Exploration Environmental Management Plan for Bidaminna for Tenements E70/4794, E70/2844, E70/3298 and E70/4919

Prepared for Image Resources

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Abbreviations and Acronyms

BAM Act	*Biosecurity and Agriculture Management Act* (2007) (WA)
BC Act	*Biodiversity Conservation Act* (2016) (WA)
BoM	Bureau of Meteorology
CALM	former Department of Conservation and Land Management, (now DBCA)
CMP	Conservation Management Plan
DAFWA	former Department of Agriculture and Food Western Australia (now DPIRD), WA Government
DBCA	Department of Biodiversity, Conservation and Attractions, WA Government
DEC	former Department of Environment and Conservation, (now DBCA).
DEE	Department of the Environment and Energy, Australian Government
Dieback Interpreter's Manual	*FEM047 Phytophthora Dieback Interpreter's Manual for lands managed by the Department*
DotE	Formerly Department of the Environment (Now Department of Water, Agriculture and the Environment)
DPIRD	Department of Primary Industries and Regional Development, WA Government
EEMP	Exploration Environmental Management Plan
EPA	Environmental Protection Authority, WA Government
EPBC Act	Environmental Protection and Biodiversity Conservation Act (1999) (Cwth)
ESA	Environmental Sensitive Area
FEMD	Forest and Ecosystem Management Division of DBCA, WA Government
IBRA	Interim Biogeographic Regionalisation for Australia
PEC	Priority Ecological Community
PoW	Programme of Works
RCAC	Reverse-Circulation Air-Core drilling
TEC	Threatened Ecological Community
WAOL	Western Australian Organism List

Executive Summary

Image Resources Ltd (Image Resources) commissioned Terratree Pty Ltd (Terratree) to develop an Exploration Environmental Management Plan (EEMP) to protect biodiversity values and manage environmental risks associated with exploration activities in tenements E70/4794, E70/2844, E70/3298 and E70/4919 at Bidaminna, Western Australia (hereafter referred to as 'the project area'). Image Resources has a strategic Conservation Management Plan (CMP) developed by Terratree as an overarching environmental management plan addressing all the environmental risks and management issues associated with Image Resources' mineral exploration activities on the Swan Coastal Plain bioregion. This EEMP is complementary to that document and is explicitly addressing the Bidammina exploration project.

The EEMP is intended to provide management guidelines to avoid impacts to biodiversity values in the first instance, and if unavoidable to minimise and mitigate these impacts. This EEMP covers activities outside of a Department of Biodiversity, Conservation and Attraction (DBCA) managed lands, however, represents DBCA best-practise management guidelines. This document can be submitted to the Department of Mines Industry Regulation and Safety (DMIRS) alongside Program of Works (PoW) applications. It is not intended to be used as a template for a Conservation Management Plan (CMP) to be submitted to DBCA for approval if Image Resources intends to explore within conservation estate.

The Bidaminna project is located within mining tenements E70/4794, E70/2844, E70/3298 and E70/4919 and is approximately 23 kilometres (km) south-east of Lancelin in the Shire of Gingin. The survey area is split into two sections, north and south of Orange Springs Road, known as Bidaminna North and Bidaminna South. The exploration will be low-impact exploration, shallow-drilling for mineral sands along approximately 27 km of proposed drill lines with a footprint of 7.6 hectares (ha). The proposed drilling programme will be undertaken using a small four-wheel drive or truck-mounted drill rig. The drill rigs will traverse the drill lines by rolling over the shrubland vegetation communities, avoiding large trees and large shrubs. All exploration related activities will be managed in accordance with *Image's Bidaminna Project: Strategic Conservation Management Plan* (Terratree, 2017) and RCAC Sampling Procedure (Image Resources 2014) and clearing of native vegetation will be minimised.

After outlining the regulatory context, the EEMP provides information relating the significant biodiversity values within the project area and the potential impact to these values posed by the exploration program.

The biodiversity and conversation values are in the project area are

- Pristine vegetation condition

- Banksia woodlands of the Swan Coastal Plain – Priority 3 Ecological Community (PEC) in Western Australia and listed federally as a Threatened Ecological Community (TEC)
- *Banksia dallanneyi subsp. Pollosta* - Priority 3 Flora species -
- Carnaby's Black Cockatoo (Endangered) (*Calyptorhynchus latirostris*) - Threatened Fauna
- Declared Wetland (an ESA)
- Absence of Introduced Flora
- Absence of *Phytophthora* Dieback.

Any substantial alteration to these biodiversity values that could potentially occur due to the proposed exploration activities are considered potential impacts. These include

- Impacts to Threatened and or Priority flora and Ecological communities
- Impacts to fauna and their habitats
- Impacts to a Declared wetland (Environmentally Sensitive Area)
- Introduction and spread of exotic species (weeds and plant pathogens)
- Soil destabilisation and erosion
- Impacts to surface and groundwater hydrology
- Uncontrolled fires (for example, originating from campfires and machinery)
- Site contamination (including from hydrocarbon, chemicals, litter and drilling wastes)
- Inadequate rehabilitation.

Biodiversity values, potential impacts, commitments, and management actions are outlined. Management actions ensure the avoidance in the first instance, minimisation and mitigation of potential impacts, including performance criteria, monitoring, and reporting commitments to achieve this. The proposed exploration program, if carried out in accordance with these management and rehabilitation actions will not result in significant impacts on conservation values in the project area.

This EEMP should be reviewed regularly so ensure continual improvement. Terratree will continue to work closely with Image Resources to implement best-practise environmental management procedures during exploration and can inform and train staff on conservation values and management requirements within the project area.

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1 Introduction

1.1 Background

Image Resources Ltd (Image Resources) commissioned Terratree Pty Ltd (Terratree) to develop an Exploration Environmental Management Plan (EEMP) to protect biodiversity values and manage environmental risks associated with exploration activities in tenements E70/4794, E70/2844, E70/3298 and E70/4919 at Bidaminna, Western Australia (hereafter referred to as 'the project area'). Image Resources has a strategic Conservation Management Plan (CMP) developed by Terratree as an overarching environmental management plan addressing all the environmental risks and management issues associated with Image Resources' mineral exploration activities on the Swan Coastal Plain bioregion. This EEMP is complementary to that document and is explicitly addressing the Bidammina exploration project.

1.2 Purpose and Scope

The EEMP is intended to provide management guidelines to avoid impacts to biodiversity values in the first instance, and if unavoidable to minimise and mitigate these impacts. This EEMP covers activities outside of a Department of Biodiversity, Conservation and Attraction (DBCA) managed lands, however, represents DBCA best-practise management guidelines.

After outlining the regulatory context, the EEMP provides information relating the significant biodiversity values within the project area and the potential impact to these values posed by the exploration program. Potential impacts on significant biodiversity values include

- Impacts to Threatened and or Priority flora and Ecological communities
- Impacts to fauna and their habitats
- Impacts to a Declared wetland
- Introduction and spread of exotic species (weeds and plant pathogens)
- Soil destabilisation and erosion
- Impacts to surface and groundwater hydrology
- Uncontrolled fires (for example, originating from campfires and machinery)
- Site contamination (including from hydrocarbon, chemicals, litter and drilling wastes)
- Inadequate rehabilitation.

The EEMP describes the commitments and management actions required to avoid impacts in the first instance, and if unavoidable to minimise and mitigate these impacts. Management actions are prescribed to achieve this, including performance criteria, monitoring and reporting commitments.

This document can be submitted to the Department of Mines Industry Regulation and Safety (DMIRS) alongside Program of Works (PoW) applications. It is not intended to be used as a template for a Conservation Management Plan (CMP) to be submitted to DBCA for approval if Image Resources intends to explore within conservation estate.

1.3 Project Location and Size

The Bidaminna project is located within mining tenements E70/4794, E70/2844, E70/3298 and E70/4919 and is approximately 23 kilometres (km) south-east of Lancelin in the Shire of Gingin. The survey area is split into two sections, north and south of Orange Springs Road, known as Bidaminna North and Bidaminna South, (**Figure 1**).

1.4 Proposed Exploration Activities

The exploration will be low-impact exploration, shallow-drilling for mineral sands along approximately 27 km of proposed drill lines with a footprint of 7.6 hectares (ha). The proposed drilling programme will be undertaken using a small four-wheel drive or truck-mounted drill rig (**Photo 1** and **Photo 2**). The drill rigs will traverse the drill lines by rolling over the shrubland vegetation communities, avoiding large trees and large shrubs. All exploration related activities will be managed in accordance with *Image's Bidaminna Project: Strategic Conservation Management Plan* (Terratree, 2017) and RCAC Sampling Procedure (Image Resources 2014), and clearing of native vegetation will be minimised

2 Regulatory Context

The following is a list of relevant government legislation, government policy, publications and project reports pertaining to the site:

Legislation

- *Biodiversity Conservation Act* (BC Act) 2016 (Western Australia)
- *Environmental Protection Act* (EP Act) 1986 (Western Australia)
- *Western Australian Planning and Development Act 2005* (Western Australia)
- *Biosecurity and Agriculture Management Act* (BAM Act) 2007 (Western Australia)
- *Environmental Protection and Biodiversity Conservation Act* (EPBC Act) 1999 (Federal).

Government Policy and Publications

- Environmental Factor Guideline – Flora and Vegetation (EPA 2016a)
- Environmental Factor Guideline – Terrestrial Fauna (EPA 2016b)
- Environmental Protection (Clearing of Native Vegetation) Regulation 2004
- Environmental Protection (Environmentally Sensitive Areas) Notice 2005
- EPBC Act Referral Guidelines for Three Threatened Black Cockatoo Species (DSEWPAC 2012)
- EPA Technical Guide – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016d)

2.1 Threatened and Priority Flora

2.1.1 Environment Protection and Biodiversity Conservation Act (1999) (Commonwealth of Australia)

At a Commonwealth level, Threatened flora are protected under the *Environment Protection and Biodiversity Conservation Act* (1999) (EPBC Act), which lists species that are considered Critically Endangered, Endangered, Conservation Dependent, Extinct or Extinct in the Wild (**Appendix A**, **Table A.1**). The EPBC Act protects matters of National Environmental Significance (matters of NES). It includes provisions to protect threatened species and communities and the conservation of migratory species.

2.1.2 Biodiversity Conservation Act (2016) (Western Australia)

In the *Biodiversity Conservation Act* (2016) (Western Australia), taxa that have been adequately searched for and are deemed to be either rare, in danger of extinction or otherwise in need of special protection in the wild are gazetted as Threatened Species (Schedule 1, BC Act 2016). Threatened Species are further categorised by the Department according to their level of threat using IUCN Red List criteria:

- **CR**: Critically Endangered – considered to be facing an extremely high risk of extinction in the wild
- **EN:** Endangered – considered to be facing a very high risk of extinction in the wild in the near future
- **VU:** Vulnerable – considered to be facing a high risk of extinction in the wild in the medium-term future.

These taxa are legally protected and their removal, or impact to their surroundings, cannot be conducted without Ministerial approval, obtained specifically on each occasion for each population.

2.1.3 Priority Flora

The Department of Biodiversity, Conservation and Attractions (DBCA, formerly DPaW) maintains a list of Priority Flora taxa. These are taxa that are considered poorly known, uncommon or under threat but for which there is insufficient justification, based on known distribution and population sizes, for inclusion in Schedule 1 of the BC Act. The list of Threatened flora is reviewed annually by a scientific panel that assesses each taxon's conservation status and ranks them into categories. The Priority Flora list is dynamic. As new information becomes available, the conservation status is reviewed and changes to the listing may result. The categories for Priority Flora give an indication of the priority for undertaking further surveys based on the number of known sites, and the degree of threat to those populations. A Priority taxon is assigned to one of five priority categories (**Appendix A, Table A.2**).

2.1.4 Locally and Regionally Significant Flora and Vegetation

In addition to plant taxa being recognised as significant through their Declared Rare of Priority Flora status, they can also be significant for several other reasons. The EPA Technical Guide for Flora and Vegetation Surveys (EPA 2016) states that flora and vegetation can be "significant" for a range of reasons, including but not limited to:

Flora

- "Being identified as threatened or priority species
- Locally endemic or association with a restricted habitat type (e.g. surface or groundwater-dependent ecosystems)
- New species or anomalous features that indicate a potential new species
- Representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions or isolated outliers of the main range)
- Unusual species, including restricted subspecies, varieties or naturally occurring hybrids
- Relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape".

Vegetation

- "Being identified as threatened or priority ecological communities
- Restricted distribution
- Degree of historical impact from threatening processes
- A role as a refuge
- Providing an important function required to maintain the ecological integrity of a significant ecosystem".

2.2 Threatened and Priority Ecological Communities

Ecological communities are naturally occurring biological assemblages located in a particular type of habitat. At a national level, Threatened Ecological Communities (TECs) are protected under the EPBC Act. TECs are listed under the EPBC Act as either 'Critically Endangered', 'Endangered' or 'Vulnerable'. The conservation code definitions for Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs) are included in **Appendix A, Table A.3**.

The DBCA also maintains a list of TECs endorsed by the WA Minister of Environment (DEC 2015) that are classified as being either 'Presumed Totally Destroyed', 'Critically Endangered', 'Endangered' or 'Vulnerable'.

The DBCA maintains an additional list of Priority Ecological Communities (PECs) for communities that could potentially be classified as TECs but are not currently adequately defined or surveyed. Communities are placed into one of five Priority categories (1-5). Definitions of these conservation codes are provided in **Appendix A, Table A.4**.

2.3 Threatened and Priority Fauna

In a legislative context, the conservation of fauna is covered primarily by the following legislation and international treaties:

- *Environment Protection and Biodiversity Conservation Act* 1999 (Cwth)
- *Biodiversity Conservation Act* 2016 (WA)
- *Environmental Protection Act* 1986 (WA)
- *Conservation and Land Management Act* 1984 (WA)
- China Australia Migratory Bird Agreement (CAMBA)
- Japan Australia Migratory Bird Agreement (JAMBA)
- Republic of Korea and Australia Migratory Bird Agreement (ROKAMBA).

The following documents are relevant to the management of fauna:

- Environmental Factor Guideline – Terrestrial Fauna (EPA 2016b)
- EPA Technical Guide – Terrestrial Fauna Surveys (EPA 2004)
- EPBC Act Referral Guidelines for Three Threatened Black Cockatoo Species.

Any animal that is native to WA is protected under the State's primary wildlife conservation legislation, the Biodiversity Conservation Act (2016). Some fauna species have additional protection at a Federal level under the *EPBC Act.* Penalties apply for any damage to individuals, populations or habitats of protected species.

2.4 Environmentally Sensitive Areas

Under section 51B of the EP Act the Minister can, by notice, declare a specified area of the State in the notice, to be an Environmentally Sensitive Area (ESA). ESAs are protected under the *Environmental Protection (Clearing of Native Vegetation) Regulation 2004* and are selected for their environmental values at state or national levels. ESAs can be assigned with regard to the following criteria:

- protection of Threatened species of native plants
- protection of wetlands and watercourses
- protection of sites that have other high conservation, scientific or aesthetic values
- protection of Aboriginal or European cultural sites
- a declared World Heritage property as defined in section 13 of the *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Ac*t) of the Commonwealth.

An ESA is defined under Regulation 6(1) of the *Environmental Protection (Clearing of Native Vegetation) Regulation 2004.* There are several ESA categories under this definition of which one is found within the project area. This is ‘A Defined Wetland and the area within 50 metres (m) of the wetland. Being an ESA, clearing permits are required for exploration activities in this area.

2.5 Introduced Flora

2.5.1 Weeds of National Significance (WONS)

At a national level, there are twenty weed species listed as Weeds of National Significance (WONS). *The Commonwealth National Weeds Strategy: A Strategic Approach to Weed Problems of National Significance* (NRMMC 2012) describes the broad goals and objectives in managing these species.

2.5.2 Declared Plants

The *Biosecurity and Agriculture Management Act* 2007 (BAM Act) seeks to prevent serious animal and plant pests and diseases from entering the State and becoming established and to minimise the spread and impact of any that are already present. The BAM Act and associated regulations replace the *Agriculture and Related Resources Protection Act* 1976 (and associated regulations). The BAM regulations were enacted on 1 May 2013, placing organisms into four categories:

- Permitted organism (listed under Section 11) – permitted in Western Australia subject to regulations.
- Prohibited organism (listed under Section 12) – prohibited in Western Australia subject to regulations (i.e. is a Declared Pest for the whole of the State).
- Permitted organism permit required (under regulation 73) – must not be imported unless in accordance with an import permit.
- Permitted organism Declared Pests (under Section 22) – can apply to a part of, or the whole of, the State.

The current Western Australian Organism List (WAOL) (DAFWA 2018) lists organisms in each of these categories. Unlisted organisms must not be imported (unless in accordance with an import permit and regulations). The BAM Act further categorises Declared Pests in one of three control categories; Exclusion, Eradication, and Management, defined in (**Appendix B**, **Table B.1**).

2.5.3 Environmental Weeds

A second and much more extensive categorisation of weeds has been developed by the DBCA in the Environmental Weed Strategy (CALM 1999). Species considered to adversely affect the communities they invade are evaluated on their invasiveness, distribution and environmental impacts and ranked into four categories based on these criteria - high, moderate, mild and low (**Appendix B**, **Table B.2** and **Table B.3**)

2.6 Phytophthora Dieback

The most recent Western Australian State of the Environment Report lists Dieback as a Priority 1 threat to biodiversity (EPA 2007). A recent review of threats to species listed as threatened under the Federal

Environment Protection and Biodiversity Conservation Act 1999 shows that *P. cinnamomi* is the second greatest invasive species threat in Australia after rabbits (Kearney *et al*. in press).

Phytophthora Dieback management is required under several regulatory mechanisms, including:

- *Phytophthora* Dieback is listed as a Key Threatening Process with the Federal Government under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- *Environmental Protection Act 1986* (EP Act) Part V S.50A "Serious Environmental Harm" provisions.

3 Regional Environment

3.1 Biogeography

There are 89 recognised Interim Biogeographical Regionalisation Areas (IBRA) Regions across Australia that have been defined based on climate, geology, landforms and characteristic vegetation and fauna. The study area lies in the Swan Coastal Plain region, within the Drummond Botanical Subdistrict of the Southwestern Botanical Province as described by Beard (1990).

The climate experienced in this district is described as dry warm Mediterranean and typically experiences five or six dry months a year, with an annual rainfall of 600 to 1000 millimetres (mm). The Southwestern Botanical Province is typified by plants from the families Fabaceae (*Acacia* spp.), Proteaceae (*Grevillea* spp.), Myrtaceae (*Melaleuca* spp.), Papilionaceae (*Daviesia* spp.), Casuarinaceae (*Allocasuarina* spp.) and Poaceae (grasses) (Mattiske, 2000). The Drummond Botanical Subdistrict is characterised by mainly *Banksia* low woodland on leached sands with *Melaleuca* swamps where ill-drained; woodland of Tuart (*Eucalyptus gomphocephala*), Jarrah (*E. marginata*) and Marri (*Corymbia callophylla*) on less leached soils.

The dominant land uses include urban development, dryland agriculture, Unallocated Crown Land and Crown reserves, conservation, forestry plantations and road easements and infrastructure.

3.2 Soils and Landforms

The Swan Coastal Plain is made up of mostly depositional material either from fluviatile or aeolian activity. The plain has coastal dunes, of which the Bassendean Dune System is the most easterly, followed by the Spearwood System and the Quindalup System fringing the coastline (McArthur, 2004). Most of the Drummond Botanical Subdistrict is underlain with Mesozoic to recent sediments of the Perth Basin (Beard, 1990). The Bassendean Dunes on which the project area is located consist of low, vegetated hills of quartz sand with numerous interdunal swamps and lakes (Beard, 1990). The sands are bleached white at the surface, however, are yellow at depth (Beard, 1990). The Bassendean system soils vary based on drainage and depth to groundwater. Well-drained sites on crests and upper slopes have a depth to groundwater of over 10m, however, areas where relief is shallow the water table rises to within 2m of the surface (McArthur, 2004).

3.3 Regional Vegetation

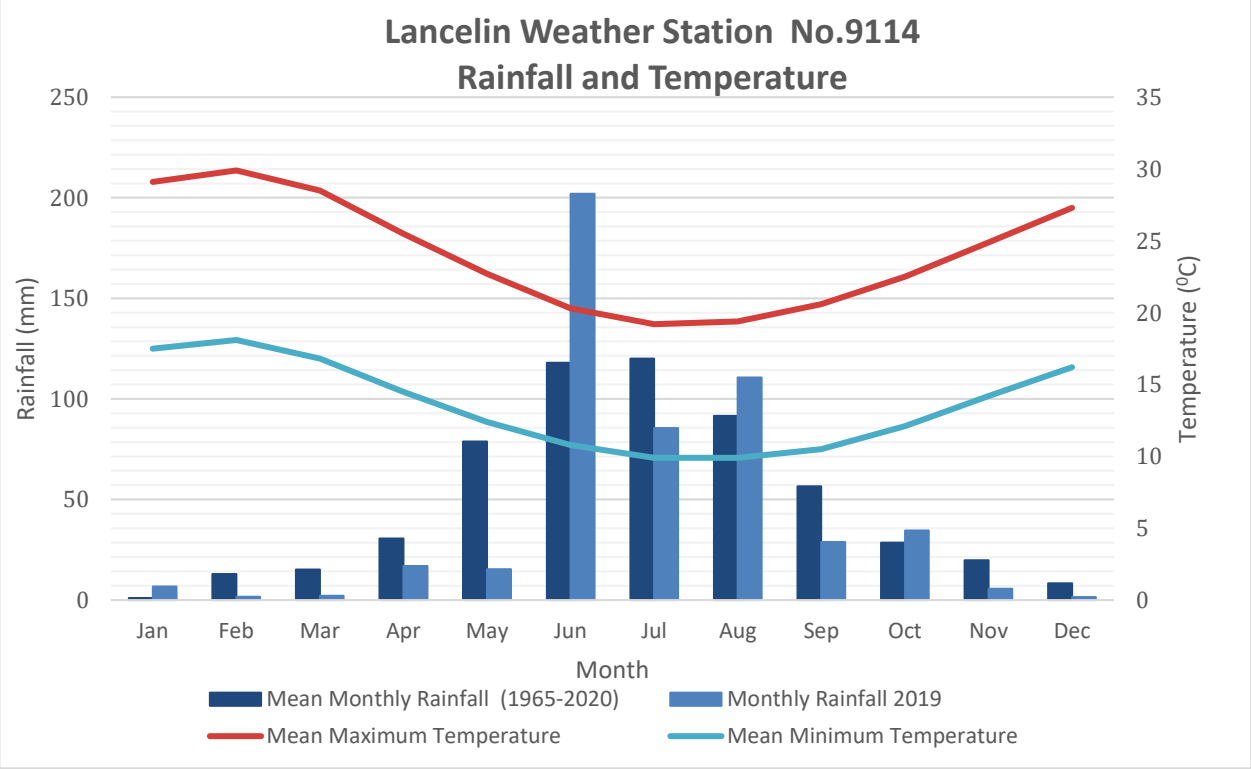
The study area is located in the northern portion of the Swan Coastal Plain (Drummond Botanical Subdistrict) of the Southwestern Province (Beard, 1990). This region supports a mainly banksia low woodland, however, dune swales tend always to be swampy, with mainly heath communities of tea tree, paperbark and reed

swamps in these conditions (Beard, 1990). The region supports trees of mainly 6 to 8m tall, with the main species being *Banksia attenuata, B. menziesii* and on wetter sites *B. ilicifolia,* along with *Eucalyptus todtiana* and Nuytsia floribunda (Beard, 1990).

The northern portion of the study area is described as having an overstorey of *Banksia attenuata, B. menziesii* and *Eucalyptus todtiana* over a shrub layer *of Adenanthos cygnorum, Allocasuarina humilis, Jacksonia furcellata, Xanthorrhoea preissii, Anigozanthos humilis, Conostylis aculeata* and *Eremaea fimbriata*. The southern portion of the study area has the same canopy layer as the northern portion; however, the shrub layer is described as dominated by Verticordia nitens and *Conospermum incurvum* (Beard, 1990).

3.4 Climate

The climate of the Swan Coastal Plain bioregion is Mediterranean, with cool, wet winters and hot, dry summers. Rainfall predominantly April-October, with low rainfall totals during December-March. The Lancelin Weather (Station Number 009114), which is located approximately 20km west of the project area, records an average of 602.2mm of rainfall on an annual basis, and experiences average temperatures ranging between 9.9 and 29.9 degrees Celsius (°C) (**Graph** 1). Receiving 511.6 mm in throughout the year in 2019, the Lancelin weather station received lower than average rainfall in every month, except June, August and October (BoM 2020).



Graph 1: Average monthly rainfall and maximum temperature at Lancelin (Station Number 009114).

3.5 Historical Land Use and Disturbance

The dominant land uses in the broader region include, dryland agriculture, plantation forestry, biodiversity conservation and mineral sands mining. Broadacre dryland agriculture, in the area required clearing most of the native vegetation and replacing it with crops and pastures for livestock grazing. As such, remnant vegetation is of relatively high conservation value due to substantial historical clearing and disturbances. However, the project is located on largely intact remnant native vegetation on Unallocated Crown land, with Nature reserves to the north and south, and broadacre agriculture to the East and West. The biodiversity values in the landscape surrounding the project area are shown in (**Figure 6**).

4 Biodiversity Values within the Project

Bidaminna North is located north of the Moore River, approximately 17km west of Reagans Ford. Significant biodiversity values in the local area include Namming Nature Reserve to the north and South Mimegarra Nature Reserve to the west. Bidaminna South is located south of the Moore River, approximately 8.5km east of Cowalla. Significant biodiversity values in the area include a Declared wetland which intersects the assessment area (UFI 9231) and the Moore River National Park (**Figure 6**).

In 2018 Image commissioned Terratree Pty Ltd (Terratree) to conduct a Targeted Flora, Vegetation survey and linear *Phytophthora* Dieback assessment. After a desktop assessment, the field survey was conducted during the peak flowering period between 29th of October 29th and November 2nd, 2018. The surveys reported the following biodiversity and conservation values within the project area:

- Pristine vegetation condition
- Banksia woodlands of the Swan Coastal Plain – Priority 3 Ecological Community (PEC) in Western Australia and listed federally as a Threatened Ecological Community (TEC)
- *Banksia dallanneyi subsp. Pollosta* - Priority 3 Flora species -
- Carnaby's Black Cockatoo (Endangered) (*Calyptorhynchus latirostris*) - Threatened Fauna
- A Declared Wetland (an ESA)
- Absence of Introduced Flora
- Absence of *Phytophthora* Dieback.

4.1 Vegetation Condition

Vegetation condition can be classified based on the (perceived) ability of the vegetation community to maintain itself, degree pf disturbance and structure alteration and ecological function, using the Keighery Condition Scale (Keighery 1994) (**Appendix C**).

During the 2018 Terratree vegetation survey, vegetation condition throughout the area was rated as Pristine, in accordance with the Keighery Condition Scale (Keighery 1994). Impacts to vegetation were largely restricted to the presence of exploration tracks and fire breaks.

4.2 A Threatened Ecological Community

Three vegetation communities were identified during the 2018 Terratree Vegetation survey (**Photo 3**, **Photo 4** and **Photo 5**). Vegetation communities are detailed in **Table 1** below and shown spatially in **Figure 2** and **Figure 3**, which show the proposed drill lines within the Bidaminna project area, the vegetation along each drill line and the total area of each community.

Vegetation Type 1 is characterised by a *Banksia* woodland tree canopy, over primarily *Verticordia nitens* (**Photo 3**). This community accounted for 65.9% of the survey lines (**Figure 2** and **Figure 3**). Vegetation Type 2 is a similar *Banksia* woodland community, however with an understorey of primarily *Eremaea pauciflora* var. *pauciflora* and *Melaleuca clavifolia* (**Photo 4**). This community was less prolific than Vegetation Type 1, accounting for 21.5% of the total assessed vegetation (**Figure 2** and **Figure 3**). Vegetation Type 3 accounted for a shrubland community characterised by primarily *Adenanthos cygnorum* and *Pericalymma ellipticum* var. *ellipticum* over *Patersonia occidentalis* and *Dasypogon bromeliifolius* (**Photo 5**). This community is restricted to areas of lower topography, occurring only in the south portion of the project area (**Figure 2** and **Figure 3**). This was the smallest community, accounting for 12.59% of the total vegetation.

The vegetation structure and composition, as well as the location, physical environment, soils and landforms for Community Types 1 and 2 are consistent with diagnostic features for the Banksia Woodlands of the Swan Coastal Plain Ecological Community DBCA 2020 and DEE 2016).

Table 1: Community Descriptions from 2018 Survey by Terratree

Type	Vegetation Community Description	Conservation Category,	
		Federal	State
1	Open woodland of *Banksia attenuata, B. menziesii* and *Eucalyptus todtiana* over shrubland of *Verticordia nitens, Adenanthos cygnorum* and *Stirlingia latifolia.*	Threatened	Priority 3(iii)
2	Open woodland of *Eucalyptus todtiana, Banksia menziesii* and *B. attenuata* over closed shrubland of *Allocasuarina humilis, Eremaea pauciflora* var. *pauciflora* and *Melaleuca clavifolia.*	Threatened	Priority 3(iii)
3	Open shrubland of *Adenanthos cygnorum, Pericalymma ellipticum* var. *ellipticum* and *Xanthorrhoea preissii* over closed low shrubland of *Patersonia occidentalis, Dasypogon bromeliifolius* and *Alexgeorgia nitens.*		

4.2.1 Banksia Woodlands of the Swan Coastal Plain

A key diagnostic feature of this ecological community is a woodland with a prominent tree layer of *Banksia attenuata* and or *B. menziesii* with scattered Eucalypts and other tree species often present among or emerging above the Banksia canopy. The understorey is a species-rich mix of sclerophyllous shrubs, graminoids and forbs (Grass-like and flowering herbaceous plants) (DEE 2016). The community is associated with sandy soils of the Swan Coastal plain characterised by high endemism and considerable localised variation in species composition across its range. It is listed as Priority 3 Ecological Community in Western Australia (DBCA 2020) and listed federally as a Threatened Ecological Community (TEC) (DEE 2016).

4.3 A Priority Flora

A database search of Naturemap identified 46 flora species of conservation significance, composed of eight Threatened, two Priority 1, seven Priority 2, eighteen Priority 3 and eleven Priority 4 species occurring within a 20km radius of the study area. The Commonwealth (EPBC Act) Protected Matters Search Tool (DotE 2018) returned five additional Critically Endangered, Endangered and Vulnerable plant species from within a 10km radius.

A total of 49 species, representing 38 genera from 18 families were recorded within the survey area during the 2018 Terratree Flora Survey. Families with the highest representation were the Proteaceae (16 taxa), Myrtaceae (16 taxa), Fabaceae (4 taxa) and Ericaceae (4 taxa) families.

No Threatened flora species were recorded during the 2018 Terratree flora survey or previous surveys of the project area (Morgan 2014 and Terratree 2018).

Previous surveys have recorded five flora species of conservation significance have been recorded within the project area. These consist of *Banksia dallanneyi* subsp*. pollosta* (Priority 3), *Dodonaea hackettiana* (Priority 4), *Hypolaena robusta* (Priority 4), *Schoenus griffinianus* (Priority 4) and *Verticordia lindleyi* subsp*. lindleyi* (Priority 4) (Morgan 2014 and Rockwater 2009).

During the 2018 Terratree flora survey, one Priority flora species was recorded within the study area, *Banksia dallanneyi* subsp. ?*pollosta.* This species is Priority 3, a 'poorly-known' species. Explanation of the conservation codes can be found in **Appendix A**.

The locations of conservation significant flora recorded within the study area have been mapped spatially in **Figure 4** and **Figure 5**.

4.3.1 Banksia dallanneyi subsp. pollosta (P3)

Banksia dallanneyi subsp. pollosta is a prostrate, lignotuberous shrub that flowers yellow-brown from August to September, and commonly occurs in grey or yellow sand on predominantly flat topography (**Photo 6**).

Banksia dallanneyi subsp. *?pollosta* was found across the entire survey area mostly, present in all three communities, mostly associated with the Type 1 and 3 communities, and most prolific in community Type 3 (**Figure 4** and **Figure 5**). *Banksia dallanneyi* subsp. *?pollosta* was recorded in four main populations, in both the north and south project areas. In total 1378 plants were observed during the survey, with 231 plants found within 5m of the survey lines. These plants are likely to be impacted by drilling activities; however, it is unlikely that drilling activities will have a significant impact on this population.

Banksia dallanneyi subsp. *pollosta* differs from *Banksia dallanneyi* subsp. *dallanneyi* (which is not a Threatened or Priority species) as it has narrower leaves, more lobes per leaf, fewer flowers per head and an upright habit.

The collected specimens could not be definitively identified due to the leaves' lobes and the leaf width within the parameters of both species. *Banksia dallanneyi* subsp. *pollosta* is said to grade into *Banksia dallanneyi* subsp. *dallanneyi* to the south of its range (Cavanagh and Pieroni 2006) and there is the potential for the specimens to be transitional.

The specimens are likely to be *Banksia dallanneyi* subsp. ?*pollosta* due to their habit, leaf width and the number of lobes. Although there is potential for some specimens to be *Banksia dallanneyi* subsp. *dallanneyi,* due to sub-species *pollosta* being a Priority 3 species, a precautionary approach should be taken.

4.4 Threatened Fauna – Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*)

The project area is located within the range of the Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) which is listed as a Threatened species (Endangered) under the EPBC Act (DSEWPaC 2012).

Important foraging habitat vegetation types for Carnaby's cockatoo are those dominated by proteaceous plant species such as *Banksia* spp. (including *Dryandra* spp.), *Hakea* spp. and *Grevillea* spp. (DSEWPaC 2012). These species are associated with the Banksia woodland and Kwongan Heathland which occurs in Bidaminna.

Carnaby's Black Cockatoo generally breeds in woodlands or forests in large trees. Breeding habitat is defined in the Black Cockatoo Referral Guidelines as:

> "trees of species known to support breeding within the range of the species which either have a suitable nest hollow OR are of a suitable diameter at breast height (DBH) to develop a nest hollow. For most tree species, suitable DBH is 500 mm. For salmon gum and wandoo, suitable DBH is 300 mm" (DSEWSPaC 2012).

There are no trees of species or size, suitable for breeding are present in Bidaminna.

As well as requiring breeding and foraging habitat, outside of the breeding season, Carnaby's use communal night roosting sights, usually located away from breeding locations, and within proximity to foraging habitat and typically close to a significant water source. Suitable night roosting trees of a group of trees tend to be the tallest trees in the vicinity. The vegetation in the project area is unlikely to be suitable for roosting habitat due to the absence of stands of tall trees.

4.5 Environmentally Sensitive Areas

Environmentally Sensitive Areas (ESA's) can apply to a range of environmental, heritage and vegetation values. ESA's category that that is applicable within the study area include a Defined Wetland and the area within 50 m of the wetland. Defined wetlands include Ramsar wetlands, conservation category wetlands and nationally important wetlands

There are several geomorphic wetlands were occurring within the project area, two of which intersect the proposed drill lines in Bidaminna South (DBCA 2017) (**Figure 6**). Wetlands of the Swan Coastal plain have been classified using a geomorphic wetland classification system based on the characteristics of landform and water permanence and assigned a management category by considering their attributes, functions and value (DEC 2007). The geomorphic wetlands on Bidaminna are classified geographically as "Damplands" and are seasonally waterlogged basins with a management category of "Conservation" (Government of Western Australia 2017 and DEC 2007). Being a Conservation category wetland, they are a Declare Wetland and is, therefore, an Environmentally Sensitive Area (ESA), protected under the *Environmental Protection Act* 1986 which requires clearing permits for exploration activities in ESAs.

The project area lies within the area of the Banksia Woodlands of the Swan Coastal Plain (refer to **Section 4.2**). Although community types 1 and 2 meet the diagnostic features of the federal TEC (DEE 2016) at the state level, it is only recognised as Priority 3, and not a TEC, so it does not qualify as an ESA.

4.6 Absence of Introduced Flora (Weeds)

No introduced flora was discovered during the 2018 Terratree flora and vegetation survey.

4.7 Dieback – Phytophthora cinnamomi

Phytophthora Dieback is a soil-borne pathogen with a range of hosts in the southwest of WA, predominantly from the Proteaceae, Ericaceae, Myrtaceae, Xanthorrhoeaceae and Fabaceae plant families. While some plant species are resistant, others are susceptible to the disease caused by the pathogen, which can result in chlorosis, dieback and usually death (Wills and Keighery 1994).

Although many *Phytophthora* species exist in Western Australia, the most virulent and pathogenic is the introduced *P. cinnamomi*. References to *Phytophthora* Dieback refer to the disease caused by this species unless otherwise specified.

According to the most recent Western Australian State of the Environment Report, Dieback is listed as a Priority One threat, and is the third-greatest threat to biodiversity after salinity and climate change (Cresswell and Murphy 2017). It is considered a more serious threat than weeds, clearing of native vegetation, acid sulphate soils and soil erosion. The effect of Dieback is significant in WA because:

- Over 40% (2,300) of the native plant species and half of the Endangered plant species, in the south-west of WA are susceptible to the pathogen
- Changes in the composition and structure of floral communities as a result of Dieback has impacts throughout the whole ecosystem, including impacts on the indigenous fauna; and

- Dieback can lead to significant soil erosion as a result of the loss of susceptible vegetation.

Dieback is spread through the movement of water and soil within the landscape. Major vectors of Dieback include, but are not limited to, wet soil adhering to vehicle tyres/tracks and earthmoving equipment. Therefore, quarantine management procedures are an effective tool to reduce the spread of Dieback as a result of earthmoving activities.

During the 2018 Terratree Phytophthora Dieback survey, four samples were taken to test for the presence of *Phytophthora cinnamomi,* and all samples recorded negative results for the disease. No positive results for *Phytophthora cinnamomi* were retrieved from the samples with no visual impacts noted during the survey. In accordance with the *Dieback Interpreters' guidelines: FEM047 Phytophthora Dieback Interpreter's Manual for lands managed by the Department* (FEMD 2015), the area was mapped to be 'uninfested' based on field evidence by an experience Dieback interpreter.

4.7.1 Other Phytophthora species

Sample BS2 returned a result consistent with that of the fungus *Aplosporella sp*. and Sample BS3 returned a result for another Phytophthora species. The full table of sample results can be found in **Table 2**.

Sample BS3 returned a negative result for *Phytophthora cinnamomi,* however, returned a positive result for another *Phytophthora arenaria.* This species of *Phytophthora* is quite distinct from *P. cinnamomi* in that it has thick-walled cells and seem to be more adapted to the harsh environmental conditions found in the northern sandplains. It is thought that these species of *Phytophthora* may be endemic due to the morphological adaptations that enable them to persist in this harsh environment. These species are often recovered in samples taken during the warmer months when *P. cinnamomi* is rarely recovered due to low levels of inoculum (Jung *et al*. 2009). The overall impact of this species is low due to the low rainfall. There were limited observable effects of this Phytophthora species on the surrounding environment, and the area was still rated as 'Pristine' (**Appendix C**) (Keighery, 1993).

Table 2: Results from samples taken from Bidaminna survey area

Sample ID	Location		Plant Sampled	Results
	Easting	Northing		
BS1	366024	6560106	*Xanthorrhoea preissii*	Negative for *Phytophthora cinnamomi*
BS2	365236	6561760	*Banksia attenuata*	*Aplosporella* sp.
BS3	363060	6566089	*Banksia attenuata*	*Phytophthora arenaria.*
BS4	367182	6557140	*Banksia attenuata*	Negative for *Phytophthora cinnamomi*

5 Management of Potential Impacts

Image is committed to avoiding impacts to significant biodiversity values in the first instance. If unavoidable, every effort will be made to minimise and mitigate impacts. Exploration activities will be conducted in accordance with Image's *Bidaminna Project: Strategic Conservation Management Plan* (Terratree, 2017) and RCAC Sampling Procedure (Image Resources 2014).

5.1 Potential Impacts

Any substantial alteration to the biodiversity values described in **Section 4** that could potentially occur as a result of the proposed exploration activities are considered potential impacts. These include

- Impacts to Threatened and or Priority flora and Ecological communities
- Impacts to fauna and their habitats
- Impacts toa Declared wetland
- Introduction and spread of exotic species (weeds and plant pathogens)
- Soil destabilisation and erosion
- Impacts to surface and groundwater hydrology
- Uncontrolled fires (for example, originating from campfires and machinery)
- Site contamination (including from hydrocarbon, chemicals, litter and drilling wastes)
- Inadequate rehabilitation.

5.2 Management Actions

Environmental aspects, potential impacts, commitments and management actions are outlined in (**Table 3**). The management actions included will ensure the avoidance in the first instance, minimisation and mitigation of potential impacts.

Table 3: Management Actions to adhere to commitments to prevent impacts to environmental aspects at Bidaminna.

Environmental Aspect	Priority Flora
Potential Impacts	▪ Damage, destruction or death to Priority Flora (*Banksia dallanneyi subsp. ?pollosta*)
Commitment	▪ Avoid or, if unavoidable, to minimise and mitigate impacts to native vegetation
Management Actions	▪ A Flora and Vegetation survey has already been conducted of the project area ▪ Restrict driving to established tracks wherever possible ▪ Avoid unnecessary disturbance to vegetation ▪ Use a 'blade up' approach to track creation, rolling rather over the vegetation ▪ If impacts to significant populations of Priority flora are unavoidable, then every effort should be made to minimise impacts by demarcating populations prior to ground disturbance activities ▪ Descriptions and photographs of conservation significant species and features potentially occurring in the project area will be made readily available to field staff ▪ Appropriate machinery for the task will be used to minimise impacts and all vehicles and machinery will be 'clean on entry' to the project area. ▪ Equipment will be parked linear along tracks, rather than side by side to minimise the impact footprint ▪ Implement appropriate rehabilitation (**Section 5.3**).
Environmental Aspect	**Threatened Ecological Community (TEC)**
Potential Impacts	▪ Damage, destruction or death to native vegetation, in particular, Banksia Woodland of the Swan Coastal Plain TEC. ▪ Alteration of species composition in a community
Commitment	▪ Avoid direct impacts on native fauna ▪ Avoid or, if unavoidable, minimise and mitigate impacts to native fauna habitat.
Management Actions	▪ Avoid unnecessary disturbance to vegetation, clearing of large mature trees and thickets ▪ Use a 'blade up' approach to track creation, rolling rather over vegetation ▪ Clearly demarcate the area of approved soil disturbance i.e. tracks, pads and sumps to avoid, or where unavoidable to minimise, impacts to the TEC ▪ Restrict driving to established tracks ▪ Appropriate machinery for the task will be used to minimise impacts and all vehicles and machinery will be 'clean on entry' to the project area. ▪ Implement appropriate rehabilitation (**Section 5.3**).
Environmental Aspect	**Threatened Fauna**
Potential Impacts	▪ Direct impact on fauna by injuring or killing fauna ▪ Indirectly impacting fauna by damaging or fragmenting habitat

Commitment	▪ Avoid impacts to Carnaby's cockatoo habitat trees including mature Banksia and *Eucalyptus todtiana Avoid* impacts on fauna as a result of uncapped drill holes
Management Actions	▪ Restrict driving to established tracks ▪ Impacts to trees including *Banksia attenuata, B. menziesii, B. ilicifolia* and *Eucalyptus todtiana* will be avoided and drill lines will go around larger trees and shrubs ▪ No pets will be allowed into the exploration areas ▪ No sumps in which fauna could become trapped will be excavated during the exploration. ▪ Implement appropriate rehabilitation (**Section 5.3**).
Environmental Aspect	**Declared Wetland ESA**
Potential Impacts	▪ Changed vegetation cover ▪ Altered hydrology ▪ Contamination with chemicals and hydrocarbons
Commitment	▪ No significant impacts to a Declared wetland ESA will occur as a result of exploration activities.
Management Actions	▪ Impacts to native vegetation will be minimised, using 'blade up' approach, avoiding mature trees and staying on existing tracks where possible. ▪ No chemical or hydrocarbon contamination of the wetland will occur ▪ Implement appropriate rehabilitation (**Section 5.3**)
Environmental Aspect	**Soil Structure and Function**
Potential Impacts	▪ Soil erosion, loss of topsoil, compaction and other impacts to soil which inhibit the growth of native vegetation.
Commitment	▪ Prevent soil erosion and to rehabilitate areas disturbed during exploration ▪ Rehabilitate disturbed areas and mitigate the impacts caused by the exploration program.
Management Actions	▪ Avoid excavation ▪ Minimise clearing of native vegetation, to avoid erosion ▪ Avoid entering the project during wet soil conditions, to avoid compaction ▪ Implement appropriate rehabilitation (**Section 5.3**)
Environmental Aspect	**Weeds and pathogens**
Potential Impacts	▪ Introduction of invasive flora, *Phytophthora cinnamomi* or other pathogens could result in: ▪ Reduced floristic diversity ▪ Altered vegetation structure ▪ Increased risk of soil erosion in some instances ▪ Altered fire regimes ▪ Impacts to the Declared Wetlandand TEC/PEC ▪ Impacts on ecosystems function

Commitment	▪ Prevent the introduction and spread of pathogens during exploration, notably Phytophthora species.
Management Actions	▪ The project area has already been surveyed for Phytophthora and found to be Uninfested. ▪ Exploration activities should be conducted during dry soil conditions only and in accordance with Image Resources' RCAC Sampling Procedure covers Dieback management. ▪ The Dieback hygiene management plan should be reviewed to confirm it is appropriate to ensure - machinery entering site, especially earth-moving equipment, is 'clean on entry' to the project area i.e. free of soil and vegetative materials - all vehicles and machinery be inspected using DBCA's Checklist for Vehicle and Machinery Inspections (**Appendix D**) and verified clean of any soil or vegetative matter before entering the assessment area - ground-disturbing activities will be avoided in wet soil conditions - disturbance activities in weed-infested areas, especially when these plant species are bearing fruit/seed should be avoided - Clean on Entry inspection points will be signposted and identified on maps provided to field personnel ▪ Field staff will receive appropriate training including - Green Card - Descriptions and photographs of significant environmental weeds potentially occurring in the program area will be made readily available to field personnel - Reporting plan, and contingency actions if weeds are found in the project area
Environmental Aspect	**Pollution - Environmental Contamination**
Potential Impacts	▪ Contamination soil and groundwater and natural environment with hydrocarbons and other chemicals and waste. ▪ Alteration of ecological communities through deaths of species caused by chemical contamination. ▪ Contamination of a Declared wetland ESA.
Commitment	▪ Prevention of soil and water contamination and to minimise air and noise pollution as a result of exploration activities.
Management Actions	▪ Exploration activities should be conducted in accordance with Image Resources RCAC Sampling Procedure which covered Hydrocarbon Management, spill prevention and response as well as dust management. ▪ All machinery including the drill rig and support vehicles carry spill kits ▪ No camping in the project area during exploration activities ▪ All waste to be removed from the project area.
Environmental Aspect	**Fire Regimes - Uncontrolled wildfire**
Potential Impacts	▪ Damage to native vegetation, soil exposure, fauna habitat

	▪ reduced biomass can increase soil instability, and create an opportunity for invasive species to establish within the burnt area
Commitment	▪ No uncontrolled fires start as a result of Image Resources exploration activities
Management Actions	▪ No fires of any sort will be lit during exploration works (e.g. no camping) ▪ No smoking at any time during exploration activities ▪ No working on total fire ban days or in bad fire conditions ▪ All vehicles and machines being operated are fitted with well-maintained exhaust systems that will prevent the accumulation of combustible material against heat surfaces and that injectors on diesel vehicles are in good working order ▪ All exploration vehicles will carry an appropriate, unexpired, serviced fire extinguisher ▪ Comply with all relevant fire control legislation, guidelines and instructions ▪ No cigarettes or other burning matter will be disposed of on the exploration site ▪ A dedicated fire fighting vehicle will be made available during Restricted or Prohibited fire periods
Environmental Aspect	**Hydrology - Groundwater and surface water resources**
Potential Impacts	▪ Reduction of groundwater ▪ Alteration of surface water flows ▪ Impacts on Declared Wetland ESA
Commitment	▪ There will be no impact to surface water flows and groundwater levels as a result of exploration activities.
Management Actions	▪ No abstraction of groundwater will occur during exploration activities ▪ No exploration activities will be undertaken within 50 metres of a surface water flow or lake
Environmental Aspect	**Rehabilitation**
Potential Impacts	▪ Inadequate rehabilitation resulting in impacts to all environmental aspects
Commitment	▪ Ensure adequate regeneration of the native vegetation on completion of works
Management Actions	▪ Create photo monitoring points before exploration activities to obtain baseline and therefore rehabilitation objectives criteria ▪ Undertake photo monitoring every quarter, biannually then annually until the site has returned to pre-exploration vegetation health ▪ Implement management actions, if monitoring finds introduced weeds or inadequate vegetation regeneration ▪ Produce rehabilitation reports at project closure ▪ Refer to **Section 5.3** for more details.

5.2.1 Training

Image Resources will ensure that personnel receive appropriate training and information in relation to environmental values of the projects area, including the risks the exploration program poses to those values and management actions to be taken to address those risks. These education and awareness programs will be conducted to ensure field and technical personnel are aware of their role in protecting these values.

Records should be maintained of all training completed and refresher training undertaken. Training must cover all the relevant components of the Biodiversity Values and Management sections including but not limited to

- Proper use of roads and tracks (staying on tracks)
- Management actions and awareness regarding native flora and fauna
- Green Card training to raise awareness around biosecurity issues especially Phytophthora Dieback and weeds
- Correct handling, storage and disposal of waste, including hydrocarbon management
- Incident response and reporting
- Rehabilitation of drill sites and access tracks.

5.2.2 Incident Response

Should an unplanned event occur that impacts on any environmental aspects outlined in **Table 3** and **Section 4** Image Resources will respond appropriately, through incident response procedures to ameliorate the impacts promptly.

5.3 Rehabilitation

5.3.1 Vegetation

No new tracks will be created, and vegetation will be rolled over or avoided. It is expected that the impacted areas will regenerate naturally and recover due to the 'blade up' approach to accessing the exploration drill lines. The ability of Kwongan shrubland to regenerate from a significantly more impactful approach, involving cleared 3D seismic survey lines in Kwongan shrubland, has been demonstrated in Beekeepers Nature (AWE 2018). However, monitoring will be carried out to ensure that rehabilitation is occurring at an appropriate rate after exploration and no weeds have been introduced (**Section 5.3.3**).

5.3.2 Drill Holes

Plugging drill holes is necessary to minimise risk to fauna and prevent groundwater contamination (DMP 2012). Drill holes are must be temporarily plugged immediately after drilling is completed and then permanently plugged and rehabilitated within six months after drilling in accordance with the DMP guidelines (DMP 2012). Drill sites should be regularly inspected to ensure that the drill holes remain securely plugged (DMP 2012).

Exploration activities will be conducted in accordance with Image Resources RCAC Sampling Procedure covers drill hole rehabilitation (Image Resources 2014).

5.3.3 Monitoring

Post-rehabilitation monitoring of affected areas will be undertaken at least quarterly, where possible, to determine if any maintenance or remediation is required until exploration sites have been successfully rehabilitated. Post rehabilitation monitoring reports should address:

- Vegetation density, diversity and foliage cover
- Landform stability
- Local disturbances impacting on rehabilitation success
- Monitoring for introduction or spread of weed species.

5.3.4 Reporting

An Exploration Completion Report must be submitted to DMIRS when rehabilitation work is finished in accordance with PoW requirements (DMP 2012). In addition to these reports, Environmental reporting will be conducted by Image Resources to ensure that the management actions were carried out and that the commitments made in this EEMP were achieved, and if not achieved appropriate response actions were carried out. An internal rehabilitation review report should be produced by Image Resources at 6 and 12 months after completion exploration activities and should focus on all the potential environmental impacts covered in this EEMP including

- The recovery of the vegetation
- Impacts to large trees
- Biosecurity status in terms of Dieback status and Introduced flora
- Soils destabilisation, erosion and compaction, changes to hydrology, control of sediment
- Site contamination and waste management.

6 Conclusion

The proposed exploration program, if carried out following management and rehabilitation actions described in **Section 5**, will not result in significant impacts on biodiversity values in the project area. This EEMP should be reviewed regularly so ensure continual improvement. Terratree will continue to work closely with Image Resources to implement best-practise environmental management procedures during exploration and can inform and provide Green Card training to field staff as required.

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Photos

Photo 1: Scale of truck-mounted drill rig. During Bidaminna exploration they will aligned one behind the other.

Photo 2: Scale of ute-mounted drill rig. During Bidaminna exploration they will aligned one behind the other.

Photo 3: Vegetation Community Type 1 - Open woodland of *Banksia attenuata, Banksia menziesii* and *Eucalyptus todtiana* over shrubland of *Verticordia nitens*, *Adenanthos cygnorum* and *Stirlingia latifolia*

Photo 4: Vegetation Community Type 2 - Open woodland of *Eucalyptus todtiana*, *Banksia menziesii* and *Banksia attenuata* over closed shrubland of *Allocasuarina humilis*, *Eremaea pauciflora var. pauciflora* and *Melaleuca clavifoli*.

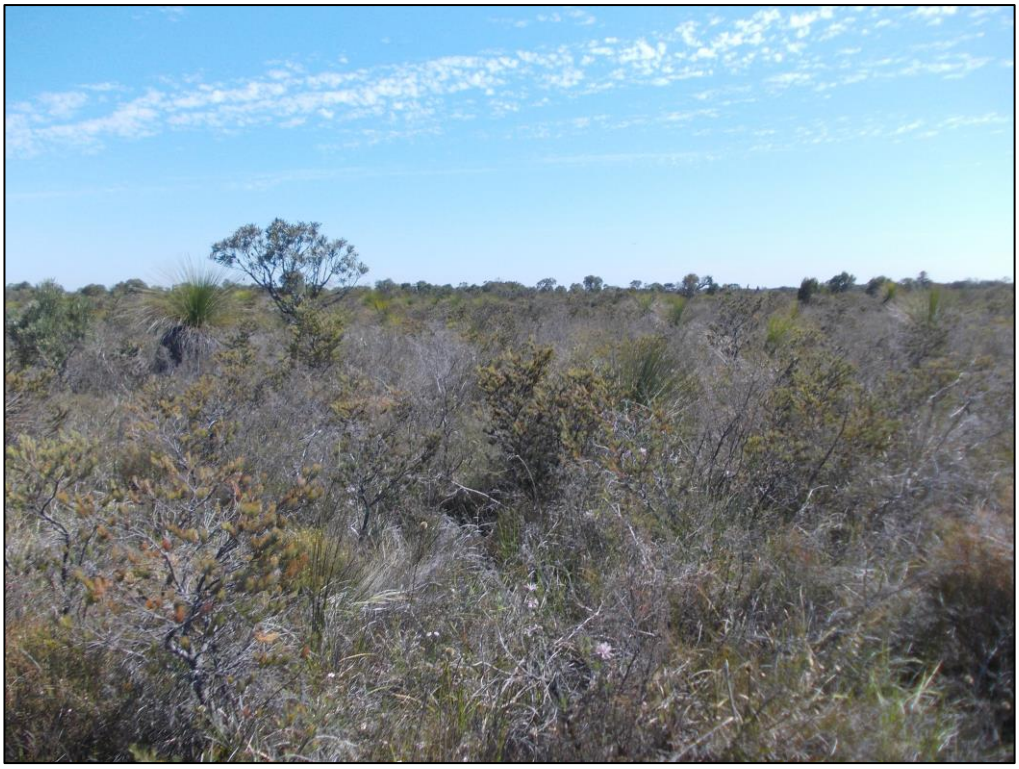
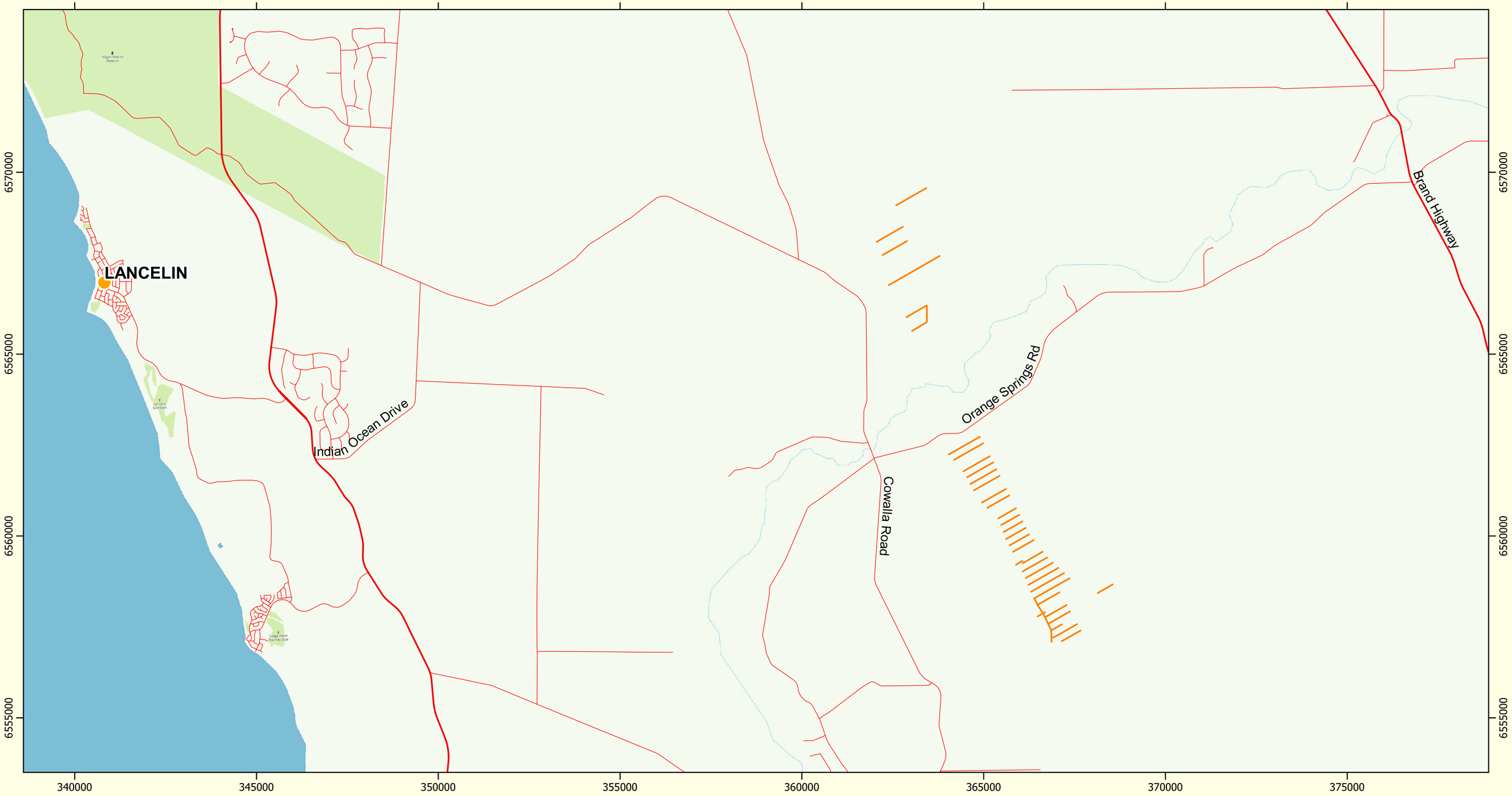


Photo 5: Vegetation Community Type 3 - Open shrubland of *Adenanthos cygnorum*, *Pericalymma ellipticum var. ellipticum* and *Xanthorrhoea preissii* over closed low shrubland of *Patersonia occidentalis*, *Dasypogon bromeliifolius* and *Alexgeorgia nitens*.

Photo 6: Priority 3 taxon *Banksia dallanneyi* subsp. *pollosta* at Bidaminna Survey Area

Figures

Figure 1: Bidaminna Project Location Map



Legend

Place Locations

- Town

Road Network

- Local Road
- State Road
- Bidaminna Proposed Drill Lines

Project Location

Bidaminna Project Location

2018 Terratree Flora and Dieback Survey for Image Resources

1 0 1 2 3 4 5 km

N

Datum: GDA 1994
Projection: MGA Zone 50

Scale: 1:100,000 at A3

Date: 05/12/2018	Prepared: G. Maslen	Project #: T18015
Expiry: 05/12/2018	Checked: G. Maslen	
Figure 1	Review: J. Grehan	Terratree
	Revision:	

Figure 2: Vegetation Communities, Bidaminna North

Legend

Bidaminna Proposed Drill Lines

Vegetation Community Types

Type 1

Type 2

Project Location

Bidaminna North Vegetation Communities

2018 Terratree Flora and Dieback Survey for Image Resources

0 250 500 750 1000 m

N

Datum: GDA 1994
Projection: MGA Zone 50

Scale: 1:20000 at A3

Date: 05/12/2018	Prepared: G. Maslen	Project #: T18015
Expiry: 05/12/2018	Checked: G. Maslen	
Figure 2	Review: J. Grehan	Terratree
	Revision:	

Figure 3: Vegetation Communities, Bidaminna South

Legend

- Bidaminna Proposed Drill Lines

Vegetation Community Types

- Type 1
- Type 2
- Type 3
- Releve Locations

Project Location

Bidaminna South Vegetation Communities

2018 Terratree Flora and Dieback Survey for Image Resources

0 500 1000 1500 2000 m

N

Datum: GDA 1994
Projection: MGA Zone 50

Scale: 1:30000 at A3

Date: 05/12/2018	Prepared: G. Maslen	Project #: T18015
Expiry: 05/12/2018	Checked: G. Maslen	
Figure 3	Review: J. Grehan	Terratree
	Revision:	

Figure 4: Location of Threatened and Priority Flora, Baidaminna North

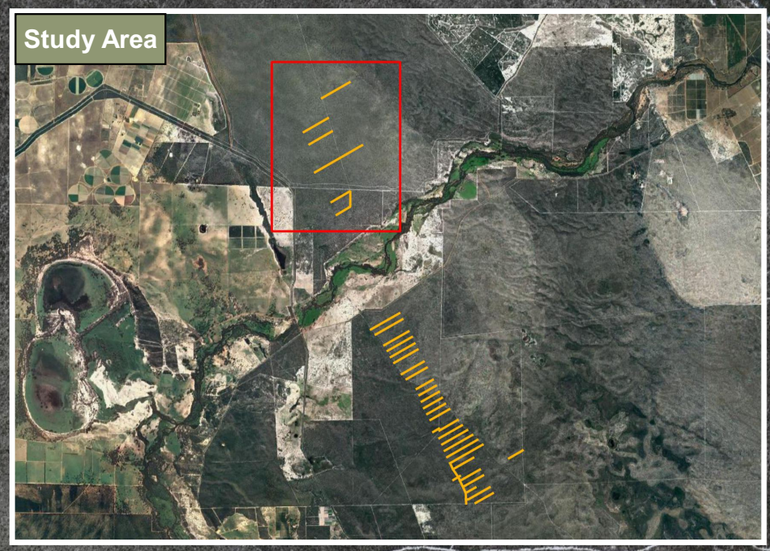
360000 361000 362000 363000 364000 365000 366000 367000

6569000

6568000

6567000

6566000



Legend

Bidaminna Proposed Drill Lines

Number of Banksia dallanneyi subsp. ?pollosta plants

- 1 - 6
- 6 - 12
- 12 - 20
- 20 - 35
- 35.0 - 50.0

Project Location

Bidaminna North Priority Species Location

2018 Terratree Flora and Dieback Survey for Image Resources

0 250 500 750 1000 m

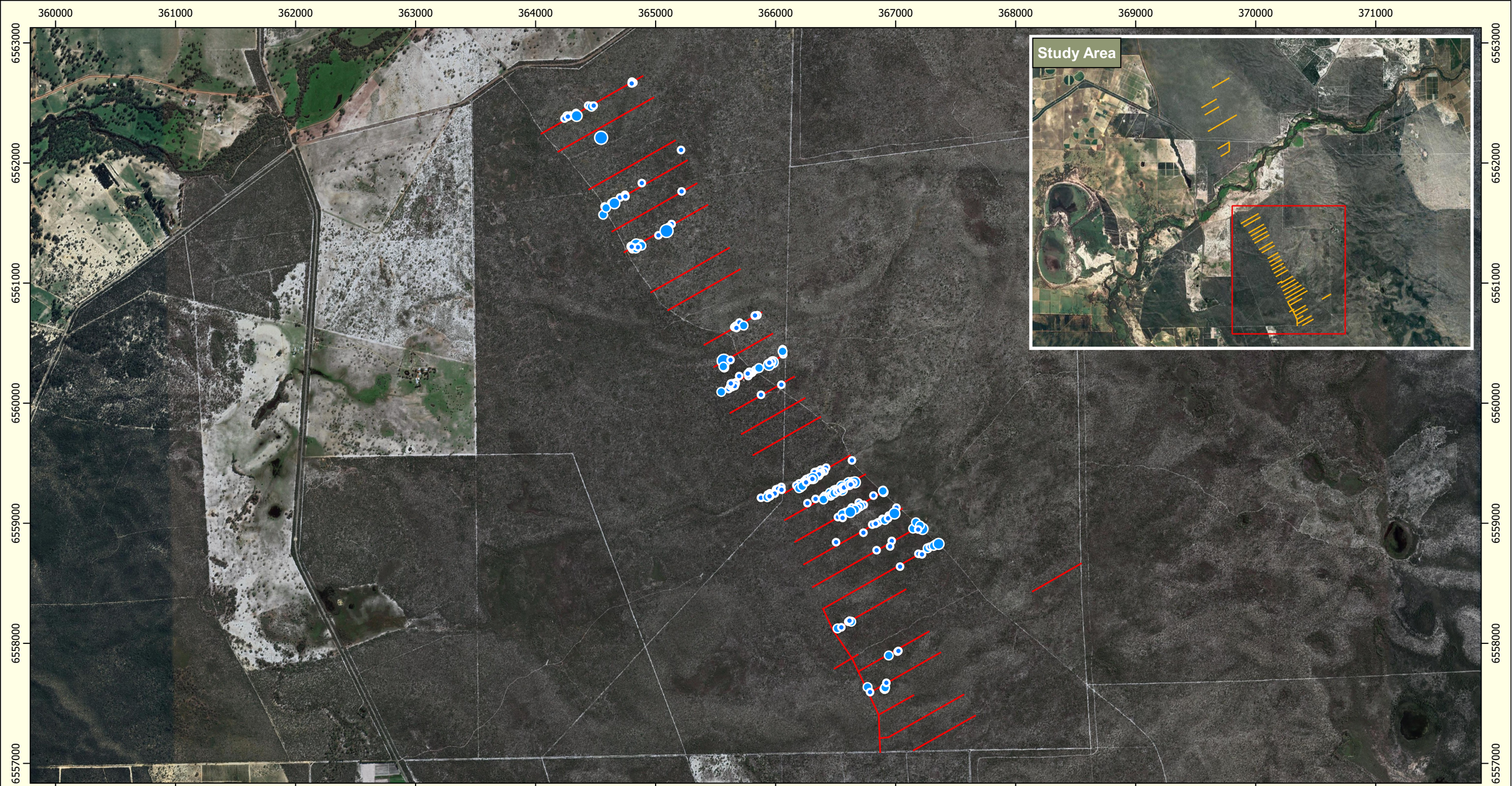
N

Datum: GDA 1994
Projection: MGA Zone 50

Scale: 1:20000 at A3

Date: 05/12/2018	Prepared: G. Maslen	Project #: T18015
Expiry: 05/12/2018	Checked: G. Maslen	
Figure 4	Review: J. Grehan	Terratree
	Revision:	

Figure 5: Location of Threatened and Priority Flora, Bidaminna South



Legend

Bidaminna Proposed Drill Lines

Number of Banksia dallanneyi subsp. ?pollosta plants

- 1 - 6
- 6 - 12
- 12 - 20
- 20 - 35
- 35 - 50

Project Location

Bidaminna South Priority Species Locations

2018 Terratree Flora and Dieback Survey for Image Resources

0 500 1000 1500 2000 m

N

Datum: GDA 1994
Projection: MGA Zone 50

Scale: 1:30000 at A3

Date: 05/12/2018	Prepared: G. Maslen	Project #: T18015
Expiry: 05/12/2018	Checked: G. Maslen	
Figure 5	Review: J. Grehan	Terratree
	Revision:	

Figure 6: Biodiversity Values in the Landscape Surrounding the Project Area.

Namming Nature Reserve
South Mimegarra Nature Reserve
Moore River
Nabaroo Nature Reserve
Moore River National Park
Moore River Nature Reserve
Gnangara-Moore River State Forest

Legend

- Roads
- Bidaminna Drill Lines

DBCA Lands

- National Park
- Nature Reserve
- Section 5(1)(g) Reserve
- State Forest

Geomorphic Wetlands

- Conservation
- Multiple Use
- Resource Enhancement
- Not Assessed
- Not Applicable

Overview

Image Resources - Bidaminna

Biodiversity Values in Local Region

0 1 2 3 4 5 km

N

Datum: GDA 1994
Projection: MGA Zone 50

Scale: 1: 12 000 at A3

Date: 05/03/2020	Prepared: H. Legge	Project No: T200011
Expiry:	Checked: J. Grehan	
Figure 6	Revision:	
	Review:	

Terratree

Appendices

Appendix A: Conservation Codes for Threatened and Priority Flora and Ecological Communities

Table A.1 – Definition of codes for Commonwealth Listed Threatened Flora

Code	Definition
Ex	**Extinct** Taxa which at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
ExW	**Extinct in the Wild** Taxa which is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
CE	**Critically Endangered** Taxa which at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
E	**Endangered** Taxa which is not critically endangered and it is facing a very high risk of extinction in the wild in the immediate or near future, as determined in accordance with the prescribed criteria.
V	**Vulnerable** Taxa which is not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
CD	**Conservation Dependent** Taxa which at a particular time if, at that time, the species is the focus of a specific conservation programme, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

Table A.2 – Definition of codes for Threatened and Priority Flora

Code	Definition
T	**Threatened Flora – (Declared Rare Flora – Extant)** Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection and have been gazetted as such (Schedule 1 under the *Wildlife Conservation Act 1950*).
X	**Presumed Extinct Flora (Declared Rare Flora - Extinct)** Taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such Schedule 2 under the *Wildlife Conservation Act 1950*).
P1	**Priority One – Poorly Known Species** Species that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.
P2	**Priority Two – Poorly Known Species** Species that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.
P3	**Priority Three – Poorly Known Species** Species that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.
P4	**Priority Four – Rare, Near Threatened and other species in need of monitoring** (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
P5	**Priority Five - Conservation Dependent species** Species that are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

Source: (DBCA, 2019)

Table A.3 – Definition of codes for Threatened Ecological Communities

Code	Definition
PD	**Presumed Totally Destroyed** An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future. An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant
CR	**Critically Endangered** An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated. An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future.
EN	**Endangered** An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future. An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future.
VU	**Vulnerable** An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range. An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future.

Table A.4 – Definition of codes for Priority Ecological Communities

Code	Definition
P1	**Priority One** Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or Pastoral lands, urban areas, active mineral leases) and for which current threats exist. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
P2:	**Priority Two** Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
P3	**Priority Three** (i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (ii) Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; (iii) Communities made up of large, and/or widespread occurrences that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.
P4	**Priority Four** Ecological communities that are adequately known, Rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring. (a) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands. (b) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (c) Ecological communities that have been removed from the list of threatened communities during the past five years. P5: Priority Five Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.
P5	**Priority Five** Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Appendix B: BAM Act Declared Pest Control Categories

Table B.1: Control Categories for Declared Pests

Declared Plant Category	Description
C1 - Exclusion	Pests assigned to this category are not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
C2 - Eradication	Pests assigned to this category are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
C3 - Management	Pests assigned to this category are established in Western Australia, but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

Source: BAM Act 2007 and WAOL (DAFWA 2018).

Table B.2: DBCA Weed Categorisation Criteria DBCA in the Environmental Weed Strategy (CALM 1999).

Criteria	Description
Invasiveness	Ability to invade bushland in good to excellent condition, or ability to invade waterways (scored as yes or no).
Distribution	Wide current or potential distribution including consideration of the known history of widespread distribution elsewhere in the world (scored as yes or no).
Environmental Impacts	The ability to change the structure, composition and function of ecosystems; in particular, an ability to form a monoculture in a vegetation community (scored as yes or no).

Table B.3: DBCA Environmental Weed Ranking

Rank	Description
High	A species that scores yes to all three of the above criteria. A rating of high indicates a species that should be prioritised for control and/or research.
Moderate	A species that scores yes for two of the above criteria. A rating of moderate indicates a species that should be monitored. Control or research should be directed to it if funds are available.
Mild	A species that scores yes to one of the criteria. A mild rating indicates monitoring or control if appropriate.
Low	A species that does not score yes for any of the criteria. A low rating indicates a low requirement for monitoring.

Appendix C: Keighery Vegetation Condition Scale

Scale		Condition
1	Pristine	Pristine or nearly so, no obvious signs of disturbance.
2	Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
3	Very Good	Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
4	Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
5	Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
6	Completely Degraded	The structure of the vegetation is no longer intact, and the area is completely or almost completely without native species. These areas are often described as "parkland cleared" with the flora comprising weed or crop species with isolated native trees or shrubs.

(Source: Keighery, 1994).

Appendix D: DBCA Checklist for Vehicle and Machinery Inspections

Registration/ID:	**Make & Model:**				
Item	**Type/Examples**	**Not Applicable**	**Not Compliant**	**Compliant**	**Initial**
Scrub bars	Front, Rear, Side				
Fenders:	Front, Rear, Side				
Fenders:					
Radiator area					
Belly plates / Underside Protection					
Bucket /blade /forks					
Rippers					
Suspension					
Spare wheels					
Wheels / tracks					
Mud flaps					
Flat sections	Esp. horizontal				
Cupped sections					
Chassis areas	H- or C- sections				
Hinged Points:	Esp articulated areas e.g. FEL / Truck/ Crane/ Excavator arm				
Leaks:	Motor, Transmission / Driveline / Hoses / Tanks / Hydraulics / Reservoirs				
Leaks:	Excessive Grease				
Spill kit(s)	(e.g. Hydrocarbon)				
Water Tanks:	Potable /Treated /Untreated/ Capacity				
Trailer(s)	Light/ Heavy/ Number/Capacity/Type				
Cargo space					
Clean down kit					
Cabin; front	Floor and seats				
Cabin; rear	Floor and seat				
floormats					
Fire suppression gear (Bushfire Act compliant?)	Extinguishers, Drafting, Capacity, Hi-Pressure-Low-Volume,				

*Previous work sites may entail sighting records of Clean-on-Exit checks & documents.

Assessing Person (Owner or Representative):				
Signature	Name	Date & Time	Company/Agency	Contact Details
				M: T: F:

Source: DPaW 2017