

Native Vegetation Management Plan

Document Number:	0016-940010196-891	Document Status:	DRAFT
Date Issued:	13 June 2020	Review Due:	13 June 2021
Document Owner:	J. Zander, T. Borlase and B. Ryan		
Document Approver:	Joanne Lee, Jacinth-Ambrosia ERCR Manager		





CONTENTS

1.	Introduction	4
1.1.	Purpose.....	4
1.2.	Scope.....	4
1.3.	Existing environment	4
2.	Compliance Requirements	6
2.1.	Legislation, Regulations and Guidelines	6
2.1.1.	Mining Act 1971	6
2.1.2.	Native Vegetation Act 1991 and Native Vegetation Regulations	6
2.2.	References.....	6
2.3.	Lease Conditions	7
2.4.	PEPR Outcomes and Measurement Criteria.....	8
3.	Site and Vegetation Description	8
3.1.	Land Use.....	8
3.2.	Vegetation Communities.....	8
3.3.	Flora of Conservation Significance.....	9
3.4.	Distribution of Weed Species.....	9
4.	Potential Impacts to Native Vegetation.....	12
5.	Management and Mitigation Measures	12
6.	Significant Environmental Benefit.....	13
6.1.	Extent of Vegetation Clearance	13
6.2.	Rehabilitation of Areas Disturbed by Mining.....	14
6.3.	Provision of SEB.....	14
7.	Monitoring	15
8.	General Monitoring	16
8.1.	Methods and frequency	16
8.2.	Landscape Function Analysis.....	16
8.2.1.	Methods and frequency	16
8.3.	Vegetation Clearance Monitoring	16
8.4.	Impacts from Dust Monitoring.....	16
8.4.1.	Methods and frequency	17
8.5.	Impacts from Mounding Groundwater	17
8.5.1.	Methods and frequency	17
9.	Auditing and Review	17
9.1.	Audits.....	17
9.2.	Review and Continuous Improvement.....	17
10.	Reporting	18
10.1.	Record Management	18
11.	Responsibilities	18
12.	Document Revision and Control.....	19

TABLES

Table 1:	PEPR Outcomes and Measurement Criteria.....	8
Table 2	Weed species recorded in Yellabinna Regional Reserve and project area	11
Table 3	Management and mitigation measures to minimise impacts to native vegetation	12
Table 4	Summary of SEB domains	Error! Bookmark not defined.
Table 5	Summary of operational vegetation monitoring.....	15
Table 6:	Audit frequency.....	17
Table 7:	Record Type and Location	18
Table 8	Responsibilities in relation to the NVMP	18



FIGURES

Figure 1 Location of the Jacinth-Ambrosia Mine	5
Figure 2 Pre-mine vegetation communities	10



1. INTRODUCTION

1.1. Purpose

The *Jacynth-Ambrosia (J-A) Native Vegetation Management Plan (NVMP)* outlines impacts to native vegetation associated with construction and operational activities at J-A and applicable management controls.

This NVMP was developed in accordance with the:

- Guidelines for a Native Vegetation Significant Environmental Benefit Policy for the Clearance of Native Vegetation Associated with the Minerals and Petroleum Industry (DWLBC 2005); and
- Guide for a Significant Environmental Benefit for the clearance of native vegetation associated with the Minerals and Petroleum Industry (*DEM/NVC, 2017*).

The NVMP provides a framework for managing and mitigating the potential impacts due to vegetation clearing and project activities as a result of the project and outlines how the project will achieve a SEB.

The purpose of this Plan is to:

- Outline the legislative commitments and obligations related to native vegetation at J-A;
- Provide a source document for all departments to use through all stages of mining and rehabilitation; and,
- Document responsibilities and reporting framework in relation to native vegetation.

The objectives of this Plan are:

- To ensure native vegetation is avoided wherever possible in site disturbance works through the Vegetation Clearance Permit system; and
- If disturbance to native vegetation is required, all reasonable steps will be undertaken to avoid impacting threatened flora species and to limit the disturbance/clearance of native vegetation.

1.2. Scope

This plan applies to all J-A Mining Leases and Miscellaneous Purpose Leases associated with the J-A operations. It is designed, implemented, monitored and revised according to Iluka policy, procedures, and standards and the operational context.

1.3. Existing environment

The mine and associated infrastructure is located within Yellabinna and Nullarbor Regional Reserves, located approximately 290 km north-west of the township of Ceduna (Appendix A). The dominant land uses of the reserves are described as conservation of the wildlife, conservation landscape and historic features, Aboriginal land use, mineral exploration and tourism. The project area does not fall within any local council boundaries and as such is described as located in an “out of council” area.

Refer to the J-A Program for Environmental Protection and Rehabilitation (PEPR) for more information on the existing environment.

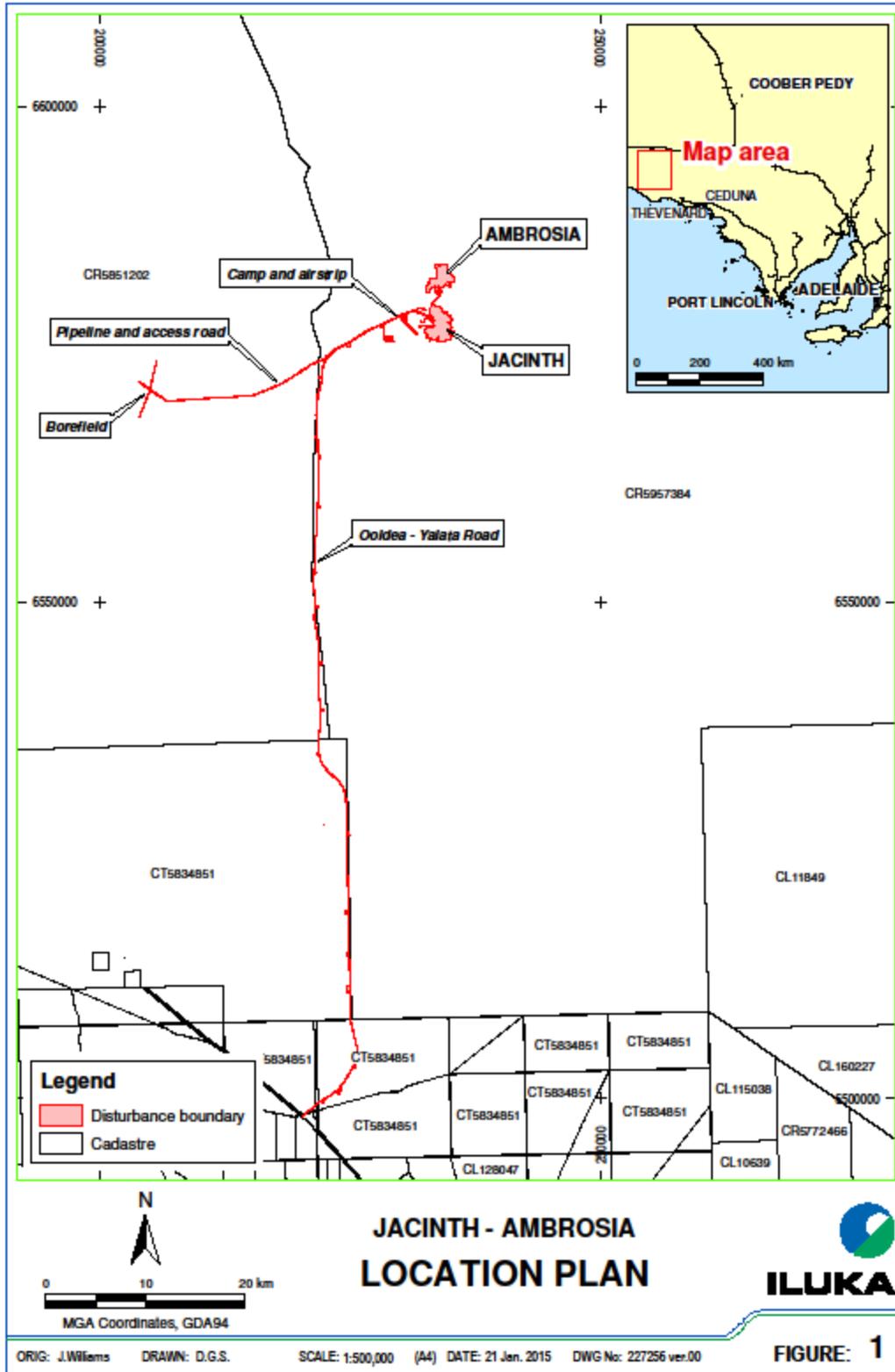


Figure 1 Location of the Jacinth-Ambrosia Mine



2. COMPLIANCE REQUIREMENTS

2.1. Legislation, Regulations and Guidelines

The following legislation, regulations and guidelines apply to native vegetation at J-A:

- *Environmental Protection and Biodiversity Conservation Act 1999* (Commonwealth);
- *Mining Act 1971*;
- *Native Vegetation Act 1991*;
- *Native Vegetation Regulations 2003 and 2017*;
- *National Parks and Wildlife Act 1972*; and,
- Yellabinna Reserves Management Plan 2013 (DEW, 2013)

2.1.1. Mining Act 1971

The principal legislation for the regulation of mining in South Australia is the *Mining Act 1971*, which is administered by the Department of Energy and Mining (DEM). Under this Act, the proponent must obtain a ML and have an approved Program for Environmental Protection and Rehabilitation (PEPR) in order to proceed with a mining project.

2.1.2. Native Vegetation Act 1991 and Native Vegetation Regulations

All native vegetation in South Australia is protected under the provisions of the *Native Vegetation Act 1991*, under which the South Australian Native Vegetation Council (NVC) must approve any clearance of vegetation not exempted under regulations.

Clearance, in relation to native vegetation, is described as:

- The killing or destruction of native vegetation;
- The removal of native vegetation;
- The severing of branches, limbs, stems or trunks of native vegetation;
- The burning of native vegetation; and
- Any other substantial damage to native vegetation, including the draining or flooding of land, or any other act or activity, that causes the killing or destruction of native vegetation, the severing of branches, limbs, stems or trunks of native vegetation or any other substantial damage to native vegetation.

Under the *Native Vegetation Act 1991*, there are exemptions for native vegetation clearance undertaken as part of operations under the *Mining Act*. The exemption allows native vegetation clearance for mining operations (other than exploration), provided it is undertaken in accordance with a management plan that details, to the satisfaction of the NVC, how the project will result in a Significant Environmental Benefit (SEB) – refer Section 6.

2.2. References

This plan shall be read in conjunction with the following Corporate Iluka and J-A site documentation;

Document ID	Title/Description
0016-890777318-18	Group Standard 7 – Environmental Management
0016-940010196-307	Program for Environmental Protection and Rehabilitation (PEPR)
0016-940010196-572	J-A HSEC Management Plan



Document ID	Title/Description
0016-940010196-262	Dust and Air Quality Management Plan
0016-940010196-345	J-A Vegetation Clearance Permitting Procedure
-	J-A Vegetation Clearance Procedure
0016-940010196-360	J-A Vegetation Clearance Application Form
-	J-A Significant Environmental Benefit (SEB) Procedure
0016-940010196-480	TWI_007_JARehab_Vegetation Condition (Dust) Monitoring
-	TWI_008_JARehab_Vegetation Condition (Mounding Groundwater) Monitoring
-	TWI_009_JARehab_Photopoint Monitoring
0016-940010196-258	J-A Pest Species Management Plan
0016-940010196-271	J-A Rehabilitation Management Plan
0016-940010196-400	J-A Mine Closure Plan
0016-940010196-860	J-A Fire Management Plan
0016-940010196-261	J-A Surface Water Management Plan
0016-940010196-266	J-A Groundwater Management Plan

2.3. Lease Conditions

The ML, MPL and EML, issued for operations at J-A, are subject to conditions under the *Mining Act 1971* (Mining Act); these conditions must be complied with during all phases of the mining operation. The conditions relevant to native vegetation management are given in Table 2.

Table 2 J-A lease and license conditions relevant to native vegetation

Lease or Licence number	Condition details
ML 6315 EML 6316 MPL 110	The Lessee must abide by the <i>National Parks and Wildlife Act 1972</i> and its associated Regulations and Plans of Management (both amended and subsequent) adopted under Section 38 of the <i>National Parks and Wildlife Act 1972</i> for the Yellabinna Regional Reserve and the Nullarbor Regional Reserve.
MPL 111	The Lessee must ensure that the post mining ecosystem and landscape function is resilient, self-sustaining and indicating that the pre-mining ecosystem and landscape function will ultimately be achieved.
	The PEPR must include a set of leading indicators to demonstrate that the closure outcome (post mining ecosystem and landscape function is resilient, self-sustaining and indicating that the pre-mining ecosystem and landscape function will ultimately be achieved) is likely to be achieved.
	The Lessee must, in constructing and operating the lease, ensure that all clearance of native vegetation is authorised under appropriate legislation.



Lease conditions are enforced by means of environmental outcomes and measurement criteria within the PEPR. This is the principal approval document governing Iluka’s operations at J-A.

2.4. PEPR Outcomes and Measurement Criteria

The PEPR was developed for the J-A Mineral Sands Mine in October 2015, superseding the Mining and Rehabilitation Plan (MARP). The PEPR is under current revision and is expected to be revised in 2020.

The PEPR includes detailed and specific information on environmental control measures and establishes outcome-based performance criteria for the mining operation. Table 1 lists the PEPR outcomes and assessment criteria applicable to the management of native vegetation management.

Table 1: PEPR Outcomes and Measurement Criteria for Native Vegetation

Outcome	Leading Indicator Criteria	Measurement Criteria
All clearance of native vegetation is authorised under appropriate legislation	All vegetation clearance is within authorised clearance boundaries.	All vegetation clearance is within authorised clearance boundaries.
Post mining ecosystem and landscape function is resilient, self-sustaining and indicating that the pre-mining ecosystem and landscape function will ultimately be achieved	-	Landscape Function Analysis indicates that rehabilitated systems are trending towards pre-disturbance landscape function based on comparison with control sites.
No uncontrolled fires caused by mining activities	-	Demonstrate no uncontrolled fires have occurred.

3. SITE AND VEGETATION DESCRIPTION

3.1. Land Use

The mine and its associated infrastructure are located within the Yellabinna and Nullarbor Regional Reserves (Figure 1). The Yellabinna Regional Reserve also occurs within the wider Yellabinna Wilderness Protection Area, designed to conserve broad scale mallee woodland ecosystems that occur south-west of South Australia. The dominant land uses of the Yellabinna and Nullarbor Regional Reserves are:

- Refuge for flora and fauna species of national or state conservation significance;
- Conservation of mallee woodland vegetation communities;
- Aboriginal land use;
- Mineral exploration; and
- Tourism.

The project area does not fall within any local council boundaries and is described as located in an “out of council” area.

3.2. Vegetation Communities

The vegetation associations of J-A and surrounds are well described. A number of baseline vegetation surveys were carried out prior to the commencement of mining operations and ongoing vegetation impact assessment surveys are conducted annually. The baseline vegetation surveys conducted at J-A and surrounds include:

- Eucla Basin Vegetation Survey: Jacinth and Ambrosia Deposits (Badman Environmental, 2006a);



- Eucla Basin, Baseline Vegetation Survey: Jacinth and Ambrosia Deposits, Infrastructure Corridor, Fowlers Bay. (Badman Environmental, 2006b)
- Vegetation Survey of the Western Access Route on Colona Station (Badman Environmental 2007);
- A Vegetation Survey of the Jacinth-Ambrosia Wellfield and Pipeline Corridor (Badman Environmental, 2007); and
- Supplementary Vegetation Survey of the S-Bend Deviation of the Access Road North of the Dog Fence (Badman Environmental, 2007).

Three main vegetation associations were identified within the J-A mining area and surrounds (Figure 2) comprising:

- **Association 1:** *Acacia papyrocarpa* (western myall)/*Eucalyptus oleosa ssp. oleosa* (red mallee) open woodland.

Association 1 comprises of open red mallee woodland with western myall woodland. It is associated with the Yellabinna dune field on the eastern side of the project area. The average tree canopy cover for this group is 16%. The understory vegetation consists of low shrublands including *Maireana* spp. (bluebush) and *Atriplex* spp. (saltbush) as well as forbs and grasses. *Eremophila scoparia* (broom emubush) and other small trees or tall shrubs such as *Santalum acuminatum* (quandong) and *Alectryon oleifolius* (bullock-bush) occur as a mid-layer of the vegetation community at most sites.

- **Association 2:** western myall low open woodland.

Association 2 comprises of scattered western myall with a chenopod low shrubland understory. It is dominated by *Maireana sedifolia* (pearl bluebush) and/or *Atriplex vesicaria* (bladder saltbush) and represents a transition in vegetation from the Nullarbor Plain to the west and the Yellabinna dune field to the east. Average tree canopy cover for sites in this group is 5%.

- **Association 3:** pearl bluebush and/or bladder saltbush low open shrubland.

Association 3 comprises of chenopod low shrubland representative of the Nullarbor Plain. The vegetation community is dominated by pearl bluebush and/or bladder saltbush with no woodland species present. The vegetation community grows on shallow soils over limestone and, in general, limestone excludes deep rooted species such as the small trees or tall shrubs that occur in other vegetation associations in the region.

3.3. Flora of Conservation Significance

One species of threatened flora is located in the J-A area and surrounds. *Santalum spicatum* (sandalwood) is listed as Vulnerable under the NPW Act. Scattered sandalwood trees were recorded across parts of both the Ambrosia and Jacinth deposits and within the vicinity of the southern portion of the borefield pipeline corridor.

3.4. Distribution of Weed Species

During the baseline surveys of the project area, seven weed species were recorded, subsequent to the initial surveys, an additional 18 weeds have been detected within the project area. Table 2 provides a summary of weed species recorded within the Yellabinna Regional Reserve and within the project area.

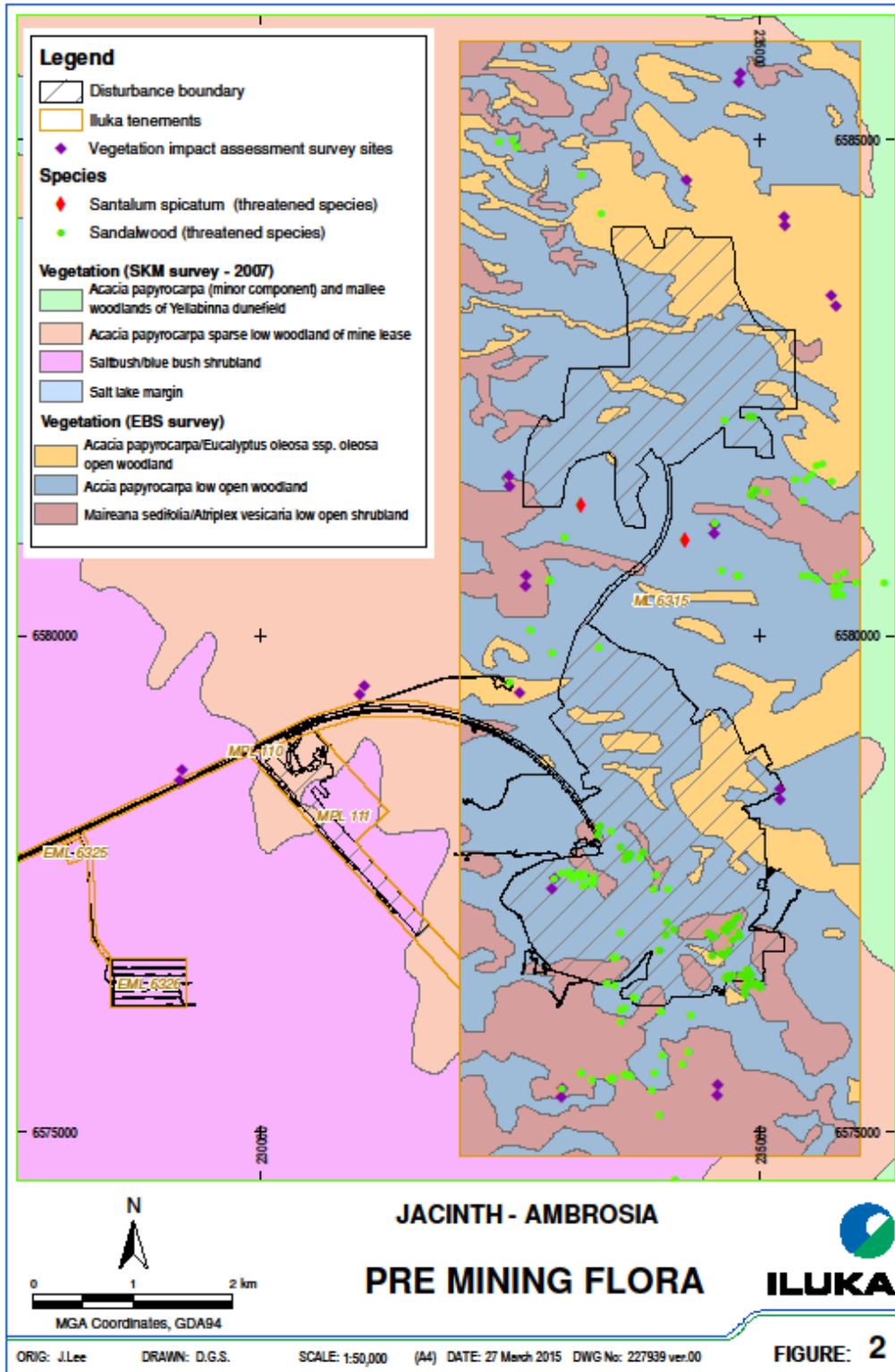


Figure 2 Pre-mine vegetation communities

Table 2 Weed species recorded in Yellabinna Regional Reserve and project area

Scientific name	Common name	Yellabinna Reserve	Regional	Baseline surveys	Subsequent to baseline
Acetosa vesicaria	ruby dock				✓
Arcotheca calendula	cape weed				✓
Avena barbata	wild oats	✓			✓
Brassica tournefortii	wild turnip	✓		✓	✓
Bromus rubens	red brome	✓			✓
Buglossoides arvensis	sheepweed	✓			
Bupleurum semicompositum	hare's ear	✓			
Cardaria draba	hoary cress	✓			
Carrichtera annua	ward's weed	✓		✓	✓
Carthamus lanatus	woolly star thistle	✓			
Cenchrus ciliaris	buffel grass	✓			✓
Centaurea melitensis	Maltese cockspur	✓			
Chenopodium sp.	fat hen				✓
Citrullus colocynthis	colocynth	✓			✓
Cucumis myriocarpus	paddy melon	✓			
Cynodon dactylon	couch grass	✓			✓
Diplotaxis muralis var. muralis	wall rocket	✓			
Ditrichia graveolens	stinkwort	✓			
Echium plantagineum	salvation Jane	✓			
Erodium aureum	stork's bill	✓		✓	
Erodium botrys	long stork's bill	✓			
Erodium cicutarium	cut leaf stork's bill	✓		✓	✓
Erodium moschatum	musky stork's bill	✓			
Gypsophila tubulosa	chalkwort	✓			
Heliotropium europaeum	potato weed	✓			
Hordeum sp.	barley grass	✓			✓
Hypochaeris glabra	smooth cat's ear	✓			
Lactuca serriola	wild lettuce				✓
Lolium sp.	rye grass				
Lycium ferocissimum	African boxthorn	✓			✓
Malva parviflora	small flower marshmallow	✓			
Marrubium vulgare	horehound				✓
Medicago sp.	medic	✓			✓
Mesembryanthemum aitonis	angled iceplant	✓			✓
Mesembryanthemum crystallinum	iceplant	✓			✓
Neotostema apulum	hairy sheep weed			✓	
Nicotiana glauca	tree tobacco	✓			
Onopordum acaulon	stemless thistle	✓			
Parapholis incurve	curly ryegrass	✓			
Plantago bellardii	hairy plantain	✓			
Polycarpon tetraphyllum	allseed	✓			
Prunus dulcis	almond	✓			
Raphanus raphanistrum	wild radish				✓
Reichardia tingitana	false sow thistle			✓	✓
Rostraria cristata	annual cat's tail	✓			
Rostraria pumila	tiny bristle grass	✓		✓	
Schinus areira	pepper tree	✓			
Schismus arabicus	-	✓			
Schismus barbatus	mulga grass	✓			
Sisymbrium erysimoides	smooth mustard	✓			
Sisymbrium irio	London rocket	✓			
Sisymbrium orientale	wild mustard	✓			✓
Solanum nigrum	blackberry nightshade	✓			✓
Sonchus oleraceus	sow thistle	✓			✓
Sonchus tenerrimus	clammy sow thistle	✓			
Spergularia diandra	lesser sand-spurrey	✓			
Tribulus terrestris	yellow vine	✓			
Urtica urens	stinging nettle	✓			
Vulpia muralis	-	✓			
Vulpia myuros	rat's tail fescue	✓			

4. POTENTIAL IMPACTS TO NATIVE VEGETATION

Potential impacts to native vegetation as a result of the mine operations at J-A include:

- Adverse effects on vegetation species (including threatened species) both locally and regionally due to clearing activities;
- Increased diversity/abundance of weed species;
- Vegetation death or stress due to "smothering" of vegetation with dust from mine activities;
- Vegetation death or stress and lack of vegetation regeneration because of the use of saline water for dust suppression;
- Impacts on existing vegetation and regenerating vegetation caused by mounding groundwater;
- Vegetation death or stress caused by a saline water spill or release from process water infrastructure;
- Impacts on vegetation in the event of an uncontrolled fire;
- Impacts on downstream vegetation due to changes in surface water flows or contamination of surface water flows.

5. MANAGEMENT AND MITIGATION MEASURES

Impact avoidance, management and mitigation measures were developed to reduce the potential impacts on native vegetation of the J-A area. Table 3 outlines the potential impacts to native vegetation and the associated management and mitigation measures.

Table 3 Management and mitigation measures to minimise impacts to native vegetation

Impact	Management and mitigation measures
Vegetation clearance	<p>Minimise the area of clearance in areas sensitive to disturbance, such as drainage lines. Stockpiles should be located to avoid ephemeral water courses. Minimise the area of clearing, as much as reasonably practical, and only clear areas immediately prior to development. Vegetation clearing will be undertaken progressively immediately prior to use of the area to minimise the amount of disturbed ground open at any one time.</p> <p>Restrict access to undisturbed areas.</p> <p>Implement a vegetation clearance procedure.</p> <p>Vegetation clearance permits to be completed in accordance with the timeframes outlined in the clearance procedure.</p> <p>Cleared vegetation to be appropriately stockpiled.</p>
Dust	<p>Implement the Dust and Air Quality Management Plan including:</p> <p>Minimise the area of disturbed open ground at any one time;</p> <p>Dust suppression during clearing and stockpiling activity;</p> <p>Restricting clearing and stockpiling activity during periods of high winds.</p>
Groundwater mounding	<p>Implement the Groundwater Management Plan, including:</p> <p>Recovery of water from tailings; and</p> <p>Groundwater level monitoring.</p>
Soil contamination (saline)	<p>Establish procedures for dust suppression.</p> <p>All relevant personnel are trained in dust control management.</p> <p>Confirm phreatic surface within tails profile is within acceptable limits prior to rehabilitation.</p> <p>Confirm gravimetric moisture content of tailings profile surface is within acceptable limits prior to rehabilitation.</p>



Impact	Management and mitigation measures
Saline water spill	Daily inspections of the borefield and associated infrastructure to be carried out. All valves on the boreline positioned in such a way that released water will be captured on borefield road or easement. Mine site pipelines bunded to prevent release to native vegetation.
Fire	Implement the Fire Risk Management Plan.
Pest plant and animals	Implement the Pest Species Management Plan. Regularly monitor disturbance areas for presence of weed species. Implement vehicle hygiene procedures for all incoming and outgoing plant and equipment. Minimise areas of disturbance (i.e. surface water ponding, no driving off access tracks etc).
Surface water	Locate stockpiles to avoid interaction with ephemeral water courses. Implement the Surface Water Management Plan controls including clean water diversion, erosion and sediment control features.

6. SIGNIFICANT ENVIRONMENTAL BENEFIT

Native vegetation in South Australia is protected by the *Native Vegetation Act 1991*. In order to clear native vegetation in South Australia, approval must first be provided by the Native Vegetation Council and, in general, the approval to clear native vegetation is accompanied by conditions, usually the requirement to offset the removal of the native vegetation.

The offset needs to provide a Significant Environmental Benefit (SEB), meaning it needs to provide an environmental gain over and above the damage being done to the native vegetation in the clearing activity. This usually involves the protection of a separate area of land for conservation or management of a monetary offset payment to the Native Vegetation Fund.

In 2017, the Native Vegetation Regulations were revised to “*Guide for a Significant Environmental Benefit for the clearance of native vegetation associated with the Minerals and Petroleum Industry (2017)* (hereby referred to as ‘the guideline’). The change in the guideline also meant a change in SEB calculations. Iluka’s SEB for J-A is a monetary offset payment to the Native Vegetation Fund for native vegetation cleared for the project. Because the J-A Mine and its associated SEB was approved under the 2003 Native Vegetation Regulations, Iluka was granted permission by the Department of Environment and Water and Department for Energy and Minerals to use the previous calculations for the life of mine. Any additional exploration or operational approvals would require the 2017 Native Vegetation Regulations assessment.

6.1. Extent of Vegetation Clearance

The anticipated total area cleared for the J-A mine and associated infrastructure, including the Ooldea Road (Access Road) is 1,660 ha (Table 4).

Based on the SEB 2003 Guidelines, all vegetation in the J-A mine area is considered to be intact vegetation (10:1), indicated by:

- All strata intact and botanical composition close to original;
- Little or no signs of disturbance;
- Little or no weed infestation;
- Soil surface crust intact; and
- Substantial litter cover.



6.2. Rehabilitation of Areas Disturbed by Mining

All areas disturbed during operations will be rehabilitated to recreate a safe, stable, vegetated landform that is consistent with surrounding conditions and allows the re-establishment of biodiversity conservation, passive tourism and traditional Aboriginal land uses. Because of rehabilitation activities, on completion of mining, the initial SEB ratio will be reduced by 50% (e.g. a 10:1 ratio will be reduced to 5:1).

6.3. Provision of SEB

The SEB procedure outlines the method for calculating the SEB for clearance of native vegetation at J-A. Table 4 provides the total SEB provision required for the clearance of native vegetation at J-A.

Table 4 Summary of SEB areas

Domain	Disturbance Area (Ha)	SEB area (10:1) (Ha)	Revised SEB area for rehabilitation (Ha)
Domain 1: Ooldea Road			
A: Borrow Pits	94	936	468
B: Water Points	3	28	14
C: Ooldea Road	155	1552	1416
Cultural Track	42	420	420
Domain 2: MPL111 Airfield and Village			
A: Airfield	40	400	401
B: Village	8	81	41
C: Drainage lines	3	26	26
Domain 3: MPL 110 Borefield and Access Road			
A: Borefield Road	49	489	245
B: Power lines and associated infrastructure	21	207	103
C: Water supply pipeline	12	120	60
D: Turkey's Nests and Bores	37	368	184
E: Tank Farm 1	3	30	15
F: EMLs and Borrow Pits	16	165	82
Domain 4: ML6315 Mine Site			
A: Jacinth Pit	247	2474	1237
B: Ambrosia Pit	285	2850	1425
C: Off-path TSF	124	1235	617
D: Stockpiles	339	3389	1695
E: Roads	82	825	413
F: Process Plant	26	253	126
G: Offices	1	12	6
H: Exploration drill sites, access tracks and water points	73	731	366
Total	1,660	16,591	9,360



7. MONITORING

Ongoing vegetation monitoring will be conducted to allow identification of any impacts of mine construction and operations on vegetation (Table 5).

Table 5 Summary of operational vegetation monitoring

Monitoring	Parameters Monitored	Monitoring Procedure	Frequency	Responsibility	Reporting
General	Diversity and abundance	Landscape Function Analysis	1, 2, 5 and 10 years post-rehabilitation	Rehabilitation Specialist	Annual compliance report (ACR) J-A Rehabilitation and Monitoring Summary (JARMS)
	Abundance of weeds	Pest Species Management Plan	Annual and during targeted management programs	Rehabilitation Specialist	ACR
Vegetation clearance	Vegetation clearance area	Vegetation Clearance Procedure	Annual	Rehabilitation Specialist	ACR SEB Reconciliation
		SEB Calculation Procedure			
		Photopoint Monitoring Procedure			
Impacts from dust	Diversity and abundance Vegetation health	Vegetation condition (dust) monitoring Remote Sensing (Normalized Difference Vegetation Index) – <i>in preparation</i>	Bi-annual	Rehabilitation Specialist Environmental Technician	JARMS
Impacts from mounding groundwater	Vegetation health	Vegetation condition (groundwater) monitoring	Annual	Rehabilitation Specialist	JARMS
	Groundwater levels	Groundwater Management Plan	Monthly/fortnightly	Environmental Specialist	ACR

8. GENERAL MONITORING

Impact assessment monitoring is conducted in all three of the vegetation associations (Figure 2) and any new areas as considered appropriate.

8.1. Methods and frequency

Monitoring sites are visually inspected and photographed to allow assessment of:

- Changes in the abundance, composition or condition of vegetation communities;
- Ongoing impacts to flora as a result of project-related activities;
- Increases in the density and distribution of known weed infestations; and
- Introduction of new weed species.

Monitoring is used to allow the comparison of quantitative data on vegetation in the different vegetation communities, and between near-mine and control sites. Vegetation monitoring will be timed following completion of rehabilitation areas and following mine closure of operations until completion criteria are met.

8.2. Landscape Function Analysis

Landscape Function Analysis (LFA) is a monitoring procedure that uses visual indicators of specific landscape characteristics to assess how effective an ecosystem operates as a biogeochemical system, and as a method of monitoring landscape rehabilitation projects (D J Tongway and N L Hindley 2004). At J-A, LFA will be conducted for all rehabilitation areas in accordance with the J-A Rehabilitation Management Plan.

8.2.1. Methods and frequency

LFA monitoring will be carried out at years 1, 2, 5 and 10 post-rehabilitation. LFA monitoring will comprise assessment of:

- Soil cover;
- Basal cover of vegetation;
- Litter cover;
- Biological soil crust;
- Crust entirety;
- Erosion type and severity;
- Deposited materials;
- Surface roughness;
- Surface resistance to disturbance;
- Slake testing; and
- Soil texture.

8.3. Vegetation Clearance Monitoring

All areas to be cleared for project purposes are documented, with information collected on the area and nature of vegetation cleared. All areas are cleared in accordance with the J-A Vegetation Clearance Procedure and Vegetation Clearance Permitting Procedure. Clearance permits will be reconciled annually against clearance areas determined from aerial photography and an annual SEB reconciliation is provided to DEW and DEM.

8.4. Impacts from Dust Monitoring

The potential impact to vegetation from dust generated by mine activities is monitored to determine the extent of any impacts. If required SEB calculations will be adjusted accordingly.

8.4.1. Methods and frequency

Monitoring sites are visually inspected and photographed to allow assessment of:

- Changes in the abundance, composition or condition of vegetation communities; and
- Deposition of dust on vegetation and biological crust.

Monitoring is used to allow the comparison of quantitative data on vegetation in the different vegetation communities and between near-mine and control sites.

Vegetation monitoring is timed as follows:

- Bi-annually (post summer and winter) to ensure the maximum number of species is recorded and any effects of rainfall on dust deposition can be captured; and
- Where impacts are recorded, monitoring will continue post-closure of the operations until completion criteria are met.

8.5. Impacts from Mounding Groundwater

Potential impacts to vegetation due to mounding groundwater is monitored annually to determine the extent of any impacts and, if necessary, SEB calculations will be adjusted accordingly. Numerous health parameters for various plant species are monitored and recorded at various distances from known water mounds or potential areas for monitoring.

8.5.1. Methods and frequency

Vegetation at monitoring sites is visually inspected and photographed to allow assessment of changes in plant health. Monitoring is used to allow the comparison of quantitative data on vegetation health between near-impact and control sites.

Vegetation monitoring is carried out annually. Where impacts are recorded, monitoring will be carried out post-closure of the operations until completion criteria are met.

9. AUDITING AND REVIEW

9.1. Audits

Audits shall be completed per the below schedule to ensure compliance with PEPR outcomes, lease conditions and the Iluka EHSMS. Table 6 denotes the compliance audit schedule.

Table 6: Audit frequency

Type	Frequency	Measured	Records
Audit	Annual	PEPR Commitments	ACR
Audit	2-Yearly	EHS Management System Standards - Internally	Cintellate – Audit
Audit	5-Yearly	EHS Management System Standards - Externally	U-Docs

9.2. Review and Continuous Improvement

This plan is reviewed on an annual basis, or where major changes to operations or procedures arise.

Monitoring as described in Section 7 may vary due to improvements identified as part of the annual audit process or due to the collection of sufficient data to provide evidence of predicted outcomes being achieved.

10. REPORTING

The following reporting requirements apply to native vegetation management:

- Hazard, incident, procedural or legislative breach – reported via the Iluka Lost Control Card (LCC) system. Records are maintained within Cintellate.
- Statutory Reporting:
 - Legislative/compliance breaches – ad-hoc reporting of incidents or compliance breaches to DEM and DEW; and
 - Compliance reporting – reporting of management performance against PEPR outcomes and Licence/approval conditions within the J-A Annual Compliance Report (ACR).

10.1. Record Management

Records associated with native vegetation management shall be administered according to Table 7.

Table 7: Record Type and Location

Type	Format	Record Location
Audits – External	Electronic	U-Docs Cintellate – Audits & Inspection Record
Audits – Internal	Electronic	Cintellate – Audits & Inspection Record
Hazards, Incidents (LCC Cards)	Electronic	Cintellate
Statutory Reports/Notifications	Electronic	U-Docs
Clearance Permits	Electronic	ArcGIS (Vegetation Clearance Master MXD) U-Docs
SEB Reconciliations/Reports	Electronic	U-Docs Annual Compliance Report Annual SEB Reconciliation

11. RESPONSIBILITIES

The responsibilities of site personnel in relation to the Plan are outlined below in Table 8.

Table 8 Responsibilities in relation to the NVMP

Responsibilities	Position	Task
Weed monitoring	Environmental Specialist and Environmental Technician	Monitor known weed infestation hotspots periodically (such as low lying areas near roadsides, ephemeral water courses etc). Undertake weed spray campaigns periodically, as required, as part of the Pest Species Management Plan.
Landscape Function Analysis	Rehabilitation Specialist	Undertake LFA monitoring at 1, 2, 5 and 10 years post-rehabilitation. Report findings in ACR and JARMS.
Vegetation clearance	Environmental Specialist and Rehabilitation Specialist	Undertake vegetation clearance permitting and supervision as required (as part of mining operations and necessary maintenance works).
SEB calculation	Rehabilitation Specialist	Undertake SEB calculations as per the SEB calculation procedure. Report in annual ACR and annual SEB reconciliation.



Responsibilities	Position	Task
Photopoint monitoring	Rehabilitation Specialist	Undertake photopoint monitoring as per the Photopoint monitoring procedure.
Vegetation condition (dust) monitoring and NDVI monitoring	Rehabilitation Specialist and Environmental Technician	Undertake bi-annual vegetation health monitoring to determine impacts from dust. Conduct annual NDVI fly over surveys. Report findings in JARMS.
Vegetation condition (groundwater) monitoring	Rehabilitation Specialist	Undertake annual vegetation health assessments and report findings in JARMS.
Groundwater monitoring	Environmental Specialist and Environmental Technician	Monitor groundwater levels monthly or fortnightly as per the Groundwater Management Plan.
Coordinate NVMP review	Rehabilitation Specialist	Ensure that the NVMP and referenced documents are kept up-to-date. Annual review of the NVMP.
Rehabilitation	Rehabilitation Specialist	Rehabilitation of previously disturbed areas as per commitments in the Rehabilitation Management Plan and the Mine Closure Plan.
Reporting to Regulators	ERCR Manager	Any non-compliance with legislation shall be coordinated by the ERCR Manager.

12. DOCUMENT REVISION AND CONTROL

All HSEC documents are reviewed every *two years at a minimum* or in the event of significant change to operations or process and through this process.

Revision	Date Issued	Reviewer	Approver	Changes Made
1.0	2010	J. Goode		Original document
2.0	2016	T. Law & J. Lee		Updated to incorporate changes to rehabilitation practices
3.0	2016	T. Law & J. Lee	N Travers	Updated to incorporate PEPR updates.
4.0	2016	J. Zander	J Lee	Annual review
5.0	2020	J. Zander, T. Borlase and B. Ryan	J lee	Review and update with PEPR changes

DISCLAIMER: When this document is printed it becomes uncontrolled. Any amendments to this document should be controlled by the document owner. All amendments, comments and reviews should be captured in the EDMS. All new revisions must be reviewed by a discipline expert and approved by the HSEC Manager – Signatures must be added to the document as part of the review and approval. Documents that are not signed should be considered as DRAFT/Not Approved.