface runoff.

The clearing of native vegetation has largely been avoided with the majority of the clearing footprint located within previously cleared agricultural areas. AER proposes to clear up to 2.8 ha of native vegetation within an area that has been cleared for agriculture.

Despite the application area being on sloping sandplain, there is likely to be little surface water runoff and therefore the proposed clearing is not likely to cause an increase in flooding to areas subject to inundation west of the clearing envelope.

Similarly, given the scale of proposed clearing and the topography of the regional landscape, the clearing is not likely to impact on the drainage characteristics of the site or the larger catchment area, or cause or exacerbate flooding in the local area.

The proposed clearing is therefore not likely to be at variance to this Principle.

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