HASTINGS
Technology Metals Limited

APPENDIX 2

YANGIBANA RARE EARTHS PROJECT

FLORA AND VEGETATION ENVIRONMENTAL MANAGEMENT PLAN

DOCUMENT NO. YGB-72-000-HSE-PRJ-PLN-0001

REVISION HISTORY

Revision	Date	Issued for	Prepared By	Reviewed By	Approved By
A	12/06/18	Issued for stakeholder review	Lara Jefferson	Stefan Wolmarans COO	Stefan Wolmarans COO
B	25/08/18	Issued for stakeholder review	Lara Jefferson Kellie Bauer-Simpson		Lara Jefferson
C	02/12/18	EPA Services Review	Lara Jefferson		Lara Jefferson
D	13/03/19	EPA Services Review	Lara Jefferson Mike Baimbridge Kellie Bauer-Simpson	Lara Jefferson	Lara Jefferson

CHANGE HISTORY

Revision	Date	Change Description	Updated by
A	12/06/2018	First Draft for Stakeholder Review Rev A	Lara Jefferson Environmental Manager
B	25/08/2018	Revised following EPA Services review comments	Lara Jefferson Environmental Manager
C	02/12/2018	Revised following EPA Services review comments	Lara Jefferson Environmental Manager
D	13/03/2019	Revised following comments from DWER TEB	Mike Baimbridge Kellie Bauer-Simpson Lara Jefferson

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SUMMARY

Hastings Technology Metals Limited has prepared this Environmental Management Plan (EMP) to meet the requirements of the Environmental Scoping Document for the Yangibana Rare Earths Project (the Proposal) as summarised below:

Title of proposal	Yangibana Rare Earths Project
Proponent Name	Hastings Technology Metals Limited
EPA assessment number	2115
Purpose	The purpose of this EMP is to meet the requirements of the Environmental Scoping Document (work program # 11): Provide a Flora and Vegetation management plan to address significant residual impacts to flora and vegetation. The following should be addressed in the plan: • Invasive species control - control of weeds, in particular through construction of infrastructure, transport and/or entry and exit points, riparian and GDE areas, vegetation units considered to have high local significance (e.g. rare units, habitat for conservation significant species) and in areas identified as in 'Excellent condition'. • Monitoring program - to monitor the significant flora and vegetation communities identified. • Management program - develop adaptive management actions to be triggered should monitoring show a decline as a result of implementing the proposal. • Management of offset (if applicable).
Key Environmental Factor	Flora and Vegetation
Objective	To protect flora and vegetation so that biological diversity and ecological integrity are maintained.
Outcome	To ensure that the Proposal avoids and minimises any adverse effects on flora and vegetation beyond the predicted impacts presented in the Environmental Review Document.

Corporate Endorsement

I hereby certify that to the best of my knowledge, the EMP provisions within this Flora and Vegetation Environmental Management Plan are true and correct and address the requirements of the Environmental Scoping Document for the Yangibana Rare Earths Project (Assessment number 2115).

[Signature of duly authorised proponent representative]

Name: Signed:

Designation: Date:

1. CONTEXT, SCOPE AND RATIONALE

1.1 PROPOSAL

Hastings Technology Metals Limited (Hastings) proposes to develop the Yangibana Rare Earths Project (the Proposal), located approximately 150km northeast of Gascoyne Junction, in the Upper Gascoyne region of Western Australia (Figure 1).

Rare Earth Elements (REE) will be mined from four deposits. During mining the REE ore will be taken to the ROM pad in preparation for processing, whereas waste rock will be deposited in waste rock landforms, alongside each respective pit. A processing plant, consisting of a beneficiation process and a hydrometallurgical process, will produce a mixed rare earths carbonate product. Tailings will be disposed in three tailings storage facilities (TSFs). Support infrastructure will include, but is not limited to, power, water, accommodation facilities, airstrip and linear infrastructure. Figure 2 shows the Project layout.

1.2 KEY ENVIRONMENTAL FACTOR

This EMP specifically addresses the Key Environmental Factor: Flora and Vegetation. The implementation of the Proposal will result in clearing of no more than 1,000 Ha of vegetation within a Development Envelope of 13,373 Ha.

1.2.1 PROPOSED ACTIVITIES

Key activities that have the potential to affect flora and vegetation include:

- Ground disturbance activities.
- Mining activities.

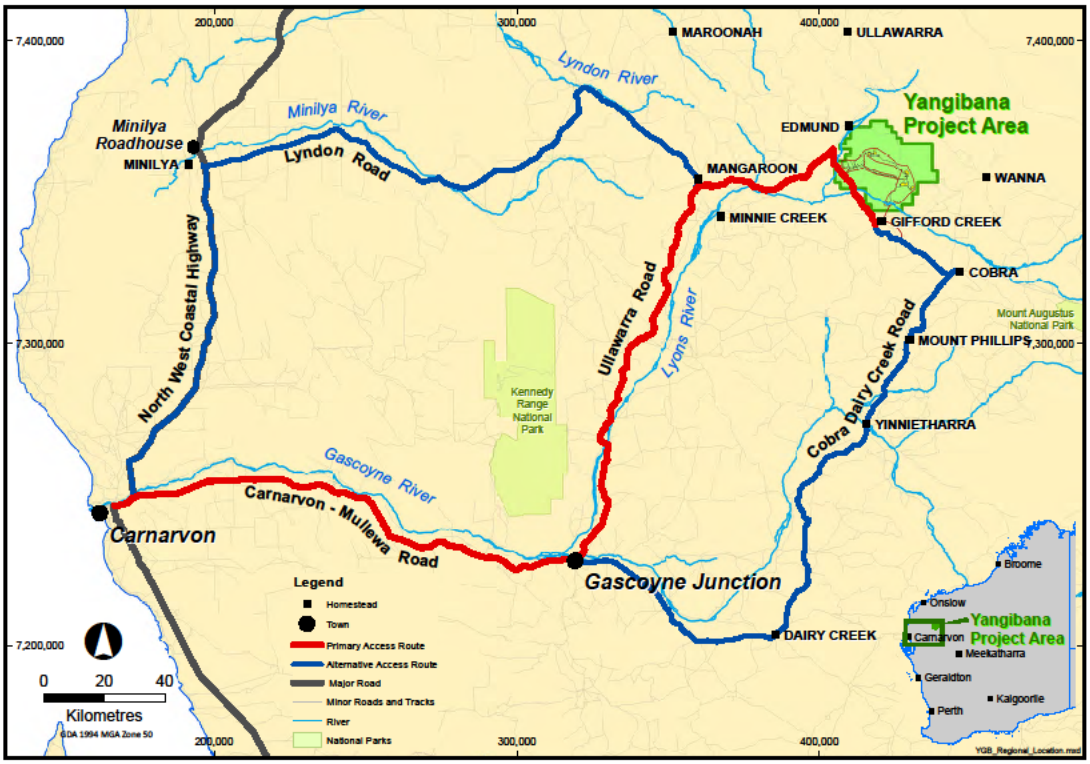
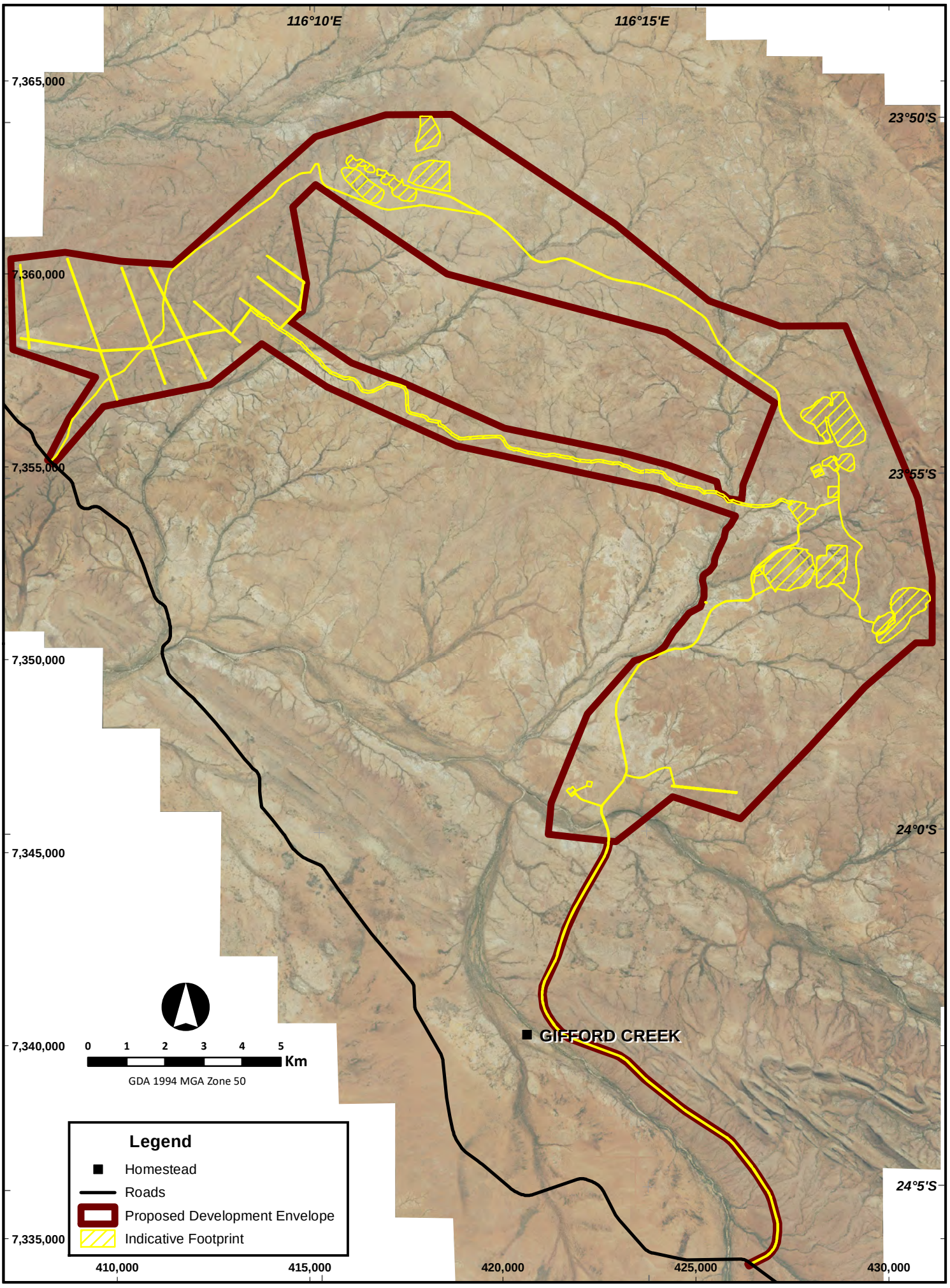


Figure 1 Proposal location



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YANGIBANA RARE EARTHS PROJECT

Development Envelope and Indicative Footprint

PER_F1-2_Envelope_Footprint.mxd
22 June 2018

Figure 2

1.2.2 SITE SPECIFIC ENVIRONMENTAL VALUE

Site-specific environmental values include:

- Priority flora (*Acacia curryana* and *Rhodanthe frenchii*)
- Potential Groundwater Dependent Ecosystems (characterised by vegetation types EvCc and AcEt)

The majority (~71%) of vegetation is in Excellent condition with native vegetation largely intact (Ecoscape 2015). No Threatened Ecological Communities (TEC) or Priority Ecological Communities (PEC), characterised by a vegetation type, were recorded within the study area, and none are listed for the Gascoyne bioregion.

Eight priority flora (Department of Biodiversity Conservation and Attractions (DBCA) listed) were recorded in the broader study area. Additionally, one undescribed species (*Elacholoma sp.* 'Showy Flowers') was recorded in the survey area but outside the Proposal development envelope. Two priority flora species occur within the development envelope, namely:

- *Acacia curryana* (Priority 1)
- *Rhodanthe frenchii* (Priority 2)

One vegetation type (EcMgCc) associated with the Lyons River represents a Groundwater Dependent Ecosystem (GDE) being characterised by *Eucalyptus camaldulensis*. Other vegetation types are considered potential GDEs due to the presence of *Eucalyptus victrix*. A 'worst case' scenario impact (direct and indirect) of 0.4% (2.55 ha) and 10% (195.8 ha) may occur to two vegetation types, EvCc and AcEt, that represent potential GDEs (due to the presence of *Eucalyptus victrix*, respectively. Only 1.2 Ha of the total mapped extent (686 Ha) of EvCc will be directly impacted, whereas 1.3 Ha may be indirectly impacted. EvCc does not occur within the drawdown contours from water abstraction neither at the borefield nor pit dewatering.

Thirty-five hectares (1.9%) of the total mapped extent (1,967 Ha) of AcEt will be directly impacted. Potential indirect water drawdown impacts from pit dewatering and water abstraction at the borefield may occur to AcEt (160.2 ha or 8.1%), which intersects the modelled post mining drawdown in the immediate surrounds. The extent of the post-mining drawdown occurs over an area of 433 ha at Bald Hill (19.0 Ha of AcEt), 514.5 ha at Frasers (20.1 Ha of AcEt) and 1241.5 ha at Yangibana (99.2 Ha of AcEt) resource areas and 514 ha at the SipHon Well Borefield (21.9 Ha of AcEt). Ecoscape (2017; Appendix 1-3) reports:

The AcEt vegetation type is primarily dominated by Acacia cyperophylla which is not known or considered to be a groundwater dependant species. This vegetation type was only occasionally observed to contain scattered or isolated individuals of Eucalyptus victrix; more commonly this species was absent. Therefore, it is considered unlikely that the AcEt vegetation type represents a groundwater dependant ecosystem, at least in most cases. The potential impact of post mining groundwater drawdown on GDE's is therefore considered likely to be negligible or nil.

However, the monitoring program will verify the above statement.

1.2.3 Potential impacts

Direct impact of approximately 1000 Ha of vegetation clearing within a Development Envelope of 13, 373 Ha.

Indirect impacts include:

- Increased fire hazards as a result of mine site activities
- Introduction, establishment and spread of weed species.
- Dust generation from vehicle movements.
- Water drawdown at the SipHon Well borefield and pit dewatering activities.
- Obstruction of natural surface water flows during flood events.
- Contamination of groundwater by chemical spills.

1.3 CONDITION REQUIREMENTS

This EMP meets the requirements of the Environmental Scoping Document (EPA, April 2017) for the Yangibana Rare Earths Project (EPA Assessment Number 2115):

11. Provide a Flora and Vegetation management plan to address significant residual impacts to flora and vegetation. The following should be addressed in the plan:

- Invasive species control - control of weeds, in particular through construction of infrastructure, transport and/or entry and exit points, riparian and GDE areas, vegetation units considered to have high local significance (e.g. rare units, habitat for conservation significant species) and in areas identified as in 'Excellent condition'.
- Monitoring program - to monitor the significant flora and vegetation communities identified.
- Management program - develop adaptive management actions to be triggered should monitoring show a decline as a result of implementing the proposal.
- Management of offset (if applicable).

The structure and content of this document takes account of the Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans (EPA, 2016).

1.4 RATIONALE AND APPROACH

Results of baseline surveys and identified assumptions and uncertainties inform the management approach for meeting the environmental objective of this EMP. The identified management actions, management targets, monitoring, reporting, and review and revision of management actions are aligned with the overall management approach.

1.4.1 Baseline Surveys

A number of studies (Ecoscape 2015, 2017; Ecological 2018; JRHC Enterprises 2016) have informed this EMP. The historical land use has been pastoral, and evidence of degradation along drainage lines occurs where hooved mammals and weeds are present. Other minor areas are classified as degraded from pastoral activities and exploration tracks and pads (to be rehabilitated at completion of exploration programme). Despite this, the majority (~71%) of the survey area is in Excellent condition with native vegetation largely intact.

1.4.1.1 Flora

A total of 472 vascular flora taxa were recorded in the survey area (55,600 Ha). No threatened flora listed under the EPBC Act (Cwth) and *Wildlife Conservation Act 1950* (WC Act; WA) were recorded in the survey area. Eight priority flora (DBCA listed) were recorded in the survey area (Figure 3):

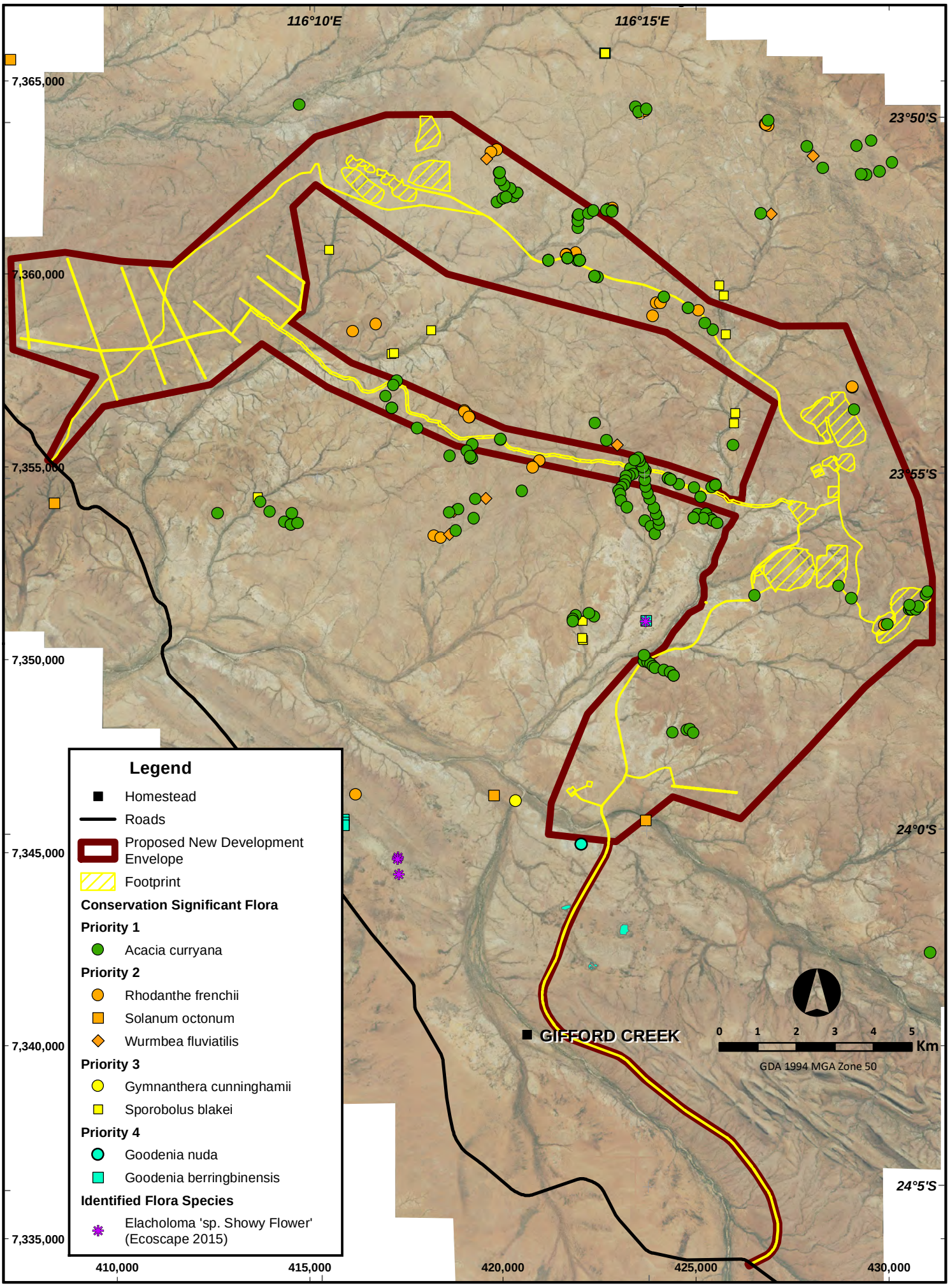
- *Acacia curryana* (Priority 1 (P1));
- *Rhodanthe frenchii* (P2);
- *Solanum octonum* (P2);
- *Wurmbea fluviatilis* (P2);
- *Gymnanthera cunninghamii* (P3);
- *Sporobolus blakei* (P3);
- *Goodenia berringbinensis* (P4); and
- *Goodenia nuda* (P4).

Additionally, one undescribed species (*Elacholoma sp.* 'Showy Flowers') was recorded in the survey area but outside the Proposal development envelope.

1.4.1.2 Vegetation

Twenty-eight vegetation types were recorded from the tenement areas with 23 vegetation types found within the development envelope. No Threatened Ecological Communities (TEC) or Priority Ecological Communities (PEC), characterised by a vegetation type, were recorded within the study area, and none are listed for the Gascoyne bioregion.

One vegetation type (EcMgCc) represents a Groundwater Dependent Ecosystem (GDE) being characterised by *Eucalyptus camaldulensis*. Vegetation types, EvCc, EvReMg, AcEt and AcAsCc, represent potential GDEs due to the presence of *Eucalyptus victrix*. EvReMg and AcAsCc do not occur within the Development Envelope (Figure 4 and 5).



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Priority Flora

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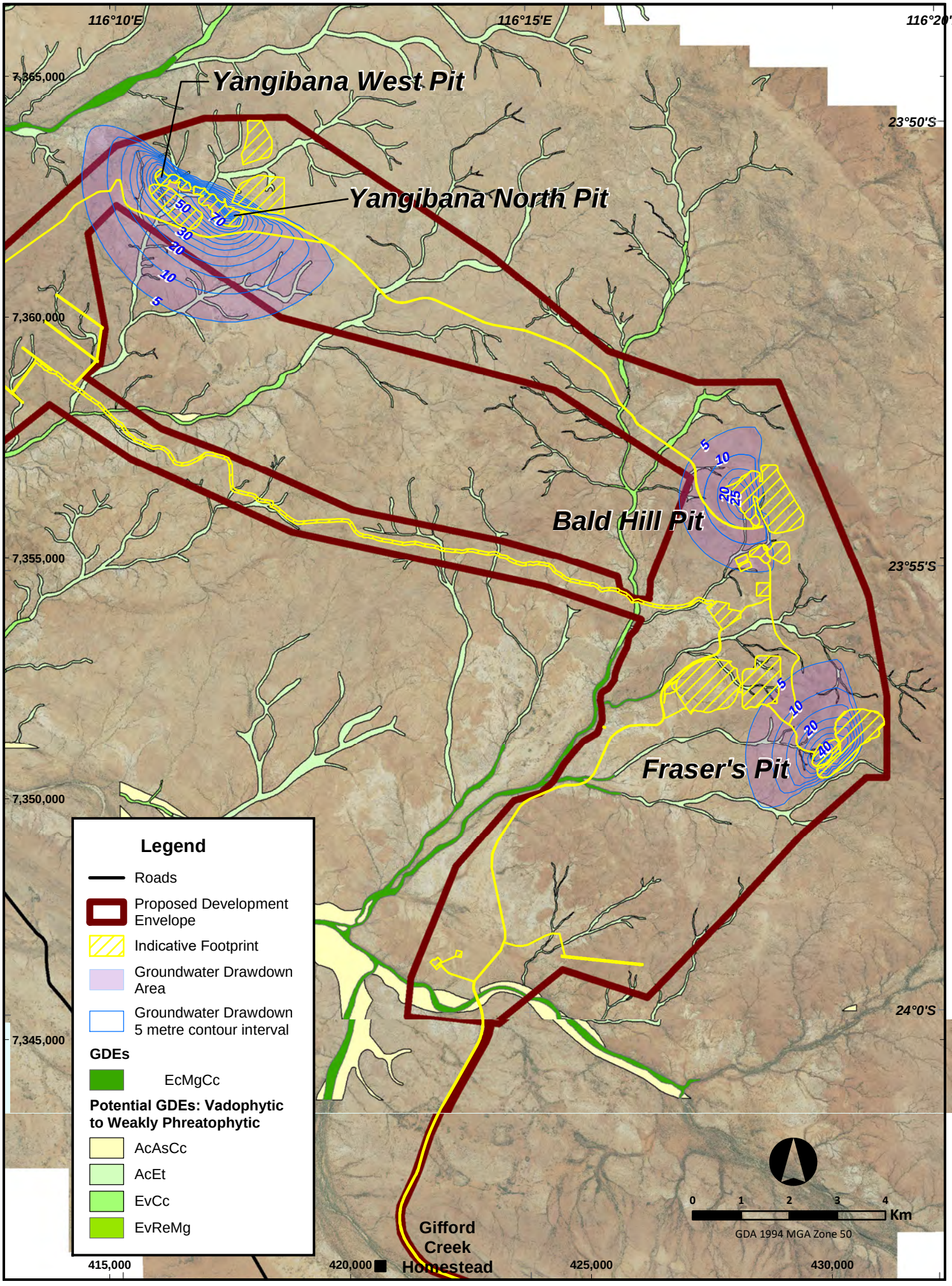
25 June 2018

Figure 3



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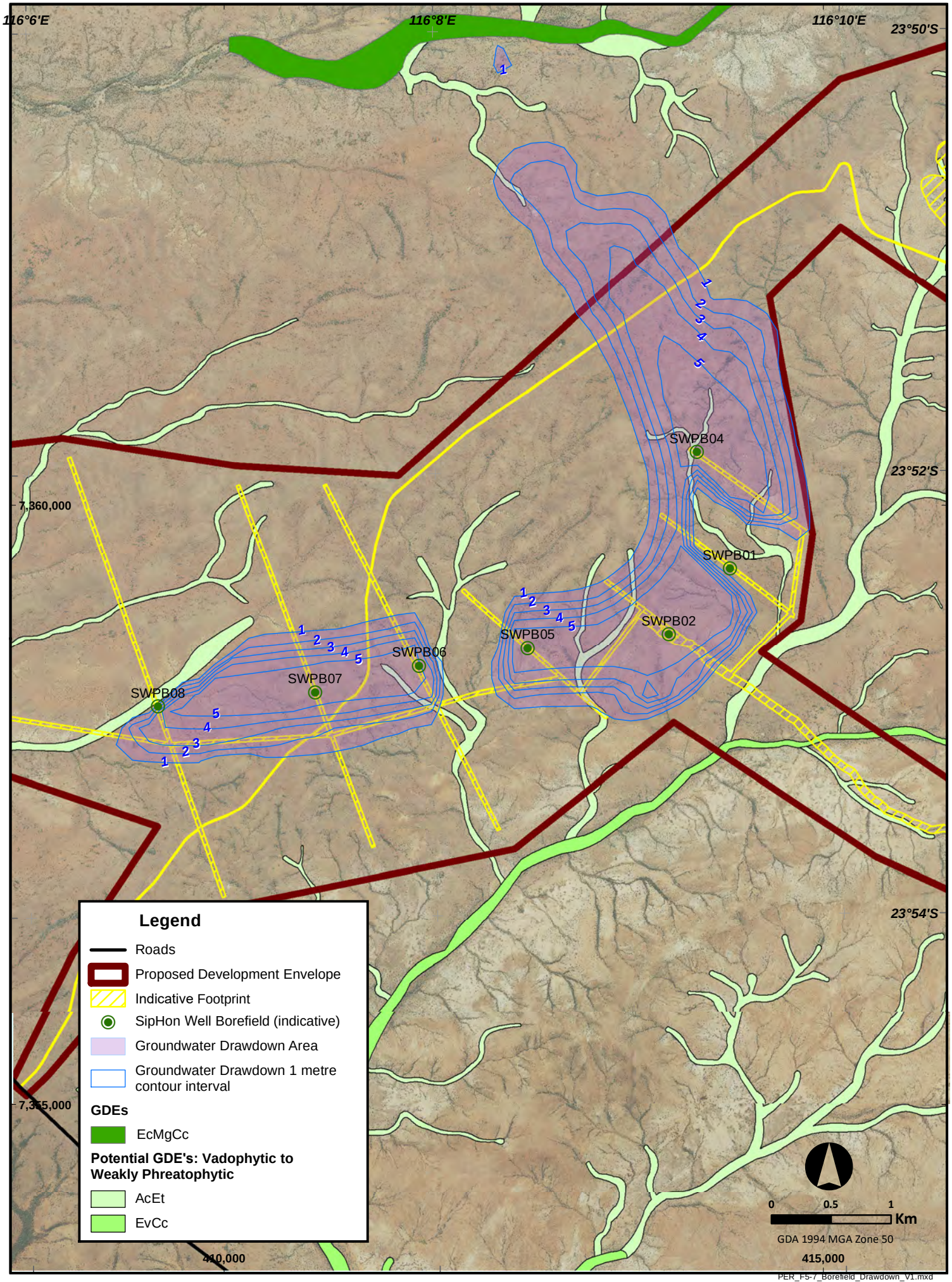
Fraser's, Bald Hill, Yangibana West and North Pits dewatering drawdown contours (life of mine)

Figure 4



YANGIBANA RARE EARTHS PROJECT

Siphon Well Borefield End dewatering drawdown contours (life of mine)

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Figure 5

1.4.1.3 Introduced Species

Twenty-four introduced plant species exist in the study area (Figure 6). *Malvastrum americanum* (Spiked Malvastrum), rates as 'very high' according to the Weed Prioritisation Process for DPaW (WA) Midwest rankings summary (2013 in Ecoscape 2015).Two species are listed as Declared Pests under the WA *Biosecurity and Agriculture Management Act 2007* (BAM Act): *Argemone ochroleuca* (Mexican Poppy); and *Datura leichhardtii* (Native Thornapple) are classified as C3 (management) for the Upper Gascoyne. Under the BAM Act, C3 organisms should have some form of management applied that will alleviate the harmful impact, reduce the numbers or distribution, or prevent/contain the spread of the pest.

1.4.2 Key Assumptions and Uncertainties

It is assumed the flora and vegetation surveys conducted to-date have accurately recorded the presence of all conservation significant species, vegetation types and habitat values in the Proposal development envelope and over a regional area of 55,600 ha.

It is uncertain what the cumulative impacts to flora and vegetation are due to historical land use activities such as pastoralism. Given no mining developments occur in the adjacent areas, the cumulative impacts from mining are not considered.

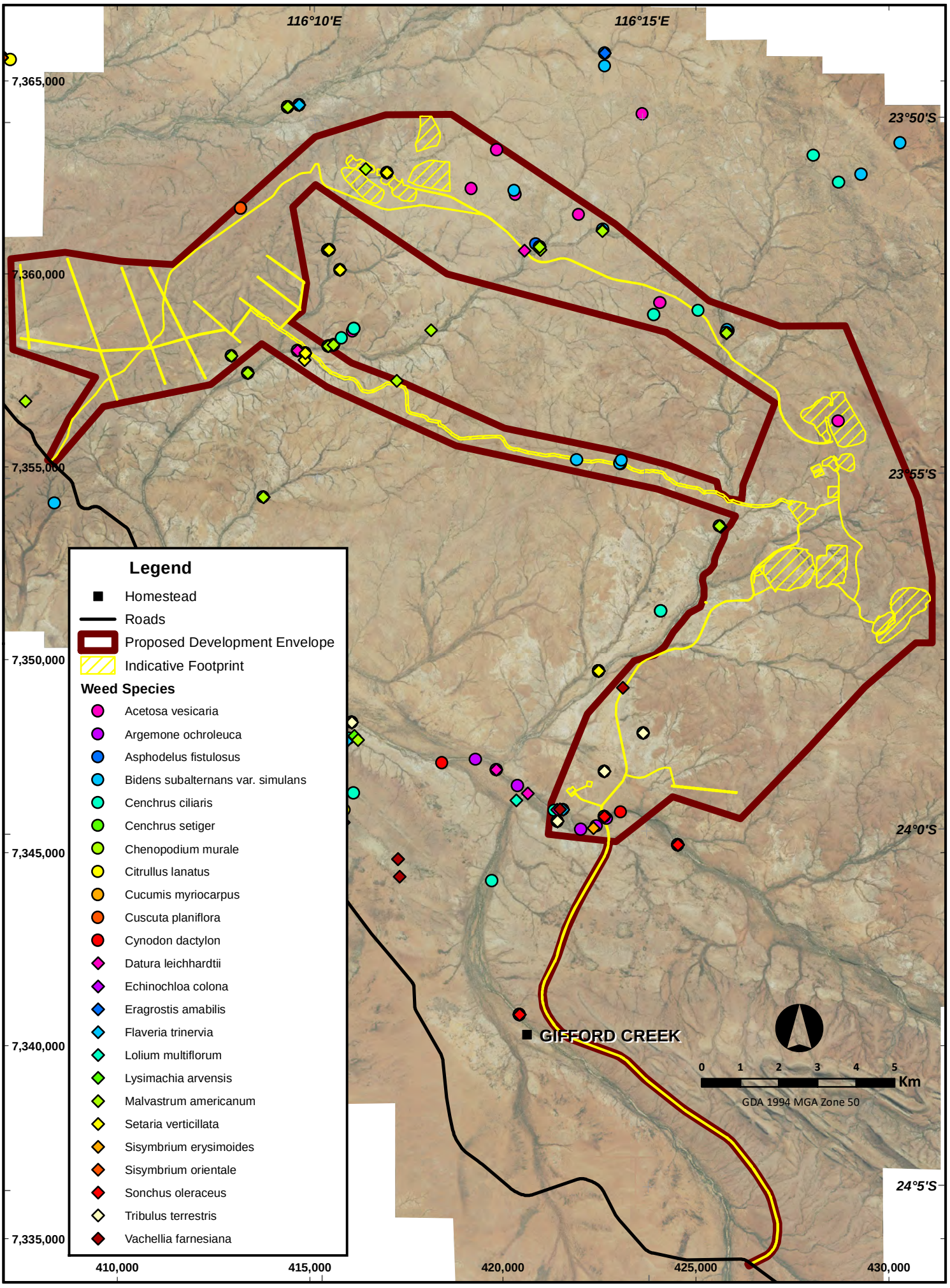
It is assumed that the likelihood of weeds entering and spreading within the Proposal envelope is high due to increased vehicle movement within the development envelope and to and from the Proposal, and that increased disturbance of the Proposal creates suitable habitat for weed establishment.

Hastings has maintained a conservative assessment of potential impacts. A 'worst case' impact scenario includes the following considerations:

- Direct impacts associated with the disturbance footprints
- Indirect impacts assume a 20m buffer around disturbance footprints for:
    - No proactive avoidance of Priority flora during clearing or pipe laying activities.
    - No active management to prevent, manage or monitor weed species allowing introduction of and initial establishment of weed species. Weed species are likely to occur on disturbed areas within the Proposal area without any form of mitigation.
    - Minor incidents associated with 'unauthorised' clearing or driving on undisturbed ground.
    - Dust deposition on areas immediately surrounding roads.
    - Minor hydrocarbon spills.
    - Localised and unanticipated erosion events that require remediation activities involving ground disturbance.
- Possible water drawdown impacts to potential Groundwater Dependent Ecosystems (GDEs) within the drawdown contours of pit dewatering and water abstraction activities. There is a high level of uncertainty as to whether water drawdown will impact the potential GDEs, and thus a conservative approach assumes an impact will occur.

While Hastings intent is to mitigate the likelihood of the occurrence of indirect impacts, the above-listed indirect impacts are common to mine sites in Western Australia and acknowledged with the inclusion of a 20m buffer.

Given there are no other nearby mining developments in the local or regional area, lessons-learnt cannot be applied and an adaptive management approach will be required.



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Weed Species Locations

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04 December 2018

Figure 6

1.4.3 Management Approach

Hastings has adopted a risk-based management approach. The risk management process is based on the approach set out in the *Leading Practice Sustainable Development Program for the Mining Industry - Risk Assessment and Management* (Department of Resources, Energy and Tourism (DRET) 2008).

The risk assessment identifies risk pathways (unwanted event and the associated environmental receptor / factor), which may cause material impact to key environmental factors. It also identifies the level of uncertainty associated with a risk pathway, which are:

- Low certainty: Risk rating is based on subjective opinion or relevant past experience. Limitations in baseline data/information, which results in general conclusions and/or further work is required.
- Moderate certainty: Risk rating is based on similar conditions being observed previously. Baseline data/information has some gaps or minor further work required.
- High certainty: Risk rating is based on testing, modelling or experiments. Baseline data/information is complete and analysis appropriate for level of data.

To focus management efforts, the risk assessment has been used to determine:

- Inherent risk of identified risk pathways;
- Mitigation of risk (using the hierarchy of controls); and
- Assessment of residual risk.

When mitigating inherent risk, treatment measures have been evaluated using the hierarchy of controls:

- Where reasonably practicable, eliminate the risk;
- Reduce the risk by substituting a different activity which poses a lower risk;
- Control the risk with engineered solutions (including physical barriers); and
- Mitigate the risk using administrative controls.

Hastings will demonstrate, throughout all phases of the Project, regular review of the risk assessment by relevant personnel and key stakeholders, progressive implementation of priority treatment measures, and on-going evaluation of performance. An adaptive management approach will be implemented, where performance objectives are not met by mitigation measures or due to change management, as a component of the continual improvement of this EMP.

1.4.4 Rationale for Choice of Management Target/s

Management targets are based on:

- Survey outcomes (local and regional) including:
    - presence of Groundwater Dependent Ecosystems (GDE) or potential GDEs;
    - presence of weed species;
    - presence of two priority flora species within the development envelope; and
    - vegetation condition.
- Proposal activities including:
    - construction of mine site infrastructure;
    - road maintenance activities between Gascoyne Junction and the mine site;
    - clearing of 1000 ha of vegetation;
    - storage of topsoil;
    - mining activities; and
    - processing of ore.
- Consideration of inherent risk severity from a risk assessment.
- Consideration of level of uncertainty.
- Industry best-practice.

2. EMP PROVISIONS

2.1 OBJECTIVE

This section of the EMP identifies the legal provisions that Hastings proposes to implement to meet the EPA objective for flora and vegetation.

> *To protect flora and vegetation so that biological diversity and ecological integrity are maintained.*

2.2 OUTCOME

The outcome is to ensure that the Proposal avoids and minimises any adverse effects on flora and vegetation beyond the predicted impacts presented in the Environmental Review Document.

2.3 MANAGEMENT ACTIONS AND TARGETS

It identifies the management target/s that Hastings will use to measure performance and monitoring that will be undertaken in relation to the management target/s. Finally, it identifies how Hastings will review and revise management actions if the management targets are exceeded.

Management-based provisions (Table 1), identified through risk assessment, will be implemented to achieve the environmental objective (Section 2.1). These management actions focus the greatest management effort on proposal activities that have the highest likelihood of causing environmental impact or where the consequence of an impact is severe and likely to be irreversible (an inherent risk rating of moderate and above). These management actions were specifically developed to meet the environmental objective for flora and vegetation and will be implemented by Hastings for the Yangibana Rare Earths Project.

Table 1 Management based provisions

EPA factor and objective
Flora and vegetation: To protect flora and vegetation so that biological diversity and ecological integrity are maintained
Values
Priority flora species: • **Acacia curryana (Priority 1)** • **Rhodanthe frenchii (Priority 2)** **Potential Groundwater Dependent Ecosystems (GDEs) characterised by vegetation types:** • **AcEt** • **EvCc**
Objectives
No decline in the viability of local populations of Priority flora species due to mining activities **No decline in potential GDEs, as characterised by *Eucalyptus victrix* due to water drawdown**

Risks and impacts	Management actions	Management targets	Monitoring	Reporting
Risk 1: Clearing outside of approved disturbance boundary Inherent risk severity: Moderate Level of certainty: Moderate Impacts: • Reduction in quality and fragmentation of significant habitat • Removal of conservation significant species (i.e. priority flora species) • Removal or fragmentation of significant vegetation communities	The Land Clearing and Topsoil Management Procedure and permitting system to be implemented. Delineation of ground disturbance boundaries (implementation of the *Flagging and Demarcation Procedure*). A 150m exclusion zone across Lyons River and Frasers Creek, as per the Native Title Agreement and Pastoral Agreement, will be implemented. Training and awareness with regard to Land Clearing and Topsoil Management Procedure. Site induction highlighting flora and vegetation values, no driving on undisturbed ground, and Hastings procedures for ground disturbance. Develop and implement the *Environmental Specification for Contractors* detailing Hastings environmental policy, minimum standards, and licence conditions.	No clearing outside the approved disturbance boundary.	Monthly audit of Hastings approved *Land Clearing and Topsoil Management Approval Forms* against actual ground disturbance during construction, and quarterly audit thereafter. Annual review of hazard and incident reports. Inspection of demarcation of approved disturbance areas prior to land disturbance activities.	The Annual Environmental Report (AER; to DMP) will include records of clearing areas. Mine Rehabilitation Fund reporting. Incidence records of unauthorised clearing outside approved boundary. Photographic evidence of demarcation of approved disturbance areas prior to land disturbance activities.
Risk 2: Groundwater drawdown Inherent risk severity: Low Level of certainty: 'Low' due to a lack of understanding as to whether potential GDE's are dependent on groundwater but 'High' with respect to having modelled the water drawdown contours.	Development of trigger levels for groundwater quality.* Development of trigger levels for groundwater drawdown.* Borefield designed to include a contingency water source supply.*	No decline in potential GDE vegetation condition beyond natural variability.	Monitoring of the condition of potential GDEs. Monitoring water abstraction.* Monitoring water quality.*	Annual groundwater monitoring report to DoW. Incidence records and investigation of decline in GDE vegetation condition beyond

Risks and impacts	Management actions	Management targets	Monitoring	Reporting
Impacts: • Loss of areas of potential GDEs	Implement an adaptive management program.* Verification of groundwater drawdown modelling.* Develop and implement the Environmental Specification for Contractors detailing Hastings environmental policy, minimum standards, and licence conditions.			natural variability (summarised in the AER). Verification report of groundwater drawdown modelling.
Risk 3: Introduction of new weed species, or spread of existing weed species, due to vehicles importing seed / plant material from outside or within the Project area. Inherent risk severity: High Level of certainty: Moderate Impacts: • Loss of flora and vegetation from displacement by weed species	The *Vehicle Inspection (Weeds and Seeds) Procedure* will be implemented to ensure all vehicles and equipment are inspected. Weed recognition will form a component of the environmental awareness program. Annual weed eradication program of existing weed species targeting *Argemone ochroleuca* (Mexican Poppy); *Datura leichhardtii* (Native Thornapple) and *Malvastrum americanum* (Spiked Malvastrum) as described in the Weed Management Procedure. Develop and implement the *Environmental Specification for Contractors* detailing Hastings environmental policy, minimum standards, and licence conditions.	No increase in composition, distribution and abundance of weed species due to the Proposal activities. Eliminate targeted weed species within Development Envelope over the life of the mine.	Weed mapping/monitoring. Audit of Vehicle Inspection (weeds and seeds) Register	Incidence reports of establishment of new weed species within the Development Envelope. The AER will include a summary of monitoring records and any incidences.
Risk 4: Bush fire because of the Proposal activities Inherent risk severity: Moderate Level of certainty: Moderate Impacts: • Change in structure and composition of vegetation communities • Loss of conservation significant flora species	Implementation of the Hot Work Permit Procedure. Fire extinguishers will be fitted to all vehicles and machinery. The Emergency Response Team will undergo regular training in fire response procedures as detailed in the *Emergency Response Plan*. The site induction will include awareness of fire prevention measures and response. Develop and implement the *Environmental Specification for Contractors* detailing Hastings environmental policy, minimum standards, and licence conditions.	No incidents of fire ignition resulting in bush fire as a result of the Proposal activities.	Audit of fire prevention measures and maintenance of fire extinguishers.	The AER will include a summary of fire ignition incidences as a result of the Proposal activities.
Risk 5: Excessive fugitive dust generation from the Proposal activities Inherent risk severity: Moderate Level of certainty: High	Dust suppression measures implemented where dust is generated commensurate with risk (e.g. water application to road surfaces prior to shift changeover).	Dust levels will not exceed thresholds (10 uGy/h) at monitoring locations within the Project / at the Project boundary because of Proposal activities.	Dust monitoring. Visual observations of excessive dust generation during proposal activities (i.e. clearing).	The AER will include a summary of dust monitoring, exceedances as a result of the Proposal activities, and associated investigations.

Risks and impacts	Management actions	Management targets	Monitoring	Reporting
Impacts: • Loss of conservation significant flora species due to impacts from dust loading on leaf surfaces • Uptake of radionuclides (in dust from tailings) by flora beyond acceptable levels	Implement dust suppression measures for mineralised ore or waste containing elevated levels of radionuclides as per that described in the *Radiation Waste Management Plan*.			
Risk 6: Alteration of surface water drainage flow patterns Inherent risk severity: Low Level of certainty: Moderate Impacts: • Shadow effects resulting in loss of flora and vegetation • Consolidation of water resulting in water inundation impacts to flora and vegetation	Linear infrastructure will incorporate engineering structures (e.g. culverts, drains) to ensure natural surface water flows are maintained. Where pipelines cross drainage channels, they will be either buried or raised above drainage channels.	No impacts to flora and vegetation because of altered surface water flow patterns.	Visual inspection* of linear infrastructure following flood events. Vegetation monitoring upstream and downstream of linear infrastructure.	The AER will include a summary of the inspection report.
Risk 7: Change in water quality because of release of chemicals Inherent risk severity: Moderate Level of certainty: Moderate Impacts: • Death of flora and vegetation in near vicinity	Diversion bunds will ensure surface water flow does not enter and flow through processing plant areas, the ROM or ore stockpiles. All chemicals will be stored in accordance with Australian Standards as detailed in the *Land Management Plan*. Materials with elevated levels of radionuclides shall be managed in accordance with the *Radiation Waste Management Plan*.	No exceedances in water quality thresholds as a result of proposal activities.*	Water quality monitoring.*	Annual groundwater monitoring report to DWER.

**Refer to the Water Management Plan*

2.4 MONITORING

The purpose of monitoring is to inform, through the management target/s, if the environmental objective is being achieved and when management actions will be reviewed and revised. Table 2-2 summarises the monitoring program to determine whether management targets are achieved. Table 2 describes the indicator and trigger criteria and threshold criteria, method, location, frequency and triggers for review of management actions in the monitoring program.

Table 1 Monitoring to measure the efficacy of management actions against the management target

Indicator	Method	Location	Frequency	Review of management actions
Management target 1: No clearing outside the approved disturbance boundary.				
Clearing outside of approved boundaries Trigger criteria: >1 non-conformance of unauthorised land clearing exceeding 2 Ha annually Threshold criteria: >1 non-conformance of unauthorised land clearing exceeding 5 Ha annually	Audit of Hastings approved *Land Clearing and Rehabilitation Register* against actual ground disturbance during construction	N/A	Monthly- construction phase Quarterly- operations phase	Where audits demonstrate non-conformance with procedures Trigger actions: As described in section 3.3 Threshold actions: Determine problem and resolve at Hastings Board level and through consultation with the EPA
Number of incidents Trigger criteria: >1 incident of unauthorised land clearing exceeding 2 Ha annually Threshold criteria: >1 incident of unauthorised land clearing exceeding 5 Ha annually	Review of hazard and incident reports	N/A	Annually	Number of reportable incidents exceed three in any one year Trigger actions: As described in section 3.3 Threshold actions: Determine problem and resolve at Hastings Board level and through consultation with the EPA
Non-conformance of demarcation boundary Trigger criteria: >1 non-conformance of demarcation boundary against approved boundary. Threshold criteria: >5 non-conformances of demarcation boundary against approved boundary	Inspection of demarcation of approved disturbance areas prior to land disturbance activities	Area demarcated for disturbance	Prior to disturbance occurring	Where demarcation for clearing occurs outside of approved disturbance footprint Trigger actions: As described in section 3.3 Threshold actions: Determine problem and resolve at Hastings Board level and through consultation with the EPA

Indicator	Method	Location	Frequency	Review of management actions
Management target 2: No decline in potential GDE vegetation condition beyond natural variability.				
Potential GDE vegetation (i.e. *Eucalyptus victrix*) condition Trigger criteria: A decrease in plant condition* as indicated by on ground monitoring of vegetation Threshold criteria: As per trigger criteria, except average plant condition score decrease ≥2 deviation from the average at analogue sites.	Monitoring of the health condition of dominant species comprising potential GDEs within the modelled drawdown impact area.	Figures 7 and 8	Biannually, in areas where water abstraction is occurring	Vegetation condition decline beyond natural variability as per trigger criteria Trigger actions: As described in section 3.3 Threshold actions: Increase monitoring to determine extent of overall decline in population health of the *Eucalyptus victrix* species. Develop mitigation action plan in consultation with EPA.
Trigger criteria: Suspected death of 2 individuals of *Eucalyptus victrix* within modelled drawdown area exceeding analogue sites. Threshold criteria: Widespread death of *Eucalyptus victrix* population within modelled drawdown area exceeding analogue sites.	Analysis of remote sensing data Supported with on-ground visual inspection of potential GDEs including photographic records	Figures 7 and 8	Quarterly	Obvious vegetation condition decline beyond natural variability as per trigger criteria Trigger actions: As described in section 3.3 Threshold actions: Increase monitoring to determine extent of overall decline in population health of the *Eucalyptus victrix* species. Develop mitigation action plan in consultation with EPA.
Management target 3: No increase in composition, distribution and abundance of weed species as a result of the Proposal activities.				
Presence of new weed species. Abundance and distribution of weed species. Trigger criteria: Presence of new weed species due to mining activities. An increase of 10% in area of existing weed populations compared to baseline weed survey. Threshold criteria:	Weed mapping / monitoring.	Areas in the immediate vicinity of the disturbance footprint Topsoil stockpiles Access roads entering and exiting site Washdown areas Rehabilitation areas	Annually or after significant rainfall/ during flowering	Where new weed species are identified Where existing or new weed species establish in areas not previously recorded. Trigger actions: As described in section 3.3. Threshold actions:

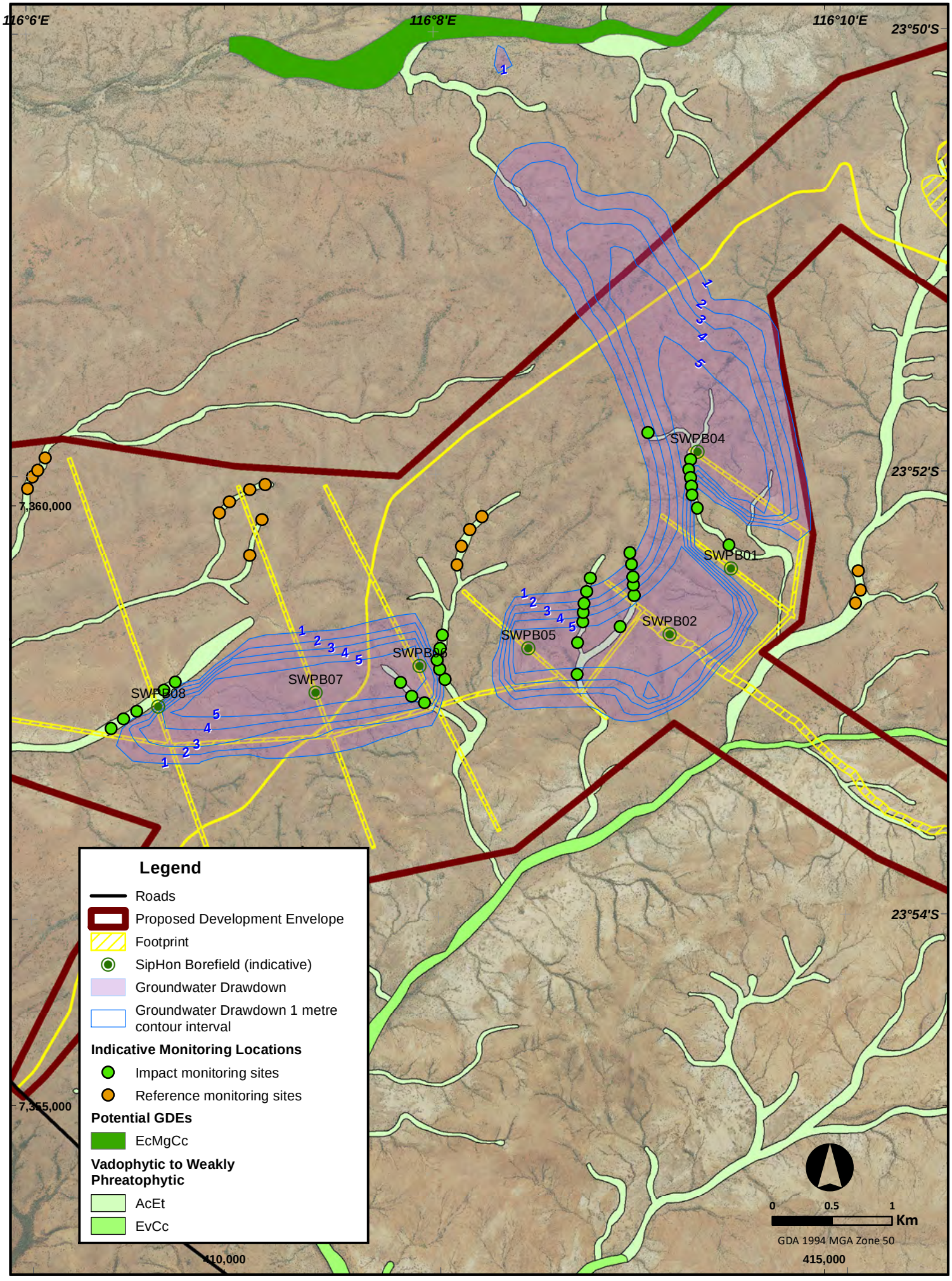
Indicator	Method	Location	Frequency	Review of management actions
An increase of 20% in area of existing weed populations compared to baseline weed survey.		Road maintenance areas between Gascoyne Junction and the mine site		Review and implement a revised weed monitoring program and increase weed eradication program frequency until weed populations are measured to be below trigger criteria.
Vehicle inspections *Trigger criteria:* >3 non-conformances per audit with Hastings *Vehicle (Weed and Seed) Inspection Procedure* *Threshold criteria:* >3 non-conformances per audit with Hastings *Vehicle (Weed and Seed) Inspection Procedure* combined with trigger criteria (above) for presence of new species and/or increase in area of existing populations.	Audit of vehicle and equipment inspection certificates	N/A	Quarterly	Where new weeds establish and/or occur in areas not previously recorded within the development envelope despite vehicle hygiene measures being implemented. Trigger actions: As described in section 3.3 Threshold actions: Review and implement a revised weed monitoring program and increase weed eradication program frequency until weed populations are measured to be below trigger criteria.
Management target 4: No incidents of fire ignition resulting in bush fire as a result of the Proposal activities that result in impacts to Priority flora.				
Bush fire Trigger criteria: >5 consecutive occurrences of non-conformance with fire prevention procedures Threshold criteria: Bush fire from mining activities impacting greater than 10Ha of priority flora habitat	Audit of fire prevention measures and maintenance of fire extinguishers	N/A	Quarterly	Where fire ignition occurs despite conformance with fire prevention measures Trigger actions: As described in section 3.3 Threshold actions: Develop mitigation action plan in consultation with EPA.
Priority flora condition and extent Trigger criteria: A decrease in plant condition*, or a significant decrease in population extent/plant abundance Threshold criteria: As per trigger criteria, except average plant condition score decrease ≥2 deviation from the average at analogue sites.	As described below	Figure 9	Biannually depending on species flowering times	Decrease in priority flora condition or a significant decrease in population extent and abundance Trigger actions: As described in section 3.3 Threshold actions:

Indicator	Method	Location	Frequency	Review of management actions
				Increase monitoring to determine extent of overall decline in population health of the Priority species. Develop mitigation action plan in consultation with EPA.
Management target 5: Dust levels will not exceed threshold criteria as a result of the Proposal activities that result in impacts to Priority flora.				
Dust levels Trigger criteria: Three consecutive exceedance of 2 mg/cm^3 at any one location Threshold criteria: Six consecutive exceedances (2 mg/cm^3) at any one location combined with the trigger criteria below for priority flora condition	Dust gauges will monitor dust levels	Downwind of dust generating activities: • Mining • ROM and crushing plant	Monthly and opportunistically	Visually dusty from mining activities and exceedances during monitoring Trigger actions: As described in section 3.3 Threshold actions: As per threshold action below for priority flora
Priority flora condition and extent Trigger criteria: A decrease in plant condition*, or a significant decrease in population extent/plant abundance Threshold criteria: As per trigger criteria, except average plant condition score decrease ≥2 deviation from the average at analogue sites.	As described below	Figure 9	Biannually depending on species' flowering times	Decrease in priority flora condition, or a significant decrease in population extent/plant abundance Trigger actions: As described in section 3.3 Threshold actions: Increase monitoring to determine extent of overall decline in population health or extent/abundance of the Priority species. Develop mitigation action plan in consultation with EPA.
Management target 6: No impacts to priority flora because of altered surface water flow patterns.				
Erosion Trigger criteria: >1 erosion event exceeding 0.2 Ha per heavy rainfall event impacting priority flora Threshold criteria:	Visual assessment of linear infrastructure following heavy rainfall events	Linear infrastructure	Visual assessment: Immediately after each heavy rainfall event	Erosion events Trigger actions: As described in section 3.3 Threshold actions:

Indicator	Method	Location	Frequency	Review of management actions
>1 erosion event exceeding 0.5 Ha per heavy rainfall event impacting priority flora				Develop mitigation plan in consultation with the EPA
Priority flora condition and extent Trigger criteria: A decrease in plant condition* or a significant decrease in population extent/plant abundance Threshold criteria: As per trigger criteria, except average plant condition score decrease ≥2 deviation from the average at analogue sites.	Monitoring of priority flora condition and population extent/plant abundance upstream and downstream of linear infrastructure.	Figure 9	Biannual priority flora condition monitoring dependent on species flowering times	Decrease in priority flora condition as per trigger criteria Trigger actions: As described in section 3.3 Threshold actions: Increase monitoring to determine extent of overall decline in population health of the Priority species. Develop mitigation action plan in consultation with EPA.
Management target 7: No exceedances in water quality thresholds as a result of proposal activities resulting in decreased priority flora condition.				
Water quality#	Water quality monitoring#	As detailed in the Water Management Plan	As detailed in the Water Management Plan	Where levels exceed the predetermined threshold levels#
Priority flora condition and population extent/abundance Trigger criteria: A decrease in plant condition* and population extent/plant abundance Threshold criteria: As per trigger criteria, except average plant condition score decrease ≥2 deviation from the average at analogue sites.	Monitoring of priority flora condition and population extent/plant abundance in vicinity of bulk chemical storage facilities	Figure 9	Biannually, dependent on species flowering times	Decrease in priority flora condition and population extent/abundance as per trigger criteria Trigger actions: As described in section 3.3 Threshold actions: Increase monitoring to determine extent of overall decline in population health of the Priority species. Develop mitigation action plan in consultation with EPA.

Refer to the Water Management Plan.

* A decrease in plant condition scale or deviation from normal phenology of one or more of the Priority flora species in the impact populations compared to analogue populations. The degree of decrease in plant condition is considered as an average plant condition score decrease ≥1 deviation from the average at analogue sites (BHP 2018))

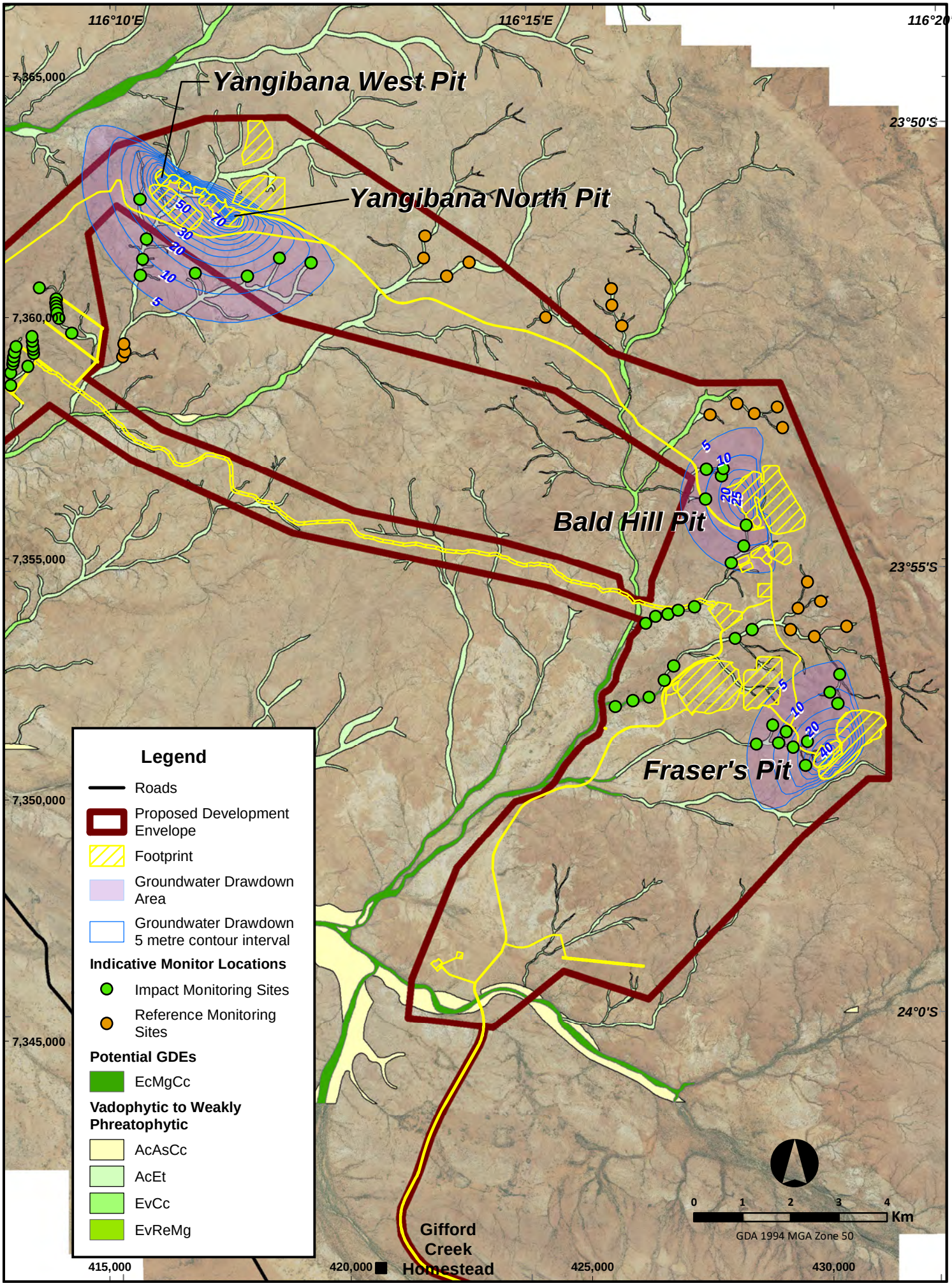


YANGIBANA RARE EARTHS PROJECT

Siphon Well Borefield
Indicative Monitoring Locations

PER_F5-7_Borefield_Drawdown_Monitoring.mxd
04 December 2018

Figure 7



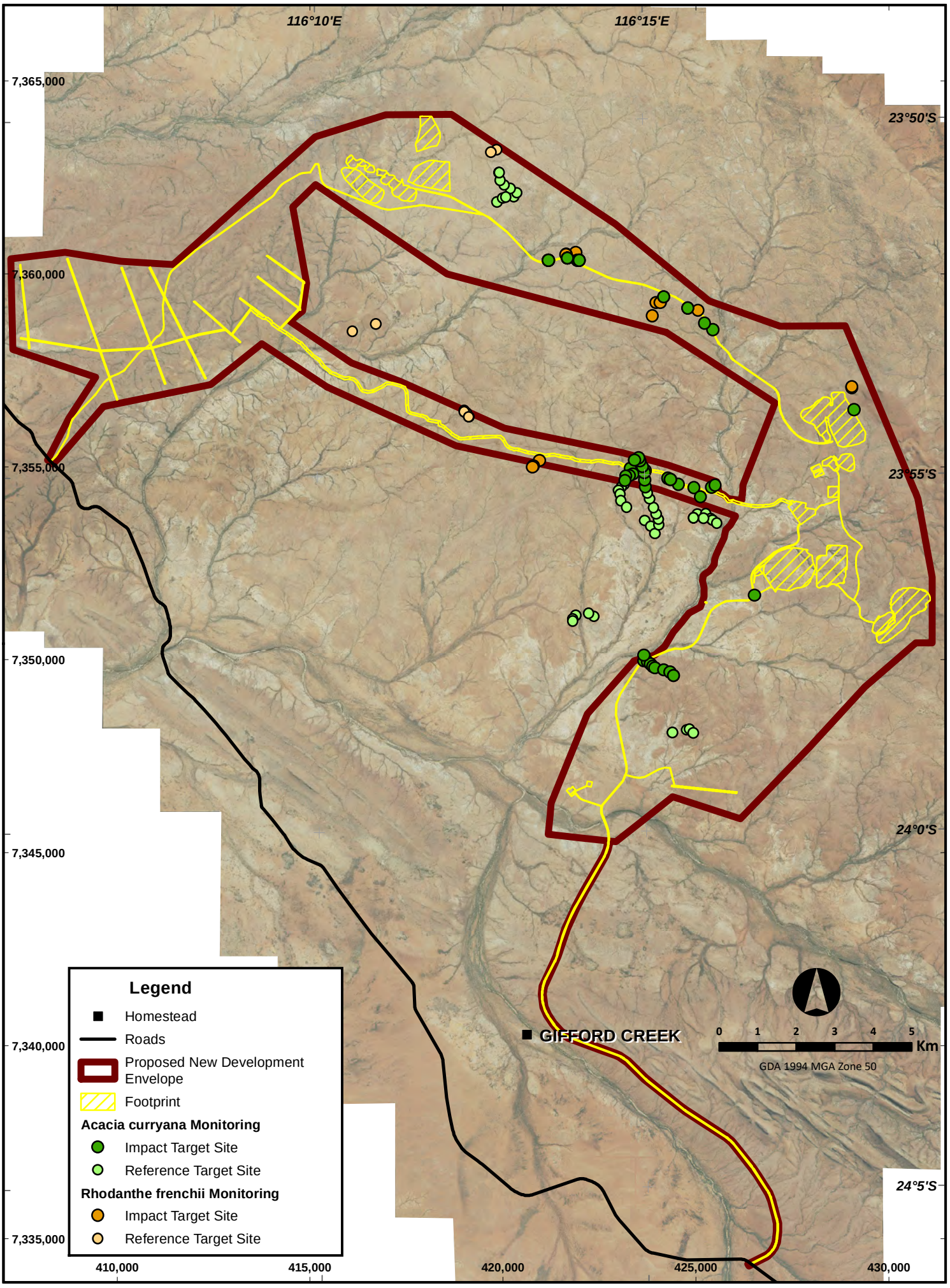
YANGIBANA RARE EARTHS PROJECT

PER_Pits_Drawdown_Monitoring.mxd
04 December 2018

HASTINGS Technology Metals Limited

Fraser's, Bald Hill, Yangibana West and North Pits Indicative Monitoring Locations

Figure 8



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YANGIBANA RARE EARTHS PROJECT

Acacia curryana and Rhodanthe frenchii Indicative Monitoring Locations

PER_Priority_Flora_Monitoring.mxd
04 December 2018

Figure 9

2.4.1 Vegetation monitoring program

Small scale vegetation monitoring

A series of analogue and impact monitoring plots will be established at (a subset of) indicative locations (as shown in Figures 7 - 9) which include:

- Quadrats with corners marked and GPS coordinates recorded for each corner.
- Photographic monitoring point marked at the northwest corner of each plot.
- A suitable proportionate selection of individual flora plants within each population, permanently marked for monitoring:
    - *Eucalyptus victrix* for assessment of groundwater drawdown impacts
    - Priority flora species for assessment of other impacts
- Individual plants tagged with unique identification number and GPS coordinates recorded.

Information that shall be recorded at each monitoring plot includes:

- Date and time of monitoring (with best attempts to reassess at corresponding time of day for photographic comparisons).
- Weather conditions at time of monitoring
- Photograph from photo-monitoring point at precise position and angle to optimise effectiveness of photographic comparison.
- Maintenance requirements (i.e. demarcation posts for quadrats and tags on individuals)
- Any presence of weeds, and if present, species and estimate percentage cover
- Dust observations
- Vegetation condition observations: Estimated % of live canopy with a vegetation condition score (as per Table 3).
- Individual plant observations for tagged plants: Plant condition score (as per Table 3); photographic record of each tagged plant; percentage of Priority species population within each condition category (as per Table 3); and any additional observations (e.g grazing impacts).

Table 2 Plant Condition Scale

Score	Descriptor	Prevailing conditions	Observations
7 a-d	Plants vegetative	Normal, dry season	Foliage may be: (a) actively growing (b) static or (c) reduced and/or (d) may demonstrate variable levels of auxiliary pigments (anthocyanins). No flower buds initiated, no flowers present, no fruits attached to plant.
6	Plants pre-reproductive	Normal, soon after rainfall	Foliage healthy and normal for prevailing seasonal conditions. Flower buds initiated but no flowers open, no fruits attached to plant.
5	Plants reproductive	Normal, following sufficient rainfall	Foliage healthy and normal for prevailing seasonal conditions. Flowers open, developing fruits may be attached to plant.
4	Plants post-reproductive	Normal, drying season, following sufficient rainfall	Foliage healthy and normal for prevailing seasonal conditions. No flowers present. Current season fruits containing viable seeds may be attached to plant and/or the plant may have recently dehisced viable seeds.
3	Plants exhibiting reduced foliage	Either: (a) Reflecting extended dry	Foliage observably reduced and not normal for prevailing seasonal conditions.

Score	Descriptor	Prevailing conditions	Observations
		seasonal conditions; or (b) Abnormal, localised impacts possible, requires investigation	Plants exhibiting discoloured-yellowed leaves, increased leaf fall.
2	Plants with partial dead canopies	Abnormal, localised impacts possible, requires investigation	Foliage observably reduced and not normal for prevailing seasonal conditions. A portion (estimate % of plant canopy is alive) of the plant canopy is alive while a proportion is dead (dried leaves attached, or dead stems held within plant canopy).
1	Plant completely dead	Abnormal, localised impacts possible, requires investigation	No live foliage held on plant, no live bark observable, irreversible death of plant.

(BHP, 2018)

The assessment of monitoring datasets shall include:

- Preceding and current weather records reflecting seasonal conditions.
- Expected plant response to potential risks, as per Table 4.

Table 3 Expected plant response to potential risks from mining activities

Potential risk	Expected plant response
Water drawdown	Inadequate availability of water, water conservation by closing stomata and thus reducing photosynthesis leading to reduced growth, leaf drop resulting in reduced canopy, leaf discolouration, wilting and curling, substantial leaf shedding, branch death, and overall poor canopy condition, reduced leaf area index and altered spectral signatures characterised by reduced 'greenness'
Fugitive Dust	Dust observed on foliage being greatest close to source and decreasing with distance, impact on photosynthesis processes by

Potential risk	Expected plant response
	blocking stomata, leaf drop thus reducing density of canopy, reduced growth, flowering and fruiting, death of individuals
Bushfire	Death of mature plants depending on intensity and patchiness of fire, loss of entire populations, increased germination and recruitment in some species and vegetative regrowth in other species post-rainfall, results in change in species richness and composition of the ecosystem.
Altered surface water flows	Water logging reduces oxygen availability to the root zone and may result in the following symptoms: wilting; development of adventitious roots near the water line; reduced growth causing epinasty (downward and outward bending of plant parts); leaf chlorosis, and in severe cases death; disruption of root hormone production and transport to other parts of the plant; disruption to nutrient metabolism; disruption to the development of healthy plant tissues such as aerenchyma (air conducting tissues) and stem hypertrophy (swelling of tissues). However, in this environment, flood waters will disappear quickly, and the greater availability of water will likely increase and health of the plants on the flooded side of the infrastructure (due to a longer period of water availability). Depletion of water availability on the shadowing side of infrastructure will likely result in symptoms similar to that displayed by water drawdown risks (above).
Soil and water contamination	Soil and water contaminants can impact a plants ability to take up water and nutrients thus reducing growth and reproductive ability and can result in structural abnormalities such as leaf curl and leaf discoloration, as well as death of individuals due to inhospitable conditions.
Increased weed invasion	Quantifiable increases in weed abundance and/or cover, with or without observable changes in the foliage cover and species diversity of native flora as a result of increased competition for space, nutrients and sunlight.

- Consideration of the preferred habitat and phenology of *Eucalyptus victrix* and Priority species (i.e. *Acacia curryana* and *Rhodanthe frenchii*) in response to seasonal conditions, as per Table 5.

Table 4 Habitat and response to season conditions of indicator species

Species	Preferred habitat
Eucalyptus victrix	Habitat *E. victrix* is a small to medium tree (5 m to 15 m) associated with red loamy or sandy soils and clay loams on floodplains and associated with hyporheic zones of rivers, creeks and associated drainages. This species is distributed across the Midwest region, Gascoyne region, Pilbara region and north-western areas of Western Australia. *E. victrix* trees have prominent tap roots and a network of laterally expansive roots near the soil surface from which vertical sinker roots can also develop. The roots are known to extend up to tens of metres to water table depth (Florentine 1999). Natural response to seasonal rainfall Flooding events are thought to trigger the reproductive cycle of *E. victrix* and ensure seedling establishment (Florentine and Fox 2002b). Natural response to dry conditions As a facultative phreatophyte, *E. victrix* will likely draw the majority of its water requirement from the unsaturated zone, but will use groundwater when available. *E. victrix* is known to demonstrate the ability to regulate water losses when water supplies are limited via regulation of stomatal conductance and structural adjustments such as leaf loss and reduced leaf area.
Acacia curryana	Habitat *Acacia curryana* is an obconic or rounded shrub to 2.5 m tall typically known from low granite hills in skeletal soils (Ecoscape 2015). *Acacia curryana* is abundant and widespread within the development envelope and beyond and frequently occurs as a dominant species of the vegetation (particularly the AcAc vegetation type). Natural response to seasonal rainfall Most likely a typical response of species in this region: Rapid growth, flowering and reproduction. This will be verified during baseline monitoring.

Species	Preferred habitat
	Natural response to dry conditions Most likely a typical response of species in this region: Aestivates, minimum foliage retained. This will be verified during baseline monitoring.
Rhodanthe frenchii	Habitat *Rhodanthe frenchii* is an erect herb recorded as growing to 35 cm tall (though commonly recorded as 50-60cm in the study area) with yellow flowers (Ecoscape 2015). *Rhodanthe frenchii* is typically known from stony hills or rocky river banks (typically occupied niche rocky habitats around large boulders or outcrops; Ecoscape 2015). Natural response to seasonal rainfall Most likely a typical response of species in this region: Rapid growth, flowering and reproduction. This will be verified during baseline monitoring. Natural response to dry conditions Most likely a typical response of species in this region: Aestivates, minimum foliage retained. This will be verified during baseline monitoring.

- Consideration of other monitoring data to inform the assessment (e.g. dust monitoring).

Broad-scale vegetation monitoring

It is intended to use the Normalised Difference Vegetation Index (NDVI) tool, using satellite imagery, which is calculated from the visible and near-infrared light reflected by vegetation. The NDVI tool provides standardised, high resolution imagery that can identify areas of change in vegetation condition on a broader scale beyond that of the focussed monitoring plots.

Healthy vegetation absorbs most of the visible light (i.e. VIS band/ red light) that hits it and reflects a large portion of the near infrared light (NIR). Unhealthy or sparse vegetation reflects more visible light and less near-infrared (specifically NIR wavelengths).

Prior to project commencement, NDVI imagery will be obtained for dry seasonal conditions and wet seasonal conditions. This will provide baseline imagery for the Project. NDVI is calculated as: NDVI = (NIR – R) / (NIR + R), where NIR is the near infrared spectral band and R is the red spectral band.

The NDVI indicates the 'greenness' of target vegetation and ranges between -1 (snow and ice) to +1 (100% healthy and dense vegetation cover). NDVI is highly correlated with per cent canopy closure. A decline in live plant cover will be reflected by a decrease in NDVI. Similarly, the 'persistence' of high NDVI values can be used to identify vegetation that remains in good condition.

Changes in NDVI are also frequently compared to changes in the Normalised Difference Water Index (NDWI), derived from the NIR and short-wave infrared (SWIR) wavelength channels. This is a good proxy for plant water stress. The SWIR reflectance reflects changes in leaf water content. As a result, the moisture condition of vegetation can be monitored. NDWI is calculated as: NDWI = (NIR – SWIR) / (NIR + SWIR).

Impact and control areas will be identified using the vegetation mapping and predicted drawdown contours. These areas will be targeted during the remote sensing analysis and a before and after/baseline assessment will be completed prior to commencement of groundwater abstraction. This will help to characterise the natural variability in vegetation condition at the site.

Monitoring Schedule

Baseline monitoring will be undertaken for the first two years following implementation of the clearing program as follows:

Monitoring	Autumn 2019	Spring 2019	Each subsequent autumn	Each subsequent spring
Vegetation (quadrats)	Baseline		Monitoring	
Priority flora and *E. victrix*	Baseline	Baseline	Monitoring	Monitoring
Remote sensing	Baseline	Baseline	Monitoring	

The monitoring program will be reviewed following the spring 2021 monitoring cycle with a view to reduce to the frequency of the annual and biannual monitoring events. The collection of baseline data will commence prior to vegetation clearing in April/May 2019.

2.5 REPORTING

2.5.1 Annual Reporting

The Compliance Assessment Report will be submitted to the Department of Water and Environmental Regulation and will demonstrate compliance with conditions of the Ministerial Statement issued under Part IV of the *Environmental Protection Act 1986* (WA).

Annual Environmental Reports shall be submitted to the Department of Mines, Industry Regulation and Safety and Department of Water and Environmental Regulation, and will demonstrate compliance with license conditions, relevant laws and responsible environmental management.

2.5.2 Reporting on Exceedance of the Management Target

Where a management target is exceeded (or not met), the CEO of the EPA Services will be notified within 7 days of identification of the exceedance.

3. ADAPTIVE MANAGEMENT AND REVIEW OF THE EMP

3.1 APPROACH

Hastings will implement adaptive management to learn from the implementation of mitigation measures, monitoring and evaluation against management target/s, to more effectively meet the environmental objective. The following approach will be followed:

- Monitoring data will be evaluated and compared to baseline and reference site data on a annual basis (or more frequently in some instances) in a process of adaptive management to verify whether or not responses to the impact are the same or similar to predictions;
- Address evaluation of assumptions and uncertainties listed in section 2.1;
- Annual review of the risk assessment and revision of risk-based priorities on the basis of monitoring program information, incidences, verification of modelling outcomes and new information;
- Increased understanding of the ecological regime, best practice, new technologies;
- Revision through consideration of incidents and associated investigations, or when management actions are not as effective as predicted or as result of change management (e.g. construction versus operations phases);
- External changes during the life of the proposal (e.g. changes to the sensitivity of the key environmental factor, implementation of other activities in the area, etc.); and
- Annual review of this EMP as a component of the continual improvement process within the Environmental Management System.

3.2 EARLY RESPONSE INDICATORS, CRITERIA AND ACTIONS

Early response indicators are used to:

- Provide information on changes, which are precursors to an environmental impact.
- Support improved understanding and identification of trends in environmental systems (EPA 2018).

The use of early response indicators in certain situations include:

- where loss or mortality is irreversible in human time scales;
- where impacts may not be detected for a prolonged period; and

- complex environmental systems where trends need to be established or where consequences of potential impacts are not well understood (e.g. long-term impacts of dewatering on groundwater systems).

For the Proposal, early response indicators are only considered for the following risk:

Risk:	Risk 1: Clearing outside of approved disturbance boundary
Rationale	The level of risk is considered moderate due to known likelihood of clearing being relatively common, although the extent is general minor or insignificant, and thus the level of certainty is also moderate.
Management target:	No clearing outside the approved disturbance boundary.
Early response indicator:	Greater than one occurrence of unauthorised clearing over an area >1Ha within a 3-month period
Rationale for the choice of the early response indicator:	If unauthorised clearing occurs greater than once over significant areas, then a non-conformance with Hastings procedures has arisen.
Early response criterion:	Incident records and investigations of unauthorised clearing activities
Early response actions:	Implement program of additional training for personnel involved in supervision or undertaking land clearing activities. Review Land clearing and topsoil management procedure in consultation with employees and contractors involved in land clearing activities to ensure it is effective. Supervision of land clearing activities by environmental personnel. Increase flagging and demarcation of land clearing boundaries to increase visibility of boundaries.
Risk:	Risk 2: Groundwater drawdown
Rationale	While the inherent risk severity is low, the level of certainty is also considered to be low due to a lack of understanding as to whether the potential GDE's are dependent on groundwater.

Management target:	No decline in potential GDE vegetation condition beyond natural variability
Early response indicator:	Decline in GDE species health condition
Rationale for the choice of the early response indicator:	If potential GDE's are solely reliant on groundwater levels then lower water levels may result in a decline in their health/condition (e.g. loss of leaves, yellowing of leaves, death of individuals).
Early response criterion:	Visual inspection of potential GDEs, including photographic records, identifies the following evidence of a decline in the health condition: • Obvious loss of leaves, • yellowing of leaves, • dead branches, and/or • reduced canopy area.
Early response actions:	• Investigate whether this is comparable with GDE condition at control sites. • Determine if the water drawdown trigger has been exceeded. If not, consider revising trigger level. • Reduce or stop water abstraction at this location. • Consult with external stakeholders (GDE-specialist consultants, regulators) of next steps. • Report findings. • Continue to monitor GDE vegetation. Monitoring frequency may increase.
Risk:	Risk 3: Introduction of new weed species, or spread of existing weed species, due to vehicles importing seed / plant material from outside or within the Project area.
Rationale	This has a high inherent risk severity due to the consequences of the establishment of weeds, the area of disturbance and suitable

	habitat for weeds and the number of weed species present on-site. The level of certainty is considered moderate.
Management target:	No increase in composition, distribution and abundance of weed species due to the Proposal activities. Eliminate targeted weed species within Development Envelope over the life of the mine.
Early response indicator:	New weed species identified on disturbed areas on site Identified weed species recorded at the site present on newly disturbed areas
Rationale for the choice of the early response indicator:	New weed species suggest that vehicle hygiene procedures are ineffective Spread of weed species on newly disturbed areas show an increase in the distribution of weeds on site
Early response criterion:	Visual monitoring by environmental staff for the establishment of weeds on disturbed areas approximately 6 weeks after rainfall. Biannual monitoring of disturbance areas by consultant botanist for the establishment of weed species
Early response actions:	• Immediate eradication program to be instigated specific to that species • Ongoing monitoring program implemented, at and in the vicinity of where the weed species was recorded, post eradication program • Revise mitigation measures to prevent introduction, establishment and spread of weed species
Risk:	Risk 4: Bush fire because of the Proposal activities
Rationale	This risk has a moderate inherent risk severity and moderate certainty due to known electricity pole fires and hot vehicle exhaust fires igniting vegetation as a result of mining activities. There are areas with sparse vegetation and unlikely to result in bushfire on site, while there are other areas with Acacia shrubs and/or Eucalyptus trees that could result in a widespread bushfire.

Management target:	No incidents of fire ignition resulting in bush fire as a result of the Proposal activities.
Early response indicator:	Incident of fire ignition from Proposal activities
Rationale for the choice of the early response indicator:	While one incident of fire ignition may not result in a bushfire, it heightens the likelihood of fire ignition resulting in a bushfire
Early response criterion:	Hazard and incident reports of fire ignition and resultant investigation
Early response actions:	Depending on the cause, the following early response actions would be implemented: • Additional training and awareness of fire ignition prevention and control measures • Additional controls identified to prevent reoccurrence
Risk:	Risk 5: Excessive fugitive dust generation from the Proposal activities
Rationale	Dust generating activities are associated with land clearing, vehicle movement, mining and processing activities. Excessive dust deposition over prolonged periods is known to negatively impact vegetation. However, during dry periods many flora species close their stomata and shed leaves for survival and are known to be resilient to dust thus the inherent risk severity is considered moderate. The level of certainty is considered high due to research in this area.
Management target:	Dust levels will not exceed thresholds (10 uGy/h) at monitoring locations within the Project / at the Project boundary because of Proposal activities.
Early response indicator:	Dust levels exceed thresholds consecutively over three or more monitoring periods between rainfall events and/or visual impacts to flora in immediate vicinity of source of fugitive dust generated by Proposal activities
Rationale for the choice of the early response indicator:	Dust monitoring stations may not be in the immediate vicinity of a dust source and thus consideration of visual impacts as well as exceedances in dust levels and a are considered. Dust storms are

	common in the region thus the impacts need to consider a fugitive dust generation source.
Early response criterion:	Visual observations of excessive dust deposition on leaves of vegetation in immediate vicinity of the source of fugitive dust generation from the Proposal activities. >1 plant of priority flora species in near vicinity of dust generation source with obvious dust deposition on leaves and showing signs of stress including: • Leaf drop • Branch death • Yellowing of leaves
Early response actions:	Implement additional dust control measures at the source of fugitive dust generation by the Proposal activity.
Risk:	Risk 6: Alteration of surface water drainage flow patterns
Rationale	Linear infrastructure has been designed to not prevent or obstruct surface water flow. As a result it is expected that there will be no alteration of surface water drainage flow patterns and thus inherent risk is considered low.
Management target:	No impacts to flora and vegetation because of altered surface water flow patterns.
Early response indicator:	Small bunds due to road and track maintenance can occur preventing water movement along its natural flow path. Inspections of linear infrastructure prior to seasonal rainfall identifies obstructions. Observations following rainfall events for water pooling as a result of linear infrastructure.
Rationale for the choice of the early response indicator:	The cause of a change in flow path needs to be identified because changes in vegetation may occur over longer time periods.
Early response criterion:	Inspections of linear infrastructure prior to seasonal heavy rainfall events.

	Observations of areas where pooling may occur following heavy rainfall events and implementing mitigation measures, e.g. additional culverts, prior to next rainfall events
Early response actions:	Maintenance of linear infrastructure, e.g. smoothing down small bunds that may occur during maintenance activities, burial of new pipelines or raising pipelines
Risk:	Risk 7: Change in water quality because of release of chemicals
Rationale	The risk severity is considered moderate due to chemicals stored at the process plant and the impact they may have should large quantities be released to the surrounding environment during a flood event. The downstream Fraser Creek and Lyons River, and nearby Frasers pastoral bore are considered sensitive receptors. The level of certainty is considered moderate.
Management target:	No exceedances in water quality thresholds as a result of proposal activities.
Early response indicator:	Exceedance of water quality thresholds greater than background levels
Rationale for the choice of the early response indicator:	Background water quality testing has been underway to determine naturally occurring fluctuations of chemical elements in groundwater and surface water.
Early response criterion:	Water quality testing as described in the Water Management Plan
Early response actions:	• Identify source of chemical release • Control chemical release • Implement mitigation actions to prevent future chemical release

3.3 REVISION OF MANAGEMENT ACTIONS

Where the management target/s is not met or exceeded, Hastings will review and revise the risk assessment, review and revise management actions and identify additional management actions where necessary. The following are examples of revised and additional management actions for each of the risks listed in Table 2-1:

Risk 1: Clearing outside of approved disturbance boundary

- Revised management action 1: Review of ground disturbance procedures, in consultation with land clearing team, to determine components of the procedure that are not clear or are not being interpreted correctly.
- Revised management action 2: Additional training and awareness.
- Additional management action 1: Contractor penalties for non-conformances.

Risk 2: Groundwater drawdown

- Revised management action 1: Revise trigger levels for groundwater quality
- Revised management action 2: Revise trigger levels for water drawdown
- Additional management action 1: Reduce water abstraction across the bore field by identifying other water source areas.

Risk 3: Introduction of new weed species, or spread of existing weed species, due to vehicles importing seed / plant material from outside or within the Project area.

- Revised management action 1: Proactive weed eradication program for non-target weed species.
- Revised management action 2: Proactive weed eradication program along road from Gascoyne Junction to the mine site.
- Additional management action 1: Eradication of weed species along river and creek system if weed seed entry to site occurs via surface water drainage from outside areas and germinate within disturbed areas.

Risk 4: Bush fire because of the Proposal activities

- Revised management action 1: Increased training and awareness
- Revised management action 2: Increase fire prevention measures
- Additional management action 1: Controlled burning, establish fire breaks around high risk areas

Risk 5: Excessive fugitive dust generation from the Proposal activities

- Revised management action 1: Increased water application to roads and/or exposed stockpiles
- Revised management action 2: Increased dust control measures
- Additional management action 1: Activity restrictions during windy weather conditions

Risk 6: Alteration of surface water drainage flow patterns

- Revised management action 1: Modifications to infrastructure – additional engineering controls post-construction.
- Revised management action 2: Dispersion of water flow due to unnatural, concentrated high velocity water movement as a result of diversion channels or culverts.
- Additional management action 1: Create gaps in small safety bunds on the sides of the roads prior to high rainfall events to ensure unrestricted water movement across the roads.

Risk 7: Change in water quality because of release of chemicals

- Revised management action 1: Additional secondary containment bunding beyond Australian standards to ensure containment of any chemicals in the event of a spill or containment failure.
- Revised management action 2: Additional training and awareness procedures.
- Additional management action 1: Substitute chemicals with biodegradable products where possible.

Reviewed and revised management actions will be implemented by Hastings to mitigate and manage risk to ensure the management target is met.

4. STAKEHOLDER CONSULTATION

Hastings consulted with key stakeholders while developing this EMP as is consistent with the EPA's expectations for this EMP to align with the principles of the EIA. Table 7 provides a summary of consultation that occurred. The comments raised during consultations with stakeholders were considered in the development of the Condition EMP. The following sections present stakeholders' comments and Hastings responses to those comments.

Table 7 Stakeholder consultation

Organisation(s)	Comments	Hastings Response to Comments
Environmental Protection Authority: Response to relevant section of the Environmental Review Document.	Requirement in the ESD for the Flora and Vegetation EMP to be included as a component of the revised version of the Environmental Review Document. Review by EPA Services (August 2018), Terrestrial Environment Branch: 1. Not consistent with EPA instructions. 2. EMP should not include assessment information nor list all values identified by technical surveys, but instead focus on specific management measures to prevent significant residual impacts. 3. ERD and technical survey reports do not contain sufficient information to determine direct or indirect impact on significant flora that are not listed as priority flora. Once this issue has been addressed, the EMP may require revision to include any species substantially impacted by the proposal. 4. EMP states it will implement an adaptive management approach (p. 19) but does not provide sufficient details of trigger or threshold criteria, or contingency actions. 5. EMP includes examples of outcome-based measures that are very broad, unlikely to be important	Production of this EMP. Revised to address EPA Services comments (August and November 2018; February 2019).

Organisation(s)	Comments	Hastings Response to Comments
	issues during assessment, and for which it would be challenging to demonstrate success, such as "No impact on vegetation", "No new weed species are introduced" (Table 2-1, p 21) Review by EPA Services (November 2018), Terrestrial Environment Branch: Include sufficient content on objectives, threshold and targeted monitoring for flora, vegetation health (GDEs) and weeds, including baseline data. Review by EPA Services (February 2019): The management-based (management targets) FVEMP refers to undeveloped objectives based trigger levels in a Water Management Plan that does not refer to the development of those trigger levels (ERD Appendix 4-4). Early response indicators, criterion and actions provided in Section 3.2 of the FVEMP provide only for the effects to flora from groundwater drawdown. The use of death of individuals as an indicator of an early response is not appropriate. A more objective and measurable early response indicator should be utilised that precedes plant death from groundwater drawdown.	
Department of Biodiversity, Conservation and Attractions (former Department of Parks and Wildlife (DPaW))	A general discussion regarding the environmental values. DPaW no longer meet with Proponents unless through formal EPA processes/requests.	No further action required.

Organisation(s)	Comments	Hastings Response to Comments
Pastoralist	Discussions and site visit of infrastructure layout and areas of high pastoral values.	Infrastructure layout takes account of pastoral values.
Traditional Owners (TOs)	Lyons River and Fraser Creek have heritage values associated with them. A 150m exclusion buffer occurs on either side of the River and Creek.	Consultation with TO's required for any activities within the 150m exclusion buffer (i.e. monitoring, weed eradication). Hastings will ensure this is included in Construction EMP and Environmental Induction.

5. REFERENCES

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EPA (2018). *Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans.* Published April 2018.

Department of Resources, Energy and Tourism (2008). *Leading Practice Sustainable Development Program for the Mining Industry - Risk Assessment and Management*. Commonwealth of Australia, May 2008.

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