# Mulga Rock Uranium Project

## Environmental Management Plan

**MRUP-EMP-000**

November 2015

Mulga Rock Uranium Project - Public Environmental Review - December 2015
**Appendix K**

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## Prepared for Vimy Resources Limited by Golder Associates Pty Ltd

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# 1. Context, scope and rationale

## 1.1 What is the proposal?

Vimy Resources Limited (Vimy) proposes to develop the Mulga Rock Uranium Project (MRUP or the Project) which lies approximately 240km east-north-east of Kalgoorlie-Boulder in the Shire of Menzies. The area is remote, located on the western flank of the Great Victoria Desert, comprising series of large, generally parallel sand dunes, with inter-dunal swales and broad flat plains.

The MRUP covers approximately 102,000 hectares on granted mining tenure (primarily M39/1080 and M39/1081) within Unallocated Crown Land (UCL). It includes two distinct mining centres, Mulga Rock East (MRE) comprising the Princess and Ambassador resources and Mulga Rock West (MRW) comprising the Emperor and Shogun resources. The two mining centres are approximately 20km apart. Up to 4.5 Million tonnes per annum (Mtpa) of ore will be mined using traditional open cut techniques, crushed, beneficiated and then processed onsite to produce, on average, 1,360 tonnes of uranium oxide concentrate (UOC) per year over the life of the Project. Base metal concentrates will also be extracted using sulphide precipitation after the uranium has been removed and sold separately.

The anticipated Life-of-Mine (LOM) is up to 16 years, based on the currently identified resource.

## 1.2 Key environmental issues

The key environmental factors identified by the Environmental Protection Authority (EPA) include:

- Flora and vegetation.
- Terrestrial fauna.
- Subterranean fauna.
- Hydrological processes.
- Inland waters environmental quality.
- Air quality and atmospheric gases.
- Human health.
- Heritage.
- Rehabilitation and decommissioning.
- Offsets.

Each of the above key environmental factors has been addressed specifically in the Public Environmental Review (PER) document submitted in November 2015. As required by the Environmental Scoping Document (ESD), management plans that describe the outcomes/objectives, management, monitoring, management targets and contingency actions for each of the above environmental factors are required to be developed.

## 1.3 Purpose

This Environmental Management Plan (EMP) describes an overarching framework for the individual management plans (MPs) that have been generated for the MRUP. The implementation of these MPs ensures that all work undertaken for the Project is conducted in an environmentally sustainable manner and that all potential environmental impacts and risks are identified and reduced to an acceptable level using the mitigation hierarchy.

## 1.4 Scope and Applicability

This EMP, and all subsidiary MPs, are applicable to all aspects and areas of the MRUP, including the mine, borefields, haul roads and transport routes. They are applicable for the life of the Project (exploration, construction, operation, rehabilitation and closure) and apply to all Vimy personnel, contractors and site visitors.

## 1.5 Structure

The MPs were structured in accordance the *Environmental Assessment Guideline 17* (EPA 2015b) and the EPA's *environmental management-based condition model template* (EPA 2015c).

The EPA has developed Environmental Assessment Guideline (EAG) 17 to provide guidance to proponents on the content of management plans under Part IV of the Environmental Protection Act 1986 (EP Act) (EPA 2015b) and to improve the effectiveness of management plans, facilitate the efficient regulatory processing of management plans, help proponents prepare management plans, and improve the readability of management plans for the public (EPA 2015b).

The Vimy Environmental Management Framework to be implemented at the MRUP is shown in Figure 3.1. In total, 39 management plans have been identified to cover the various environmental aspects for this Project and 24 of these are required for the PER document (highlighted below in Figure 3.1).

## 1.6 Revision

Given the preliminary nature of the existing MPs, the commitments made may be further revised as part of Vimy's adaptive management process. It is therefore not recommended that Project approval conditions set by the government are based explicitly on these commitments as they will likely evolve as the Project development studies progress.

## 2. Legislative Approval and Vimy Requirements

Key legislation protecting the environment in response to the MRUP is the Australian Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and both the Western Australian *Environmental Protection Act 1986* and *Mining Act 1978*.

Should the Project receive environmental approval under this key legislation, other Commonwealth and Western Australian legislation may apply to project approvals of operational aspects of the Project. This legislation is listed below:

Commonwealth legislation:

- *Australian Radiation Protection and Nuclear Safety Act 1998.*
- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984.*
- *Environment Protection and Biodiversity Conservation Act 1999.*
- *Civil Aviation Act 1988.*
- *Customs Act 1901.*
- *National Greenhouse and Energy Reporting Act 2007.*
- *Native Title Act 1993.*
- *Nuclear Non-Proliferation (Safeguards) Act 1987*.
- *Nuclear Safeguards (Producers of Uranium Concentrates) Charge Act 1993.*

Western Australian legislation:

- *Aboriginal Heritage Act 1972.*
- *Agriculture and Related Resources Protection Act 1976.*
- *Animal Welfare Act 2002.*
- *Biosecurity and Agriculture Management Act 2007.*
- *Bush Fires Act 1954.*
- *Conservation and Land Management Act 1984.*
- *Contaminated Sites Act 2003.*
- *Country Areas Water Supply Act 1947.*
- *Dangerous Goods Safety Act 2004.*
- *Dangerous Goods (Transport) Act 1998.*
- *Electricity Act 1945.*
- *Environmental Protection Act 1986.*
- *Environmental Protection (Clearing of Native Vegetation) Regulations 2004.*
- *Environmental Protection (Noise) Regulations 1997.*
- *Environmental Protection Regulations 1987.*
- *Explosives and Dangerous Goods Act 1961.*

- *Health Act 1911.*
- *Heritage of Western Australia Act 1990.*
- *Land Administration Act 1997.*
- *Local Government Act 1995.*
- *Main Roads Act 1930.*
- *Mine Safety and Inspection Act 1994.*
- *Mining Act 1978.*
- *Occupational Safety and Health Act 1984.*
- *Planning and Development Act 2005.*
- *Rights in Water and Irrigation Act 1914.*
- *Soil and Land Conservation Act 1945.*
- *Pollution of Waters by Oil and Noxious Substances Act 1987.*
- *Waterways Conservation Act 1976.*
- *Wildlife Conservation Act 1950*.
- *Radiation Safety Act 1975.*

In addition to the above legislative and approval requirements, Vimy's overarching Environmental Policy (Section 3.1) will govern the management of all operations undertaken at the MRUP.

Specific legislative and approval requirements are also outlined within each management plan.

# 3. Environmental Management Framework

## 3.1 Management Plan Framework

The Vimy Environmental Management Framework to be implemented at the MRUP is shown in Figure 3.1. In total, 39 management plans have been identified to cover the various environmental aspects for this Project and 24 of these are required for the PER document (highlighted below in

The Vimy Environmental Policy is provided as Figure 3.2, whilst the Occupational Health and Safety Policy is provided as Figure 3.3.

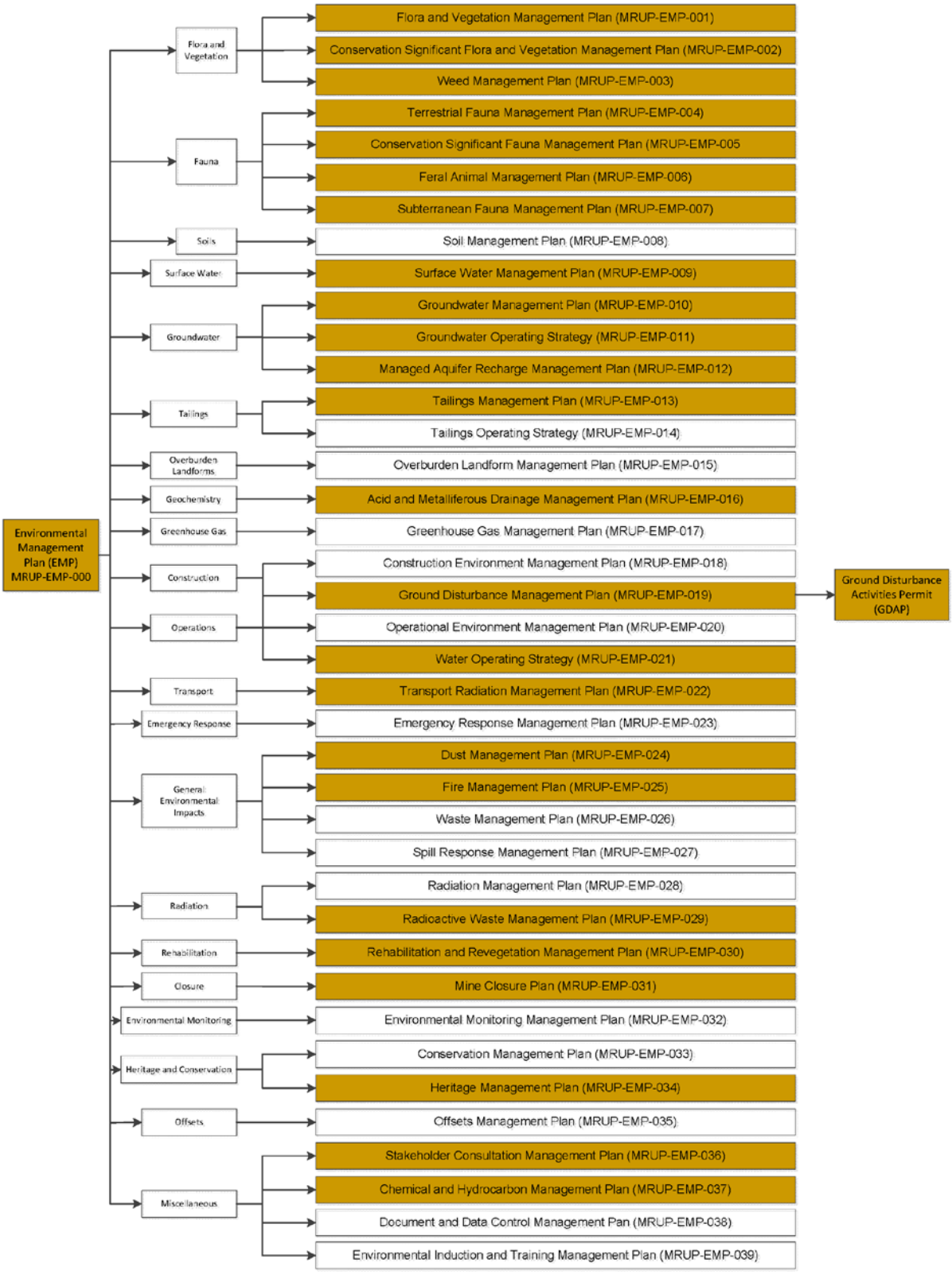


**Figure 3.1: Vimy Environmental Management Framework for the MRUP Environmental Policy**

VIMY RESOURCES

## Environmental Policy

**We will seek to conduct our activities in an environmentally responsible manner so as to both minimise our impact on the environment and to promote the efficient and economic use of resources.**

**We will ensure that our exploration and mining activities are conducted in compliance with all applicable environmental legislation, regulations and codes of practice. Over and above compliance, we are committed to minimising our impact on the environment and communities in which we operate through:**

- Integrating environmental, social, economic and waste minimisation considerations into all activities, from project planning, exploration, construction, mining and processing to the eventual closure and rehabilitation of our sites;
- Identifying environmental risks associated with exploration and mining activities and developing appropriate controls and strategies to monitor and manage potential impacts;
- Applying effective practices to minimise the impact of our operations on water, land and air, and through the implementation of appropriate engineering design in all aspects of our operations. Construction and operational activities will be monitored and controlled to meet appropriate performance standards and measurable objectives;
- Promoting environmental awareness and responsibility by providing appropriate training programs and information on conservation, required environmental management standards and stewardship for all employees and contractors;
- Fostering the initiation and ownership of environmental activities by all company personnel, thereby building a strong environmentally aware business culture that reflects our commitment to the principles of sustainability;
- Fostering and promoting research activities associated with the definition and management of biodiversity values in the regions in which we operate;
- Building constructive and collaborative working relationships with external stakeholders; and
- Rehabilitating disturbed areas to a safe, stable and non-polluting condition which is compatible with the surrounding environment in function and form.

**Mike Young**
Managing Director and CEO

Date: July 2015

**Figure 3.2: Vimy Environmental Policy**

## Occupational Health and Safety Policy

**We are strongly committed to a healthy and safe working environment and to the welfare of all employees and contractors. We acknowledge that achieving these objectives is a responsibility shared by all employees.**

**We will ensure that our exploration and mining activities are conducted in compliance with all applicable legislation, regulations and codes of practice in the field of occupational health and safety. Over and above compliance, we are aspiring to zero harm to our employees, contractors and the broader community we operate in, by**:

- Implementing and maintaining work practices which are safe and focused on minimising the short and long term risks to the health of our employees and contractors and third parties;
- Training, re-training, informing, instructing and supervising all employees so as to ensure that they perform their work duties safely;
- Identifying, assessing and managing risks and hazards associated with exploration and mining activities and developing appropriate controls and strategies to monitor and manage potential impacts;
- Committing the human, technical and financial resources necessary to achieving these objectives;
- Ensuring contractors adopt and implement OHS standards at least equal to those of Vimy Resources, which are to be reflected in any contractual agreements;
- Developing and implementing appropriate management systems at all sites, including via the use of inductions and toolbox meetings;
- Fostering a safety conscious and proactive attitude amongst all company personnel, aiming to build on the combined knowledge and experience of all involved and encouraging leadership and continuous improvement in the area of safety; and
- Ensuring that, as a condition of employment, all employees abide by the site rules and follow their duty of care to themselves and fellow workers.

**Mike Young**
Managing Director and CEO

Date: July 2015

**Figure 3.3: Vimy Occupational Health and Safety Policy**

# 4. Structure of the Management Plans

The MPs developed for the project are based on the *Environmental Assessment Guideline 17* (EPA 2015b) and the EPA's *environmental management-based condition model template* (EPA 2015c).

The adopted structure for the management plans is provided below:

1. Summary
2. Context, scope and rationale
   - 2.1 What is the proposal?
   - 2.2 What key environmental factor/s does this MP address?
   - 2.3 Rationale and approach in meeting the environmental objective
3. MP provisions
   - 3.1 Environmental objective
   - 3.2 Management actions to be implemented
   - 3.3 Management target
   - 3.4 Monitoring
   - 3.5 Review and revision of management actions
   - 3.6 Reporting provisions
4. Adaptive management and review of the MP
5. Stakeholder consultation
6. References

# 5. Environmental Impacts

## 5.1 Environmental Impact Assessment

An Environmental Impact Assessment (EIA) is an important step in the management of any environmental factor. Identifying, locating, quantifying and assessing significance of potential impacts (direct and indirect) requires a good understanding of both baseline ecosystem functioning, as well as the functioning of the post-mine landforms within the native environment. The EIA process should therefore be conducted by suitably qualified persons who have familiarity with a region and operation.

Potential environmental impacts or events may occur during exploration, construction, operation and rehabilitation. To facilitate the application of a systematic approach to environmental management, and the identification of appropriate management strategies, impacts are separated into:

- Direct impacts – refer to direct interaction of an event or activity with an environmental or social factor or aspect (e.g. clearing has a direct impact on vegetation).
- Indirect impacts - refer to impacts that are not caused as a direct result of the event, but due to complex impact pathway, which may be second or third tiered (e.g. dust generated during clearing activities may impact on the quality of the nearby vegetation).

## 5.2 Risk Assessment

Once the potential direct and indirect impacts of the proposal are clearly identified a risk assessment is then undertaken for each potential impact. This means that the likelihood and consequences of each potential impact is estimated. An example of the methodology for risk assessment, used in the various management plans, is provided below.

The function of the risk assessment is not to repeat or supersede the original assessment of a project or its conditions of approval. Rather it is to ensure that these risks are effectively translated into actual mitigation and management actions. Impacts with higher risk ratings usually require more management actions and controls. This minimises the likelihood of the risk occurring and reduces the consequences to acceptable levels.

### 5.2.1 Evaluating Risk

The process of evaluating and managing risk for the MRUP is in accordance with *AS/NZS ISO 31000:2009 Risk Management – Principles and Guidelines* (Standards Australia 2009).

Each environmental risk associated with an impact or event is given a rating in terms of likelihood and consequence using the criteria listed in Table 5.1 and Table 5.2.

### 5.2.2 Risk Rating

By combining the likelihood and consequence ratings an overall risk rating of low, medium, high or severe is obtained using the Risk Matrix shown in Table 5.3.

**Table 5.1: Qualitative measure of likelihood (how likely is it that an impact or event will occur after control or management strategies have been put in place)**

| Rating | Code | Description |
|---|---|---|
| Rare | L1 | May occur in exceptional circumstances. |
| Unlikely | L2 | Could occur but considered unlikely or doubtful. |
| Possible | L3 | Might occur during the life of the project. |
| Likely | L4 | Will probably occur during the life of the project. |
| Highly likely | L5 | Is expected to occur in most circumstances. |

**Table 5.2: Qualitative measure of consequence (what will be the consequence if an impact or event does occur)**

| Rating | Code | Description |
|---|---|---|
| Minor | C1 | Minor incident of environmental damage that can be reversed. |
| Moderate | C2 | Isolated but substantial instances of environmental damage that could be reversed with intensive effects. |
| High | C3 | Substantial instances of environmental damage that could be reversed with intensive effects. |
| Major | C4 | Major loss of environmental amenity and real danger of continuing. |
| Critical | C5 | Severe widespread loss of environmental amenity and irrecoverable environmental damage. |

**Table 5.3: Risk Rating Table**

| | | Consequence | | | | |
|---|---|---|---|---|---|---|
| | | Minor (C1) | Moderate (C2) | High (C3) | Major (C4) | Critical (C5) |
| Likelihood | Rare (L1) | Very Low | Very Low | Low | Medium | Medium |
| | Unlikely (L2) | Very Low | Low | Medium | Medium | High |
| | Possible (L3) | Very Low | Low | Medium | High | High |
| | Likely (L4) | Low | Medium | High | High | Severe |
| | Highly Likely (L5) | Low | Medium | High | Severe | Severe |

# 6. Mitigation Hierarchy

Mitigation hierarchy emphasises best practice of avoiding or reducing residual impacts that a project has on the environment. The following mitigation hierarchy was used to develop controls for the issues identified (in order of most effective to least effective):

- Avoid.
- Minimise.
- Mitigate.
- Rehabilitate.
- Offset.

The approach is outlined in Figure 6.1.

## 6.1 Environmental Offsets

Through the application of the mitigation hierarchy, described in Section 6, the requirement for, and magnitude of, Environment Offsets for a project can be determined. As described in the Environmental Protection Authority (EPA) Environmental Protection Bulletin No. 1 (EPB1), and the EPA Position Statement 9 (EPA, 2006), Environmental Offsets are actions that counterbalance identified significant residual environmental impacts or risks (i.e. after the mitigation hierarchy has been applied) from a project to provide an overall environmental benefit. The derivation of an Offset is shown schematically in Figure 6.1.

The EPBC Act 1999 Environmental Offsets Policy (DSEWPaC 2012) outlines the Commonwealth government's approach to the use of offsets under the EPBC Act. The Policy defines offsets as 'measures that compensate the residual adverse impacts of an action on the environment'. The policy states that avoidance and mitigation measure must be the primary strategy to manage significant impacts and that offsets do not reduce likely impacts but rather compensate for residual significant impacts.

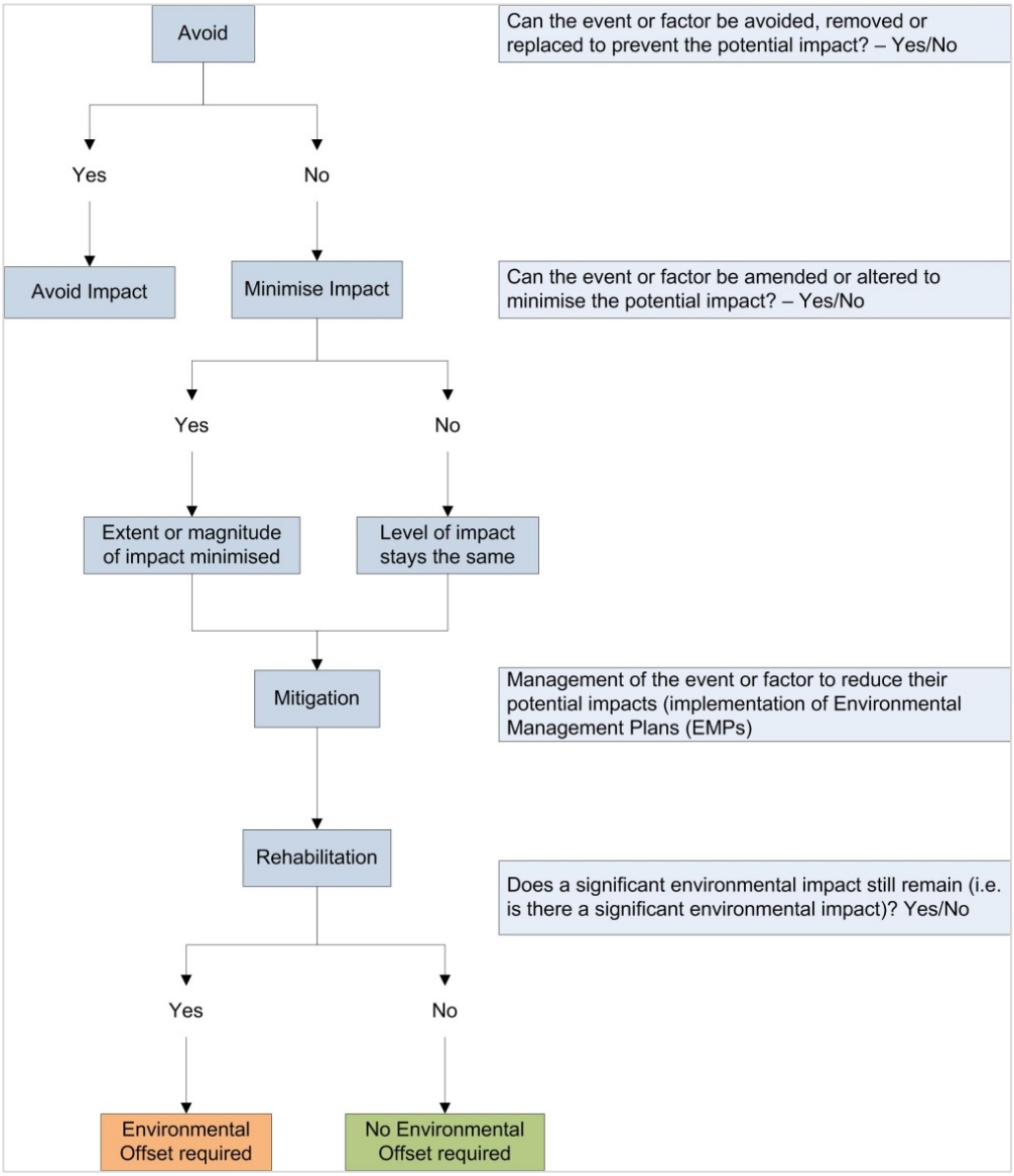


**Figure 6.1: Mitigation hierarchy approach to assessing residual impacts and triggers for potential offsets**

# 7. Environmental Management

As outlined in the Mitigation Hierarchy (Section 6), environmental management (or mitigation) should be implemented for events or factors which cannot be avoided (with or without minimisation), in order lessen the inherent impacts or risks of impact of the event or factor.

## 7.1 Management Measures or Commitments

Management measures or commitments made by Vimy to mitigate potential impacts are either classified as qualitative or quantitative. Qualitative measures generally involve visual observation of a particular activity, or implementation of a particular action to avoid an impact, and thus are more likely to be lead indicators (such as restricting vehicle speeds on access road to minimise the generation of dust). In contrast, quantitative measures are generally lag indicators and involve actual trigger values (e.g. dust deposition levels at compliance points will not exceed 2g/$m^2$/annum (attributed to by the project) or radiation exposure levels on the outside of the cargo transport unit will not exceed 0.02mSv/h).

Quantitative measures can further be broken-down into static or target measures. Static measures typically involve utilising existing baseline or analogue monitoring points/stations (e.g. dust monitoring stations), whilst targeted measures involved specific monitoring an environmental factor (e.g. dust) over a specified relatively short time frame (e.g. personnel performing a routine task within the process plant will wear personal dust monitors over an set time period and this measure value compared to regulatory or industry standard values to determine compliance).

All management measures are captured in one specific database for ease of access and auditing.

## 7.2 Environmental Objectives and Performance Indicators

This section of the MPs documents the overall objective of the Management Plan and the relevant performance indicators that are to be used to assess or monitor progress to achieving the specific objective. It is essential that carefully considered performance indicators are developed as these effectively establish the monitoring program that is required to assess performance. If they are not linked then there is a risk that the monitoring program is redundant and providing no valuable information to guide future development and improvement, which is the fundamental concept of Vimy's adaptive management approach to environmental management.

## 7.3 Monitoring

Monitoring is a critical step in any adaptive management feedback cycle as it provides the necessary information to establish the effectiveness of the implemented management measure in achieving the environmental objective and the performance against key indicators (e.g. completion criteria). The monitoring sections contained within the various MPs outline the overall monitoring objective and include preliminary details on the monitoring methodology to be employed, and the frequency and duration of monitoring activities. Monitoring details will be finalised as part of the operational MPs and the Environmental Monitoring Management Plan (MRUP-EMP-032).

## 7.4 Reporting

For the majority of the MPs developed for the MRUP, the data/results captured are stored within the Vimy Environmental Database in accordance with the standards and processes outlined in MRUP-EMP-038 (Document and Data Control Management Plan). This information is then extracted and presented in the Annual Environmental Review (AER) for the project and utilised to update, and keep current, the associated Minesite Rehabilitation Fund (MRF) disturbance tables.

Through this process of data capture and storage, information concerning the identified environmental factors and the efficacy of the various MPs can be easily extracted and presented to the relevant regulatory agencies or stakeholder groups.

## 7.5 Corrective (Contingency) Actions

The MPs include procedures for addressing:

- Monitoring results which exceed performance indicators for corrective action.
- Potential corrective actions to be implemented.
- Reporting non-compliance with approval conditions to the relevant authority.
- Environmental incidents and emergencies.

The MPs also address the person responsible for implementing the above procedures. Auditable systems should be developed for recording the implementation of the corrective actions or procedures and their outcomes.

# 8. References

DSEWPaC (2012) *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy*. Department of Sustainability, Environment, Water, Population and Communities, Commonwealth of Australia.

EPA (2006) *Environmental Offsets, Position Statement No. 9*. Environmental Protection Authority, Perth, Western Australia.

EPA (2014) *Environmental Offsets, Environmental Protection Bulletin No. 1*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015a) *Environmental Assessment Guideline for Environmental principles, factors and objectives, EAG 8*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015b) *Environmental Assessment Guideline for Preparation of management plans under Part IV of the Environmental Protection Act 1986, EAG 17*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015c) *Title of Condition Environmental Management Plan, Environmental management-based condition model template*. Environmental Protection Authority, Perth, Western Australia.

# Mulga Rock Uranium Project

# Flora and Vegetation Management Plan

## MRUP-EMP-001

November 2015


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# 1. Summary

The table below presents the environmental management target/s to measure achievement of the environmental objective that must be met through implementation of this Management Plan (MP).

| Title of proposal | Mulga Rock Uranium Project |
|---|---|
| Proponent | Vimy Resources Limited |
| Environmental Scoping Document | Assessment Number 1979 |
| Purpose of this MP | The Flora and Vegetation Management Plan is submitted to outline MRUP's proposed procedures and practices to be implemented to meet the EPA's environmental objective for the key environmental factor/s. |
| EPA's environmental objective for the key environmental factor/s | Flora and Vegetation: To maintain representation, diversity, viability and ecological function at the species, population and community level. |
| Vimy's environmental objective | Ensure that the impact upon the flora and vegetation resulting from the development of the MRUP is minimised in terms of both its extent and duration. |
| Management target/s | • Management target 1: Minimise disturbance activities where practicable.<br>• Management target 2: Implement a Ground Disturbance Activity Permit (GDAP) to manage all vegetation disturbance.<br>• Management target 3: Avoid clearing Priority Flora populations where practicable.<br>• Management target 4: Maintain overall health of flora and vegetation by minimising indirect impacts such as dust.<br>• Management target 5: Avoid or minimise the introduction and spread of weed species.<br>• Management target 6: Progressively rehabilitate disturbed areas, where practicable.<br>• Management target 7: Awareness of environmental outcomes by all MRUP personnel and contractors. |

**Corporate endorsement**

I hereby certify that to the best of my knowledge, the MP provisions within this Flora and Vegetation Management Plan are true and correct.

[Signature of duly authorised proponent representative]

Name: Signed:

Designation: Date:

# 2. Context, scope and rationale

## 2.1 What is the proposal?

Vimy Resources Limited (Vimy) proposes to develop the Mulga Rock Uranium Project (MRUP or the Project) which lies approximately 240km east-north-east of Kalgoorlie-Boulder in the Shire of Menzies. The area is remote, located on the western flank of the Great Victoria Desert, comprising series of large, generally parallel sand dunes, with inter-dunal swales and broad flat plains.

The MRUP covers approximately 102,000 hectares on granted mining tenure (primarily M39/1080 and M39/1081) within Unallocated Crown Land (UCL). It includes two distinct mining centres, Mulga Rock East (MRE) comprising the Princess and Ambassador resources and Mulga Rock West (MRW) comprising the Emperor and Shogun resources, which are approximately 20km apart. Up to 4.5 Million tonnes per annum (Mtpa) of ore will be mined using traditional open cut techniques, crushed, beneficiated and then processed onsite to produce, on average, 1,360 tonnes of uranium oxide concentrate (UOC) per year over the life of the Project. Base metal concentrates will also be extracted using sulphide precipitation after the uranium has been removed and sold separately.

The anticipated Life-of-Mine (LOM) is up to 16 years, based on the currently identified resource.

This MP has been based on *Environmental Assessment Guideline 17* (EPA 2015b) and the EPA's *environmental management-based condition model template* (EPA 2015c).

## 2.2 What key environmental factor/s does this MP address?

This MP specifically addresses the Flora and Vegetation environmental factor.

Flora and Vegetation is a key environmental factor for this proposal because baseline surveys have identified 14 Priority Flora species in the area and, prior to a recent fire, the condition of the vegetation usually lies somewhere between Good and Pristine.

Potential direct impacts to flora and vegetation include:

- Clearing/ground disturbance - the MRUP Proposal involves the clearing of up to 3,800ha of native vegetation (a large proportion of which has recently burnt - 74% of the Development Envelope) for the establishment of mine and associated infrastructure. This will directly impact on vegetation, cause the loss of conservation significant flora species and impact on fauna habitat within the MRUP area.

Potential indirect impacts on flora and vegetation include:

- Generation of dust from mining activities and transport (vehicles).
- Use of saline water for dust suppression on transport routes.
- Alteration of fire regime.
- Radiation exposure (through dust).
- Introduction and spread of invasive weed species.

No vegetation will be affected by water extraction or reinjection as the underlying aquifer is not connected to surface ecosystems and there are no terrestrial groundwater dependent ecosystems (GDEs).

## 2.3 Rationale and approach in meeting the environmental objective

Results of baseline surveys and a number of assumptions and uncertainties inform the management approach for meeting the EPA's environmental objective for Flora and Vegetation. The identified management actions, management targets and proposed review and revision processes are aligned with the overall management approach.

### 2.3.1 Results of baseline surveys conducted

The MRUP area falls within the Shield subregion (GVD1) of the Great Victoria Desert bioregion. The MRUP area corresponds to 'Pre-European Vegetation Association 84', within the GVD1 Shield IBRA subregion.

Flora and vegetation surveys undertaken are summarised in Table 2.1.

**Table 2.1: Flora and vegetation surveys and investigations**

| Fieldwork Timing | Author | Title and Scope of Survey | |
|---|---|---|---|
| 20-24 Aug 2007 | Mattiske Consulting Pty Ltd (MCPL) | Reconnaissance | Level 1 |
| 18-24 Feb 2008 | MCPL | Mapping | Level 1 |
| 8-12 Dec 2008 | MCPL | Mapping and Targeted Surveys | Level 2 |
| 17-23 Aug 2009 | MCPL | Mapping and Targeted Surveys | Level 2 |
| 14-18 Sept 2009 | MCPL | Mapping and Targeted Surveys | Level 2 |
| 9-13 Nov 2009 | MCPL | Targeted Survey | Level 2 |
| 18-23 March 2010 | MCPL | Mapping and Targeted Surveys | Level 2 |
| 22-28 May 2010 | MCPL | Mapping and Update on Survey Work Completed | Level 2 |
| 15-23 July 2010 | MCPL | Mapping and Update on Survey Work Completed | Level 2 |
| 2-5 Nov 2010 | MCPL | Mapping and Update on Survey Work Completed | Level 2 |
| 2013 | MCPL | Update on Survey Work Completed | Level 2 |
| 7-14 April 2014 | MCPL | Mapping | Level 2 |
| 8-15 Aug 2014 | MCPL | Targeted Survey | Level 2 |
| 2 – 9 Sept 2015 | MCPL | Mapping update | Level 2 |

The MRUP area is located in a region where the condition of the vegetation usually lies somewhere between Good and Pristine depending mainly on the fire history. Recent fire activity (November 2014) burnt 78% of the Project Disturbance Footprint and 74% of the Project Development Envelope reducing the vegetation condition temporarily to Degraded (MCPL 2015). Fire activity may be a significant threat to conservation significant flora; however, it is also acknowledged that fire may be an important aspect for the germination, establishment and successive of the native vegetation in the MRUP region.

### Flora

A total of 239 permanent monitoring plots were set up across the MRUP area with an additional 587 relevé mapping sites. A total of 326 vascular plant taxa, representative of 140 genera and 43 families, have been recorded during surveys at the Project area. The majority of taxa recorded were representative of the *Fabaceae* (52 taxa), *Myrtaceae* (40 taxa), *Goodeniaceae* (25 taxa) and *Proteaceae* (23 taxa) families, with no introduced species recorded. Fourteen Priority Flora species were recorded:

- *Hibbertia crispula* (Priority 1 and Vulnerable).
- *Dampiera eriantha* (Priority 1).
- *Neurachne lanigera* (Priority 1).
- *Isotropis canescens* (Priority 2).
- *Malleostemon* sp. Officer Basin (D. Pearson 350) (Priority 2).
- *Styphelia* sp. Great Victoria Desert (N. Murdock 44) (Priority 2).
- *Baeckea* ?sp. Sandstone (C.A. Gardner s.n. 26 Oct. 1963) (Priority 3).
- *Labichea eremaea* (Priority 3).
- *Ptilotus blackii* (Priority 3).
- *Comesperma viscidulum* (Priority 4).
- *Conospermum toddii* (Priority 4).
- *Dicrastylis cundeeleensis* (Priority 4).
- *Grevillea secunda* (Priority 4).
- *Olearia arida* (Priority 4).

### Vegetation

A total of 26 vegetation communities have been defined within the MRUP area. Of these 26 communities, there are 14 'Eucalypt woodland communities' (E1-E14), one 'Acacia woodland community' (A1), 10 'Shrubland communities' (S1-S10) and one 'Chenopod shrubland community' (C1) (MCPL 2015). The Eucalypt woodland community represents the most dominant vegetation system in the MRUP representing 75% of the total mapped vegetation.

No Threatened Ecological Communities (TECs) as defined by the EPBC Act are known to occur within or in close proximity to the MRUP area.

One Priority Ecological Community (PEC – Priority 3(ii)) known as the 'Yellow sand plain communities of the Great Victoria Desert', located in the Goldfields region is recognised by DPaW to exist in the region due to very diverse mammalian and reptile fauna and distinctive plant communities. Whilst this PEC is not clearly identified or defined, it is similar to vegetation community S6 (MCPL 2015).

### 2.3.2 Key assumptions and uncertainties

It is assumed that the desktop investigations and surveys undertaken for MRUP have sufficiently identified the species and map the vegetation within and surrounding the Project area. However, due to natural disturbances such as fire, it is possible that species may not have been recorded during the survey effort.

### 2.3.3 Management approach

An adaptive risk based approach to management has been adopted by Vimy for the MRUP. This has been informed by a range of specialist scientific studies for the MRUP and regional area, as well as database searches and other regional project information.

This information has allowed Vimy to prioritise and manage significant risks using the mitigation hierarchy (i.e. avoid, minimise, manage, rehabilitate and offset) and develop an adaptive management system. Adaptive management allows for adaptations due to changing project conditions and the dynamic nature of ecosystems in order to achieve the MRUP environmental objectives.

This management approach is consistent for all the environmental factors for the Project.

### 2.3.4 Rationale for choice of management target/s

Vimy has chosen management based targets. These have been chosen to prioritise significant risks identified for the project and are based on:

- Baseline information and available data for the site and local region.
- The relationship between relevant proposal aspects and impacts on the environmental factor at the MRUP.
- Scientific credibility.
- Consistent with monitoring programs already underway on the site, in the region and industry standards.

Management targets will be reviewed annually to ensure they remain relevant and reflect Vimy and the EPA's environmental objective. Any changes to management targets reported as part of the Annual Environmental Report (AER).

# 3. MP provisions

This section of the MP identifies the legal provisions that Vimy proposes to implement to ensure that the impact upon the flora and vegetation resulting from the development of the MRUP is minimised in terms of both its extent and duration. It identifies the management target/s that Vimy will use to measure performance and monitoring that will be undertaken in relation to the management target/s. Finally, it identifies how Vimy will review and revise management actions if the management targets are exceeded.

## 3.1 Environmental objective for MRUP

The overall objective of this Management Plan is to ensure that the impact upon the flora and vegetation resulting from the development of the MRUP is minimised in terms of both its extent and duration.

## 3.2 Management actions to be implemented

MRUP activities/aspects which have the potential to cause environmental impacts to flora and vegetation have been evaluated through a risk analysis. No risks were identified that required potential 'very high' or 'high' risks or impacts requiring specific management. Despite this, in the interest of continual improvement, Vimy will implement the risk-based management actions presented in Table 3.1.

**Table 3.1: Risk-based management actions that will be implemented to meet the environmental objective**

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| **Ground Disturbance** | | | | |
| Unauthorised clearing leading to the loss and degradation of important flora and vegetation | Disturbance to native vegetation will be minimised through the use of the Ground Disturbance Activity Permit (GDAP) system | Ground Disturbance Management Plan (MRUP-EMP-019)<br>Ground Disturbance Activity Permit (GDAP) (MRUP-POL-001) | Low | Construction, Operations and Closure |
| | GDAP must be completed by relevant personnel and authorised by the Environmental Superintendent prior to any ground disturbance activities | Ground Disturbance Management Plan (MRUP-EMP-019)<br>Ground Disturbance Activity Permit (GDAP) (MRUP-POL-001) | Low | Construction, Operations and Closure |
| | Driving off tracks will not be permitted without prior authorisation<br>Access to areas of native vegetation will be restricted to minimise the risk of unauthorised disturbance | Ground Disturbance Management Plan (MRUP-EMP-019)<br>Ground Disturbance Activity Permit (GDAP) (MRUP-POL-001) | Low | Construction, Operations and Closure |
| | Disturbed areas no longer required for operations are to be rehabilitated as soon as is practicable | Rehabilitation and Revegetation Management Plan (MRUP-EMP-030)<br>Conceptual Mine Closure Plan (MRUP-EMP-031) | Low | Construction, Operations and Closure |
| | If populations of conservation significant species are found during the GDAP survey process, protocols set out within the relevant procedures will be followed prior to any ground disturbance activities | Ground Disturbance Management Plan (MRUP-EMP-019)<br>Ground Disturbance Activity Permit (GDAP) (MRUP-POL-001)Conservation Significant Flora and Vegetation Management Plan (MRUP-EMP-002) | Low | Design, Construction, Operations and Closure |
| | A central GIS database containing the spatial location of soil associations, vegetation communities, individual conservation significant flora and any other environmentally significant locations will be kept and referred to throughout the GDAP process | Conservation Significant Flora and Vegetation Management Plan (MRUP-EMP-002)<br>Conservation Significant Fauna Management Plan (MRUP-EMP-005) | Low | Design, Construction, Operations and Closure |

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| | | Heritage Management Plan (MRUP-EMP-034)<br>Ground Disturbance Management Plan (MRUP-EMP-019)<br>Ground Disturbance Activity Permit (GDAP) (MRUP-POL-001)Document and Data Control Management Plan (MRUP-EMP-038) | | |
| **Dust** | | | | |
| Earthworks, operations and vehicle movements generate dust that affect the health of vegetation | Control ambient dust impacts to flora and vegetation from Project activities through implementation of the Dust Management Plan (MRUP-EMP-024) | Dust Management Plan (MRUP-EMP-024) | Low | Construction, Operations and Closure |
| | Drainage from areas treated with saline or brackish water for dust suppression is contained.<br>Water truck operators will be made aware of impacts of potential overspray onto vegetated areas, particularly during windy conditions. | Dust Management Plan (MRUP-EMP-024)<br>Operational Environmental Management Plan (MRUP-EMP-020) | Low | Construction, Operations and Closure |
| **Fire** | | | | |
| Altered fire regimes impact reproduction or regeneration of vegetation communities | Ensure all clearance activity is conducted in accordance with the Fire Management Plan | Fire Management Plan (MRUP-EMP-025) | Low | Construction, Operations and Closure |
| **Weeds** | | | | |
| Increased disturbance increases weed competition | Ensure implementation of site wide vehicle hygiene strategy outlined within the Weed Management Plan (MRUP-EMP-003) | Weed Management Plan (MRUP-EMP-003) | Low | Construction, Operations and Closure |
| | Any occurrence of weeds found during flora monitoring will be included within the central database and incorporated into the GDAP system to prevent | Weed Management Plan (MRUP-EMP-003)<br>Document and Data Control | Low | Construction, Operations and Closure |

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| | potential spreading of invasive species<br><br>Weeds will be eradicated following protocols within the Weed Management Plan (MRUP-EMP-003) | Management Plan (MRUP-EMP-038)<br>Ground Disturbance Management Plan (MRUP-EMP-019)<br>Ground Disturbance Activity Permit (GDAP) (MRUP-POL-001) | | |
| **Monitoring** | | | | |
| Changes to flora and vegetation are not captured over time. | Selected vegetation monitoring plots and sampling sites established prior to construction will continue to be monitored as baseline reference sites. Methodologies implemented in the various baseline studies will be maintained during the monitoring phase. | Weed Management Plan (MRUP-EMP-003)<br>Dust Management Plan (MRUP-EMP-024)<br>Radiation Management Plan (MRUP-EMP-028)<br>Conservation Significant Flora and Vegetation Management Plan (MRUP-EMP-002)<br>Environmental Monitoring Management Plan (MRUP-EMP-032)<br>Conceptual Mine Closure Plan (MRUP-EMP-031) | Low | Construction, Operations and Closure |

## 3.3 Management target

Management targets will be employed to measure and report against achievement of MRUP's environmental objective. The results of the flora and vegetation baseline studies suggest that the management targets listed in Table 3.2 will achieve Vimy's environmental objective.

**Table 3.2: Management target/s to measure the efficacy of management actions relative to the environmental objective**

| | |
|---|---|
| Proposed environmental objective | Ensure that the impact upon the flora and vegetation resulting from the development of the MRUP is minimised in terms of both its extent and duration. |
| Management target 1 | Minimise disturbance activities where practicable |
| Management target 2 | Implement a Ground Disturbance Activity Permit (GDAP) to manage all vegetation disturbance |
| Management target 3 | Avoid clearing Priority Flora populations where practicable |
| Management target 4 | Maintain overall health of flora and vegetation by minimising indirect impacts such as dust |
| Management target 5 | Avoid or minimise the introduction and spread of weed species |
| Management target 6 | Progressively rehabilitate disturbed areas, where practicable |
| Management target 7 | Awareness of environmental outcomes by all MRUP personnel and contractors |

## 3.4 Monitoring

The purpose of monitoring is to inform, through the management target/s, if the environmental objective (Section 3.1) is being achieved and when management actions will have to be reviewed and revised. This section describes how Vimy will undertake monitoring to determine whether the management targets are achieved.

Proposed monitoring methods, locations, parameters and frequencies are outlined in Table 3.3 below. Exact monitoring locations will be finalised as part of the operational MPs and the development of the Environmental Monitoring Management Plan (MRUP-EMP-032). Where practicable, monitoring points will be located to correlate with previous baseline surveys.

**Table 3.3: Monitoring to measure the efficacy of management actions against the management targets**

| Indicator | Method | Location | Parameters | Frequency |
|---|---|---|---|---|
| **Management target 1**: Minimise disturbance activities where practicable | | | | |
| Disturbance areas within the Development Envelope are equal to or less than those scheduled | Reconcile (audit) GDAP system (authorised clearing v's actual clearing) | Project area | Vegetation area cleared, ground disturbed | On completion of clearance activity |
| **Management target 2**: Implement a Ground Disturbance Activity Permit (GDAP) to manage all vegetation disturbance | | | | |
| No disturbance prior to a GDAP being issued or disturbance to areas not covered by the GDAP | Ground Disturbance Activity Permit application prepared and approved. | Project area | Clearing of vegetation | Prior to clearance activities |
| **Management target 3**: Avoid clearing Priority Flora populations where practicable | | | | |
| All proposed disturbance areas assessed for Priority Flora species prior to clearance activities | Visual inspection/audit as per GDAP process | Project area | Presence of Priority Flora species | Prior to clearance activities |
| Consideration given to adjustment of disturbance areas to avoid Priority Flora as provided within Conservation Significant Flora and Vegetation MP (MRUP-EMP-002) | Visual inspection/audit as per GDAP process | Project area | Presence of Priority Flora species | Prior to clearance activities |
| **Management target 4**: Maintain overall health of flora and vegetation by minimising indirect impacts such as dust | | | | |
| Flora and vegetation monitoring indicates minimal decline in health of flora and vegetation due to impacts from Project activities | Health assessment and photo monitoring within selected monitoring plots | Adjacent to operational areas, and transport corridors | Health of vegetation | Annually |
| | Visual assessment, or equivalent, from appropriately trained MRUP personnel | Perimeter of clearance boundaries | Health of vegetation | Annually |

| Indicator | Method | Location | Parameters | Frequency |
|---|---|---|---|---|
| **Management target 5:** Avoid or minimise the introduction and spread of weed species | | | | |
| No increase in the occurrence of weeds within the Project area | Species identification, photo monitoring, diversity, foliage cover and density within selected monitoring plots and other sampling sites | Adjacent to operational areas, and transport corridors | Presence of weed species | Annually |
| | Visual assessment, or equivalent, from appropriately trained MRUP personnel | Perimeter of clearance boundaries | Presence of weed species | Annually |
| Weed Management Plan (MRUP-EMP-003) effectively implemented | Audit by Environmental staff | Project area | Implementation of Weed Management Plan (MRUP-EMP-003) prior to clearance activities commencing. | Prior to clearance activities commencing |
| **Management target 6:** Progressively rehabilitate disturbed areas, where practicable | | | | |
| Rehabilitation of disturbed areas occurs as soon as is practicable | Audit by Environmental staff | Project area | Implementation of the Soil Management Plan (MRUP-EMP-008), Overburden Landform Management Plan (MRUP-EMP-015) and Rehabilitation and Revegetation Management Plan (MRUP-EMP-030) | Operations and closure |
| **Management target 7:** Awareness of environmental outcomes by all MRUP personnel and contractors | | | | |
| Documented induction materials and management procedures | Audit by Environmental Staff | Project area | Environmental Induction and Training Management Plan (MRUP-EMP-039) | Annually |

## 3.5 Review and revision of management actions

In the event that a management target is not met or is exceeded, Vimy will implement the following adaptive management procedure:

- Investigate the potential cause of failing to meet the management target and identify any impacts to flora or vegetation resulting from this failing.
- If the causes of failing to meet the management target or any impacts identified are a result of the MRUP, the risk assessment will be reviewed and revised risk based management actions will be implemented so that the MRUP environmental objective is met.

Performance meeting management targets will be reported as part of the Annual Environmental Report (AER).

### 3.5.1 Corrective Actions

If monitoring actions outlined in Section 3.4 indicate that the indicators and management targets are not being met then the associated corrective actions outlined below will be implemented.

**Table 3.4: Flora and Vegetation Corrective Actions**

| Performance Indicator | Action | Responsibility |
|---|---|---|
| Disturbance of native vegetation outside approved clearance area | • Immediately stop ground disturbance activity.<br>• Conduct investigation to determine specific cause of the over clearance.<br>• Review GDAP process and develop additional management measures if required.<br>• Rehabilitate as soon as practicable. | Mine Manager and Environmental Manager |
| Decline in health of native vegetation observed | • Conduct investigation to determine specific cause of the impact.<br>• Implement appropriate control measures to reduce or rectify impact. | Environmental Manager |
| Identification of invasive weed species | • Conduct investigation to determine source of weed species.<br>• Implement appropriate control measures.<br>• Review and, if necessary, update Weed MP and hygiene measures. | Environmental Manager |
| Decline in health or species diversity at baseline monitoring locations within or outside of Project area | • Conduct investigation to determine specific cause of the impact.<br>• If impact is determined to be caused by Project activity, implement appropriate control measures to minimise impact.<br>• Ameliorate impact if appropriate. | Environmental Manager |

## 3.6 Reporting provisions

### 3.6.1 Annual reporting

Performance in protecting flora and vegetation will be assessed against management targets outlined in Table 3.2 and reported as part of the AER. In the event that the MRUP environmental objective is not achieved during the reporting period, the AER will include a description of the effectiveness of revised and/or additional management actions implemented and an analysis of trends.

The first AER will be submitted in accordance with the timeline outlined in the Condition Statement following the acceptance of the PER by the EPA.

### 3.6.2 Reporting on exceedance of the management target

In the event of a failure of a management target outlined in Table 3.2 resulting in a significant environmental impact, Vimy will verbally notify the CEO of the OEPA within 48 hours of learning of the exceedance. A written report detailing the exceedance and the outcome of the investigation will be provided to the CEO of the OEPA within seven days. Exceedances of management targets not deemed significant will be reported in the AER.

A significant impact is defined as an unplanned, long term or irreversible impact to flora, vegetation or fauna of conservation significance within the MRUP Development Envelope as a result of MRUP activities.

The MP reporting template is presented in Table 3.5.

**Table 3.5: Management Plan reporting table**

| Key environmental factor: Flora and Vegetation | | |
|---|---|---|
| Environmental objective and management target set in the MP | Reporting on the management objective and management target for [Month 20xx] to [Month 20yy] | Status[1] |
| Environmental objective: Ensure that the impact upon the flora and vegetation resulting from the development of the MRUP is minimised in terms of both its extent and duration. | Impacts to the flora and vegetation resulting from the development of the MRUP *[were / were not]* minimised in terms of both its extent and duration. | ■ YES or<br>● NO |
| Management target 1: Minimise disturbance activities where practicable. | Management target 1: Disturbance activities *[were / were not]* minimised where practicable. | ■ YES or<br>● NO |
| Management target 2: Implement a Ground Disturbance Activity Permit (GDAP) to manage all vegetation disturbance. | Management target 2: Ground Disturbance Activity Permits (GDAP) *[were / were not]* implemented to manage all vegetation disturbance. | ■ YES or<br>● NO |
| Management target 3: Avoid clearing Priority Flora populations where practicable. | Management target 3: Clearing of Priority Flora populations *[was / was not]* avoided where practicable. | ■ YES or<br>● NO |
| Management target 4: Maintain overall health of flora and vegetation by minimising indirect impacts such as dust. | Management target 4: Overall health of flora and vegetation *[was / was not]* maintained by minimising indirect impacts such as dust. | ■ YES or<br>● NO |
| Management target 5: Avoid or minimise the introduction and spread of weed species. | Management target 5: The introduction and spread of weed species *[was / was not]* avoided or minimised. | ■ YES or<br>● NO |
| Management target 6: Progressively rehabilitate disturbed areas, where practicable. | Management target 6: Disturbed areas *[were / were not]* progressively rehabilitated, where practicable. | ■ YES or<br>● NO |
| Management target 7: Awareness of environmental outcomes by all MRUP personnel and contractors. | Management target 7: All MRUP personnel and contractors *[are / are not]* aware of environmental outcomes. | ■ YES or<br>● NO |
| Notes:<br>1. The status of achievement of the environmental objectives is indicated by the following symbols:<br>■ Environmental objective achieved<br>● Environmental objective not achieved | | |

# 4. Adaptive management and review of the MP

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

- Monitoring data will be systematically evaluated and compared to baseline and reference site data in accordance with Table 3.3 in a process of adaptive management to verify whether responses to the impact are the same or similar to predictions.
- Re-evaluate the risk assessment and revision of risk-based priorities on the basis of monitored information.
- Increased understanding of the local and regional ecological regime.
- Revision when management actions are not as effective as predicted.
- 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.).
- Review of MP – changes to MP provisions required by a condition, timeframe, etc.

# 5. Stakeholder consultation

Consultation regarding conservation significant flora and vegetation has been undertaken with Department of Environment and Regulation (DER) and Department of Parks and Wildlife (DPAW) during the preparation of the Environmental Scoping Document (ESD).

# 6. References

The following references were used in developing this MP.

EPA (2000) *Position Statement 2: Environmental Protection of Native Vegetation in Western Australia*. Environmental Protection Authority, Perth, Western Australia.

EPA (2004) *Guidance for the Assessment of Environmental Factors – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia, No. 51.* Environmental Protection Authority, Perth, Western Australia.

EPA (2006) *Guideline for the Assessment of Environmental Factors – Rehabilitation of Terrestrial Ecosystems, No. 6.* Environmental Protection Authority, Perth, Western Australia.

EPA (2015a) *Environmental Assessment Guideline for Environmental principles, factors and objectives, EAG 8*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015b) *Environmental Assessment Guideline for Preparation of management plans under Part IV of the Environmental Protection Act 1986, EAG 17*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015c) *Title of Condition Environmental Management Plan, Environmental management-based condition model template*. Environmental Protection Authority, Perth, Western Australia.

MCPL (2015) *Assessment of Flora and Vegetation Surveys conducted for the Mulga Rock Uranium Project, Great Victoria Desert, WA*. Unpublished report by Mattiske Consulting Pty Ltd for Vimy Resources, October, 2015.

# Mulga Rock Uranium Project

# Conservation Significant Flora and Vegetation Management Plan

**MRUP-EMP-002**

November 2015


**Vimy Resources Limited**

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| 0 | BJL | EWC | JT | 06.11.2015 | |
| | | | | | |

## Prepared for Vimy Resources Limited by Golder Associates Pty Ltd

# Table of Contents



# List of Tables

# 1. Summary

The table below presents the environmental management target/s to measure achievement of the environmental objective that must be met through implementation of this Management Plan (MP).

| Title of proposal | Mulga Rock Uranium Project |
|---|---|
| Proponent | Vimy Resources Limited |
| Environmental Scoping Document | Assessment Number 1979 |
| Purpose of this MP | The Conservation Significant Flora and Vegetation Management Plan is submitted to outline MRUP's proposed procedures and practices to be implemented to meet the EPA's environmental objective for the key environmental factor/s. |
| EPA's environmental objective for the key environmental factor/s | Flora and Vegetation: To maintain representation, diversity, viability and ecological function at the species, population and community level. |
| Vimy's Environmental objective | Prevent or mitigate potential impacts from MRUP activities on conservation significant flora and vegetation which occur in the MRUP area. |
| Management target/s | • Management target 1: Avoid clearing Priority Flora populations where practicable. |

**Corporate endorsement**

I hereby certify that to the best of my knowledge, the MP provisions within this Conservation Significant Flora and Vegetation Management Plan are true and correct.

[Signature of duly authorised proponent representative]

Name: Signed:

Designation: Date:

# 2. Context, scope and rationale

## 2.1 What is the proposal?

Vimy Resources Limited (Vimy) proposes to develop the Mulga Rock Uranium Project (MRUP or the Project) which lies approximately 240km east-north-east of Kalgoorlie-Boulder in the Shire of Menzies. The area is remote, located on the western flank of the Great Victoria Desert, comprising series of large, generally parallel sand dunes, with inter-dunal swales and broad flat plains.

The MRUP covers approximately 102,000 hectares on granted mining tenure (primarily M39/1080 and M39/1081) within Unallocated Crown Land (UCL). It includes two distinct mining centres, Mulga Rock East (MRE) comprising the Princess and Ambassador resources and Mulga Rock West (MRW) comprising the Emperor and Shogun resources, which are approximately 20km apart. Up to 4.5 Million tonnes per annum (Mtpa) of ore will be mined using traditional open cut techniques, crushed, beneficiated and then processed onsite to produce, on average, 1,360 tonnes of uranium oxide concentrate (UOC) per year over the life of the Project. Base metal concentrates will also be extracted using sulphide precipitation after the uranium has been removed and sold separately.

The anticipated Life-of-Mine (LOM) is up to 16 years, based on the currently identified resource.

This MP has been based on *Environmental Assessment Guideline 17* (EPA 2015b) and the EPA's *environmental management-based condition model template* (EPA 2015c).

## 2.2 What key environmental factor/s does this MP address?

This MP specifically addresses the Flora and Vegetation environmental factor.

Flora and Vegetation is a key environmental factor for this proposal because a species listed as vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* and a number of Priority species listed by the Department of Parks and Wildlife have the potential to occur in the MRUP area.

Potential direct impacts to flora and vegetation include:

- Clearing/ground disturbance - the MRUP Proposal involves the clearing of up to 3,800ha of native vegetation (a large proportion of which has recently burnt - 74% of the Development Envelope) for the establishment of mine and associated infrastructure. This has the potential to directly impact on vegetation by causing the loss of conservation significant flora species within the MRUP area.

Potential indirect impacts on flora and vegetation include:

- Dust deposition from mining activities and transport (vehicles) which may cause a decline in health of the conservation significant flora.
- Over spray or runoff from saline water used for dust suppression on transport routes which may cause a decline in health or death of conservation significant flora.
- Alteration of fire regime, which may decrease the representation of conservation significant flora in the region.
- Radiation exposure (through dust) which may cause a decline in health or death of conservation significant flora.
- Introduction and spread of invasive weed species which may out compete conservation significant flora present in the area.
- Increase in the native feral animals in the area which may decrease the health of the conservation significant flora by grazing, or ground compaction.

No vegetation will be affected by water extraction or reinjection as the underlying aquifer is not connected to surface ecosystems and there are no terrestrial groundwater dependent ecosystems (GDEs).

## 2.3 Rationale and approach in meeting the environmental objective

Results of baseline surveys and a number of assumptions and uncertainties inform the management approach for meeting the MRUP environmental objective. The identified management actions, management targets and proposed review and revision of management actions are aligned with the overall management approach.

### 2.3.1 Results of baseline surveys conducted

The MRUP area falls within the Shield subregion (GVD1) of the Great Victoria Desert bioregion. The MRUP area corresponds to 'Pre-European Vegetation Association 84', within the GVD1 Shield IBRA subregion.

Flora and vegetation surveys undertaken are summarised in Table 2.1.

**Table 2.1: Flora and vegetation surveys and investigations**

| Fieldwork Timing | Author | Title and Scope of Survey | |
|---|---|---|---|
| 20-24 Aug 2007 | Mattiske Consulting Pty Ltd (MCPL) | Reconnaissance | Level 1 |
| 18-24 Feb 2008 | MCPL | Mapping | Level 1 |
| 8-12 Dec 2008 | MCPL | Mapping and Targeted Surveys | Level 2 |
| 17-23 Aug 2009 | MCPL | Mapping and Targeted Surveys | Level 2 |
| 14-18 Sept 2009 | MCPL | Mapping and Targeted Surveys | Level 2 |
| 9-13 Nov 2009 | MCPL | Targeted Survey | Level 2 |
| 18-23 March 2010 | MCPL | Mapping and Targeted Surveys | Level 2 |
| 22-28 May 2010 | MCPL | Mapping and Update on Survey Work Completed | Level 2 |
| 15-23 July 2010 | MCPL | Mapping and Update on Survey Work Completed | Level 2 |
| 2-5 Nov 2010 | MCPL | Mapping and Update on Survey Work Completed | Level 2 |
| 2013 | MCPL | Update on Survey Work Completed | Level 2 |
| 7-14 April 2014 | MCPL | Mapping | Level 2 |
| 8-15 Aug 2014 | MCPL | Targeted Survey | Level 2 |
| 2 – 9 Sept 2015 | MCPL | Mapping update | Level 2 |

The MRUP area is located in a region where the condition of the vegetation usually lies somewhere between Good and Pristine depending mainly on the fire history. Recent fire activity (November 2014) burnt 78% of the Project Disturbance Footprint and 74% of the Project Development Envelope reducing the vegetation condition temporarily to Degraded (MCPL 2015). Fire activity may be a significant threat to conservation significant flora; however, it is also acknowledged that fire may be an important aspect for the germination, establishment and successive of the native vegetation in the MRUP region.

### Flora

A total of 239 permanent monitoring plots were set up across the MRUP area with an additional 587 relevé mapping sites. Fourteen Priority Flora species were recorded:

- *Hibbertia crispula* (Priority 1 and Vulnerable),
- *Dampiera eriantha* (Priority 1),
- *Neurachne lanigera* (Priority 1),
- *Isotropis canescens* (Priority 2),
- *Malleostemon* sp. Officer Basin (D. Pearson 350) (Priority 2),
- *Styphelia* sp. Great Victoria Desert (N. Murdock 44) (Priority 2),
- *Baeckea* ?sp. Sandstone (C.A. Gardner s.n. 26 Oct. 1963) (Priority 3),
- *Labichea eremaea* (Priority 3),
- *Ptilotus blackii* (Priority 3),
- *Comesperma viscidulum* (Priority 4),
- *Conospermum toddii* (Priority 4),
- *Dicrastylis cundeeleensis* (Priority 4),
- *Grevillea secunda* (Priority 4) and
- *Olearia arida* (Priority 4).

### Vegetation

No Threatened Ecological Communities (TECs) as defined by the EPBC Act are known to occur within or in close proximity to the MRUP area.

One Priority Ecological Community (PEC – Priority 3(ii)) known as the 'Yellow sand plain communities of the Great Victoria Desert', located in the Goldfields region is recognised by DPaW to exist in the region due to very diverse mammalian and reptile fauna and distinctive plant communities. Whilst this PEC is not clearly identified or defined, it has affinities to the MCPL mapped S6 vegetation community (MCPL 2015).

## 2.3.2 Key assumptions and uncertainties

It is assumed that the desktop investigations and surveys undertaken for MRUP have sufficiently identified the species and map the vegetation within and surrounding the Project area. However, due to natural disturbances such as fire, it is possible that species may not have been recorded during the survey effort.

## 2.3.3 Management approach

An adaptive risk based approach to management has been adopted by Vimy for the MRUP. This has been informed by a range of specialist scientific studies for the MRUP and regional area, as well as database searches and other regional project information.

This information has allowed Vimy to prioritise and manage significant risks using the mitigation hierarchy (i.e. avoid, minimise, manage, rehabilitate and offset) and develop an adaptive management system. Adaptive management allows for adaptations due to changing project conditions and the dynamic nature of ecosystems in order to achieve the MRUP environmental objectives.

This management approach is consistent for all the environmental factors for the Project.

### 2.3.4 Rationale for choice of management target/s

Vimy has chosen management based targets. These have been chosen to prioritise significant risks identified for the project and are based on:

- Baseline information and available data for the site and local region.
- The relationship between relevant proposal aspects and impacts on the environmental factor at the MRUP.
- Scientific credibility.
- Consistent with monitoring programs already underway on the site, in the region and industry standards.

Management targets will be reviewed annually to ensure they remain relevant and reflect Vimy and the EPA's environmental objective. Any changes to management targets will be reported as part of the Annual Environmental Report (AER).

# 3. MP provisions

This section of the MP identifies the legal provisions that Vimy proposes to implement to prevent or mitigate potential impacts from MRUP activities on conservation significant flora and vegetation which occur in the MRUP area. It identifies the management target/s that Vimy will use to measure performance and monitoring that will be undertaken in relation to the management target/s. Finally, it identifies how Vimy will review and revise management actions if the management targets are exceeded.

## 3.1 Environmental objective

Prevent or mitigate potential impacts from MRUP activities on conservation significant flora and vegetation which occur in the MRUP area.

## 3.2 Management actions to be implemented

MRUP activities/aspects which have the potential to cause environmental impacts to flora and vegetation have been evaluated through a risk analysis. No risks were identified that required potential 'very high' or 'high' risks or impacts requiring specific management. Despite this, in the interest of continual improvement, Vimy will implement the risk-based management actions presented in Table 3.1.

**Table 3.1: Risk-based management actions that will be implemented to meet the environmental objective**

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| Clearing and ground disturbance | A Ground Disturbance Activity Permit (GDAP)must be completed by relevant personnel and authorised by the Environmental Supervisor prior to any ground disturbance activities. | Ground Disturbance Management Plan (MRUP-EMP-019)<br>Ground Disturbance Activity Permit (GDAP) (MRUP-POL-001)Environmental Monitoring Management Plan (MRUP-EMP-032) | Low | Prior to any clearance |
| | A central database containing the spatial location of soil associations, vegetation communities, individual conservation significant flora and any other environmentally significant locations will be kept and referred to throughout the GDAP process (according to protocols established within the Document and Data Control MP: MRUP-EMP-038). | Document and Data Control Management Plan (MRUP-EMP-038)<br>Ground Disturbance Management Plan (MRUP-EMP-019)<br>Ground Disturbance Activity Permit (GDAP) (MRUP-POL-001) | Low | Prior to any clearance |
| | Driving off tracks will not be allowed without prior authorisation. Access to areas of native vegetation will be restricted to minimise the risk of unauthorised disturbance. | Ground Disturbance Management Plan (MRUP-EMP-019)<br>Ground Disturbance Activity Permit (GDAP) (MRUP-POL-001) | Low | Life of the Project |
| | Should populations of conservation significant flora species be found during the GDAP process, each population will be demarcated and recorded within the central database and consideration will be given to avoiding direct and indirect impacts. | Document and Data Control Management Plan (MRUP-EMP-038)<br>Ground Disturbance Management Plan (MRUP-EMP-019)<br>Ground Disturbance Activity Permit (GDAP) (MRUP-POL-001) | Low | Life of the Project |
| | Prior to the direct disturbance of any identified Priority Flora species, consultation will be sought with DPaW and other key stakeholders. | Conservation Significant Flora and Vegetation Management Plan (MRUP-EMP-002) | Low | Life of the Project |
| | Avoidance of Vegetation Community type S6 where practicable. | Ground Disturbance Management Plan (MRUP-EMP-019) | Low | Life of the Project |
| Offsite impacts | Where communities that support Priority Flora species are located in close proximity to impact sources (such as dust), potential impacts will be monitored. | Environmental Monitoring Management Plan (MRUP-EMP-032) | Low | Life of the Project |

## 3.3 Management target

Management targets will be employed to measure and report against achievement of MRUP's environmental objective. The results of the flora and vegetation baseline studies suggest that the management target listed in Table 3.2 will achieve Vimy's environmental objective.

**Table 3.2: Management target/s to measure the efficacy of management actions relative to the environmental objective**

| | |
|---|---|
| Proposed environmental objective | Prevent or mitigate potential impacts from MRUP activities on conservation significant flora and vegetation which occur in the MRUP area. |
| Management target 1 | Avoid clearing Priority Flora populations where practicable. |

## 3.4 Monitoring

The purpose of monitoring is to inform, through the management target/s, if the environmental objective (Section 3.1) is being achieved and when management actions will have to be reviewed and revised. This section describes how Vimy will undertake monitoring to determine whether the management targets are achieved.

Proposed monitoring methods, locations, parameters and frequencies are outlined in Table 3.3 below. Exact monitoring locations will be finalised as part of the operational MPs and the development of the Environmental Monitoring Management Plan (MRUP-EMP-032). Where practicable, monitoring points will be located to correlate with previous baseline surveys.

**Table 3.3: Monitoring to measure the efficacy of management actions against the management targets**

| Indicator | Method | Location | Parameters | Frequency |
|---|---|---|---|---|
| **Management target 1**: Avoid clearing Priority Flora populations where practicable | | | | |
| The mapped locations of all Priority Flora species will be maintained in a central database for use during the GDAP process | Geo-referenced flora surveys | Any disturbance areas within the Project area. | NA | Prior to any clearance |
| All proposed clearing areas assessed for Priority Flora prior to clearance activities | GDAP protocols will require assessment for Priority species in the proposed area of disturbance before the approval of the disturbance activity | Any disturbance areas within the Project area. | Presence of Priority Species | Prior to any clearance |
| Consideration given to adjustment of clearing areas to avoid Priority Flora | Conservation significant species will be avoided, where practicable, and managed through the GDAP protocols. | Any disturbance areas within the Project area | Project change records | Prior to any clearance |

## 3.5 Review and revision of management actions

In the event that a management target is not met or is exceeded, Vimy will implement the following procedure:

- Investigate the potential cause of failing to meet the management target and identify any impacts to conservation significant flora and vegetation.
- If the causes of failing to meet the management target or any impacts identified are a result of the MRUP, the risk assessment will be reviewed and revised risk based management actions will be implemented so that the MRUP environmental objective is met.

Performance meeting management targets will be reported as part of the Annual Environmental Report (AER).

### 3.5.1 Corrective Actions

If monitoring actions outlined in Section 3.4 indicate that the indicators and management targets are not being met then the associated corrective actions outlined below will be implemented.

**Table 3.4: Flora and Vegetation Corrective Actions**

| Performance Indicator | Action | Responsibility |
|---|---|---|
| Disturbance of Priority species prior to GDAP process and stakeholder consultation | • Immediately stop disturbance activity.<br>• Raise action as an environmental incident.<br>• Conduct investigation to determine specific cause of incident.<br>• Review GDAP process and develop additional management measures if required.<br>• Rehabilitate if required. | Mine Manager and Environmental Department |
| Impact on Priority species from indirect sources | • Conduct investigation to determine specific cause of the impact.<br>• Review relevant management plans and operational procedures.<br>• Develop corrective measures to minimise re-occurrence if necessary. | Environmental Department |

## 3.6 Reporting provisions

### 3.6.1 Annual reporting

Performance in protecting conservation significant flora and vegetation will be assessed against management targets outlined in Table 3.2 and reported as part of the AER. In the event that the MRUP environmental objective is not achieved during the reporting period, the AER will include a description of the effectiveness of revised and/or additional management actions implemented and an analysis of trends.

The first AER will be submitted in accordance with the timeline outlined in the Condition Statement following the acceptance of the PER by the EPA.

### 3.6.2 Reporting on exceedance of the management target

In the event of a failure of a management target outlined in Table 3.2 resulting in a significant environmental impact, Vimy will verbally notify the CEO of the OEPA within 48 hours of learning of the exceedance. A written report detailing the exceedance and the outcome of the investigation will be provided to the CEO of the OEPA within seven days. Exceedances of management targets not deemed significant will be reported in the AER.

A significant impact is defined as an unplanned, long term or irreversible impact to conservation significant flora and vegetation within the MRUP Development Envelope as a result of MRUP activities.

The MP reporting template is presented in Table 3.5.

**Table 3.5: Management Plan reporting table**

| Key environmental factor: Flora and Vegetation | | |
|---|---|---|
| Environmental objective and management target set in the MP | Reporting on the management objective and management target for [Month 20xx] to [Month 20yy] | Status[1] |
| Environmental objective: Prevent or mitigate potential impacts from MRUP activities on conservation significant flora and vegetation which occur in the MRUP area. | Potential impacts from MRUP activities on conservation significant flora and vegetation which occur in the MRUP area *[were / were not]* prevented or mitigated. | ■ YES or<br>● NO |
| Management target 1: Avoid clearing Priority Flora populations where practicable. | Management target 1: Clearing of Priority Flora populations *[was / was not]* avoided where practicable. | ■ YES or<br>● NO |
| Notes:<br>1. The status of achievement of the environmental objectives is indicated by the following symbols:<br>■ Environmental objective achieved<br>● Environmental objective not achieved | | |

# 4. Adaptive management and review of the MP

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

- Monitoring data will be systematically evaluated and compared to baseline and reference site data in accordance with Table 3.3 in a process of adaptive management to verify whether responses to the impact are the same or similar to predictions.
- Re-evaluate the risk assessment and revision of risk-based priorities on the basis of monitored information.
- Increased understanding of the local and regional ecological regime.
- Revision when management actions are not as effective as predicted,
- 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
- Review of MP – changes to MP provisions required by a condition, timeframe, etc.

# 5. Stakeholder consultation

Consultation regarding conservation significant flora and vegetation has been undertaken with Department of Environment and Regulation (DER) and Department of Parks and Wildlife (DPAW) during the preparation of the Environmental Scoping Document (ESD). Vimy will continue to consult with regulators as part of the ongoing review process and adaptive management strategy for this MP.

# 6. References

The following references were used in developing this MP.

EPA (2000) *Position Statement 2: Environmental Protection of Native Vegetation in Western Australia*. Environmental Protection Authority, Perth, Western Australia.

EPA (2006) *Guideline for the Assessment of Environmental Factors: Guidance Statement No. 6. Rehabilitation of Terrestrial Ecosystems.* Environmental Protection Authority, Perth, Western Australia.

EPA (2015a) *Environmental Assessment Guideline for Environmental principles, factors and objectives, EAG 8*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015b) *Environmental Assessment Guideline for Preparation of management plans under Part IV of the Environmental Protection Act 1986, EAG 17*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015c) *Title of Condition Environmental Management Plan, Environmental management-based condition model template*. Environmental Protection Authority, Perth, Western Australia.

MCPL (2015) *Assessment of Flora and Vegetation Surveys conducted for the Mulga Rock Uranium Project, Great Victoria Desert, WA*. unpublished report by Mattiske Consulting Pty Ltd for Vimy Resources, April, 2015.

# Mulga Rock Uranium Project

## Weed Management Plan

**MRUP-EMP-003**

November 2015


**Vimy Resources Limited**

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| 0 | BJL | EWC | JT | 06.11.2015 | |
| | | | | | |

## Prepared for Vimy Resources Limited by Golder Associates Pty Ltd

# Table of Contents



# List of Tables

# 1. Summary

The table below presents the environmental management target/s to measure achievement of the environmental objective that must be met through implementation of this Management Plan (MP).

| Title of proposal | Mulga Rock Uranium Project |
|---|---|
| Proponent | Vimy Resources Limited |
| Environmental Scoping Document | Assessment Number 1979 |
| Purpose of this MP | The Weed Management Plan is submitted to outline MRUP's proposed procedures and practices to be implemented to meet the EPA's environmental objective for the key environmental factor/s. |
| EPA's environmental objective for the key environmental factor/s | Flora and Vegetation: To maintain representation, diversity, viability and ecological function at the species, population and community level. |
| Vimy's environmental objective | Prevent, identify, control and limit the introduction and spread of invasive weed species across the MRUP. |
| Management target/s | • Management target 1: Prevent the introduction of weed species into the MRUP area.<br>• Management target 2: Weed hygiene practices will limit the introduction and spread of any potential weed infestations within the MRUP. |

**Corporate endorsement**

I hereby certify that to the best of my knowledge, the MP provisions within this Weed Management Plan are true and correct.

[Signature of duly authorised proponent representative]

Name: Signed:

Designation: Date:

# 2. Context, scope and rationale

## 2.1 What is the Proposal?

Vimy Resources Limited (Vimy) proposes to develop the Mulga Rock Uranium Project (MRUP or the Project) which lies approximately 240km east-north-east of Kalgoorlie-Boulder in the Shire of Menzies. The area is remote, located on the western flank of the Great Victoria Desert, comprising series of large, generally parallel sand dunes, with inter-dunal swales and broad flat plains.

The MRUP covers approximately 102,000 hectares on granted mining tenure (primarily M39/1080 and M39/1081) within Unallocated Crown Land (UCL). It includes two distinct mining centres, Mulga Rock East (MRE) comprising the Princess and Ambassador resources and Mulga Rock West (MRW) comprising the Emperor and Shogun resources, which are approximately 20km apart. Up to 4.5 Million tonnes per annum (Mtpa) of ore will be mined using traditional open cut techniques, crushed, beneficiated and then processed onsite to produce, on average, 1,360 tonnes of uranium oxide concentrate (UOC) per year over the life of the Project. Base metal concentrates will also be extracted using sulphide precipitation after the uranium has been removed and sold separately.

The anticipated Life-of-Mine (LOM) is up to 16 years, based on the currently identified resource.

This MP has been based on *Environmental Assessment Guideline 17* (EPA 2015b) and the EPA's *environmental management-based condition model template* (EPA 2015c).

## 2.2 What Key Environmental Factor/s does this MP address?

This MP specifically addresses the Flora and Vegetation environmental factor.

Flora and Vegetation is a key environmental factor for this because the MRUP occurs within an area that has no recorded weeds.

The introduction of weed species and the potential spread of resulting weed infestations may lead to the following impacts:

- Decline in vegetation condition with loss of native floristic communities, associations and overall floristic diversity.
- Introduction/encouragement of disease and pests.
- Habitat and food resource reduction/loss to native fauna.

## 2.3 Rationale and approach in meeting the environmental objective

Results of baseline surveys and a number of assumptions and uncertainties inform the management approach for meeting the EPA's environmental objective for Flora and Vegetation. The identified management actions, management targets and proposed review and revision processes are aligned with the overall management approach.

### 2.3.1 Results of baseline surveys conducted

The MRUP area falls within the Shield subregion (GVD1) of the Great Victoria Desert bioregion. The MRUP area corresponds to 'Pre-European Vegetation Association 84', within the GVD1 Shield IBRA subregion.

Flora and vegetation surveys undertaken are summarised in Table 2.1.

**Table 2.1: Flora and vegetation surveys and investigations**

| Fieldwork Timing | Author | Title and Scope of Survey | |
|---|---|---|---|
| 20-24 Aug 2007 | Mattiske Consulting Pty Ltd (MCPL) | Reconnaissance | Level 1 |
| 18-24 Feb 2008 | MCPL | Mapping | Level 1 |
| 8-12 Dec 2008 | MCPL | Mapping and Targeted Surveys | Level 2 |
| 17-23 Aug 2009 | MCPL | Mapping and Targeted Surveys | Level 2 |
| 14-18 Sept 2009 | MCPL | Mapping and Targeted Surveys | Level 2 |
| 9-13 Nov 2009 | MCPL | Targeted Survey | Level 2 |
| 18-23 March 2010 | MCPL | Mapping and Targeted Surveys | Level 2 |
| 22-28 May 2010 | MCPL | Mapping and Update on Survey Work Completed | Level 2 |
| 15-23 July 2010 | MCPL | Mapping and Update on Survey Work Completed | Level 2 |
| 2-5 Nov 2010 | MCPL | Mapping and Update on Survey Work Completed | Level 2 |
| 2013 | MCPL | Update on Survey Work Completed | Level 2 |
| 7-14 April 2014 | MCPL | Mapping | Level 2 |
| 8-15 Aug 2014 | MCPL | Targeted Survey | Level 2 |
| 2 – 9 Sept 2015 | MCPL | Mapping update | Level 2 |

The surveys have not identified any introduced (weed) species or declared (plant) pests pursuant to the *Biosecurity and Agriculture Management Act 2007 (BAM Act)* at the MRUP.

### 2.3.2 Key assumptions and uncertainties

It is assumed that the desktop investigations and surveys undertaken for MRUP have sufficiently identified the species and map the vegetation within and surrounding the Project area. However, due to natural disturbances such as fire, it is possible that species may not have been recorded during the survey effort.

### 2.3.3 Management approach

An adaptive risk based approach to management has been adopted by Vimy for the MRUP. This has been informed by a range of specialist scientific studies for the MRUP and regional area, as well as database searches and other regional project information.

This information has allowed Vimy to prioritise and manage significant risks using the mitigation hierarchy (i.e. avoid, minimise, manage, rehabilitate and offset) and develop an adaptive management system. Adaptive management allows for adaptations due to changing project conditions and the dynamic nature of ecosystems in order to achieve the MRUP environmental objectives.

This management approach is consistent for all the environmental factors for the Project.

### 2.3.4 Rationale for choice of management target/s

Vimy have chosen management based targets. These have been chosen to prioritise significant risks identified for the project and are based on:

- Baseline information and available data for the site and local region.
- The relationship between relevant proposal aspects and impacts on the environmental factor at the MRUP.
- Scientific credibility.
- Consistent with monitoring programs already underway on the site, in the region and industry standards.

Management targets will be reviewed annually to ensure they remain relevant and reflect Vimy and the EPA's environmental objective. Any changes to management targets reported as part of the Annual Environmental Report (AER).

# 3. MP provisions

This section of the MP identifies the legal provisions that Vimy proposes to implement to prevent, identify, control and limit the introduction and spread of invasive weed species across the MRUP. It identifies the management target/s that Vimy will use to measure performance and monitoring that will be undertaken in relation to the management target/s. Finally, it identifies how Vimy will review and revise management actions if the management targets are exceeded.

## 3.1 Environmental objective

It is Vimy's environmental objective to prevent, identify, control and limit the introduction and spread of invasive weed species across the MRUP.

## 3.2 Management actions to be implemented

MRUP activities/aspects which have the potential to cause environmental impacts to flora and vegetation have been evaluated through a risk analysis. No risks were identified that required potential 'very high' or 'high' risks or impacts requiring specific management. Despite this, in the interest of continual improvement, Vimy will implement the risk-based management actions presented in Table 3.1.

**Table 3.1: Risk-based management actions that will be implemented to meet the environmental objective**

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| **Land Clearing Weed Management Strategies** | | | | |
| Land clearing increases the likelihood of weed proliferation | Develop and implement a Weed Management Plan that focuses on the prevention, identification and eradication of new weed infestation at the MRUP. | Weed Management Plan (MRUP-EMP-003) | Low | Construction, Operations and Closure |
| | Ground Disturbance Activity Permits (GDAPs) will incorporate weed management aspects, including determination of weed status before clearing commences at a site and implementing weed hygiene procedures during all ground disturbance operations. | Ground Disturbance MP (MRUP-EMP-019)<br>Ground Disturbance Activity Permit (GDAP) (MRUP-POL-001) | Low | Construction and Operations |
| | Avoid vegetation clearing where practicable and keep to a minimum where not practicable, as detailed in the Ground Disturbance Management Plan (MRUP-EMP-019), in order to minimise the introduction and spread of weeds. | Ground Disturbance MP (MRUP-EMP-019)<br>Ground Disturbance Activity Permit (GDAP) (MRUP-POL-001) | Low | Construction, Operations and Closure |
| | If weeds are identified, the Environmental Department will take appropriate action to eradicate the infestation and ensure that weeds are not spread to other areas of the MRUP. | Ground Disturbance MP (MRUP-EMP-019)<br>Ground Disturbance Activity Permit (GDAP) (MRUP-POL-001)Soil Management Plan (MRUP-EMP-008) | Low | Construction, Operations and Closure |
| | Avoid disturbing areas that have known weed infestations during wet conditions. | Ground Disturbance MP (MRUP-EMP-019)<br>Ground Disturbance Activity Permit (GDAP) (MRUP-POL-001) | Low | Construction, Operations and Closure |
| | Road design will incorporate established weed hygiene standards for road construction and maintenance, including:<br>• Grading of material from upslope to downslope<br>• Confinement of all soil and drainage to catchment | Road Designs – Operational Environmental Management Plan (MRUP-EMP-020) | Low | Construction, Operations and Closure |

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| | Development of a weed identification guide to be made available to all personnel that are managing ground disturbance activities. | N/A | Low | Pre-construction |
| | Where practicable, vehicles will be site dedicated. | NA | Low | Construction, Operations and Closure |
| **Operations and Closure Weed Management Strategies** | | | | |
| Increased vehicle use can introduce new weed species | Develop an ongoing weed monitoring and management programme. | Weed Management Plan (MRUP-EMP-003)<br>Environmental Monitoring Management Plan (MRUP-EMP-0332) | Low | Pre-construction |
| Construction, operations and closure activities may increase fire risks and subsequent exposed soils that can encourage weed establishment | Appropriate fire management will be implemented according to the Fire Management Plan in order to minimise introduction and spread of weeds after fire. | Fire Management Plan (MRUP-EMP-025) | Low | Construction, Operations and Closure |
| | Prepare and implement a strategy for the prevention of unplanned fires, including training appropriate staff in the use of fire extinguishers, fitting all vehicles with fire extinguishers and equipping the emergency response team to contain fires onsite. | Fire Management Plan (MRUP-EMP-025) | Low | Construction, Operations and Closure |
| | Recently burnt areas within the Development Envelope will be monitored for weeds, particularly in consideration of edge effects and the ecological opportunity for weeds to establish, and treated accordingly. | Environmental Monitoring Management Plan (MRUP-EMP-0332) | Low | Construction and Operations |
| | Implement a feral animal management procedure to monitor and manage feral herbivores around the Project that may be increasing the spread and distribution of weeds throughout the MRUP. | Feral Animal Management Plan (MRUP-EMP-006) | Low | Construction, Operations and Closure |
| | Implement a progressive rehabilitation and closure plan to ensure disturbed areas are rehabilitated as soon as practicable. | Rehabilitation and Revegetation Management Plan (MRUP-EMP-030) | Low | Construction, Operations and Closure |

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| Proliferation of weeds through onsite hygiene practices | Develop and implement a weed awareness programme for staff and contractors including potential impacts, objectives and management strategies. This programme should include inductions, ongoing training, vehicle hygiene training and site communications. | Environmental Induction and Training Management Plan (MRUP-EMP-039) | Low | Construction and Operations |
| | Ensure conditions are included in all applicable contracts to ensure contractors adhere to the requirements of this Weed Management Plan. | Contracts | Low | Construction, Operations and Closure |
| | Implement dust control measures to minimise the indirect and direct impacts to flora, which may subsequently promote weed incursion into an area. | Dust Management Plan (MRUP-EMP-024) | Low | Pre-construction, construction and operations |
| | Develop reporting procedures that enable identification of new weed infestations to be reported to site environmental staff and recorded in site systems. | Environmental Monitoring Management Plan (MRUP-EMP-032)<br>Document and Data Control Management Plan (MRUP-EMP-039) | Low | Construction and Operations |
| | Develop and implement a weed eradication procedure that outlines targets for weed eradication, and the management process to follow should they be identified in the MRUP area. i.e. identify the weed; identify the weed category (is it a declared pest? Weed of National Significance (WONS)? etc.) and determine the methodology of eradication for each different species and infestation type. | Weed Management Plan (MRUP-EMP-003) | Low | Construction and Operations |

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| **Weed Hygiene Management Strategies** | | | | |
| Proliferation of weeds through onsite hygiene practices | Develop and implement a weed hygiene procedure that outlines the methods of weed hygiene for the MRUP including hygiene certification and mine access restrictions. | Weed Management Plan (MRUP-EMP-003) | Low | Pre-construction |
| | Vehicles, plant and equipment will be inspected to ensure that all visible soil and vegetation material has been removed. Inspections will be documented. | Weed Hygiene Procedure (developed as part of the previous action)<br>Document and Data Control Management Plan (MRUP-EMP-038) | Very low | Constructiona and Operations |
| | All personnel will be restricted from driving on non-essential roads and tracks. No unnecessary tracks will be created. | Inspection / Audit | Low | Construction, Operations and Closure |
| | The haul road and access roads will be sign posted as a private road, with access limited to mine personnel, DPaW staff and other authorised visitors. Public access to the MRUP will be restricted. | Inspection / Audit | Low | Constructiona and Operations |

## 3.3 Management target

Management targets will be employed to measure and report against achievement of MRUP's environmental objective. The results of the flora and vegetation baseline studies suggest that the management targets listed in Table 3.2 will achieve Vimy's environmental objective.

**Table 3.2: Management target/s to measure the efficacy of management actions relative to the environmental objective**

| | |
|---|---|
| Proposed environmental objective | Prevent, identify, control and limit the introduction and spread of invasive weed species across the MRUP. |
| Management target 1 | Prevent the introduction of weed species into the MRUP area. |
| Management target 2 | Weed hygiene practices will limit the introduction and spread of any potential weed infestations within the MRUP. |

## 3.4 Monitoring

The purpose of monitoring is to inform, through the management target/s, if the environmental objective (Section 3.1) is being achieved and when management actions will have to be reviewed and revised. This section describes how Vimy will undertake monitoring to determine whether the management targets are achieved.

Proposed monitoring methods, locations, parameters and frequencies are outlined in Table 3.3 below. Exact monitoring locations will be finalised as part of the operational MPs and the development of the Environmental Monitoring Management Plan (MRUP-EMP-032). Where practicable, monitoring points will be located to correlate with previous baseline surveys.

**Table 3.3: Monitoring to measure the efficacy of management actions against the management targets**

| Indicator | Method | Location | Parameters | Frequency |
|---|---|---|---|---|
| **Management target 1:** Prevent the introduction of weed species into the MRUP area. | | | | |
| Weed monitoring indicates MRUP activities have not resulted in the introduction of any weed species. | Species identification, photo monitoring, diversity, foliage cover and density within selected monitoring plots and other sampling sites | Adjacent to operational areas, and transport corridors | Presence of weed species | Annually |
| | Visual assessment, or equivalent, from appropriately trained MRUP personnel | Perimeter of clearance boundaries | Presence of weed species | Annually |
| **Management target 2:** Weed hygiene practices will limit the introduction and spread of any potential weed infestations within the MRUP. | | | | |
| Audit and compliance activities indicate that weed hygiene practices and methods are adhered to and utilised across the MRUP area. | Audit by Environmental staff | Project area | Implementation of Weed Management Plan (MRUP-EMP-003).<br>Personnel trained in and aware of the Weed Management Plan (MRUP-EMP-003). | Annually |

## 3.5 Review and revision of management actions

In the event that a management target is not met or is exceeded, Vimy will implement the following adaptive management procedure:

- Investigate the potential cause of failing to meet the management target and identify any impacts to from weeds.
- If the causes of failing to meet the management target or any impacts identified are a result of the MRUP, the risk assessment will be reviewed and revised risk based management actions will be implemented so that the MRUP environmental objective is met.

Performance meeting management targets will be reported as part of the Annual Environmental Report (AER).

### 3.5.1 Corrective Actions

If monitoring actions outlined in Section 3.4 indicate that the indicators and management targets are not being met then the associated corrective actions outlined below will be implemented.

**Table 3.4: Weed Management Contingency Actions**

| Performance Indicator | Action | Responsibility |
|---|---|---|
| Monitoring demonstrates the introduction of a new weed species | Raise as Environmental Incident<br>Identify the weed species and determine the weed category type (e.g. if Declared weed)<br>Implement control measures to minimise weed spread<br>Investigate weed hygiene practices to help determine cause of weed introduction<br>Implement appropriate eradication measures based on weed species and area of infiltration as soon as is practicable | Environmental Manager |
| Weed species are reported to environmental staff | Conduct inspection of indicated area to determine if new invasive weed species is present<br>Should weed species be present, follow protocol outlined above | Environmental Manager |
| Weed hygiene procedures are not followed (e.g. failure to complete weed inspection of entering vehicle to Project area) | Raise as Environmental Incident<br>Investigate cause of non-compliance<br>Re-induct responsible parties<br>Review hygiene procedures | Environmental Manager |

## 3.6 Reporting provisions

### 3.6.1 Annual reporting

Performance in protecting flora and vegetation will be assessed against management targets outlined in Table 3.2 and reported as part of the AER. In the event that the MRUP environmental objective is not achieved during the reporting period, the AER will include a description of the effectiveness of revised and/or additional management actions implemented and an analysis of trends.

The first AER will be submitted in accordance with the timeline outlined in the Condition Statement following the acceptance of the PER by the EPA.

### 3.6.2 Reporting on exceedance of the management target

In the event of a failure of a management target outlined in Table 3.2 resulting in a significant environmental impact, Vimy will verbally notify the CEO of the OEPA within 48 hours of learning of the exceedance. A written report detailing the exceedance and the outcome of the investigation will be provided to the CEO of the OEPA within seven days. Exceedances of management targets not deemed significant will be reported in the AER.

A significant impact is defined as an unplanned, long term or irreversible impact to flora, vegetation or fauna of conservation significance within the MRUP Development Envelope as a result of MRUP activities.

The MP reporting template is presented in Table 3.5.

**Table 3.5: Management Plan reporting table**

| Key environmental factor: Weed Management | | |
|---|---|---|
| Environmental objective and management target set in the MP | Reporting on the management objective and management target for [Month 20xx] to [Month 20yy] | Status[1] |
| Environmental objective: Prevent, identify, control and limit the introduction and spread of invasive weed species across the MRUP. | The prevention, identification, control and limitation of the introduction and spread of invasive weed species across the MRUP [was / was not] achieved. | ■ YES or<br>● NO |
| Management target 1: Prevent the introduction of weed species into the MRUP area. | Management target 1: Prevent the introduction of weed species into the MRUP area [was / was not] achieved. | ■ YES or<br>● NO |
| Management target 2: Weed hygiene practices will limit the introduction and spread of any potential weed infestations within the MRUP. | Management target 2: Weed hygiene practices [did / did not] limit the introduction and spread of any potential weed infestations within the MRUP. | ■ YES or<br>● NO |

Notes:

1. The status of achievement of the environmental objectives is indicated by the following symbols:
   - ■ Environmental objective achieved
   - ● Environmental objective not achieved

# 4. Adaptive management and review of the MP

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

- Monitoring data will be systematically evaluated and compared to baseline and reference site data in accordance with Table 3.3 in a process of adaptive management to verify whether responses to the impact are the same or similar to predictions,
- Re-evaluate the risk assessment and revision of risk-based priorities on the basis of monitored information,
- Increased understanding of the local and regional ecological regime,
- Revision when management actions are not as effective as predicted,
- 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
- Review of MP – changes to MP provisions required by a condition, timeframe, etc.

# 5. Stakeholder consultation

Consultation relevant to this MP has been undertaken with Decision Making Authorities (DMAs) and other relevant State government departments and local government authorities, in particular the Department of Parks and Wildlife (DPAW) in Perth and Kalgoorlie.

## 6. References

The following references were used in developing this MP.

DPI (2008) *Queensland Weed Spread Prevention Strategy*. Department of Primary Industries and Fisheries, Brisbane, Queensland.

EPA (2000) *Position Statement 2: Environmental Protection of Native Vegetation in Western Australia*. Environmental Protection Authority, Perth, Western Australia.

EPA (2006) *Guideline for the Assessment of Environmental Factors: Guidance Statement No. 6. Rehabilitation of Terrestrial Ecosystems.* Environmental Protection Authority, Perth, Western Australia.

EPA (2015a) *Environmental Assessment Guideline for Environmental principles, factors and objectives, EAG 8*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015b) *Environmental Assessment Guideline for Preparation of management plans under Part IV of the Environmental Protection Act 1986, EAG 17*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015c) *Title of Condition Environmental Management Plan, Environmental management-based condition model template*. Environmental Protection Authority, Perth, Western Australia.

Mattiske (2015) *Assessment of Flora and Vegetation Surveys conducted for the Mulga Rock Uranium Project, Great Victoria Desert, WA*. Unpublished report by Mattiske Consulting Pty Ltd for Vimy Resources, April, 2015.

# Mulga Rock Uranium Project

# Terrestrial Fauna Management Plan

## MRUP-EMP-004

November 2015


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## Prepared for Vimy Resources Limited by Golder Associates Pty Ltd

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# List of Tables

# 1. Summary

The table below presents the environmental management target/s to measure achievement of the environmental objective that must be met through implementation of this Management Plan (MP).

| Title of proposal | Mulga Rock Uranium Project |
|---|---|
| Proponent | Vimy Resources Limited |
| Environmental Scoping Document | Assessment Number 1979 |
| Purpose of this MP | The Terrestrial Fauna Management Plan is submitted to outline MRUP's proposed procedures and practices to be implemented to meet the EPA's environmental objective for the key environmental factor/s. |
| EPA's environmental objective for the key environmental factor/s | Terrestrial Fauna: To maintain representation, diversity, viability and ecological function at the species, population and assemblage level. |
| Vimy's Environmental objective | Ensure that the impact upon native fauna as a result of the development of the MRUP will be minimised. |
| Management target/s | • Management target 1: Minimise disturbance activities where practicable.<br>• Management target 2: Avoid clearing 'prime habitats' of MNES listed species where practicable.<br>• Management target 3: Maintain overall health of native fauna species by minimising indirect impacts.<br>• Management target 4: Avoid or minimise the introduction and spread of feral animals. |

**Corporate endorsement**

I hereby certify that to the best of my knowledge, the MP provisions within this Terrestrial Fauna Management Plan are true and correct.

[Signature of duly authorised proponent representative]

Name: Signed:

Designation: Date:

# 2. Context, scope and rationale

## 2.1 What is the proposal?

Vimy Resources Limited (Vimy) proposes to develop the Mulga Rock Uranium Project (MRUP or the Project) which lies approximately 240km east-north-east of Kalgoorlie-Boulder in the Shire of Menzies. The area is remote, located on the western flank of the Great Victoria Desert, comprising series of large, generally parallel sand dunes, with inter-dunal swales and broad flat plains.

The MRUP covers approximately 102,000 hectares on granted mining tenure (primarily M39/1080 and M39/1081) within Unallocated Crown Land (UCL). It includes two distinct mining centres, Mulga Rock East (MRE) comprising the Princess and Ambassador resources and Mulga Rock West (MRW) comprising the Emperor and Shogun resources, which are approximately 20km apart. Up to 4.5 Million tonnes per annum (Mtpa) of ore will be mined using traditional open cut techniques, crushed, beneficiated and then processed onsite to produce, on average, 1,360 tonnes of uranium oxide concentrate (UOC) per year over the life of the Project. Base metal concentrates will also be extracted using sulphide precipitation after the uranium has been removed and sold separately.

The anticipated Life-of-Mine (LOM) is up to 16 years, based on the currently identified resource.

This MP has been based on *Environmental Assessment Guideline 17* (EPA 2015b) and the EPA's *environmental management-based condition model template* (EPA 2015c).

## 2.2 What key environmental factor/s does this MP address?

This MP specifically addresses the Terrestrial Fauna environmental factor.

Terrestrial Fauna is a key environmental factor for this proposal because surveys have identified the regional presence of at least eight species of native marsupial, 10 species of other native mammals (rodents, bats and dingos), 38 species of native bird, 53 species of reptiles, one species of frog. One species identified as a Matter of National Environmental Significance (MNES) has been identified within the Project area.

Potential direct impacts to terrestrial fauna include:

- Clearing. Fauna may be killed, injured or trapped during the clearing process, or during the construction and subsequent operations. Clearing of native vegetation will also result in the loss or fragmentation of fauna habitat and the consequential displacement of fauna or to their isolation.
- Vehicle strike.

Potential indirect impacts on fauna include:

- Radiation.
- Altered fire regimes.
- Increased access for feral animals to resources.
- Noise and light spill.
- Changes in air quality.

## 2.3 Rationale and approach in meeting the environmental objective

Results of baseline surveys and a number of assumptions and uncertainties inform the management approach for meeting the EPA's environmental objective for Terrestrial Fauna. The identified management actions, management targets and proposed review and revision processes are aligned with the overall management approach.

### 2.3.1 Results of baseline surveys and scientific studies conducted

A number of general and targeted terrestrial fauna surveys and related studies have been conducted across the MRUP Development Envelope, and over the wider area to establish regional context.

Fauna surveys have identified the regional presence of at least eight species of native marsupial, 10 species of other native mammals (rodents, bats and dingos), 38 species of native bird, 53 species of reptiles, one species of frog and several feral animal species.

Eight native species identified regionally are Matters of National Environmental Significance (MNES) and listed as vulnerable or endangered. These are described in the Conservation Significant Fauna Management Plan (MRUP-EMP-005).

A large number of invertebrates were also identified over the course of a short-range endemic (SRE) survey including 15 mygalomorph spiders, five pseudoscorpions, four scorpions, three slaters, two centipedes, two millipedes and one snail (Bennelongia 2015). Twelve of these species were regarded as having a moderate risk of being an SRE while three where identified to be potential SREs.

### 2.3.2 Key assumptions and uncertainties

It is assumed that the desktop investigations and surveys undertaken for MRUP have sufficiently identified the species within and surrounding the Project area. However, with transient and migratory species, it is possible that some species have not been recorded during the survey effort.

### 2.3.3 Management approach

An adaptive risk based approach to management has been adopted by Vimy for the MRUP. This has been informed by a range of specialist scientific studies for the MRUP and regional area, as well as database searches and other regional project information.

This information has allowed Vimy to prioritise and manage significant risks using the mitigation hierarchy (i.e. avoid, minimise, manage, rehabilitate and offset) and develop an adaptive management system. Adaptive management allows for adaptations due to changing project conditions and the dynamic nature of ecosystems in order to achieve the MRUP environmental objectives.

This management approach is consistent for all the environmental factors for the Project.

### 2.3.4 Rationale for choice of management target/s

Vimy has chosen management based targets. These have been chosen to prioritise significant risks identified for the project and are based on:

- Baseline information and available data for the site and local region.
- The relationship between relevant proposal aspects and impacts on the environmental factor at the MRUP.
- Scientific credibility.
- Consistent with monitoring programs already underway on the site, in the region and industry standards.

Management targets will be reviewed annually to ensure they remain relevant and reflect Vimy and the EPA's environmental objective. Any changes to management targets reported as part of the Annual Environmental Report (AER).

# 3. MP provisions

This section of the MP identifies the legal provisions that Vimy proposes to implement to ensure that the impact upon native fauna as a result of the development of the MRUP will be minimised. It identifies the management target/s that Vimy will use to measure performance and monitoring that will be undertaken in relation to the management target/s. Finally, it identifies how Vimy will review and revise management actions if the management targets are exceeded.

## 3.1 Environmental objective

Ensure that the impact upon native fauna as a result of the development of the MRUP will be minimised.

## 3.2 Management actions to be implemented

MRUP activities/aspects which have the potential to cause environmental impacts to terrestrial fauna have been evaluated through a risk analysis. No risks were identified that required potential 'very high' or 'high' risks or impacts requiring specific management. Despite this, in the interest of continual improvement, Vimy will implement the risk-based management actions presented in Table 3.1.

**Table 3.1: Risk-based management actions that will be implemented to meet the environmental objective**

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| **Habitat Disturbance** | | | | |
| Habitat disturbance can significantly impact fauna individuals and populations | Disturbance to native fauna habitats will be minimised through the use of the Ground Disturbance Activity Permit (GDAP) system. | Ground Disturbance Management Plan (MRUP-EMP-019)<br>Ground Disturbance Activity Permit (GDAP) (MRUP-POL-001)<br>Document and Data Management Plan (MRUP-EMP-038) | Low | Construction, Operations and Closure |
| | A GDAP must be completed by relevant personnel and authorised by the Environmental Supervisor prior to any ground disturbance activities. | | Low | |
| | Continuously update all fauna related information into the central Vimy database. | | Very low | |
| | Disturbed areas no longer required for operations to be rehabilitated through progressive rehabilitation procedures as soon as practical. | Rehabilitation and Revegetation Management Plan (MRUP-EMP-030) | Low | Construction, Operations and Closure |
| | Should populations of conservation significant species be found during the GDAP survey process, document and immediately seek advice from relevant authorities | Conservation Significant Fauna Management Plan (MRUP-EMP-005)<br>Ground Disturbance Activity Permit (GDAP) (MRUP-POL-001) | Low | Construction, Operations and Closure |
| **Trenches** | | | | |
| Entrapment, injury or death of fauna trough site works | All trenches onsite will have a mode of egress for trapped fauna | Construction Environmental Management Plan (MRUP-EMP-018)<br>Operational Environmental Management Plan (MRUP-EMP-020) | Very low | Construction and Operations |
| | All trenches onsite will be backfilled, or otherwise removed, as soon as is practicable | Construction Environmental Management Plan (MRUP-EMP-018) | Very low | Construction and Operations |

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| **Vehicle Movements** | | | | |
| Vehicle collisions causing injury or death of fauna | Only allow driving off established tracks with prior authorisation from Environmental Department or, in the case of an emergency situation, the Registered Mine Manager. | Ground Disturbance Management Plan (MRUP-EMP-019) | Low | Construction, Operations and Closure |
| | Restrict access to areas of native vegetation to minimise the risk of unauthorised disturbance. | | Low | |
| | Enforce speed limits at all times. All site roads will have a speed limit of 80kmph except where otherwise signposted. | Environmental Induction and Training Management Plan (MRUP-EMP-039) | Low | Construction, Operations and Closure |
| | Reduce speed limits in areas or at times where fauna are expected to be susceptible to vehicle strikes. | | Low | |
| | Limit the use of vehicles at dawn, dusk and night where practicable. | | Low | |
| | Educate workforce as part of induction about the risks of fauna strikes (locations, terrains, time of day). | | Low | |
| | After the death of five animals at one location (varied species) in one year, the Vimy Environmental Department will investigate the likely cause of the concentration of incidents and will implement appropriate preventative measures to prevent or greatly reduce the potential for future incidents. | Environmental Monitoring Management Plan (MRUP-EMP-032) | Low | Construction, Operations and Closure |
| | A nominated person will remove and dispose of animal fatalities from the haul road. Pouches of female marsupials will be checked for live young. Live young (of suitable size) are to be transported to a registered wildlife rehabilitator, as soon as practicable, under the direction of the Vimy Environmental Department and the guidance of DPaW and the wildlife rehabilitator. | Environmental Monitoring Management Plan (MRUP-EMP-032) | Low | Construction, Operations and Closure |

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| **Fire Management** | | | | |
| Operation-based fire causing injury or death of fauna | Ensure alterations to ground disturbance through the GDAP system as a result of fauna surveys and monitoring are in accordance with the Fire Management Plan (MRUP-EMP-025) i.e. fire breaks are required to remain in place for the LOM. | Fire Management Plan (MRUP-EMP-025)<br>Ground Disturbance MP (MRUP-EMP-019)<br>Ground Disturbance Activity Permit (GDAP) (MRUP-POL-001) | Low | Construction, Operations and Closure |
| **Introduced Fauna (feral animals)** | | | | |
| Introduced species outcompeting native fauna, causing ecological shifts | Monitor feral animal numbers as per the protocols within the Feral Animal Management Plan (MRUP-EMP-006). | Feral Animal Management Plan (MRUP-EMP-006) | Low | Construction, Operations and Closure |
| | Control feral animal numbers as per the protocols within the Feral Animal Management Plan (MRUP-EMP-006). | | Low | |
| | No domestic animals are permitted to be brought onto site under any circumstances. | Feral Animal Management Plan (MRUP-EMP-006) | Very low | Construction, Operations and Closure |
| | All waste material (especially putrescible waste) is to be disposed of appropriately onsite. Landfill facilities are to be fenced. | Feral Animal Management Plan (MRUP-EMP-006)<br>Waste Management Plan (MRUP-EMP-026) | Low | Construction, Operations and Closure |
| | Site inductions for all site personnel will include discussion of the site-wide Vimy policy to not permit interaction or interference with any fauna, and to contact the Environmental Department for assistance if required (e.g. snake removal). This will include the prevention of feeding any fauna (including feral cats and dogs) onsite. | Operational Environmental Management Plan (MRUP-EMP-020). | Very low | Construction, Operations and Closure |

## 3.3 Management target

Management targets will be employed to measure and report against achievement of MRUP's environmental objective. The results of the fauna baseline studies suggest that the management targets listed in Table 3.2 will achieve Vimy's environmental objective.

**Table 3.2: Management target/s to measure the efficacy of management actions relative to the environmental objective**

| | |
|---|---|
| Proposed environmental objective (for MP during assessment) | Ensure that the impact upon native fauna as a result of the development of the MRUP will be minimised. |
| Management target 1 | Minimise disturbance activities where practicable. |
| Management target 2 | Avoid clearing 'prime habitats' of MNES listed species where practicable. |
| Management target 3 | Maintain overall health of native fauna species by minimising indirect impacts. |
| Management target 4 | Avoid or minimise the introduction and spread of feral animals. |

## 3.4 Monitoring

The purpose of monitoring is to inform, through the management target/s, if the environmental objective (Section 3.1) is being achieved and when management actions will have to be reviewed and revised. This section describes how Vimy will undertake monitoring to determine whether the management targets are achieved.

Proposed monitoring methods, locations, parameters and frequencies are outlined in Table 3.3 below. Exact monitoring locations will be finalised as part of the operational MPs and the development of the Environmental Monitoring Management Plan (MRUP-EMP-032). Where practicable, monitoring points will be located to correlate with previous baseline surveys.

**Table 3.3: Monitoring to measure the efficacy of management actions against the management targets**

| Indicator | Method | Location | Parameters | Frequency |
|---|---|---|---|---|
| **Management target 1**: Minimise disturbance activities where practicable. | | | | |
| Disturbance areas within the Development Envelope are equal to or less than those scheduled | Reconcile (audit) GDAP system (authorised clearing v's actual clearing) | Project area | Vegetation area cleared, ground disturbed | On completion of clearance activity |
| **Management target 2**: Avoid clearing 'prime habitats' of MNES listed species where practicable. | | | | |
| All proposed clearing areas are assessed for conservation significant fauna and habitat prior to disturbance activities | Consideration given to adjustment of disturbance to avoid prime habitats of MNES listed species as provided within the Conservation Significant Flora and Vegetation Management Plan (MRUP-EMP-002)<br>Visual inspection/audit as per GDAP process | Project area | Disturbance of habitat | As required prior to clearing activity |
| **Management target 3**: Maintain overall health of native fauna species by minimising indirect impacts. | | | | |
| Habitat monitoring indicates minimal decline in health of habitats due to impacts from Project activities | Visual inspection/audit as per GDAP process | Project area | Disturbance of habitat | Annually |
| **Management target 4**: Avoid or minimise the introduction and spread of feral animals. | | | | |
| No increase in the occurrence of feral animals within the Project area beyond natural variability. | Feral Animal MP (MRUP-EMP-006) implemented and followed | Project area | Increase in population or species numbers | Annual fauna surveys |

## 3.5 Review and revision of management actions

In the event that a management target is not met or is exceeded, Vimy will implement the following adaptive management procedure:

- Investigate the potential cause of failing to meet the management target and identify any impacts to terrestrial fauna.
- If the causes of failing to meet the management target or any impacts identified are a result of the MRUP, the risk assessment will be reviewed and revised risk based management actions will be implemented so that the MRUP environmental objective is met.

Performance meeting management targets will be reported as part of the Annual Environmental Report (AER).

### 3.5.1 Corrective Actions

If monitoring actions outlined in Section 3.4 indicate that the indicators and management targets are not being met then the associated corrective actions outlined below will be implemented.

**Table 3.4: Terrestrial Fauna Corrective Actions**

| Performance Indicator | Action | Responsibility |
|---|---|---|
| Disturbance of fauna habitat outside approved clearance area | Immediately stop clearance activity.<br>Conduct investigation to determine specific cause of the over clearance.<br>Review GDAP process and develop additional management measures if required.<br>Rehabilitate as soon as practicable. | Mine Manager and Environmental Manager |
| Total disturbance area projected for the given year of operational life of MRUP exceeds the amount authorised | Implementation of tighter controls over disturbance areas to reduce total disturbance area to equal or lower than that projected for the given year of operational life, within 12 months. | Mine Manager and Environmental Manager |
| Conservation significant fauna strikes recorded in a particular location > 1 incident/yr | Environmental Manager investigates whether conservation significant fauna are located in the locality and what protocols, if any, can be implemented to reduce the potential for further strikes (as per the Conservation Fauna Management Plan: MRUP-EMP-004).<br>Any identified specimen will be placed within a plastic bag, labelled and placed within a dedicated freezer. It will be forwarded to DPaW as soon as is practical. | Environmental Manager in consultation with Mine Manager |
| Non-conservation significant vertebrate fauna strikes recorded in a particular location > 5 incidents/quarter | Environmental Manager investigates and determines whether implementation of appropriate preventative measures should be introduced.<br>Each strike is to be identified, if practicable, and the information added to the Vimy environmental database. | Environmental Manager in consultation with Mine Manager |
| Feral or native fauna observed to be attracted to Project facilities | Control measures put in place to prevent access to Project facilities acting as an attractant (e.g. fencing of potable water storage areas). | Environmental Manager in consultation with Mine Manager |
| Feral animal numbers are determined to be increasing within the Project area but NOT causing a hazard to site personnel | Environmental Manager investigates the extent to which the population increase is caused by Project activities<br>Appropriate control measures are put in place (fencing, trapping, baiting). | Environmental Manager in consultation with Mine Manager |

| Performance Indicator | Action | Responsibility |
|---|---|---|
| Feral animals are causing a hazard to site personnel (within the Project area or on access roads to Project area) | Environmental Manager investigates hazard<br>Appropriate measures are put in place to minimise threat (fencing, personnel access restrictions, vehicle speed restrictions)<br>Environmental Manager informs all site personnel of hazard and appropriate methods of avoiding it. | Environmental Manager in consultation with Mine Manager |
| Measurable deterioration in the condition of any terrestrial fauna habitat in the Project area is identified | Identify the cause of the deterioration. If associated with Project activities, implement measures (as detailed in the relevant management plan) to prevent further deterioration and if practicable rectify damage already caused (e.g. dust suppression, weed eradication, feral animal control). | Environmental Manager in consultation with Mine Manager |
| Measurable decline in health or vegetation communities or species diversity at baseline monitoring locations within or outside of Project area | Identify whether the cause of the deterioration is fauna related (particularly whether it is related to feral animals).<br>If related to fauna, identify whether the relationship is caused or aggravated by Project activities.<br>If related to Project activities, enact appropriate measures to control fauna to prevent further deterioration. | Environmental Manager in consultation with Mine Manager |
| Feral animal infestations causing hygiene hazards to camp food and/or water supplies or accommodation areas | Environmental Manager investigates hazard<br>Appropriate measures are put in place to minimise threat (changes to food storage, barriers to access to camp water supplies, clean-up of infested areas)<br>Environmental Manager informs all site personnel of hazard and appropriate methods of avoiding it. | Environmental Manager in consultation with Camp Manager |

## 3.6 Reporting provisions

### 3.6.1 Annual reporting

Performance in protecting terrestrial fauna will be assessed against management targets outlined in Table 3.2 and reported as part of the AER. In the event that the MRUP environmental objective is not achieved during the reporting period, the AER will include a description of the effectiveness of revised and/or additional management actions implemented and an analysis of trends.

The first AER will be submitted in accordance with the timeline outlined in the Condition Statement following the acceptance of the PER by the EPA.

### 3.6.2 Reporting on exceedance of the management target

In the event of a failure of a management target outlined in Table 3.2 resulting in a significant environmental impact, Vimy will verbally notify the CEO of the OEPA within 48 hours of learning of the exceedance. A written report detailing the exceedance and the outcome of the investigation will be provided to the CEO of the OEPA within seven days. Exceedances of management targets not deemed significant will be reported in the AER.

A significant impact is defined as an unplanned, long term or irreversible impact to terrestrial fauna of conservation significance within the MRUP Development Envelope as a result of MRUP activities.

The MP reporting template is presented in Table 3.5.

**Table 3.5: Management Plan reporting table**

| Key environmental factor: Terrestrial Fauna | | |
|---|---|---|
| Environmental objective and management target set in the MP | Reporting on the management objective and management target for [Month 20xx] to [Month 20yy] | Status[1] |
| Environmental objective: Ensure that the impact upon native fauna as a result of the development of the MRUP will be minimised. | Impacts upon native fauna as a result of the development of the MRUP *[were / were not]* minimised. | ■ YES or<br>● NO |
| Management target 1: Minimise disturbance activities where practicable. | Management target 1: Disturbance activities *[were / were not]* minimised where practicable. | ■ YES or<br>● NO |
| Management target 2: Avoid clearing 'prime habitats' of MNES listed species where practicable. | Management target 2: Clearing 'prime habitats' of MNES listed species *[was / was not]* avoided where practicable. | ■ YES or<br>● NO |
| Management target 3: Maintain overall health of native fauna species by minimising indirect impacts. | Management target 3: Overall health of native fauna species *[was / was not]* maintained by minimising indirect impacts. | ■ YES or<br>● NO |
| Management target 4: Avoid or minimise the introduction and spread of feral animals. | Management target 4: The introduction and spread of feral animals *[was / was not]* avoided or minimised. | ■ YES or<br>● NO |

Notes:

1. The status of achievement of the environmental objectives is indicated by the following symbols:
   - ■ Environmental objective achieved
   - ● Environmental objective not achieved

# 4. Adaptive management and review of the MP

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

- Monitoring data will be systematically evaluated and compared to baseline and reference site data in accordance with Table 3.3 in a process of adaptive management to verify whether responses to the impact are the same or similar to predictions,
- Re-evaluate the risk assessment and revision of risk-based priorities on the basis of monitored information,
- Increased understanding of the local and regional ecological regime,
- Revision when management actions are not as effective as predicted,
- 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
- Review of MP – changes to MP provisions required by a condition, timeframe, etc.

# 5. Stakeholder consultation

Consultation relevant to this MP has been undertaken with Decision Making Authorities (DMAs) and other relevant State government departments and local government authorities, in particular the Department of Parks and Wildlife (DPAW) in Perth and Kalgoorlie.

# 6. References

The following references were used in developing this MP.

Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) (2014) *Technical Report 167 (2014) – A review of existing Australian radionuclide activity concentration data in non-human biota inhabiting uranium mining environments*.

Bennelongia (2015). *Short-range Endemic Fauna at the Mulga Rock Uranium Project*, unpublished report by Bennelongia Pty Ltd for Vimy Resources, February 2015. [PER Appendix B7].

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EPA (2015b) *Environmental Assessment Guideline for Preparation of management plans under Part IV of the Environmental Protection Act 1986, EAG 17*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015c) *Title of Condition Environmental Management Plan, Environmental management-based condition model template*. Environmental Protection Authority, Perth, Western Australia.

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# Mulga Rock Uranium Project

# Conservation Significant Fauna Management Plan

**MRUP-EMP-005**

November 2015


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## Prepared for Vimy Resources Limited by Golder Associates Pty Ltd

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# List of Tables

# 1. Summary

The table below presents the environmental management target/s to measure achievement of the environmental objective that must be met through implementation of this Management Plan (MP).

| Title of proposal | Mulga Rock Uranium Project |
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| Proponent | Vimy Resources Limited |
| Environmental Scoping Document | Assessment Number 1979 |
| Purpose of this MP | The Conservation Significant Fauna Management Plan is submitted to outline MRUP's proposed procedures and practices to be implemented to meet the EPA's environmental objective for the key environmental factor/s. |
| EPA's environmental objective for the key environmental factor/s | Terrestrial Fauna: To maintain representation, diversity, viability and ecological function at the species, population and assemblage level. |
| Vimy's Environmental objective | Ensure that 'prime habitats' of Conservation Significant Fauna species currently identified, likely to occur or possibly occurring within the Development Envelope are protected from unnecessary destruction, disturbance or degradation over the course of the mining operation. |
| Management target/s | • Management target 1: Avoid clearing 'prime habitats' of MNES listed and Conservation Significant Fauna species where practicable.<br>• Management target 2: Maintain overall health of MNES listed and Conservation Significant Fauna species by minimising indirect impacts. |

**Corporate endorsement**

I hereby certify that to the best of my knowledge, the MP provisions within this Conservation Significant Fauna Management Plan are true and correct.

[Signature of duly authorised proponent representative]

Name: Signed:

Designation: Date:

# 2. Context, scope and rationale

## 2.1 What is the proposal?

Vimy Resources Limited (Vimy) proposes to develop the Mulga Rock Uranium Project (MRUP or the Project) which lies approximately 240km east-north-east of Kalgoorlie-Boulder in the Shire of Menzies. The area is remote, located on the western flank of the Great Victoria Desert, comprising series of large, generally parallel sand dunes, with inter-dunal swales and broad flat plains.

The MRUP covers approximately 102,000 hectares on granted mining tenure (primarily M39/1080 and M39/1081) within Unallocated Crown Land (UCL). It includes two distinct mining centres, Mulga Rock East (MRE) comprising the Princess and Ambassador resources and Mulga Rock West (MRW) comprising the Emperor and Shogun resources, which are approximately 20km apart. Up to 4.5 Million tonnes per annum (Mtpa) of ore will be mined using traditional open cut techniques, crushed, beneficiated and then processed onsite to produce, on average, 1,360 tonnes of uranium oxide concentrate (UOC) per year over the life of the Project. Base metal concentrates will also be extracted using sulphide precipitation after the uranium has been removed and sold separately.

The anticipated Life-of-Mine (LOM) is up to 16 years, based on the currently identified resource.

This MP has been based on *Environmental Assessment Guideline 17* (EPA 2015b) and the EPA's *environmental management-based condition model template* (EPA 2015c).

## 2.2 What key environmental factor/s does this MP address?

This MP specifically addresses the Terrestrial Fauna environmental factor.

Terrestrial Fauna is a key environmental factor for this proposal because clearing has the potential to impact on potential fauna habitat. Eight species identified regionally are Matters of National Environmental Significance (MNES) and listed as vulnerable or endangered, while six additional species were identified as being of conservation significance. Although all identified regionally, only the Sandhill Dunnart has been both sighted and had 'prime habitat' identified within the Project area.

Potential direct impacts to terrestrial fauna include:

- Clearing - fauna may be killed, injured or trapped during the clearing process, or during the construction and subsequent operations that follow. Clearing of native vegetation will also result in the loss or fragmentation of fauna habitat and the consequential displacement of fauna or to their isolation.

Vehicle strike.

Potential indirect impacts on fauna include:

- Radiation.
- Altered fire regimes.
- Increased access for feral animals to resources.
- Noise and light spill.
- Changes in air quality.

## 2.3 Rationale and approach in meeting the environmental objective

Results of baseline surveys and a number of assumptions and uncertainties inform the management approach for meeting the EPA's environmental objective for Terrestrial Fauna. The identified management actions, management targets and proposed review and revision processes are aligned with the overall management approach.

### 2.3.1 Results of baseline surveys conducted

There have been a number of surveys wholly or partly concerned with identifying MNES listed and Conservation Significant Fauna species and/or determining the distribution of the 'prime habitat' of these species within the region or, specifically, within the MRUP area.

MNES listed species identified in the region (either in the field surveys or the Camera Trapping Protocol [CTP] report) are listed in Table 2.1.

**Table 2.1: MNES listed species Identified in the vicinity of the MRUP**

| | | | |
|---|---|---|---|
| *Leipoa ocellata* | Malleefowl | *Notoryctes typhlops* | Southern Marsupial Mole |
| *Pezoporus occidentalis* | Night Parrot | *Sminthopsis psammophila* | Sandhill Dunnart |
| *Polytelis alexandrae* | Princess Parrot, Alexandra's Parrot | *Ardea alba* | Great Egret, White Egret, Eastern Great Egret |
| *Merops ornatus* | Rainbow Bee-eater | *Charadrius veredus* | Oriental Plover, Oriental Dotterel |

Of the eight MNES listed species identified in the region:

- No suitable habitat for *Leipoa ocellata* (Malleefowl) has been identified in the Project area. This strongly suggests that the MRUP will not have a significant impact on this species (Vimy 2015b).
- There is unlikely to be any suitable habitat for the Night Parrot (*Pezoporus occidentalis*), Rainbow Bee-eater (*Merops ornatus*), Great Egret (*Ardea alba*), Oriental Plover (*Charadrius veredus*), or the Princess Parrot/Alexandra's Parrot (*Polytelis alexandrae*) present in the Project area and therefore none of these species is likely to occur in the area and there will be no direct or indirect impact on these birds.
- Although the habitat of the *Notoryctes typhlops* (Southern Marsupial Mole) is poorly understood, its distribution in the arid sandy regions of Australia is thought to be widespread. Evidence for activity of the *Notoryctes typhlops* in the Project area is extremely limited. As such, it has been concluded that the MRUP would have no significant impact on *Notoryctes typhlops* (Ninox, 2015a).
- *Sminthopsis psammophila* (Sandhill Dunnart) has not been observed within the Development Envelope of the MRUP subsequent to the initial (Martinick 1985) fauna survey (Vimy 2015a) and the suitable habitat that existed within the Project area was destroyed by an intense wildfire in November, 2014. As such, it is concluded that the MRUP will not have any significant impact on any current populations of *Sminthopsis psammophila*.

Six additional species have been identified as being State listed (Wildlife Conservation Act 1950 or DPaW):

- *Aspidites ramsayi* (Woma Python).
- *Dasycercus cristicauda* (Crest-tailed Mulgara)
- *Dasycercus blythi* (Brush-tailed Mulgara).
- *Lerista puncticauda* (Dotty-tailed Robust Slider).
- *Liopholis kintorei* (Great Desert Skink).
- *Ardeotis australis* (Bustard).

A large number of invertebrates were also identified over the course of a short-range endemic (SRE) survey (Bennelongia 2015). Twelve of these species were regarded as having a moderate risk of being an SRE while three where identified to be potential SREs. It was determined that all of the SREs identified, including those only sampled within the proposed Disturbance Footprint, were likely to be more widespread than the vicinity of the Project due to the wider occurrence of the habitats in which they occurred, and are therefore unlikely to be threatened by the MRUP.

### 2.3.2 Key assumptions and uncertainties

It is assumed that the desktop investigations and surveys undertaken for MRUP have sufficiently identified the species within and surrounding the Project area. However, with transient and migratory species, it is possible that some species have not been recorded during the survey effort.

### 2.3.3 Management approach

An adaptive risk based approach to management has been adopted by Vimy for the MRUP. This has been informed by a range of specialist scientific studies for the MRUP and regional area, as well as database searches and other regional project information.

This information has allowed Vimy to prioritise and manage significant risks using the mitigation hierarchy (i.e. avoid, minimise, manage, rehabilitate and offset) and develop an adaptive management system. Adaptive management allows for adaptations due to changing project conditions and the dynamic nature of ecosystems in order to achieve the MRUP environmental objectives.

This management approach is consistent for all the environmental factors for the Project.

### 2.3.4 Rationale for choice of management target/s

Vimy have chosen management based targets. These have been chosen to prioritise significant risks identified for the project and are based on:

- Baseline information and available data for the site and local region.
- The relationship between relevant proposal aspects and impacts on the environmental factor at the MRUP.
- Scientific credibility.
- Consistent with monitoring programs already underway on the site, in the region and industry standards.

Management targets will be reviewed annually to ensure they remain relevant and reflect Vimy and the EPA's environmental objective. Any changes to management targets will be reported as part of the Annual Environmental Report (AER).

# 3. MP provisions

This section of the MP identifies the legal provisions that Vimy proposes to implement to ensure that the impact upon native fauna as a result of the development of the MRUP will be minimised. It identifies the management target/s that Vimy will use to measure performance and monitoring that will be undertaken in relation to the management target/s. Finally, it identifies how Vimy will review and revise management actions if the management targets are exceeded.

## 3.1 Environmental objective

Ensure that 'prime habitats' of Conservation Significant Fauna species currently identified, likely to occur or possibly occurring within the Development Envelope are protected from unnecessary destruction, disturbance or degradation over the course of the mining operation.

## 3.2 Management actions to be implemented

MRUP activities/aspects which have the potential to cause environmental impacts to fauna have been evaluated through a risk analysis. No risks were identified that required potential 'very high' or 'high' risks or impacts requiring specific management. Despite this, in the interest of continual improvement, Vimy will implement the risk-based management actions presented in Table 3.1.

**Table 3.1: Risk-based management actions that will be implemented to meet the environmental objective**

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| **Habitat disturbance** | | | | |
| Construction of the mine and infrastructure can reduce habitat for conservation-dependent species. | Disturbance to prime habitats of MNES listed and Conservation Significant Fauna species will be minimised through the use of the Ground Disturbance Activity Permit (GDAP) system. | Ground Disturbance Management Plan (MRUP-EMP-019)<br>Ground Disturbance Activity Permit (GDAP) (MRUP-POL-001)<br>Document and Data Control Management Plan (MRUP-EMP-038) | Low | Construction, Operations and Closure |
| | A GDAP must be completed by relevant personnel and authorised by the Environmental Supervisor prior to any ground disturbance activities. | Ground Disturbance Management Plan (MRUP-EMP-019)<br>Ground Disturbance Activity Permit (GDAP) (MRUP-POL-001)<br>Document and Data Control Management Plan (MRUP-EMP-038) | Low | Construction, Operations and Closure |
| | Disturbed sites no longer required for operations to be rehabilitated through progressive rehabilitation procedures as soon as is practical. | Rehabilitation and Revegetation Management Plan (MRUP-EMP-030) | Low | Construction, Operations and Closure |
| | A central database containing the spatial location of soil associations, vegetation communities and prime habitats for MNES listed and Conservation Significant Fauna species, and any other environmentally significant locations, will be kept and referred to throughout the GDAP. | Document and Data Control Management Plan (MRUP-EMP-038)<br>Ground Disturbance Activity Permit (GDAP) (MRUP-POL-001) | Low | Construction, Operations and Closure |

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| **Vehicle Movements** | | | | |
| Vehicular collisions causing significant injury or death to conservations-dependent species | Driving off tracks will not be allowed without prior authorisation from the Environmental Department or, the case of an emergency, the Registered Mine Manager. Access to areas of prime habitat of MNES listed and Conservation Significant Fauna species will be restricted to minimise the risk of unauthorised disturbance. | Ground Disturbance Management Plan (MRUP-EMP-019) | Low | Construction, Operations and Closure |
| | The enforcement of speed limits, particularly in areas where fauna are expected to be susceptible to vehicle strikes. | Operational Environmental Management Plan (MRUP-EMP-020) | Low | Construction, Operations and Closure |
| | Limit the use of vehicles at dawn, dusk and night where practicable. | Operational Environmental Management Plan (MRUP-EMP-020) | Low | Construction, Operations and Closure |
| | Education of workforce as part of induction about the risks of fauna strikes (locations, terrains and time of day). | Environmental Induction and Training Management Plan (MRUP-EMP-039) | Low | Construction, Operations and Closure |
| | After the death of a conservation significant faunal species, the Vimy Environmental Department will investigate if a population or specific habitat of that species is located in the vicinity of the incident, and will instigate measures to reduce the potential for future incidents. Such measures will be dependent upon the species and the situation. | Operational Environmental Management Plan (MRUP-EMP-020) | Low | Construction, Operations and Closure |

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| **Dust** | | | | |
| Indirect faunal impacts through reduced habitat health | Control ambient dust levels from Project activities | Dust Management Plan (MRUP-EMP-024). | Low | Construction, Operations and Closure |
| | Saline or brackish water used for dust suppression restricted to cleared areas. Water truck operators will be made aware of impacts of potential overspray onto vegetated areas, particularly during windy conditions. | Dust Management Plan (MRUP-EMP-024). | Low | Construction, Operations and Closure |
| | Dust generating activities will be avoided around prime habitats of MNES listed and Conservation Significant Fauna species wherever practicable. | Dust Management Plan (MRUP-EMP-024). | Low | Construction, Operations and Closure |
| | Incorporation of a binding agent into the construction of the haul road will be considered due to the potential for minimising saline water requirement. | Dust Management Plan (MRUP-EMP-024). | Low | Construction, Operations and Closure |
| **Fire Management** | | | | |
| Operations increasing the risk of fire | Ensure all clearance activity is conducted in accordance with approved Fire Management procedures | Fire Management Plan (MRUP-EMP-025). | Low | Construction, Operations and Closure |
| **Radiation exposure** | | | | |
| Operations increasing the risk radiation exposure | Ensure implementation of the Radiation Management Plan (MRUP-EMP-028). | Radiation Management Plan (MRUP-EMP-028) | Low | Construction, Operations and Closure |

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| **Introduced flora (invasive weed species)** | | | | |
| Introduced flora have a negative impact on conservation significant fauna | Ensure implementation of site-wide vehicle hygiene strategy | Weed Management Plan (MRUP-EMP-003). | Low | Construction, Operations and Closure |
| | Where practicable vehicles will be site dedicated. | | | |
| | Any occurrence of weeds will be included within the central database and incorporated into the GDAP system to prevent potential spreading of invasive species. | Weed Management Plan (MRUP-EMP-003). | Low | Construction, Operations and Closure |
| **Introduced fauna (feral animals)** | | | | |
| Introduced fauna have a negative impact on conservation significant fauna | The numbers of feral animals will be monitored utilising the Feral Animal Management Plan (MRUP-EMP-006), which outlines management measures should significant impacts be detected. | Feral Animal Management Plan (MRUP-EMP-006) | Low | Construction, Operations and Closure |
| **Species Recognition and Reporting** | | | | |
| Misidentification and reporting of conservation significant fauna | All site-based workers will be educated as part of their induction programme to recognise conservation significant fauna (such as the Sandhill Dunnart, the Southern Marsupial Mole, the Woma Python and the Malleefowl) that may potentially inhabit the area and any evidence of the existence of the presence of such fauna such as the presence of Malleefowl mounds. | Environmental Management Plan (MRUP-EMP-000)<br>Environmental Induction and Training Management Plan (MRUP-EMP-039) | Very low | Construction, Operations and Closure |
| | All site-based workers will be required to report any observations or any evidence of the presence of conservation significant fauna. | Environmental Management Plan (MRUP-EMP-000)<br>Environnemental Monitoring Management Plan (MRUP-EMP-032) | Low | Construction, Operations and Closure |

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| | All observations of conservation significant fauna will be entered into the central database. If appropriate (i.e. the observation is not believed to be transient), areas where conservation significant fauna are thought to be present will either be avoided, where practical, or subject to appropriate measures to reduce the likelihood of adverse impacts. | Document and Data Control Management Plan (MRUP-EMP-038) protocols | Low | |
| **Monitoring** | | | | |
| Significant change in conservation significant fauna numbers is not identified. | Fauna monitoring will be undertaken according to the protocols established within the Environmental Monitoring Management Plan. Long term monitoring sites outside the Project area will be used as control sites against which fauna sightings within the Project area can be referenced. Particular attention will be paid to the monitoring of prime habitats for MNES listed and Conservation Significant Fauna species. | Terrestrial Fauna Management Plan (MRUP-EMP-004)<br>Environnemental Monitoring Management Plan (MRUP-EMP-032)<br>Flora and Vegetation Management Plan (MRUP-EMP-001) | Low | Construction, Operations and Closure |

## 3.3 Management target

Management targets will be employed to measure and report against achievement of MRUP's environmental objective. The results of the fauna baseline studies suggest that the management targets listed in Table 3.2 will achieve Vimy's environmental objective.

**Table 3.2: Management target/s to measure the efficacy of management actions relative to the environmental objective**

| | |
|---|---|
| Proposed environmental objective (for MP during assessment) | Ensure that 'prime habitats' of Conservation Significant Fauna species currently identified, likely to occur or possibly occurring within the Development Envelope are protected from unnecessary destruction, disturbance or degradation over the course of the mining operation. |
| Management target 1 | Avoid clearing 'prime habitats' of MNES listed and Conservation Significant Fauna species where practicable. |
| Management target 2 | Maintain overall health of MNES listed and Conservation Significant Fauna species by minimising indirect impacts. |

## 3.4 Monitoring

The purpose of monitoring is to inform, through the management target/s, if the environmental objective (Section 3.1) is being achieved and when management actions will have to be reviewed and revised. This section describes how Vimy will undertake monitoring to determine whether the management targets are achieved.

Proposed monitoring methods, locations, parameters and frequencies are outlined in Table 3.3 below. Exact monitoring locations will be finalised as part of the operational MPs and the development of the Environmental Monitoring Management Plan (MRUP-EMP-032). Where practicable, monitoring points will be located to correlate with previous baseline surveys.

**Table 3.3: Monitoring to measure the efficacy of management actions against the management targets**

| Indicator | Method | Location | Parameters | Frequency |
|---|---|---|---|---|
| **Management target 1**: Avoid clearing 'prime habitats' of MNES listed and Conservation Significant Fauna species where practicable. | | | | |
| All proposed clearing areas are assessed for conservation significant fauna and habitat prior to clearance activities | Visual inspection/audit as per GDAP process | Project area | Disturbance of habitat | As required prior to clearing activity |
| Consideration given to adjustment of disturbance to avoid prime habitats of MNES listed species as provided within the Conservation Significant Flora and Vegetation MP (MRUP-EMP-002) | Visual inspection/audit as per GDAP process | Project area | Presence of Priority Flora species | Prior to clearance activities |
| **Management target 2**: Maintain overall health of MNES listed and Conservation Significant Fauna species by minimising indirect impacts. | | | | |
| MNES population and habitat monitoring indicates minimal decline in fauna populations or the health of prime habitats due to impacts from Project activities. | Health assessment and photo monitoring within selected monitoring plots | Adjacent to operational areas, and transport corridors | Health of vegetation, disturbance of habitat | Annually |
| | Visual assessment from Environmental staff | Perimeter of clearance boundaries | Health of vegetation, disturbance of habitat | Annually |

## 3.5 Review and revision of management actions

In the event that a management target is not met or is exceeded, Vimy will implement the following procedure:

- Investigate the potential cause of failing to meet the management target and identify any impacts to fauna of conservation significance.
- If the causes of failing to meet the management target or any impacts identified are a result of the MRUP, the risk assessment will be reviewed and revised risk based management actions will be implemented so that the MRUP environmental objective is met.

Performance meeting management targets will be reported as part of the Annual Environmental Report (AER).

### 3.5.1 Corrective Actions

If monitoring actions outlined in Section 3.4 indicate that the indicators and management targets are not being met then the associated corrective actions outlined below will be implemented.

**Table 3.4: Conservation Significant Fauna (MNES listed and Conservation Significant Fauna species) Corrective Actions**

| Performance Indicator | Action | Responsibility |
|---|---|---|
| Disturbance of prime habitat of MNES listed or Conservation Significant Fauna species beyond approved Disturbance Footprint | • Immediately stop clearing/disturbance activity.<br>• Conduct investigation to determine specific cause of incident.<br>• Review GDAP process and develop additional management measures if required.<br>• Rehabilitate disturbance as soon as practicable. | Environmental Manager |
| Conservation significant fauna strikes recorded in a particular location > 1 incident/yr | • Environmental Manager investigates whether conservation significant fauna are located in the locality and what, if anything, can be implemented to reduce the potential for further strikes – such as rerouting traffic. | Environmental Manager in consultation with Mine Manager |
| Feral animal numbers are determined to be increasing within the Project area | • Environmental Manager investigates whether MNES or Conservation Significant Fauna species or prime habitat of MNES or Conservation Significant Fauna species is being impacted.<br>• If MNES or Conservation Significant Fauna species are being impacted then feral animal control measures such as fencing are put in place. | Environmental Manager in consultation with Mine Manager |
| Measurable deterioration in the condition of prime habitat of MNES listed or Conservation Significant Fauna species is identified in the Project area | • Identify the cause of the deterioration. If associated with Project activities, implement measures to prevent further deterioration and if practicable, rectify damage already caused (such as weed eradication or feral animal control). | Environmental Manager in consultation with Mine Manager |

## 3.6 Reporting provisions

### 3.6.1 Annual reporting

Performance in protecting terrestrial fauna will be assessed against management targets outlined in Table 3.2 and reported as part of the AER. In the event that the MRUP environmental objective is not achieved during the reporting period, the AER will include a description of the effectiveness of revised and/or additional management actions implemented and an analysis of trends.

The first AER will be submitted in accordance with the timeline outlined in the Condition Statement following the acceptance of the PER by the EPA.

### 3.6.2 Reporting on exceedance of the management target

In the event of a failure of a management target outlined in Table 3.2 resulting in a significant environmental impact, Vimy will verbally notify the CEO of the OEPA within 48 hours of learning of the exceedance. A written report detailing the exceedance and the outcome of the investigation will be provided to the CEO of the OEPA within seven days. Exceedances of management targets not deemed significant will be reported in the AER.

A significant impact is defined as an unplanned, long term or irreversible impact to terrestrial fauna of conservation significance within the MRUP Development Envelope as a result of MRUP activities.

The MP reporting template is presented in Table 3.5.

**Table 3.5: Management Plan reporting table**

| Key environmental factor: Terrestrial Fauna | | |
|---|---|---|
| Environmental objective and management target set in the MP | Reporting on the management objective and management target for [Month 20xx] to [Month 20yy] | Status[1] |
| Environmental objective: Ensure that 'prime habitats' of Conservation Significant Fauna species currently identified, likely to occur or possibly occurring within the Development Envelope are protected from unnecessary destruction, disturbance or degradation over the course of the mining operation. | 'Prime habitats' of Conservation Significant Fauna species currently identified, likely to occur or possibly occurring within the Development Envelope *[were / were not]* protected from unnecessary destruction, disturbance or degradation over the course of the mining operation. | ■ YES or<br>● NO |
| Management target 1: Avoid clearing 'prime habitats' of MNES listed and Conservation Significant Fauna species where practicable. | Management target 1: Clearing 'prime habitats' of MNES listed and Conservation Significant Fauna species *[was / was not]* avoided where practicable. | ■ YES or<br>● NO |
| Management target 2: Maintain overall health of MNES listed and Conservation Significant Fauna species by minimising indirect impacts. | Management target 2: Overall health of MNES listed and Conservation Significant Fauna species *[was / was not]* maintained by minimising indirect impacts. | ■ YES or<br>● NO |

Notes:

1. The status of achievement of the environmental objectives is indicated by the following symbols:
   - ■ Environmental objective achieved
   - ● Environmental objective not achieved

# 4. Adaptive management and review of the MP

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

- Monitoring data will be systematically evaluated and compared to baseline and reference site data in accordance with Table 3.3 in a process of adaptive management to verify whether responses to the impact are the same or similar to predictions.
- Re-evaluate the risk assessment and revision of risk-based priorities on the basis of monitored information.
- Increased understanding of the local and regional ecological regime.
- Revision when management actions are not as effective as predicted.
- 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.).
- Review of MP – changes to MP provisions required by a condition, timeframe, etc.

# 5. Stakeholder consultation

Consultation relevant to this MP has been undertaken with Decision Making Authorities (DMAs) and other relevant State government departments and local government authorities, in particular the Department of Parks and Wildlife (DPAW) in Perth and Kalgoorlie.

# 6. References

The following references were used in developing this MP.

Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) (2014) *Technical Report 167 (2014) – A review of existing Australian radionuclide activity concentration data in non-human biota inhabiting uranium mining environments*.

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Ninox Wildlife Consulting (2010). *A Fauna Survey of the Proposed Mulga Rock Project Area, Great Victoria Desert, Western Australian*, unpublished report by Ninox Wildlife Consulting for Energy and Minerals Australia, January 2010. [PER Appendix B2]

Ninox Wildlife Consulting (2015a). *A Report on the Southern Marsupial Mole, Mulga Rock Uranium Project, Great Victoria Desert, Western Australia*, unpublished report by Ninox Wildlife Consulting for Vimy Resources, May 2015. [PER Appendix B4]

Ninox Wildlife Consulting (2015b). *An Updated Report on the Herpetofauna of the Proposed Mulga Rock Project Area, Great Victoria Desert, Western Australia*, unpublished report by Ninox Wildlife Consulting for Vimy Resources, April 2015. [PER Appendix B6]

Sonter (2015). *Occupational and Environmental Radiation Predictions and Controls, Mulga Rock Uranium Project - Radiation Report*, unpublished report by Radiation Advice and Solutions Pty Ltd for Vimy Resources, June 2015. [PER Appendix F1]

Vimy Resources Limited (2015a). *Camera Trapping Protocol - Sandhill Dunnart (Sminthopsis psammophila) - Mulga Rock Project Area*, unpublished report prepared by Jan Henry, Xavier Moreau and Morris Wu for Vimy Resources, June 2015. [PER Appendix B3]

Vimy Resources Limited (2015b). *Fauna Assessment for the Malleefowl (Leipoa ocellata) – Mulga Rock Project Area*, unpublished report prepared by Woolard Consulting Pty Ltd for Vimy Resources, May 2015. [PER Appendix B5].

# Mulga Rock Uranium Project

# Feral Animal Management Plan

## MRUP-EMP-006

November 2015


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| 0 | BJL | EWC | JT | 06.11.2015 | |
| | | | | | |

## Prepared for Vimy Resources Limited by Golder Associates Pty Ltd

# Table of Contents



# List of Tables

# 1. Summary

The table below presents the environmental management target/s to measure achievement of the environmental objective that must be met through implementation of this Management Plan (MP).

| Title of proposal | Mulga Rock Uranium Project |
|---|---|
| Proponent | Vimy Resources Limited |
| Environmental Scoping Document | Assessment Number 1979 |
| Purpose of this MP | The Feral Animal Management Plan is submitted to outline MRUP's proposed procedures and practices to be implemented to meet the EPA's environmental objective for the key environmental factor/s. |
| EPA's environmental objective for the key environmental factor/s | Terrestrial Fauna: To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.<br>Flora and Vegetation: To maintain representation, diversity, viability and ecological function at the species, population and community level. |
| Environmental objective | Ensure feral animal numbers do not increase and no fauna are encouraged to site by attraction to any facilities. |
| Management target/s | • Management target 1: Avoid or minimise the introduction and spread of feral animals. |

**Corporate endorsement**

I hereby certify that to the best of my knowledge, the MP provisions within this Feral Animal Management Plan are true and correct.

[Signature of duly authorised proponent representative]

Name: Signed:

Designation: Date:

# 2. Context, scope and rationale

## 2.1 What is the proposal?

Vimy Resources Limited (Vimy) proposes to develop the Mulga Rock Uranium Project (MRUP or the Project) which lies approximately 240km east-north-east of Kalgoorlie-Boulder in the Shire of Menzies. The area is remote, located on the western flank of the Great Victoria Desert, comprising series of large, generally parallel sand dunes, with inter-dunal swales and broad flat plains.

The MRUP covers approximately 102,000 hectares on granted mining tenure (primarily M39/1080 and M39/1081) within Unallocated Crown Land (UCL). It includes two distinct mining centres, Mulga Rock East (MRE) comprising the Princess and Ambassador resources and Mulga Rock West (MRW) comprising the Emperor and Shogun resources, which are approximately 20km apart. Up to 4.5 Million tonnes per annum (Mtpa) of ore will be mined using traditional open cut techniques, crushed, beneficiated and then processed onsite to produce, on average, 1,360 tonnes of uranium oxide concentrate (UOC) per year over the life of the Project. Base metal concentrates will also be extracted using sulphide precipitation after the uranium has been removed and sold separately.

The anticipated Life-of-Mine (LOM) is up to 16 years, based on the currently identified resource.

This MP has been based on *Environmental Assessment Guideline 17* (EPA 2015b) and the EPA's *environmental management-based condition model template* (EPA 2015c).

## 2.2 What key environmental factor/s does this MP address?

This MP specifically addresses the Terrestrial Fauna and Flora and Vegetation environmental factors.

The Terrestrial Fauna and Flora and Vegetation are key environmental factors because six species of introduced mammal have been identified at the MRUP.

Potential environmental impacts as a result of feral animals include:

- Increased populations of feral predators (especially cats) may have a deleterious effect on native animal populations through predation.
- Increased populations of feral herbivores (such as rabbits and camels) may impact native populations through increased competition for resources, and cause a decline in vegetation health and reduce revegetation success.

Potential safety and health impacts as a result of feral animals include:

- Camels pose a major safety hazard to occupants of vehicles travelling to and from the MRUP. Camels may also pose a safety hazard once entering the Project area, either through becoming trapped in an excavation or fenced area that needs to be accessed by personnel, or by bolting after being startled.
- Mice pose a significant risk to kitchen and camp hygiene. The increase in mice numbers, if not managed, may act as an attractant and food source to feral cats.

## 2.3 Rationale and approach in meeting the environmental objective

Results of baseline surveys and a number of assumptions and uncertainties inform the management approach for meeting the EPA's environmental objective for Flora and Vegetation. The identified management actions, management targets and proposed review and revision processes are aligned with the overall management approach.

### 2.3.1 Results of baseline surveys conducted

Two non-species-specific terrestrial fauna surveys have been undertaken on and around the MRUP area. These two surveys were concerned (in part) with identifying feral animal species in the vicinity of the MRUP. Vimy also conducted an extensive, multi-year monitoring program using remote operation cameras (the Camera Trapping Protocol [CTP]) which captured numerous images of feral animal species in the area.

Six species of introduced mammals have been identified (by either in the field surveys, the CTP or visual observations from field staff or fauna consultants) in the region (Table 2.1). Camels have been observed to be widespread and abundant.

**Table 2.1: Feral animal species identified in the vicinity of the MRUP**

| Mammals | |
|---|---|
| **Scientific Name** | **Common Name** |
| *Felis catus* | Cat |
| *Canis familiaris* | Dog or cross-breed Dingo |
| *Oryctolagus cuniculus* | Rabbit |
| *Camelus dromedarius* | One-humped Camel |
| *Equus asinus* | Donkey |
| *Mus musculus domesticus* | House Mouse |

### 2.3.2 Key assumptions and uncertainties

All of the species identified above have been sighted on site. Any other feral species that are nationally listed which have not been identified will also be managed.

### 2.3.3 Management approach

An adaptive risk based approach to management has been adopted by Vimy for the MRUP. This has been informed by a range of specialist scientific studies for the MRUP and regional area, as well as database searches and other regional project information.

This information has allowed Vimy to prioritise and manage significant risks using the mitigation hierarchy (i.e. avoid, minimise, manage, rehabilitate and offset) and develop an adaptive management system. Adaptive management allows for adaptations due to changing project conditions and the dynamic nature of ecosystems in order to achieve the MRUP environmental objectives.

This management approach is consistent for all the environmental factors for the Project.

### 2.3.4 Rationale for choice of management target/s

Vimy has chosen management based targets to prioritise significant risks identified for the project and are based on:

- Baseline information and available data for the site and local region.
- The relationship between relevant proposal aspects and impacts on the environmental factor at the MRUP.
- Scientific credibility.
- Consistent with monitoring programs already underway on the site, in the region and industry standards.

Management targets will be reviewed annually to ensure they remain relevant and reflect Vimy and the EPA's environmental objective. Any changes to management targets reported as part of the Annual Environmental Report (AER).

# 3. MP provisions

This section of the MP identifies the legal provisions that Vimy proposes to implement to ensure that the impact upon the flora and vegetation resulting from the development of the MRUP is minimised in terms of both its extent and duration. It identifies the management target/s that Vimy will use to measure performance and monitoring that will be undertaken in relation to the management target/s. Finally, it identifies how Vimy will review and revise management actions if the management targets are exceeded.

## 3.1 Environmental objective

Ensure feral animal numbers do not increase and no fauna are encouraged to site by attraction to any facilities.

## 3.2 Management actions to be implemented

MRUP activities/aspects which have the potential to cause environmental impacts as a result of feral animals have been evaluated through a risk analysis. No risks were identified that required potential 'very high' or 'high' risks or impacts requiring specific management. Despite this, in the interest of continual improvement, Vimy will implement the risk-based management actions presented in Table 3.1.

**Table 3.1: Risk-based management actions that will be implemented to meet the environmental objective**

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| **Feral animals attracted to company facilities (e.g. water sources) or observed to be increasing within the Project area.** | | | | |
| Degradation and depletion of water sources and supplies through increased pest numbers | Investigation into the extent to which it is caused by Project activities.<br><br>Appropriate measures implemented to either:<br>• Prevent access to what is acting as the attractor<br>• Humanely and legally reduce feral animal numbers (baits, traps). | Environmental Management Plan (MRUP-EMP-000)<br>Operational Environmental Management Plan (MRUP-EMP-020)<br>Surface Water Management Plan (MRUP-EMP-009)<br>Environmental Monitoring Management Plan (MRUP-EMP-032) | Low | Construction, Operations and Closure |
| **Large feral animals (e.g. camels) on transport routes to MRUP** | | | | |
| Pest species causing traffic hazards and increasing the risk of injury | Speed limit of 80km/h enforced for all company personnel, contractors and visitors to site on company controlled transport routes leading to MRUP.<br>Standard practices implemented to ensure occupants of all vehicles travelling on transport routes are informed of recent large animal sightings prior to travel.<br>Education of all site workers of the dangers of large feral animals on the access roads (i.e. inclusion in Site Induction). | Environmental Management Plan (MRUP-EMP-000)<br>Operational Environmental Management Plan (MRUP-EMP-020) | Medium | Construction, Operations and Closure |

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| **Large feral animals within Project area** | | | | |
| Degradation and depletion of water sources, natural resources through increased pest numbers | Fence off pits or other hazards that may trap feral animals.<br>Remove or isolate (fence off) attractors to feral animals (e.g. water sources).<br>Standard practices implemented to ensure all site personnel are informed of sightings of large feral animals on or around the Project area.<br>Education of all site workers of the dangers of large feral animals on site and what actions should be taken if they are sighted. | Environmental Management Plan (MRUP-EMP-000)<br>Operational Environmental Management Plan (MRUP-EMP-020)<br>Surface Water Management Plan (MRUP-EMP-009)<br>Environmental Monitoring Management Plan (MRUP-EMP-032) | Low | Construction, Operations and Closure |
| **Feral animals that may be a hygiene risk (e.g. rodent infestation)** | | | | |
| Pest species increasing the risk of disease transmission | Investigation into the cause of the infestation.<br>Appropriate measures implemented to:<br>• Reduce/remove the attractant<br>• Humanely reduce their numbers (baits, traps, fumigation).<br>• Clean formerly infested area. | Environmental Management Plan (MRUP-EMP-000)<br>Operational Environmental Management Plan (MRUP-EMP-020)<br>Environmental Monitoring Management Plan (MRUP-EMP-032)<br>Waste Management Plan (MRUP-EMP-026) | Low | Construction, Operations and Closure |

## 3.3 Management target

Management targets will be employed to measure and report against achievement of MRUP's environmental objective. The results of the terrestrial fauna baseline studies suggest that the management targets listed in Table 3.2 will achieve Vimy's environmental objective.

**Table 3.2: Management target/s to measure the efficacy of management actions relative to the environmental objective**

| | |
|---|---|
| Proposed environmental objective | Ensure feral animal numbers do not increase and no fauna are encouraged to site by attraction to any facilities. |
| Management target 1 | Avoid or minimise the introduction and spread of feral animals. |

## 3.4 Monitoring

The purpose of monitoring is to inform, through the management target/s, if the environmental objective (Section 3.1) is being achieved and when management actions will have to be reviewed and revised. This section describes how Vimy will undertake monitoring to determine whether the management targets are achieved.

Proposed monitoring methods, locations, parameters and frequencies are outlined in Table 3.3 below. Exact monitoring locations will be finalised as part of the operational MPs and the development of the Environmental Monitoring Management Plan (MRUP-EMP-032). Where practicable, monitoring points will be located to correlate with previous baseline surveys.

**Table 3.3: Monitoring to measure the efficacy of management actions against the management targets**

| Indicator | Method | Location | Parameters | Frequency |
|---|---|---|---|---|
| **Management target 1**: Avoid or minimise the introduction and spread of feral animals. | | | | |
| No increase in the occurrence of feral animals within the Project area beyond natural variability. | Feral Animal MP (MRUP-EMP-006) implemented and followed | Project area | Increase in population or species numbers | Annual fauna surveys. |

## 3.5 Review and revision of management actions

In the event that a management target is not met or is exceeded, Vimy will implement the following procedure:

- Investigate the potential cause of failing to meet the management target and identify any impacts from feral animals, and
- If the causes of failing to meet the management target or any impacts identified are a result of the MRUP, the risk assessment will be reviewed and revised risk based management actions will be implemented so that the MRUP environmental objective is met.

Performance meeting management targets will be reported as part of the Annual Environmental Report (AER).

### 3.5.1 Corrective Actions

If monitoring actions outlined in Section 3.4 indicate that the indicators and management targets are not being met then the associated corrective actions outlined in Table 3.4 will be implemented.

**Table 3.4: Feral animal corrective actions**

| Performance Indicator | Action | Responsibility |
|---|---|---|
| Feral or native fauna observed to be attracted to Project facilities | Control measures put in place to prevent access to Project facilities acting as an attractant (e.g. fencing). | Environmental Manager in consultation with Mine Manager |
| Feral animal numbers are determined to be increasing within the Project area but NOT causing a hazard to site personnel | Environmental Manager investigates the extent to which the population increase is caused by Project activities.<br>Appropriate control measures are put in place (fencing, trapping, baiting). | Environmental Manager in consultation with Mine Manager |
| Feral animals are causing a hazard to site personnel (within the Project area or on access roads to Project area) | Environmental Manager investigates hazard.<br>Appropriate measures are put in place to minimise threat (fencing, personnel access restrictions, vehicle speed restrictions).<br>Environmental Manager informs all site personnel of hazard and appropriate methods of avoiding it. | Environmental Manager in consultation with Mine Manager |
| Measurable deterioration in the condition of any terrestrial fauna habitat in the Project area is identified | Identify whether the cause of the deterioration is related to feral animals.<br>If related to feral animals identify whether the relationship is caused or aggravated by Project activities.<br>If related to Project activities, enact appropriate measures to control feral animal populations or access to the affected vegetation (e.g. fencing, baiting, relocation, trapping). | Environmental Manager in consultation with Mine Manager |
| Measurable deterioration in health or vegetation communities or species diversity at baseline monitoring locations within or outside of Project area | Identify whether the cause of the deterioration is related to feral animals.<br>If related to feral animals identify whether the relationship is caused or aggravated by Project activities.<br>If related to Project activities, enact appropriate measures to control feral animal populations or access to the affected vegetation (e.g. fencing, baiting, relocation, trapping). | Environmental Manager in consultation with Mine Manager |
| Feral animal infestations causing hygiene hazards to camp food and/or water supplies or accommodation areas | Environmental Manager investigates hazard.<br>Appropriate measures are put in place to minimise threat (changes to food storage, barriers to access to camp water supplies, clean-up of infested areas).<br>Environmental Manager informs all site personnel of hazard and appropriate methods of avoiding it. | Environmental Manager in consultation with Camp Manager |

## 3.6 Reporting provisions

### 3.6.1 Annual reporting

Performance in controlling feral animals impacts will be assessed against management targets outlined in Table 3.2 and reported as part of the AER. In the event that the MRUP environmental objective is not achieved during the reporting period, the AER will include a description of the effectiveness of revised and/or additional management actions implemented and an analysis of trends.

The first AER will be submitted in accordance with the timeline outlined in the Condition Statement following the acceptance of the PER by the EPA.

### 3.6.2 Reporting on exceedance of the management target

In the event of a failure of a management target outlined in Table 3.2 resulting in a significant environmental impact, Vimy will verbally notify the CEO of the OEPA within 48 hours of learning of the exceedance. A written report detailing the exceedance and the outcome of the investigation will be provided to the CEO of the OEPA within seven days. Exceedances of management targets not deemed significant will be reported in the AER.

A significant impact is defined as an unplanned, long term or irreversible impact as a result of feral animals to flora, vegetation or fauna of conservation significance within the MRUP Project Envelope as a result of MRUP activities.

The MP reporting template is presented in Table 3.5.

**Table 3.5: Management Plan reporting table**

| Key environmental factor: Flora and Vegetation and Terrestrial Fauna | | |
|---|---|---|
| Environmental objective and management target set in the MP | Reporting on the management objective and management target for [Month 20xx] to [Month 20yy] | Status[1] |
| Environmental objective: Ensure feral animal numbers do not increase and no fauna are encouraged to site by attraction to any facilities. | Feral animal numbers *[did / did not]* increase and fauna *[were / were not]* encouraged to site by attraction to any facilities. | ■ YES or<br>● NO |
| Management target 1: Avoid or minimise the introduction and spread of feral animals. | Management target 1: The introduction and spread of feral animals *[was / was not]* avoided or minimised. | ■ YES or<br>● NO |
| Notes:<br>1. The status of achievement of the environmental objectives is indicated by the following symbols:<br>■ Environmental objective achieved<br>● Environmental objective not achieved | | |

# 4. Adaptive management and review of the MP

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

- Monitoring data will be systematically evaluated and compared to baseline and reference site data in accordance with Table 3.3 in a process of adaptive management to verify whether responses to the impact are the same or similar to predictions.
- Re-evaluate the risk assessment and revision of risk-based priorities on the basis of monitored information.
- Increased understanding of the local and regional ecological regime.
- Revision when management actions are not as effective as predicted.
- 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.).
- Review of MP – changes to MP provisions required by a condition, timeframe, etc.

# 5. Stakeholder consultation

Consultation relevant to this MP has been undertaken with Decision Making Authorities (DMAs) and other relevant State government departments and local government authorities, in particular the Department of Parks and Wildlife (DPAW) in Perth and Kalgoorlie.

# 6. References

The following references were used in developing this MP.

Department of Environment and Conservation (DEC) (2011). *Standard Operating Procedure 5.2 – Remote Operation of Cameras*, Version 1.0, Perth, Western Australia.

EPA (2015a) *Environmental Assessment Guideline for Environmental principles, factors and objectives, EAG 8*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015b) *Environmental Assessment Guideline for Preparation of management plans under Part IV of the Environmental Protection Act 1986, EAG 17*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015c) *Title of Condition Environmental Management Plan, Environmental management-based condition model template*. Environmental Protection Authority, Perth, Western Australia.

EPA and DEC (2010) T*echnical Guide: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment*, Perth, Western Australia.

Martinick (1986). *Mulga Rock - Flora, Fauna and Radioecology Survey*, unpublished report by 'W.G Martinick and Associates Pty Ltd' for PNC Exploration (Australia) Pty Ltd, January 1986.

National Health and Medical Research Council Australian Research Council (2013) *Australian Code for the Care and Use of Animals for scientific purposes* 8th Edition, Commonwealth of Australia.

Ninox Wildlife Consulting (2010). A *Fauna Survey of the Proposed Mulga Rock Project Area, Great Victoria Desert, Western Australian*, unpublished report by Ninox Wildlife Consulting for Energy and Minerals Australia, January 2010**.**

Vimy Resources Limited (2015a). *Camera Trapping Protocol - Sandhill Dunnart (Sminthopsis psammophila) - Mulga Rock Project Area*, unpublished report prepared by Jan Henry, Xavier Moreau and Morris Wu for Vimy Resources, June 2015.

# Mulga Rock Uranium Project

# Subterranean Fauna Management Plan

## MRUP-EMP-007

November 2015


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## Prepared for Vimy Resources Limited by Golder Associates Pty Ltd

# Table of Contents



# List of Tables

# 1. Summary

The table below presents the environmental management target/s to measure achievement of the environmental objective that must be met through implementation of this Management Plan (MP).

| Title of proposal | Mulga Rock Uranium Project |
|---|---|
| Proponent | Vimy Resources Limited |
| Environmental Scoping Document | Assessment Number 1979 |
| Purpose of this MP | The Subterranean Fauna Management Plan is submitted to outline MRUP's proposed procedures and practices to be implemented to meet the EPA's environmental objective for the key environmental factor/s. |
| EPA's environmental objective for the key environmental factor/s | Subterranean Fauna: To maintain representation, diversity, viability and ecological function at the species, population and assemblage level. |
| Environmental objective | To ensure that subterranean fauna (both stygofauna and troglofauna) within the Project area are protected from unnecessary destruction, disturbance or degradation over the course of the mining operation. |
| Management target/s | • Management target 1: Avoid hydrocarbons or other chemicals entering the soil and overburden or groundwater.<br>• Management target 2: Minimise disturbance to potential habitats of stygofauna (groundwater fauna). |

**Corporate endorsement**

I hereby certify that to the best of my knowledge, the MP provisions within this Subterranean Fauna Management Plan are true and correct.

[Signature of duly authorised proponent representative]

Name: Signed:

Designation: Date:

# 2. Context, scope and rationale

## 2.1 What is the proposal?

Vimy Resources Limited (Vimy) proposes to develop the Mulga Rock Uranium Project (MRUP or the Project) which lies approximately 240km east-north-east of Kalgoorlie-Boulder in the Shire of Menzies. The area is remote, located on the western flank of the Great Victoria Desert, comprising series of large, generally parallel sand dunes, with inter-dunal swales and broad flat plains.

The MRUP covers approximately 102,000 hectares on granted mining tenure (primarily M39/1080 and M39/1081) within Unallocated Crown Land (UCL). It includes two distinct mining centres, Mulga Rock East (MRE) comprising the Princess and Ambassador resources and Mulga Rock West (MRW) comprising the Emperor and Shogun resources, which are approximately 20km apart. Up to 4.5 Million tonnes per annum (Mtpa) of ore will be mined using traditional open cut techniques, crushed, beneficiated and then processed onsite to produce, on average, 1,360 tonnes of uranium oxide concentrate (UOC) per year over the life of the Project. Base metal concentrates will also be extracted using sulphide precipitation after the uranium has been removed and sold separately.

The anticipated Life-of-Mine (LOM) is up to 16 years, based on the currently identified resource.

This MP has been based on *Environmental Assessment Guideline 17* (EPA 2015b) and the EPA's *environmental management-based condition model template* (EPA 2015c).

## 2.2 What key environmental factor/s does this MP address?

This MP specifically addresses the Subterranean Fauna environmental factor.

Management of Subterranean Fauna is a key environmental factor for this proposal because they show high endemism and many are relics from previous climatic conditions. The importance of retaining subterranean fauna biodiversity lies in preserving ecosystem function.

Potential direct impacts on stygofauna populations (if they occur) include:

- Groundwater abstraction from the proposed extraction borefield at Kakarook North and associated drawdown in water table.
- Mine dewatering that would precede the commencement of open cut mining, and the subsequent altering of water levels.
- Reinjection of mine dewatering water into the aquifer in a different location downstream from the mining area, and potential for habitat loss or modification.
- Seepage from the base of in-pit TSFs and the potential for the modification of groundwater quality.
- Hydrocarbon spillage.

Potential impacts on troglofauna populations (if they occur) include:

- Overburden removal associated with the open cut mining operations.
- Hydrocarbon spillage.

Potential indirect impacts to both stygofauna and troglofauna (if they occur) include:

- Vibrations from heavy equipment that could cause subterranean voids to collapse.
- Reduction in organic inputs (i.e. vegetation clearing and stockpiling of topsoil may reduce the flow of organic material into shallow subterranean systems).

## 2.3 Rationale and approach in meeting the environmental objective

Results of baseline surveys and a number of assumptions and uncertainties inform the management approach for meeting MRUP's objectives for protection of subterranean fauna. The identified management actions, management targets and proposed review and revision of management actions are aligned with the overall management approach.

### 2.3.1 Results of baseline surveys conducted

There have been two subterranean surveys undertaken in the Project area. Prior to these surveys, there have been no recorded stygofauna located within 100km of the Project area (Rockwater 2015).

#### Stygofauna

The aquifer underlying the mining area and the reinjection area is saline to hypersaline (with recorded salinities typically greater than 50,000mg/L TDS (Rockwater 2015)) and no stygofauna were detected during surveys.

The Kakarook North aquifer, from which water will be extracted for processing and other purposes, is brackish (generally less than 5,300mg/L TDS). Only two species of aquatic worms were collected from two of the 12 holes sampled. The groundwater oligochaete *Enchytraeus* sp. 1 (PSS) is a species complex that has been recorded in other parts of WA including the Pilbara, Kimberley and Northern Goldfields regions. Tubificidae sp. MR1 is a potential new species and has only been recorded from the Kakarook North area (Rockwater 2015).

#### Troglofauna

Only three species of troglofauna were detected during the site sampling; two symphylans and an isopod (Rockwater 2015). Two of these species may be affected by the Project development, but both were also sampled well beyond the Development Envelope. The study found that the troglofauna habitat is potentially widespread over a distance of at least 50km in the broader region.

The superficial Aeolian sands that mostly characterise the Project area not considered a core habitat for true troglofauna and deeper underlying sandy layers are unlikely to contain any suitable fissures or voids. The only likely exception may be the extent to which ancient root channels may have created such voids in this material.

### 2.3.2 Key assumptions and uncertainties

Studies of subterranean fauna have highlighted considerable challenges related to

- Identifying species.
- Limitations of sampling with respect to stratification and behavioural avoidances.
- Understanding the ecological function.

The sampling undertaken for MRUP is assumed to be representative of the stygofauna and troglofauna assemblages and distribution.

### 2.3.3 Management approach

An adaptive risk based approach to management has been adopted by Vimy for the MRUP. This has been informed by a range of specialist scientific studies for the MRUP and regional area, as well as database searches and other regional project information.

This information has allowed Vimy to prioritise and manage significant risks using the mitigation hierarchy (i.e. avoid, minimise, manage, rehabilitate and offset) and develop an adaptive management system. Adaptive management allows for adaptations due to changing project conditions and the dynamic nature of ecosystems in order to achieve the MRUP environmental objectives.

This management approach is consistent for all the environmental factors for the Project.

### 2.3.4 Rationale for choice of management target/s

Vimy has chosen management based targets . These have been chosen to prioritise significant risks identified for the project and are based on:

- Baseline information and available data for the site and local region.
- The relationship between relevant proposal aspects and impacts on the environmental factor at the MRUP.
- Scientific credibility.
- Consistent with monitoring programs already underway on the site, in the region and industry standards.

Management targets will be reviewed annually to ensure they remain relevant and reflect Vimy and the EPA's environmental objective. Any changes to management targets will be reported as part of the Annual Environmental Report (AER).

# 3. MP provisions

This section of the MP identifies the legal provisions that Vimy proposes to implement to avoid or minimise disturbance or potential impact to subterranean fauna (both stygofauna and troglofauna) during the course of the development and operation of the MRUP. It identifies the management target/s that Vimy will use to measure performance and monitoring that will be undertaken in relation to the management target/s. Finally, it identifies how Vimy will review and revise management actions if the management targets are exceeded.

## 3.1 Environmental objective

To ensure that subterranean fauna (both stygofauna and troglofauna) within the Project area are protected from unnecessary destruction, disturbance or degradation over the course of the mining operation.

## 3.2 Management actions to be implemented

MRUP activities/aspects which have the potential to cause environmental impacts from dust have been evaluated through a risk analysis. No risks were identified that required potential 'very high' or 'high' risks or impacts requiring specific management. Despite this, in the interest of continual improvement, Vimy will implement the risk-based management actions presented in Table 3.1.

**Table 3.1: Risk-based management actions that will be implemented to meet the environmental objective**

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| Chemical or Hydrocarbon Spills | Storing and handling of all hydrocarbons and other potentially hazardous chemicals in accordance with the relevant management plans | Operational Environmental Management Plan (MRUP-EMP-020)<br>Chemical and Hydrocarbon Management Plan (MRUP-EMP-037). | Low | Lift of mine |
| | Regular inspections of all stored hydrocarbons and hazardous chemicals by relevant personnel (Environmental Department, Safety Manager, or Site Manager) | Chemical and Hydrocarbon Management Plan (MRUP-EMP-037) | Low | Lift of mine |
| | Response to spillages in accordance with the relevant management plans | Spill Response Management Plan (MRUP-EMP-027)<br>Chemical and Hydrocarbon Management Plan (MRUP-EMP-037).<br>Waste Management Plan (MRUP-EMP-026) | Low | Lift of mine |
| | Regular monitoring of groundwater quality for evidence of chemical or hydrocarbon spills in accordance with the relevant management plans. | Groundwater Management Plan (MRUP-EMP-010)<br>Environmental Monitoring Management Plan (MRUP-EMP-032) | Low | Lift of mine |
| Worker Awareness | Ensure all onsite workers are aware of the presence of subterranean fauna, the importance of its conservation and actions that may be detrimental to its survival (e.g. chemical/hydrocarbon spills, pollution or chemical imbalance of reinjection water). | Environmental Management Plan (MRUP-EMP-000)<br>Operational Environmental Management Plan (MRUP-EMP-020)<br>Environmental Induction and Training Management Plan (MRUP-EMP-039) | Very low | Lift of mine |

## 3.3 Management target

Management targets will be employed to measure and report against achievement of MRUP's environmental objective. The results of the subterranean fauna baseline studies suggest that the management targets listed in Table 3.2 will achieve Vimy's environmental objective.

**Table 3.2: Management target/s to measure the efficacy of management actions relative to the environmental objective**

| | |
|---|---|
| Proposed environmental objective (for MP during assessment) | To ensure that subterranean fauna (both stygofauna and troglofauna) within the Project area are protected from unnecessary destruction, disturbance or degradation over the course of the mining operation. |
| Management target 1 | Avoid hydrocarbons or other chemicals entering the soil and overburden or groundwater. |
| Management target 2 | Minimise disturbance to potential habitats of stygofauna (groundwater fauna). |

## 3.4 Monitoring

The purpose of monitoring is to inform, through the management target/s, if the environmental objective (Section 3.1) is being achieved and when management actions will have to be reviewed and revised. This section describes how Vimy will undertake monitoring to determine whether the management targets are achieved.

Proposed monitoring methods, locations, parameters and frequencies are outlined in Table 3.3 below. Exact monitoring locations will be finalised as part of the operational MPs and the development of the Environmental Monitoring Management Plan (MRUP-EMP-032). Where practicable, monitoring points will be located to correlate with previous baseline surveys.

Monitoring of the groundwater quality will continue throughout the life of the mine until closure, as per the protocols established within the Groundwater Management Plan (MRUP-EMP-010) and the Environmental Monitoring Management Plan (MRUP-EMP-032).

**Table 3.3: Monitoring to measure the efficacy of management actions against the management targets**

| Indicator | Method | Location | Parameters | Frequency |
|---|---|---|---|---|
| **Management target 1**: Avoid hydrocarbons or other chemicals entering the soil and overburden or groundwater. | | | | |
| All hydrocarbons and chemicals stored in accordance with established procedures. | Storing and handling of all hydrocarbons and other potentially hazardous chemicals in accordance with the relevant management plans:<br>• Operational Environment Management Plan (MRUP-EMP-020)<br>• Waste Management Plan (MRUP-EMP-026)<br>• Chemical and Hydrocarbon Management Plan (MRUP-EPM-037) | Project area | Management of spills | As required following incident |
| All spills managed in accordance with established procedures. | Response to spillages be in accordance with the relevant management plans:<br>• Spill Response Management Plan (MRUP-EMP-027)<br>• Groundwater Management Plan (MRUP-EMP-010). | Project area | Management of spills | As required following incident |
| **Management target 2**: Minimise disturbance to potential habitats of stygofauna (groundwater fauna). | | | | |
| Compliance with the Water Operating Strategy | Ensure groundwater is extracted, reinjected and managed in accordance with the Groundwater Management Plan (MRUP-EMP-010).<br>Implementation of Water Operating Strategy (MRUP-EMP-021) | Project area | Volume of water extracted<br>Volume of water reinjected | Lift of mine<br>Closure |

## 3.5 Review and revision of management actions

In the event that a management target is not met or is exceeded, Vimy will implement the following adaptive management procedure:

- Investigate the potential cause of failing to meet the management target and identify any impacts to subterranean fauna resulting from this failing.
- If the causes of failing to meet the management target or any impacts identified are a result of the MRUP, the risk assessment will be reviewed and revised risk based management actions will be implemented so that the MRUP environmental objective is met.

Performance meeting management targets will be reported as part of the Annual Environmental Report (AER).

### 3.5.1 Corrective Actions

If monitoring actions outlined in Section 3.4 indicate that the indicators and management targets are not being met then the associated corrective actions outlined below will be implemented.

**Table 3.4: Subterranean Fauna Corrective Actions**

| Performance Indicator | Action | Responsibility |
|---|---|---|
| Hydrocarbon or hazardous chemical spill occurs | Environmental Department investigates the cause of the spill and, particularly, whether all directives in the relevant Management Plans were adhered to (such as Operational Environmental MP: MRUP-EMP-020).<br>Environmental Department investigates the response to the spill and whether all directives in the Spill Response MP (MRUP-EMP-027) were adhered to.<br>Environmental Department investigates the size of the spill, the area affected and whether a risk exists of the spill entering the groundwater.<br>Procedures are reviewed and changes made to the relevant Environmental Management Plan(s), if required, to prevent a repeat of the incident.<br>If groundwater is likely to be impacted, a program of groundwater monitoring is instigated to determine extent, if any, of groundwater pollution due to spill in accordance with the Groundwater MP (MRUP-EMP-010) and Environmental MP (MRUP-EMP-032). | Environmental Department in consultation with the Fuel/Chemical Stores Manager. |
| Extraction or reinjection of water from/to groundwater not in accordance with appropriate Management Plan | Environmental Manager investigates the cause of the incident and, particularly, whether all directives in the Groundwater MP (MRUP-EMP-010) were adhered to.<br>Environmental Manager investigates likely consequences of breach.<br>Procedures are reviewed and changes made to the relevant Management Plan(s), if required, to prevent a repeat of the incident.<br>If groundwater is likely to be impacted, a program of groundwater monitoring is instigated to determine extent, if any, of groundwater pollution due to spill in accordance with the Groundwater MP (MRUP-EMP-010) and Environmental MP (MRUP-EMP-032). | Environmental Department in consultation with Borefield/Reinjection Field Operations Manager. |

## 3.6 Reporting provisions

### 3.6.1 Annual reporting

Performance in protecting subterranean fauna will be assessed against management targets outlined in Table 3.2 and reported as part of the AER. In the event that the MRUP environmental objective is not achieved during the reporting period, the AER will include a description of the effectiveness of revised and/or additional management actions implemented and an analysis of trends.

The first AER will be submitted in accordance with the timeline outlined in the Condition Statement following the acceptance of the PER by the EPA.

### 3.6.2 Reporting on exceedance of the management target

In the event of a failure of a management target outlined in Table 3.3 resulting in a significant environmental impact, Vimy will verbally notify the CEO of the OEPA within 48 hours of learning of the exceedance. A written report detailing the exceedance and the outcome of the investigation will be provided to the CEO of the OEPA within seven days. Exceedances of management targets not deemed significant will be reported in the AER.

A significant impact is defined as an unplanned, long term or irreversible impact to subterranean fauna within the MRUP Development Envelope as a result of MRUP activities.

The MP reporting template is presented in Table 3.5.

**Table 3.5: Management Plan reporting table**

| Key environmental factor: Subterranean Fauna | | |
|---|---|---|
| Environmental objective and management target set in the MP | Reporting on the management objective and management target for [Month 20xx] to [Month 20yy] | Status[1] |
| Environmental objective: To ensure that subterranean fauna (both stygofauna and troglofauna) within the Project area are protected from unnecessary destruction, disturbance or degradation over the course of the mining operation. | Subterranean fauna (both stygofauna and troglofauna) within the Project area *[were / were not]* protected from unnecessary destruction, disturbance or degradation over the course of the mining operation. | ■ YES or<br>● NO |
| Management target 1: Avoid hydrocarbons or other chemicals entering the soil and overburden or groundwater. | Management target 1: Hydrocarbons or other chemicals *[were / were not]* avoided from entering the soil and overburden or groundwater. | ■ YES or<br>● NO |
| Management target 2: Minimise disturbance to potential habitats of stygofauna (groundwater fauna). | Management target 2: Disturbance to potential habitats of stygofauna (groundwater fauna) *[were / were not]* minimised. | ■ YES or<br>● NO |

Notes:

1. The status of achievement of the environmental objectives is indicated by the following symbols:
   - ■ Environmental objective achieved
   - ● Environmental objective not achieved

# 4. Adaptive management and review of the MP

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

- Monitoring data will be systematically evaluated and compared to baseline and reference site data in accordance with Table 3.3 in a process of adaptive management to verify whether responses to the impact are the same or similar to predictions.
- Re-evaluate the risk assessment and revision of risk-based priorities on the basis of monitored information.
- Increased understanding of the local and regional ecological regime.
- Revision when management actions are not as effective as predicted.
- 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.).
- Review of MP – changes to MP provisions required by a condition, timeframe, etc.

# 5. Stakeholder consultation

Consultation regarding subterranean fauna has primarily been with Decision Making Authorities (DMAs) and other relevant State government departments including Department of Parks and Wildlife (DPaW).

# 6. References

The following references were used in developing this MP.

EPA (2007) *Draft Guidance Statement No. 54a (Technical Appendix to Guidance Statement No. 54) - Sampling Methods and Survey Considerations for Subterranean Fauna in Western Australia*, EPA, August 2007.

EPA (2014) *Environmental Assessment Guideline No. 12 - Consideration of Subterranean Fauna in Environmental Impact Assessment in WA*, EPA, June 2013.

EPA (2015a) *Environmental Assessment Guideline for Environmental principles, factors and objectives, EAG 8*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015b) *Environmental Assessment Guideline for Preparation of management plans under Part IV of the Environmental Protection Act 1986, EAG 17*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015c) *Title of Condition Environmental Management Plan, Environmental management-based condition model template*. Environmental Protection Authority, Perth, Western Australia.Government of Western Australia (2011) Environmental Offsets Policy, Perth, Western Australia.

Government of Western Australia (2014) *Environmental Offsets Guidelines*, Perth, Western Australia.

Rockwater (2015) *Mulga Rock Project: Subterranean Fauna Pilot Study*, unpublished report by Rockwater Pty Ltd for Vimy Resources, March 2015.

Woolard (2015) *Mulga Rock Uranium Project: Stygofauna Pilot Assessment*, unpublished report prepared by Colin Woolard Pty Ltd for Vimy Resources, April 2015.

# Mulga Rock Uranium Project

## Surface Water Management Plan

**MRUP-EMP-009**

November 2015


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| | | | | | |

## Prepared for Vimy Resources Limited by Golder Associates Pty Ltd

# Table of Contents



# List of Tables

# 1. Summary

The table below presents the environmental management target/s to measure achievement of the environmental objective that must be met through implementation of this Management Plan (MP).

| Title of proposal | Mulga Rock Uranium Project |
|---|---|
| Proponent | Vimy Resources Limited |
| Environmental Scoping Document | Assessment Number 1979 |
| Purpose of this MP | The Surface Water Management Plan outlines MRUP's proposed procedures and practices to be implemented to meet the EPA's environmental objective for the key environmental factor/s. |
| EPA's environmental objective for the key environmental factor/s | Hydrological Processes: To maintain the hydrological regimes of groundwater and surface water so that existing and potential uses, including ecosystem maintenance, are protected.<br>Inland Waters Environmental Quality: To maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected. |
| Vimy's environmental objective | Prevent or minimise impacts to surface water from MRUP activities. |
| Management target/s | Management target 1: Minimise site impact on natural surface water systems |

**Corporate endorsement**

I hereby certify that to the best of my knowledge, the MP provisions within this Surface Water Management Plan are true and correct.

[Signature of duly authorised proponent representative]

Name: Signed:

Designation: Date:

# 2. Context, scope and rationale

## 2.1 What is the proposal?

Vimy Resources Limited (Vimy) proposes to develop the Mulga Rock Uranium Project (MRUP or the Project) which lies approximately 240km east-north-east of Kalgoorlie-Boulder in the Shire of Menzies. The area is remote, located on the western flank of the Great Victoria Desert, comprising series of large, generally parallel sand dunes, with inter-dunal swales and broad flat plains.

The MRUP covers approximately 102,000 hectares on granted mining tenure (primarily M39/1080 and M39/1081) within Unallocated Crown Land (UCL). It includes two distinct mining centres, Mulga Rock East (MRE) comprising the Princess and Ambassador resources and Mulga Rock West (MRW) comprising the Emperor and Shogun resources, which are approximately 20km apart. Up to 4.5 Million tonnes per annum (Mtpa) of ore will be mined using traditional open cut techniques, crushed, beneficiated and then processed onsite to produce, on average, 1,360 tonnes of uranium oxide concentrate (UOC) per year over the life of the Project. Base metal concentrates will also be extracted using sulphide precipitation after the uranium has been removed and sold separately.

The anticipated Life-of-Mine (LOM) is up to 16 years, based on the currently identified resource.

This MP has been based on *Environmental Assessment Guideline 17* (EPA 2015b) and the EPA's *environmental management-based condition model template* (EPA 2015c).

## 2.2 What key environmental factor/s does this MP address?

This MP specifically addresses the Hydrological Processes and Inland Waters Environmental Quality environmental factors.

Hydrological Processes and Inland Waters Environmental Quality are key environmental factors for this proposal because of their importance in maintaining ecosystem function and health, as well as resources for other users.

There are negligible surface water flows within the MRUP, even under a 1:100 year 72 hour event, with the majority of water captured within defined topographic depressions. The potential for these topographic depressions to fill, overtop and then form an interconnected flow line, is therefore very low, as the vast majority of rainfall will infiltrate the deep sandy soils and recharge the deeper soil horizons. As there are no defined surface water channels or natural surface water bodies within the Project area, there is little risk that the Project will have any impact on natural surface waters. The following potential minor impacts on the local surface environment have been identified:

- Overtopping of surface water storages, including water dams and tailings storage facilities (TSFs), following extreme rainfall events.
- Increased sedimentation in surface water runoff and drainage lines through clearance.
- Disconnection between the surface water and groundwater within the mining areas.

Potential direct impacts that link to flora and vegetation include:

- Changes to habitat as a result of altered surface hydrology.
- Localised runoff within the site areas mobilising contaminants into the surroundings.

## 2.3 Rationale and approach in meeting the environmental objective

Results of baseline surveys and a number of assumptions and uncertainties inform the management approach for meeting MRUP's objectives for protection of surface waters. The identified management actions, management targets and proposed review and revision of management actions are aligned with the overall management approach.

### 2.3.1 Results of baseline surveys conducted

A baseline surface water assessment was conducted by Rockwater (2015) to identify the primary surface water regimes operating within the MRUP area, and to assess the need for surface water management infrastructure. In summary, no defined surface water channels were identified within the Project area; in the event of heavy rainfall, water is expected to collect in local depressions and either evaporate or infiltrate into the ground. No surface water management infrastructure was recommended or considered necessary (Rockwater, 2015).

### 2.3.2 Key assumptions and uncertainties

There is a reasonable confidence level relating to the likelihood and consequences of the MRUP not impacting surface water flows and indirect effects to other environmental factors.

### 2.3.3 Management approach

An adaptive risk based approach to management has been adopted by Vimy for the MRUP. This has been informed by a range of specialist scientific studies for the MRUP and regional area, as well as database searches and other regional project information.

This information has allowed Vimy to prioritise and manage significant risks using the mitigation hierarchy (i.e. avoid, minimise, manage, rehabilitate and offset) and develop an adaptive management system. Adaptive management allows for adaptations due to changing project conditions and the dynamic nature of ecosystems in order to achieve the MRUP environmental objectives.

This management approach is consistent for all the environmental factors for the Project.

### 2.3.4 Rationale for choice of management target/s

Vimy has chosen management based targets. These have been chosen to prioritise significant risks identified for the project and are based on:

- Baseline information and available data for the site and local region.
- The relationship between relevant proposal aspects and impacts on the environmental factor at the MRUP.
- Scientific credibility.
- Consistent with monitoring programs already underway on the site, in the region and industry standards.

Management targets will be reviewed annually to ensure they remain relevant and reflect Vimy and the EPA's environmental objective. Any changes to management targets will be reported as part of the Annual Environmental Report (AER).

# 3. MP provisions

This section of the MP identifies the legal provisions that Vimy proposes to implement to avoid or minimise disturbance or potential impact to surface waters during the course of the development and operation of the MRUP. It identifies the management target/s that Vimy will use to measure performance and monitoring that will be undertaken in relation to the management target/s. Finally, it identifies how Vimy will review and revise management actions if the management targets are exceeded.

## 3.1 Environmental objective

Prevent or minimise impacts to surface water from MRUP activities.

## 3.2 Management actions to be implemented

MRUP activities/aspects which have the potential to cause environmental impacts to surface waters have been evaluated through a risk analysis. No risks were identified that required potential 'very high' or 'high' risks or impacts requiring specific management. Despite this, in the interest of continual improvement, Vimy will implement the risk-based management actions presented in Table 3.1.

**Table 3.1: Risk-based management actions that will be implemented to meet the environmental objective**

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| Risk of flooding or overtopping of operational areas following heavy rainfall. | Monitoring of surface water storage freeboard | Water Operating Strategy (MRUP-EMP-021)<br>Tailings Management Plan (MRUP-EMP-013) | Low | Pre-construction (planning)<br>Life of mine |
| | Dewatering equipment in place to remove any direct rainfall onto the pit areas | Groundwater Management Plan (MRUP-EMP-010) | Low | Life of mine |
| | Appropriate road crossings (floodways) installed at identified low points in access and haul roads | Construction Environmental Management Plan (MRUP-EMP-018) | Low | Construction<br>Life of mine |
| Potential contamination of surface water from leaks and spills from chemical and fuel transfer and storage areas and along transport route. | Bunding of chemical storage and fuelling areas | Construction Environment Management Plan (MRUP-EMP-018)<br>Chemical and Hydrocarbon Management Plan (MRUP-EMP-037) | Low | Construction<br>Life of mine<br>Closure |
| | Develop a Spill Response Management Plan | Spill Response Management Plan (MRUP-EMP-027) | Low | Pre-construction<br>Life of mine |

## 3.3 Management target

Management targets will be employed to measure and report against achievement of MRUP's environmental objective. The results of the baseline studies suggest that the management targets listed in Table 3.2 will achieve Vimy's environmental objective.

**Table 3.2: Management target/s to measure the efficacy of management actions relative to the environmental objective**

| | |
|---|---|
| Proposed environmental objective (for MP during assessment) | Prevent or minimise impacts to surface water from MRUP activities. |
| Management target 1 | Minimise site impact on natural surface water systems |

## 3.4 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 have to be reviewed and revised. This section describes how Vimy will undertake monitoring to determine whether the management targets are achieved.

Proposed monitoring methods, locations, parameters and frequencies are outlined in Table 3.3 below. Exact monitoring locations will be finalised as part of the operational MPs and the development of the Environmental Monitoring Management Plan (MRUP-EMP-032). Where practicable, monitoring points will be located to correlate with previous baseline surveys.

**Table 3.3: Monitoring to measure the efficacy of management actions against the management targets**

| Indicator | Method | Location | Parameters | Frequency |
|---|---|---|---|---|
| **Management target 1:** Minimise site impact on natural surface water systems | | | | |
| Containment of uncontrolled runoff of potentially contaminated surface water | Drainage infrastructure location, design, construction and operation to minimise adverse impacts to surface water; | Project area | Water quality measures; flow volumes | During design, construction, operation and closure (for the life of the Project). |

## 3.5 Review and revision of management actions

In the event that a management target is not met or is exceeded, Vimy will implement the following adaptive management procedure:

- Investigate the potential cause of failing to meet the management target and identify any impacts to surface water.
- If the causes of failing to meet the management target or any impacts identified are a result of the MRUP, the risk assessment will be reviewed and revised risk based management actions will be implemented so that the MRUP environmental objective is met.

Performance meeting management targets will be reported as part of the Annual Environmental Report (AER).

### 3.5.1 Corrective Actions

If monitoring actions outlined in Section 3.4 indicate that the indicators and management targets are not being met then the associated corrective actions outlined below will be implemented.

**Table 3.4: Corrective Actions**

| Performance Indicator | Action | Responsibility |
|---|---|---|
| Surface water quality changes exceed determined values | • Conduct investigation to determine specific cause of the impact.<br>• Review Groundwater MP procedures and update where necessary to reduce further impacts. | Environmental Manager |

## 3.6 Reporting provisions

### 3.6.1 Annual reporting

Performance in protecting surface water will be compared against management targets outlined in Table 3.2 and reported as part of the Annual Environmental Report (AER). In the event that the MRUP environmental objective is not achieved during the reporting period, the AER will include a description of the effectiveness of revised and/or additional management actions implemented and an analysis of trends.

The first AER will be submitted in accordance with the timeline outlined in the Condition Statement following the acceptance of the PER by the EPA.

### 3.6.2 Reporting on exceedance of the management target

In the event of a failure of a management target outlined in Table 3.2 resulting in a significant environmental impact, Vimy will verbally notify the CEO of the OEPA within 48 hours of learning of the exceedance. A written report detailing the exceedance and the outcome of the investigation will be provided to the CEO of the OEPA within seven days. Exceedances of management targets not deemed significant will be reported in the AER.

A significant impact is defined as an unplanned, long term or irreversible impact to surface water within the MRUP Development Envelope as a result of MRUP activities.

The MP reporting template is presented in Table 3.4.

**Table 3.5: Management Plan reporting template**

| Key environmental factor: Hydrological Processes and Inland Waters Environmental Quality | | |
|---|---|---|
| Environmental objective and management target set in the MP | Reporting on the management objective and management target for [Month 20xx] to [Month 20yy] | Status[1] |
| Environmental objective: Prevent or minimise impacts to surface water from MRUP activities.<br><br>Management target 1: Minimise site impact on natural surface water systems. | Impacts to surface water from MRUP activities *[were / were not]* prevented or minimised.<br><br>Management target 1: Site impact on natural surface water systems *[was / was not]* minimised. | ■ YES or<br>● NO<br><br>■ YES or<br>● NO |

Notes:

1. The status of achievement of the environmental objectives is indicated by the following symbols:
   - ■ Environmental objective achieved
   - ● Environmental objective not achieved

# 4. Adaptive management and review of the MP

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

- Re-evaluate the risk assessment and revision of risk-based priorities on the basis of monitored information.
- Increased understanding of the local and regional surface water regime.
- Revision when management actions are not as effective as predicted,
- 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.).
- Review of MP – changes to MP provisions required by a condition, timeframe, etc.

# 5. Stakeholder consultation

Consultation regarding groundwater, surface water and aquifer recharge has predominantly been with Decision Making Authorities (DMAs) and other relevant State government departments including Department of Mines and Petroleum (DMP), Department of Parks and Wildlife (DPaW), Department of Environment (DER), Department of Water (DoW), EPA and the Department of Health (DoH).

# 6. References

The following references were used in developing this MP.

ANZECC and ARMCANZ (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Canberra, ACT.

ANZECC and ARMCANZ (2000), *National Water Quality Management Strategy Paper No.4: Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Canberra, ACT.

EPA (2015a) *Environmental Assessment Guideline for Environmental principles, factors and objectives, EAG 8*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015b) *Environmental Assessment Guideline for Preparation of management plans under Part IV of the Environmental Protection Act 1986, EAG 17*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015c) *Title of Condition Environmental Management Plan, Environmental management-based condition model template*. Environmental Protection Authority, Perth, Western Australia.

DoW (2010) *Operational Policy No. 5.08 – Use of Operating Strategies in the Water Licencing Process*, Perth, Western Australia.

DoW (2013) *Water licensing delivery series - Report No.12: Western Australian water in mining guideline*, Perth, Western Australia.

Government of WA (2004) *State Water Quality Management Strategy Document No. 6*, Perth, Western Australia.

Rockwater (2015) *Mulga Rock Uranium Project, surface water assessment and management plan*. Report for Vimy Resources, July 2015.

Water Authority of W.A. (1994) *Goldfields Groundwater Area Management Plan*. Groundwater and Environment Branch Report GW157.

# Mulga Rock Uranium Project

# Groundwater Management Plan

## MRUP-EMP-010

November 2015


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## Prepared for Vimy Resources Limited by Golder Associates Pty Ltd

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# List of Tables

# 1. Summary

The table below presents the environmental management target/s to measure achievement of the environmental objective that must be met through implementation of this Management Plan (MP).

| Title of proposal | Mulga Rock Uranium Project |
|---|---|
| Proponent | Vimy Resources Limited |
| Environmental Scoping Document | Assessment Number 1979 |
| Purpose of this MP | The Groundwater Management Plan is submitted to outline MRUP's proposed procedures and practices to be implemented to meet the EPA's environmental objective for the key environmental factor/s. |
| EPA's environmental objective for the key environmental factor/s | Hydrological Processes: To maintain the hydrological regimes of groundwater and surface water so that existing and potential uses, including ecosystem maintenance, are protected.<br>Inland Waters Environmental Quality: To maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected. |
| Vimy's environmental objective | To ensure that the impact on the quality of groundwater as a result of the development of the MRUP will be minimised and that there will be no adverse impact upon any contained biota. |
| Management target/s | • Management target 1: Minimise the potential environmental impacts associated with the utilisation of groundwater.<br>• Management target 2: Maximise beneficial uses of water.<br>• Management target 3: Groundwater levels are consistent with predicted hydrogeological regime.<br>• Management target 4: Groundwater quality is maintained within acceptable limits compared to baseline values.<br>• Management target 5: Monitor and report sufficiently to demonstrate compliance. |

**Corporate endorsement**

I hereby certify that to the best of my knowledge, the MP provisions within this Groundwater Management Plan are true and correct.

[Signature of duly authorised proponent representative]

Name: Signed:

Designation: Date:

# 2. Context, scope and rationale

## 2.1 What is the proposal?

Vimy Resources Limited (Vimy) proposes to develop the Mulga Rock Uranium Project (MRUP or the Project) which lies approximately 240km east-north-east of Kalgoorlie-Boulder in the Shire of Menzies. The area is remote, located on the western flank of the Great Victoria Desert, comprising series of large, generally parallel sand dunes, with inter-dunal swales and broad flat plains.

The MRUP covers approximately 102,000 hectares on granted mining tenure (primarily M39/1080 and M39/1081) within Unallocated Crown Land (UCL). It includes two distinct mining centres, Mulga Rock East (MRE) comprising the Princess and Ambassador resources and Mulga Rock West (MRW) comprising the Emperor and Shogun resources, which are approximately 20km apart. Up to 4.5 Million tonnes per annum (Mtpa) of ore will be mined using traditional open cut techniques, crushed, beneficiated and then processed onsite to produce, on average, 1,360 tonnes of uranium oxide concentrate (UOC) per year over the life of the Project. Base metal concentrates will also be extracted using sulphide precipitation after the uranium has been removed and sold separately.

The anticipated Life-of-Mine (LOM) is up to 16 years, based on the currently identified resource.

This MP has been based on *Environmental Assessment Guideline 17* (EPA 2015b) and the EPA's *environmental management-based condition model template* (EPA 2015c).

## 2.2 What key environmental factor/s does this MP address?

This MP specifically addresses the subterranean fauna, hydrological processes and inland waters environmental quality environmental factors.

Groundwater is a key environmental factor for the proposal because as the natural movement of groundwater through the aquifer is very slow, the removal or addition of a large volume of water in one region of the aquifer has the potential to impact on the functioning of the aquifer.

The following potential direct impacts on the groundwater system have been identified:

- Groundwater drawdown associated with pit dewatering and borefield extraction.
- Groundwater mounding within the vicinity of the injection bore field (reinjection borefield).
- Changes to groundwater chemistry resulting from Acid Mine Drainage (mining areas).
- Changes to groundwater chemistry resulting from leaching from the in-pit tailings storage facilities (mining areas).

For many open cut mining projects, additional environmental and safety risks arise from the formation of a pit lake in the remaining mine void after the cessation of mining. This will not occur at the MRUP, as the open voids will be backfilled with mine waste rock or tailings material prior to site closure.

The following potential indirect impacts have been identified:

- Potential impacts on subterranean fauna.
- Potential impacts on groundwater dependent ecosystems or vegetation.
- Impacts to existing and potential groundwater users.
- Increased radionuclide distribution.

The severity of any indirect impacts will depend primarily on:

- The horizontal and vertical extent of any groundwater drawdown cone or mounding.
- Which groundwater quality parameters are affected, and the degree (%) change from background.
- The longevity of the changes.

This Groundwater MP should be read in conjunction with the Groundwater Operating Strategy (MRUP-EMP-011), the Managed Aquifer Recharge Management Plan (MRUP-EMP-012) and the overarching Water Operating Strategy (MRUP-EMP-021) for the site.

## 2.3 Rationale and approach in meeting the environmental objective

Results of baseline surveys and a number of assumptions and uncertainties inform the management approach for meeting MRUP's environmental objective. The identified management actions, management targets and proposed review and revision of management actions are aligned with the overall management approach.

### 2.3.1 Results of studies and modelling investigations conducted

Numerous studies and modelling investigations have been undertaken to assess aspects of the environment relevant to the management of groundwater.

The water table in the Mulga Rock East area is 29 to 49m below ground level (bgl), and generally lies within fine-grained, carbonaceous sediments of Eocene age. The water table is very flat (hydraulic gradient ~0.002), with an elevation of around 285 to 290m Australian Height Datum (AHD). Seasonal and annual water level variations are very small, indicating very little recharge or discharge from the basin.

The extraction or reintroduction of water to the groundwater system will take place in three areas; Kakarook North (extraction borefield), mining areas – dewatering (extraction) and tailings deposition (recharge), and the reinjection borefield (recharge).

#### Kakarook North (extraction borefield)

Kakarook North is a southerly trending sedimentary basin with a saturated thickness of up to 42m. It is proposed to extract water from this location for the duration of the Project at a rate of up to 3.0GL/a, with an expected average of around 1.8GL/a. The total volume of low-salinity groundwater in the area that has been drilled is estimated to be around 167GL: this is equivalent to more than 90 years' extraction of the required supply (Rockwater 2015).

### Mining areas – dewatering (extraction) and tailings deposition (recharge)

The area intended to be mined sits in what is an oxbow remnant of a paleochannel. The water table in the palaeochannel aquifer sits at an elevation of about 285 to 290m AHD; about 50m bgl, and is very flat. There is very little flow into (recharge) or out of (discharge) this basin. However, the gradient of the water table suggests that there is minor flow into the basin from the north-east and an even smaller amount flowing in from the north-west, and that it continues to flow southward. The initial mining area (Mulga Rock East - MRE) sits in a tributary area where the water level is somewhat higher, at up to 300m AHD – between 29 and 49m bgl. Mining in the latter years (Mulga Rock West - MRW) will take place in an area with a flat water table within the main palaeodrainage (basin).

The amount of water required to be extracted for dewatering of the mining areas is dependent upon the area and depth being mined. Modelling suggests that it would vary between 0.06GL/a to 1.5GL/a (Rockwater 2015). This dewatering water will be used for in-pit processing activities and for dust suppression. When the amount of water extracted exceeds these uses (demand is estimated at around 0.85GL/a), the surplus will be reinjected.

In-pit disposal of tailings is estimated to return around 0.25GL/a of water to the aquifer (Rockwater, 2015). Modelling of the in-pit TSF recharge indicated only very minor mounding of groundwater in the vicinity of the in-pit TSF facility during operations, and showed the water table would return to pre-mine conditions in the post-closure environment.

### Reinjection borefield (recharge)

Reinjection into the aquifer will take place about 12km south of the initial mining area (MRE). This is the same aquifer that underlies all the areas being mined, but in an area down-gradient where the groundwater has higher salinity. Consequently, the reinjected water quality will be no worse than that of the groundwater into which it is being injected. Current modelling suggests that reinjection will only occur in years when the amount extracted exceeds around 0.85GL/a, which means that it will only occur in some years (two years under the current modelling). The projected volumes for reinjection suggest that the amount reinjected is unlikely to exceed 0.7GL/a in the years when it is required (Rockwater 2015).

### 2.3.2 Key assumptions and uncertainties

It is assumed that the desktop and field investigations and surveys undertaken for MRUP have sufficiently identified the groundwater characteristics surrounding the Project area.

Groundwater modelling has been based on the predicted mining activities. A change in mining process may affect modelling outcomes.

### 2.3.3 Management approach

An adaptive risk based approach to management has been adopted by Vimy for the MRUP. This has been informed by a range of specialist scientific studies for the MRUP and regional area, as well as database searches and other regional project information.

This information has allowed Vimy to prioritise and manage significant risks using the mitigation hierarchy (i.e. avoid, minimise, manage, rehabilitate and offset) and develop an adaptive management system. Adaptive management allows for adaptations due to changing project conditions and the dynamic nature of ecosystems in order to achieve the MRUP environmental objectives.

This management approach is consistent for all the environmental factors for the Project.

### 2.3.4 Rationale for choice of management target/s

Vimy have chosen management-based management targets. These have been chosen to prioritise significant risks identified for the project and are based on:

- Baseline information and available data for the site and local region.
- The relationship between relevant proposal aspects and impacts on the environmental factor at the MRUP.
- Scientific credibility.
- Consistent with monitoring programs already underway on the site, in the region and industry standards.

Management targets will be reviewed annually to ensure they remain relevant and reflect Vimy and the EPA's environmental objective. Any changes to management targets will be reported as part of the Annual Environmental Report (AER).

# 3. MP provisions

This section of the MP identifies the legal provisions that Vimy proposes to implement to ensure that the impact on the quality of groundwater as a result of the development of the MRUP will be minimised and that there will be no adverse impact upon any contained biota. It identifies the management target/s that Vimy will use to measure performance and monitoring that will be undertaken in relation to the management target/s. Finally, it identifies how Vimy will review and revise management actions if the management targets are exceeded.

## 3.1 Environmental objective

To ensure that the impact on the quality of groundwater as a result of the development of the MRUP will be minimised and that there will be no adverse impact upon any contained biota.

## 3.2 Management actions to be implemented

MRUP activities/aspects which have the potential to cause environmental impacts to groundwater have been evaluated through a risk analysis. No risks were identified that required potential 'very high' or 'high' risks or impacts requiring specific management. Despite this, in the interest of continual improvement, Vimy will implement the risk-based management actions presented in Table 3.1.

**Table 3.1: Risk-based management actions that will be implemented to meet the environmental objective**

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| Groundwater contamination | Develop a Groundwater Management Plan to guide implementation of groundwater management strategies | Groundwater Management Plan (MRUP-EMP-010) | Low | Pre-construction |
| Excess use of groundwater may impact ecosystem function | Develop a Water Operating Strategy to ensure efficiency of water use, so that extraction and injection volumes can be minimised | Water Operating Strategy (MRUP-EMP-021) | Low | Pre-construction |
| | Develop an ongoing groundwater monitoring program to guide monitoring activities | Groundwater Management Plan (MRUP-EMP-010) | Low | Pre-construction |
| | Monitor groundwater levels in all mining areas, the water extraction borefield, and the reinjection borefield | Groundwater Management Plan (MRUP-EMP-010) | Low | Life of mine (Quarterly) |
| | Monitor groundwater quality parameters in all mining areas, the water extraction borefield, and the reinjection borefield | Groundwater Management Plan (MRUP-EMP-010) | Low | Life of mine (Quarterly) |
| Groundwater contamination | Monitor quantity and quality of all water streams (including process water and tailings) that may eventually be reintroduced to the groundwater system | Groundwater Management Plan (MRUP-EMP-010) | Low | Operations (Quarterly) |
| Excess use of groundwater may impact ecosystem function | Monitoring of subterranean fauna communities | Subterranean Fauna Management Plan (MRUP-EMP-007) | Low | Life of mine |
| | Monitoring of flora and vegetation communities | Flora and Vegetation Management Plan (MRUP-EMP-001) | Very low | Life of mine |

## 3.3 Management target

Management targets will be employed to measure and report against achievement of MRUP's environmental objective. The results of the groundwater baseline studies suggest that the management targets listed in Table 3.2 will achieve Vimy's environmental objective.

**Table 3.2: Management target/s to measure the efficacy of management actions relative to the environmental objective**

| | |
|---|---|
| Proposed environmental objective (for MP during assessment) | To ensure that the impact on the quality of groundwater as a result of the development of the MRUP will be minimised and that there will be no adverse impact upon any contained biota. |
| Management target 1 | Minimise the potential environmental impacts associated with the utilisation of groundwater. |
| Management target 2 | Maximise beneficial uses of water. |
| Management target 3 | Groundwater levels are consistent with predicted hydrogeological regime. |
| Management target 4 | Groundwater quality is maintained within acceptable limits compared to baseline values. |
| Management target 5 | Monitor and report sufficiently to demonstrate compliance |

## 3.4 Monitoring

The purpose of monitoring is to inform, through the management target/s, if the environmental objective (Section 3.1) is being achieved and when management actions will have to be reviewed and revised. This Section describes how Vimy will undertake monitoring to determine whether the management targets are achieved.

Proposed monitoring methods, locations, parameters and frequencies are outlined in Table 3.3 below. Exact monitoring locations will be finalised as part of the operational MPs and the development of the Environmental Monitoring Management Plan (MRUP-EMP-032). Where practicable, monitoring points will be located to correlate with previous baseline surveys.

**Table 3.3: Monitoring to measure the efficacy of management actions against the management targets**

| Indicator | Method | Location | Parameters | Frequency |
|---|---|---|---|---|
| **Management target 1:** Minimise the potential environmental impacts associated with the utlisation of groundwater. | | | | |
| Adhere to approval groundwater licence conditions | • Audit confirms compliance with groundwater licence<br>Implement Groundwater Operating Strategy (MRUP-EMP-011) | Project area | Works approvals | Operation |
| **Management target 2:** Maximise beneficial uses of water | | | | |
| Extraction, use and reinjection volumes are within approved parameters | Implement the Managed Aquifer Recharge Management Plan (MRUP-EMP-012) | Project area | Water volume monitoring | Lift of mine, closure |
| **Management target 3:** Groundwater levels are consistent with predicted hydrogeological regime. | | | | |
| Monitoring confirms no adverse impacts | Monitoring confirms no adverse impacts | Project area | Water level monitoring | As required in approved Conceptual Mine Closure Plan (MRUP-EMP-031) |
| **Management target 4:** Groundwater quality is maintained within acceptable limits compared to baseline values. | | | | |
| Groundwater quality is maintained within agreed parameters compared to baseline levels. | Monitoring confirms that site-specific management targets have not been exceeded | Project area | Water quality monitoring | As required in approved Conceptual Mine Closure Plan (MRUP-EMP-031) |

| Indicator | Method | Location | Parameters | Frequency |
|---|---|---|---|---|
| **Management target 5:** Monitor and report sufficiently to demonstrate compliance | | | | |
| Compliance with the approval/license/works approval conditions | Develop and implement a groundwater monitoring program in accordance with an approval, license or works approval<br>Management targets and monitoring strategies developed<br>Monitoring requirements included in the site-specific Groundwater Operating Strategy (MRUP-EMP-011)<br>Reporting requirements fulfilled<br>Compliance with the approval/licence/works approval conditions | Project area | Compliance monitoring | Lift of mine, closure |

## 3.5 Review and revision of management actions

In the event that a management target is not met or is exceeded, Vimy will implement the following adaptive management procedure:

- Investigate the potential cause of failing to meet the management target and identify any impacts to groundwater.
- If the causes of failing to meet the management target or any impacts identified are a result of the MRUP, the risk assessment will be reviewed and revised risk based management actions will be implemented so that the MRUP environmental objective is met.

Performance meeting management targets will be reported as part of the Annual Environmental Report (AER).

### 3.5.1 Corrective Actions

If monitoring actions outlined in Section 3.4 indicate that the indicators and management targets are not being met then the associated corrective actions outlined below will be implemented.

**Table 3.4: Corrective Actions**

| Performance Indicator | Action | Responsibility |
|---|---|---|
| Dewatering volume likely to exceed estimated volume or flow rate | • Conduct investigation to determine specific cause of the impact.<br>• Reassess dewatering volume against licence requirements, and apply for an amendment, if necessary.<br>• Review Groundwater MP procedures and update where necessary to reduce further impacts.<br>• Review potential impacts on the managed aquifer recharge scheme, and adjust the Managed Aquifer Recharge MP (MRUP-EMP-012), where necessary. | General Manager<br><br>Environmental Manager |
| Water supply borefield extraction volume on track to exceed estimated volume or flow rate | • Conduct investigation to determine specific cause of the impact.<br>• Reassess extraction volume against licence requirements, and apply for an amendment, if necessary.<br>• Review Groundwater MP procedures and update where necessary to reduce further impacts. | General Manager<br><br>Environmental Manager |
| Groundwater level changes exceed trigger values | • Conduct investigation to determine specific cause of the impact.<br>• Review Groundwater MP procedures and update where necessary to reduce further impacts. | Environmental Manager |
| Measured groundwater quality falls outside of the site-specific trigger level value for one or more constituents | • Raise as environmental incident report.<br>• Conduct investigation to determine specific cause of the impact.<br>• Implement appropriate control measures to reduce further impact.<br>• Review Groundwater MP procedures and update where necessary to reduce further impacts. | Environmental Manager |

| Performance Indicator | Action | Responsibility |
|---|---|---|
| Water quality of reinjection water falls outside of expected levels for one or more constituents | • Raise as environmental incident report.<br>• Conduct investigation to determine specific cause of the impact.<br>• Implement appropriate control measures to reduce further impact (e.g. dilute process water with fresh groundwater).<br>• Review MAR MP procedures and update where necessary to reduce further impacts. | Environmental Manager |
| Reinjection volume on track to exceed estimated volume or flow rate of recharge | • Conduct investigation to determine specific cause of the impact.<br>• Reassess injection volume against licence requirements, and apply for an amendment, if necessary.<br>• Implement appropriate control measures to reduce further impact (e.g. find alternative uses or disposal methods).<br>• Review Managed Aquifer Recharge MP (MRUP-EMP-012) procedures and update where necessary to reduce further impacts. | General Manager<br><br>Environmental Manager |
| Indirect impacts to subterranean fauna detected | • Raise as environmental incident report.<br>• Conduct investigation to determine if the cause of the impact could be related to site activities covered by this Groundwater MP.<br>• Implement appropriate control measures to reduce further impact. | Environmental Manager |

## 3.6 Reporting provisions

### 3.6.1 Annual reporting

Performance in protecting groundwater will be assessed against management targets outlined in Table 3.2 and reported as part of the AER. In the event that the MRUP environmental objective is not achieved during the reporting period, the AER will include a description of the effectiveness of revised and/or additional management actions implemented and an analysis of trends.

The first AER will be submitted in accordance with the timeline outlined in the Condition Statement following the acceptance of the PER by the EPA.

### 3.6.2 Reporting on exceedance of the management target

In the event of a failure of a management target outlined in Table 3.2 resulting in a significant environmental impact, Vimy will verbally notify the CEO of the OEPA within 48 hours of learning of the exceedance. A written report detailing the exceedance and the outcome of the investigation will be provided to the CEO of the OEPA within seven days. Exceedances of management targets not deemed significant will be reported in the AER.

A significant impact is defined as an unplanned, long term or irreversible impact to groundwater within the MRUP Development Envelope as a result of MRUP activities.

The MP reporting template is presented in Table 3.5.

**Table 3.5: Management Plan reporting table**

| Key environmental factor: Hydrological Processes and Inland Waters Environmental Quality | | |
|---|---|---|
| Environmental objective and management target set in the MP | Reporting on the management objective and management target for [Month 20xx] to [Month 20yy] | Status[1] |
| Environmental objective: To ensure that the impact on the quality of groundwater as a result of the development of the MRUP will be minimised and that there will be no adverse impact upon any contained biota. | The impact on the quality of groundwater as a result of the development of the MRUP *[was / was not]* minimised and there *[were / were not]* adverse impacts upon any contained biota. | ■ YES or<br>● NO |
| Management target 1: Minimise the potential environmental impacts associated with the utilisation of groundwater. | Management target 1: The potential environmental impacts associated with the utilisation of groundwater *[were / were not]* minimised. | ■ YES or<br>● NO |
| Management target 2: Maximise beneficial uses of water. | Management target 2: The beneficial uses of water *[were / were not]* maximised | ■ YES or<br>● NO |
| Management target 3: Groundwater levels are consistent with predicted hydrogeological regime. | Management target 3: Groundwater levels *[were / were not]* consistent with predicted hydrogeological regime. | ■ YES or<br>● NO |
| Management target 4: Groundwater quality is maintained within acceptable limits compared to baseline values. | Management target 4: Groundwater quality *[was / was not]* maintained within acceptable limits compared to baseline values. | ■ YES or<br>● NO |
| Management target 5: Monitor and report sufficiently to demonstrate compliance | Management target 5: Monitoring and reporting *[was / was not]* sufficient to demonstrate compliance | ■ YES or<br>● NO |

Notes:

1. The status of achievement of the environmental objectives is indicated by the following symbols:
   - ■ Environmental objective achieved
   - ● Environmental objective not achieved

# 4. Adaptive management and review of the MP

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

- Monitoring data will be systematically evaluated and compared to baseline and reference site data in accordance with Table 3.3 in a process of adaptive management to verify whether responses to the impact are the same or similar to predictions.
- Re-evaluate the risk assessment and revision of risk-based priorities on the basis of monitored information.
- Increased understanding of the local and regional ecological regime.
- Revision when management actions are not as effective as predicted.
- 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.).
- Review of MP – changes to MP provisions required by a condition, timeframe, etc.

# 5. Stakeholder consultation

Consultation regarding groundwater, surface water and aquifer recharge has predominantly been with Decision Making Authorities (DMAs) and other relevant State government departments including Department of Mines and Petroleum (DMP), Department of Parks and Wildlife (DPaW), Department of Environment (DER), Department of Water (DoW), EPA and the Department of Health (DoH).

# 6. References

The following references were used in developing this MP.

ANZECC and ARMCANZ (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Canberra, ACT.

Douglas, G B, Gray, D J, and Butt, C R M (1993) *Geochemistry, mineralogy and hydrogeochemistry of the ambassador multi-element lignite deposit, Western Australia*. Unpublished report to PNC Exploration (Australia) Pty Ltd.

DoW (2011) *Operational Policy No.1.01 – Managed aquifer recharge in Western Australia*, Perth, Western Australia.

DoW (2013) *Strategic Policy No.2.09 – Use of mine dewatering surplus*, Perth, Western Australia.

DoW (2010) *Operational Policy No. 5.08 – Use of Operating Strategies in the Water Licencing Process*, Perth, Western Australia.

DoW (2011) *Operational Policy No. 1.02 – Policy on Water Conservation and Efficiency Plans*, Perth, Western Australia.

EPA (2013) *Environmental Assessment Guideline for Consideration of subterranean fauna in environmental impact assessment in Western Australia*. EAG 12, Perth, Western Australia.

EPA (2015a) *Environmental Assessment Guideline for Environmental principles, factors and objectives, EAG 8*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015b) *Environmental Assessment Guideline for Preparation of management plans under Part IV of the Environmental Protection Act 1986, EAG 17*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015c) *Title of Condition Environmental Management Plan, Environmental management-based condition model template*. Environmental Protection Authority, Perth, Western Australia.

Government of WA (2004) *State Water Quality Management Strategy Document No. 6*, Perth, Western Australia.

GRC (1984) *Lake Minigwal Uranium Prospect, groundwater study*, for PNC Exploration (Australia) Pty Ltd.

GRC (1985) *Mulga Rock Prospect, Stage 2 hydrogeological investigation*, for PNC Exploration (Australia) Pty Ltd.

GRC (1986) *Report on groundwater exploration at Mulga Rock Prospect, 1985*, for PNC Exploration (Australia) Pty Ltd.

Rockwater (2010) *Ambassador deposit scoping study, assessment of dewatering requirements and water supply sources*. Report for Energy and Minerals Australia Ltd.

Rockwater (2013) *Mulga Rock project, hydrogeology, and assessment of dewatering requirements and water supply sources*. Report for Energy and Minerals Australia Ltd.

Rockwater (2015) *Mulga Rock Uranium Project, results of hydrogeological investigations and numerical modelling*. Report for Vimy Resources Ltd.

Water Authority of W.A. (1994) *Goldfields Groundwater Area Management Plan*. Groundwater and Environment Branch Report GW157.

# Mulga Rock Uranium Project

# Groundwater Operating Strategy

## MRUP-EMP-011

November 2015


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Peer reviewer: Phil Warton, Rockwater Pty Ltd.

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## List of Tables

# 1. Introduction

## 1.1 Objectives

This Groundwater Operating Strategy has been developed in accordance with the principles and strategies documented within the Vimy Resources Limited (Vimy) overarching Environmental Management Plan (MRUP-EMP-000). This EMP provides a management framework which directs and guides the development and implementation of all environmental management plans and operating strategies for the Mulga Rock Uranium Project (MRUP).

The MRUP will include groundwater extraction activities, comprising dewatering of open cut mine pits and extraction of process water from a nearby borefield, as well as reinjection of some water into the local aquifer system at times of excess water supply. This Groundwater Operating Strategy was therefore developed to identify and outline the management of all groundwater resources on site.

## 1.2 Scope and Applicability

The purpose of the Groundwater Operating Strategy is to provide a framework of procedures and monitoring processes to manage groundwater use and protection in the MRUP. The Groundwater Operating Strategy is applicable across all aspects and areas of the MRUP, including the mine, borefields, haul roads and access roads.

The Groundwater Operating Strategy is applicable for the Life of Mine (LOM) and applies to all Vimy personnel, contractors and site visitors.

This Groundwater Operating Strategy supplements the Groundwater Management Plan (MRUP-EMP-010) and should be read in conjunction with the overarching Water Operating Strategy (MRUP-EMP-021) for the site.

## 1.3 Key Legislation

The key legislation applicable to this Groundwater Operating Strategy includes the following:

- *Rights in Water and Irrigation Act 1914.*
- *Environmental Protection Act 1986.*
- *Environment Protection and Biodiversity Conservation Act 1999.*

## 1.4 Key Standards and Guidelines

The key standards and guidelines used and referred to during the development of this Groundwater Operating Strategy include the following:

- ANZECC and ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Canberra, ACT.
- ANZECC and ARMCANZ (2000), National Water Quality Management Strategy Paper No.4: Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Canberra, ACT.
- Water Authority of W.A. (1994) Goldfields Groundwater Area Management Plan. Groundwater and Environment Branch Report GW157.
- DoW (2011) Operational Policy No. 1.02 - Policy on Water Conservation and Efficiency Plans, Perth, Western Australia.

- DoW (2013) Strategic Policy No. 2.09 – Use of mine dewatering surplus, Perth, Western Australia.
- DoW (2010) Operational Policy No. 5.03 – Metering the taking of water, Perth, Western Australia.
- DoW (2010) Operational Policy No. 5.08 – Use of Operating Strategies in the Water Licensing Process, Perth, Western Australia.
- DoW (2013) Water licensing delivery series - Report No.12: Western Australian water in mining guideline, Perth, Western Australia.
- Government of WA (2004) State Water Quality Management Strategy Document No. 6, Perth, Western Australia.
- IUCN Adaptive Management Framework.

## 1.5 Previous Studies Completed

A number of investigations have been undertaken to assess aspects of the environment relevant to the management of groundwater (Table 1.1).

**Table 1.1: Groundwater Investigations**

| Title and Scope of Survey | Author and Timing |
|---|---|
| Groundwater Study – Lake Minigwal | GRC (1984) |
| Stage 2 Hydrogeological Investigation – Mulga Rock Prospect | GRC (1985) |
| Groundwater exploration report – Mulga Rock Prospect | GRC (1986) |
| Geochemistry, mineralogy, and hydrogeochemistry at Ambassador | Douglas et al (1993) |
| Dewatering study – Ambassador deposit | Rockwater (2010) |
| Dewatering and water supply – Mulga Rock Project | Rockwater (2013) |
| Numerical Groundwater Modelling – Mulga Rock Project | Rockwater (2015) |

The water table in the Mulga Rock East area is 29 to 49m below ground level (bgl), and generally lies within fine-grained, carbonaceous sediments of Eocene age. The water table is very flat (hydraulic gradient ~0.002), with an elevation of around 285 to 290m AHD. Seasonal and annual water level variations are very small, indicating very little recharge or discharge from the basin.

# 2. Administrative Requirements

## 2.1 Roles and Responsibilities

The provisional roles and responsibilities for relevant personnel involved in the implementation of the Groundwater Operating Strategy are listed in Table 2.1.

**Table 2.1: Roles and Responsibilities**

| Position | Responsibility |
|---|---|
| General Manager | • Ensuring the objectives of the Groundwater Operating Strategy and associated management plans are achieved. |
| Environmental Manager | • Implementation of the strategy.<br>• Undertake assessment and review into the effectiveness of management plans, updating and refining where deemed necessary to ensure management goals are achieved. |
| Environment Superintendent | • Ensure all MRUP staff are aware of their roles and responsibilities in relation to the Groundwater Operating Strategy.<br>• Deliver relevant training and induction to MRUP staff, contractors and visitors.<br>• Formulate and implement compliance audits of the Groundwater Operating Strategy and associated activities. |
| Operation Managers and Site Supervisors | • Ensure OS and associated management plans are adhered to by all MRUP staff, contractors and visitors.<br>• Assist in compliance audit activities. |
| All MRUP personnel, contractors and visitors | • Conduct all relevant activities in accordance with management plan guidelines.<br>• Report all incidents which may cause or have caused exceedance of reporting guidelines. |

## 2.2 Auditing and Revision of the Operating Strategy

The adaptive management strategies used by Vimy will involve ongoing review and updates to allow iterative improvement of the management plan and the incorporation of any changes to mining activities or improvements in management and monitoring strategies.

## 2.3 Stakeholder Consultation

Where relevant, stakeholders will be consulted with regards to ongoing monitoring, management and contingencies as part of the adaptive management strategy and ongoing review process.

## 2.4 Schedules

The schedules listed in Table 2.2 are proposed for the implementation of the Groundwater Operating Strategy and the associated management strategies.

**Table 2.2: Management Schedules for the Groundwater Operating Strategy**

| Management Action | Personnel | Schedule |
|---|---|---|
| Review the Groundwater Operating Strategy and associated management plans | Environmental Superintendent | Annually |
| Conduct groundwater monitoring activities | Environmental Manager | Quarterly |
| Environmental reporting | Environmental Manager | Annually |

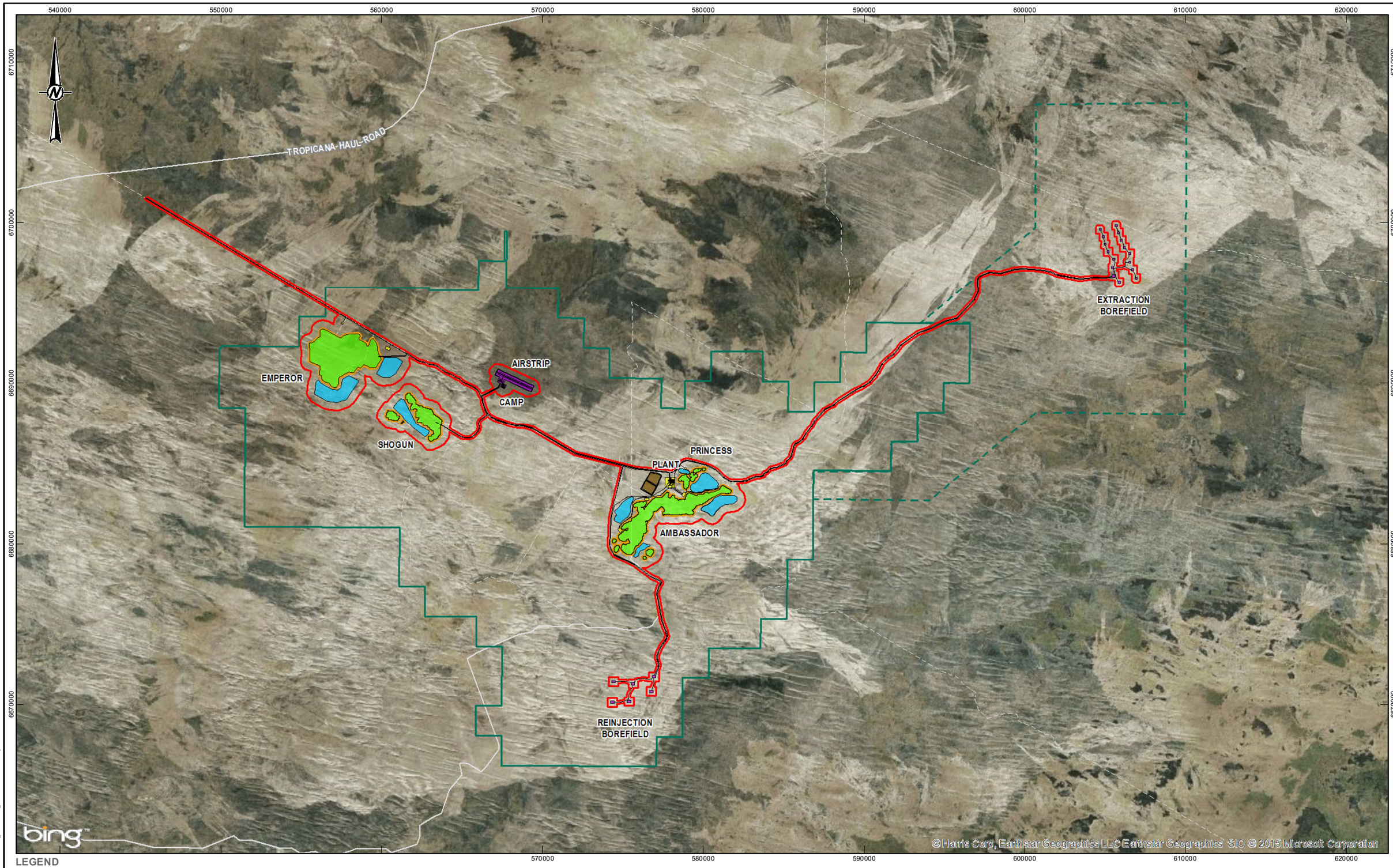
# 3. Water Sources and Sinks

A pre-mine water balance has been completed, which identifies all water sources and sinks for the MRUP, and describes the primary water flow pathways between the source areas, the processing circuit, and final sinks. Each major component of the water balance is discussed in the following sections, and a schematic, depicting the overall site water balance is included as Figure 3.2.

## 3.1 Site Overview

The location of proposed major water infrastructure in relation to the mining areas is shown on Figure 3.1. Groundwater infrastructure will be developed to meet the needs of the business, the environment and stakeholders whilst aiming to maximise flexibility in operations.

Planned development of the dewatering and injection system is outlined in more detail in the Groundwater Management Plan (MRUP-EMP-010) and Managed Aquifer Recharge Management Plan (MRUP-EMP-012).




## LEGEND

- MINOR ROAD/TRACK
- ROAD
- MRUP DEVELOPMENT ENVELOPE
- PROJECT BOUNDARY (MINING TENURE)
- PROJECT BOUNDARY (MISCELLANEOUS TENURE)
- PIT
- OVERBURDEN LANDFORM
- PROCESSING INFRASTRUCTURE
- ABOVE GROUND TSF
- SUPPORTING INFRASTRUCTURE
- PIT CLEARING (50 m BUFFER )

## NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

## REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA

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CLIENT
VIMY RESOURCES LIMITED

CONSULTANT
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| | |
|---|---|
| YYYY-MM-DD | 2015-10-29 |
| DESIGNED | MS |
| PREPARED | MS |
| REVIEWED | DCR |
| APPROVED | DCR |

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
**PROJECT TENURE, PROPOSED DEVELOPMENT ENVELOPE AND DISTURBANCE FOOTPRINT**

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 1540340 | MRUP-EMP-011 | 0 | **3.1** |

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## 3.2 Groundwater Sources

Two primary groundwater sources have been identified to meet site water demand. The first source is mine pit dewatering water, which will be used primarily to supply water for the processing circuit and for dust suppression purposes. A borefield will also be developed at Kakarook North (approximately 30 km north-east of the initial mining area) to supply additional water for processing and for domestic uses, as needed.

The supply of water from dewatering activities, which will extract water from a palaeochannel aquifer, will be variable throughout the project, ranging between 0.06 and 1.5GL/a. The abstraction borefield, which is geologically separate from the palaeochannel aquifer, and relatively fresh, is estimated to supply up to 3.0GL/a for the project, with an expected average of around 1.8GL/a.

## 3.3 Water Sinks

A major proportion of the water used onsite will be passed through the processing circuit and deposited back into the mining areas as tailings. For the in-pit TSFs most of this water will eventually drain back into the groundwater system as the tailings settle, or will be evaporated, whilst for the above-ground TSF an underdrainage system will remove excess pore water for re-use or likely reinjection into the groundwater system. Other water sinks include evaporation from the water storages, beneficial domestic uses, and minor volumes tied up in processing circuit by-products (e.g. beneficiation rejects).

At times when dewatering water supply exceeds site water requirements, excess water will be returned to the palaeochannel aquifer via the reinjection borefield (approximately 12km south of the initial mining area). The projected volumes for reinjection suggest that the amount reinjected is unlikely to exceed 0.7GL/a in the years when it is required.

## 3.4 Primary Water Flow Pathways

The primary water flow pathways are depicted in Figure 3.2.

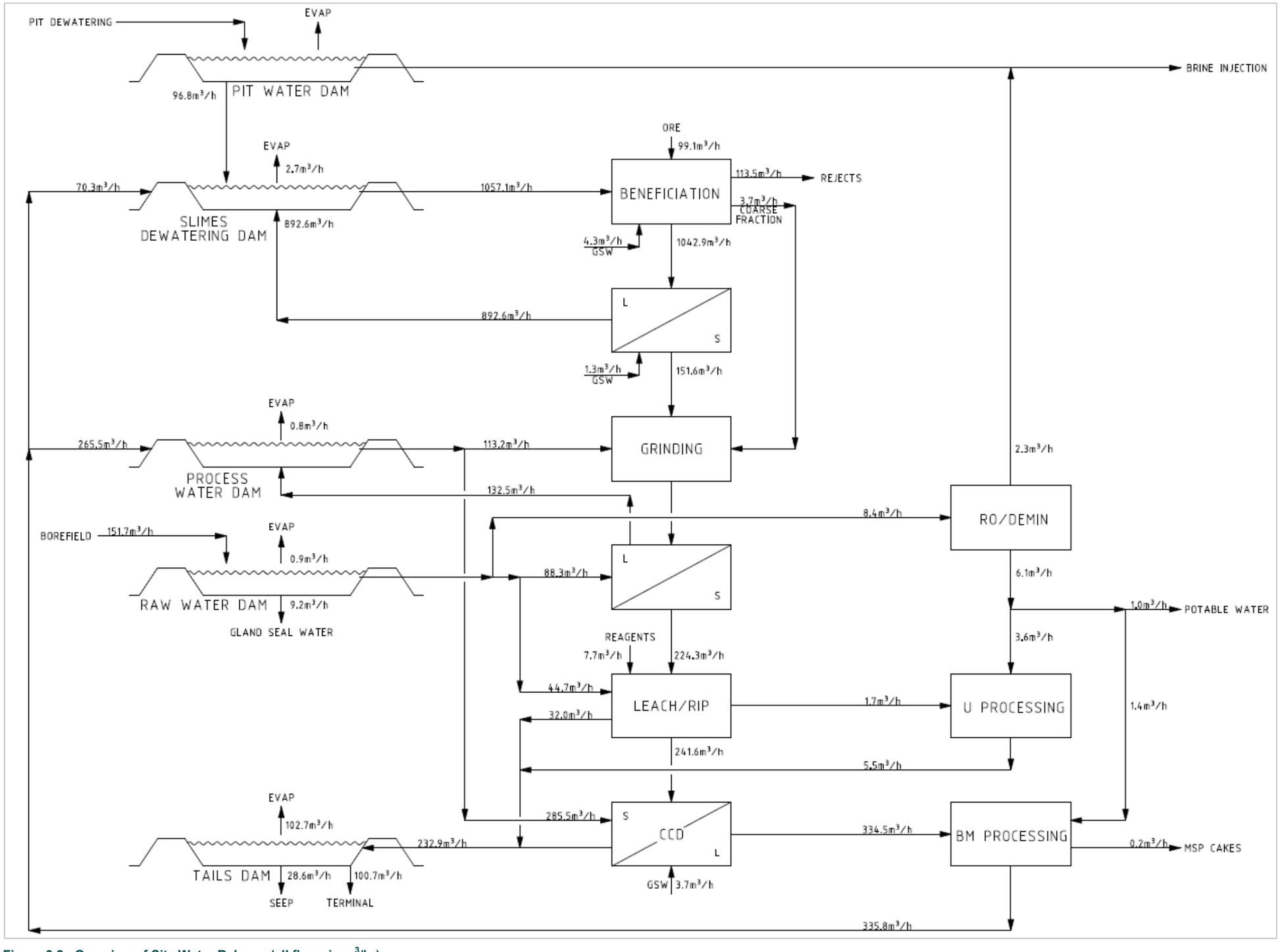


**Figure 3.2: Overview of Site Water Balance (all flows in $m^3/hr$)**

# 4. Identifying and Managing Impacts

Potential impacts and environmental risks resulting from the operation are described in the following management plans, along with proposed management strategies and operational controls intended to prevent or reduce the level of impact:

- Groundwater Management Plan (MRUP-EMP-010).
- Managed Aquifer Recharge Management Plan (MRUP-EMP-012).

These documents discuss the following aspects of environmental impact assessment and management, and will be adhered to as part of the Groundwater Operating Strategy:

- Environmental impact assessment.
- Objectives and performance indicators.
- Management actions.
- Environmental monitoring.
- Management targets.
- Corrective actions.

# 5. Operating Rules

## 5.1 Dewatering System

Dewatering is only required during the active mining and in-pit processing (i.e. beneficiation) phase of the MRUP. The mine pits will only intersect the water table in the basal 2-5m, and thus the requirement for dewatering is limited to an extent of around 3-6m below the natural water table.

All dewatering activity will be conducted in accordance with dewatering licence conditions.

## 5.2 Borefield Extraction

Kakarook North is a southerly trending sedimentary basin with a saturated thickness of up to 42 metres. It is about 16 kilometres long and between 5 and 8 kilometres wide and it is located approximately 30 kilometres north-east of the initial mining area (Figure 3.1). It is proposed to extract water from this location for the duration of the Project at a rate of up to 3.0GL/a, with an expected average of around 1.8GL/a.

In total, up to 3.0GL/a of brackish water is proposed to be extracted from the extraction borefield and an additional 0.7GL/a of mine dewatering water (which is saline to hypersaline) will enter the process plant with the ore as slurry.

All borefield extraction activity will be conducted in accordance with relevant licence conditions.

## 5.3 Groundwater Reinjection System

The reinjection program, which will only run in years when there is surplus dewatering water needing to be disposed of, will be part of a Managed Aquifer Recharge scheme and will be licensed under the RIWI Act. Reinjection will take place into the aquifer about 12 kilometres south of the initial mining area (Figure 3.1).

Reinjection activities will be managed according to the Managed Aquifer Recharge Management Plan (MRUP-EMP-2012), and any relevant licence conditions.

# 6. Monitoring and Reporting

## 6.1 Monitoring and Reporting Overview

Groundwater-specific monitoring activities are described in the Groundwater Management Plan (MRUP-EMP-010), and will primarily include analysis of groundwater quality from monitoring bores across the site, and recording of groundwater elevations in each bore. It is anticipated that this will occur on a quarterly or biannual basis (or as directed in the licence conditions), with reporting occurring annually as part of the AER process.

## 6.2 Flow Metering

All groundwater abstraction and reinjection activities will be monitored with flow meters. The calibration of the meters will be checked twice each year (or at the frequency recommended by the manufacturer) to ensure ongoing accuracy.

## 6.3 Monitoring Points

Dedicated monitoring bores will be identified within the Groundwater Management Plan (MRUP-EMP-010) for inclusion in regular groundwater monitoring activities. These bores will be located:

- Within the palaeochannel, to monitor aquifer drawdown associated with dewatering activities, and potential impacts from tailings seepage.
- Within the abstraction borefield, to monitor aquifer drawdown.
- Within the reinjection borefield, to monitor mounding in the aquifer and identify any changes to groundwater quality.

## 6.4 Maintenance

An inspection and maintenance schedule will be implemented, as follows:

- Flow meters on all bores are tested for accuracy and calibrated by *in situ* validation, twice a year or as per manufacturer specifications.
- Leak detection is undertaken via daily visual inspections of pipework and fittings. Comparison of meter readings at various points between abstraction and consumption points are used to identify any other losses from the system.

# 7. Contingency Program

All water-related contingency operations are covered in the overarching Water Operating Strategy (MRUP-EMP-021). In addition, the following management plans detail contingency measures related to environmental impact assessment and risk management (e.g. development of trigger levels and corrective actions):

- Groundwater Management Plan (MRUP-EMP-010)
- Managed Aquifer Recharge Management Plan (MRUP-EMP-012).

# 8. Water Use Efficiency

A site-wide Water Conservation and Efficiency Plan (including all water managed on site, not only groundwater) is included in the overarching Water Operating Strategy (MRUP-EMP-021).

# 9. Summary of Commitments

This Groundwater Operating Strategy has been prepared in order to satisfy commitments within the PER and conditions of the groundwater licences to take water. It is expected that this document will be updated to include future potential conditions / commitments that may result following regulatory review and assessment, including stakeholder consultation, and licence applications. At this time, only commitments within the PER are available and these include:

- Water conservation principles will govern the extraction and utilisation of groundwater throughout the MRUP, extraction rates not to exceed allocated licence conditions.
- Adhere to all licence conditions set by the various regulatory agencies.
- Water protection principles will be adopted across all operational activities to ensure protection of groundwater systems, and the overall quality of the ecosystem.

## 10. References

ANZECC and ARMCANZ (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Canberra, ACT.

ANZECC and ARMCANZ (2000), *National Water Quality Management Strategy Paper No.4: Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Canberra, ACT.

DoW (2010a) *Operational Policy No. 5.03 – Metering the taking of water*, Perth, Western Australia.

DoW (2010b) *Operational Policy No. 5.08 – Use of Operating Strategies in the Water Licencing Process*, Perth, Western Australia.

DoW (2011) *Operational Policy No. 1.02 - Policy on Water Conservation and Efficiency Plans*, Perth, Western Australia.

DoW (2013a) *Strategic Policy No.2.09 – Use of mine dewatering surplus*, Perth, Western Australia.

DoW (2013b) *Water licensing delivery series - Report No.12: Western Australian water in mining guideline*, Perth, Western Australia

Government of WA (2004) *State Water Quality Management Strategy Document No. 6*, Perth, Western Australia.

Water Authority of W.A. (1994) *Goldfields Groundwater Area Management Plan*. Groundwater and Environment Branch Report GW157.

# Mulga Rock Uranium Project

# Managed Aquifer Recharge Management Plan

## MRUP-EMP-012

November 2015


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| 0 | BJL | EWC | JT | 06.11.2015 | |
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## Prepared for Vimy Resources Limited by Golder Associates Pty Ltd

# Table of Contents



# List of Tables

# 1. Summary

The table below presents the environmental management target/s to measure achievement of the environmental objective that must be met through implementation of this Management Plan (MP).

| Title of proposal | Mulga Rock Uranium Project |
|---|---|
| Proponent | Vimy Resources Limited |
| Environmental Scoping Document | Assessment Number 1979 |
| Purpose of this MP | The Managed Aquifer Recharge Management Plan is submitted to outline MRUP's proposed procedures and practices to be implemented to meet the EPA's environmental objective for the key environmental factor/s. |
| EPA's environmental objective for the key environmental factor/s | Hydrological Processes: To maintain the hydrological regimes of groundwater and surface water so that existing and potential uses, including ecosystem maintenance, are protected.<br>Inland Waters Environmental Quality: To maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected. |
| Vimy's environmental objective | To minimise any impacts on the operation of the MRUP and on the groundwater system at the MRUP. |
| Management target/s | • Management target 1: Maximise beneficial uses of water.<br>• Management target 2: All surplus site water is able to be reinjected, where practicable.<br>• Management target 3: Groundwater quality is maintained within agreed parameters compared to background levels. |

**Corporate endorsement**

I hereby certify that to the best of my knowledge, the MP provisions within this Managed Aquifer Recharge Management Plan are true and correct.

[Signature of duly authorised proponent representative]

Name: Signed:

Designation: Date:

# 2. Context, scope and rationale

## 2.1 What is the proposal?

Vimy Resources Limited (Vimy) proposes to develop the Mulga Rock Uranium Project (MRUP or the Project) which lies approximately 240km east-north-east of Kalgoorlie-Boulder in the Shire of Menzies. The area is remote, located on the western flank of the Great Victoria Desert, comprising series of large, generally parallel sand dunes, with inter-dunal swales and broad flat plains.

The MRUP covers approximately 102,000 hectares on granted mining tenure (primarily M39/1080 and M39/1081) within Unallocated Crown Land (UCL). It includes two distinct mining centres, Mulga Rock East (MRE) comprising the Princess and Ambassador resources and Mulga Rock West (MRW) comprising the Emperor and Shogun resources, which are approximately 20km apart. Up to 4.5 Million tonnes per annum (Mtpa) of ore will be mined using traditional open cut techniques, crushed, beneficiated and then processed onsite to produce, on average, 1,360 tonnes of uranium oxide concentrate (UOC) per year over the life of the Project. Base metal concentrates will also be extracted using sulphide precipitation after the uranium has been removed and sold separately.

The anticipated Life-of-Mine (LOM) is up to 16 years, based on the currently identified resource.

This MP has been based on *Environmental Assessment Guideline 17* (EPA 2015b) and the EPA's *environmental management-based condition model template* (EPA 2015c).

## 2.2 What key environmental factor/s does this MP address?

This MP specifically addresses the Hydrological Processes and Inland Waters Environmental Quality environmental factor.

The MRUP will include a Managed Aquifer Recharge (MAR) scheme, which will involve reinjection of some water into the local aquifer via a dedicated reinjection borefield at times of excess water supply. This is likely to have an effect on water quality in the aquifer, as the chemistry of injection water will differ to some degree from that of the native aquifer, and may cause some temporary groundwater mounding. The potential also exists for clogging of the injection bores, resulting in inadequate disposal capacity for excess water.

### 2.2.1 Direct Impacts to the Groundwater System

The MAR scheme will involve the reinjection of around 0.7 GL/a of process water back into the aquifer system. As baseline movement of groundwater through the aquifer is very slow (the hydraulic gradient is flat, and recharge and discharge rates are low), the addition of a large volume of water in one region of the aquifer has the potential to impact on the groundwater system.

Two primary impacts are expected to result from the implementation of the MAR scheme:

- Groundwater mounding: Local increase in groundwater level within the vicinity of the injection bore field, which could result in the rise of saline water into the root zone of local vegetation, causing die-off. This risk is considered to be low given the depth to groundwater (> 29 m) and the high permeability of the aquifer.
- Groundwater quality: Changes to groundwater chemistry are possible with the reinjection of pit dewatering water.

### 2.2.2 Direct Impacts to the MRUP

Operation of the MAR scheme has the potential to impact on the broader site operations, particularly in the event of unexpected failures or downtime. The primary risk to the mine site resulting from its reliance on the MAR scheme is from excessive pressure build up in injection bores due to clogging of the bores. This can lead to surface leakage of saline water in the vicinity of the injection bore, and means that excess water from site can no longer be disposed at the required flow rate.

Excess pressure build up within the MAR system also has potential implications for pipeline integrity (i.e. increased frequency of leaks).

### 2.2.3 Indirect Impacts

If the direct impacts are significant in scale and are long-lasting, additional indirect impacts are possible, including:

- Potential impacts on subterranean fauna.
- Impacts to existing and potential groundwater users.
- Increased radionuclide distribution.

The severity of any indirect impacts will depend primarily on:

- The horizontal and vertical extent of any groundwater mounding.
- Which groundwater quality parameters are affected, and the degree (%) change from background.
- The longevity of the changes.

It is important to note that the nearest potential environmental receptor of conservational significance is Queen Victoria Springs, located approximately 14km south of the proposed reinjection borefield and 24km south of the Mulga Rock East deposits. However, the spring is a seasonal, perched feature that is unconnected to the palaeochannel aquifer.

This MAR MP should be read in conjunction with the Groundwater Management Plan (MRUP-EMP-010), Groundwater Operating Strategy (MRUP-EMP-011) and the Water Operating Strategy (MRUP-EMP-021).

## 2.3 Rationale and approach in meeting the environmental objective

Results of baseline surveys and a number of assumptions and uncertainties inform the management approach for meeting MRUP's environmental objective. The identified management actions, management targets and proposed review and revision of management actions are aligned with the overall management approach.

### 2.3.1 Results of (baseline surveys/modelling/scientific studies/tests) conducted

Numerous studies and modelling investigations have been undertaken to assess aspects of the environment relevant to the management of groundwater.

The water table throughout MRUP is around 29 to 49m below ground level (bgl), and generally lies within fine-grained, carbonaceous sediments of Eocene age. The water table is very flat (hydraulic gradient ~ 0.002), with an elevation of around 285 to 290mAHD across the MRUP. Seasonal and annual water level variations are very small, indicating very little recharge or discharge from the palaeochannel system.

Reinjection into a palaeochannel aquifer will take place about 12 km south of the initial mining area. Reinjection will only occur in years when the amount extracted (i.e. via Kakarook abstraction borefield and dewatering of mine areas) exceeds the operational demand (around 0.85GL/a). Current modelling suggests that this will only occur in two years during the operation. The projected volumes for reinjection suggest that the amount reinjected is unlikely to exceed 0.7GL/a in the years when it is required (total of around 1.5GL for the two years).

The reinjection will be into the same aquifer that underlies the mining area. However, as the water moves south down gradient, the quality deteriorates along the length of the palaeochannel so that the reinjected water will be of better quality than the *in situ* groundwater. Water quality analyses from 17 bores in the reinjection area showed that groundwater was naturally acidic, with pH ranging between 3.9 and 6.9, but generally between 4.5 and 5.0. The salinity ranged between 20,000mg/L and 73,000mg/L TDS with an average around 51,500mg/L (seawater is around 35,000mg/L). This is considerably higher than the salinity found within the mining area at Mulga Rock East (7,500 to 37,600mg/L).

Pumping tests in the reinjection borefield showed that the aquifer is highly permeable, with hydraulic conductivity values ranging from 9 to 140m/day. Numerical modelling suggests that temporary mounding would not exceed 2m.

### 2.3.2 Key assumptions and uncertainties

It is assumed that the desktop and field investigations and surveys undertaken for MRUP have sufficiently identified the groundwater characteristics surrounding the Project area.

Groundwater modelling has been based on the predicted mining activities. A change in mining process may affect modelling outcomes.

### 2.3.3 Management approach

An adaptive risk based approach to management has been adopted by Vimy for the MRUP. This has been informed by a range of specialist scientific studies for the MRUP and regional area, as well as database searches and other regional project information.

This information has allowed Vimy to prioritise and manage significant risks using the mitigation hierarchy (i.e. avoid, minimise, manage, rehabilitate and offset) and develop an adaptive management system. Adaptive management allows for adaptations due to changing project conditions and the dynamic nature of ecosystems in order to achieve the MRUP environmental objectives.

This management approach is consistent for all the environmental factors for the Project.

### 2.3.4 Rationale for choice of management target/s

Vimy has chosen management based targets. These have been chosen to prioritise significant risks identified for the project and are based on:

- Baseline information and available data for the site and local region.
- The relationship between relevant proposal aspects and impacts on the environmental factor.
- Scientific credibility.
- Consistent with monitoring programs already underway on the site, in the region and industry standards.

Management targets will be reviewed annually to ensure they remain relevant and reflect Vimy and the EPA's environmental objective. Any changes to management targets reported as part of the Annual Environmental Report (AER).

# 3. MP provisions

This section of the MP identifies the legal provisions that Vimy proposes to implement to minimise any impacts on the operation of the MRUP and on the groundwater system at the MRUP. It identifies the management target/s that Vimy will use to measure performance and monitoring that will be undertaken in relation to the management target/s. Finally, it identifies how Vimy will review and revise management actions if the management targets are exceeded.

## 3.1 Environmental objective

To minimise any impacts on the groundwater system at the MRUP.

## 3.2 Management actions to be implemented

MRUP activities/aspects which have the potential to cause environmental impacts to groundwater have been evaluated through a risk analysis. No risks were identified that required potential 'very high' or 'high' risks or impacts requiring specific management. Despite this, in the interest of continual improvement, Vimy will implement the risk-based management actions presented in Table 3.1.

**Table 3.1: Risk-based management actions that will be implemented to meet the environmental objective**

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| Groundwater Mounding | Maximise beneficial uses of water | Groundwater Operating Strategy (MRUP-EMP-011) | Low | Operation |
| | • Monitoring of groundwater levels according to the Groundwater Management Plan (MRUP-EMP-010). | Groundwater Management Plan (MRUP-EMP-010) | Low | Operation and closure |
| Groundwater Quality | • Develop site-specific groundwater management targets | Environmental Monitoring Plan (MRUP-EMP-028) | Low | Pre-operation |
| | • Monitoring of mine dewatering water and in-pit sump water quality on an ongoing basis to ensure that water is suitable for reinjection. | Water Operating Strategy (MRUP-EMP-021)<br>Environmental Monitoring Plan (MRUP-EMP-028) | Low | Operation |
| | • Monitoring of groundwater quality parameters according to Groundwater Management Plan (MRUP-EMP-010) | Groundwater Management Plan (MRUP-EMP-010)<br>Environmental Monitoring Plan (MRUP-EMP-028) | Low | Operation and closure |
| Subterranean Fauna | • Monitoring of standard groundwater quality parameters according to Groundwater Management Plan (MRUP-EMP-010) | Groundwater Management Plan (MRUP-EMP-010)<br>Environmental Monitoring Plan (MRUP-EMP-028) | Low | Operation and closure |
| | • Monitoring of subterranean fauna communities according to Subterranean Fauna Management Plan (MRUP-EMP-007) | Subterranean Fauna Management Plan (MRUP-EMP-007) | Low | Operation and closure |
| Flora and Vegetation | • Visual inspection to confirm no surface leakage in vicinity of injection bores/pipelines | Water Operating Strategy (MRUP-EMP-021) | Low | Operation |
| | • Monitoring of flora and vegetation communities according to Flora and Vegetation Management Plan (MRUP-EMP-001) | Flora and Vegetation Management Plan (MRUP-EMP-001) | Low | Operation |

## 3.3 Management target

Management targets will be employed to measure and report against achievement of MRUP's environmental objective. The results of the hydrogeological baseline studies suggest that the management targets listed in Table 3.2 will achieve Vimy's environmental objective.

**Table 3.2: Management target/s to measure the efficacy of management actions relative to the environmental objective**

| | |
|---|---|
| Proposed environmental objective | To minimise any impacts on the operation of the MRUP and on the groundwater system at the MRUP. |
| Management target 1 | Maximise beneficial uses of water. |
| Management target 2 | All surplus site water is able to be reinjected, where practicable. |
| Management target 3 | Groundwater quality is maintained within agreed parameters compared to background levels. |

## 3.4 Monitoring

The purpose of monitoring is to inform, through the management target/s, if the environmental objective (Section 3.1) is being achieved and when management actions will have to be reviewed and revised. This section describes how Vimy will undertake monitoring to determine whether the management targets are achieved.

Proposed monitoring methods, locations, parameters and frequencies are outlined in Table 3.3 below. Exact monitoring locations will be finalised as part of the operational MPs and the development of the Environmental Monitoring Management Plan (MRUP-EMP-032). Where practicable, monitoring points will be located to correlate with previous baseline surveys.

**Table 3.3: Monitoring to measure the efficacy of management actions against the management targets**

| Indicator | Method | Location | Parameters | Frequency |
|---|---|---|---|---|
| **Management target 1**: Maximise beneficial uses of water. | | | | |
| Reduction in the amount of water needing to be managed by the MAR scheme. | Flow monitoring | Reinjection borefield | Volume | As required in Environmental Monitoring Plan (MRUP-EMP-32). |
| **Management target 2**: All surplus site water is able to be reinjected, where practicable. | | | | |
| Reinjection flow rates and volume are as expected. | Flow monitoring | Reinjection borefield | Volume | As required in Groundwater Operating Strategy (MRUP-EMP-011). |
| No leakage at the bore head or along the MAR pipeline. | Flow monitoring and visual inspections | Project area | Volume | As required in Groundwater Operating Strategy (MRUP-EMP-011). |
| **Management target 3**: Groundwater quality is maintained within agreed parameters compared to background levels. | | | | |
| This is confirmed through monitoring, conducted as part of the Groundwater Management Plan (MRUP-EMP-010). | Monitoring confirms that site-specific management targets have not been exceeded | Reinjection borefield | Water quality monitoring | As required in Environmental Monitoring Plan (MRUP-EMP-028). |

## 3.5 Review and revision of management actions

In the event that a management target is not met or is exceeded, Vimy will implement the following adaptive management procedure:

- Investigate the potential cause of failing to meet the management target and identify any impacts to aquifer recharge.
- If the causes of failing to meet the management target or any impacts identified are a result of the MRUP, the risk assessment will be reviewed and revised risk based management actions will be implemented so that the MRUP environmental objective is met.

Performance meeting management targets will be reported as part of the Annual Environmental Report (AER).

### 3.5.1 Corrective Actions

If monitoring actions outlined in Section 3.4 indicate that the indicators and management targets are not being met then the associated corrective actions outlined below will be implemented.

**Table 3.4: Corrective Actions**

| Performance Indicator | Action | Responsibility |
|---|---|---|
| Reinjection volume likely to exceed estimated volume or flow rate of recharge | • Conduct investigation to determine specific cause of the impact.<br>• Reassess injection volume against licence requirements, and apply for an amendment, if necessary.<br>• Implement appropriate control measures to reduce further impact (e.g. find alternative uses or disposal methods).<br>• Review MAR MP procedures and update where necessary to reduce further impacts. | Mine Manager and Environmental Manager |
| Clogging of injection bores limits the rate of recharge and/or causes saline water leakage at surface surrounding injection bore | • Monitor pressure and flow rate at the injection bores and re-develop if necessary. | Mine Manager and Environmental Manager |
| Water quality of reinjection water falls outside of expected levels for one or more constituents | • Raise as environmental incident report.<br>• Conduct investigation to determine specific cause of the impact.<br>• Implement appropriate control measures to reduce further impact (e.g. dilute process water with lower salinity groundwater).<br>• Review MAR MP procedures and update where necessary to reduce further impacts. | Environmental Manager |
| Groundwater quality in the injection borefield falls outside of the site-specific trigger level value for one or more constituents | • Raise as environmental incident report.<br>• Conduct investigation to determine specific cause of the impact.<br>• Review MAR MP procedures and update where necessary to reduce further impacts. | Environmental Manager |

## 3.6 Reporting provisions

### 3.6.1 Annual reporting

Performance in managing aquifer recharge will be compared against management targets outlined in Table 3.2 and reported as part of the Annual Environmental Report (AER). In the event that the MRUP environmental objective is not achieved during the reporting period, the AER will include a description of the effectiveness of revised and/or additional management actions implemented and an analysis of trends.

The first AER will be submitted in accordance with the timeline outlined in the Condition Statement following the acceptance of the PER by the EPA.

### 3.6.2 Reporting on exceedance of the management target

In the event of a failure of a management target outlined in Table 3.2 resulting in a significant environmental impact, Vimy will verbally notify the CEO of the OEPA within 48 hours of learning of the exceedance. A written report detailing the exceedance and the outcome of the investigation will be provided to the CEO of the OEPA within seven days. Exceedances of management targets not deemed significant will be reported in the AER.

A significant impact is defined as an unplanned, long term or irreversible impact to aquifer recharge within the MRUP Development Envelope as a result of MRUP activities.

The MP reporting template is presented in Table 3.5.

**Table 3.5: Management Plan reporting table**

| Key environmental factor: Hydrological Processes and Inland Waters Environmental Quality | | |
|---|---|---|
| Environmental objective and management target set in the MP | Reporting on the management objective and management target for [Month 20xx] to [Month 20yy] | Status[1] |
| Environmental objective: To minimise any impacts on the operation of the MRUP and on the groundwater system at the MRUP. | Any impacts on the operation of the MRUP and on the groundwater system at the MRUP *[were / were not]* minimised. | ■ YES or<br>● NO |
| Management target 1: Maximise beneficial uses of water. | Management target 1: Beneficial uses of water *[was / was not]* maximised. | ■ YES or<br>● NO |
| Management target 2: All surplus site water is able to be reinjected, where practicable. | Management target 2: All surplus site water *[was / was not]* able to be reinjected where practicable. | ■ YES or<br>● NO |
| Management target 3: Groundwater quality is maintained within agreed parameters compared to background levels. | Management target 3: Groundwater quality *[was / was not]* within agreed parameters compared to background levels. | ■ YES or<br>● NO |

Notes:

1. The status of achievement of the environmental objectives is indicated by the following symbols:
   - ■ Environmental objective achieved
   - ● Environmental objective not achieved

# 4. Adaptive management and review of the MP

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

- Monitoring data will be systematically evaluated and compared to baseline and reference site data in accordance with Table 3.3 in a process of adaptive management to verify whether responses to the impact are the same or similar to predictions.
- Re-evaluate the risk assessment and revision of risk-based priorities on the basis of monitored information.
- Increased understanding of the local and regional ecological regime.
- Revision when management actions are not as effective as predicted.
- 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.).
- Review of MP – changes to MP provisions required by a condition, timeframe, etc.

# 5. Stakeholder consultation

Consultation regarding groundwater, surface water and aquifer recharge has predominantly been with Decision Making Authorities (DMAs) and other relevant State government departments including Department of Mines and Petroleum (DMP), Department of Parks and Wildlife (DPaW), Department of Environment (DER), Department of Water (DoW), EPA and the Department of Health (DoH).

# 6. References

The following references were used in developing this MP.

ANZECC and ARMCANZ (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Canberra, ACT.

Douglas, G B, Gray, D J, and Butt, C R M (1993) *Geochemistry, mineralogy and hydrogeochemistry of the ambassador multi-element lignite deposit, Western Australia*. Unpublished report to PNC Exploration (Australia) Pty Ltd.

DoW (2011) *Operational Policy No.1.01 – Managed aquifer recharge in Western Australia*, Perth, Western Australia.

DoW (2013) *Strategic Policy No.2.09 – Use of mine dewatering surplus*, Perth, Western Australia.

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# Mulga Rock Uranium Project

# Tailings Management Plan

## MRUP-EMP-013

November 2015


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| | | | | | |

## Prepared for Vimy Resources Limited by Golder Associates Pty Ltd

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# List of Tables

# 1. Summary

The table below presents the environmental management target/s to measure achievement of the environmental objective that must be met through implementation of this Management Plan (MP).

| Title of proposal | Mulga Rock Uranium Project |
|---|---|
| Proponent | Vimy Resources Limited |
| Environmental Scoping Document | Assessment Number 1979 |
| Purpose of this MP | The Tailings Management Plan is submitted to outline MRUP's proposed procedures and practices to be implemented to meet the EPA's environmental objective for the key environmental factor/s. |
| EPA's environmental objective for the key environmental factor/s | Subterranean Fauna: To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.<br>Flora and Vegetation: To maintain representation, diversity, viability and ecological function at the species, population and community level.<br>Terrestrial Fauna: To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.<br>Hydrological Processes: To maintain the hydrological regimes of groundwater and surface water so that existing and potential uses, including ecosystem maintenance, are protected.<br>Inland Waters Environmental Quality: To maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected. |
| Vimy's Environmental objective | Prevent or minimise impacts to terrestrial fauna, subterranean fauna, flora and vegetation, surface water and groundwater from MRUP activities. |
| Management target/s | • Management target 1: Monitor surrounding groundwater quality to assess seepage from In-pit TSFs.<br>• Management target 2: Monitor seepage water quality.<br>• Management target 3: Assess impacts of tailings on groundwater.<br>• Management target 4: Collect sufficient information to satisfy regulatory requirements under ANCOLD (2012) guidelines.<br>• Management target 5: Assess all tailings pipelines for structural integrity and leaks.<br>• Management target 6: Assess all tailings pump infrastructure for structural integrity and leaks.<br>• Management target 7: Ensure freeboard present within each TSF is above acceptable limits.<br>• Management target 8: Assess all TSFs for structural integrity, performance of instrumentation and underdrainage and leak detection system |

**Corporate endorsement**

I hereby certify that to the best of my knowledge, the MP provisions within this Tailings Management Plan are true and correct.

[Signature of duly authorised proponent representative]

Name: Signed:

Designation: Date:

# 2. Context, scope and rationale

## 2.1 What is the proposal?

Vimy Resources Limited (Vimy) proposes to develop the Mulga Rock Uranium Project (MRUP or the Project) which lies approximately 240km east-north-east of Kalgoorlie-Boulder in the Shire of Menzies. The area is remote, located on the western flank of the Great Victoria Desert, comprising series of large, generally parallel sand dunes, with inter-dunal swales and broad flat plains.

The MRUP covers approximately 102,000 hectares on granted mining tenure (primarily M39/1080 and M39/1081) within Unallocated Crown Land (UCL). It includes two distinct mining centres, Mulga Rock East (MRE) comprising the Princess and Ambassador resources and Mulga Rock West (MRW) comprising the Emperor and Shogun resources, which are approximately 20km apart. Up to 4.5 Million tonnes per annum (Mtpa) of ore will be mined using traditional open cut techniques, crushed, beneficiated and then processed onsite to produce, on average, 1,360 tonnes of uranium oxide concentrate (UOC) per year over the life of the Project. Base metal concentrates will also be extracted using sulphide precipitation after the uranium has been removed and sold separately.

The anticipated Life-of-Mine (LOM) is up to 16 years, based on the currently identified resource.

This MP has been based on *Environmental Assessment Guideline 17* (EPA 2015b) and the EPA's *environmental management-based condition model template* (EPA 2015c).

## 2.2 What key environmental factor/s does this MP address?

This MP specifically addresses Subterranean Fauna, Flora and Vegetation, Terrestrial Fauna, Hydrological Processes and Inland Waters Environmental Quality environmental factors.

The MRUP will result in the generation of a tailings product which will be stored in above-ground and in-pit tailings storage facilities (TSFs). These storage facilities and the handling of the tailings material have the potential to impact on surrounding environmental values including fauna, flora and vegetation, subterranean fauna, surface and groundwater.

## 2.3 Rationale and approach in meeting the environmental objective

Results of baseline surveys and a number of assumptions and uncertainties inform the management approach for meeting MRUP's environmental objective. The identified management actions, management targets and proposed review and revision of management actions are aligned with the overall management approach.

### 2.3.1 Results of (baseline surveys/modelling/scientific studies/tests) conducted

The TSF designs are based on tailings characteristics obtained during the following studies:

- GHD (2015a) Mulga Rock Uranium Project Tailings Storage Study.
- GHD (2015b) Mulga Rock Uranium Project Tailings Groundwater Assessment of Tailings and process Water Disposal to Princess Pit.
- ANSTO (2015) Mulga Rock Tailings Characterisation Testwork.
- SWC (2015) Physio-chemical characterisation of ore and tailings from the Mulga Rock Uranium Project.

### 2.3.2 Key assumptions and uncertainties

For the purpose of this management plan, it is assumed that the results derived from the laboratory testings reflect the behaviour of the tailings material *in situ*.

The potential for tailings to oxidise and generate Acid and Metalliferous Drainage (AMD) is limited by the high carbon content of the tailings, the materials inherent buffering capacity, the limited oxygen diffusion into clayey tailings at field capacity and the low permeability of the tailings following drainage.

It is important to note that further review and specific investigations are currently being undertaken as part of the Pre-Feasibility Study, which may result in an optimisation of the above design specifications.

### 2.3.3 Management approach

An adaptive risk based approach to management has been adopted by Vimy for the MRUP. This has been informed by a range of specialist scientific studies for the MRUP and regional area, as well as database searches and other regional project information.

This information has allowed Vimy to prioritise and manage significant risks using the mitigation hierarchy (i.e. avoid, minimise, manage, rehabilitate and offset) and develop an adaptive management system. Adaptive management allows for adaptations due to changing project conditions and the dynamic nature of ecosystems in order to achieve the MRUP environmental objectives.

This management approach is consistent for all the environmental factors for the Project.

### 2.3.4 Rationale for choice of management target/s

Vimy has chosen management based targets. These have been chosen to prioritise significant risks identified for the project and are based on:

- Baseline information and available data for the site and local region.
- The relationship between relevant proposal aspects and impacts on the environmental factor at the MRUP.
- Scientific credibility.
- Consistent with monitoring programs already underway on the site, in the region and industry standards.

Management targets will be reviewed annually to ensure they remain relevant and reflect Vimy and the EPA's environmental objective. Any changes to management targets reported as part of the Annual Environmental Report (AER).

# 3. MP provisions

This section of the MP identifies the legal provisions that Vimy proposes to implement to prevent or minimise impacts to terrestrial fauna, subterranean fauna, flora and vegetation, surface water and groundwater from MRUP activities. It identifies the management target/s that Vimy will use to measure performance and monitoring that will be undertaken in relation to the management target/s. Finally, it identifies how Vimy will review and revise management actions if the management targets are exceeded.

## 3.1 Environmental objective

Prevent or minimise impacts to terrestrial fauna, subterranean fauna, flora and vegetation, surface water and groundwater from MRUP activities.

## 3.2 Management actions to be implemented

MRUP activities/aspects which have the potential to cause environmental impacts from tailings have been evaluated through a risk analysis. No risks were identified that required potential 'very high' or 'high' risks or impacts requiring specific management. Despite this, in the interest of continual improvement, Vimy will implement the risk-based management actions presented in Table 3.1.

**Table 3.1: Risk-based management actions that will be implemented to meet the environmental objective**

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| Failure of tailings embankment walls(s) | Design, construction and operation of facility is carried out in accordance with ANCOLD (2012) guidelines and the 2012 Code of Practice for Tailings Storage in WA. | ANCOLD (2012) guidelines and the 2012 Code of Practice for Tailings Storage in WA. | Low | Design, construction and operation |
| | Annual inspection/audit of facility and operational activities from independent geotechnical or engineering specialist. | Operational Environmental Management Plan (MRUP-EMP-020) | Low | Life of the mine, closure |
| | Freeboard of each TSF is managed appropriately to ensure sufficient factor of safety in accordance with ANCOLD (2012) guidelines and the 2012 Code of Practice for Tailings Storage in WA. | ANCOLD (2012) guidelines and the 2012 Code of Practice for Tailings Storage in WA. | Low | Life of the mine, closure |
| Tailings pipeline failure or leak | Design, construction and operation of pipeline infrastructure is carried out in accordance with ANCOLD (2012) guidelines and the 2012 Code of Practice for Tailings Storage in WA. | ANCOLD (2012) guidelines and the 2012 Code of Practice for Tailings Storage in WA. | Low | Design and construction |
| | Daily inspections of pipelines carried out, appropriate quality control used during construction. | Operational Environmental Management Plan (MRUP-EMP-020) | Low | Life of the mine |
| Uncontrolled tailings seepage from above-ground TSF | Facility is designed in accordance with tailings characterisation test work and ANCOLD (2012) guidelines and the 2012 Code of Practice for Tailings Storage in WA. | ANCOLD (2012) guidelines and the 2012 Code of Practice for Tailings Storage in WA. | Low | Design and construction |
| | Double liner system is installed, with fit-for-purpose leak detection system. | TSF Design Report | Low | Design and construction |
| | TSF is positioned with geological/topographical situation to limit impacts from potential seepage. | TSF Design Report | Low | Design and construction |
| Overtopping of TSFs | Deposition of tailings material is monitored using instrumentation and visual assessment in accordance with ANCOLD (2012) guidelines and the 2012 Code of Practice for Tailings Storage in WA. | ANCOLD (2012) guidelines and the 2012 Code of Practice for Tailings Storage in WA. | Low | Life of the mine |
| | Freeboard is monitored to ensure available capacity and remove risk of overtopping in accordance with ANCOLD (2012) guidelines and the 2012 Code of Practice for Tailings Storage in WA. | ANCOLD (2012) guidelines and the 2012 Code of Practice for Tailings Storage in WA. | | Life of the mine |
| | Facilities are designed with spillway capable of managing a probable maximum flood event. | ANCOLD (2012) guidelines and the 2012 Code of Practice for Tailings Storage in WA | | Design and construction |

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| Seepage from in-pit TSFs impacting on downstream environmental receptors | Monitor downstream bores to identify whether seepage plume is occurring and to quantify the changes in groundwater quality.<br>Monitoring of these bores will provide sufficient lead time to develop and implement appropriate mitigation strategies, if required, to ensure groundwater quality remains equivalent to background levels at the tenement boundary. | Groundwater Management Plan (MRUP-EMP-010)<br>Environmental Monitoring Management Plan (MRUP-EMP-032) | | Life of the mine, closure |

## 3.3 Management target

Management targets will be employed to measure and report against achievement of MRUP's environmental objective. The results of the tailings studies suggest that the management targets listed in Table 3.2 will achieve Vimy's environmental objective.

**Table 3.2: Management target/s to measure the efficacy of management actions relative to the environmental objective**

| | |
|---|---|
| Proposed environmental objective | Prevent or minimise impacts to surface water and groundwater from MRUP activities. |
| Management target 1 | Assess impacts of tailings on groundwater |
| Management target 2 | Collect sufficient information to satisfy regulatory requirements under ANCOLD (2012) guidelines. |
| Management target 3 | Assess all tailings pipelines for structural integrity and leaks |
| Management target 4 | Assess all tailings pump infrastructure for structural integrity and leaks |
| Management target 5 | Ensure freeboard present within each TSF is above acceptable limits |
| Management target 6 | Assess all TSFs for structural integrity, performance of instrumentation and underdrainage and leak detection system |

## 3.4 Monitoring

The purpose of monitoring is to inform, through the management target/s, if the environmental objective (Section 3.1) is being achieved and when management actions will have to be reviewed and revised. This section describes how Vimy will undertake monitoring to determine whether the management targets are achieved.

Proposed monitoring methods, locations, parameters and frequencies are outlined in Table 3.3 below. Exact monitoring locations will be finalised as part of the operational MPs and the development of the Environmental Monitoring Management Plan (MRUP-EMP-032). Where practicable, monitoring points will be located to correlate with previous baseline surveys.

**Table 3.3: Operational monitoring to measure the efficacy of management actions against the management targets**

| Indicator | Method | Location | Parameters | Frequency |
|---|---|---|---|---|
| **Management target 1**: Monitor surrounding groundwater quality to assess seepage from In-pit TSFs | | | | |
| No significant change to groundwater quality | Collect water samples and send for Laboratory Analysis | Monitoring bore locations detailed in the Environmental Monitoring Management Plan (MRUP-EMP-032) | Groundwater quality | Quarterly |
| **Management target 2**: Monitor seepage water quality | | | | |
| No significant change to surrounding surface water quality | Collect water samples and send for Laboratory Analysis | Above-ground TSF cells | Drainage water quality from Above-ground TSF | Quarterly or as determined by risk analysis |
| **Management target 3**: Assess impacts of tailings on groundwater | | | | |
| Leachate meets the water quality objectives | Collect water samples and send for laboratory analysis | All TSFs | Water quality parameters in groundwater | Quarterly |
| **Management target 4**: Collect sufficient information to satisfy regulatory requirements under ANCOLD (2012) guidelines. | | | | |
| Water balance is verified | Direct measurement (computerised instrumentation) | All TSFs | Flow metering of all tailings deposition flows, including tailings production, slurry pump operation and outlet deposition | Quarterly |
| **Management target 5**: Assess all tailings pipelines for structural integrity and leaks | | | | |
| Implementation of Operation and Maintenance and Surveillance (OMS) Procedures as per ANCOLD (2012) Guidelines | Field inspection | Active tailings pipeline infrastructure | Pipeline(s) integrity | To be determined by failure consequence category as per ANCOLD (2012) |
| **Management target 6**: Assess all tailings pump infrastructure for structural integrity and leaks | | | | |
| Implementation of Operation and Maintenance and Surveillance (OMS) Procedures | Field inspection | Active tailings pipeline infrastructure | Tailings slurry pump | To be determined by failure consequence category as per ANCOLD (2012) |

| Indicator | Method | Location | Parameters | Frequency |
|---|---|---|---|---|
| **Management target 7**: Ensure freeboard present within each TSF is above acceptable limits | | | | |
| Implementation of Operation and Maintenance and Surveillance Procedures | Direct measurement (computerised instrumentation)<br>Field inspection | All TSFs | Freeboard | To be determined by failure consequence category as per ANCOLD (2012) |
| **Management target 8**: Assess all TSFs for structural integrity, performance of instrumentation and underdrainage and leak detection system | | | | |
| Implementation of Operation and Maintenance and Surveillance Procedures | Field inspection and audit of operational records | All TSF | Structural integrity of TSF(s) | Annual inspection |

## 3.5 Review and revision of management actions

In the event that a management target is not met or is exceeded, Vimy will implement the following adaptive management procedure:

- Investigate the potential cause of failing to meet the management target and identify any impacts resulting from this failing.
- If the causes of failing to meet the management target or any impacts identified are a result of the MRUP, the risk assessment will be reviewed and revised risk based management actions will be implemented so that the MRUP environmental objective is met.

Performance meeting management targets will be reported as part of the Annual Environmental Report (AER).

### 3.5.1 Corrective Actions

If monitoring actions outlined in Section 3.4 indicate that the indicators and management targets are not being met then the associated corrective actions outlined below will be implemented.

**Table 3.4: Corrective Actions**

| Performance Indicator | Action | Responsibility |
|---|---|---|
| Measured groundwater quality falls outside of the site-specific trigger level value for one or more constituents | • Raise as environmental incident report.<br>• Conduct investigation to determine specific cause of the impact.<br>• Implement appropriate control measures to reduce further impact.<br>• Review Groundwater MP procedures and update where necessary to reduce further impacts. | Environmental Manager |
| Surface water quality changes exceed determined values | • Conduct investigation to determine specific cause of the impact.<br>• Review Groundwater MP procedures and update where necessary to reduce further impacts. | Environmental Manager |
| No leaks from TSF infrastructure | • Conduct investigation to determine specific cause of the impact.<br>• Implement appropriate control measures to reduce further impact. | Environmental Manager |

## 3.6 Reporting provisions

### 3.6.1 Annual reporting

Performance in managing tailings will be compared against management targets outlined in Table 3.2 and reported as part of the Annual Environmental Report (AER). In the event that the MRUP environmental objective is not achieved during the reporting period, the AER will include a description of the effectiveness of revised and/or additional management actions implemented and an analysis of trends.

The first AER will be submitted in accordance with the timeline outlined in the Condition Statement following the acceptance of the PER by the EPA.

### 3.6.2 Reporting on exceedance of the management target

In the event of a failure of a management target outlined in Table 3.2 resulting in a significant environmental impact, Vimy will verbally notify the CEO of the OEPA within 48 hours of learning of the exceedance. A written report detailing the exceedance and the outcome of the investigation will be provided to the CEO of the OEPA within seven days. Exceedances of management targets not deemed significant will be reported in the AER.

A significant impact is defined as an unplanned, long term or irreversible environmental impact as a result of tailings management within the MRUP Development Envelope as a result of MRUP activities.

The MP reporting template is presented in Table 3.5.

**Table 3.5: Management Plan reporting table**

| Key environmental factor: Subterranean fauna, Hydrological Processes, Terrestrial Environmental Quality, Terrestrial fauna and Inland Waters Environmental Quality | | |
|---|---|---|
| Environmental objective and management target set in the MP | Reporting on the management objective and management target for [Month 20xx] to [Month 20yy] | Status[1] |
| Prevent or minimise impacts to surface water and groundwater from MRUP activities. | Impacts to the surface water and groundwater from MRUP activities *[were / were not]* minimised or prevented. | ■ YES or<br>● NO |
| Management target 1: Monitor surrounding groundwater quality to assess seepage from In-pit TSFs | Management target 1: Surrounding groundwater quality *[was / was not]* monitored to assess seepage from In-pit TSFs | ■ YES or<br>● NO |
| Management target 2: Monitor seepage water quality | Management target 2: Seepage water quality *[was / was not]* monitored | ■ YES or<br>● NO |
| Management target 3: Assess impacts of tailings on groundwater | Management target 3: Impacts of tailings on groundwater *[were / were not]* assessed | ■ YES or<br>● NO |
| Management target 4: Collect sufficient information to satisfy regulatory requirements under ANCOLD (2012) guidelines. | Management target 4: Sufficient information to satisfy regulatory requirements under ANCOLD (2012) guidelines *[was / was not]* collected. | ■ YES or<br>● NO |
| Management target 5: Assess all tailings pipelines for structural integrity and leaks | Management target 5: All tailings pipelines *[were / were not]* assessed for structural integrity and leaks | ■ YES or<br>● NO |
| Management target 6: Assess all tailings pump infrastructure for structural integrity and leaks | Management target 6: All tailings pump infrastructure *[was / was not]* assessed for structural integrity and leaks | ■ YES or<br>● NO |
| Management target 7: Ensure freeboard present within each TSF is above acceptable limits | Management target 7: Freeboard *[was / was not]* ensured to be present within each TSF above acceptable limits | ■ YES or<br>● NO |
| Management target 8: Assess all TSFs for structural integrity, performance of instrumentation and underdrainage and leak detection system | Management target 8: All TSFs *[were / were not]* assessed for structural integrity, performance of instrumentation and underdrainage and leak detection system | ■ YES or<br>● NO |

| Key environmental factor: Subterranean fauna, Hydrological Processes, Terrestrial Environmental Quality, Terrestrial fauna and Inland Waters Environmental Quality |
|---|
| Notes:<br>1. The status of achievement of the environmental objectives is indicated by the following symbols:<br>■ Environmental objective achieved<br>● Environmental objective not achieved |

# 4. Adaptive management and review of the MP

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

- Monitoring data will be systematically evaluated and compared to baseline and reference site data in accordance with Table 3.3 in a process of adaptive management to verify whether responses to the impact are the same or similar to predictions.
- Re-evaluate the risk assessment and revision of risk-based priorities on the basis of monitored information.
- Increased understanding of the local and regional ecological regime.
- Revision when management actions are not as effective as predicted.
- 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.).
- Review of MP – changes to MP provisions required by a condition, timeframe, etc.

# 5. Stakeholder consultation

Consultation has predominantly been with Decision Making Authorities (DMAs) and other relevant State government departments and local government authorities as well as environmental non-government organisations including Department of Mines and Petroleum (DMP), Department of Parks and Wildlife (DPaW), Department of Environment (DER) and Department of Water (DoW)..

# 6. References

The following references were used in developing this MP.

ANCOLD (2012), *Guidelines on Tailings Dams – Planning, Design, Construction, Operation and Closure*. Australian National Committee on Large Dams.

ANCOLD (2014), *Regulation and practice for the environmental management of dams in Australia*. Australian National Committee on Large Dams.

Australian Nuclear Science and Technology Organisation (ANSTO), (2015). *Mulga Rock Tailings Characterisation Test work*, Report for Vimy Resources Limited.

DEC Water Quality Protection, Perth, Western Australia. Waters and Rivers Commission (1994) *Goldfields Groundwater Area Management Plan*.

DME (1999) *Guidelines on the Safe Design and Operating Standards for Tailings Storage*. Department of Minerals and Energy, Perth, Western Australia.

Department of Industry and Resources (DOIR), (1999). *Mining, Environmental Management Guidelines, Safe Design and Operating Standards for Tailings Storage*. Perth, Western Australia.

Department of Industry and Resources (DOIR), (2007). *Mining Environmental Management Guidelines, Development of an Operation and Maintenance Manual for Tailings Storage*. Perth, Western Australia.

EPA (2015a) *Environmental Assessment Guideline for Environmental principles, factors and objectives, EAG 8*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015b) *Environmental Assessment Guideline for Preparation of management plans under Part IV of the Environmental Protection Act 1986, EAG 17*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015c) *Title of Condition Environmental Management Plan, Environmental management-based condition model template*. Environmental Protection Authority, Perth, Western Australia.

GHD (2015a). *Mulga Rock Uranium Project Tailings Storage Study*. Unpublished Report to Vimy Resources Limited by GHD, Perth, Western Australia.

GHD (2015b). *Groundwater Assessment of Tailings and Process Water Disposal to Princess Pit*. Unpublished Report to Vimy Resources Limited by GHD, Perth, Western Australia

International Commission on Large Dams (ICOLD), (1996) M*onitoring of Tailings Dams – Review and Recommendations*, Bulletin no 104

Soilwater Consultants (2015a). *Physio-chemical characterisation of ore and tailings from the Mulga Rock Uranium Project*. Unpublished Report to Vimy Resources Limited by Soilwater Consultants (SWC), Perth, Western Australia

Soilwater Consultants (2015b). *Mulga Rock Uranium Project Tailings Storage Facility Seepage Analysis*. Unpublished Report to Vimy Resources Limited by Soilwater Consultants (SWC), Perth, Western Australia.

# Mulga Rock Uranium Project

# Acid and Metalliferous Drainage Management Plan

**MRUP-EMP-016**

November 2015


**Vimy Resources Limited**

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## Prepared for Vimy Resources Limited by Golder Associates Pty Ltd

# Table of Contents



# List of Tables

# 1. Summary

The table below presents the environmental management target/s to measure achievement of the environmental objective that must be met through implementation of this Management Plan (MP).

| Title of proposal | Mulga Rock Uranium Project |
|---|---|
| Proponent | Vimy Resources Limited |
| Environmental Scoping Document | Assessment Number 1979 |
| Purpose of this MP | The Acid and Metalliferous Drainage Management Plan is submitted to outline MRUP's proposed procedures and practices to be implemented to meet the EPA's environmental objective for the key environmental factor/s. |
| EPA's environmental objective for the key environmental factor/s | Subterranean Fauna: To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.<br>Terrestrial Fauna: To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.<br>Hydrological Processes: To maintain the hydrological regimes of groundwater and surface water so that existing and potential uses, including ecosystem maintenance, are protected.<br>Inland Waters Environmental Quality: To maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected. |
| Environmental objective | To assess the risk to the environment from the disturbance and exposure of the earth through mining activities and prevent or minimise impacts to surface water and groundwater from MRUP activities. |
| Management target/s | • Management target 1: Continually classify and appropriately treat material.<br>• Management target 2: Establish water baselines and monitor water quality with trigger values. |

**Corporate endorsement**

I hereby certify that to the best of my knowledge, the MP provisions within this Acid and Metalliferous Drainage Management Plan are true and correct.

[Signature of duly authorised proponent representative]

Name: Signed:

Designation: Date:

# 2. Context, scope and rationale

## 2.1 What is the Proposal?

Vimy Resources Limited (Vimy) proposes to develop the Mulga Rock Uranium Project (MRUP or the Project) which lies approximately 240km east-north-east of Kalgoorlie-Boulder in the Shire of Menzies. The area is remote, located on the western flank of the Great Victoria Desert, comprising series of large, generally parallel sand dunes, with inter-dunal swales and broad flat plains.

The MRUP covers approximately 102,000 hectares on granted mining tenure (primarily M39/1080 and M39/1081) within Unallocated Crown Land (UCL). It includes two distinct mining centres, Mulga Rock East (MRE) comprising the Princess and Ambassador resources and Mulga Rock West (MRW) comprising the Emperor and Shogun resources, which are approximately 20km apart. Up to 4.5 Million tonnes per annum (Mtpa) of ore will be mined using traditional open cut techniques, crushed, beneficiated and then processed onsite to produce, on average, 1,360 tonnes of uranium oxide concentrate (UOC) per year over the life of the Project. Base metal concentrates will also be extracted using sulphide precipitation after the uranium has been removed and sold separately.

The anticipated Life-of-Mine (LOM) is up to 16 years, based on the currently identified resource.

This MP has been based on *Environmental Assessment Guideline 17* (EPA 2015b) and the EPA's *environmental management-based condition model template* (EPA 2015c).

## 2.2 What Key Environmental Factor/s does this MP address?

This MP specifically addresses the Subterranean Fauna, Terrestrial Fauna, Hydrological Processes, and Inland Waters Environmental Quality environmental factors.

These are important environmental factors for this proposal because Acid and Metalliferous Drainage, if not managed appropriately, has the potential to cause long term environmental impacts to the MRUP and surrounding environment.

## 2.3 Rationale and approach in meeting the Environmental Objective

Results of baseline surveys and a number of assumptions and uncertainties inform the management approach for meeting MRUP's environmental objective. The identified management actions, management targets and proposed review and revision of management actions are aligned with the overall management approach.

### 2.3.1 Results of (baseline surveys/modelling/scientific studies/tests) conducted

Geochemical characterisation of the Overburden and Ore materials has been undertaken by ANSTO (2015), SWC (2015a, b), and assayed during geological drilling. In this work, the multi-elemental composition of the solid-phase has been quantified, either using ICP-OES/MS or XRF and standard Acid Rock Drainage (ARD) techniques (i.e. AMIRA, 2002), whilst the potential for mobilisation of metals and metalloids were determined using the Australian Standard Leach Procedure (ASLP) with site water as the extractant. The results of this geochemical characterisation are summarised below:

- Overburden materials to within 2 – 5 m of the water table (i.e. associated with the capillary fringe) classified as Non-Acid Forming (NAF), with negligible Acid and Metalliferous Drainage (AMD) potential.
- The basal 2 – 5 m of the Oxidised Eocene sediments (Overburden) likely contain residual sulfides and elevated mobile metals.
- The overburden materials are inherently moderately acidic (pH 4 – 6) and have low salinities (EC < 100 mS/m) in response to the extensive weathering and leaching.
- The Ore material is classified as Potential Acid Forming (PAF); recent studies have recorded average Total S contents of 1.64% across the orebody and an associated sulphide-S content (80 – 90% of the Total S) of 1.3 – 1.5%. This equates to a Maximum Potential Acidity of around 43 kg $H_2SO_4$/t. Given the ore material also exists in an acid condition, due to previous (and possibly contemporaneous) sulphide oxidation, it contains no effective or readily available Acid Neutralising Capacity (ANC), and thus the MPA is equivalent to the Net Acid Producing Potential (NAPP). The corresponding Net Acid Generation (NAG) of the orebody varies from 15 to 57 $H_2SO_4$/t.
- ASLP testing of the Ore material using a brackish solution as the lixiviant demonstrated that Cd, Co, Fe, Se and Zn may leach from the ore (lignite) materials if they are crushed and then deposited into a brackish environment, with all other elements assessed were considered to have been retained in the solid phase (i.e. through strong organic-metal complexes); hence not mobile to leaching solutions.

### 2.3.2 Key assumptions and uncertainties

The mineralogy of the proposed area is complex and, it is understood the bulk of the uranium minerals are laterally diffused through the richly organic carboniferous sediments. A review of the physiochemical characterisation of the MRUP investigation conducted by Soil Water Group (SWG) in June 2015 indicates the major base minerals which coincide with the uranium deposit and are within the proposed mining domain include: cobalt, copper, nickel, scandium and zinc.

The data available to assess the AMD potential of the geological units within the Project area are limited. It is known from the geological setting that unoxidised geologies will be acid forming. However, the risk of AMD at the site is unknown. Thus, this plan presents a discussion of the possible management strategies for AMD at the site without providing specifics as to its nature and extent. Further, following limitations and assumptions exist within this MP:

- The precautionary principle which stipulates that in the absence of certainty (data) a conservative assumption will apply.
- The plan will be updated and revised when additional data becomes available.

### 2.3.3 Management approach

An adaptive risk based approach to management has been adopted by Vimy for the MRUP. This has been informed by a range of specialist scientific studies for the MRUP and regional area, as well as database searches and other regional project information.

This information has allowed Vimy to prioritise and manage significant risks using the mitigation hierarchy (i.e. avoid, minimise, manage, rehabilitate and offset) and develop an adaptive management system. Adaptive management allows for adaptations due to changing project conditions and the dynamic nature of ecosystems in order to achieve the MRUP environmental objectives.

This management approach is consistent for all the environmental factors for the Project.

If AMD is discharged during operations/closure and through a risk assessment is proven to pose an unacceptable risk to the receiving environment, drainage treatment technologies must be incorporated into mine water management for MRUP Project.

### 2.3.4 Rationale for choice of management target/s

Vimy has chosen management based targets. These have been chosen to prioritise significant risks identified for the project and are based on:

- Baseline information and available data for the site and local region.
- The relationship between relevant proposal aspects and impacts on flora and vegetation at the MRUP.
- Scientific credibility.
- Consistent with monitoring programs already underway on the site, in the region and industry standards.

Management targets will be reviewed annually to ensure they remain relevant and reflect Vimy and the EPA's environmental objective. Any changes to management targets reported as part of the Annual Environmental Report (AER).

# 3. MP provisions

This section of the MP identifies the provisions that Vimy proposes to implement to assess the risk to the environment from the disturbance and exposure of the earth through mining activities and prevent or minimise impacts to surface water and groundwater from MRUP activities. It identifies the management target/s that Vimy will use to measure performance and monitoring that will be undertaken in relation to the management target/s. Finally, it identifies how Vimy will review and revise management actions if the management targets are exceeded.

## 3.1 Environmental objective

To assess the risk to the environment from the disturbance and exposure of the earth through mining activities and prevent or minimise impacts to surface water and groundwater from MRUP activities.

## 3.2 Management actions to be implemented

MRUP activities/aspects which have the potential to cause environmental impacts from tailings have been evaluated through a risk analysis. No risks were identified that required potential 'very high' or 'high' risks or impacts requiring specific management. Despite this, in the interest of continual improvement, Vimy will implement the risk-based management actions presented in Table 3.1.

**Table 3.1: Risk-based management actions that will be implemented to meet the condition environmental objective**

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| Materials Requiring Special Handling (MRSH) | Implement waste schedules with demarcated material storage areas | Surface Water Management Plan (MRUP-EMP-009)<br>Groundwater Management Plan (MRUP-EMP-010)<br>Groundwater Operating Strategy (MRUP-EMP-011)<br>Managed Aquifer Recharge Management Plan (MRUP-EMP-012)<br>Operational Environment Management Plan (MRUP-EMP-020)<br>Water Operating Strategy (MRUP-EMP-021) | Low | Design, construction and operation |
| Deleterious water quality | Separation, containment and treatment of water | Surface Water Management Plan (MRUP-EMP-009)<br>Groundwater Management Plan (MRUP-EMP-010)<br>Groundwater Operating Strategy (MRUP-EMP-011)<br>Managed Aquifer Recharge Management Plan (MRUP-EMP-012)<br>Operational Environment Management Plan (MRUP-EMP-020)<br>Water Operating Strategy (MRUP-EMP-021) | Low | Life of the Project |

## 3.3 Management target

Studies to allow for the completion of this section are yet to be undertaken. At the present time all data will be compared to the relevant national water quality objective. A management target will be employed to measure and report against achievement of MRUP's environmental objective. The results of the AMD study suggest the management targets in Table 3.2 are sufficient until further information is known. It is important to state that any AMD MP needs to be adaptive.

**Table 3.2: Management target/s to measure the efficacy of management actions relative to the environmental objective**

| | |
|---|---|
| Proposed environmental objective | To assess the risk to the environment from the disturbance and exposure of the earth through mining activities and prevent or minimise impacts to surface water and groundwater from MRUP activities. |
| Management target 1 | Continually classify and appropriately treat material |
| Management target 2 | Establish water baselines and monitor water quality with trigger values |

## 3.4 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 have to be reviewed and revised. This section describes how Vimy will undertake monitoring to determine whether the management targets are achieved.

Proposed monitoring methods, locations, parameters and frequencies are outlined in Table 3.3 below. Exact monitoring locations will be finalised as part of the operational MPs and the development of the Environmental Monitoring Management Plan (MRUP-EMP-032). Where practicable, monitoring points will be located to correlate with previous baseline surveys.

**Table 3.3: Operational monitoring to measure the efficacy of management actions against the management targets**

| Indicator | Method | Location | Parameters | Frequency |
|---|---|---|---|---|
| **Management target 1**: Continually classify and appropriately treat material | | | | |
| Overburden material to be used in landform construction is characterised and identified to be geochemical stable and non-polluting. | Geochemical testing of overburden and ore material<br>Monitoring reports indicate that NAF and PAF materials are appropriately managed | OLs, ROM pad | Standard geochemical suite of parameters | Life of the mine, closure |
| **Management target 2:** Establish water baselines and monitor water quality with trigger values | | | | |
| Water quality is maintained within agreed levels | Water quality measurements.<br>Manage surface water to minimise the risk of contamination | In-pit sumps, dewatering and pit monitoring borefield | Standard suite of water quality parameters | Life of the mine, closure |

## 3.5 Review and revision of management actions

In the event that a management target is not met or is exceeded, Vimy will implement the following adaptive management procedure:

- Investigate the potential cause of failing to meet the management target and identify any impacts resulting from this failing.
- If the causes of failing to meet the management target or any impacts identified are a result of the MRUP, the risk assessment will be reviewed and revised risk based management actions will be implemented so that the MRUP environmental objective is met.

Performance meeting management targets will be reported as part of the Annual Environmental Report (AER).

### 3.5.1 Corrective Actions

If monitoring actions outlined in Section 3.4 indicate that the indicators and management targets are not being met then the associated corrective actions outlined below will be implemented.

**Table 3.4: Corrective Actions**

| Performance Indicator | Action | Responsibility |
|---|---|---|
| Overburden material used in landform construction is not characterised | • Raise as environmental incident report.<br>• Conduct investigation to determine specific cause of the impact.<br>• Implement appropriate control measures to reduce further impact. | Environmental Manager |
| Surface water quality changes exceed trigger values | • Develop a strategy to determine suitable management actions, measures while ensuring any contaminants are contained and reduced/removed to an approved level.<br>• Increase monitoring of down gradient ground water and natural drainage lines in catchments where water quality has been compromised.<br>• If AMD is discharged during operations/closure and through a risk assessment is proven to pose an unacceptable risk to the receiving environment, drainage treatment technologies must be incorporated into mine water management for MRUP Project | Environmental Manager |
| Waste inappropriately stored | • Conduct investigation to determine specific cause of the impact.<br>• Implement appropriate control measures to reduce further impact.<br>• Increase monitoring and inspections to ensure that material or waste is transported to the correct locations and placed as required. | Environmental Manager |

## 3.6 Reporting provisions

### 3.6.1 Annual reporting

Performance in managing AMD will be compared against management targets outlined in Table 3.2 and reported as part of the Annual Environmental Report (AER). In the event that the MRUP environmental objective is not achieved during the reporting period, the AER will include a description of the effectiveness of revised and/or additional management actions implemented and an analysis of trends.

The first AER will be submitted in accordance with the timeline outlined in the Condition Statement following the acceptance of the PER by the EPA.

### 3.6.2 Reporting on exceedance of the management target

In the event of a failure of a management target outlined in Table 3.2 resulting in a significant environmental impact, Vimy will verbally notify the CEO of the OEPA within 48 hours of learning of the exceedance. A written report detailing the exceedance and the outcome of the investigation will be provided to the CEO of the OEPA within seven days. Exceedances of management targets not deemed significant will be reported in the AER.

A significant impact is defined as an unplanned, long term or irreversible impact to water quality, flora, vegetation or fauna of conservation significance within the MRUP Development Envelope and greater area as a result of MRUP activities.

The MP reporting template is presented in Table 3.5.

**Table 3.5: Management Plan reporting table**

| Key environmental factor: Subterranean fauna, Hydrological Processes, Terrestrial Environmental Quality, Terrestrial fauna and Inland Waters Environmental Quality | | |
|---|---|---|
| Environmental objective and management target set in the MP | Reporting on the management objective and management target for [Month 20xx] to [Month 20yy] | Status[1] |
| Condition environmental objective: To assess the risk to the environment from the disturbance and exposure of the earth through mining activities and prevent or minimise impacts to surface water and groundwater from MRUP activities. | The risk to the environment from disturbance and exposure *[was / was not]* determined, and impacts to surface water and groundwater from the MRUP activities [was / was not] prevented or minimised. | ■ YES or<br>● NO |
| Management target 1: Continually classify and appropriately treat material. | Management target 1: Material *[was / was not]* continually classified and appropriately treated | ■ YES or<br>● NO |
| Management target 2: Establish water baselines and monitor water quality with trigger values | Management target 2: Water baselines [were / were not] recorded and water quality *[was / was not]* tested | ■ YES or<br>● NO |

Notes:

1. The status of achievement of the condition environmental objectives is indicated by the following symbols:
   - ■ Condition environmental objective achieved
   - ● Condition environmental objective not achieved

# 4. Adaptive management and review of the MP

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

- Monitoring data will be systematically evaluated and compared to baseline and reference site data in accordance with Table 3.3 in a process of adaptive management to verify whether responses to the impact are the same or similar to predictions.
- Re-evaluate the risk assessment and revision of risk-based priorities on the basis of monitored information.
- Increased understanding of the local and regional ecological regime.
- Revision when management actions are not as effective as predicted.
- 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.
- Review of MP – changes to MP provisions required by a condition, timeframe, etc.

# 5. Stakeholder consultation

Consultation has predominantly been with Decision Making Authorities (DMAs) and other relevant State government departments and local government authorities as well as environmental non-government organisations including Department of Mines and Petroleum (DMP), Department of Parks and Wildlife (DPaW), Department of Environment (DER) and Department of Water (DoW)..

# 6. References

The following references were used in developing this MP.

ANSTO 2015 *Mulga Rock Tailings Characterisation Testwork*, unpublished report prepared for Vimy Resources Limited, February 2015.

EPA (2015a) *Environmental Assessment Guideline for Environmental principles, factors and objectives, EAG 8*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015b) *Environmental Assessment Guideline for Preparation of management plans under Part IV of the Environmental Protection Act 1986, EAG 17*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015c) *Title of Condition Environmental Management Plan, Environmental management-based condition model template*. Environmental Protection Authority, Perth, Western Australia.

SWC 2015a, *Physicochemical Characterisation of Ore and Tailings from the Mulga Rock Uranium Project*, unpublished report prepared for Vimy Resources Limited, October 2015.

SWC 2015b, *Terrain Analysis and Materials Characterisation for the Mulga Rock Uranium Project*, unpublished report prepared for Vimy Resources Limited, October 2015.

# Mulga Rock Uranium Project

# Ground Disturbance Management Plan

## MRUP-EMP-019

November 2015


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# List of Tables

# 1. Introduction

## 1.1 What is the Proposal?

Vimy Resources Limited (Vimy) proposes to develop the Mulga Rock Uranium Project (MRUP or the Project) which lies approximately 240km east-north-east of Kalgoorlie-Boulder in the Shire of Menzies. The area is remote, located on the western flank of the Great Victoria Desert, comprising series of large, generally parallel sand dunes, with inter-dunal swales and broad flat plains.

The MRUP covers approximately 102,000 hectares on granted mining tenure (primarily M39/1080 and M39/1081) within Unallocated Crown Land (UCL). It includes two distinct mining centres, Mulga Rock East (MRE) comprising the Princess and Ambassador resources and Mulga Rock West (MRW) comprising the Emperor and Shogun resources, which are approximately 20km apart. Up to 4.5 Million tonnes per annum (Mtpa) of ore will be mined using traditional open cut techniques, crushed, beneficiated and then processed onsite to produce, on average, 1,360 tonnes of uranium oxide concentrate (UOC) per year over the life of the Project. Base metal concentrates will also be extracted using sulphide precipitation after the uranium has been removed and sold separately.

The anticipated Life-of-Mine (LOM) is up to 16 years, based on the currently identified resource.

## 1.2 Objectives

This Ground Disturbance Management Plan (Ground Disturbance MP) has been developed in accordance with the principles and strategies discussed within Vimy Resources' overarching Environmental Management Plan (MRUP-EMP-000), which provides a management framework to direct and guide the development of all environmental management documentation.

## 1.3 Scope and Applicability

The purpose of the Ground Disturbance MP is to provide a framework of procedures and monitoring processes to prevent or minimise the potential for the ground disturbance that has not been approved via the Ground Disturbing Activity Permit (GDAP) in order to protect environmental values of the MRUP area. The Ground Disturbance Management Plan is applicable across all aspects and areas of the MRUP, including the mine, borefields, haul roads and access roads.

The Ground Disturbance Management Plan is applicable for the Life of Mine (LOM) and applies to all Vimy personnel, contractors and site visitors.

This Ground Disturbance Management Plan supplements the Flora and Vegetation Management Plan (MRUP-EMP-001), the Conservation Significant Flora and Vegetation Management Plan (MRUP-EMP-002) and Construction and Operational Environment MPs (MRUP-EMP-018 and 020).

# 2. Relevant Legislation, Standards and Guidelines

## 2.1 Key Legislation

The key legislation applicable to this management plan include the following:

- *Conservation and Land Management Act 1984.*
- *Soil and Land Conservation Act 1945.*
- *Bush Fires Act 1954.*
- *Environmental Protection Act 1986.*

## 2.2 Key Standards and Guidelines

The key industry standards and guidelines applicable to this management plan include the following:

- EPA (2000) Position Statement 2: Environmental Protection of Native Vegetation in Western Australia.
- EPA (2006) Guideline for the Assessment of Environmental Factors: Guidance Statement No. 6. Rehabilitation of Terrestrial Ecosystems.
- DPI (2008) Queensland Weed Spread Prevention Strategy.
- DEC (2010) A guideline for managing the impacts of dust and associated contaminants from land development sites, contaminated sites remediation and other related activities.
- EPA Guidance Statement No. 41 - Assessment of Aboriginal Heritage (EPA April 2004).
- Department of Aboriginal Affairs and Department of Premier and Cabinet - Aboriginal Heritage Due Diligence Guidelines, Version 3.0 (DAA and DPC April 2013).

## 2.3 Environmental Conditions and Commitments

The Ground Disturbance MP has been prepared in order to satisfy commitments within the PER. It is expected that this management plan will be updated to include future potential conditions / commitments that may result following regulatory review and assessment, including stakeholder consultation, and licence applications. At this point in time, only commitments within the PER are available and these include:

- The areas being cleared will be managed through the application of a GDAP. This will ensure that any key locations regarded as environmentally sensitive (such as location of conservation significant flora or refuge areas created by fire) are avoided where practical and the extent of all clearances is minimised. The same system will monitor clearances and ensure that rehabilitation takes place as soon as is practical.

## 3. Roles and Responsibilities

The provisional roles and responsibilities for relevant personnel involved in the implementation of the MRUP Ground Disturbance MP are listed in Table 3.1.

**Table 3.1: Roles and Responsibilities**

| Position | Responsibility |
|---|---|
| General Manager | • Ultimate responsibility for ensuring the objectives of the Ground Disturbance MP are achieved. |
| Environmental Manager | • Implementation of the GDAP process.<br>• Undertake assessment and review into the effectiveness of the GDAP process, updating and refining where deemed necessary to ensure management goals are achieved. |
| Environment Superintendent | • Ensure all MRUP staff are aware of their roles and responsibilities in relation to the GDAP process.<br>• Deliver relevant training and induction to MRUP staff, contractors and visitors.<br>• Formulate and implement compliance audits of the GDAP process and associated activities. |
| Operation Managers and Site Supervisors | • Ensure GDAP process is adhered to by all MRUP staff, contractors and visitors.<br>• Assist in compliance audit activities. |
| All MRUP personnel, contractors and visitors | • Conduct all relevant activities in accordance with the GDAP process.<br>• Report all incidents which may cause or have caused exceedance of reporting guidelines. |

# 4. Objectives and Performance Indicators

The objective of this Ground Disturbance MP is to ensure procedures are in place to minimise the impact on all environmental values from clearance activities. This minimisation will principally be achieved through the use and implementation of a GDAP system which will set out the various activities and approvals necessary prior to and during clearing activities.

# 5. Management Actions

Prior to any ground disturbance, a GDAP must be completed by the operational supervisor and approved by the Environmental Manager. Once the checklist within the GDAP is completed, a copy must be provided to the Environmental Department and filed for future reference, according to the protocols within the Document and Data Control Management Plan (MRUP-EMP-038). The onsite supervisor in charge of the disturbance activity is responsible for ensuring that:

- A minimum area is disturbed for establishment of the required infrastructure or landform.
- All required approvals are in place and clearing activity is kept within approved areas.
- The area to be disturbed is clearly communicated to operators undertaking the clearing and that they are informed of the clearance boundaries and any significant environmental aspects (such as nearby Priority Flora species, dust emissions etc.).
- Disturbance is carried out in a progressive manner so that areas to be cleared for future use are left undisturbed until required.

# 6. Reporting and Auditing

## 6.1 Reporting

The GDAP forms will be held in a central database as outlined in the Document and Data Control Management Plan (MRUP-EMP-038). Any environmental incidents will be reported within the Annual Environmental Report.

## 6.2 Auditing and Revision of Management Plan

The GDAP process will be reviewed annually to incorporate any changes to mining activities or management and monitoring strategies which may impact on ground disturbance management.

## 6.3 Stakeholder Consultation

Consultation regarding ground disturbance has been undertaken with Department of Environment and Regulation (DER) and Department of Parks and Wildlife (DPAW) during the preparation of the Environmental Scoping Document (ESD).

# 7. References

DAA and DPC (2013) *Aboriginal Heritage - Due Diligence Guidelines, Version 3.0*. Department of Aboriginal Affairs and Department of Premier and Cabinet. Perth, Western Australia.

DEC (2010) *A guideline for managing the impacts of dust and associated contaminants from land development sites, contaminated sites remediation and other related activities*. Department of Environment and Conservation, Government of Western Australia.

DPI (2008) *Queensland Weed Spread Prevention Strategy*. Department of Primary Industries and Fisheries, Brisbane, Queensland.

EPA (2000) *Position Statement 2: Environmental Protection of Native Vegetation in Western Australia*. Environmental Protection Authority, Perth, Western Australia.

EPA (2004) *Guidance Statement No. 41: Assessment of Aboriginal Heritage*. Perth, Western Australia.

EPA (2006) *Guideline for the Assessment of Environmental Factors: Guidance Statement No. 6. Rehabilitation of Terrestrial Ecosystems.* Environmental Protection Authority, Perth, Western Australia.

# Mulga Rock Uranium Project

# Water Operating Strategy

## MRUP-EMP-021

November 2015


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Prepared by Soilwater Consulting Pty Ltd.

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## List of Figures



## List of Tables

# 1. Introduction

## 1.1 Objectives

This Water Operating Strategy has been developed in accordance with the principles and strategies documented within the Vimy Resources Limited (Vimy) overarching Environmental Management Plan (MRUP-EMP-000). This MP provides a management framework which directs and guides the development and implementation of all environmental management plans and operating strategies for the Mulga Rock Uranium Project (MRUP).

The MRUP will include groundwater extraction activities, comprising dewatering of open cut mine pits and extraction of process water from a nearby borefield, as well as reinjection of some water into the local aquifer system at times of excess water supply. The MRUP will also involve considerable transfer, recycling, and beneficial use of several different water streams to support ore processing and general site operations. This Water Operating Strategy was therefore developed to identify and outline the management of all water streams on site.

## 1.2 Scope and Applicability

The purpose of the Water Operating Strategy is to provide a framework of procedures and monitoring processes to manage water use, storage and transfer in the MRUP. The Water Operating Strategy is applicable across all aspects and areas of the MRUP, including the mine, bore fields, haul roads and access roads.

The Water Operating Strategy is applicable for the Life of Mine (LOM) and applies to all Vimy personnel, contractors and site visitors.

This Water Operating Strategy supplements the Surface Water Management Plan (MRUP-EMP-009), Groundwater Management Plan (MRUP-EMP-010), Groundwater Operating Strategy (MRUP-EMP-011) and the Managed Aquifer Recharge Management Plan (MRUP-EMP-012).

## 1.3 Key Legislation

The key legislation applicable to this Water Operating Strategy includes the following:

- *Rights in Water and Irrigation Act 1914.*
- *Environmental Protection Act 1986.*
- *Environment Protection and Biodiversity Conservation Act 1999.*

## 1.4 Key Standards and Guidelines

The key standards and guidelines used and referred to during the development of this Water Operating Strategy include the following:

- ANZECC and ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Canberra, ACT.
- ANZECC and ARMCANZ (2000), National Water Quality Management Strategy Paper No.4: Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Canberra, ACT.
- Water Authority of W.A. (1994) Goldfields Groundwater Area Management Plan. Groundwater and Environment Branch Report GW157.
- DoW (2011) Operational Policy No. 1.02 - Policy on Water Conservation and Efficiency Plans, Perth, Western Australia.
- DoW (2013) Strategic Policy No.2.09 – Use of mine dewatering surplus, Perth, Western Australia.

- DoW (2010) Operational Policy No. 5.03 – Metering the taking of water, Perth, Western Australia.
- DoW (2010) Operational Policy No. 5.08 – Use of Operating Strategies in the Water Licensing Process, Perth, Western Australia.
- DoW (2013) Water licensing delivery series - Report No.12: Western Australian water in mining guideline, Perth, Western Australia
- Government of WA (2004) State Water Quality Management Strategy Document No. 6, Perth, Western Australia.
- IUCN Adaptive Management Framework.

## 1.5 Environmental Conditions and Commitments

This Water Operating Strategy has been prepared in order to satisfy commitments within the PER. The overarching commitment of this operating strategy (OS) is to maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected.

It is expected that this document will be updated to include future conditions / commitments that may result following regulatory review and assessment, including stakeholder consultation, and licence applications. At this time, only commitments within the PER are available and these include:

- Water conservation principles will govern the extraction and utilisation of water throughout the MRUP.
- Adhere to all licence conditions set by the various regulatory agencies.
- Water protection principles will be adopted across all operational activities to ensure protection of surface and groundwater systems, and the overall quality of the ecosystem.

## 1.6 Previous Studies Completed

A number of investigations have been undertaken to assess aspects of the environment relevant to the management of water (Table 1.1).

**Table 1.1: Completed Investigations**

| Title and Scope of Survey | Author and Timing |
|---|---|
| Groundwater Study – Lake Minigwal | GRC (1984) |
| Stage 2 Hydrogeological Investigation – Mulga Rock Prospect | GRC (1985) |
| Groundwater exploration report – Mulga Rock Prospect | GRC (1986) |
| Geochemistry, mineralogy, and hydrogeochemistry at Ambassador | Douglas et al (1993) |
| Dewatering study – Ambassador deposit | Rockwater (2010) |
| Dewatering and water supply – Mulga Rock Project | Rockwater (2013) |
| Numerical Groundwater Modelling – Mulga Rock Project | Rockwater (2015) |
| Surface Water Assessment and Management Plan | Rockwater (2015) |

The water table in the Mulga Rock East area is 29 to 49m below ground level (bgl), and generally lies within fine-grained, carbonaceous sediments of Eocene age. The water table is very flat (hydraulic gradient ~0.002), with an elevation of around 285 to 290m Australian Height Datum (AHD). Seasonal and annual water level variations are very small, indicating very little recharge or discharge from the basin.

# 2. Administrative Requirements

## 2.1 Roles and Responsibilities

The provisional roles and responsibilities for relevant personnel involved in the implementation of the Water Operating Strategy are listed in Table 2.1.

**Table 2.1: Roles and Responsibilities**

| Position | Responsibility |
|---|---|
| General Manager | • Ensuring the objectives of the Water Operating Strategy and associated management plans are achieved. |
| Environmental Manager | • Implementation of the strategy.<br>• Undertake assessment and review into the effectiveness of management plans, updating and refining where deemed necessary to ensure management goals are achieved. |
| Environment Superintendent | • Ensure all MRUP staff are aware of their roles and responsibilities in relation to the Water Operating Strategy.<br>• Deliver relevant training and induction to MRUP staff, contractors and visitors.<br>• Formulate and implement compliance audits of the Water Operating Strategy and associated activities. |
| Operation Managers and Site Supervisors | • Ensure Water Operating Strategy and associated management plans are adhered to by all MRUP staff, contractors and visitors.<br>• Assist in compliance audit activities. |
| All MRUP personnel, contractors and visitors | • Conduct all relevant activities in accordance with management plan guidelines.<br>• Report all incidents which may cause or have caused exceedance of reporting guidelines. |

## 2.2 Auditing and Revision of the Operating Strategy

The adaptive management strategies used by Vimy will involve ongoing review and updates to allow iterative improvement of the management plan and the incorporation of any changes to mining activities or improvements in management and monitoring strategies.

## 2.3 Stakeholder Consultation

Where relevant, stakeholders will be consulted with regards to ongoing monitoring, management and contingencies as part of the adaptive management strategy and ongoing review process.

## 2.4 Schedules

The schedules listed in Table 2.2 are proposed for the implementation of the Water Operating Strategy and the associated management strategies.

**Table 2.2: Management Schedules for the Water Operating Strategy**

| Management Action | Personnel | Schedule |
|---|---|---|
| Review the Water Operating Strategy and associated management plans | Environmental Superintendent | Annually |
| Conduct monitoring activities | Environmental Manager | Quarterly |
| Environmental reporting | Environmental Manager | Annually |

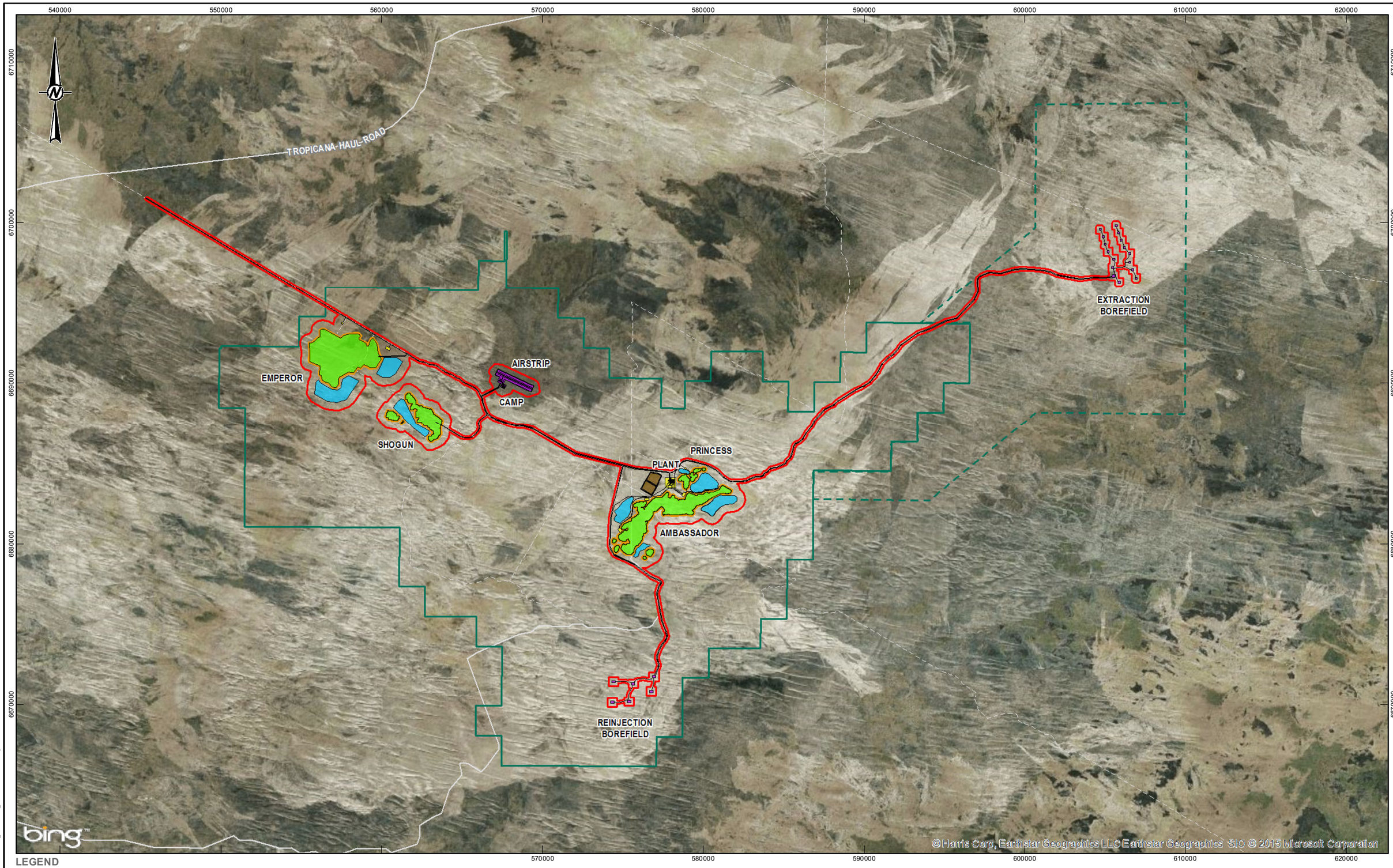
# 3. Water Sources and Sinks

A pre-mine water balance has been completed, which identifies all water sources and sinks for the MRUP, and describes the primary water flow pathways between the different components of the site, including storages, process circuits, and consumptive uses. Each major component of the water balance is discussed in the following sections, and a schematic depicting the overall site water balance is included as Figure 3.2.

## 3.1 Site Overview

The location of proposed major water infrastructure in relation to the mining areas is shown on Figure 3.1. A high level description of the system is provided below. Water infrastructure will be developed to meet the needs of the business, the environment and stakeholders, whilst aiming to maximise flexibility in operations.

Planned development of the dewatering and injection system is outlined in more detail in the Groundwater Management Plan (MRUP-EMP-010) and Managed Aquifer Recharge Management Plan (MRUP-EMP-012).




## LEGEND

- MINOR ROAD/TRACK
- ROAD
- MRUP DEVELOPMENT ENVELOPE
- PROJECT BOUNDARY (MINING TENURE)
- PROJECT BOUNDARY (MISCELLANEOUS TENURE)
- PIT
- OVERBURDEN LANDFORM
- PROCESSING INFRASTRUCTURE
- ABOVE GROUND TSF
- SUPPORTING INFRASTRUCTURE
- PIT CLEARING (50 m BUFFER )

## NOTES

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

## REFERENCE

INFRASTRUCTURE DATA PROVIDED BY CLIENT
AERIAL IMAGERY SOURCED FROM ESRI ONLINE
TOPOGRAPHY BASED ON NATIONAL DEM 1 S SOURCED FROM GEOSCIENCE AUSTRALIA

0 5 10
1:220,000 KILOMETRES

CLIENT
VIMY RESOURCES LIMITED

CONSULTANT
Golder Associates

| | |
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| YYYY-MM-DD | 2015-10-29 |
| DESIGNED | MS |
| PREPARED | MS |
| REVIEWED | DCR |
| APPROVED | DCR |

PROJECT
MULGA ROCK URANIUM PROJECT

TITLE
**PROJECT TENURE, PROPOSED DEVELOPMENT ENVELOPE AND DISTURBANCE FOOTPRINT**

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 1540340 | MRUP-EMP-021 | 0 | **3.1** |

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25mm

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## 3.2 Water Sources

Two primary water sources have been identified to meet site water demand. The first source is mine pit dewatering water, which will be used primarily to supply water for the processing circuit and for dust suppression purposes. A borefield will also be developed at Kakarook North (approximately 30 km north-east of the initial mining area) to supply additional water for processing and for domestic uses, as needed.

The supply of water from dewatering activities, which will extract water from a palaeochannel aquifer, will be variable throughout the project, ranging between 0.06 and 1.5 GL/a. The abstraction borefield, which is geologically separate from the palaeochannel aquifer, and relatively fresh, is estimated to supply up to 1.8 GL/a, as required.

## 3.3 Water Sinks

A major proportion of the water used onsite will be passed through the processing circuit and deposited back into the mining areas as tailings. Most of this water will eventually drain back into the groundwater system as the tailings settle (as for the in-pit TSF), will be reused or reinjected (as for the above-ground TSF) or will be evaporated. Other water sinks include evaporation from the water storages, beneficial domestic uses, and minor volumes tied up in processing circuit by-products (e.g., Beneficiation rejects and mixed sulphide product (MSP) cakes).

At times when dewatering water supply exceeds site water requirements, excess water will be returned to the palaeochannel aquifer via the reinjection borefield (approximately 12 km south of the initial mining area). The projected volumes for reinjection suggest that the amount reinjected is unlikely to exceed 0.7GL/a in the years when it is required.

## 3.4 Water Storages

The following water storages will be constructed on site, and will provide temporary storage for water to be used for various purposes:

- Pit Water Dam.
- Slimes Dewatering Dam.
- Process Water Dam.
- Raw Water Dam.

## 3.5 Primary Water Flow Pathways

The primary water flow pathways are depicted in Figure 3.2.

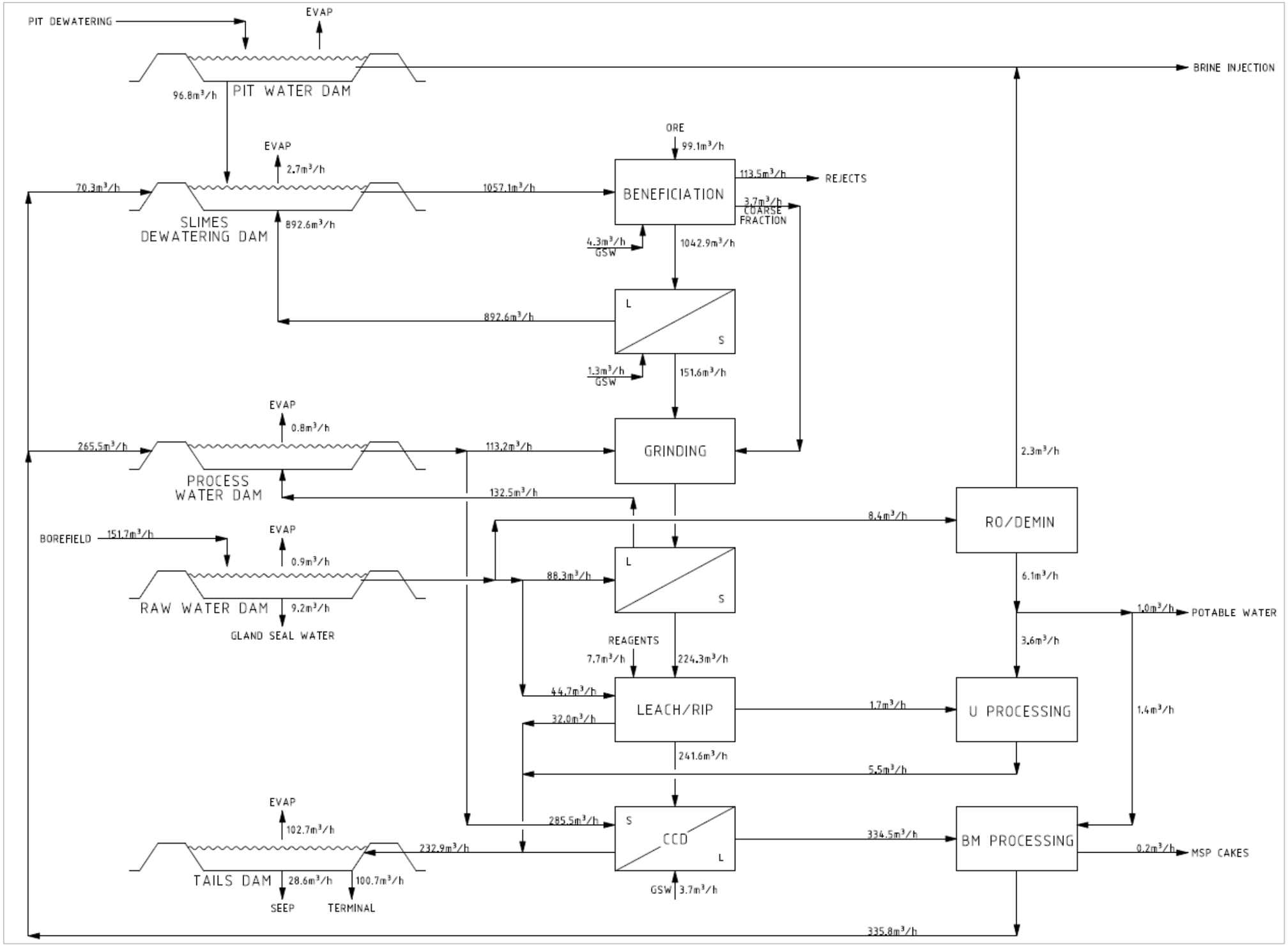


**Figure 3.2: Overview of Site Water Balance (all flows in $m^3$/hr)**

# 4. Identifying and Managing Impacts

Potential impacts and environmental risks resulting from the operation are described in the following Management Plans, along with proposed management strategies and operational controls intended to prevent or reduce the level of impact:

- Surface Water Management Plan (MRUP-EMP-009).
- Groundwater Management Plan (MRUP-EMP-010).
- Managed Aquifer Recharge Management Plan (MRUP-EMP-012).

These documents discuss the following aspects of environmental impact assessment and management, and will be adhered to as part of the Water Operating Strategy:

- Environmental Impact Assessment.
- Objectives and Performance Indicators.
- Management Actions.
- Environmental Monitoring.
- Trigger Levels.
- Corrective Actions.

# 5. Operating Rules

## 5.1 Dewatering System

Dewatering is only required during the active mining and in-pit processing (i.e. beneficiation) phase of the MRUP. The mine pits will only intersect the water table in the basal 2–5 m, and thus the requirement for dewatering is limited to an extent of around 3–6 m.

All dewatering activity will be conducted in accordance with dewatering licence conditions.

## 5.2 Borefield Extraction

Kakarook North is a southerly trending sedimentary basin with a saturated thickness of up to 42 metres. It is about 16 kilometres long and between 5 and 8 kilometres wide and it is located approximately 30 kilometres north-east of the initial mining area (Figure 3.1). It is proposed to extract water from this location for the duration of the Project at a rate of up to 1.8GL/a

The 1.8GL/a of brackish water extracted from Kakarook North, will be supplemented with an additional 0.7GL/a of mine dewatering water (which is saline to hyper saline) for the processing of the ore as a slurry.

All borefield extraction activity will be conducted in accordance with relevant licence conditions.

## 5.3 Groundwater Reinjection System

The reinjection program, which will only run in years when there is surplus dewatering water needing to be disposed of, will be part of a Managed Aquifer Recharge scheme and will be licensed under the *Rights in Water and Irrigation Act 1914* (RIWI Act). Reinjection will take place into the aquifer about 12 kilometres south of the initial mining area (Figure 3.1).

Reinjection activities will be managed according to the Managed Aquifer Recharge Management Plan (MRUP-EMP-2012) and any relevant licence conditions.

## 5.4 Conveyance

Pipelines will be established to convey water (A) from the water supply borefield to site – approximately 30km, (B) from site to the reinjection borefield – approximately 12km, and (C) additional smaller pipelines will be established to move water around and between the mining areas, as required.

Pipeline sizes and routes have been designed to:

- Optimise hydraulic performance in combination with pump duties.
- Meet connectivity requirements.
- Comply with relevant regulatory approvals and licence requirements.

A number of storage dams will be used within the processing area for transferring, mixing, and storing the water required for the various stages of the processing circuit. The dams used to hold process water will be plastic-lined and no seepage from them is expected to occur. The processing plant area will be bunded and sealed to ensure that any spills will be contained within the bunded area.

## 5.5 Processing Circuit

As much as practicable, process water will be obtained from mine dewatering water in the first instance. This will be supplemented by brackish borefield water for processing purposes where an additional volume, or a lower salinity, is required. All process water will be recycled to the fullest extent possible.

The initial physical processing of the ore (beneficiation) will take place within the mining pit outline area and will use mine dewatering water. The beneficiated ore is expected to be piped as slurry from the pits to the processing plant.

Once at the processing plant, additional water derived from the Kakarook North borefield will be added. Processing water will be held in dams close to the processing plant and recycled from the various stages in the processing plant for reuse where possible.

As water is used throughout the processing circuit, it will become more saline. When the salinity increases beyond the level where it is suitable for process use it will be used to form a slurry to pump the tails to the TSF.

Any spillage of any intermediate processing material will be within the process plant area which will be bunded and sealed, ensuring that any spillage will be contained. The only material leaving the process plant area will be packaged final product and waste water and tailings which will be pumped to the appropriate TSF.

# 6. Monitoring and Reporting

## 6.1 Monitoring and Reporting Overview

Groundwater-specific monitoring activities are described in the Groundwater Management Plan (MRUP-EMP-010), and will primarily include analysis of groundwater quality samples from monitoring bores across the site, and recording of groundwater elevations in each bore. It is anticipated that this will occur on a monthly basis, with reporting annually as part of the Annual Environmental Report (AER) process.

Several additional water streams onsite will be monitored for quality and volume movement as part of this Water Operating Strategy, in order to allow for calculation of the operational water balance, and the assessment of operational water quality objectives. The following general parameters will be monitored, and are summarised in Table 6.1:

- Water quality parameters of dewatering water.
- Water quality parameters of process water.
- Water quality parameters of tailings material.
- Flow rate and total volume of all additional major water flows (e.g. process water flows and tailings deposition).

**Table 6.1: General Water Monitoring Actions**

| Parameter | Objective | Frequency | Method | Location | Responsibility |
|---|---|---|---|---|---|
| Water quality parameters of dewatering water | Assess water chemistry against site-specific trigger values | Monthly | Collect water samples and send for Laboratory Analysis | Pit Water Dam | Environmental Manager |
| Water quality parameters of process water streams | Assess water chemistry against site-specific trigger values | Monthly | Collect water samples and send for Laboratory Analysis | Slimes Dewatering Dam<br>Process Water Dam<br>Raw Water Dam | Environmental Manager |
| Water quality parameters of tailings material | Assess water quality of potential leachate | Monthly | Collect water samples and send for Laboratory Analysis | Active TSF cells | Environmental Manager |
| Flow metering of all major water flows | Collect sufficient information to verify site water balance | Continuous (review monthly) | Direct measurement | All extraction and injection points, all storages and major transfer locations | Environmental Manager |

## 6.2 Maintenance

An inspection and maintenance schedule will be implemented, as follows:

- All water storage facilities are inspected daily by the maintenance personnel, checking for water leaks, controls and condition of containment dams. Problems are rectified as they arise.
- Leak detection is undertaken via daily visual inspections of pipework, ponds and fittings. Comparison of meter readings at various points between abstraction and consumption points are used to identify any losses from the system.
- Flow meters on all bores are tested to accuracy and calibrated by in-situ validation, twice a year or as per manufacturer specifications.

# 7. Contingency Operations

## 7.1 Alternative Water Supply

With a continuing increase in salinity of water from the dewatering system, additional options may be required to ensure suitable water quality for the operations (Note: the efficiency of the processing plant is strongly reliant on the chloride level of the water and optimally should not exceed 10g/L). The most suitable options include:

- Blending of saline dewatering water with brackish borefield water to obtain water of suitable quality.
- Addition of a reverse osmosis plant to reduce the salinity of abstracted water for ongoing brackish supply.

# 8. Water Conservation and Efficiency Plan

## 8.1 Objectives

The intent of this Water Conservation and Efficiency Plan is to pursue the most efficient use of an available water entitlement, and document a water efficiency implementation program, ensuring that the appropriate knowledge, systems and infrastructure are in place to minimise water use.

## 8.2 Commitments

Vimy acknowledges the importance of water as an essential resource for successfully meeting its operational objectives. We also realise the need to use this resource responsibly, in a manner that is sustainable and complementary to Vimy's overarching Environmental Policy.

In addressing this policy, Vimy will:

- Incorporate water efficiency measures into new and refurbished facilities through best practice in water efficient design, the selection and sizing of plant and equipment, systems and other water infrastructure.
- Maintain plant and equipment, and control and manage systems and water infrastructure in such a way as to maximise efficiency.
- Monitor and report on water consumption at micro and macro levels, and identify and implement opportunities for improved water efficiency.
- Promote awareness of the responsibility for water conservation to all operational staff.
- Pursue the use of alternate water sources to supplement potable water use.
- Strive to meet our obligations as a member of the Global Community including legislative requirements and minimising environmental impact.
- Strive to procure, distribute and maintain water resources at the lowest cost while addressing the items above.

## 8.3 Guiding Principles

The following water conservation hierarchy will be applied to water conservation and efficiency at the MRUP:

- Avoid: use options not requiring water where possible.
- Reduce: use suitable equipment, technology and systems to reduce the amount of water used.
- Recycle: recycle water to minimise the need to use more water.
- Fit-for-purpose: use lower quality water that is 'fit-for-purpose' where possible.

## 8.4 The Planning Cycle

The specific steps in the planning cycle outlined in Figure 8.1 are described in more detail in the following sections. This "adaptive management" approach will be implemented to ensure that water conservation and efficiency is continuously improved throughout the life of mine.

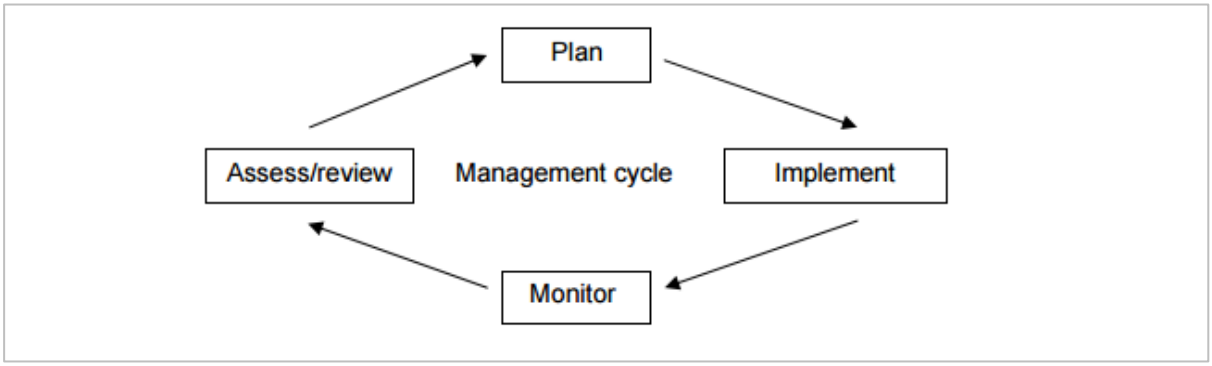


**Figure 8.1: Planning management cycle**

### 8.4.1 Measure Water Use (Monitor)

Taking an inventory of the existing water resources, the water supply and water demand system and the conditions affecting its use is an important part of the water conservation/efficiency plan process. This step will be implemented throughout the life of the operation according to the monitoring plan outlined in Section 6.

Methods of measuring water use include:

- Read and record water meter readings regularly.
- Record pump operating hours and relate to volume of water abstracted (consult pump manufacturer).
- Estimate flow rates and operating time by measuring how long it takes to fill a container of known volume.

### 8.4.2 Identify Opportunities for Improved Efficiency (Assess)

Identify water management opportunities and goals based on anticipated benefits from improved operational efficiency of the water supply and water demand system. Reducing water demand by adopting water efficient practices can provide benefits and reduce energy and water supply costs. In turn, minimising the volume of water taken from the water resource has environmental and social benefits. This step can be achieved by understanding the nature and cost of water use.

Things that will be done to better understand the water use:

- Identify trends, patterns or limitations – including any seasonal variations, unexplained increases, water losses or unaccounted water.
- Relate use to a unit rate (e.g. 6 000kL/hectare per annum, 30kL/animal per annum, 100 000kL/ore production per annum).
- Consider energy costs to pump and/or distribute water.
- Consider maintenance costs (for pumps, pipes, valves, controllers etc.).
- Consider water treatment costs to make water suitable for use (where relevant).
- Consider if any activities could be undertaken using less water.

### 8.4.3 Identify and Select Water Efficient Measures (Plan)

Determine any improvements to the water supply and water demand system and identify and select water efficiency measures to improve water efficiency within a reasonable planning timeframe.

This will be achieved by reviewing the list of water efficiency measures indicated in Appendix B of the DoW Operational Policy No. 1.02 - *Policy on Water Conservation and Efficiency Plans* (2013), and identifying the measures that have already been implemented and those that are planned, including a timeframe for implementation. Consider that changing technology may lead to greater innovation in water use efficiency.

### 8.4.4 Implement Water Conservation Efficiency Plan (Implement)

The method for actioning the water conservation/efficiency plan requirements, reporting the results and reviewing the plan's content is outlined in Table 8.1.

**Table 8.1: Implementation of the Water Conservation and Efficiency Plan**

| Item | Timeframe | Responsibility |
|---|---|---|
| Measurement of water use | Quarterly | Environmental Manager |
| Review of monitoring data | Annual | Environmental Manager |
| Identification and selection of further water use efficiency measures | Annual | Mine Manager and Environmental Manager |
| Implementation of water use efficiency measures | Continuous | Mine Manager and Environmental Manager |
| Review the Water Conservation and Efficiency Plan | Annual | Environmental Manager |

### 8.4.5 Review

The plan will be reviewed annually, in context with the monitoring data collected throughout the operations. Appropriate adjustments to planned efficiency measures will be implemented as they are identified through this review process.

## 8.5 Proposed Water Efficiency Measures

A number of measures will be utilised to reduce the demand on fresh/brackish water at the mine site, including those outlined in Table 8.2.

**Table 8.2: Water use efficiency measures**

| Site Activity | Proposed Efficiency Measures |
|---|---|
| System design | • Use appropriate fittings to avoid unnecessary or continual discharge<br>• All abstraction and reinjection appropriately metered<br>• When planning a new project, ensure that water efficiency is considered<br>• Process water recycling (associated with crushing and screening) |
| Water accounting and loss control | • Implement a regular maintenance plan<br>• Regular inspection of pipelines and plant to detect any leaks<br>• Implement a procedure for reporting leaks, so that they can be promptly repaired |
| Information and education | • Include Water Awareness in Staff Training and inductions |
| Replacements and upgrading | • Ensure that new equipment is water efficient |
| Dust suppression | • Utilise lower quality water for road dust suppression where possible; |
| Domestic uses | • Use low-flow taps, shower head and sprinkler systems in all facilities |

## 9. References

ANZECC and ARMCANZ (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Canberra, ACT.

ANZECC and ARMCANZ (2000), *National Water Quality Management Strategy Paper No.4: Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Canberra, ACT.

DoW (2010a) *Operational Policy No. 5.03 – Metering the taking of water,* Perth, Western Australia.

DoW (2010b) *Operational Policy No. 5.08 – Use of Operating Strategies in the Water Licensing Process*, Perth, Western Australia.

DoW (2011) *Operational Policy No. 1.02 - Policy on Water Conservation and Efficiency Plans*, Perth, Western Australia.

DoW (2013a) *Strategic Policy No.2.09 – Use of mine dewatering surplus*, Perth, Western Australia.

DoW (2013b) *Water licensing delivery series - Report No.12: Western Australian water in mining guideline*, Perth, Western Australia

Government of WA (2004) *State Water Quality Management Strategy Document No. 6,* Perth, Western Australia.

Water Authority of W.A. (1994) *Goldfields Groundwater Area Management Plan*. Groundwater and Environment Branch Report GW157.

# Mulga Rock Uranium Project

# Transport Radiation Management Plan

## MRUP-EMP-022

November 2015


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| | | | | | |

## Prepared for Vimy Resources Limited by Golder Associates Pty Ltd

# Table of Contents



# List of Tables

# 1. Summary

The table below presents the environmental management target/s to measure achievement of the environmental objective that must be met through implementation of this Management Plan (MP).

| Title of proposal | Mulga Rock Uranium Project |
|---|---|
| Proponent | Vimy Resources Limited |
| Environmental Scoping Document | Assessment Number 1979 |
| Purpose of this MP | The Transport Radiation Management Plan is submitted to outline MRUP's proposed procedures and practices to be implemented to meet the EPA's environmental objective for the key environmental factor/s. |
| EPA's environmental objective for the key environmental factor/s | Human Health: To ensure that human health is not adversely affected. |
| Environmental objective | To ensure the safe delivery of Uranium Oxide Concentrate (UOC) product to the required destination, in accordance with Australian and International Guidelines. |
| Management target/s *(measureable, proposal-specific)* | Management target 1: Minimise the potential health and environmental impacts associated with the transport of UOC. |

**Corporate endorsement**

I hereby certify that to the best of my knowledge, the MP provisions within this Transport Radiation Management Plan are true and correct.

[Signature of duly authorised proponent representative]

Name: Signed:

Designation: Date:

# 2. Context, scope and rationale

## 2.1 What is the proposal?

Vimy Resources Limited (Vimy) proposes to develop the Mulga Rock Uranium Project (MRUP or the Project) which lies approximately 240km east-north-east of Kalgoorlie-Boulder in the Shire of Menzies. The area is remote, located on the western flank of the Great Victoria Desert, comprising series of large, generally parallel sand dunes, with inter-dunal swales and broad flat plains.

The MRUP covers approximately 102,000 hectares on granted mining tenure (primarily M39/1080 and M39/1081) within Unallocated Crown Land (UCL). It includes two distinct mining centres, Mulga Rock East (MRE) comprising the Princess and Ambassador resources and Mulga Rock West (MRW) comprising the Emperor and Shogun resources, which are approximately 20km apart. Up to 4.5 Million tonnes per annum (Mtpa) of ore will be mined using traditional open cut techniques, crushed, beneficiated and then processed onsite to produce, on average, 1,360 tonnes of uranium oxide concentrate (UOC) per year over the life of the Project. Base metal concentrates will also be extracted using sulphide precipitation after the uranium has been removed and sold separately.

The anticipated Life-of-Mine (LOM) is up to 16 years, based on the currently identified resource.

This MP has been based on *Environmental Assessment Guideline 17* (EPA 2015b) and the EPA's *environmental management-based condition model template* (EPA 2015c).

## 2.2 What key environmental factor/s does this MP address?

This MP specifically addresses the Human Health environmental factor.

Human health is a key environmental factor for this proposal because the transport of the UOC exhibits some degree of risk to human health.

Mining and processing at the MRUP will result in a Uranium Oxide Concentrate (UOC) that will be transported by road to the Port of Adelaide for offshore shipping. This transport of the UOC exhibits some degree of risk to both the environmental and human health, and consequently this MP was prepared to ensure the safe delivery of this product to the required destination, in accordance with Australian and International Guidelines.

Uncontrolled release of the UOC may occur during or following:

- Packaging of the UOC product.
- Piercing of packaging by machinery (i.e. forklift) during loading and unloading activities.
- Excessive dust generation during packaging and loading activities.
- Rupture of UOC packaged product during transport.
- Truck crash and breaching of UOC storage contain.

## 2.3 Rationale and approach in meeting the environmental objective

Results of baseline surveys and a number of assumptions and uncertainties inform the management approach for meeting MRUP's environmental objective for transport radiation management. The identified management actions, management targets and proposed review and revision of management actions are aligned with the overall management approach.

### 2.3.1 Results of (baseline surveys/modelling/scientific studies/tests) conducted

A risk assessment for the transport of UOC from the site to the Port of Adelaide have been considered in the overarching Risk Assessment for the Project. Overall the risks to human health and environmental ecosystems is considered low, due to the low radiological properties of the UOC and the packaging and transport management strategies to be implemented.

Work undertaken by Mark Sonter (Sonter, 2015) has identified the following exposure dose rates for both workers associated with the MRUP and the general public during transport of the UOC:

- Transport workers: 0.25 mSv/year (based on the driver/s being 4 m from the container and spending 30 hours in 'contact' every 9 – 10 days.
- Members of the Public: 0.003 mSv/year (given the limited time that any member of the public is expected to be in close proximity to the UOC).

Findings from Sonter (2015) also demonstrated the MRUP surface gamma doserate is typical of inland arid Australia, which is characterised by extremely low dose rates, consistent with Aeolian sediments landforms.

### 2.3.2 Key assumptions and uncertainties

The key assumptions and uncertainties relevant to this MP are:

- Radiation calculations have been based on the predicted concentrations and exposure scenarios.

### 2.3.3 Management approach

An adaptive risk based approach to management has been adopted by Vimy for the MRUP. This has been informed by a range of specialist scientific studies for the MRUP and regional area, as well as database searches and other regional project information.

This information has allowed Vimy to prioritise and manage significant risks using the mitigation hierarchy (i.e. avoid, minimise, manage, rehabilitate and offset) and develop an adaptive management system. Adaptive management allows for adaptations due to changing project conditions and the dynamic nature of ecosystems in order to achieve the MRUP environmental objectives.

This management approach is consistent for all the environmental factors for the Project.

### 2.3.4 Rationale for choice of management target/s

Vimy has chosen management based targets. These have been chosen to prioritise significant risks identified for the project and are based on:

- Baseline information and available data for the site and local region.
- The relationship between relevant proposal aspects and the environmental factors.
- Scientific credibility.
- Consistent with monitoring programs already underway on the site, in the region and industry standards.

Management targets will be reviewed annually to ensure they remain relevant and reflect Vimy and the EPA's environmental objective. Any changes to management targets will be reported as part of the Annual Environmental Report (AER).

# 3. MP provisions

This section of the MP identifies the legal provisions that Vimy proposes to implement to ensure the safe delivery of Uranium Oxide Concentrate (UOC) product to the required destination, in accordance with Australian and International Guidelines. It identifies the management target/s that Vimy will use to measure performance and monitoring that will be undertaken in relation to the management target/s. Finally, it identifies how Vimy will review and revise management actions if the management targets are exceeded.

## 3.1 Environmental objective

To ensure the safe delivery of UOC product to the required destination, in accordance with Australian and International Guidelines.

## 3.2 Management actions to be implemented

MRUP transport activities/aspects which have the potential to cause environmental impacts as a result of transport of UOC have been evaluated through a risk analysis. No risks were identified that required potential 'very high' or 'high' risks or impacts requiring specific management. Despite this, in the interest of continual improvement, Vimy will implement the risk-based management actions presented in Table 3.1.

**Table 3.1: Risk-based management actions that will be implemented to meet the environmental objective**

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| Radiation exposure | Review dosimeter or TLD badge results for personnel involved in the packing of UOC | Radiation Management Plan (MRUP-EMP-028) | Low | Operations |
| | Review dosimeter or TLD badge results for personnel involved in the transport of UOC | Radiation Management Plan (MRUP-EMP-028) | Low | Operations |
| | Collect and review gamma meter results from around the UOC CTU at every stop along the transport route | Radiation Management Plan (MRUP-EMP-028) | Low | Operations |
| | Review and assessment of all radiation meter results to ensure compliance | Radiation Management Plan (MRUP-EMP-028) | Low | |

## 3.3 Management target

Management targets will be employed to measure and report against achievement of MRUP's environmental objective. The results of the radiation baseline studies suggest that the management targets listed in Table 3.3 will achieve Vimy's environmental objective.

**Table 3.2: Management target/s to measure the efficacy of management actions relative to the environmental objective**

| | |
|---|---|
| Proposed environmental objective (for MP during assessment) | To ensure the safe delivery of Uranium Oxide Concentrate (UOC) product to the required destination, in accordance with Australian and International Guidelines. |
| Management target 1 | Minimise the potential health and environmental impacts associated with the transport of UOC. |

## 3.4 Monitoring

The purpose of monitoring is to inform, through the management target/s, if the environmental objective (Section 3.1) is being achieved and when management actions will have to be reviewed and revised. This section describes how Vimy will undertake monitoring to determine whether the management targets are achieved.

Proposed monitoring methods, locations, parameters and frequencies are outlined in Table 3.4 below. Exact monitoring locations will be finalised as part of the development of the Radiation Management Plan (MRUP-EMP-028).

**Table 3.3: Monitoring to measure the efficacy of management actions against the management targets**

| Indicator | Method | Location | Parameters | Frequency |
|---|---|---|---|---|
| **Management target 1:** Minimise the potential health and environmental impacts associated with the transport of UOC. | | | | |
| Develop and implement an Emergency Response Management Plan (MRUP-EMP-023) | Audit | Project area<br>Transport routes | Specified in Emergency Response Management Plan (MRUP-EMP-023) | As specified in Emergency Response Management Plan (MRUP-EMP-023) |
| Develop and implement a Radiation Management Plan (MRUP-EMP-028) | Audit | Project area<br>Transport routes | Specified in Radiation Management Plan (MRUP-EMP-028) | As specified in Radiation Management Plan (MRUP-EMP-028) |
| Monitoring results confirm radiation dose rates are within the predicted range | Radiation monitoring | Project area<br>Transport routes | Specified in Radiation Management Plan (MRUP-EMP-028) | As specified in Radiation Management Plan (MRUP-EMP-028) |

## 3.5 Review and revision of management actions

In the event that a management target is not met or is exceeded, Vimy will implement the following adaptive management procedure:

- Investigate the potential cause of failing to meet the management target and identify any impacts resulting from this failing.
- If the causes of failing to meet the management target or any impacts identified are a result of the MRUP, the risk assessment will be reviewed and revised risk based management actions will be implemented so that the MRUP environmental objective is met.

Performance meeting management targets will be reported as part of the Annual Environmental Report (AER).

### 3.5.1 Corrective Actions

If monitoring actions outlined in Section 3.4 indicate that the indicators and management targets are not being met then the associated corrective actions outlined below will be implemented.

**Table 3.4: Corrective Actions**

| Performance Indicator | Action | Responsibility |
|---|---|---|
| Measured exposure dose rates are on track to exceed the occupational (20mSv/y) or background (1mSv/y) trigger levels | • Conduct investigation to determine specific cause of the impact.<br>• Stop work until source of impact determined and mitigation strategies implemented. | General Manager<br>Radiation Officer |
| Identified uncontrolled release of UOC | • Implement Emergency Response Management Plan to ensure uncontrolled release is cleaned up.<br>• Ensure correct PPE used.<br>• Investigate causes for uncontrolled release. | General Manager<br>Radiation Officer |

## 3.6 Reporting provisions

### 3.6.1 Annual reporting

Performance in achieving radiation transport management targets outlined in Table 3.3 will be reported as part of the Annual Environmental Report (AER). In the event that the MRUP environmental objective is not achieved during the reporting period, the AER will include a description of the effectiveness of revised and/or additional management actions implemented and an analysis of trends.

The first AER will be submitted in accordance with the timeline outlined in the Condition Statement following the acceptance of the PER by the EPA.

### 3.6.2 Reporting on exceedance of the management target

In the event of a failure of a management target outlined in Table 3.3 resulting in a significant environmental impact, Vimy will verbally notify the CEO of the OEPA within 48 hours of learning of the exceedance. A written report detailing the exceedance and the outcome of the investigation will be provided to the CEO of the OEPA within seven days. Exceedances of management targets not deemed significant will be reported in the AER.

A significant impact is defined as an unplanned, long term or irreversible impact as a result of transport of UOC within the MRUP Development Envelope or along transport routes, as a result of MRUP activities.

The MP reporting template is presented in Table 3.5.

**Table 3.5: Management Plan reporting table**

| Key environmental factor: Human Health | | |
|---|---|---|
| Environmental objective and management target set in the MP | Reporting on the management objective and management target for [Month 20xx] to [Month 20yy] | Status[1] |
| Environmental objective: To ensure the safe delivery of Uranium Oxide Concentrate (UOC) product to the required destination, in accordance with Australian and International Guidelines. | The safe delivery of Uranium Oxide Concentrate (UOC) product to the required destination, in accordance with Australian and International Guidelines *[was / was not]* achieved. | ■ YES or<br>● NO |
| Management target 1: Minimise the potential health and environmental impacts associated with the transport of UOC. | Management target 1: The potential health and environmental impacts associated with the transport of UOC *[were / were not]* minimised. | ■ YES or<br>● NO |
| Notes:<br>1. The status of achievement of the environmental objectives is indicated by the following symbols:<br>■ Environmental objective achieved<br>● Environmental objective not achieved | | |

# 4. Adaptive management and review of the MP

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

- Monitoring data will be systematically evaluated and compared to baseline and reference site data in accordance with Table 3.3 in a process of adaptive management to verify whether responses to the impact are the same or similar to predictions.
- Re-evaluate the risk assessment and revision of risk-based priorities on the basis of monitored information.
- Increased understanding of the local and regional ecological regime.
- Revision when management actions are not as effective as predicted.
- 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.).
- Review of MP – changes to MP provisions required by a condition, timeframe, etc.

# 5. Stakeholder consultation

Consultation has predominantly been with Decision Making Authorities (DMAs) and other relevant State government departments and local government authorities as well as environmental non-government organisations.

# 6. References

The following references were used in developing this MP.

EPA (2015a) *Environmental Assessment Guideline for Environmental principles, factors and objectives, EAG 8*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015b) *Environmental Assessment Guideline for Preparation of management plans under Part IV of the Environmental Protection Act 1986, EAG 17*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015c) *Title of Condition Environmental Management Plan, Environmental management-based condition model template*. Environmental Protection Authority, Perth, Western Australia.

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UNSCEAR (2008). *Sources and effects of ionisation radiation*, United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR).

Uranium Council (2012). *Guide to Safe Transport of Uranium Oxide Concentrate*. Department of Resources, Energy and Tourism, Australian Government. Canberra, Australia.

# Mulga Rock Uranium Project

# Dust Management Plan

## MRUP-EMP-024

November 2015


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| 0 | BJL | EWC | JT | 06.11.2015 | |
| | | | | | |

## Prepared for Vimy Resources Limited by Golder Associates Pty Ltd

# Table of Contents



# List of Tables

# 1. Summary

The table below presents the environmental management target/s to measure achievement of the environmental objective that must be met through implementation of this Management Plan (MP).

| Title of proposal | Mulga Rock Uranium Project |
|---|---|
| Proponent | Vimy Resources Limited |
| Environmental Scoping Document | Assessment Number 1979 |
| Purpose of this MP | The Dust Management Plan is submitted to outline MRUP's proposed procedures and practices to be implemented to meet the EPA's environmental objective for the key environmental factor/s. |
| EPA's environmental objective for the key environmental factor/s | Air Quality and Atmospheric Gases: To maintain air quality for the protection of the environment and human health and amenity, and to minimise the emission of greenhouse and other atmospheric gases through the application of best practice. |
| Environmental objective | To ensure that dust emissions generated from the MRUP do not adversely affect surrounding environmental values or the health and amenity of people and surrounding land uses. |
| Management target/s | Management target 1: Dust emissions generated from the Project do not adversely affect surrounding environmental values / receptors or the health of people and amenity of surrounding land use. |

**Corporate endorsement**

I hereby certify that to the best of my knowledge, the MP provisions within this Dust Management Plan are true and correct.

[Signature of duly authorised proponent representative]

Name: Signed:

Designation: Date:

# 2. Context, scope and rationale

## 2.1 What is the proposal?

Vimy Resources Limited (Vimy) proposes to develop the Mulga Rock Uranium Project (MRUP or the Project) which lies approximately 240km east-north-east of Kalgoorlie-Boulder in the Shire of Menzies. The area is remote, located on the western flank of the Great Victoria Desert, comprising series of large, generally parallel sand dunes, with inter-dunal swales and broad flat plains.

The MRUP covers approximately 102,000 hectares on granted mining tenure (primarily M39/1080 and M39/1081) within Unallocated Crown Land (UCL). It includes two distinct mining centres, Mulga Rock East (MRE) comprising the Princess and Ambassador resources and Mulga Rock West (MRW) comprising the Emperor and Shogun resources, which are approximately 20km apart. Up to 4.5 Million tonnes per annum (Mtpa) of ore will be mined using traditional open cut techniques, crushed, beneficiated and then processed onsite to produce, on average, 1,360 tonnes of uranium oxide concentrate (UOC) per year over the life of the Project. Base metal concentrates will also be extracted using sulphide precipitation after the uranium has been removed and sold separately.

The anticipated Life-of-Mine (LOM) is up to 16 years, based on the currently identified resource.

This MP has been based on *Environmental Assessment Guideline 17* (EPA 2015b) and the EPA's *environmental management-based condition model template* (EPA 2015c).

## 2.2 What key environmental factor/s does this MP address?

This MP specifically addresses the Air Quality and Atmospheric Gases environmental factors.

Air Quality and Atmospheric Gases are key environmental factors for the proposal because dust has the potential to travel long distances and affect air quality on both a local and/or a regional scale. Due to the presence of naturally occurring radionuclides at the MRUP, dust emissions from the Project may potentially include some radioactive dust. The deposition of dust may have impacts on the surrounding environmental values – including flora and fauna (through inhalation or ingestion of above-ground vegetation where dust has settled).

Due to the remote location of the Project, the main sources of dust which occur in the vicinity of the Project are from natural processes including bush fires and wind erosion. The main airborne emission sources from the Project are expected to be dust from cleared areas, pits, tailings storage facilities, recently rehabilitated sites, earth moving and wheel generated dust from vehicles. The majority of airborne particulates from the site are likely to be visible dust, with a potential for some fine particulate ($PM_{10}$). Combustion or point source stack emissions of particulates will also be generated from power generation infrastructure (i.e. diesel or gas fired generators).

Potential dust impacts include:

- Health risks to humans.
- Vegetation health and quality, through deposition and coating of above-ground biomass.
- Health risks to non-human biota.
- Dust build-up on infrastructure and vehicles increasing required frequency of cleaning.
- Staining of infrastructure and vehicles surfaces.

## 2.3 Rationale and approach in meeting the environmental objective

Results of baseline surveys and a number of assumptions and uncertainties inform the management approach for meeting MRUP's environmental objective. The identified management actions, management targets and proposed review and revision of management actions are aligned with the overall management approach.

### 2.3.1 Results of (baseline surveys/modelling/scientific studies/tests) conducted

Dust has been measured at the Project as part of environmental baseline data acquisition as follows:

- High volume air sampler (HVAS):
  - 56 samples taken since May 2012
  - Sample periods range from 1 to 37 days.
- Dust deposition gauge:
  - 9 samples each from ten separate sites taken since July 2013
  - Sample periods range from 29 to 86 days.

Using this information, a *Dispersion Modelling* report has been prepared by GHD (2015) for the MRUP. The report quantified current dust levels to develop a predictive model and assessed four scenario years (selected based on the greatest throughput for each pit). Outcomes of the modelling (GHD 2015) included:

- Of the various assessment criteria assessed for the four scenarios, predicted dust concentrations at MRUP Accommodation ranged between 7% and 65%, while concentrations at the MRUP site boundaries ranged between 1% and 53% of the guidelines for the scenarios.
- The predicted concentrations of the three population receptors surrounding the MRUP range from 0.01% to 0.9% of any of the criteria assessed.
- Predicted dust deposition is highest at MRUP Accommodation, though well below the monthly deposition criteria (less than 1%). Deposition at other sites is predicted to be much lower.
- The majority of dust in the area will be through dust emission processes that naturally occur in the environment. Namely, wind erosion from open areas and bush fire smoke.
- Cumulative ambient dust concentration may on occasion exceed guideline values at MRUP Accommodation but this cannot be quantified without hourly or daily measurements being taken at the MRUP site.
- Due to the large separation distances between the sources and the receptor, cumulative dust deposition is unlikely to be significantly affected at receptors, as the predicted dust deposition values are 3 to 7 orders of magnitude smaller than current measured dust deposition values.
- As the closest major dust source to MRUP is Tropicana (110 km from MRUP), cumulative impacts from the two sources are likely to be insignificant.
- The predicted concentrations of power plant emissions at all receptors are below the assessment criteria for all assessed pollutants.

### 2.3.2 Key assumptions and uncertainties

The key assumptions and uncertainties relevant to this MP are:

- Air dispersion modelling has been based on the predicted mining activities. A change in mining process may affect modelling and dust outcomes.
- Environmental and seasonal variability has been accounted for within the air dispersion modelling; however, this is unpredictable and may impact dust levels.

### 2.3.3 Management approach

An adaptive risk based approach to management has been adopted by Vimy for the MRUP. This has been informed by a range of specialist scientific studies for the MRUP and regional area, as well as database searches and other regional project information.

This information has allowed Vimy to prioritise and manage significant risks using the mitigation hierarchy (i.e. avoid, minimise, manage, rehabilitate and offset) and develop an adaptive management system. Adaptive management allows for adaptations due to changing project conditions and the dynamic nature of ecosystems in order to achieve the MRUP environmental objectives.

This management approach is consistent for all the environmental factors for the Project.

### 2.3.4 Rationale for choice of management target/s

Vimy has chosen management based targets. These have been chosen to prioritise significant risks identified for the project and are based on:

- Baseline information and available data for the site and local region.
- The relationship between relevant proposal aspects and impacts on flora and vegetation at the MRUP.
- Scientific credibility.
- Consistent with monitoring programs already underway on the site, in the region and industry standards.

Management targets will be reviewed annually to ensure they remain relevant and reflect Vimy and the EPA's environmental objective. Any changes to management targets will be reported as part of the Annual Environmental Report (AER).

# 3. MP provisions

This section of the MP identifies the legal provisions that Vimy proposes to implement to ensure that dust emissions generated from the MRUP do not adversely affect surrounding environmental values, non-human receptors such as flora and fauna, or the health and amenity of people and surrounding land uses. It identifies the management target/s that Vimy will use to measure performance and monitoring that will be undertaken in relation to the management target/s. Finally, it identifies how Vimy will review and revise management actions if the management targets are exceeded.

## 3.1 Environmental objective

To ensure that dust emissions generated from the MRUP do not adversely affect surrounding environmental values, non-human receptors such as flora and fauna, or the health and amenity of people and surrounding land uses.

## 3.2 Management actions to be implemented

MRUP activities/aspects which have the potential to cause environmental impacts from dust have been evaluated through a risk analysis. No risks were identified that required potential 'very high' or 'high' risks or impacts requiring specific management. Despite this, in the interest of continual improvement, Vimy will implement the risk-based management actions presented in Table 3.1.

**Table 3.1: Risk-based management actions that will be implemented to meet the environmental objective**

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| **Land clearing dust management** | | | | |
| Poor management during land clearing and construction activities generates dust | Consider adverse weather conditions when clearing to avoid generating excessive dust. | Ground Disturbance Management Plan (MRUP-EMP-019)<br>GDAP (MRUP-POL-001) | Low | Construction and Operations |
| | Clearing to be conducted in a progressive manner to avoid disturbing areas before required and increasing the potential of dust generation for an extended period longer than necessary. | Ground Disturbance Management Plan (MRUP-EMP-019)<br>GDAP (MRUP-POL-001) | Low | Construction and Operations |
| | Implementation of management strategies to limit dust generation from construction material (e.g. cement, stockpiled aggregate / overburden etc.) | Construction Environment Management Plan (MRUP-EMP-018) | Low | Construction and Operations |
| | Dust control strategies such as water spraying and use of stabilisation agents will be used in areas identified as dust generating. Frequency of use is to be determined by conditions (weather, operational use etc.) | Operational Environment Management Plan (MRUP-EMP-020) | Low | Construction and Operations |
| | Road maintenance should be of a standard to prevent excessive dusting. | Operational Environment Management Plan (MRUP-EMP-020) | Low | Construction and Operations |
| | Quarterly analysis of high volume and dust deposition data obtained by static monitors to determine if negative trends are evident and if further or modified dust management strategies are required. | Environmental Monitoring Management Plan (MRUP-EMP-032) | Low | Construction and Operations |
| | Environmental inductions given to all MRUP employees and contractors to include information on:<br>• Potential sources of dust<br>• Dust suppression activities<br>• Speed limits on site and restricted access areas. | Environmental Induction and Training Management Plan (MRUP-EMP-039) | Low | Construction and Operations |

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| **Operational and closure activities dust management** | | | | |
| Poor management during operational and closure phase activities generates dust | Develop procedures for haul road construction and maintenance that outline timing and quality of water to be used in haul road watering, as well as additional maintenance activities such as grading etc. | Construction Environment Management Plan (MRUP-EMP-018)<br>Road Designs for Environmental Management (MRUP-POL-002) | Low | Construction, Operations and Closure |
| | Surface stabilisation methods (i.e. water carts, dust suppression additives etc.) will be employed in areas where dust emissions are likely to cause safety issues. | Operational Environment Management Plan (MRUP-EMP-020) | Low | Operations and Closure |
| | Limit road speeds near dust sensitive environmental receptors. | Flora and Vegetation Management Plan (MRUP-EMP-001) | Low | Operations |
| | Maintain dust suppression systems such as sprinklers and dust barriers in operational areas prone to dust generation (e.g. processing plant and ROM pad). | Operational Environment Management Plan (MRUP-EMP-020)<br>Radiation Management Plan (MRUP-EMP-028) | Low | Operations |
| | Manage tailings placement to limit dust generation capacity from excessive drying of top tailings layer. | Tailings Management Plan (MRUP-EMP-013) | Low | Operations |
| | Conduct progressive rehabilitation to reduce dust generation. | Soil Management Plan (MRUP-EMP-008)<br>Rehabilitation and Revegetation Management Plan (MRUP-EMP-030) | Low | Operations |

## 3.3 Management target

Management targets will be employed to measure and report against achievement of MRUP's environmental objective. The results of the baseline studies suggest that the management targets listed in Table 3.2 will achieve Vimy's environmental objective.

**Table 3.2: Management target/s to measure the efficacy of management actions relative to the environmental objective**

| | |
|---|---|
| Proposed environmental objective | To ensure that dust emissions generated from the MRUP do not adversely affect surrounding environmental values or the health and amenity of people and surrounding land uses. |
| Management target 1 | Dust emissions generated from the Project do not adversely affect surrounding environmental values / receptors or the health of people and amenity of surrounding land use. |

## 3.4 Monitoring

The purpose of monitoring is to inform, through the management target/s, if the environmental objective (Section 3.1) is being achieved and when management actions will have to be reviewed and revised. This section describes how Vimy will undertake monitoring to determine whether the management targets are achieved.

Proposed monitoring methods, locations, parameters and frequencies are outlined in Table 3.3 below. Exact monitoring locations will be finalised as part of the operational MPs and the development of the Environmental Monitoring Management Plan (MRUP-EMP-032). Where practicable, monitoring points will be located to correlate with previous baseline surveys.

**Table 3.3: Monitoring to measure the efficacy of management actions against the management targets**

| Indicator | Method | Location | Parameters | Frequency |
|---|---|---|---|---|
| **Management target 1:** Dust emissions generated from the Project do not adversely affect surrounding environmental values / receptors or the health of people and amenity of surrounding land use. | | | | |
| Health of accommodation village personnel is not adversely impacted by dust generation associated with the operation of the MRUP. | Air/dust monitoring | Accommodation Village | Dust levels | Quarterly |
| Flora and vegetation monitoring indicates minimal decline in health of flora and vegetation due to impacts from Project activities. | Health assessment and photo monitoring within selected monitoring plots | Adjacent to operational areas, and transport corridors | Health of vegetation | Annually |
| | Visual assessment from Environmental staff | Perimeter of clearance boundaries | Health of vegetation | Annually |

**Table 3.4: Ambient dust concentration and deposition targets**

| Dust measurement | Averaging Period | Target | Reference |
|---|---|---|---|
| $PM_{10}$ | 24-hour | 50µg/$m^3$ | NEPM 2003 |
| Deposition | Annual | 2g/$m^2$/month | NSW DEC 2005 |

## 3.5 Review and revision of management actions

In the event that a management target is not met or is exceeded, Vimy will implement the following procedure:

- Investigate the potential cause of failing to meet the management target and identify any impacts from dust.
- If the causes of failing to meet the management target or any impacts identified are a result of the MRUP, the risk assessment will be reviewed and revised risk based management actions will be implemented so that the MRUP environmental objective is met.

### 3.5.1 Corrective Actions

If monitoring actions outlined in Section 3.4 indicate that the indicators and management targets are not being met then the associated corrective actions outlined below will be implemented.

**Table 3.5: Dust management corrective actions**

| Performance Indicator | Action | Responsibility |
|---|---|---|
| Decline in vegetation health at flora monitoring locations attributed to dust levels | • Conduct investigation to determine specific cause of the impact<br>• Implement appropriate dust control measures to reduce further impact (e.g. speed reduction in strategic locations) | Environmental Manager |
| Exceedance of ambient dust level trigger at monitoring locations | • Raise as environmental incident report<br>• Conduct investigation to determine specific cause of the impact<br>• Implement appropriate dust control measures to reduce further impact<br>• Review Dust MP procedures and update where necessary to reduce further impacts | Environmental Manager |
| Exceedance of ambient dust deposition level trigger at monitoring locations | • Raise as environmental incident report<br>• Conduct investigation to determine specific cause of the impact<br>• Implement appropriate dust control measures to reduce further impact<br>• Review Dust MP procedures and update where necessary to reduce further impacts | Environmental Manager |
| Observation of visible excessive dust at mine site | • Conduct investigation to determine specific cause of the impact<br>• Implement necessary controls to prevent further impacts (e.g. increase water cart usage and reduce work load in certain wind conditions)<br>• Raise as environmental incident report | General Manager |

## 3.6 Reporting provisions

### 3.6.1 Annual reporting

A summary of the dust monitoring results will be provided in the Annual Environmental Report (AER), such that performance against the management targets outlined in Table 3.2 can be reported. In the event that the MRUP environmental objective is not achieved during the reporting period, the AER will include a description of the effectiveness of revised and/or additional management actions implemented and an analysis of trends.

Performance of the dust monitoring will be assessed against management targets outlined in Table 3.2 and reported as part of the AER. In the event that the MRUP environmental objective is not achieved during the reporting period, the AER will include a description of the effectiveness of revised and/or additional management actions implemented and an analysis of trends.

The first AER will be submitted in accordance with the timeline outlined in the Condition Statement following the acceptance of the PER by the EPA.

### 3.6.2 Reporting on exceedance of the management target

In the event of a failure of a management target outlined in Table 3.2 resulting in a significant environmental impact, Vimy will verbally notify the CEO of the OEPA within 48 hours of learning of the exceedance. A written report detailing the exceedance and the outcome of the investigation will be provided to the CEO of the OEPA within seven days. Exceedances of management targets not deemed significant will be reported in the AER.

A significant impact is defined as an unplanned, long term or irreversible impact to flora, vegetation or fauna of conservation significance within the MRUP Development Envelope as a result of MRUP activities.

The MP reporting template is presented in Table 3.6.

**Table 3.6: Management Plan reporting table**

| Key environmental factor: Air Quality and Atmospheric Gases | | |
|---|---|---|
| Environmental objective and management target set in the MP | Reporting on the management objective and management target for [Month 20xx] to [Month 20yy] | Status[1] |
| Environmental objective: To ensure that dust emissions generated from the MRUP do not adversely affect surrounding environmental values or the health and amenity of people and surrounding land uses. | Dust emissions generated from the MRUP *[did / did not]* adversely affect surrounding environmental values or the health and amenity of people and surrounding land uses. | ■ YES or<br>● NO |
| Management target 1: Dust emissions generated from the Project do not adversely affect surrounding environmental values / receptors or the health of people and amenity of surrounding land use. | Management target 1: Dust emissions generated from the Project *[did / did not]* adversely affect surrounding environmental values / receptors or the health of people and amenity of surrounding land use. | ■ YES or<br>● NO |

Notes:

1. The status of achievement of the environmental objectives is indicated by the following symbols:
   - ■ Environmental objective achieved
   - ● Environmental objective not achieved

# 4. Adaptive management and review of the MP

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

- Monitoring data will be systematically evaluated and compared to baseline and reference site data in a process of adaptive management to verify whether responses to the impact are the same or similar to predictions.,
- Re-evaluate the risk assessment and revision of risk-based priorities on the basis of monitored information,
- Increased understanding of the local and regional ecological regime,
- Revision when management actions are not as effective as predicted,
- 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.),
- Review of MP – changes to MP provisions required by a condition; timeframe, etc.

# 5. Stakeholder consultation

Given the isolation of the Project there are no local communities that are likely to be impacted by dust; however, consultation will be undertaken with Tropicana Gold Mine and the Shires of Menzies should dust become a significant issue. Consultation during the development of this MP was conducted with relevant State Government agencies including OEPA, Department of Health and Department of Parks and Wildlife.

# 6. References

The following references were used in developing this MP.

AS/NZS 3580.10.1 (2003) *Methods for sampling and analysis of ambient air - Determination of particulate matter - Deposited matter - Gravimetric method*. Standards Australia.

DEC (2006) *Guidance notes: Air quality and air pollution modelling*. Department of Environment and Conservation, Goverment of Western Australia.

DEC (2011) *A guideline for managing the impacts of dust and associated contaminants from land development sites, contaminated sites remediation and other related activities*. Department of Environment and Conservation, Government of Western Australia.

EPA (2015a) *Environmental Assessment Guideline for Environmental principles, factors and objectives, EAG 8*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015b) *Environmental Assessment Guideline for Preparation of management plans under Part IV of the Environmental Protection Act 1986, EAG 17*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015c) *Title of Condition Environmental Management Plan, Environmental management-based condition model template*. Environmental Protection Authority, Perth, Western Australia.

GHD (2015) *Mulga Rock Uranium Project dispersion modelling*. Unpublished report prepared for Vimy Resources Limited.

NEPM (2003) *National Environment Protection (Ambient Air Quality) Measure*. National Environmental Protection Council, Canberra.

NSW DEC (2005) *Approved methods for the modelling and assessment of air pollutants in New South Wales*. NSW Department of Environment and Conservation, 26 August, 2005.

# Mulga Rock Uranium Project

# Fire Management Plan

## MRUP-EMP-025

November 2015


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## Prepared for Vimy Resources Limited by Golder Associates Pty Ltd

# Table of Contents



# List of Tables

# 1. Summary

The table below presents the environmental management target/s to measure achievement of the environmental objective that must be met through implementation of this Management Plan (MP).

| Title of proposal | Mulga Rock Uranium Project |
|---|---|
| Proponent | Vimy Resources Limited |
| Environmental Scoping Document | Assessment Number 1979 |
| Purpose of this MP | The Fire Management Plan is submitted to outline MRUP's proposed procedures and practices to be implemented to meet the EPA's environmental objective for the key environmental factor/s. |
| EPA's environmental objective for the key environmental factor/s | • Flora and Vegetation: to maintain representation, diversity, viability and ecological function at the species, population and community level.<br>• Terrestrial Fauna: to maintain representation, diversity, viability and ecological function at the species, population and assemblage level.<br>• |
| Environmental objective | Avoid or minimise the potential and direct impacts of fire and fire management to the environment, to mine operation and to human life and health. |
| Management target/s *(measureable, proposal-specific)* | • Management target 1: Minimise clearance/back burning of conservation significant areas.<br>• Management target 2: Keep fire controls within approved areas.<br>• Management target 3: Minimise potential for runoff of fuels, hazardous chemicals or fire suppression systems into native vegetation during fire incidents.<br>• Management target 4: Preventive fire controls are authorised and undertaken in accordance with GDAP. |

**Corporate endorsement**

I hereby certify that to the best of my knowledge, the MP provisions within this Fire Management Plan are true and correct.

[Signature of duly authorised proponent representative]

Name: Signed:

Designation: Date:

# 2. Context, scope and rationale

## 2.1 What is the proposal?

Vimy Resources Limited (Vimy) proposes to develop the Mulga Rock Uranium Project (MRUP or the Project) which lies approximately 240km east-north-east of Kalgoorlie-Boulder in the Shire of Menzies. The area is remote, located on the western flank of the Great Victoria Desert, comprising series of large, generally parallel sand dunes, with inter-dunal swales and broad flat plains.

The MRUP covers approximately 102,000 hectares on granted mining tenure (primarily M39/1080 and M39/1081) within Unallocated Crown Land (UCL). It includes two distinct mining centres, Mulga Rock East (MRE) comprising the Princess and Ambassador resources and Mulga Rock West (MRW) comprising the Emperor and Shogun resources, which are approximately 20km apart. Up to 4.5 Million tonnes per annum (Mtpa) of ore will be mined using traditional open cut techniques, crushed, beneficiated and then processed onsite to produce, on average, 1,360 tonnes of uranium oxide concentrate (UOC) per year over the life of the Project. Base metal concentrates will also be extracted using sulphide precipitation after the uranium has been removed and sold separately.

The anticipated Life-of-Mine (LOM) is up to 16 years, based on the currently identified resource.

This MP has been based on *Environmental Assessment Guideline 17* (EPA 2015b) and the EPA's *environmental management-based condition model template* (EPA 2015c).

## 2.2 What key environmental factor/s does this MP address?

This MP addresses Terrestrial Fauna, Flora and Vegetation environmental factors.

Fire is a key environmental factor because baseline flora and vegetation assessments have identified Priority Flora species and the condition of the vegetation usually lies between Good and Pristine. Targeted fauna surveys have been completed for three native species regionally, which are listed as vulnerable or endangered under the EPBC Act (Matters of National Environmental Significance (MNES)), The Sandhill Dunnart has been both sighted and had 'prime habitat' identified within the Project area.

Fire management practices, as well as fire itself, have the potential to have a direct impact to fauna and flora and vegetation. It is noted that a large proportion (~80%) of the Disturbance Footprint has recently been burnt.

Potential environmental impacts of ineffectively managed fire incidents include:

- Large scale and uncontrolled release of toxic agents into the environment (e.g. fuel, chemicals or toxic smoke).
- Loss of ecological communities and habitats of high conservation value.

Direct environmental impacts of fire management practices at the MRUP will include:

- Clearing of native vegetation in the immediate vicinity of fixed plant and equipment.
- Clearing or back burning of native vegetation within designated fire breaks (around fixed plant and infrastructure).
- Back burning or clearing of native vegetation within designated fire evacuation zones, including those in more remote parts of the Project area.

Potential and indirect environmental impacts of fire management practices at the MRUP include:

- Fire breaks and other long term impediments to fire progression associated with the Project (e.g. roads) lead to longer periods between natural bushfires and associated habitat regeneration in some parts of the Project area.
- Runoff from fire suppression systems (e.g. water or foam), when used on chemical, machinery or structure fires, releases toxic materials into the surrounding environment.

## 2.3 Rationale and approach in meeting the environmental objective

Results of baseline surveys and a number of assumptions and uncertainties inform the management approach for meeting MRUP's environmental objective. The identified management actions, management targets and proposed review and revision of management actions are aligned with the overall management approach.

### 2.3.1 Results of (baseline surveys/modelling/scientific studies/tests) conducted

Numerous Level 1 and Level 2 flora and vegetation and fauna field assessments of the MRUP area have been undertaken.

The MRUP area is located in a region where the condition of the vegetation usually lies somewhere between Good and Pristine depending mainly on the fire history. Recent fire activity (November 2014) burnt 78% of the Project Disturbance Footprint and 74% of the Project Development Envelope reducing the vegetation condition temporarily to Degraded (MCPL 2015). Fire activity may be the greatest threat to conservation significant flora growing in the area, as large areas burn quite frequently and some species of flora are not entirely well adapted to survive intense fires (MCPL 2015). Whilst frequent, intense fires are presently the greatest threat to some the highest conservation significant flora (*Hibbertia crispula* and *Malleostemon* sp. Officer Basin (D.Pearson 350)), this may not be the case for other Priority species which have been recorded in high numbers post fire events.

Three of the native species identified regionally are MNES listed as vulnerable or endangered. These are: one bird *Leipoa ocellata* (Malleefowl), and two marsupials, *Notoryctes typhlops* (Southern Marsupial Mole) and *Sminthopsis psammophila* (Sandhill Dunnart). Although all identified regionally, only the Sandhill Dunnart has been both sighted and had 'prime habitat' identified within the Project area. Almost all the identified prime habitat of the Sandhill Dunnart within the Project area (with the exception of about four hectares) was destroyed by a wildfire in November, 2014.

### 2.3.2 Key assumptions and uncertainties

The key assumptions and uncertainties relevant to this MP are:

- The role fire plays in the course of natural occurrence and regeneration of vegetation communities may be unknowingly impacted by MRUP activities and actions.
- The remoteness and inaccessibility of much of the MRUP area may make it difficult to access fire locations during an event.

### 2.3.3 Management approach

An adaptive risk based approach to management has been adopted by Vimy for the MRUP. This has been informed by a range of specialist scientific studies for the MRUP and regional area, as well as database searches and other regional project information.

This information has allowed Vimy to prioritise and manage significant risks using the mitigation hierarchy (i.e. avoid, minimise, manage, rehabilitate and offset) and develop an adaptive management system. Adaptive management allows for adaptations due to changing project conditions and the dynamic nature of ecosystems in order to achieve the MRUP environmental objectives.

This management approach is consistent for all the environmental factors for the Project.

### 2.3.4 Rationale for choice of management target/s

Vimy has chosen management based targets. These have been chosen to prioritise significant risks identified for the project and are based on:

- Baseline information and available data for the site and local region.
- The relationship between relevant proposal aspects and the environmental factor.
- Scientific credibility.
- Consistent with monitoring programs already underway on the site, in the region and industry standards.

Management targets will be reviewed annually to ensure they remain relevant and reflect Vimy and the EPA's environmental objective. Any changes to management targets will be reported as part of the Annual Environmental Report (AER).

# 3. MP provisions

This section of the MP identifies the legal provisions that Vimy proposes to implement to avoid or minimise the potential and direct impacts of fire and fire management to the environment, to mine operation and to human life and health. It identifies the management target/s that Vimy will use to measure performance and monitoring that will be undertaken in relation to the management target/s. Finally, it identifies how Vimy will review and revise management actions if the management targets are exceeded.

## 3.1 Environmental objective

Avoid or minimise the potential and direct impacts of fire and fire management to the environment, to mine operation and to human life and health.

## 3.2 Management actions to be implemented

MRUP activities/aspects which have the potential to cause environmental impacts as a result of fire have been evaluated through a risk analysis. No risks were identified that required potential 'very high' or 'high' risks or impacts requiring specific management. Despite this, in the interest of continual improvement, Vimy will implement the risk-based management actions presented in Table 3.1.

**Table 3.1: Risk-based management actions that will be implemented to meet the environmental objective**

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| Change of fire regimes | • Develop and implement Fire Management Plan (MRUP-EMP-025), including fire break protocols.<br>• Develop and implement a Permit system (Hot works). | Operational Environmental Management Plan (MRUP-EMP-020) | Low | Construction, Operations and Closure |
| Loss of habitat from increase in fires | • Develop and implement Fire Management Plan (MRUP-EMP-025), including fire break protocols.<br>• Develop and implement a Permit system (Hot works). | Operational Environmental Management Plan (MRUP-EMP-020)<br>Flora and Vegetation MP (MRUP-EMP-001)<br>Terrestrial Fauna MP (MRUP-EMP-004) | Low | Construction, Operations and Closure |
| Increased risk of fire and impacts on conservation significant species | • No unauthorised off-road driving.<br>• Ground Disturbance Management Plan (MRUP-EMP-019) | Operational Environmental Management Plan (MRUP-EMP-020)<br>Flora and Vegetation MP (MRUP-EMP-001)<br>Terrestrial Fauna MP (MRUP-EMP-004)<br>Ground Disturbance Management Plan (MRUP-EMP-019) | Low | Construction, Operations and Closure |
| Increased risk of fire due to vehicle and machinery movement. | • Develop and implement Fire Management Plan (MRUP-EMP-025).<br>• No unauthorised off-road driving.<br>• Ground Disturbance Management Plan (MRUP-EMP-019) | Operational Environmental Management Plan (MRUP-EMP-020)<br>Ground Disturbance Management Plan (MRUP-EMP-019) | Low | Construction, Operations and Closure |
| Increased risk of fire due to improved access (e.g. vehicles, cigarette butts, camp fires, deliberately lit fires). | • No unauthorised off-road driving.<br>• Ground Disturbance Management Plan (MRUP-EMP-019)<br>• All mine site personnel informed of their responsibilities regarding managing fire risk (designated smoking areas etc.). | Operational Environmental Management Plan (MRUP-EMP-020)<br>Ground Disturbance Management Plan (MRUP-EMP-019)<br>Environmental Induction and Training Management Plan (MRUP-EMP-039)<br>Ground Disturbance Management Plan (MRUP-EMP-019) | Low | Construction, Operations and Closure |

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| Mobile emergency response systems are not available | • Review of all required equipment is made (mobile fire suppression equipment, medical equipment).<br>• Emergency response training systems enacted.<br>• All mine site personnel informed of their responsibilities in an emergency incident.<br>• All emergency response equipment is maintained and regularly tested. | Emergency Response Management Plan (MRUP-EMP-023) | Medium | Construction, Operations and Closure |
| Unapproved and inadequate fire breaks and access tracks installed. | • Fire breaks, fire evacuation zones and access tracks are designed, approved by the Environmental Department and the Registered Site Manager, installed and maintained. Planned disturbance to native vegetation and, particularly, areas of conservation significance to be minimised through the use of the GDAP system. | Flora and Vegetation Management Plan (MRUP-EMP-001)<br>Terrestrial Fauna Management Plan (MRUP-EMP-004)<br>Ground Disturbance MP (MRUP-EMP-019) | Low | Construction, Operations and Closure |
| Onsite infrastructure, plant and equipment do not meet legislated fire safety standards. | • Fire safety standards of all construction plans approved.<br>• Fire safety standards of all mobile equipment approved. | Construction Environmental Management Plan (MRUP-EMP-018) | Low | Construction and Operations |
| Fire suppression contaminates areas of native vegetation | • Bunds and/or drains around all site infrastructure should be designed to prevent fire suppression runoff from entering native vegetation areas, and approved before construction. | Construction Environmental Management Plan (MRUP-EMP-018) | Low | Construction and Operations |
| Hot works are not managed and pose a fire risk. | • Hot works permits are required from site supervisor when work is to occur outside of workshop infrastructure. | Operational Environmental Management Plan (MRUP-EMP-020) | Low | Construction and Operations |

## 3.3 Management target

Management targets will be employed to measure and report against achievement of MRUP's environmental objective. The results of the baseline studies suggest that the management targets listed in Table 3.2 will achieve Vimy's environmental objective.

**Table 3.2: Management target/s to measure the efficacy of management actions relative to the environmental objective**

| | |
|---|---|
| Proposed environmental objective (for MP during assessment) | Avoid or minimise the potential and direct impacts of fire and fire management to the environment, to mine operation and to human life and health. |
| Management target 1 | Minimise clearance/back burning of conservation significant areas. |
| Management target 2 | Keep fire controls within approved areas. |
| Management target 3 | Minimise potential for runoff of fuels, hazardous chemicals or fire suppression systems into native vegetation during fire incidents. |
| Management target 4 | Preventive fire controls are authorised and undertaken in accordance with GDAP. |

## 3.4 Monitoring

The purpose of monitoring is to inform, through the management target/s, if the environmental objective (Section 3.1) is being achieved and when management actions will have to be reviewed and revised. This section describes how Vimy will undertake monitoring to determine whether the management targets are achieved.

Proposed monitoring methods, locations, parameters and frequencies are outlined in Table 3.3 below. Exact monitoring locations will be finalised as part of the operational MPs and the development of the Environmental Monitoring Management Plan (MRUP-EMP-032). Where practicable, monitoring points will be located to correlate with previous baseline surveys.

In the event of a fire, Vimy will undertake an assessment of impacts to flora and vegetation post-fire within the Project area.

**Table 3.3: Monitoring to measure the efficacy of management actions against the management targets**

| Indicator | Method | Location | Parameters | Frequency |
|---|---|---|---|---|
| **Management target 1:** Minimise clearance/back burning of conservation significant areas. | | | | |
| Fire controls are designed so as to avoid, as much as possible, conservation significant areas of native vegetation (Priority Flora or prime habitats of conservation significant fauna). | Visual inspection/audit as per GDAP process | Project Area | Presence of Priority species | Prior to clearance activity |
| **Management target 2:** Keep fire controls within approved areas. | | | | |
| Areas designated to be cleared or back burned to construct firebreaks are approved via the GDAP system and are then annually audited and visually inspected. | Visual inspection/audit as per GDAP process | Project Area | Unauthorised clearing | On completion of clearance activity |
| **Management target 3:** Minimise potential for runoff of fuels, hazardous chemicals or fire suppression systems into native vegetation during fire incidents. | | | | |
| Fire suppression runoff from plant and infrastructure is to be prevented from entering areas of native vegetation – bunds and drains are pre-emptively installed where necessary. | Visual inspection/audit for compliance with the Chemical and Hydrocarbon Management Plan (MRUP-EMP-037)<br>Visual inspection/audit as per GDAP process | Plant/infrastructure areas | Installation of bunds and drainage | As required |
| **Management target 4:** Preventive fire controls are authorised and undertaken in accordance with GDAP. | | | | |
| Documented induction materials, including field identification sheets of conservation significant flora species, and management procedures. | Ground Disturbance Activity Permit application prepared and approved by relevant authority). | Project Area | GDAP | As required |

## 3.5 Review and revision of management actions

In the event that a management target is not met or is exceeded, Vimy will implement the following adaptive management procedure:

- Investigate the potential cause of failing to meet the management target and identify any impacts resulting from this failing, and
- If the causes of failing to meet the management target or any impacts identified are a result of the MRUP, the risk assessment will be reviewed and revised risk based management actions will be implemented so that the MRUP environmental objective is met.

Performance meeting management targets will be reported as part of the Annual Environmental Report (AER).

### 3.5.1 Corrective Actions

If monitoring actions outlined in Section 3.4 indicate that the indicators and management targets are not being met then the associated corrective actions outlined below will be implemented.

**Table 3.4: Corrective Actions**

| Performance Indicator | Action | Responsibility |
|---|---|---|
| Disturbance of native vegetation outside approved clearance or back burn envelope for firebreaks, fire evacuation zones or access tracks. | • Immediately stop clearance/ back burn activity.<br>• Conduct investigation to determine specific cause of the over clearance.<br>• Review GDAP process and develop additional management measures if required.<br>• Rehabilitate if required. | Safety Manager and Environmental Manager |
| Emergency Response Equipment found to be faulty or inadequate. | • Immediately review equipment failure.<br>• Identify necessary equipment upgrades or repairs<br>• Seek financial approval for upgrades or repairs.<br>• Repair or upgrade equipment.<br>• Review training requirements for upgraded equipment.<br>• Adjust training documentation and exercises accordingly. | Safety Manager and Emergency Response Coordinator |
| Infrastructure, plant or equipment fire safety equipment found to be faulty or non-compliant with revised regulations. | • Immediately review equipment failure.<br>• Identify necessary equipment upgrades or repairs.<br>• Seek financial approval for upgrades or repairs.<br>• Repair or upgrade equipment. | Safety Manager |

## 3.6 Reporting provisions

### 3.6.1 Annual reporting

Performance in managing fire hazards will be compared against management targets outlined in Table 3.2 and reported as part of the Annual Environmental Report (AER). In the event that the MRUP environmental objective is not achieved during the reporting period, the AER will include a description of the effectiveness of revised and/or additional management actions implemented and an analysis of trends.

The first AER will be submitted in accordance with the timeline outlined in the Condition Statement following the acceptance of the PER by the EPA.

### 3.6.2 Reporting on exceedance of the management target

In the event of a failure of a management target outlined in Table 3.2 resulting in a significant environmental impact, Vimy will verbally notify the CEO of the OEPA within 48 hours of learning of the exceedance. A written report detailing the exceedance and the outcome of the investigation will be provided to the CEO of the OEPA within seven days. Exceedances of management targets not deemed significant will be reported in the AER.

A significant impact is defined as an unplanned, long term or irreversible environmental impact as a result of fire within the MRUP Development Envelope as a result of MRUP activities.

The MP reporting template is presented in Table 3.5.

**Table 3.5: Management Plan reporting table**

| Key environmental factor: Flora and Vegetation and Terrestrial Fauna | | |
|---|---|---|
| Environmental objective and management target set in the MP | Reporting on the management objective and management target for [Month 20xx] to [Month 20yy] | Status[1] |
| Environmental objective: Avoid or minimise the potential and direct impacts of fire and fire management to the environment, to mine operation and to human life and health. | Potential and direct impacts of fire and fire management to the environment, to mine operation and to human life and health [were / were not] avoided or minimised. | ■ YES or<br>● NO |
| Management target 1: Minimise clearance/back burning of conservation significant areas. | Management target 1: Clearance burning of conservation significant areas [was / was not] minimised. | ■ YES or<br>● NO |
| Management target 2: Keep fire controls within approved areas. | Management target 2: Fire breaks [were / were not] kept within approved areas. | ■ YES or<br>● NO |
| Management target 3: Minimise potential for runoff of fuels, hazardous chemicals or fire suppression systems into native vegetation during fire incidents. | Management target 3: Potential for runoff of fuels, hazardous chemicals or fire suppression systems into native vegetation during fire incidents [was / was not] minimised. | ■ YES or<br>● NO |
| Management target 4: Preventive fire controls are authorised and undertaken in accordance with GDAP. | Management target 4: Preventive fire controls [were / were not] authorised and undertaken in accordance with GDAP | ■ YES or<br>● NO |

Notes:

1. The status of achievement of the environmental objectives is indicated by the following symbols:
   - ■ Environmental objective achieved
   - ● Environmental objective not achieved

# 4. Adaptive management and review of the MP

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

- Monitoring data will be systematically evaluated and compared to baseline and reference site data in a process of adaptive management to verify whether responses to the impact are the same or similar to predictions.
- Re-evaluate the risk assessment and revision of risk-based priorities on the basis of monitored information.
- Increased understanding of the local and regional ecological regime.
- Revision when management actions are not as effective as predicted.
- 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.).
- Review of MP – changes to MP provisions required by a condition; timeframe, etc.

## 5. Stakeholder consultation

Stakeholder consultation regarding fire management will be undertaken with relevant State government departments and local government authorities – such as Department of Parks and Wildlife (DPAW) and Shire of Menzies. Vimy will also consult with MRUP's nearest neighbours at Tropicana Gold Mine and Pinjin Station regarding any potential impacts or practices outside MRUP boundaries. Onsite contractors will be regularly consulted in regards to the effectiveness of the MP and will be considered as part of the ongoing review process and adaptive management strategy.

# 6. References

The following references were used in developing this MP.

DMP (1997) *Foam Fire Suppression Systems on Mine Vehicles-Guideline*, Department of Mines and Petroleum (DMP), Western Australia.

DMP (2013) *Accident and Incident Reporting–Guideline* Third Edition, Department of Mines and Petroleum, Western Australia.

DMP (2014) *Effective Safety and Health Supervision in Western Australian Mining Operations-Guideline*, Department of Mines and Petroleum (DMP), Western Australia.

EPA (2015a) *Environmental Assessment Guideline for Environmental principles, factors and objectives, EAG 8*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015b) *Environmental Assessment Guideline for Preparation of management plans under Part IV of the Environmental Protection Act 1986, EAG 17*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015c) *Title of Condition Environmental Management Plan, Environmental management-based condition model template*. Environmental Protection Authority, Perth, Western Australia.

MCPL (2015) *Assessment of Flora and Vegetation Surveys conducted for the Mulga Rock Uranium Project, Great Victoria Desert, WA*. Unpublished report by Mattiske Consulting Pty Ltd for Vimy Resources, April, 2015.

# Mulga Rock Uranium Project

# Rehabilitation and Revegetation Management Plan

## MRUP-EMP-030

November 2015


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| | | | | | |

## Prepared for Vimy Resources Limited by Golder Associates Pty Ltd

# Table of Contents



# List of Tables

# 1. Summary

The table below presents the environmental management target/s to measure achievement of the environmental objective that must be met through implementation of this Management Plan (MP).

| Title of proposal | Mulga Rock Uranium Project |
|---|---|
| Proponent | Vimy Resources Limited |
| Environmental Scoping Document | Assessment Number 1979 |
| Purpose of this MP | The Rehabilitation and Revegetation Management Plan is submitted to outline MRUP's proposed procedures and practices to be implemented to meet the EPA's environmental objective for the key environmental factor/s. |
| EPA's environmental objective for the key environmental factor/s | Rehabilitation and decommissioning: To ensure that premises are decommissioned and rehabilitated in an ecologically sustainable manner. |
| Environmental objective | To ensure that rehabilitation activities are effective at achieving closure goals and do not adversely impact on surrounding environmental values. |
| Management target/s | • Management target 1: Ensure stakeholder interests are considered during all stages of closure planning.<br>• Management target 2: Progressively rehabilitate and revegetate disturbed areas, where practicable.<br>• Management target 3: Develop safe, stable, non-polluting landforms capable of sustaining agreed post-mine land use.<br>• Management target 4: Revegetate disturbed areas to meet post-mine land use objectives.<br>• Management target 5: Rehabilitation activities do not adversely affect surrounding environmental values. |

**Corporate endorsement**

I hereby certify that to the best of my knowledge, the MP provisions within this Rehabilitation and Revegetation Management Plan are true and correct.

[Signature of duly authorised proponent representative]

Name: Signed:

Designation: Date:

# 2. Context, scope and rationale

## 2.1 What is the proposal?

Vimy Resources Limited (Vimy) proposes to develop the Mulga Rock Uranium Project (MRUP or the Project) which lies approximately 240km east-north-east of Kalgoorlie-Boulder in the Shire of Menzies. The area is remote, located on the western flank of the Great Victoria Desert, comprising series of large, generally parallel sand dunes, with inter-dunal swales and broad flat plains.

The MRUP covers approximately 102,000 hectares on granted mining tenure (primarily M39/1080 and M39/1081) within Unallocated Crown Land (UCL). It includes two distinct mining centres, Mulga Rock East (MRE) comprising the Princess and Ambassador resources and Mulga Rock West (MRW) comprising the Emperor and Shogun resources, which are approximately 20km apart. Up to 4.5 Million tonnes per annum (Mtpa) of ore will be mined using traditional open cut techniques, crushed, beneficiated and then processed onsite to produce, on average, 1,360 tonnes of uranium oxide concentrate (UOC) per year over the life of the Project. Base metal concentrates will also be extracted using sulphide precipitation after the uranium has been removed and sold separately.

The anticipated Life-of-Mine (LOM) is up to 16 years, based on the currently identified resource.

This MP has been based on *Environmental Assessment Guideline 17* (EPA 2015b) and the EPA's *environmental management-based condition model template* (EPA 2015c).

## 2.2 What key environmental factor/s does this MP address?

This MP specifically addresses the Rehabilitation and Decommissioning environmental factor.

The key rehabilitation activities planned by Vimy during rehabilitation and revegetation activities that have the potential to impact on the environment include:

- Ground disturbance.
- Vehicle movement.
- Materials handling and movement.
- Landform construction.
- Waste management.
- Decommissioning / closure activities.
- Rehabilitation activities (e.g. ripping, seeding).

The potential impacts arising from these activities include:

- Chemical and/or hydrocarbon leaks or spills.
- Excessive erosion.
- Mobilisation of sediments.
- Increased dust emission.
- Introduction / spread of invasive weed species.

## 2.3 Rationale and approach in meeting the environmental objective

Results of baseline surveys and a number of assumptions and uncertainties inform the management approach for meeting MRUP's environmental objective for rehabilitation and revegetation. The identified management actions, management targets and proposed review and revision of management actions are aligned with the overall management approach.

### 2.3.1 Results of baseline surveys conducted

The Shogun area was rehabilitated prior to 2000 by the previous tenement holders, with the rehabilitation program being completed in December 2001. This was a trial pit was backfilled with mixed Miocene and oxidised Eocene geologies (as per the current mine plan). The salvaged sand was spread across the disturbed site at a depth of 10cm and then contour ripped. Nearby Mallee branches laden with green fruit were spread over the site. There was no initial seeding or soil amelioration. However, the site was seeded after around 2000. Anecdotal comments indicate that there was no significant revegetation for the first five to 10 years, after which, a relatively dense stand of Mallee became established. Unfortunately environmental records were not kept to indicate why this was the case, but it may have been due to the later seeding of the site or adequate and sustained levels of rainfall.

A survey was undertaken in September 2015 to assess the flora and vegetation and to establish monitoring plots within the Shogun rehabilitation trial pit area. Two locations were surveyed; Shogun 01 (backfilled void) and Shogun 02 (stockpile of sand)

The survey identified 14 native vascular plant taxa, representative of eight plant genera and 10 plant families in Shogun 01 (MCPL 2015). Shogun 02 had a total of 27 native vascular plant taxa recorded, representative of 21 plant genera and 14 plant families. Five opportunistic species were recorded whilst traversing the area on foot that were not recorded in the plots. Species recorded within the plots and as opportunistic observations were generally established shrubs or trees, and no seedlings were observed. No introduced (weed) species were observed in the Shogun rehabilitation area.

No threatened flora (listed under State or Federal legislation) were recorded in either of the plots or opportunistically. Two priority flora were recorded in the Shogun rehabilitation area.

The vegetation community at Shogun 01 does not closely resemble vegetation communities within the local area (as defined by Mattiske Consulting Pty Ltd (MCPL) during baseline surveys), mainly due to a lack of understorey species present within the plot. The vegetation community within Shogun 02 has similarities to the MCPL vegetation community E8 (MCPL 2015) with regards to the understorey.

The Shogun rehabilitation area was not burnt in the November 2014 fire, however there is evidence of the fire burning up to the edge of the rehabilitation area particularly on the northern side.

It is also noted that 13 flora and vegetation surveys have been conducted at the MRUP and its surrounds since 2007 providing an extensive set of baseline botanical data.

### 2.3.2 Key assumptions and uncertainties

It is assumed that the area to be cleared will be kept to a minimum based on safety and operational constraints. Maps will be produced that detail the areas to be cleared, including the timing of the clearing operations for the life of the mine. It is assumed that the maps will be updated on a regular basis, incorporating any progressive rehabilitation and revegetation works, with revegetation success reported annually. The growth medium will be a key success factor for revegetation.

Prior to commencement of operations, Vimy will also undertake a desktop audit of existing rehabilitation within the MRUP, and potentially from further afield (i.e. associated with borrow pits along the Tropicana Haul Road), to establish whether useful information can be obtained on specific rehabilitation techniques and whether further monitoring should be continued of these sites to enhance the knowledge of rehabilitation with a view to improving rehabilitation techniques proposed for the MRUP.

It is noted that rehabilitation procedures or seed mixes from previous rehabilitation trials at Shogun were not recorded.

The species selection for revegetation will be based on the results of the baseline flora and vegetation surveys.

It is assumed that growth medium that is stockpiled for more than two years does not contain a viable seed bank for passive revegetation.

### 2.3.3 Management approach

An adaptive risk based approach to management has been adopted by Vimy for the MRUP. This has been informed by a range of specialist scientific studies for the MRUP and regional area, as well as database searches and other regional project information.

This information has allowed Vimy to prioritise and manage significant risks using the mitigation hierarchy (i.e. avoid, minimise, manage, rehabilitate and offset) and develop an adaptive management system. Adaptive management allows for adaptations due to changing project conditions and the dynamic nature of ecosystems in order to achieve the MRUP environmental objectives.

This management approach is consistent for all the environmental factors for the Project.

### 2.3.4 Rationale for choice of management target/s

Vimy has chosen management based targets. These have been chosen to prioritise significant risks identified for the project and are based on:

- Baseline information and available data for the site and local region.
- The relationship between relevant proposal aspects and impacts on the environmental factor at the MRUP.
- Scientific credibility.
- Consistent with monitoring programs already underway on the site, in the region and industry standards.

Management targets will be reviewed annually to ensure they remain relevant and reflect Vimy and the EPA's environmental objective. Any changes to management targets will be reported as part of the Annual Environmental Report (AER).

# 3. MP provisions

This section of the MP identifies the legal provisions that Vimy proposes to implement to ensure that rehabilitation activities are effective at achieving closure goals and do not adversely impact on surrounding environmental values. It identifies the management target/s that Vimy will use to measure performance and monitoring that will be undertaken in relation to the management target/s. Finally, it identifies how Vimy will review and revise management actions if the management targets are exceeded.

## 3.1 Environmental objective

To ensure that rehabilitation activities are effective at achieving closure goals and do not adversely impact on surrounding environmental values.

## 3.2 Management actions to be implemented

MRUP rehabilitation and revegetation activities/aspects which have the potential to cause environmental impacts have been evaluated through a risk analysis. No risks were identified that required potential 'very high' or 'high' risks or impacts requiring specific management. Despite this, in the interest of continual improvement, Vimy will implement the risk-based management actions presented in Table 3.1.

**Table 3.1: Risk-based management actions that will be implemented to meet the environmental objective**

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| Poor rehabilitation could lead to poor functioning ecosystems | Implement targeted stakeholder communications strategy that reflects the needs of identified stakeholders and manages stakeholder expectations | Stakeholder Consultation Management Plan (MRUP-EMP-036) | Low | Pre-construction |
| Timely and planned rehabilitation will limit erosion and maximise revegetation success | Establish rehabilitation and revegetation schedule based on operational LOM plan<br>Identify closure domains within the site with similar rehabilitation, decommissioning and closure requirements and develop rehabilitation work programs for each domain or feature according to the post-operational land use criteria | Operational Environmental Management Plan (MRUP-EMP-020)<br>Conceptual Mine Closure Plan (MRUP-EMP-031) | Low | Pre-construction |
| | Conduct progressive rehabilitation on disturbed land no longer required for operations according to rehabilitation schedule | Rehabilitation and Revegetation Schedule | Low | Construction, Operations and Closure |
| Poor rehabilitation could lead to poor functioning ecosystems | Conduct adequate characterisation of materials and soils during all Project phases to identify rehabilitation risks and issues | Acid and Metalliferous Drainage Management Plan (MRUP-EMP-016)<br>Soil Management Plan (MRUP-EMP-008)<br>Conceptual Mine Closure Plan (MRUP-EMP-031) | Low | Design, Construction, Operations and Closure |
| Timely and planned rehabilitation will limit erosion and maximise revegetation success | Design and construct landforms aligned with post-mine land use objectives and closure objectives | Overburden Landform Management Plan (MRUP-EMP-015)<br>Design Specification for Backfilling Mine Pits and Reconstruction of Sustainable Post-Mine Soil Profile | Low | Design, Construction, Operations and Closure |

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| Poor rehabilitation could lead to poor functioning ecosystems | Remediate any area declared contaminated as defined under the Contaminated Sites Act 2003 in accordance with DER (2011) guidelines | Conceptual Mine Closure Plan (MRUP-EMP-031)<br>DER (2011) Contaminated Sites Management Series – Assessment Levels for Soil, Sediment and Water | Low | Construction, Operations and Closure |
| | Identify appropriate local provenance seed mix and revegetation methods required to meet post-mine land use and closure objectives | Flora and Vegetation Management Plan (MRUP-EMP-001)<br>Conceptual Mine Closure Plan (MRUP-EMP-031) | Low | Design, Construction, Operations and Closure |
| | Conduct vegetation and rehabilitation trials to determine effective techniques required for different soils types and closure domains | Conceptual Mine Closure Plan (MRUP-EMP-031)<br>Soil Management Plan (MRUP-EMP-008)<br>Overburden Landform Management Plan (MRUP-EMP-015) | Low | Operations and Closure |
| | Update Rehabilitation and Revegetation Schedule and Mine Closure Plan where applicable with results of trials and research outcomes | Conceptual Mine Closure Plan (MRUP-EMP-031) | Low | Operations and Closure |
| Timely and planned rehabilitation will limit erosion and maximise revegetation success | Remove, store and replace cleared vegetation and soil in accordance with relevant management plans | Soil Management Plan (MRUP-EMP-008)<br>Flora and Vegetation Management Plan (MRUP-EMP-001) | Low | Construction, Operations and Closure |
| Poor rehabilitation could lead to poor functioning ecosystems | Implement monitoring program to measure performance of rehabilitation against completion criteria | Environmental Monitoring Management Plan (MRUP-EMP-031)<br>Conceptual Mine Closure Plan (MRUP-EMP-031) | Low | Construction, Operations and Closure |
| Timely and planned rehabilitation will limit erosion and maximise revegetation success | Update document management system and GIS database with rehabilitation and revegetation activities and outcomes | Document and Data Control Management Plan (MRUP-EMP-039) | Low | Construction, Operations and Closure |
| | Report outcomes of rehabilitation and revegetation activities against relevant completion criteria developed within Mine Closure Plan in accordance with the *Guidelines for Preparing Mine Closure Plans* to Key stakeholders | Conceptual Mine Closure Plan (MRUP-EMP-031) | Low | Operations and Closure |

## 3.3 Management target

Management targets will be employed to measure and report against achievement of MRUP's environmental objective.

**Table 3.2: Management target/s to measure the efficacy of management actions relative to the environmental objective**

| Proposed environmental objective (for MP during assessment) | To ensure that rehabilitation activities are effective at achieving closure goals and do not adversely impact on surrounding environmental values. |
|---|---|
| Management target 1 | Ensure stakeholder interests are considered during all stages of closure planning. |
| Management target 2 | Progressively rehabilitate and revegetate disturbed areas, where practicable. |
| Management target 3 | Develop safe, stable, non-polluting landforms capable of sustaining agreed post-mine land use. |
| Management target 4 | Revegetate disturbed areas to meet post-mine land use objectives. |
| Management target 5 | Rehabilitation activities do not adversely affect surrounding environmental values. |

## 3.4 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 have to be reviewed and revised. This section describes how Vimy will undertake monitoring to determine whether the management targets are achieved.

Proposed monitoring methods, locations, parameters and frequencies are outlined in Table 3.3 below. Exact monitoring locations will be finalised as part of the operational MPs and the development of the Environmental Monitoring Management Plan (MRUP-EMP-032). Where practicable, monitoring points will be located to correlate with previous baseline surveys.

**Table 3.3: Monitoring to measure the efficacy of management actions against the management targets**

| Indicator | Method | Location | Parameters | Frequency |
|---|---|---|---|---|
| **Management target 1:** Ensure stakeholder interests are considered during all stages of closure planning. | | | | |
| Stakeholder communication strategy and register developed | Implementation of the Stakeholder Consultation Management Plan (MRUP-EMP-036)<br>Communication with all parties that have a direct interest in the project.<br>Maintain a communications register<br>Review Conceptual Mine Closure Plan (MRUP-EMP-031) during LOM in accordance with statutory requirements. | Project areas | Register | For the life of the Project. |
| **Management target 2:** Progressively rehabilitate and revegetate disturbed areas, where practicable. | | | | |
| Closure domains are identified continually throughout LOM | Review and update the Conceptual Mine Closure Plan (MRUP-EMP-31). | Project areas | Annual Environmental Report | For the life of the Project. |
| GIS tables/maps are updated with operational / rehabilitation activities conducted, recorded in AER | Geo-referenced data management | Project areas | Review register | For the life of the Project. |
| **Management target 3:** Develop safe, stable, non-polluting landforms capable of sustaining agreed post-mine land use. | | | | |
| Landforms are constructed and managed according to detail set out in mine closure plan (MCP). | Review and update the Conceptual Mine Closure Plan (MRUP-EMP-31).<br>Direct measurements of erosion and sediment loss | Project areas | Sustainable landforms | Operations and closure. |
| Landforms demonstrably safe, stable, non-polluting according to closure criteria set in MCP | Audit of the closure works | Project areas | Sustainable landforms | Upon closure. |

| Indicator | Method | Location | Parameters | Frequency |
|---|---|---|---|---|
| **Management target 4:** Revegetate disturbed areas to meet post-mine land use objectives. | | | | |
| Disturbed areas revegetated according to post-operational land use objectives | Rehabilitation monitoring confirms landforms constructed to design. | Project areas | Sustainable landforms<br>% success of revegetation | For the life of the Project. |
| **Management target 5:** Rehabilitation activities do not adversely affect surrounding environmental values. | | | | |
| Rehabilitation activities follow best practice guidelines to remove or mitigate impacts on surrounding environmental values | Rehabilitation activities designed for landform and wind-dominated forces in accordance with Rehabilitation and Revegetation Management Plan (MRUP-EMP-030),Environmental Monitoring Management Plan (MRUP-EMP-032) and Weed Management Plan (MRUP-EMP-003) | Project areas | Sustainable landforms<br>% success of revegetation | For the life of the Project. |

## 3.5 Review and revision of management actions

In the event that a management target is not met or is exceeded, Vimy will implement the following procedure:

- Investigate the potential cause of failing to meet the management target and identify any impacts to surrounding environmental values due to rehabilitation activities.
- If the causes of failing to meet the management target or any impacts identified are a result of the MRUP, the risk assessment will be reviewed and revised risk based management actions will be implemented so that the MRUP environmental objective is met.

Performance meeting management targets will be reported as part of the Annual Environmental Report (AER).

### 3.5.1 Corrective Actions

If monitoring actions outlined in Section 3.4 indicate that the indicators and management targets are not being met then the associated corrective actions outlined below will be implemented.

**Table 3.4: Rehabilitation and revegetation management corrective actions**

| Performance Indicator | Action | Responsibility |
|---|---|---|
| Progressive rehabilitation is not occurring in identified closure domains which are no longer required for operational activities | • Review Rehabilitation and Revegetation Schedule<br>• Review GIS database of rehabilitation activities and outcomes<br>• Update Rehabilitation and Revegetation Schedule where necessary | General Manager<br>Environmental Manager |
| Rehabilitation and revegetation of disturbed areas is not demonstrably meeting post-mine land use or closure objectives | • Review monitoring techniques<br>• Review rehabilitation and revegetation methods used within relevant closure domain<br>• Implement additional trials where necessary<br>• Conduct stakeholder consultation with regards to rehabilitation techniques and closure objectives<br>• Update Mine Closure Plan and relevant management plans where necessary | General Manager<br>Environmental Manager |
| Constructed landforms are not demonstrably meeting post-mine land use or closure objectives | • Review monitoring techniques<br>• Review rehabilitation and revegetation methods used within relevant closure domain<br>• Implement additional trials where necessary<br>• Conduct stakeholder consultation with regards to rehabilitation techniques and closure objectives<br>• Update Mine Closure Plan and relevant management plans where necessary | General Manager<br>Environmental Manager |
| Rehabilitation activities are impacting on surrounding environmental values | • Stop rehabilitation activities in the relevant area<br>• Investigate the cause of environmental impact<br>• Review rehabilitation and revegetation methods used within relevant closure domain<br>• Develop alternative rehabilitation techniques or management measures to eliminate or mitigate impact where necessary | Environmental Manager |

## 3.6 Reporting provisions

### 3.6.1 Annual reporting

Performance in achieving the rehabilitation and revegetation environmental objective will be compared against management targets outlined in Table 3.2 and reported as part of the Annual Environmental Report (AER). In the event that the MRUP environmental objective is not achieved during the reporting period, the AER will include a description of the effectiveness of revised and/or additional management actions implemented and an analysis of trends.

The first AER will be submitted in accordance with the timeline outlined in the Condition Statement following the acceptance of the PER by the EPA.

### 3.6.2 Reporting on exceedance of the management target

In the event of a failure of a management target outlined in Table 3.2 resulting in a significant environmental impact, Vimy will verbally notify the CEO of the OEPA within 48 hours of learning of the exceedance. A written report detailing the exceedance and the outcome of the investigation will be provided to the CEO of the OEPA within seven days. Exceedances of management targets not deemed significant will be reported in the AER.

A significant impact is defined as an unplanned, long term or irreversible impact to flora, vegetation or fauna of conservation significance within the MRUP Development Envelope as a result of MRUP activities.

The MP reporting template is presented in Table 3.5.

**Table 3.5: Management Plan reporting table**

| Key environmental factor: Rehabilitation and decommissioning | | |
|---|---|---|
| Environmental objective and management target set in the MP | Reporting on the management objective and management target for [Month 20xx] to [Month 20yy] | Status[1] |
| Environmental objective: To ensure that rehabilitation activities are effective at achieving closure goals and do not adversely impact on surrounding environmental values. | Rehabilitation activities *[were / were not]* effective at achieving closure goals and *[did / did not]* adversely impact on surrounding environmental values. | ■ YES or<br>● NO |
| Management target 1: Ensure stakeholder interests are considered during all stages of closure planning. | Management target 1: Stakeholder interests *[were / were not]* considered during all stages of closure planning. | ■ YES or<br>● NO |
| Management target 2: Progressively rehabilitate and revegetate disturbed areas, where practicable. | Management target 2: Disturbed areas *[were / were not]* progressively rehabilitated and revegetated where practicable. | ■ YES or<br>● NO |
| Management target 3: Develop safe, stable, non-polluting landforms capable of sustaining agreed post-mine land use. | Management target 3: Safe, stable, non-polluting landforms capable of sustaining agreed post-mine land use *[were / were not]* developed. | ■ YES or<br>● NO |
| Management target 4: Revegetate disturbed areas to meet post-mine land use objectives. | Management target 4: Disturbed areas *[were / were not]* revegetated to meet post-mine land use objectives. | ■ YES or<br>● NO |
| Management target 5: Rehabilitation activities do not adversely affect surrounding environmental values. | Management target 5: Rehabilitation activities *[did / did not]* adversely affect surrounding environmental values. | ■ YES or<br>● NO |

Notes:

1. The status of achievement of the environmental objectives is indicated by the following symbols:
   - ■ Environmental objective achieved
   - ● Environmental objective not achieved

# 4. Adaptive management and review of the MP

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

- Monitoring data will be systematically evaluated and compared to baseline and reference site data on a quarterly (visual inspection) and annual (photo monitoring and health assessment) basis in a process of adaptive management to verify whether responses to the impact are the same or similar to predictions.
- Re-evaluate the risk assessment and revision of risk-based priorities on the basis of monitored information.
- Increased understanding of the local and regional ecological regime.
- Revision when management actions are not as effective as predicted.
- 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.).
- Review of MP – changes to MP provisions required by a condition; timeframe, etc.

# 5. Stakeholder consultation

Consultation regarding rehabilitation and revegetation has been undertaken with Department of Mines and Petroleum, Department of Parks and Wildlife, the Wongatha People and the OEPA. Consultation has also been undertaken with Tropicana Gold Mine.

# 6. References

The following references were used in developing this MP.

DITR (2006) *Mine Closure and Completion, Leading Practice Sustainable Development Program for the Mining Industry*. Department of Industry Tourism and Resources, Canberra, ACT.

EPA (2006) *Guideline for the Assessment of Environmental Factors: Guidance Statement No. 6. Rehabilitation of Terrestrial Ecosystems*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015a) *Environmental Assessment Guideline for Environmental principles, factors and objectives, EAG 8*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015b) *Environmental Assessment Guideline for Preparation of management plans under Part IV of the Environmental Protection Act 1986, EAG 17*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015c) *Title of Condition Environmental Management Plan, Environmental management-based condition model template*. Environmental Protection Authority, Perth, Western Australia.

DMP and EPA (2015) *Guidelines for Preparing Mine Closure Plans*. Perth, Western Australia.

MCPL (2015) *Review of Shogun Rehabilitation, Mulga Rock Uranium Project, Vimy Resources Ltd.* Mattiske Consulting Pty Ltd

# Mulga Rock Uranium Project

# Heritage Management Plan

## MRUP-EMP-034

November 2015


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## Prepared for Vimy Resources Limited by Golder Associates Pty Ltd

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# List of Tables

# 1. Summary

The table below presents the environmental management target/s to measure achievement of the environmental objective that must be met through implementation of this Management Plan (MP).

| Title of proposal | Mulga Rock Uranium Project |
|---|---|
| Proponent | Vimy Resources Limited |
| Environmental Scoping Document | Assessment Number 1979 |
| Purpose of this MP | The Heritage Management Plan is submitted to outline MRUP's proposed procedures and practices to be implemented to meet the EPA's environmental objective for the key environmental factor/s. |
| EPA's environmental objective for the key environmental factor/s | Heritage: To ensure that historical and cultural associations, and natural heritage, are not adversely affected. |
| Environmental objective | To avoid or minimise disturbance or potential impact to any heritage sites during the course of the development and operation of the MRUP. |
| Management target/s *(measureable, proposal-specific)* | • Management target 1: Ensure that historical and cultural values within and surrounding the Project area are not adversely affected.<br>• Management target 2: No unauthorised disturbance of heritage artefacts or sites. |

**Corporate endorsement**

I hereby certify that to the best of my knowledge, the MP provisions within this Heritage Management Plan are true and correct.

[Signature of duly authorised proponent representative]

Name: Signed:

Designation: Date:

# 2. Context, scope and rationale

## 2.1 What is the proposal?

Vimy Resources Limited (Vimy) proposes to develop the Mulga Rock Uranium Project (MRUP or the Project) which lies approximately 240km east-north-east of Kalgoorlie-Boulder in the Shire of Menzies. The area is remote, located on the western flank of the Great Victoria Desert, comprising series of large, generally parallel sand dunes, with inter-dunal swales and broad flat plains.

The MRUP covers approximately 102,000 hectares on granted mining tenure (primarily M39/1080 and M39/1081) within Unallocated Crown Land (UCL). It includes two distinct mining centres, Mulga Rock East (MRE) comprising the Princess and Ambassador resources and Mulga Rock West (MRW) comprising the Emperor and Shogun resources, which are approximately 20km apart. Up to 4.5 Million tonnes per annum (Mtpa) of ore will be mined using traditional open cut techniques, crushed, beneficiated and then processed onsite to produce, on average, 1,360 tonnes of uranium oxide concentrate (UOC) per year over the life of the Project. Base metal concentrates will also be extracted using sulphide precipitation after the uranium has been removed and sold separately.

The anticipated Life-of-Mine (LOM) is up to 16 years, based on the currently identified resource.

This MP has been based on *Environmental Assessment Guideline 17* (EPA 2015b) and the EPA's *environmental management-based condition model template* (EPA 2015c).

## 2.2 What key environmental factor/s does this MP address?

This MP specifically addresses the Heritage environmental factor.

The main risk to Aboriginal heritage from the project relates to the potential interference or damage to any sites in the Disturbance Footprint.

The Disturbance Footprint and Development Envelope of the Project occur in an area with no current Native Title Claim. The Wongatha people have previously lodged a Native Title Claim over an area largely to the north of the Project, which includes the proposed extraction borefield, but this claim was rejected by the Federal Court. Since this decision, the Wongatha people have asserted 'traditional rights' over this area (described as Wongatha Country).

There are no significant heritage sites located in the Disturbance Footprint, but there is one Registered Site (ID 1986; Minigwal 3) located at the edge of the proposed overburden landform for the Emperor pit. It is described on the register as an artefact/scatter site and, as such, is an archaeological site (containing physical evidence of past activity). A further four registered sites, which are also artefact scatters, are in the same vicinity but further away from any proposed disturbance activities. One sits 370m from the Emperor OL and three are further away – between 2-6km from any planned disturbance. There are no registered ethnographic sites (significant due to spiritual, social, aesthetic or historical reasons).

## 2.3 Rationale and approach in meeting the environmental objective

Results of baseline surveys and a number of assumptions and uncertainties inform the management approach for meeting MRUP's objectives for protection of heritage values. The identified management actions, management targets and proposed review and revision of management actions are aligned with the overall management approach.

### 2.3.1 Results of baseline surveys conducted

There are no significant heritage sites located in the Disturbance Footprint, but there is one Registered Site (ID 1986; Minigwal 3) located at the edge of the proposed Development Envelope. It is described on the heritage register as an artefact/scatter site and, as such, is an archaeological site (containing physical evidence of past activity) rather than an ethnographic one (significant due to spiritual, social, aesthetic or historical reasons).

The results of the Heritage surveys undertaken are summarised below.

#### Previous Heritage Surveys

A total of five surveys have been conducted over the Project area:

- McKeich (1982) – carried out an ethnographic survey of the region surrounding the Project area involving interviewing twelve Aboriginal elders from Cundeelee, and seven Aboriginal elders from Mt Margaret. The discussions indicated that the area had no present significance and that there were no specific mythological, sacred or camping sites within the Project area they were aware of.
- O'Connor (1984) – carried out an archaeological survey in the region for Aboriginal sites. The survey located six sites containing surface scatters of stone artefacts, however only one site, at a location some distance outside the Development Envelope, was deemed to be archaeologically significant.
- Glendenning (2014) – carried out an archaeological survey in the region for Aboriginal sites. No archaeological sites were identified within the 64 different one hectare sites surveyed across the Project area.
- Mathieu (2015) – carried out two ethnographic surveys of the region surrounding the Project area (one for men and the other for women). The survey interviewed senior Wongatha people who were nominated for participation by the North East Independent Body. The findings were consistent with the 1982 survey with neither survey identifying any ethnographically significant sites.

### 2.3.2 Key assumptions and uncertainties

The key assumptions and uncertainties relevant to this MP are:

- An additional (currently unknown) group or individual may claim a connection to the land where the MRUP is located.
- When disturbance activities start, unidentified sites or artefacts may be uncovered.

### 2.3.3 Management approach

An adaptive risk based approach to management has been adopted by Vimy for the MRUP. This has been informed by a range of specialist scientific studies for the MRUP and regional area, as well as database searches and other regional project information.

This information has allowed Vimy to prioritise and manage significant risks using the mitigation hierarchy (i.e. avoid, minimise, manage, rehabilitate and offset) and develop an adaptive management system. Adaptive management allows for adaptations due to changing project conditions and the dynamic nature of ecosystems in order to achieve the MRUP environmental objectives.

This management approach is consistent for all the environmental factors for the Project.

### 2.3.4 Rationale for choice of management target/s

Vimy has chosen management based targets. These have been chosen to prioritise significant risks identified for the project and are based on:

- Baseline information and available data for the site and local region.
- The relationship between relevant proposal aspects and impacts on heritage at the MRUP.
- Scientific credibility.
- Consistent with monitoring programs already underway on the site, in the region and industry standards.

Management targets will be reviewed annually to ensure they remain relevant and reflect Vimy and the EPA's environmental objective. Any changes to management targets reported as part of the Annual Environmental Report (AER).

# 3. MP provisions

This section of the MP identifies the legal provisions that Vimy proposes to implement to avoid or minimise disturbance or potential impact to any heritage sites during the course of the development and operation of the MRUP. It identifies the management target/s that Vimy will use to measure performance and monitoring that will be undertaken in relation to the management target/s. Finally, it identifies how Vimy will review and revise management actions if the management targets are exceeded.

## 3.1 Environmental objective

To avoid or minimise disturbance or potential impact to any heritage sites during the course of the development and operation of the MRUP.

## 3.2 Management actions to be implemented

MRUP activities/aspects which have the potential to cause environmental impacts have been evaluated through a risk analysis. No risks were identified that required potential 'very high' or 'high' risks or impacts requiring specific management. Despite this, in the interest of continual improvement, Vimy will implement the risk-based management actions presented in Table 3.1.

**Table 3.1: Risk-based management actions that will be implemented to meet the environmental objective**

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| **Clearing and ground disturbance** | | | | |
| Unauthorised ground disturbance leading to impacts to items of heritage significance. | Should any items of significance be found during clearance works, clearing will stopped immediately so an assessment of the potential artefacts can be carried out by an appropriately qualified person. DAA will be notified and consultation with relevant stakeholders will be sought prior to any disturbance. This protocol will be defined within the Ground Disturbance Activity Permit (GDAP) process. | Heritage Management Plan (MRUP-EMP-032)<br>Ground Disturbance Management Plan (MRUP-EMP-019)<br>Document and Data Control Management Plan (MRUP-EMP-038) | Low | Construction, Operations and Closure |
| | Driving off tracks will not be allowed without prior authorisation. Access to areas outside of the clearance boundary will be restricted to minimise the risk of unauthorised disturbance. | Ground Disturbance Management Plan (MRUP-EMP-019) | Low | Construction, Operations and Closure |
| | A central database containing the spatial location of any culturally significant artefacts or locations will be kept and referred to throughout the GDAP clearance process (according to protocols within the Document and Data Control MP: MRUP-EMP-038). | Ground Disturbance Management Plan (MRUP-EMP-019)<br>Document and Data Control Management Plan (MRUP-EMP-038) | Low | Construction, Operations and Closure |
| | Cultural awareness and artefact recognition training will be provided for all MRUP personnel involved in the field during construction and operational phases of the Project. | Environmental Induction and Training Management Plan (MRUP-EMP-039)<br>Heritage Management Plan (MRUP-EMP-032)<br>Document and Data Control Management Plan (MRUP-EMP-038) | Low | Construction, Operations and Closure |
| **Stakeholder Consultation** | | | | |
| Works are undertaken without consulting relevant stakeholders. | Develop a stakeholder consultation register which adheres to the requirements of the Aboriginal Heritage Act (according to protocols established within the Stakeholder Consultation MP: MRUP-EMP-036). The DAA will be informed of any disputes which may occur with Aboriginal groups during the Project period. | Stakeholder Consultation Management Plan (MRUP-EMP-036)<br>Document and Data Control Management Plan (MRUP-EMP-038) | Low | Construction, Operations and Closure |

## 3.3 Management target

Management targets will be employed to measure and report against achievement of MRUP's environmental objective. The results of the baseline studies suggest that the management targets listed in Table 3.2 will achieve Vimy's environmental objective.

**Table 3.2: Management target/s to measure the efficacy of management actions relative to the environmental objective**

| | |
|---|---|
| Proposed environmental objective (for MP during assessment) | To avoid or minimise disturbance or potential impact to any heritage sites during the course of the development and operation of the MRUP. |
| Management target 1 | Ensure that historical and cultural values within and surrounding the Project area are not adversely affected. |
| Management target 2 | No unauthorised disturbance of heritage artefacts or sites. |

## 3.4 Monitoring

No specific ongoing monitoring actions will be required for the management of heritage values at the MRUP. The Environmental Manager will have the responsibility of ensuring that the GDAP process is adhered to prior and during all clearance activities, and that the management strategies outlined in Section 3.2 are followed.

## 3.5 Review and revision of management actions

In the event that a management target is not met or is exceeded, Vimy will implement the following procedure:

- Investigate the potential cause of failing to meet the management target and identify any impacts to heritage, and
- If the causes of failing to meet the management target or any impacts identified are a result of the MRUP, the risk assessment will be reviewed and revised risk based management actions will be implemented so that the MRUP environmental objective is met.

Performance meeting management targets will be reported as part of the Annual Environmental Report (AER).

### 3.5.1 Corrective Actions

If the GDAP process indicates that the environmental objective and management targets are not being met (i.e. if a potentially significant and unknown artefact is disturbed in a permitted area), then the associated corrective actions outlined below will be implemented as soon as possible.

**Table 3.3: Heritage Management Plan Corrective Actions**

| Performance Indicator | Action | Responsibility |
|---|---|---|
| Disturbance of potential culturally significant artefact without prior approval | • Immediately stop clearance activity.<br>• Set up buffer zone to prevent further disturbance until identification /investigation is complete.<br>• Inform DAA and other relevant stakeholders, raise environmental incident report.<br>• Conduct investigation with appropriate stakeholders to determine if discovery is culturally significant.<br>• Review GDAP process with regards to heritage values and develop additional management measures if required. | Environmental Manager |

## 3.6 Reporting provisions

### 3.6.1 Annual reporting

Performance in protecting heritage will be compared against management targets outlined in Table 3.2 and reported as part of the Annual Environmental Report (AER). In the event that the MRUP environmental objective is not achieved during the reporting period, the AER will include a description of the effectiveness of revised and/or additional management actions implemented and an analysis of trends.

The first AER will be submitted in accordance with the timeline outlined in the Condition Statement following the acceptance of the PER by the EPA.

### 3.6.2 Reporting on exceedance of the management target

In the event of a failure of a management target outlined in Table 3.2 resulting in a significant environmental impact, Vimy will verbally notify the CEO of the OEPA within 48 hours of learning of the exceedance. A written report detailing the exceedance and the outcome of the investigation will be provided to the CEO of the OEPA within seven days. Exceedances of management targets not deemed significant will be reported in the AER.

A significant impact is defined as an unplanned, long term or irreversible impact to heritage within the MRUP Development Envelope as a result of MRUP activities.

The MP reporting template is presented in Table 3.4.

**Table 3.4: Management Plan reporting table**

| Key environmental factor: Heritage | | |
|---|---|---|
| Environmental objective and management target set in the MP | Reporting on the management objective and management target for [Month 20xx] to [Month 20yy] | Status[1] |
| Environmental objective: To avoid or minimise disturbance or potential impact to any heritage sites during the course of the development and operation of the MRUP. | Disturbance or potential impact to any heritage sites during the course of the development and operation of the MRUP *[were / were not]* avoided or minimised. | ■ YES or<br>● NO |
| Management target 1: Ensure that historical and cultural values within and surrounding the Project area are not adversely affected. | Management target 1: Historical and cultural values within and surrounding the Project area *[were / were not]* adversely affected. | ■ YES or<br>● NO |
| Management target 2: No unauthorised disturbance of heritage artefacts or sites. | Management target 2: There *[was / was not]* unauthorised disturbance of heritage artefacts or sites. | ■ YES or<br>● NO |

Notes:

1. The status of achievement of the environmental objectives is indicated by the following symbols:
   - ■ Environmental objective achieved
   - ● Environmental objective not achieved

# 4. Adaptive management and review of the MP

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

- In the event that a heritage site is identified, data will be systematically evaluated and compared to baseline and reference site data.
- Re-evaluate the risk assessment and revision of risk-based priorities on the basis of monitored information.
- Increased understanding of the local and regional heritage regime.
- Revision when management actions are not as effective as predicted.
- 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.).
- Review of MP – changes to MP provisions required by a condition, timeframe, etc.

## 5. Stakeholder consultation

Consultation regarding Aboriginal Heritage has been with representatives of the Wongatha people who are broadly accepted as the appropriate traditional owner group for the MRUP area. Other consultation has occurred with the Department of Aboriginal Affairs (DAA).

## 6. References

The following references were used in developing this MP.

DAA and DPC (2013) *Aboriginal Heritage - Due Diligence Guidelines, Version 3.0*. Department of Aboriginal Affairs and Department of Premier and Cabinet. Perth, Western Australia.

EPA (2004) *Guidance Statement No. 41: Assessment of Aboriginal Heritage*. Perth, Western Australia.

EPA (2015a) *Environmental Assessment Guideline for Environmental principles, factors and objectives, EAG 8*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015b) *Environmental Assessment Guideline for Preparation of management plans under Part IV of the Environmental Protection Act 1986, EAG 17*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015c) *Title of Condition Environmental Management Plan, Environmental management-based condition model template*. Environmental Protection Authority, Perth, Western Australia.

Glendenning (2014). *A report of an Archaeological Survey of the Proposed Mulga Rock Project Northeast of Kalgoorlie*, unpublished report prepared for Vimy Resources, August 2014.

Mathieu (2015). *Report of an Ethnographic survey: Mulga Rock Uranium Project Area, Great Victoria Desert*, unpublished report prepared for Vimy Resources, May 2015.

McKeich (1982). *A Survey for Aboriginal Sites in the Cundeelee Minigwal Area*, unpublished report prepared for PNC Exploration (Australia) Pty Ltd, August 1982.

O'Connor (1984). *An Archaeological Survey for Aboriginal Sites in the PNC Exploration Lease Area, Officer Basin, Great Victoria Desert*, unpublished report by Centre for Prehistory, UWA for Energy and Minerals Australia Ltd, 1984.

# Mulga Rock Uranium Project

## Stakeholder Consultation Management Plan

**MRUP-EMP-036**

November 2015


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## Prepared for Vimy Resources Limited by Golder Associates Pty Ltd

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# 1. Introduction

Vimy Resources (Vimy) will be developing the Mulga Rock Uranium Project (MRUP, the Project) into an operating mine. This stakeholder consultation management plan (plan) forms one of the project Environmental Management Plans (EMPs) and has the project specific number of MRUP-EMP-036. The plan sets out Vimy's intentions to undertake targeted consultation with potentially impacted and interested stakeholders during the approvals stages of the proposed development through to construction and operations. The plan provides a framework and schedule for the Project team to proactively engage with stakeholders and seek their feedback on the MRUP in the context of Western Australia's early stages of developing uranium projects. The document will be regularly updated and reviewed as the MRUP advances through future stages.

## 2. Background

The Mulga Rock Uranium Project (MRUP) lies approximately 240km east-north-east of Kalgoorlie-Boulder in the Shire of Menzies (Figure 1). The area is remote and access is limited to four-wheel-drive vehicles. The nearest residential town to the Project is Laverton, approximately 200km to the north-west. Other regional residential communities include Pinjin Station, approximately 100km to the west, Coonana Aboriginal community approximately 130km to the south-south-west, Kanandah Station homestead approximately 150km to the south-east and the Tropicana Gold Mine approximately 110km to the north-east of the Project (Figure 2).

The MRUP covers approximately 102,000 hectares on granted mining tenure (primarily M39/1080 and M39/1081) within Unallocated Crown Land (UCL). Up to 4.5 Million tonnes per annum (Mtpa) of ore will be mined using traditional open cut techniques, crushed, beneficiated and then processed at an acid leach and precipitation treatment plant to produce, on average, 1,360 tonnes of uranium oxide concentrate (UOC) per year over the life of the Project. The anticipated Life-of-Mine (LOM) is up to 16 years, based on the currently identified resource.

The MRUP has been the priority Project for Vimy, and its predecessor Energy and Minerals Australia Limited (EMA), since 2005. EMA undertook ad hoc consultation with stakeholders on an ongoing basis, aligning with the early exploration phase of the Project. Vimy's concurrent development of the MRUP through pre-feasibility and environmental approvals has compressed timeframes for detailed consultation with stakeholders prior to the submission of the Public Environmental Review (PER) as the primary approvals document. This plan provides a detailed strategy to undertake targeted consultation for the MRUP.

For the purposes of consultation, the MRUP is considered in the context of uranium mining in WA as a new venture. To date, there is no operating uranium mine in WA. Two other proponents, Toro and Cameco, have projects approved for development through State and Federal processes but have delayed final investment decisions until the price of uranium improves.

## 3. Objectives

The objectives for this plan are:

- Establish and maintain relationships with stakeholders potentially impacted by the development of the MRUP.
- Develop stakeholder knowledge and understanding of uranium mining processes, transport of uranium product and its role as a non-fossil energy source.
- Develop stakeholder knowledge and understanding regarding perceived risks to human health from the development of uranium mines and handling of uranium products.
- Provide an opportunity for stakeholders to put forward their queries and concerns regarding the MRUP and have them addressed by Vimy.
- Provide an opportunity for stakeholder feedback regarding the MRUP to be considered and potentially implemented in Project design, mitigations and management procedures.

# 4. Key Issues

Uranium mining continues to be a contentious proposition for some in the WA community, particularly those who have not been adequately informed about the mining, processing, transport and safe use of uranium and its role in the nuclear fuel cycle. Some stakeholders are entrenched in their opposition to nuclear power as an energy source, and therefore oppose any new uranium mines. This context will influence anticipated stakeholder queries and concerns regarding the development of the MRUP. While two other proponents have had projects approved, none has progressed through to construction or operations – leaving Western Australia without an operating uranium mine. South Australia's Olympic Dam has been operating as a poly-metallic mine since 1988 and the Ranger Uranium Mine in the Northern Territory started mining in 1980 but has been processing stockpiled ore since 2012. While industry partners make their own decisions regarding final investments, Vimy's schedule for development of MRUP could make it the first operating uranium mine in WA – a proposition that would attract a higher level of public interest, comment and opinion upon its transition from proposal to construction and operations. An understanding of the key issues likely to be raised by stakeholders will assist Vimy to meet the objectives of this plan and meet the expectations of regulators during primary and secondary approvals stages.

The key issues are likely to be:

- Perceptions of safety around potential exposure to radiation (for humans and the environment) during mining, processing and transport of uranium product.
- Potential environmental impacts from management and disposal of tailings following mining and processing.
- Potential impacts to local fauna from loss of habitat, due to clearing.
- Opportunities for employment and training – how many jobs will be available and will they be filled by people from the Goldfields region?
- Opportunities for regional economic development – local business partnerships and contracts during construction and operations.
- Entrenched opposition to any new uranium mines.

# 5. Stakeholder identification

Stakeholders have been identified and mapped using a stakeholder mapping matrix. The matrix evaluates the level of interest/influence in the Project for each stakeholder group and provides a reference for prioritising engagement and assigning appropriate engagement methods to stakeholders. The stakeholder map also provides a method of tracking contact with stakeholders and acts as an internal actions list. A Stakeholder Consultation Table (Vimy 2015, Appendix J1)) has recorded meetings with stakeholders since 2008. The current MRUP Stakeholder Map is held by Vimy and regularly updated. A summary description of the approach to engagement for categories of stakeholders is provided in Sections 5.1 to 5.6.

## 5.1 Regulators

Vimy has engaged regularly with decision making authorities (DMAs) or regulators responsible for authorising and providing permits for the proposed MRUP. The key authorities for this engagement are:

- Environmental Protection Authority (EPA)
- Department of Environment Regulation (DER)
- Department of Mines and Petroleum (DMP) – in Perth and Kalgoorlie
- Department of Parks and Wildlife (DPAW) – in Perth and Kalgoorlie
- Department of Water (DoW)
- Department of Health (DoH)
- Department of Aboriginal Affairs (DAA)
- Department of the Environment (DoE – Commonwealth)

Engagement with these stakeholders is issue specific and regularly requires technical input from Vimy's specialist advisors and consultants. The usual method of engagement is through face-to-face meetings, supported by the provision of written reports, summary updates, PowerPoint presentations and email queries and responses.

## 5.2 Local Government

The local government authorities (LGAs) of highest priority for engagement are the Shire of Menzies and the City of Kalgoorlie Boulder. While there will be no project-related activities apparent in the town of Menzies – the MRUP is located within the Shire of Menzies and Vimy is already a significant ratepayer to this council. Vimy's intention to employ people from the region and support regional businesses and suppliers is likely to benefit people living within these two LGAs first. The company has undertaken to provide both LGAs with regular project updates and is seeking input regarding broader community engagement during the PER public comment period. The usual method of engagement is face-to-face meetings with the Project Manager, Company Director or CEO. These are supported by regular phone discussions and emails as required.

The proposed preferred transport route for UOC includes the following LGAs in WA:

- Shire of Menzies
- Shire of Kalgoorlie-Boulder
- Shire of Coolgardie
- Shire of Dundas

In South Australia:

- Outback Communities Authority
- District Council of Ceduna
- District Council of Streaky Bay
- District Council of Wudinna
- District Council of Kimba
- Port August City Council
- District Council of Mount Remarkable
- Port Pirie Regional Council
- Wakefield Regional Council
- District Council of Mallala
- City of Playford
- City of Salisbury
- City of Port Adelaide Enfield

## 5.3 Industry Neighbours

Vimy's closest neighbour is the Tropicana Joint Venture, approximately 110 km to the north-east of the MRUP. The gold mine opened in 2014 and is run by AngloGold Ashanti Australia Ltd (AngloGold). The site operates with a fly-in-fly-out workforce, with policies to provide local and regional benefits through direct employment or engagement of regional businesses. Tropicana and Vimy have formed agreements to share resources, specifically Tropicana's access road and Vimy's extraction bore. Through regular discussions, Vimy has also gained knowledge and information form Tropicana's shared prior experience developing a resource in a similar location with the same local stakeholders. Vimy hopes to continue collaborating with AngloGold Ashanti, particularly in relation to developing local economic development opportunities.

Discussions have been held with Tisala Pty Ltd, operators of Pinjin Station. The enterprise has some capacity for earthmoving works and a minor contract has been issued for upcoming trial mining works in November 2015. Vimy hopes to continue this relationship as the MRUP develops.

## 5.4 Aboriginal Engagement

Aboriginal engagement will be undertaken on a broad and inclusive basis. Vimy will work to engage all groups with a traditional connection to the land where MRUP is located. The current acknowledged group for the MRUP is the Wongatha – though no native title claim has been lodged for the Project area itself. All cultural heritage surveys have been conducted with the Wongatha. Vimy hopes to develop programs for maximising local employment and contracting opportunities and will seek to engage local Aboriginal businesses as part of this program. Early discussions have taken place with AngloGold to understand the success and learnings of their programs in this area. Tisala Pty Ltd, operators of Pinjin Station, is an Aboriginal owned entity led by the Thomas family who identify as Wongatha traditional owners. Vimy is in the process of engaging Tisala for some minor works. Engagement with Wongatha is usually through key representatives, who facilitate broader meetings on an as-needs basis.

## 5.5 Local Business Engagement

Vimy is committed to employing local and supporting local businesses for contracting and/or supply of goods and services during the development of the MRUP. The company has been in regular contact with representatives of the Kalgoorlie-Boulder Chamber of Commerce and Industry (KBCCI) as representatives of small business in the Kalgoorlie-Boulder region. Vimy has also held discussions to share learnings and experiences with AngloGold regarding local business partnerships. The usual method of engagement with local businesses is through KBCCI or direct discussions with business operators.

## 5.6 Non-Government Organisations

The Conservation Council of WA (CCWA) and WA Nuclear Free Alliance are two of the non-government organisations (NGOs) with an entrenched position of opposition to any new uranium mines. Vimy has engaged openly with representatives of both organisations and provided free access to information regarding the MRUP and the results of our technical studies. This has usually been through a face-to-face meeting.

## 6. Key Messages

Key messages provide a focus for engagement activities and highlight the priority messages Vimy would like to communicate with stakeholders. The messages should be short, concise and easy to remember and will form part of all written materials

1. Vimy Resources is confident it can develop the Mulga Rock Uranium Project to operate as a safe, productive and profitable source of uranium for the world's nuclear power industry.
2. Vimy believes nuclear power will continue to be a substantial part of the mix of the world's alternative energy choices.
3. The mining, processing, transport and shipment of uranium ore is happening all over the world without incident.
4. Vimy is committed to working with local and regional stakeholders to maximise economic benefits for people closest to the Project area.
5. Vimy is committed to working with Aboriginal stakeholders to develop opportunities for Aboriginal participation through jobs, training or business partnerships. We will also work with our Aboriginal stakeholders to build cultural awareness among site-based Project staff through appropriate inductions and/or awareness programs.

# 7. Engagement Methods

Methods of engagement are a combination of written and verbal communication methods, with the most effective being face-to-face meetings. Vimy's project team are responsible for delivering the engagement. A sufficient level of MRUP information will be publicly accessible and stakeholders seeking more information will be encouraged to contact Vimy directly. Local and regionally based stakeholders will be given priority for engagement over other community-based stakeholders such as NGOs or Perth-based stakeholders.

## 7.1 Project Website and FAQ

When the PER document is released for public comment, the MRUP project website will be updated to provide summary information including:

- A project description.
- Summary of the approvals stages and current status of approvals.
- Summary of key issues and how they are being addressed through studies/ investigations.
- Links to the full PER (when released by the EPA for public comment).
- A frequently asked questions (FAQ) section addressing common questions regarding the project, uranium mining and radiation.
- Email address and telephone number for people to submit inquiries or phone Vimy for more information.
- Links to external resources including the DMP webpage Uranium Mining in Western Australia and the Minerals Council of Australia's (MCA) webpage Australia's Uranium Industry.

## 7.2 Project Fact Sheet

A printed version of the website information will be published in an A4 handout and used to support face-to-face meetings with stakeholders and community meetings during the public comment period of the PER. The fact sheet will be dated and include a web address to guide stakeholders to the Vimy website for regular updates and to lodge any additional queries.

## 7.3 Key Stakeholder Briefings

Face-to-face meetings are acknowledged as the most effective way to build relationships with stakeholders and quickly and effectively address concerns or queries. These meetings will continue to be used for key stakeholder briefings, where there is often a specific issue that needs to be discussed. For example, meetings with DMAs are often related to a specific technical study such as the effect of contaminants on groundwater. Vimy project team members are selected for these meetings on a case-by-case basis. In some circumstances, Vimy's specialist consultants are called upon to assist with these meetings.

Key stakeholder briefings are also undertaken with political representatives such as State Government Ministers or Federal members and their offices (chiefs of staff). These meetings are usually undertaken by senior members of Vimy's executive and board.

In the case of LGA meetings, Vimy's Project Manager or other senior team members will represent the MRUP at a face-to-face meeting with the LGA CEO and/or President/Mayor. Meetings will be arranged during the public comment period of the PER.

## 7.4 Open House Meetings

Open house community meetings will be hosted in Kalgoorlie-Boulder and Menzies during the public comment period of the PER. The meetings will be coordinated through direct invitation to a representative range of community-based groups sourced through the LGA and other key stakeholders (e.g. women's groups, youth groups, local environmental groups, business networks). A public notice advertising the Open House dates and times will also be published in The Kalgoorlie Miner. The open house format will provide an opportunity for stakeholders to seek information in an informal setting. Project team members will be available to meet and greet visitors, talk through written information and answer any queries or concerns on the spot. A record of queries will be maintained and circulated through future Project updates.

A stand-alone meeting will be arranged during this time for Aboriginal representatives of the Wongatha people. This meeting will be held in Kalgoorlie at a pre-arranged time. The meeting will include a presentation of information tailored to the audience and may be held in conjunction with a re-convening of AngloGold's Indigenous Reference Group (IRG). Discussions are currently underway with AngloGold representatives to explore this option.

## 7.5 Industry Forums

Vimy has actively participated in industry forums such as Diggers and Dealers and Down the Track. The forums provide an opportunity to present an update on the MRUP and gain an understanding of local capacity for contracting and supply. Vimy will continue accessing these forums, particularly as coordinated by KBCCI, for this purpose.

## 7.6 Transport Road Trip

Vimy's CEO and Project Manager will undertake a road trip along the proposed transport route to introduce the MRUP to key stakeholders and address any concerns regarding transport of UOC. The route includes four LGAs in WA and 13 in South Australia. Meetings will be arranged with LGA representatives and any other community stakeholders on the way through each location. Discussions will be held in advance with LGAs to gauge the level of interest from community representatives. The Roadshow will be supported by written materials and a PowerPoint presentation where appropriate.

## 7.7 Site Visit to Port Adelaide

Vimy's CEO and Project Manager are investigating the potential to take a group of key stakeholders to the Port of Adelaide to see the handling and shipping procedures for loading UOC onto boats for export. Potential participants for this familiarisation tour would be representatives of the Wongatha people and representative of the Shire of Menzies and City of Kalgoorlie-Boulder. Discussions are currently underway with the Port of Adelaide to determine the logistics for this activity.

## 7.8 Distribution of PER

The PER will be available for download from the Vimy website once approved for public release from the EPA. An advertisement will be placed in The West Australian and The Kalgoorlie Miner advising stakeholders how to access the full document. The document and all appendices will be available by request in hard copy or on CD from Vimy's West Perth office. Hard copies and a CD copy will be provided to the City of Kalgoorlie-Boulder William Grundt Memorial Library and the State Library of Western Australia.

## 8. Implementation schedule

An indicative schedule for the implementation of stakeholder consultation activities is presented in Table 8.1. Actual dates will be coordinated according to stakeholder availability and considering local and regional calendars. Vimy will endeavour to provide at least two weeks' notice to stakeholders ahead of any meetings.

**Table 8.1: Stakeholder Consultation Schedule**

| Date | Activity | Stakeholder Groups | Responsibility |
|---|---|---|---|
| **Before PER Release** | | | |
| October 2015 – mid-December 2015 | • Industry forums – Down the Track<br>• Ongoing discussions with AngloGold<br>• DMA meetings<br>• Key stakeholder briefings as required | • Regional businesses<br>• Industry neighbours<br>• Regulators<br>• Political members | Vimy Executive, Project Team, specialist consultants |
| November 2015 | • Community meeting with Wongatha, possibly in collaboration with AngloGold | • Traditional owners | Vimy Project Team |
| November – December 2015 | • Preparation of information materials – website, project fact sheet, FAQ. | • All | Vimy Project Team |
| **PER Release for Public Comment** | | | |
| December 2015 – February 2016 | • PER distribution<br>• Key stakeholder briefings – LGAs, KBCCI, DMAs, political representatives as required<br>• Open House meetings<br>• Transport road trip<br>• Port of Adelaide site visit | All | Vimy Executive, Project Team |

## 9. Review

This plan is considered a live document, to be regularly reviewed and updated according to changes in the Project's development and whenever the Project Team identifies a change in stakeholder relations which may necessitate a revised approach. At a minimum, the plan will be revised twice a year and/or immediately following a phase of engagement with key stakeholders. Feedback from stakeholders regarding their consultation preferences will be considered and incorporated in future revisions of the plan where appropriate.

The next revision will be undertaken after the public comment period for the PER.

## 10. References

Vimy Resources Limited, 2015, Mulga Rock Uranium Project Public Environmental Review (PER)

# Mulga Rock Uranium Project

# Chemical and Hydrocarbon Management Plan

**MRUP-EMP-037**

November 2015


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| | | | | | |

## Prepared for Vimy Resources Limited by Golder Associates Pty Ltd

# Table of Contents



# List of Tables

# 1. Summary

The table below presents the environmental management target/s to measure achievement of the environmental objective that must be met through implementation of this Management Plan (MP).

| Title of proposal | Mulga Rock Uranium Project |
|---|---|
| Proponent | Vimy Resources Limited |
| Environmental Scoping Document | Assessment Number 1979 |
| Purpose of this MP | The Chemical and Hydrocarbon Management Plan is submitted to outline MRUP's proposed procedures and practices to be implemented to meet the EPA's environmental objective for the key environmental factor/s. |
| EPA's environmental objective for the key environmental factor/s | Hydrological Processes: To maintain the hydrological regimes of groundwater and surface water so that existing and potential uses, including ecosystem maintenance, are protected.<br>Inland Waters Environmental Quality: to maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected.<br>Subterranean Fauna: To maintain representation, diversity, viability and ecological function at the species, population and assemblage level |
| Vimy's environmental objective | To ensure that the impact on the quality of soil and groundwater as a result of the development of the MRUP will be minimised. |
| Management target/s | • Management target 1: All personnel have the necessary training to deal with environmental incidents.<br>• Management target 2: All chemicals and hydrocarbons are stored in a manner that meets the requirements of legislation and guidelines, reflects industry best practice, and minimises the risk to the environment.<br>• Management target 3: Any chemical or hydrocarbon spills are managed such that there is the minimum impact on the environment.<br>• Management target 4: The use and disposal of chemicals and hydrocarbons does not cause pollution to the environment. |

**Corporate endorsement**

I hereby certify that to the best of my knowledge, the MP provisions within this [Title] Management Plan are true and correct.

[Signature of duly authorised proponent representative]

Name: Signed:

Designation: Date:

# 2. Context, scope and rationale

## 2.1 What is the proposal?

Vimy Resources Limited (Vimy) proposes to develop the Mulga Rock Uranium Project (MRUP or the Project) which lies approximately 240km east-north-east of Kalgoorlie-Boulder in the Shire of Menzies. The area is remote, located on the western flank of the Great Victoria Desert, comprising series of large, generally parallel sand dunes, with inter-dunal swales and broad flat plains.

The MRUP covers approximately 102,000 hectares on granted mining tenure (primarily M39/1080 and M39/1081) within Unallocated Crown Land (UCL). It includes two distinct mining centres, Mulga Rock East (MRE) comprising the Princess and Ambassador resources and Mulga Rock West (MRW) comprising the Emperor and Shogun resources, which are approximately 20km apart. Up to 4.5 Million tonnes per annum (Mtpa) of ore will be mined using traditional open cut techniques, crushed, beneficiated and then processed onsite to produce, on average, 1,360 tonnes of uranium oxide concentrate (UOC) per year over the life of the Project. Base metal concentrates will also be extracted using sulphide precipitation after the uranium has been removed and sold separately.

The anticipated Life-of-Mine (LOM) is up to 16 years, based on the currently identified resource.

This MP has been written in accordance with *Environmental Assessment Guideline 17* (EPA 2015b) and using the EPA's *environmental management-based condition model template* (EPA 2015c).

## 2.2 What key environmental factor/s does this MP address?

This MP specifically addresses the following environmental factors.

- Hydrological Processes.
- Inland Waters Environmental Quality.
- Flora and vegetation.
- Subterranean Fauna.

Hydrological Processes and the quality of inland waters (surface and groundwater), and flora and vegetation and subterranean fauna are key environmental factors. With a range of chemicals and hydrocarbons proposed to be used and stored for the duration of mining, incorrect management could lead to impacts on surrounding soils, flora and vegetation, groundwater and subterranean fauna.

To enable mine development, processing and operation, MRUP will use a range of chemicals and fuels for plant equipment.

The following potential direct impacts on soil, flora and vegetation, groundwater and subterranean fauna have been identified:

- A low risk of contaminating the paleodrainage channel aquifer through hydrocarbon leaks and spills.
- A low risk of contamination of groundwater aquifers from leaks and spills via chemical and fuel transfer, as well as through storage.
- A low risk of impacting flora and vegetation through hydrocarbon leaks and spills.
- A low risk of impacting subterranean fauna through hydrocarbon leaks into groundwater aquifers.

Implementation of this Chemical and Hydrocarbon Management Plan (MRUP-EMP-037) reduces the likelihood and consequence of the risk.

## 2.3 Rationale and approach in meeting the environmental objective

Results of baseline surveys and a number of assumptions and uncertainties inform the management approach for meeting the EPA's environmental objective for Chemical and Hydrocarbon Management. The identified management actions, management targets and proposed review and revision processes are aligned with the overall management approach.

The specific objectives of this plan include:

- Ensure that appropriate management standards are implemented to minimise the impact of hydrocarbons and chemical on the environmental factors.
- Ensure a rapid response to spills.
- Ensure that disposal of contaminated material is in accordance with standards.

### 2.3.1 Results of studies conducted

Numerous studies and modelling investigations have been undertaken to assess aspects of the environment relevant to the management of soils, groundwater and vegetation and flora. Please refer to MRUP-EMP-008, MRUP-EMP-010 and MRUP-EMP-001 respectively.

### 2.3.2 Key assumptions and uncertainties

It is assumed that the volume of potential spills from machinery as likely to be inconsequential compared to the volume of the aquifer.

It is assumed that MRUP will create a number of permanent chemical and hydrocarbon storage facilities as well as a number of temporary chemical and hydrocarbons storage facilities across its Project area. The volumes of chemicals and fuels requiring storage are currently unknown but expected to include diesel, engine oils, waste oils and benefaction chemicals.

### 2.3.3 Management approach

An adaptive risk based approach to management has been adopted by Vimy for the MRUP. This has been informed by a range of specialist scientific studies for the MRUP and regional area, as well as database searches and other regional project information.

This information has allowed Vimy to prioritise and manage significant risks using the mitigation hierarchy (i.e. avoid, minimise, manage, rehabilitate and offset) and develop an adaptive management system. Adaptive management allows for adaptations due to changing project conditions and the dynamic nature of ecosystems in order to achieve the MRUP environmental objectives.

This management approach is consistent for all the environmental factors for the Project.

### 2.3.4 Rationale for choice of management target/s

Vimy has chosen management based targets. These have been chosen to prioritise significant risks identified for the project and are based on:

- Baseline information and available data for the site and local region.
- The relationship between relevant proposal aspects and impacts on the environmental factor.
- Scientific credibility.
- Consistent with monitoring programs already underway on the site, in the region and industry standards.

Management targets will be reviewed annually to ensure they remain relevant and reflect Vimy and the EPA's environmental objective. Any changes to management targets reported as part of the Annual Environmental Report (AER).

# 3. MP provisions

This section of the MP identifies the legal provisions that Vimy proposes to implement to ensure the impact from chemical and hydrocarbon spills to Hydrological Processes and Inland Waters Environmental Quality resulting from the development of the MRUP is minimised in terms of both its extent and duration. It identifies the management target/s that Vimy will use to measure performance and monitoring that will be undertaken in relation to the management target/s. Finally, it identifies how Vimy will review and revise management actions if the management targets are exceeded.

## 3.1 Environmental objective

The overall objective of this MP is to ensure the impact from chemical and hydrocarbon spills to Hydrological Processes and Inland Waters Environmental Quality resulting from the development of the MRUP is minimised in terms of both its extent and duration.

## 3.2 Management actions to be implemented

MRUP activities/aspects which have the potential to cause environmental impacts to Hydrological Processes have been evaluated through a risk analysis. No risks were identified that required potential 'very high' or 'high' risks or impacts requiring specific management. Despite this, in the interest of continual improvement, Vimy will implement the risk-based management actions presented in Table 3.1.

**Table 3.1: Risk-based management actions that will be implemented to meet the environmental objective**

| Risk and key impacts | Management actions | Guiding document | Risk-based priority | Timeframe/ Project phase |
|---|---|---|---|---|
| Soil, surface water or groundwater contamination through hydrocarbon leak/spill in storage. | Training and awareness of personnel | Environmental Management Plan (MRUP-EMP-000)<br>Environmental Induction and Training Management Plan (MRUP-EMP-039) | Low | Construction, Operation and Closure |
| | Secondary containment will be in accordance with Australian Standards. | Spill Response Management Plan (MRUP-EMP-027). | Low | Construction, Operation and Closure |
| | Ensure a current MSDS for chemicals stored is maintained near all storage areas, in a clearly identified file. | Relevant MSDS documentation | Low | Construction, Operation and Closure |
| | Appropriate spill equipment shall be strategically located. | Spill Response Management Plan (MRUP-EMP-027) | Low | Construction, Operation and Closure |

## 3.1 Management target

Management targets will be employed to measure and report against achievement of MRUP's environmental objective. The results of the studies suggest that the management targets listed in Table 3.2 will achieve Vimy's environmental objective.

**Table 3.2: Management target/s to measure the efficacy of management actions relative to the environmental objective**

| | |
|---|---|
| Proposed environmental objective | The impact from chemical and hydrocarbon spills to Hydrological Processes and Inland Waters Environmental Quality resulting from the development of the MRUP is minimised in terms of both its extent and duration. |
| Management target 1 | Relevant personnel have the necessary training to deal with environmental incidents. |
| Management target 2 | All chemicals and hydrocarbons are stored in a manner that meets the requirements of legislation and guidelines, reflects industry best practice, and minimises the risk to the environment. |
| Management target 3 | Any chemical or hydrocarbon spills are managed such that there is the minimum impact on the environment. |
| Management target 4 | The use and disposal of chemicals and hydrocarbons does not cause pollution to the environment. |

## 3.2 Monitoring

The purpose of monitoring is to inform, through the management target/s, if the environmental objective (Section 3.1) is being achieved and when management actions will have to be reviewed and revised. This section describes how Vimy will undertake monitoring to determine whether the management targets are achieved.

Proposed monitoring methods, locations, parameters and frequencies are outlined in Table 3.3 below. Exact monitoring locations will be finalised as part of the operational MPs and the development of the Environmental Monitoring Management Plan (MRUP-EMP-032).

**Table 3.3: Monitoring to measure the efficacy of management actions against the management targets**

| Indicator | Method | Location | Parameters | Frequency |
|---|---|---|---|---|
| **Management target 1**: Relevant personnel have the necessary training to deal with environmental incidents. | | | | |
| Adequate number of personnel trained in environmental incident responses and suitable resources available. | • Implementation of ERP | Project area | Training records | Life of mine |
| **Management target 2**: All chemicals and hydrocarbons are stored in a manner that meets the requirements of legislation and guidelines, reflects industry best practice, and minimises the risk to the environment | | | | |
| All spills managed in accordance with established procedures. | • Train personnel in requirements for spill response within terrestrial environment.<br>• Conduct training exercises in spill prevention and control. | Project area | Management of spills | Monitoring through accident and incident reports and through outcomes of training exercises for the life of the Project |
| **Management target 3**: Any chemical or hydrocarbon spills are managed such that there is the minimum impact on the environment | | | | |
| All hydrocarbons and chemicals stored in accordance with established requirements. | Construct site and establish storage facilities that meet requirements of the Chemical and Hydrocarbon Storage Procedures. | Project area | Storage of hydrocarbons and chemicals | Life of mine |
| **Management target 4**: The use and disposal of chemicals and hydrocarbons does not cause pollution to the environment | | | | |
| Compliance with the requirements of procedures and MSDS.<br>No pollution to the environment from the use and disposal of chemicals and hydrocarbons. | • All chemicals and hydrocarbons shall be used only for their intended purpose<br>• Any specific environmental controls and disposal conditions identified in the Material Safety Data Sheet shall be complied with.<br>• Appropriate spill equipment shall be located in close proximity to where chemicals and hydrocarbons are being used.<br>• Hazardous and dangerous wastes shall be segregated from the general waste stream.<br>• Train personnel in correct handling and disposal of hydrocarbons and chemicals | Project area | Use of hydrocarbons and chemicals | Life of mine |

## 3.3 Review and revision of management actions

In the event that a management target is not met or is exceeded, Vimy will implement the following adaptive management procedure:

- Investigate the potential cause of failing to meet the management target and identify any impacts to Hydrological Processes resulting from this failing.
- If the causes of failing to meet the management target or any impacts identified are a result of the MRUP, the risk assessment will be reviewed and risk based management actions will be implemented so that the MRUP environmental objective is met.

Performance meeting management targets will be reported as part of the Annual Environmental Report (AER).

### 3.3.1 Corrective Actions

If monitoring actions outlined in Section 3.2 indicate that the indicators and management targets are not being met then the associated corrective actions outlined below will be implemented.

**Table 3.4: Hydrological Procedures (Chemical and Hydrocarbon) Corrective Actions**

| Performance Indicator | Action | Responsibility |
|---|---|---|
| Training | • Ensure all personnel inducted. Retrain depending on result of training exercises or changes in procedures. | Training and Environmental Manager |
| Spills managed in accordance with established procedures | • Revision of procedures<br>• Introduction of additional engineering controls<br>• Site remediation and/or rehabilitation | Environmental Manager |
| Hydrocarbons and chemicals stored in accordance with established requirements | • Implementation of corrective and preventative actions identified as necessary through the accident and incident investigation | Environmental Manager |
| Use and disposal of chemicals and hydrocarbons does not cause pollution to the environment | • Implementation of corrective and preventative actions identified as necessary through the accident and incident investigation | Environmental Manager |

## 3.4 Reporting provisions

### 3.4.1 Annual reporting

Performance in protecting Hydrological Processes will be assessed against management targets outlined in Table 3.2 and reported as part of the AER. In the event that the MRUP environmental objective is not achieved during the reporting period, the AER will include a description of the effectiveness of revised and/or additional management actions implemented and an analysis of trends.

The first AER will be submitted in accordance with the timeline outlined in the Condition Statement following the acceptance of the PER by the EPA.

### 3.4.2 Reporting on exceedance of the management target

In the event of a failure of a management target outlined in Table 3.2 resulting in a significant environmental impact, Vimy will verbally notify the CEO of the OEPA within 48 hours of learning of the exceedance. A written report detailing the exceedance and the outcome of the investigation will be provided to the CEO of the OEPA within seven days. Exceedances of management targets not deemed significant will be reported in the AER.

A significant impact is defined as an unplanned, long term or irreversible impact to flora, vegetation or fauna of conservation significance within the MRUP Development Envelope as a result of MRUP activities.

The MP reporting template is presented in Table 3.5.

**Table 3.5: Management Plan reporting table**

| Key environmental factor: Hydrological Processes and Inland Waters Environmental Quality (Chemical and Hydrocarbons) | | |
|---|---|---|
| Environmental objective and management target set in the MP | Reporting on the management objective and management target for [Month 20xx] to [Month 20yy] | Status[1] |
| Management target 1: All personnel have the necessary training to deal with environmental incidents. | Management target 1: All personnel have/do not have the necessary training to deal with environmental incidents. | ■ YES or<br>● NO |
| Management target 2: All chemicals and hydrocarbons are stored in a manner that meets the requirements of legislation and guidelines, reflects industry best practice, and minimises the risk to the environment | Management target 2: Chemicals and hydrocarbons are/are not stored in a manner that meets the requirements of legislation and guidelines, reflects industry best practice, and minimises the risk to the environment | ■ YES or<br>● NO |
| Management target 3: Any chemical or hydrocarbon spills are managed such that there is the minimum impact on the environment. | Management target 3: Chemical or hydrocarbon spills are/are not managed such that there is the minimum impact on the environment. | ■ YES or<br>● NO |
| Management target 4: The use and disposal of chemicals and hydrocarbons does not cause pollution to the environment. | Management target 4: The use and disposal of chemicals and hydrocarbons does/ does not cause pollution to the environment. | ■ YES or<br>● NO |

Notes:

1. The status of achievement of the environmental objectives is indicated by the following symbols:
   - ■ Environmental objective achieved
   - ● Environmental objective not achieved

# 4. Adaptive management and review of the MP

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

- Monitoring data will be systematically evaluated and compared to baseline and reference site data in accordance with Table 3.2 in a process of adaptive management to verify whether responses to the impact are the same or similar to predictions.
- Re-evaluate the risk assessment and revision of risk-based priorities on the basis of monitored information.
- Increased understanding of the local and regional ecological regime.
- Revision when management actions are not as effective as predicted.
- 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.).
- Review of MP – changes to MP provisions required by a condition, timeframe, etc.

# 5. Stakeholder consultation

Stakeholder consultation relevant to this MP will be undertaken with State and Commonwealth regulators as required, particularly OEPA and Department of Environment Regulation.

# 6. References

The following references were used in developing this MP.

EPA (2015a) *Environmental Assessment Guideline for Environmental principles, factors and objectives, EAG 8*. Environmental Protection Authority, Perth, Western Australia.

EPA (2015b) *Environmental Assessment Guideline for Preparation of management plans under Part IV of the Environmental Protection Act 1986, EAG 17*. Environmental Protection Authority, Perth, Western Australia.

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