WILUNA URANIUM PROJECT

ENVIROMENTAL REVIEW AND MANAGEMENT PROGRAMME (ERMP)

EPA Assessment No 1819

JULY 2011

PART 2
Environmental management strategy documents
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CURRENCY
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Title: Environmental Management and Review Programme for the Proposed Wiluna Uranium Project.
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<tr>
<td>Author:</td>
<td>R. Yeeles</td>
</tr>
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1 Introduction

This document has been prepared to describe Toro’s principles for environmental management of the Wiluna Uranium Project (the Project) and consolidates the commitments, management measures, objectives, assessment criteria and monitoring requirements from the Environmental Review and Management Programme (ERMP) into a stand-alone document that can be regularly reviewed and updated. The following Environmental Management Strategy Documents (EMSDs) are likely to be revised and updated in response to community and stakeholder comments and suggestions, as well as Toro’s commitment to continuous improvement.

Attached to this document are EMSDs for:

- Dust Management
- Vegetation Clearing and Soils
- Weed Management
- Water Management
- Groundwater Dependent Vegetation
- Fauna
- Noise
- Radioactive Waste Management
- Waste Management
- Fire Management
- Stygofauna
- Radiation Management Plan
- Aboriginal Cultural Heritage Management Plan
- Transport Management Plan
- Mine Closure and Rehabilitation

The purpose of these EMSDs is to describe management actions to be implemented during the construction, operational, closure and rehabilitation phases of the Project. These management actions have been developed to avoid or mitigate the potential impacts of the Project and to protect conservation and biodiversity values.

As such these EMSDs describe how Toro would:

- Identify potential direct and indirect environmental impacts from risk assessments;
- Provide environmental indicators, objectives and targets;
- Comply with relevant legislation and regulatory requirements; and
- Implement management measures, methods and reporting, auditing and review mechanisms.

A series of management objectives, targets and indicators has been developed to manage potential and direct impacts to various aspects of the environment in relation to the Project.

1.1 Project Overview

The Wiluna Project is in the Murchison region of Western Australia, approximately 960km north east of Perth. It is based on mining two deposits: Centipede and Lake Way. The Centipede deposit is approximately 30km south of the town of Wiluna and the Lake Way deposit is approximately 15km south of Wiluna. The total Project encompasses Centipede East (tenement number M53/224), Centipede West (tenement numbers M53/0113, P53/1355, P53/1356, P53/1357, P53/1396), Lake Way (tenement number M53/1090) and the West Creek borefield (tenement number L53/0150).
The principal activities planned for the Project include:

- Development and operation of a uranium mine encompassing the Lake Way and Centipede deposits;
- Construction and operation of a uranium ore processing, packing and handling facility;
- Development of the West Creek borefield to supply water to the Project;
- Support facilities including an accommodation village, mine administration buildings and workshops, haul roads, power generation and transmission facilities, communications systems and water and waste management;
- Transport of uranium product within Australia for export; and
- Closure and rehabilitation of the mine and other areas disturbed by the Project.

The area in which the Project would be developed predominantly comprises native vegetation, with the exception of minor areas of existing disturbance associated with roads and access tracks and previous mining activity (Outback Ecology Services, 2010). The total area of disturbance required for the development of the Project over the planned 14-year-life-span would be approximately 1,530 hectares (ha), including Project infrastructure. The Centipede deposit covers approximately 580ha, with its eastern boundary on the edge of the salt lake. The Lake Way deposit covers approximately 700ha on the northern sections of the lake system. The mineralisation for the Centipede and Lake Way deposits is typically contained within zones lying at between 1m and 15m below the land surface. The shallow nature and relatively broad areal extent of the deposits mean that open cut would be the most appropriate mining method. The mining method would use surface miners as the primary ore fleet and conventional excavators and/or scrapers for the waste mining. It is unlikely that drilling or blasting would be required for mining.

These EMSDs are part of a suite of plans that deal with impacts and aspects of the Project. They are designed to assist Toro to undertake environmental management in a manner that is compliant with relevant legislation, safe and environmentally responsible. All EMSDs would be periodically reviewed as part of Toro’s commitment to continuous improvement, and for their continued application to the Project, particularly during the operational phase.
2 Legislative Requirements

Toro would comply with all relevant Commonwealth and State legislation and regulations that apply to environmental management aspects of the construction, operational, closure and rehabilitation phases of the Project.

Applicable legislation:

**Commonwealth Legislation**
- Aboriginal and Torres Strait Islander Heritage Protection Act 1984;
- Australian Heritage Council Act 2003;
- Energy Efficiency Opportunities Act 2006 (and Regulations 2006);
- Environmental Protection and Biodiversity Conservation Act 1999;
- National Greenhouse and Energy Reporting Act 2007 (and Regulations 2008);
- Native Title Act 1993

**Western Australian Legislation**
- Aboriginal Heritage Act 1972;
- Bushfires Act 1954;
- Conservation and Land Management Act 1984;
- Contaminated Sites Act 2003;
- Dangerous Goods Safety Act 2004 (and Regulations 2004);
- Environmental Protection Act 1986;
- Environmental Protection (Noise) Regulations 1997;
- Environmental Protection (Clearing of Native Vegetation) Regulation 2004;
- Health Act 1911;
- Heritage of Western Australia Act 1990;
- Land Act 1933;
- Land Administration Act 1997;
- Local Government Act 1960;
- Mining Act 1978;
- Mines, Safety and Inspection Act 1994 (and Regulations 1995);
- Native Title (State Provisions) Act 1999;
- Nuclear Waste Storage (Prohibitions) Act 1999;
- Radiation Safety Act 1975;
- Radiation Safety (General Regulations) 1983;
- Radiation Safety (Transport of Radioactive Substances) Regulations 2002;
- Rights in Water and Irrigation Act 1945-1982;
- Soil and Land Conservation Act 1945;
- Waterways Conservation Act 1945;

2.1 Other Applicable Guidelines, Policies and Standards
The EMSDs outline the scope of the proposal and the potential impacts that have been identified by Toro. Risk assessments have been undertaken, taking into consideration the Risk Management Standard AS 4360 and HB 203 Environmental Guidance document.
The overarching Western Australian guidelines, policies and standards relevant to these EMSDs are listed below in Table 1. Each EMSD includes a summary table of relevant legislation, guidelines, policies and standards pertinent to that Strategy.

**Table 1. Western Australian guidelines, policies and standards**

<table>
<thead>
<tr>
<th>Environmental Protection Authority</th>
<th>Position Statement No 2 – Environmental Protection of Native Vegetation in Western Australia (2000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Protection Authority</td>
<td>Position Statement No 3 – Terrestrial Biological Surveys as an Element of Biodiversity Protection in Western Australia (2002)</td>
</tr>
<tr>
<td>Environmental Protection Authority</td>
<td>Position Statement No 5 – Environmental Protection and Ecological Sustainability of The Rangelands in Western Australia (2004)</td>
</tr>
<tr>
<td>Environmental Protection Authority</td>
<td>Position Statement No 6 – Towards Sustainability (2004)</td>
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<tr>
<td>Environmental Protection Authority</td>
<td>Position Statement No 7 - Principles of Environmental Protection (2004)</td>
</tr>
<tr>
<td>Environmental Protection Authority</td>
<td>Position Statement No 9 – Environmental Offsets (2006)</td>
</tr>
<tr>
<td>Environmental Protection Authority</td>
<td>Guidance Statement No 2 – Guidance for Risk Assessment and Management: Offsite individual risk from Hazardous Industrial Plant (2000b)</td>
</tr>
<tr>
<td>Environmental Protection Authority</td>
<td>Guidance Statement No 6 – Rehabilitation of Terrestrial Ecosystems (2006)</td>
</tr>
<tr>
<td>Environmental Protection Authority</td>
<td>Guidance Statement No 8 (Draft) – Environmental Noise (2007)</td>
</tr>
<tr>
<td>Environmental Protection Authority</td>
<td>Guidance Statement No 12 – Minimising Greenhouse Gases (2002)</td>
</tr>
<tr>
<td>Environmental Protection Authority</td>
<td>Guidance Statement No 19 – Environmental Offsets – Biodiversity (2008)</td>
</tr>
<tr>
<td>Environmental Protection Authority</td>
<td>Guidance Statement No 20 – Sampling of Short Range Endemic Invertebrate Fauna for Environmental Impact Assessment in Western Australia (2009)</td>
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<tr>
<td>Environmental Protection Authority</td>
<td>Guidance Statement No 41 - Assessment of Aboriginal Heritage (2004c)</td>
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<tr>
<td>Environmental Protection Authority</td>
<td>Guidance Statement No 51 – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment (2004d)</td>
</tr>
<tr>
<td>Environmental Protection Authority</td>
<td>Guidance Statement No 54 – Sampling of Subterranean Fauna in Groundwater and Caves (2003b)</td>
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<tr>
<td>Environmental Protection Authority</td>
<td>Guidance Statement No 54 a - Draft Sampling Methods and Survey Considerations for Subterranean Fauna in Western Australia (2007)</td>
</tr>
<tr>
<td>Environment Protection Authority</td>
<td>Draft State Environmental (Ambient Air) Policy (2009)</td>
</tr>
<tr>
<td>Department of Environment and Conservation</td>
<td>A Guideline for managing the impacts of dust and associated contaminants from land development sites, contaminated sites and remediation and other related activities (2011)</td>
</tr>
</tbody>
</table>
2.2 Toro Policies

Environment Policy – Wiluna Project

Toro Energy Limited is committed to the welfare of all employees, contractors and the local communities in which we operate. Our goal is to have an injury free workplace with zero harm to our personnel, business, environment and community. We strive to support the principles of environmental sustainability and minimise potential effects to the environment.

To deliver on this commitment we will:

- Operate in compliance with all relevant environmental laws and regulations, and where possible, endeavour to exceed those standards;
- Identify and manage all risks and hazards;
- Create a culture where compliance with all relevant environmental laws and regulations is a part of our daily business;
- Uphold ethical business practices and set appropriate and measurable environmental objectives and targets;
- Manage and minimise all waste streams;
Legislative Requirements

- Set and achieve targets that promote efficient use of resources and include reducing and preventing pollution;
- Promote protection of the environment through all phases of our operations, from exploration through to mining, and eventually decommissioning;
- Provide appropriate training and support to all employees and contractors to enable them to meet their environmental obligations;
- Work with local Indigenous groups and communities to achieve mutually agreeable project outcomes; and
- Aim to continually improve on our environmental performance through regular review of performance against set targets, and the reporting of such reviews.

Occupational Health & Safety Policy – Wiluna Project

Toro Energy Limited is committed to the welfare of all employees, contractors and the local communities in which we operate. Our goal is to have an injury free workplace with zero harm to our personnel, business, environment and community. We strive to create a culture where safety is a core value, acknowledging that achieving this objective is fundamental to creating a healthy, safe environment and preventing occupational illness and injury.

To deliver on this commitment we will:

- Define improvement objectives and assign responsibility and accountability for health and safety performance;
- Commit adequate resources for the effective implementation of the Health & Safety Management System;
- Establish health and safety procedures and management systems and integrate them fully into design, operating and contracting activities;
- Comply with all health and safety laws and regulations, adopt industry best practice and provide additional levels of health and safety protection where practicable;
- Ensure all employees are appropriately trained to accomplish their job tasks in a safe manner;
- Evaluate employee health and safety performance, rewarding excellence and providing direction for improvement when appropriate;
- Through constructive consultation & communication with all stakeholders, encourage full participation in the prevention of accidents and incidents;
- Conduct periodic health & safety system reviews and audits to measure our performance & drive continual improvement.
Indigenous Relations Policy – Wiluna Project

Toro Energy will respect the culture of Indigenous people in our Project Area by:

• Involving them in discussions about our Project planning, implementation, operations, closure and rehabilitation;
• Sharing information in a manner which best meets their needs;
• Explaining how risks are to be managed;
• Developing a Heritage Management Plan to minimise Project impacts and ensure continuing protection of cultural heritage sites;
• Encouraging the use of their knowledge and skills in land management;
• Supporting their cultural, social and economic aspirations through training, employment and business development opportunities;
• Ensuring all our employees and contractors receive cultural awareness training.
3 Implementation

3.1 Roles and responsibilities
Table 2 below outlines provisional roles and responsibilities of Toro employees and contractors responsible for the implementation of its Environmental Management Strategies.

Table 2. Roles and Responsibilities

<table>
<thead>
<tr>
<th>ROLE</th>
<th>RESPONSIBILITY</th>
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<tbody>
<tr>
<td>Mine Manager</td>
<td>On-site management and responsibility for the Project, Toro employees and contractors</td>
</tr>
<tr>
<td>Occupational Health, Safety and Environment (OHS&amp;E) Manager</td>
<td>Induct staff, contractors and visitors to site about the requirements of the EMSDs; Onsite responsibility for implementation of environmental policies, procedures and systems; Ensure Compliance Register is implemented and maintained; Ensure compliance with all environmental policies, procedures and systems by Toro employees, contractors and visitors to site; and Inform relevant regulatory authority personnel in the event of a reportable incident (within 24 hours or as required by legislation).</td>
</tr>
<tr>
<td>Environmental Officer</td>
<td>Maintain and update procedures and forms for documenting environmental incidents, non-compliances and complaints; Record all non-compliances, incidents and complaints on the Compliance Register; Correct all non-compliances to the satisfaction of the OHS&amp;E Manager; Report on implementation and effectiveness of corrective actions; Carry out environmental audits and ongoing monitoring to verify compliance; and Liaise with interested communities and stakeholders.</td>
</tr>
<tr>
<td>Contractors</td>
<td>Carry out work in accordance with the EMSDs; Obtain and hold on site any documentation needed to undertake work; and Train staff (as required) so that work is carried out to comply with requirements of the EMSDs.</td>
</tr>
<tr>
<td>All other Toro personnel and site visitors</td>
<td>Comply with all relevant site procedures and policies.</td>
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</tbody>
</table>
3.2 Training and competence
All Toro employees and contractors would have the appropriate training, knowledge and skills required to perform their duties in accordance with Toro policies, procedures and relevant legislative requirements.

Employees and contractors would undergo an induction process, which would include awareness and appreciation of Toro’s management systems, Environmental Policy, Occupational Health and Safety Policy, Radiation Policy, Indigenous Relations Policy, management strategies and procedural requirements.

Site Inductions would be performed by a qualified person, such as the Occupational Health, Safety and Environment (OHS&E) Manager. They would be provided to all Toro employees, contractors and visitors upon first arriving at site. All inductees would be required to complete and obtain a satisfactory result on an induction questionnaire. The OHS&E Manager would retain the completed induction questionnaires and a record of all personnel who have completed the induction process.

Training would be provided by Toro on an as-needs basis to its employees. Contractors would be responsible for determining and providing appropriate training to their employees.

3.3 Communications and reporting
Environmental incidents, new Standard Operating Procedures, issues or management strategies would be communicated to all staff via toolbox meetings. Signage, where appropriate, would be implemented to provide information to Toro employees, contractors and visitors to site.

Ongoing training (as required) for Toro employees and contractors would also provide a forum for ongoing communications.

An incident reporting procedure would be implemented for all Toro employees and contractors. General community and stakeholder consultation would be ongoing in accordance with the Toro Community Policy.

The Environmental Policy, procedures and standard forms would be readily accessible and available to all Toro employees, contractors and visitors to site.

3.4 Monitoring
Monitoring activities would continue for the life of the Project. Monitoring activities may include:
- Internal audits and inspections;
- Internal Compliance Register review;
- External audits and inspections; and
- Incidental observations.

All audits and inspections would be performed by qualified and experienced personnel. Audit and inspection frequency would be determined in the management strategy for compliance. All audit and inspection results would be reported to Toro management as soon as they were available. An audit/inspection report would be generated and stored within the Toro environmental database. The report would generate a corrective action procedure (where non-conformance or an incident had been recorded), and subsequent audits would review progress on implementation of the recommended corrective actions.
3.5 **Compliance Register**
As part of Toro’s commitment to compliance with all legislative and regulatory requirements and to continuous improvement, the Compliance Register would be an integral part of the Toro Environmental Management System. This Register would include:
- All relevant legislation and other requirements;
- Lease conditions (permits and approvals);
- Toro’s supporting documentation (policies and procedures); and
- Conditions for closure and rehabilitation.

This Register would be an internal document from which any internal and external reporting requirements would be generated.

3.6 **Performance and compliance measures**
Auditing would be undertaken as part of Toro’s internal audit process. Compliance audits would occur annually at a minimum.

3.7 **Review (performance and compliance assessment)**
As part of Toro’s commitment to continuous improvement, each EMSD would be subject to internal review once every 5 years or when relevant new information became available. All EMSDs, once reviewed, would have the status change altered on Toro’s document control system.

3.8 **Management response**
A management response would be triggered automatically by a non-compliance incident.

3.9 **Records and document control**
Toro would implement and maintain a database for management of environmental data. This database would also include Toro’s policies, procedures, compliance register and audit information.
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<tr>
<td>Author:</td>
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1 Introduction

This Dust Environmental Management Strategy Document (EMSD) has been prepared by Toro Energy Limited (Toro) to describe management actions to be implemented during the construction and operational phases of the Wiluna Uranium Project (the Project), as well as providing methods to determine management success of dust management during the construction and operation of the Project. A Dust Management Plan for the decommissioning phase would be developed if required during the operational phase of the Project.

This EMSD outlines Toro’s overall approach to dust impact and risk management, sets appropriate performance criteria for the prevention of adverse impacts to surrounding communities and ecologically sensitive areas, and describes the monitoring and reviews necessary to ensure the performance of the system.

This EMSD is part of a suite of plans that deal with impacts and aspects of the Project. It is designed to assist Toro employees and contractors to undertake dust management in a manner that is safe, environmentally responsible and compliant with relevant legislation. All management strategies would be periodically reviewed as part of Toro’s commitment to continuous improvement and for their continued application to the Project, particularly during the operational phase.

1.1 Project Overview

The Wiluna Project is in the Murchison region of Western Australia, approximately 960km north east of Perth. It is based on mining two deposits: Centipede and Lake Way. The Centipede deposit is approximately 30km south of the town of Wiluna and the Lake Way deposit is approximately 15km south of Wiluna. The total Project encompasses Centipede East (tenement number M53/224), Centipede West (tenement numbers M53/0113, P53/1355, P53/1356, P53/1357, P53/1396), Lake Way (tenement number M53/1090) and the West Creek borefield (tenement number L53/0150).

The principal activities planned for the Project include:
- Development and operation of a uranium mine encompassing the Lake Way and Centipede deposits;
- Construction and operation of a uranium ore processing, packing and handling facility;
- Development of the West Creek borefield to supply water to the Project;
- Support facilities including an accommodation village, mine administration buildings and workshops, haul roads, power generation and transmission facilities, communications systems and water and waste management;
- Transport of uranium product within Australia for export; and
- Closure and rehabilitation of the mine and other areas disturbed by the Project.

The proposed total area of disturbance required for the development of the Project over the planned 14-year-life-span is approximately 1,530 hectares (ha). The Centipede deposit covers approximately 580ha, with its eastern boundary on the edge of the salt lake. The Lake Way deposit covers approximately 700ha on the northern sections of the lake system. The mineralisation for the Centipede and Lake Way deposits is typically contained within zones lying at between 1m and 15m below the land surface. The shallow nature and relatively broad areal extent of the deposits mean that open cut would be the most appropriate mining method. The mining method would use surface miners as the primary
ore fleet and conventional excavators and/or scrapers for the waste mining. It is unlikely that drilling or blasting would be required for mining.

The Project would involve mining up to about 1.8 million tonnes (Mt) of mineralised ore per year, producing up to 1,200 tonnes per annum (tpa) of uranium oxide concentrate (UOC). The mineralised ore would be processed at the mine site, with concentrate transported to Adelaide and/or Darwin for export shipment to worldwide markets.

The key characteristics of the proposed development relevant to this EMSD are described in Table 1.

**Table 1: Key project characteristics**

<table>
<thead>
<tr>
<th>Project Element</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>Operational purpose</td>
<td>Mining of uranium mineralised ore and production of uranium oxide concentrate over a nominal project life of up to 12 years based on current resources.</td>
</tr>
<tr>
<td>Life of mine</td>
<td>14 years (includes construction, operations and closure).</td>
</tr>
<tr>
<td>Mining method</td>
<td>Open pit using surface miners and heavy machinery.</td>
</tr>
<tr>
<td>Annual production</td>
<td>Up to 1,200 tonnes uranium oxide concentrate.</td>
</tr>
<tr>
<td>Processing method</td>
<td>Crushing and grinding followed by elevated temperature agitated alkaline leach (in tanks), solid/liquid separation and direct precipitation of uranium oxide concentrate.</td>
</tr>
<tr>
<td>Tailings</td>
<td>In-pit, below grade disposal.</td>
</tr>
<tr>
<td>Waste</td>
<td>Overburden to be temporarily stored adjacent to pit, then backfilled into void.</td>
</tr>
<tr>
<td>Mine rehabilitation</td>
<td>Land would be recontoured to blend with local terrain and revegetated using local provenance species.</td>
</tr>
<tr>
<td>Location of operations</td>
<td>Approximately 570km north of Kalgoorlie and between 15 and 30km south of Wiluna.</td>
</tr>
<tr>
<td>Estimated ground disturbance</td>
<td>1530ha including plant and infrastructure disturbance.</td>
</tr>
<tr>
<td>Maximum mining depth</td>
<td>Up to 15 metres.</td>
</tr>
<tr>
<td>Mine Access road</td>
<td>A purpose built haul road would link the deposits to be mined (approximately 26km long) to the process plant.</td>
</tr>
<tr>
<td>Workforce</td>
<td>Up to 350 people (construction phase).</td>
</tr>
<tr>
<td></td>
<td>Up to 170 people (operations phase).</td>
</tr>
</tbody>
</table>
2 Scope

This EMSD provides a reference for monitoring, reporting and auditing as necessary to minimise identified and potential environmental impacts of the Project. It is being submitted to the Environmental Protection Authority (EPA) with the Environmental Management and Review Programme (ERMP) as part of the environmental assessment and approvals process for the Project.

This EMSD has been prepared based on:
- Toro’s Environment Policy;
- Toro’s Indigenous Relations Policy;
- Toro’s Occupational Health and Safety Policy;
- Relevant Commonwealth and Western Australian legislation;
- Other legal obligations;
- Identified potential direct and indirect environmental impacts from risk assessments;
- Consultants’ reports;
- Relevant permits and standards; and
- Toro’s commitment to continuous improvement.

This EMSD has been developed to provide for the management of dust generated by construction and operational activities associated with the Project, including:
- Dust generated from the construction of site infrastructure.
- Dust generated from the extraction of mined materials.
- Dust generated from the transport and handling of mined materials.
- Dust generated from the maintenance of site infrastructure.
- Dust generated as a result of wind erosion.
3 Relevant legislation, standards and guidelines

There are currently no relevant Western Australian standards related to permissible ground-level dust concentrations. In lieu of such standards, and in accordance with the current Draft State Environmental (Ambient Air) Policy 2009 (the Draft Policy) (EPA 2009) authorised under the Western Australian Environment Protection Act 1986 (EPA 1986), the Wiluna Uranium Project would aim to comply with the requirements of the National Environment Protection (Ambient Air Quality) Measure as varied (the NEPM) (NEPC 2003).

Where the NEPM does not specify a relevant dust criterion, reference would be made to the World Health Organisation Air Quality Guidelines (WHO 2006) or other criteria determined by the Western Australian Department of Environment and Conservation to be applicable to the Western Australian context (DEC 2008). For the purpose of the assessment presented in the Project ERMP and this EMSD, additional performance criteria were obtained from the EPA's Environment Protection (Kwinana) (Atmospheric Wastes) Policy 1999 (EPA 1999) and the New South Wales Department of Environment, Climate Change and Water Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (DECCW 2005).
4 Objectives and criteria

The Project is located in remote central Western Australia. The Draft Policy (see previous Section) contains advice in relation to the interpretation of the NEPM criteria in remote areas, specifically:

- Where there is a reasonable likelihood that no sensitive areas will be present, the criteria may be achieved at the nearest sensitive receiver rather than the premises boundary, where sensitive receivers are defined as areas where humans reside or areas of cultural and/or environmental significance (including environmentally sensitive areas declared under the Act).
- It is expected that industry would adopt and achieve best practice management of its operation and emissions control, which may require emission limits to be set and monitored at the source.

The nearest sensitive receivers to the proposed development are listed in Table 2 and illustrated in Figure 1.

Table 2: Location of nearest sensitive receivers

<table>
<thead>
<tr>
<th>Receptor</th>
<th>Distance (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toro House</td>
<td>9.4</td>
</tr>
<tr>
<td>Apex Village</td>
<td>6.3</td>
</tr>
<tr>
<td>Wiluna township</td>
<td>12.6</td>
</tr>
<tr>
<td>Lake Way Station</td>
<td>28</td>
</tr>
<tr>
<td>Millbillillie Station</td>
<td>7.7</td>
</tr>
<tr>
<td>Nganganawili Community</td>
<td>5.2</td>
</tr>
<tr>
<td>Bondini Reserve</td>
<td>12.0</td>
</tr>
<tr>
<td>Proposed operations village</td>
<td>5.2</td>
</tr>
<tr>
<td>Proposed construction village</td>
<td>5.2</td>
</tr>
</tbody>
</table>

1 Distance from nearest operation-related dust generating activities at Year 8
2 No legislative requirement for accommodation villages to meet the performance criteria

In accordance with the Draft Policy, a target of meeting the performance criteria developed for the Project at each of the above-mentioned sensitive receivers would represent compliance with the over-arching dust management objective of no adverse impacts to sensitive receivers as a result of the proposed development. Table 3 summarises the objective and criteria applied to the Project.

Table 3: Dust management objective and performance criteria

<table>
<thead>
<tr>
<th>Objective</th>
<th>Performance criteria to be met at nearest sensitive receivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>No adverse impacts to sensitive receivers as a result of the proposed Wiluna Uranium Project</td>
<td></td>
</tr>
<tr>
<td>NEPM (Air Quality Standards) PM&lt;sub&gt;10&lt;/sub&gt; 50 (24-hour average)</td>
<td></td>
</tr>
<tr>
<td>NEPM (Advisory standard) PM&lt;sub&gt;2.5&lt;/sub&gt; 25 (24-hour average)</td>
<td></td>
</tr>
<tr>
<td>WHO PM&lt;sub&gt;10&lt;/sub&gt; 8 (annual average)</td>
<td></td>
</tr>
<tr>
<td>Kwinana EPP&lt;sup&gt;1&lt;/sup&gt; TSP 90 (24-hour average)</td>
<td></td>
</tr>
<tr>
<td>NSW DECC&lt;sup&gt;2&lt;/sup&gt; TSP 90 (annual average)</td>
<td></td>
</tr>
<tr>
<td>Dust deposition 4&lt;sup&gt;2&lt;/sup&gt; (total deposition)</td>
<td></td>
</tr>
<tr>
<td>Dust deposition 2&lt;sup&gt;2&lt;/sup&gt; (additional deposition)</td>
<td></td>
</tr>
</tbody>
</table>

1 Environmental Protection Authority Environment Protection (Kwinana)(Atmospheric Wastes) Policy 1999 (EPA 1999)
2 NSW Department of Environment, Climate Change and Water Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (DECCW 2005)
3 measured in units of g/m²/month
5 Management commitments

Section 6 of the Project ERMP outlines the management commitments proposed in order to manage dust generation from the proposed development in accordance with the development objectives and performance criteria. These commitments were incorporated into the air quality impact assessment presented in the ERMP and are summarised in Table 4.

Table 4: Dust management actions

<table>
<thead>
<tr>
<th>Environmental aspect</th>
<th>Assessed impact</th>
<th>Management actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground level concentrations of dust exceeding criteria at sensitive receivers</td>
<td>No exceedance of ground level concentrations of dust at sensitive receivers is predicted</td>
<td>Application of water to haul and access roads within the mining lease as necessary</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Application of water to the Run-of-Mine and applying ALARA in design</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Water sprays utilised</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Immediate use of waste material from the mine in backfilling operations, minimising double handling</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prompt progressive rehabilitation (including revegetation) of inactive mining and tailings areas</td>
</tr>
</tbody>
</table>
6 Contingency and risk management

A high-level risk assessment was undertaken to categorise the nature of the risks related to the generation of dust from the Project. Contingencies to manage the identified risks were then developed. These are detailed in Table 5.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Event</th>
<th>Risk</th>
<th>Contingency action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure construction</td>
<td>Wind erosion of areas cleared of vegetation during construction</td>
<td>Dust generation greater than that predicted in the ERMP assessment resulting in adverse impacts to nearby sensitive receivers</td>
<td>Application of water at the dust-generation source via water truck, sprinklers or sprays</td>
</tr>
<tr>
<td>Mined materials handling (ore and waste extraction)</td>
<td>Mined material drier than modelled</td>
<td>Dust generation greater than that predicted in the ERMP assessment resulting in adverse impacts to nearby sensitive receivers</td>
<td>Application of water at the dust-generation source via water truck, sprinklers or sprays</td>
</tr>
<tr>
<td></td>
<td>Silt content of mined material greater than modelled</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean wind speed greater than modelled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mined materials handling (ore and waste transport)</td>
<td>Use of greater gross-weight haul trucks than modelled</td>
<td>Dust generation greater than that predicted in the ERMP assessment resulting in adverse impacts to nearby sensitive receivers</td>
<td>Increase water application rate to haul roads</td>
</tr>
<tr>
<td></td>
<td>Silt content of haul roads greater than modelled</td>
<td></td>
<td>Further engineering of haul road surfaces to minimise dust generation</td>
</tr>
<tr>
<td></td>
<td>Haul roads greater in length, or more frequently used, than modelled</td>
<td></td>
<td>Relocation of stockpiles to locations closer to the active mining areas</td>
</tr>
<tr>
<td></td>
<td>Over-estimation of the mitigation effectiveness of haul road watering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mined materials handling (ore and waste stockpiling)</td>
<td>Mined material drier than modelled</td>
<td>Dust generation greater than that predicted in the ERMP assessment resulting in adverse impacts to nearby sensitive receivers</td>
<td>Application of water at the dust-generation source via water truck, sprinklers or sprays</td>
</tr>
<tr>
<td></td>
<td>Silt content of mined material greater than modelled</td>
<td></td>
<td>Minimise dump drop distances through use of alternative dumping practices (eg, dumping over berms)</td>
</tr>
<tr>
<td></td>
<td>Mean wind speed greater than modelled</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dump distances greater than assumed in modelling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grading (haul road maintenance)</td>
<td>Grader operates at a speed in excess of that used in the modelling</td>
<td>Dust generation greater than that predicted in the ERMP assessment resulting in adverse impacts to nearby sensitive receivers</td>
<td>Place a speed restriction on grader operations</td>
</tr>
<tr>
<td>Wind erosion</td>
<td>Silt content of mined material greater than modelled</td>
<td>Dust generation greater than that predicted in the ERMP assessment resulting in adverse impacts to nearby sensitive receivers</td>
<td>Reduce the height of stockpiles</td>
</tr>
<tr>
<td></td>
<td>Less annual rainfall than assumed in the modelling</td>
<td></td>
<td>Implement alternative rehabilitation practices to promote faster revegetation of exposed areas</td>
</tr>
<tr>
<td></td>
<td>Wind speeds greater than modelled</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Over-estimation of the mitigation effectiveness of stockpile watering</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Over-estimation of the mitigation effectiveness of revegetation/rehabilitation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


7 Monitoring

In order to assess the performance of the management commitments against the predictions of the air quality impact assessment presented in the ERMP, and determine the need, or otherwise, to implement contingency actions, a dust monitoring system would be established. The proposed dust monitoring system would be designed to assess compliance against the performance criteria outlined in this EMSD and provide information to Toro for the purpose of further understanding the nature of dust generation from the proposed development. This would be achieved by initially installing dust monitors in proximity to the operation, coupled with the installation of a meteorological monitoring station. Dependent on the results of the dust monitoring, the number of dust monitors may be increased or reduced to suit the assessed risk of exceedance of the performance criteria. This system is detailed in the following Sections.

7.1 Standards and guidelines

The dust monitoring system would be installed and operated in accordance with the relevant Australian Standards as summarised in Table 6.

<table>
<thead>
<tr>
<th>Dust size fraction</th>
<th>Standard number</th>
<th>Standard title</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>AS3580.1.1:2007</td>
<td>Methods for sampling and analysis of ambient air - Guide to siting air monitoring equipment</td>
</tr>
<tr>
<td></td>
<td>AS3580.9.7:2009</td>
<td>Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - Dichotomous sampler (PM$<em>{10}$, coarse PM and PM$</em>{2.5}$) - Gravimetric method</td>
</tr>
<tr>
<td>Ambient Air</td>
<td>AS2923.1987</td>
<td>Guide for measurement of horizontal wind for air quality applications</td>
</tr>
<tr>
<td>Total suspended particulates (TSP)</td>
<td>AS3580.9.3:2003</td>
<td>Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - Total suspended particulate matter (TSP) - High volume sampler gravimetric method</td>
</tr>
<tr>
<td>PM$_{10}$</td>
<td>AS3580.9.11:2008 (as amended 2009)</td>
<td>Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM$_{10}$ beta attenuation monitors</td>
</tr>
<tr>
<td></td>
<td>AS3580.9.6:2003</td>
<td>Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM$_{10}$ high volume sampler with size-selective inlet - Gravimetric method</td>
</tr>
<tr>
<td></td>
<td>AS3580.9.8:2008</td>
<td>Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM$_{10}$ continuous direct mass method using a tapered element oscillating microbalance analyser</td>
</tr>
<tr>
<td></td>
<td>AS3580.9.9:2006</td>
<td>Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM$_{10}$ low volume sampler - Gravimetric method</td>
</tr>
<tr>
<td>PM$_{2.5}$</td>
<td>AS3580.9.10:2006</td>
<td>Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM$_{2.5}$ low volume sampler - Gravimetric method</td>
</tr>
<tr>
<td>Deposited dust</td>
<td>AS3580.10.1:2003</td>
<td>Methods for sampling and analysis of ambient air - Determination of particulate matter - Deposited matter - Gravimetric method</td>
</tr>
<tr>
<td>Meteorology</td>
<td>AS3580.14 (DRAFT)</td>
<td>Methods for sampling and analysis of ambient air - Meteorological monitoring for ambient air quality monitoring applications</td>
</tr>
</tbody>
</table>
7.2 System overview
The proposed dust monitoring system would have two primary purposes:
• To monitor the effectiveness of dust management commitments, demonstrated through meeting the nominated performance criteria at the nearest sensitive receivers; and
• To quantify the contribution of the Project to regional air quality.

The proposed monitoring system has yet to be designed in full, but is planned to comprise:
• PM$_{10}$ dust monitors, located at the nearest sensitive receivers and at a significant distance to the south of the proposed operation to act as a background monitoring site.
• A meteorological station to be located within the mining lease.
• A network of passive dust deposition monitors located at various distances and orientations from the proposed development.
• High volume air sampling to monitor TSP concentrations, primarily for radiation dose assessment.

The meteorological and dust monitoring information would be used to determine both compliance with the performance criteria and allow identification of specific dust sources, permitting more targeted mitigation, if required. Standard factors would be used to infer TSP and PM$_{2.5}$ compliance from the PM$_{10}$ monitors. Dust deposition monitoring would assist in understanding the correlation between community perceptions of dust and actual dust deposition, as well as providing information to assist in determining the potential impact of dust deposition on vegetation. As mining operations progressed, a review of the dust monitor locations would be undertaken to ensure they remained representative of the dust impacts likely to be received at the nearest sensitive receivers.

7.3 At-source monitoring
At-source dust monitoring may be undertaken as necessary to understand factors that influence localised (on-site) dust concentrations that have been identified as having the potential to affect local amenity and vegetation. This would be used to enhance the dust model assumptions and confirm the effectiveness of at-source dust mitigation.
8 Responsibility and reporting

8.1 Responsibilities and training
All construction and operational employees, contractors and subcontractors would participate in a site-specific induction process, which would, amongst other topics, discuss Toro’s approach to dust management. This would include procedures and processes related to dust minimisation during construction and operation activities.

The overall responsibility for the management of site activities would reside with the General Manager. Specific environmental aspects of the General Manager’s role would include:

- Ensuring that all construction and operational personnel did not undertake activities that caused, or were likely to cause, environmental harm unless all reasonable and practicable measures had been taken to prevent or minimise the harm
- Ensuring that all construction and operational personnel were inducted and aware of their environmental responsibilities.
- Ensuring that legislative requirements were met.

8.2 Internal and external reporting
The dust and meteorological monitoring results would be maintained in an electronic data management system and relevant results would be compiled to allow comparison to the performance criteria.

External reporting would be undertaken as required under specific site licences and permits.

8.3 Community consultation
Community consultation was undertaken during the preparation of the Project ERMP. This consultation identified a number of issues of concern to members of local communities related to the potential emission of dusts from the proposed development, specifically:

- Long-term effects on the environment and the health of communities
- Contamination of water and ‘bush tucker’

Management commitments to mitigate these concerns are outlined in the ERMP. However, for the purpose of this EMSD, a community and stakeholder correspondence register would be established to manage feedback regarding dust issues and concerns. This register would:

- Maintain a list of all relevant communities and stakeholders.
- Record correspondence received regarding dust-related issues.
- Provide a means for tracking the implementation of corrective actions (if necessary).
- Record correspondence returned to the communities and stakeholders regarding their dust concerns.

8.4 System review and audit
This dust monitoring plan would be reviewed annually, with regard to:

- The appropriateness of the nominated performance criteria in light of community and stakeholder feedback and assessments of health and environmental impacts.
- The appropriateness of the monitoring system to provide adequate data to allow assessment against the performance criteria.
• The appropriateness of the management commitments and identified contingency measures.

Audits of the various elements of data management required under this management plan would be undertaken as necessary.
9 References


Environment Protection Act 1986 (WA)


Environmental Protection Authority (EPA) 2009, State Environmental (Ambient Air) Policy 2009 - DRAFT, Perth.


Definitions

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEC</td>
<td>Department of Environment and Conservation (WA)</td>
</tr>
<tr>
<td>EPA</td>
<td>Environment Protection Authority (WA)</td>
</tr>
<tr>
<td>ERMP</td>
<td>Wiluna Uranium Project Environmental Review and Management Programme</td>
</tr>
<tr>
<td>Km</td>
<td>Kilometres</td>
</tr>
<tr>
<td>Mt</td>
<td>Million tonnes</td>
</tr>
<tr>
<td>NEPC</td>
<td>National Environment Protection Council</td>
</tr>
<tr>
<td>NEPM</td>
<td>National Environment Protection (Ambient Air Quality) Measure 2003</td>
</tr>
<tr>
<td>PM$_{2.5}$</td>
<td>Particulate matter less than 2.5 microns</td>
</tr>
<tr>
<td>PM$_{10}$</td>
<td>Particulate matter less than 10 microns</td>
</tr>
<tr>
<td>ROM</td>
<td>Run-of-mine</td>
</tr>
<tr>
<td>Tpa</td>
<td>Tonnes per annum</td>
</tr>
<tr>
<td>TSP</td>
<td>Total Suspended Particulate (also known as PM$_{10}$)</td>
</tr>
<tr>
<td>µg/m$^3$</td>
<td>Micrograms per cubic metre</td>
</tr>
<tr>
<td>UOC</td>
<td>Uranium Oxide Concentrate</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organisation</td>
</tr>
<tr>
<td>Title:</td>
<td>VEGETATION CLEARING AND SOILS</td>
</tr>
<tr>
<td>----------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>Department:</td>
<td>HSE</td>
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<tr>
<td>Version No:</td>
<td>1.0</td>
</tr>
<tr>
<td>Original Date:</td>
<td>January 2011</td>
</tr>
<tr>
<td>Author:</td>
<td>R. Wedd</td>
</tr>
<tr>
<td>Revision Date:</td>
<td>July 2011</td>
</tr>
<tr>
<td>Approved by:</td>
<td>R. Dossor</td>
</tr>
</tbody>
</table>
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1 Introduction

This Vegetation Clearing and Soils Environmental Management Strategy Document (EMSD) has been prepared by Toro Energy Limited (Toro) to describe management actions to be implemented during the construction and operational phases of the Wiluna Uranium Project (the Project), as well as providing methods to determine management success of vegetation clearing and soil management during the construction and operation of the Project. A Vegetation Clearing and Soils Management Plan for the decommissioning phase would be developed if required during the operational phase of the Project.

This EMSD describes how Toro would:
• Identify potential direct and indirect environmental impacts from risk assessments in relation to vegetation clearing and soils;
• Provide environmental indicators, objectives and targets; and
• Implement management measures, methods and reporting, auditing and review.

This EMSD is part of a suite of plans that deal with impacts and aspects of the Project. This EMSD is designed to assist Toro employees and contractors to undertake vegetation clearing and soils management in a manner that is compliant with relevant legislation, safe and environmentally responsible. All management plans and strategies would be periodically reviewed as part of Toro’s commitment to continuous improvement, and for their continued application to the Project, particularly during the operational phase.

Work is ongoing to place the vegetation within the survey areas into a regional context, and this information will be used to better determine the conservation significance of any vegetation. Groundwater Dependent Vegetation (GDV) is present in the Project Area, and discussed in a separate management strategy, Groundwater Dependent Vegetation Environmental Management Strategy. Weed Management is another separate Environmental Management Strategy. Dust, which is generated from a range of mining activities, including clearing of vegetation and soils management, is covered in a Dust Environmental Management Strategy.

1.1 Project Overview
The Wiluna Project is in the Murchison region of Western Australia, approximately 960km north east of Perth. It is based on mining two deposits: Centipede and Lake Way. The Centipede deposit is approximately 30km south of the town of Wiluna and the Lake Way deposit is approximately 15km south of Wiluna. The total Project encompasses Centipede East (tenement number M53/224), Centipede West (tenement numbers M53/0113, P53/1355, P53/1356, P53/1357, P53/1396), Lake Way (tenement number M53/1090) and the West Creek borefield (tenement number L53/0150).

The principal activities planned for the Project include:
• Development and operation of a uranium mine encompassing the Lake Way and Centipede deposits;
• Construction and operation of a uranium ore processing, packing and handling facility;
• Development of the West Creek borefield to supply water to the Project;
• Support facilities including an accommodation village, mine administration buildings and workshops, haul roads, power generation and transmission facilities, communications systems and water and waste management;
• Transport of uranium product within Australia for export; and
• Rehabilitation and closure of the mine and other areas disturbed by the Project.
The proposed total area of disturbance required for the development of the Project over the planned 14-year-life-span is approximately 1,530 hectares (ha). The Centipede deposit covers approximately 580ha, with its eastern boundary on the edge of the salt lake. The Lake Way deposit covers approximately 700ha on the northern sections of the lake system. The mineralisation for the Centipede and Lake Way deposits is typically contained within zones lying at between 1m and 15m below the land surface. The shallow nature and relatively broad areal extent of the deposits mean that open cut would be the most appropriate mining method. The mining method would use surface miners as the primary ore fleet and conventional excavators and/or scrapers for the waste mining. It is unlikely that drilling or blasting would be required for mining.

1.2 Site Preparation
The construction of access and haul roads, associated mining infrastructure and development of the mine site would require vegetation clearing and earthworks.

The Centipede deposit would be mined first and would operate for approximately 5 years, following which mining would move to Lake Way and continue for another 5 years. Figure 1 shows the cumulative land disturbance and rehabilitation anticipated for the duration of the Project.

Access to the Centipede deposit would be via a purpose built road of approx 8km in length that would connect the mine site with the Goldfields Highway. A haul road would be established for the transportation of ore from the Lake Way deposit to a processing plant near the Centipede deposit.

Site preparation would consist of the progressive clearing of vegetation and topsoil prior to construction, mining and processing activities. Clearing and stripping would proceed progressively as areas were required for mining and infrastructure development. Vegetation and topsoil would be stockpiled separately to ensure maximum reuse of these resources in subsequent rehabilitation. Stockpiles would be no more than 2m high. Where possible topsoil would be stripped and placed directly onto completed backfill and rehabilitation earthworks. There would be alteration to the natural landform with the mine and access tracks and roads, and the creation of an evaporation pond.
2 Scope

This EMSD provides a reference for monitoring, reporting and auditing as necessary to minimise identified and potential environmental impacts of the Project. It is being submitted to the Environmental Protection Authority (EPA) with the Environmental Review and Management Programme (ERMP) as part of the environmental assessment and approvals process for the Project.

This EMSD has been prepared based on:
- Toro’s Environment Policy;
- Toro’s Indigenous Relations Policy;
- Toro’s Occupational Health and Safety Policy;
- Relevant Commonwealth and Western Australian legislation;
- Other legal obligations;
- Identified potential direct and indirect environmental impacts from risk assessments;
- Consultants’ reports;
- Relevant permits and standards; and
- Toro’s commitment to continuous improvement.

This EMSD has been developed to:
- Demonstrate how Toro would minimise the potential impact of vegetation clearing and soils management activities associated with the construction and operational phases of the Project;
- Describe proposed monitoring activities;
- Describe vegetation clearing and soils management controls for the life of the Project;
- Demonstrate reporting, auditing and review mechanisms;
- Provide a procedure for dealing with emergency events;
- Outline procedures for consultation and complaints; and
- Guide the development of other site specific plans and procedures relevant to the Project.

This EMSD covers the following elements of the Project:
- Construction and mining of the Lake Way and Centipede deposits;
- Construction and operation of a processing, packing and handling facility;
- Development of the West Creek borefield; and
- General infrastructure including an accommodation village, mine administration buildings and workshops, haul roads, power generation and transmission facilities, communications systems and water and waste management.
3 Legislative Requirements

Toro would comply with all relevant Commonwealth and State legislation and regulations that apply to the vegetation clearing, earthworks and rehabilitation management aspects of the construction, operational closure and rehabilitation phases of the Project. In relation to vegetation clearing and soils management, the following legislation and regulations are applicable:

**Western Australian Legislation**
- Bushfires Act 1954;
- Conservation and Land Management Act 1984;
- Environmental Protection Act 1986;
- Environmental Protection (Clearing of Native Vegetation) Regulation 2004;
- Mining Act 1978;

Permits to clear native vegetation are required under the *Environmental Protection Act 1986* (WA), and since July 2005, the Department of Mines and Petroleum has had responsibility for the administration, assessment and approval of clearing permit applications relating to mineral and petroleum activities in Western Australia.

Toro would apply for all relevant permits to clear vegetation for the construction and operation of the mine.

3.1 Other Applicable Guidelines and Standards

This EMSD outlines the scope of the proposal and the potential impacts that have been identified by Toro. The risk assessment process is based upon the framework stated with the Australian Standard AS4360 titled 'Risk Management' along with the Guide HB203 titled 'Environmental Risk Management — Principles and Process'.

The following Toro documents should be read in conjunction with this EMSD:
- Weed Management Strategy;
- Fauna Management Strategy;
- Fire Management Strategy;
- Cultural Heritage Management Plan;
- Groundwater Dependent Vegetation Management Strategy;
- Dust Management Strategy;
- Water Management Strategy.
### Table 1. Western Australian Guidelines, Policies and Standards

<table>
<thead>
<tr>
<th>Authority/Affiliation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Protection Authority</td>
<td>Position Statement No 2 – Environmental Protection of Native Vegetation in Western Australia (2000)</td>
</tr>
<tr>
<td>Environmental Protection Authority</td>
<td>Position Statement No 5 – Environmental Protection and Ecological Sustainability of Rangelands in Western Australia (2004)</td>
</tr>
<tr>
<td>Environmental Protection Authority</td>
<td>Position Statement No 6 – Towards Sustainability (2004)</td>
</tr>
<tr>
<td>Environmental Protection Authority</td>
<td>Position Statement No 7 - Principles of Environmental Protection (2004)</td>
</tr>
<tr>
<td>Environmental Protection Authority</td>
<td>Guidance Statement No 6 – Rehabilitation of Terrestrial Ecosystems (2006)</td>
</tr>
<tr>
<td>Environmental Protection Authority</td>
<td>Guidance Statement No 51 – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment (2004d)</td>
</tr>
</tbody>
</table>
4 Related Toro Environmental Documents

The following Toro documents were considered in the completion of this EMSD:

- Chapters 1 and 2 from the Environmental Review and Management Programme (Toro, June 2011).
- Groundwater Dependent Ecosystems (GDE) Management Strategy (Niche Environmental Services, January 2011).
- Wiluna Uranium Deposit – Water Supply Options (RPS Aquaterra, September 2010).
- Wiluna Uranium Project – Surface Hydrology Studies (RPS Aquaterra, September 2010).
5 Vegetation

As described by Niche (2010), there was no flora or vegetation (ecological communities or conservation areas) listed for the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) Protected Matters database search area. No Declared Rare Flora (DRF) was listed in the Department of Environment and Conservation (DEC) database search. During the vegetation surveys undertaken by Niche (2010), four priority flora and two potential new species were recorded.

A total of 21 priority flora were listed in the database search results, of which six were priority 1 taxa, 13 were priority 2 taxa and the remaining two were priority 3 taxa. No Threatened Ecological Communities (TECs) as defined by the DEC were identified as occurring within the database search area. A total of 30 Priority Ecological Communities (PECs) were listed in the database, of which two were flora communities, being:

- Wiluna West vegetation complexes (Banded Ironstone Formation – (BIF)) – this is a Priority 1 ecological community located to the west of the proposed borefield. The PEC has a buffer of 17,500m, which intercepts the northeast corner of the borefield;
- Montague Range vegetation complexes (BIF) – this is a Priority 1 ecological community located to the southwest of the Project Area. The buffer of this PEC is 25,000m. This complex does not intercept Toro tenements.

Both of these PECs are located on BIF ridges. There are no BIF ridges within the Centipede or Lake Way deposits. There is a small BIF ridge within the proposed borefield that has a low relief and is essentially an occluded ridge. It is not considered that this ridge is part of either of the PECs listed above (Niche 2010).

A total of three alien taxa were recorded during the surveys. The declared plant Acetosa vesicaria (ruby dock) was recorded at the Centipede deposit, in one section of the proposed borefield and in other locations not within Toro tenements. Acetosa vesicaria is a significant environmental weed, and whilst not a Weed of National Significance (WONS) or a declared plant pursuant to the Agriculture and Related Resources Protection Act (1976), infestations should be managed. The other alien taxa were not considered to be of any significance (Niche 2011a). There is the potential for new weeds to enter the Project Area, and this is discussed further in the Weed Management Strategy.

5.1 Centipede

Within the Centipede deposit, there were five clearly defined zones of vegetation, being:

- Tecticornia spp vegetation on the playa;
- Fringing vegetation, which was distributed as a belt along the interzone between the playa and the dune system;
- A foredune system, characterised by low shrubs over spinifex with an emergent canopy of Callitris columellaris;
- A rear dune (called dune) system comprised of Acacia species and mallee eucalypts over spinifex; and
- Calcrete platform, which was located in one section of the Project Area behind the rear dune (Niche 2010).

5.2 Lake Way

The Lake Way deposit commences on the lake, with the first vegetation recorded on the playa adjoining the lake proper. The playa vegetation extends for a short distance before being replaced by a dune system that is interspersed with sections of fringing Melaleuca.
xerophila closed forest and claypan vegetation and ends on the calcrete platform at the northern end of the tenement. Within the Lake Way deposit, there are five distinct zones, being:

- *Tecticornia* spp vegetation on the playa;
- Fringing vegetation, which was distributed as a belt along the interzone between the playa or claypans and the dune system;
- A system of anastomising claypans with halophytic vegetation;
- A low dune system comprised of *Acacia* species and mallee eucalypts over spinifex; and
- Calcrete platform dominated by *Acacia* species, with a small section of mallee vegetation (Niche 2010).

### 5.3 Borefield

The borefield was broadly defined as being a drainage flat lying in a series of low sandstone hills in the south and west with a calcrete platform to the east, both of which are replaced by an expansive plains system draining into a well-defined creek line. Within the borefield, six broad groupings were defined:

- A creek system characterised by well-defined banks;
- A drainage system characterised by a poorly defined series of shallow-banked to non-banked drainage lines;
- An extensive plains system, dominated by *Acacia* species;
- A small section of Banded Ironstone;
- A series of sandstone hills; and
- A section of calcrete (Niche 2010).

### 5.4 Aboriginal plant use

Surveys conducted by Niche Environmental Services with Traditional Owners were completed in April 2010. The surveys were conducted over the Lake Way and Centipede deposits. Eight species were identified as having value for food, medicinal or cultural uses (such as making weapons, artefacts or for passing on knowledge to children). The species identified were all noted as not having conservation significance (Niche 2011b).
6 Soils

There is substantial variation in some of the physical and chemical characteristics of soils within the Project Area, with the greatest variation being between the various soil/landform associations identified. The majority of the soils assessed within both the Centipede and Lake Way deposits were classified as non-sodic. Tests undertaken by Outback Ecology Services (2010a) indicate there were no apparent correlations between soil sodicity, position within the landscape, or depth of soil sampled. Most soil materials sampled were below the detectable limit (limits of reporting) for As, Be, Bo, Cd, Hg, Mo, Se, and Th, with Al, Ba, Co, Cr, Cu, Fe, Mn, Ni, Pb, V and Zn regularly detected at a reportable level. There was an observed trend between multi-element concentrations and soil landform association, with low lying areas, i.e. the claypan, creekline and drainage sites observing higher concentrations of Al and V (Outback Ecology Services 2010a).

Differences in soil texture, soil pH and salinity are likely to necessitate the separate handling and stockpiling of surface soils from the various soil/landform associations present. The different properties of the soils from different positions in the landscape will, in some instances, influence their suitability for placement as a rehabilitation medium (Outback Ecology Services 2010). Some of the soils in the Project Area are considered to be potentially problematic in terms of salinity and/or sodicity, if handled or managed inappropriately (Outback Ecology Services 2010a).

6.1 Centipede

The Centipede deposit comprises five different soil/landform associations, namely calcareous (flats and rises), claypan, creekline, drainage line and dune areas. The dominant soil/landform across the tenement areas is the calcareous association. Several of the soils within the Centipede deposit were identified by Outback Ecology Services (2010) as being partially or completely dispersive. There was no apparent relationship between soil/landform association and soil structural stability, with soils from all soil landform associations observing complete or partially dispersive properties. Dune sites were the most stable and several calcareous sites were also observed to have structurally stable, non-dispersive soils (Outback Ecology Services 2010a).

6.2 Lake Way

The Lake Way deposit comprises four different soil/landform associations, namely the calcareous flats, claypan, dune and playa areas, with the dominant soil landforms being the dune and claypan. As was the case with the Centipede deposit, the soil profiles present within the Lake Way deposit exhibited a large degree of morphological variation (Outback Ecology Services 2010a).

Several of the soils in the Lake Way deposit were identified by Outback Ecology Services (2010a) as being partially or completely dispersive. There was no apparent relationship between soil/landform association and soil structural stability, with soils from all soil landform associations observing complete or partial dispersive properties. The claypan soils were mostly stable, and the soils from the calcareous sites were also relatively stable (Outback Ecology Services 2010a).

6.3 Haul Road Corridor

Soil pH values at sites along the haul road corridor ranged between pH 5.4 (strongly acid), to 9 (moderately alkaline) in H_2O. The majority of soil materials sampled were classed as neutral (pH 6.5 to 8) to moderately alkaline (pH 8 to 9). Several soils were classed as saline,
with one ‘extremely saline’ site. This site was also the only one to be classed as sodic (Outback Ecology Services 2010a).
7 Overview of potential impacts

Clearing and earthworks activities would be required for construction of mine infrastructure (including access tracks and roads). Impacts from clearing of vegetation and earthworks would be higher during construction of the mine compared to during the operational phase. During operation of the mine, it is anticipated that minimal earthworks and clearing would be required (apart from progressive clearing for mining), and that there would be little impact to the landform and soils from these activities during this phase.

Soils have the potential to erode during clearing and earthworks activities. Stockpiles of soils created during earthworks activities may also erode, primarily due to wind activity, but also through rill erosion during rainfall events. Given the general increase in salinity with depth, it would be important for soil management for future rehabilitation that soils from deep within the soil profile were not stockpiled with topsoil materials.

Potential impacts from clearing of vegetation and earthworks for the development of the Project include the following:

- Soil erosion;
- Dust generation;
- Loss of habitat (through clearing or fire);
- Loss of seedbank;
- Weed spread;
- Degradation of soil quality;
- Increased surface water runoff from landform alteration;
- Loss of plant species that have cultural significance.

There are other identified threatening processes to the vegetation communities in the Project Area that are not related to mining activities, but together may contribute to cumulative effects. These include:

- Overgrazing by cattle;
- Grazing by camels and rabbits;
- Track proliferation (from non-mining related activities);
- Fire; and
- Drought (Niche 2010).

7.1 Soil erosion

Erosion of soil can occur from clearing activities where inadequate earthworks are implemented (such as spoon drains and contour banks), and from compaction of soils from machinery. Topsoil stockpiles may also be susceptible to erosion. In areas where the vegetation cover of soil is limited, creation and use of tracks/haul roads may lead to increased levels of erosion. Some of the surface soils in the Project Area have poor structural stability (Outback Ecology Services 2010a) and may therefore be more susceptible to erosion compared to others in the Area. Impacts from soil erosion may range from loss of seedbank through movement of topsoil material to alterations in landforms.

7.2 Dust generation

Dust would be generated from land clearing activities and from vehicle movement throughout the life of the Project. Generation of dust would occur when cleared areas (including roads) are dry and if stockpiles of soil are dry. Wind would also contribute to dust...
generation (when wind speeds are high enough to cause dust movement). Dust storms are known to occur in the Project Area. Dust may coat vegetation, affecting their growth habit.

Dust suppression would be an ongoing activity, using water sprayed on tracks and roads to reduce dust from vehicle movement, and general construction activities. During mining, a surface miner fitted with a Donaldson dust suppression unit and a shroud enclosing the cutting wheel would assist in minimising dust generation. Impacts to vegetation from dust are considered to be minor. A Dust Environmental Management Strategy has been developed for the Project.

7.3 Loss of habitat
Clearing of vegetation would be an unavoidable outcome of Project execution, and represent the most direct impact on the habitats and fauna assemblages present within the Project Area. Impacts to fauna are discussed in the Fauna Environmental Management Strategy. Most of the 19 habitats present over the Project Area are widely represented throughout the region, so there would be opportunity for displaced fauna to seek refuge in surrounding habitat (Outback Ecology Services 2010b). To reduce the overall area of disturbance, internal mine roads and services would be established where possible over areas to be mined or that have been mined. Loss of habitat is not considered to represent a significant risk to local faunal populations.

7.4 Loss of seedbank
Loss of seedbank material may be caused from topsoil erosion, inappropriate topsoil stockpile design and maintenance, and from clearing of reproductively viable vegetation (such as mature trees). Loss of seedbank material may have impacts on local floristic diversity and future rehabilitation requirements. With appropriate management of these issues, and given that most of the vegetation communities are well represented in the region, it is not considered that seedbank loss would have a significant impact on local flora communities or on future rehabilitation efforts.

7.5 Weed spread
The spread of weeds species through mining activities (such as the creation of new tracks) has the potential to contribute to a range of negative impacts. Weed species are recognised as having the capacity to displace native species and alter vegetation structure and local fire regimes. Habitat fragmentation can also provide opportunities for weed invasion. Spread of weeds, without appropriate management controls, has the potential to cause significant environmental impacts within the Project Area and potentially beyond. These impacts are discussed further in the Weed Environmental Management Strategy.

7.6 Degradation of soil quality
Degradation of the quality of surface soils (including changes to salinity and/or sodicity) may occur if they are managed inappropriately. Degradation of soil quality (topsoil and subsoil) may also occur through unmanaged spills or leaks during construction and operation (such as hydrocarbons or other chemical spills). To reduce impacts from spills or leaks to the receiving environment, a series of management procedures would be implemented. Identification of impacts and the associated management actions for such leaks and spills is discussed in the Waste Environmental Management Strategy.

VEGETATION CLEARING AND SOILS
7.7 Increased surface water runoff from landform alteration
Following from erosion of soils is the potential for surface water runoff from altered landforms (such as topsoil stockpiles). Increased surface water runoff has the potential to exacerbate further erosion in the area and to spread weed seeds, which may be present in the soils as well as heavy metals and other contamination (such as hydrocarbons). A separate Water Management Strategy has been developed for the Project.

7.8 Loss of plant species which have cultural significance
The potential impacts to culturally important plant species in the Project Area were assessed during the surveys over the proposed Centipede and Lake Way deposits. The impacts to individual species were considered to be minimal from a conservation perspective, with all species recorded during the surveys noted as being either locally common or widespread in Western Australia (Niche 2011b). Impacts to species such as Acacia victoriae, Acacia tetragonophylla, Acacia burkittii, Santalum spicatum, Marsdenia australis and Cyperus bulbosus, which were identified during the bush tucker surveys, are therefore considered to be comparatively low due to their widespread distributions (Niche 2011b). Rhagodia drummondii is subject to high levels of grazing by cattle. The removal of some of these plants from within the Project Area from mining related activities should not constitute a significant impact, but combined with grazing impacts may be magnified.

The impact to the species Hrigiokea francisiana, however, may be considered to be significant from an Aboriginal cultural perspective because of the availability of trees with a large enough bole (which is required to form items such as shields, woomeras, boomerangs or carrying trays). While this species was recorded in a number of locations within and adjacent to the Project Area during the bush tucker surveys, the number of large specimens observed was uncommon. Given that the species require a large bole to be of any use, the removal of any large trees would potentially constitute a significant cultural impact. Maintaining knowledge of the technique of manufacture and ensuring that the traditional usage of the artefacts is passed on is of cultural importance. Trees of the correct size are sought so that young children can be shown how these items are manufactured and have the historic importance of these artefacts detailed (Niche 2011b).
8 Environmental Objectives, Targets and Indicators

A series of management objectives, targets and indicators has been developed to manage potential and direct impacts of vegetation clearing and soil management in relation to the Project.

Objectives: what Toro aims to achieve.

Targets: defined objective levels.

Indicators: measures, which are either quantitative or qualitative, to determine whether the objectives have been met.

The environmental objectives, targets and indicators as determined by Toro for vegetation clearing and soils management are shown in Table 2.

Table 2. Objectives, Targets and Indicators

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Targets</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimise habitat clearing</td>
<td>Minimise potential impacts to fauna habitat</td>
<td>No vegetation clearing outside of authorised areas</td>
</tr>
<tr>
<td>Reduce loss of topsoil and/or seed bank from inadequate stripping, inappropriate storage and road construction</td>
<td>Topsoil depth targets – would be stripped to a minimum of 50mm.</td>
<td>No stripping less than 50mm. Stockpile storage max 2m.</td>
</tr>
<tr>
<td>Reduce impacts from introduced flora from Toro operations</td>
<td>No introduction of new weeds into the Project Area.</td>
<td>Flora survey results</td>
</tr>
<tr>
<td>Reduce impacts from fugitive dust from land clearing and earthworks</td>
<td>Minimise dust generation impacts to vegetation communities</td>
<td>Flora survey results, Dust monitoring results</td>
</tr>
<tr>
<td>Reduce erosion impacts on soil quality</td>
<td>No erosion impacts to soils on areas of disturbance</td>
<td>Soil monitoring survey results</td>
</tr>
<tr>
<td>Reduce surface water runoff from altered landforms</td>
<td>No erosion impacts from surface water runoff on areas of disturbance</td>
<td>Surface water monitoring survey results</td>
</tr>
<tr>
<td>Minimise impacts to plants of cultural significance</td>
<td>Maximise retention of mature trees of species of cultural significance</td>
<td>Flora and bush tucker survey results</td>
</tr>
<tr>
<td>Successful rehabilitation of areas impacted by Toro operations</td>
<td>Progressive rehabilitation of disturbed areas</td>
<td>Rehabilitation surveys/trials results</td>
</tr>
</tbody>
</table>
9 Management Strategies and Actions

9.1 Key strategies
Detailed vegetation clearing, earthworks and rehabilitation management documentation would be developed for the construction and operational phases of the Project. Documentation relevant to decommissioning would be developed during the operational phase. Documentation would include specific policies and standard operating procedures. Issues associated with vegetation clearing would be raised by Toro in regular consultation with communities and stakeholders.

9.2 Management Actions
Management actions, reporting and corrective actions are listed below:

Table 3. Management Actions

<table>
<thead>
<tr>
<th>Objective</th>
<th>Management Action</th>
<th>Reporting Mechanisms</th>
<th>Corrective Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimise habitat clearing</td>
<td>• All significant fauna habitat to be identified, mapped and demarcated on site (with signage and if appropriate)</td>
<td>• Monitoring of habitat/vegetation via surveys</td>
<td>• Review of Vegetation Clearing and Soil Management Strategy; contractor compliance; inductions; and standard operating procedures</td>
</tr>
<tr>
<td></td>
<td>• No off-road driving unless in case of an emergency or permitted by the OHS&amp;E Manager</td>
<td>• Incident reports</td>
<td>• Implementation of findings from review/reports</td>
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<tr>
<td></td>
<td>• No unauthorised clearing of vegetation (as per Toro vegetation clearing procedure)</td>
<td>• Inspections and audits</td>
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<tr>
<td></td>
<td>• Maximise retention of mature/large trees</td>
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<tr>
<td></td>
<td>• Maximise retention of fauna burrows</td>
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<td></td>
<td>• Standard operating procedures</td>
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<tr>
<td></td>
<td>• Undertake progressive rehabilitation</td>
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<tr>
<td>Reduce loss of topsoil and/or seed bank from inadequate stripping, inappropriate storage and road construction</td>
<td>• Design &amp; installation standards (including roads)</td>
<td>• Monitoring per compliance register</td>
<td>• Review Vegetation Clearing and Soil Management Strategy</td>
</tr>
<tr>
<td></td>
<td>• Standard operating procedures</td>
<td>• Inspection &amp; audit</td>
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<tr>
<td></td>
<td>• Undertake progressive rehabilitation</td>
<td>• Incident reports</td>
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<tr>
<td>Reduce impacts from introduced flora from Toro operations</td>
<td>Vegetation Clearing and Soil Management Strategy</td>
<td>Implementation of findings from review</td>
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<tr>
<td>Employee/Contractor inductions</td>
<td>Monitoring introduced flora via surveys</td>
<td>Review of Weed Management Strategy; contractor compliance; inductions; and standard operating procedures</td>
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<tr>
<td>Contractor management (pre-cleaning of vehicles and machinery)</td>
<td>People (e.g. visual observations)</td>
<td>Implementation of findings from review</td>
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<tr>
<td>Designated wash down area</td>
<td>Inspections and audits</td>
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<tr>
<td>Standard operating procedures</td>
<td>Incident reports</td>
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<td>Weed Management Strategy</td>
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<table>
<thead>
<tr>
<th>Reduce impacts from fugitive dust from land clearing and earthworks</th>
<th>Road and earthworks site wetting via water trucks</th>
<th>Review of water application rates and/or frequency</th>
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<tbody>
<tr>
<td>Speed limits (for vehicles)</td>
<td>Inspection &amp; audit</td>
<td>Review of speed limits</td>
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<tr>
<td>Minimise footprint</td>
<td>Monitoring per compliance register</td>
<td>Review of land clearance</td>
</tr>
<tr>
<td>Standard operating procedures</td>
<td>Incident reports</td>
<td>Implement other findings from reviews</td>
</tr>
<tr>
<td>No off-road driving unless in case of an emergency or permitted by the OHS&amp;E Manager</td>
<td>Flora surveys</td>
<td></td>
</tr>
<tr>
<td>Design &amp; installation standards for erosion and sediment control structures</td>
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<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Reduce erosion impacts on soil quality</th>
<th>Design &amp; installation standards for erosion and sediment control structures (e.g. contour banks and drains)</th>
<th>Review of Vegetation Clearing and Soil Management Strategy; contractor compliance; and standard operating procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard operating procedures (e.g. machinery movement limited to designated areas)</td>
<td>Soil monitoring survey results</td>
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</tr>
<tr>
<td>Vegetation Clearing and</td>
<td>Inspection &amp; audit</td>
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</tr>
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<td></td>
<td>Incident reports</td>
<td></td>
</tr>
<tr>
<td>Soil Management Strategy (including direct return of topsoils)</td>
<td>Contractor management</td>
<td>Implement findings from survey reviews</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td>-----------------------</td>
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</tr>
<tr>
<td><strong>Reduce surface water runoff from altered landforms</strong></td>
<td>Design &amp; installation standards for erosion and sediment control structures (e.g. contour banks), and topsoil stockpiles</td>
<td>Implement findings from survey reviews and incident reports</td>
</tr>
<tr>
<td>- Standard operating procedures (e.g. minimising land disturbing activities during rainfall events)</td>
<td>- Surface water monitoring survey results</td>
<td></td>
</tr>
<tr>
<td>- Machinery movement limited to designated areas</td>
<td>- Inspection &amp; audit Incident reports</td>
<td></td>
</tr>
<tr>
<td><strong>Minimise impacts to plants of cultural significance</strong></td>
<td>Standard operating procedures (e.g. avoidance of mature trees of cultural significance)</td>
<td>Implement findings from survey reviews and incident reports</td>
</tr>
<tr>
<td>- Consultation with Traditional Owners</td>
<td>- Inspection (e.g. surveys) Incident reports</td>
<td></td>
</tr>
<tr>
<td><strong>Successful rehabilitation of areas impacted by Toro operations</strong></td>
<td>Progressive rehabilitation of disturbed areas</td>
<td>Implement findings from survey reviews and incident reports</td>
</tr>
<tr>
<td>- Direct return of topsoils</td>
<td>- Rehabilitation trials and survey results Incident reports (e.g. fire incidents)</td>
<td></td>
</tr>
<tr>
<td>- Monitoring program implemented which should include a number of undisturbed analogue sites</td>
<td>- Closure and Rehabilitation Plan</td>
<td></td>
</tr>
</tbody>
</table>
10 References


Glossary

Anastomising: interconnecting network of veins, lines, streams or other features

Groundwater-dependent vegetation: vegetation that requires access to groundwater so that ecological structure and function can be maintained

Halophytic: a plant that thrives in saline soil

Sodi: containing sodium

Acronyms and abbreviations

BIF: Banded Ironstone Formation

CHMP: Cultural Heritage Management Plan

DEC: Department of Environment and Conservation

DRF: Declared Rare Flora

EMP: Environmental Management Plan

EPA: Environmental Protection Authority

EPBC Act: Environmental Protection and Biodiversity Conservation Act, 1999

GDV: Groundwater-dependent vegetation

Ha: hectares

PEC: Priority Ecological Community

SOP: Standard Operating Procedure

TEC: Threatened Ecological Community

Toro: Toro Energy Limited

WONS: Weeds of National Significance
Figure 1. Cumulative land disturbance and rehabilitation
<table>
<thead>
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<th>Title:</th>
<th>WEED</th>
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<td>Original Date:</td>
<td>January 2011</td>
</tr>
<tr>
<td>Author:</td>
<td>R. Wedd</td>
</tr>
<tr>
<td>Revision Date:</td>
<td>July 2011</td>
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<tr>
<td>Approved by:</td>
<td>R. Dossor</td>
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1 Introduction

The Weed Environmental Management Strategy Document (EMSD) has been prepared by Toro Energy Limited (Toro) to describe management actions to be implemented during the construction and operational phases of the Wiluna Uranium Project (the Project), as well as providing methods to determine weed management success during the construction and operation of the project. A Weed Management Plan for the decommissioning phase would be developed if required during the operational phase of the Project.

This EMSD describes how Toro would:
- Comply with relevant legislation and standards for weed management;
- Identify potential direct and indirect environmental impacts from weed species;
- Provide environmental indicators, objectives and targets; and
- Implement management measures, methods and reporting, auditing and review.

This EMSD is part of a suite of plans that deal with impacts and aspects of the Project. This EMSD is designed to assist Toro employees and contractors to undertake weed management in a manner that is compliant with relevant legislation, safe and environmentally responsible. All management plans and strategies would be periodically reviewed as part of Toro’s commitment to continuous improvement, and for their continued application to the Project, particularly during the operational phase.

1.1 Project Overview

The Wiluna Project is in the Murchison region of Western Australia, approximately 960 km north east of Perth. It is based on mining two deposits: Centipede and Lake Way. The Centipede deposit is approximately 30 km south of the town of Wiluna, and the Lake Way deposit is approximately 15 km south of Wiluna. The total Project encompasses Centipede East (tenement number M 53/224), Centipede West (tenement numbers M53/0113, P53/1355, P53/1356, P53/1357, P53/1396), Lake Way (tenement number M53/1090) and West Creek borefield (tenement number L53/0150).

The principal activities planned for the Project include:
- Development and operation of a uranium mine encompassing the Lake Way and Centipede deposits;
- Construction and operation of a uranium ore processing, packing and handling facility;
- Development of the West Creek borefield to supply water to the Project;
- Support facilities including an accommodation village, mine administration buildings and workshops, haul roads, power generation and transmission facilities, communications systems and water and waste management;
- Transport of uranium product within Australia for export; and
- Rehabilitation and closure of the mine and other areas disturbed by the Project.

The proposed total area of disturbance required for the development of the Project over the planned 14 year life span is approximately 1 530 hectares (ha) including infrastructure. This area predominantly comprises native vegetation, with the exception of minor areas of existing disturbance associated with roads and access tracks and previous mining activity in the Project locality (Outback Ecology Services 2010).

2 Scope

This EMSD provides a reference for monitoring, reporting and auditing as necessary to minimise identified and potential environmental impacts of the Project. It will be submitted
to the Environmental Protection Authority (EPA) with the Environmental Review and Management Programme (ERMP) as part of the environmental assessment and approvals process for the Project.

The EMSD has been prepared based on:
- Toro’s Environment Policy;
- Toro’s Indigenous Relations Policy;
- Relevant Commonwealth and Western Australian legislation;
- Other legal obligations;
- Consultants’ reports;
- Identified potential direct and indirect environmental impacts from risk assessments;
- Relevant permits and standards; and
- Toro’s commitment to continuous improvement.

The EMSD has been developed to:
- Outline the existing information available in relation to levels of weed infestation in the Project Area;
- Identify and assess potential impacts on the environment as a consequence of weed infestation existing prior to and resulting from Project activities;
- Describe proposed management and monitoring strategies;
- Demonstrate reporting, auditing and review mechanisms;
- Outline procedures for consultation and complaints; and
- Guide the development of other site specific plans and procedures relevant to the Project.

The EMSD covers the following elements of the Project:
- Construction and mining of the Lake Way and Centipede deposits;
- Construction and operation of a processing, packing and handling facility;
- Development of the West Creek borefield; and
- General infrastructure including an accommodation village, mine administration buildings and workshops, haul roads, power generation and transmission facilities, communications systems and water and waste management.
3 Legislative Requirements

Toro would comply with all relevant Commonwealth and State legislation that applies to weed management aspects of the construction and operational phases of the Project. In relation to weed management, the following legislation is applicable:

**Commonwealth Legislation**
- *Environment Protection and Biodiversity Conservation Act 1999*

**Western Australian Legislation**
- *Agriculture and Related Resources Protection Act 1976*
- *Environmental Protection Act 1986;*
- *Soil and Land Conservation Act 1945.*

3.1 Other Applicable Guidelines and Standards

The EMSD outlines the scope of the proposal and the potential impacts that have been identified by Toro. The risk assessment process is based upon the framework stated with the Australian Standard AS4360 titled ‘Risk Management’ along with the Guide HB203 titled ‘Environmental Risk Management — Principles and Process’.

The following Toro documents should be read in conjunction with this EMSD:
- Fauna Environmental Management Strategy;
- Vegetation Clearing and Soils Environmental Management Strategy;
- Fire Environmental Management Strategy;
- Cultural Heritage Management Plan;
- Groundwater Dependent Vegetation Environmental Management Strategy;
- Dust Environmental Management Plan;
- Water Environmental Management Strategy.

<table>
<thead>
<tr>
<th>Department of Agriculture and Food, WA (DAFWA)</th>
<th>List of declared plants pursuant to section 37 of the <em>Agriculture and Related Resources Act, 1976</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Department of Environment and Conservation (DEC)</td>
<td>Environmental Weed Strategy for Western Australia</td>
</tr>
<tr>
<td>Department of Agriculture, Fisheries and Forestry (DAFF) and Department of Sustainability, Environment, Water, Populations and Community (DSEWPC)</td>
<td>Weeds in Australia website, incorporating the Weeds of National Significance (WONS) listings, interactive identification search engine and management advice</td>
</tr>
</tbody>
</table>
4 Related Toro Environmental Documents

The following Toro documents were considered in the completion of this EMSD:

- Chapters 1 and 2 from the Environmental Review and Management Programme (ERMP) (Toro, June 2011).
- Interim Assessment of Flora and Vegetation at the Toro Energy Wiluna Uranium Project: Lake Way, Centipede and Borefield (Niche Environmental Services, 2010).
- Groundwater Dependent Ecosystems (GDE) Management Plan (Niche Environmental Services, January 2011).
- Wiluna Uranium Deposit – Water Supply Options (RPS Aquaterra, September 2010).
- Wiluna Uranium Project – Surface Hydrology Studies (RPS Aquaterra, September 2010).
5 Alien taxa (weeds) currently known in the Project Area

The invasive weed, *Acetosa vesicaria* (ruby dock) (Figure 1) was recorded during surveys over the Project Area (Niche Environmental Services, 2011). *A. vesicaria* was rated high as an environmental weed (DEC, 1999), based on its distribution, invasiveness and impacts. Weeds that are rated as high are considered to be priorities for control (ibid). *A. vesicaria* is an erect, annual herb growing to 1m (Western Australian Herbarium, 2010). The species produces red-pink flowers between July and September (ibid). The species is noted as occurring in desert areas and can inhabit a range of environments, including rocky and sandy soil in disturbed and undisturbed vegetation (ibid). The species is noted as being drought resistant with the propensity to invade disturbed land, commonly along waterways (Cunningham *et al.*, 1981). The species can be grazed by cattle, but is not considered to be a food source due to the presence of oxalate and nitrates in the foliage (ibid).

During surveys over the Centipede deposit, this species was noted in two locations. In one of them, a single plant was recorded and removed. A larger population was recorded on the northern side of the deposit. In this location, the infestation was noted as being comparatively widespread, covering an area of approximately 10 ha. The infestation was noted in samphire vegetation, with a large number of small plants recorded. A number were in flower. Evidence of grazing was noted, but this was limited. The species was also recorded adjacent to the Goldfields Highway and accommodation blocks at the nearby Apex Wiluna Gold mine. The locations of these records are mapped in Niche Environmental Services (2011) and are presented in Figure 2 in the EMSD.

All other species of weeds recorded during the surveys within the Project Area were not identified as being environmental weeds or declared plants pursuant to Section 37 of the *Agriculture and Related Resources Protection Act*, 1976. There are other species with the potential to occur in the Project Area, based on known distribution and habitat preference. Critical amongst these are; *Tamarix aphylla* (athel pine); *Opuntia stricta* (Prickly pear); *Cenchrus ciliaris* (buffel grass); and, *Eragrostis curvula* (Africa lovegrass). It should be noted that these species are not currently known from within the Project Area, but are considered to be species that, if introduced into the Project Area, would have the capacity to establish and thrive.
6 Overview of potential impacts

Weeds are plants that are growing where they are not wanted (Humphries et al., 1991). Within the broad definition of weeds, there are rankings of weeds based on potential impacts. Impacts can range from minor to significant. Minor impacts in this EMSD are defined as those impacts that are unlikely to lead to displacement of native species or alteration of ecological processes. Significant impacts in the EMSD are defined as those with the potential to displace native species, dominate vegetation or alter ecological processes.

Weeds have to be introduced into an area. Once introduced, weeds will then establish and potentially be dispersed. Recognising how weeds are introduced into an area and vectors of dispersal are central to limiting infestation. Therefore, controlling vectors of dispersal becomes central to limiting avenues for entry of weeds into the Project Area.

The potential impacts associated with invasion into the Project Area are classified into direct and indirect impacts. A direct impact is defined as an impact that can be linked to the specific problem, such as displacement of native species. An indirect impact is an impact that is not directly linked to the specific problem, but happens as a consequence of another action, such as the movement of a vehicle through the Project Area serving to disperse seeds.

Direct impacts:
• Displacement of native species;
• Alteration of structure of native vegetation; and
• Potential alteration of fire regimes.

Potential indirect impacts:
• Movement of soil;
• Movement of vehicles;
• Movement of cattle;
• Pooling of water; and
• Fragmentation of vegetation.

6.1 Displacement of native species
Weed species are recognised as having the capacity to displace native species (Hussey & Wallace, 1993; Adair & Groves, 1998; Csurhes & Edwards, 1998). This can happen due to a number of factors, but the most widely recognised is the ability to outcompete native species, either in rates of germination or growth (Lonsdale, 1999; Randall, 2000). In the context of a disturbed environment such as a mine site, being a ruderal species can provide an opportunity to establish prior to any native species. By establishing and growing faster than native species, weeds can occupy niches that would otherwise be occupied by native species. Over time, the competitive interactions between weed and native species can result in the loss of native species (Hussey & Wallace, 1993; Hobbs, 2000).

Displacement of native species will generally only occur in instances where weed management is inadequate or poorly implemented, resulting in the successful establishment of weeds. The purpose of the Weed Environmental Management Strategy is to develop the procedures and protocols for identifying weed species and approaches to management within the Project Area. This should reduce the probability that weeds have the opportunity to become well established and thus negate the risk of displacement of native species. Provided that weed monitoring and management are effectively undertaken, the potential for displacement of native species as a direct consequence of invasion by weed species is considered to be comparatively low.
6.2 Alteration of structure of native vegetation

As weed species become more established in an area, there is the potential that weeds will lead to an alteration in the structure of vegetation (D’Antonio & Vitousek, 1992; Hobbs, 2000). This can happen as a consequence of the displacement of native species, which over time reduces recruitment and establishment of species that contribute to the structural integrity of the vegetation. This is particularly relevant with species that are capable of forming a monoculture, such as **Acetosa vesicaria**.

The potential for invasive weeds to displace native species, leading to a change in structure of vegetation, is generally the result of ineffective or inadequate weed monitoring and management. The risk of this occurring within the Project Area would be managed by developing and implementing this EMSD. Effective and well-planned weed monitoring should result in detection of weed species at the early stage of infestation, which allows for the implementation of management strategies aimed at containing or eliminating weeds. The potential for weed invasion to advance within the Project Area to a point where the structure of native vegetation would be impacted is considered to be low.

6.3 Potential alteration of fire regimes

The vegetation across much of Australia has evolved with a fire response (Baird, 1977; Hopper, 2003; Dixon & Barrett, 2003). As such, fire is intricately linked with the germination of many seeds of Australian species. In addition to this, other species have developed the capacity to regenerate after fire. While fire is central to the ecology of Australian flora, there is a negative association with alterations to the fire regime (D’Antonio, 2000). The fire regime, defined as the intensity and frequency of fires, can be affected by the fuel characteristics of the vegetation.

When vegetation is invaded by grass species, there is the potential for a change in both the intensity and frequency of fires (ibid). Grasses are recognised as having the capacity to alter the characteristics of fires as a consequence of how they alter the fuel load (ibid; Hussey & Wallace, 1993). Grasses increase the fuel load, especially in relation to how quickly a fire burns. It is acknowledged that in spinifex vegetation, the introduction of grass weeds would be unlikely to significantly alter the fire characteristics of this vegetation. In vegetation with a low density of native grasses, the introduction of grass species may increase the susceptibility of the vegetation to fire.

There are currently no weeds within the Project Area that are grasses. Therefore, the risk of changes to the fire regime of the Area is negligible. Effective monitoring would be implemented to detect whether weed species with the capacity to alter the fire regime are within the Project Area, with an appropriate management plan to be developed in the instance that they are recorded. Based on this, the risk of weed species altering the local fire regime is considered to be low.

6.4 Movement of soil

With the exception of species that are serotinous, soil is the location in which most species’ seeds are stored. The combination of seeds within the soil is known as the soil seedbank. While this feature is central to both native regeneration of vegetation and rehabilitation of disturbed areas, the soil seedbank is also a potential source of seeds of weed species. Movement of soil during construction of the mine and extraction of resources can therefore potentially result in the movement of seeds of weed species to new areas.

The risk of this in relation to the Project is considered to be high, particularly in the area of the Centipede deposit, where the weed **Acetosa vesicaria** has been noted. To manage the risks associated with this, it will be critical to ensure that weed species in areas where soil is...
to be moved are noted. It is also critical to ensure that the location to which the infested soil has been moved is noted. When soil that has been noted as potentially containing seeds of weeds species is moved, there should be monitoring of the soil to ensure that weeds have not been moved. Where no weed species have been recorded, the risk is lower, but there is still the potential that seeds of weed species are present in the soil. Therefore, all movement of soil should be well-documented and monitored to facilitate detection of weeds and development of an appropriate management response.

6.5 Movement of vehicles
Weeds require introduction into an area before they can become established. There is typically a need for a dispersal vector to assist with the distribution of propagules into new areas. While there are natural dispersal vectors over which limited control can be exerted, such as wind, there are dispersal vectors that are not natural. One example of an unnatural vector of dispersal is the movement of vehicles. Vehicles can act as dispersal vectors in two ways; by carrying propagules and by generating movement of soils in which seeds may be located.

The movement of vehicles within the Project Area would largely be along primary, constructed tracks, with a limited amount of movement along secondary tracks. Monitoring for weeds would occur along these tracks, which should facilitate early detection of weed species. In addition to this, where vehicles are to be moved from areas with known infestations of weeds, this would be limited as far as is practicable. The movement of vehicles from areas of infestation to other, non-infested, areas, can be tracked. This would allow for the development of a monitoring programme that focuses on these areas. The risks of dispersal of propagules of weeds as a consequence of vehicle movements is considered to be relative to the degree of existing weed infestation. Provided that vehicle movements are planned in consideration of this, the risk is considered to be low.

6.6 Movement of cattle
Cattle can potentially act as a vector of dispersal of propagules of weeds. Cattle may graze on weed species, including times during which the species is fruiting. In these circumstances, cattle may ingest seeds, which can later be deposited in other areas in manure. The dispersal of seeds in manure can aid the establishment of weeds, as it provides a source of nutrients while the seedling is growing. In addition to this, cattle can carry seeds of weeds on them, which may be deposited in other areas.

The risk of movement of seeds of weed species by cattle is a product of the amount of cattle activity and the diversity and intensity of infestations of weeds in the areas over which cattle move. In the context of what is currently known about weed species in the Project Area, this would potentially only relate to the species *Acetosa vesicaria*. There was some evidence of grazing on *A. vesicaria* by cattle within the Centipede deposit noted during botanical surveys (Niche Environmental Services, 2011). There was no evidence noted that cattle had been responsible for dispersal of the species, but given that spring 2011 was the first time that this species was recorded, there may be evidence in the future.

The most effective way to manage cattle-related dispersal is to exclude cattle from the Project Area. This would prevent cattle grazing on weed species, as well as native species. In the instance that cattle are excluded from the Project Area, the risk associated with cattle and the dispersal of weeds is considered to be negligible.

6.7 Pooling of water
Water is required to stimulate seeds to germinate. The pooling of water, which may come from a number of natural or unnatural sources, may provide the conditions suitable for
promoting the germination of seeds and subsequent establishment of weed species. Natural pooling of water may occur after significant rainfall events, with the extent or volume of pooled water potentially affected by Project infrastructure, such as road culverts. Unnatural sources of water that might pool would potentially come from bores, pit dewatering or leaks in pipelines.

The risk of pooling of water within the Project Area leading to conditions conducive to the establishment of weeds is considered to be low. Natural pooling of water may occur within the Project Area, but this is largely beyond the control of the operator, with the exception of areas with engineering alterations such as road culverts. Unnatural pooling of water should not occur within the Project Area, but in the instance that it does, the location of it would be noted. Annual monitoring for weeds should include areas where water would potentially pool or locations where pooling has been noted. This would facilitate early detection of weeds and the corresponding development of an appropriate management response.

6.8 Fragmentation of vegetation
Habitat fragmentation can potentially provide opportunities for weed invasion. Fragmentation of vegetation alters the edge to area ratio, creating additional edges and reducing the area (Panetta & Hopkins, 1991; Luken, 1997). Weeds typically invade from the edge into vegetation, so the creation of additional edges provides more locations for the establishment of weeds (Panetta & Hopkins, 1991). By managing fragmentation of vegetation, the number of new edges being created can be limited, thus reducing avenues for weeds to establish.

The fragmentation of native vegetation is likely to occur as a consequence of the development of mine infrastructure and the mine operational areas. The combination of fragmentation of vegetation and the movement of soil and vehicles potentially creates opportunities for the introduction and establishment of weeds. Based on this, there is a moderate risk that fragmentation of vegetation would result in the introduction of weeds. The use of the monitoring programme should facilitate early detection of weeds, which would allow for the implementation of an appropriate management approach.
7 Environmental Objectives, Targets and Indicators

A series of management objectives, targets and indicators has been developed to manage potential and direct impacts of weed management in relation to the Project.

Objectives: what Toro aims to achieve.

Targets: defined objective levels.

Indicators: measures which are either quantitative or qualitative to determine whether the objectives have been met.

The overarching objective of this EMSD is to develop a framework to reduce impacts associated with weed invasions and to reduce the potential for invasion by other weed species during the construction and operation of the Project. The environmental objectives, targets and indicators as determined by Toro for weed management are shown below in Table 2.

Table 2 Summary of Objectives, Targets and Indicators

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Targets</th>
<th>Indicators</th>
</tr>
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<tbody>
<tr>
<td>Controlling existing infestations of <em>A. vesicaria</em>.</td>
<td>Reduction in abundance and density of existing infestations of <em>A. vesicaria</em>. Ultimate goal is to control infestation and remove the species from within the Project Area.</td>
<td>Density and abundance data for species unchanged or lower in annual monitoring programme.</td>
</tr>
<tr>
<td>Containing existing distribution of <em>A. vesicaria</em>.</td>
<td>Distribution of <em>A. vesicana</em> within Project Area contained within current, known distribution. No new records.</td>
<td>No records of <em>A. vesicaria</em> in annual monitoring surveys outside of current distribution.</td>
</tr>
<tr>
<td>Manage existing infestation of <em>A. vesicaria</em> with no impacts on surrounding native vegetation.</td>
<td>Infestations of <em>A. vesicaria</em> to be managed without causing damage to surrounding native vegetation as far as is practicable.</td>
<td>No evidence of loss of cover, density and diversity of native vegetation noted during annual monitoring.</td>
</tr>
<tr>
<td>Restricting the introduction of new weed species that would be considered to have the potential to cause a significant environmental impact.</td>
<td>No new weed species not currently known in the Project Area.</td>
<td>No records of weeds that are noted as being with medium to high environmental impact (DEC (1999)).</td>
</tr>
</tbody>
</table>
8 Management Strategies and Actions

8.1 Key strategies
Detailed weed management documentation would be developed for the construction and operational phases of the Project. Documentation relevant to decommissioning would be developed during the operational phase. Documentation would include specific policies and standard operating procedures, and would be developed in collaboration with interested communities and stakeholders.

Management strategies and actions are discussed below in Table 3.

8.2 Management Actions
Management actions, reporting and corrective actions are listed below. It should be noted that while the focus of this EMSD is currently on the existing environmental weed *Acetosa vesicaria*, it can be amended to incorporate other species. The underlying management actions, reporting mechanisms and corrective actions would be the same for new species.

<table>
<thead>
<tr>
<th>Table 3 Management Actions</th>
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<tr>
<td><strong>Objective</strong></td>
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<tr>
<td>Controlling existing</td>
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<td>infestations of *A.</td>
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<td>Containing existing</td>
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<td>Manage existing infestation</td>
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<td>of <em>A. vesicaria</em> with no</td>
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<td>impacts on surrounding</td>
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<td>native vegetation.</td>
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*Note: MSDS stands for Material Safety Data Sheet.*
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<tr>
<th>Methods</th>
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</thead>
<tbody>
<tr>
<td><strong>Restricting the introduction of new weed species that would be considered to have the potential to cause a significant environmental impact.</strong></td>
</tr>
<tr>
<td>- Standard operating procedures (e.g. limit movement of vehicles to defined number of tracks and recording of new tracks)</td>
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<tr>
<td>- Restrict movement of vehicles and equipment from areas with weed infestation to areas without weed infestation</td>
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<tr>
<td>- Restrict or exclude the movement of cattle</td>
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<tr>
<td>- Avoid allowing discharge or groundwater to pond</td>
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<tr>
<td>- Maintain awareness of species with potential to occur in the area and undertake monitoring to determine whether present.</td>
</tr>
<tr>
<td>- Check exclusion barriers for cattle to ensure no access is occurring.</td>
</tr>
<tr>
<td>- Annual monitoring/surveys</td>
</tr>
<tr>
<td>- Review control measures for new weed species.</td>
</tr>
<tr>
<td>- Develop management and monitoring plan and review effectiveness.</td>
</tr>
</tbody>
</table>
9 References


Glossary

Declared plant: A plant that has been listed under the provisions of the Agriculture and Related Resources Act 1976. Declared plants are weeds that are noted as having high impacts and for which a certain level of management is required by the landholder or manager.

Environmental weed: A weed that has the capacity to alter ecosystem processes or functions.

Environmental weed strategy: A document prepared by the DEC, in collaboration with other stakeholders, that defines approaches to weeds within Western Australia, including a list of known weed species and their ranking in relation to potential or actual environmental impacts.

Invasive weed: A weed that is characterised by the capacity to increase the size and distribution of populations.

Monoculture: A population or ecological community consisting of one species.

Nitrate: A salt of nitric acid.

Oxalate: A salt or an ester of oxalic acid.

Propagules: Any part of a plant that can give rise to another plant, includes seeds, corms, tuber and rhizomes.

Ruderal: A plant that grows on rubbish, waste or disturbed lands.

Serotinous: Fruit that remains closed on the tree, with seed usually released in response to an environmental trigger. Serotiny is synonymous with bradyspory.

Weed of National Significance: A weed that has been identified as one of the 20 most dangerous weed species in Australia.

Acronyms and abbreviations

DAFF: Department of Agriculture, Fisheries and Forestry
DAFWA: Department of Agriculture and Food, Western Australia
DEC: Department of Environment and Conservation
DSEWPC: Department of Sustainability, Environment, Water, Populations and Communities
EPA: Environmental Protection Authority
WONS: Weeds of National Significance
Figures

Figure 1. Image of Acetosa vesicaria (ruby dock)
Figure 2 Map showing location of records of *Acetosa vesicaria* in relation to the Toro Energy Wiluna Uranium Project
<table>
<thead>
<tr>
<th><strong>Title:</strong></th>
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<tbody>
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<td>HSE</td>
</tr>
<tr>
<td><strong>Version No:</strong></td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Original Date:</strong></td>
<td>January 2011</td>
</tr>
<tr>
<td><strong>Author:</strong></td>
<td>R. Wedd</td>
</tr>
<tr>
<td><strong>Revision Date:</strong></td>
<td>July 2011</td>
</tr>
<tr>
<td><strong>Approved by:</strong></td>
<td>R. Dossor</td>
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</tbody>
</table>
8.5 Impact on downstream vegetation communities
8.6 Ponding of Water in Upstream Areas
8.7 Siltation of Lake Way
8.8 Contamination from Spillage or Discharge
8.9 Lowering of watertable (aquifer drawdown) during dewatering
  8.9.1 Centipede Deposit
  8.9.2 Lake Way Deposit
8.10 Aquifer drawdown from groundwater abstraction for mine water supply
  8.10.1 Centipede Deposit
  8.10.2 Lake Way Deposit
8.11 Possible effects on groundwater dependent ecosystems (GDEs), including stygofauna and vegetation, from aquifer drawdown
8.12 Deterioration in groundwater quality at the West Creek Borefield due to inflow of saline water from underlying 'palaeochannel' aquifer
8.13 Solute tracking from in-pit tailings disposal (uncontrolled releases or seepage)
  8.13.1 Centipede Deposit
  8.13.2 Lake Way Deposit
8.14 Contamination from Spillage or Discharge
9 Environmental Objectives, Targets and Indicators
10 Management Strategies and Actions
  10.1 Key Strategies
  10.2 Management Actions
11 References
1 Introduction

The Water Environmental Management Strategy Document (EMSD) has been prepared by Toro Energy Limited (Toro) to describe groundwater and surface water management to be implemented during the construction and operational phases of the Wiluna Uranium Project (the Project), as well as providing methods to determine water management success during the construction and operation of the Project. A Water Management Plan for the decommissioning phase would be developed if required during the operational phase of the Project.

This EMSD describes:

- Existing hydrogeology and surface water hydrology for the Project Area;
- Potential environmental impacts to groundwater and surface water from the Project;
- Environmental indicators, objectives and targets for groundwater and surface water management; and
- Water management strategies and actions.

This EMSD is part of a suite of plans that deal with impacts and aspects of the Project. This EMSD is designed to assist Toro employees and contractors to undertake water management in a manner that is compliant with relevant legislation, safe and environmentally responsible. All EMSDs would be periodically reviewed as part of Toro’s commitment to continuous improvement, and for their continued application to the Project, particularly during the operational phase.

1.1 Project Overview

The Project is in the Murchison region of Western Australia, approximately 960km north east of Perth. It is based on mining two deposits: Centipede and Lake Way. The Centipede deposit is approximately 30km south of the town of Wiluna, and the Lake Way deposit is approximately 15km south of Wiluna. The total Project encompasses Centipede East (tenement number M53/224), Centipede West (tenement numbers M53/0113, P53/1355, P53/1356, P53/1357, P53/1396), Lake Way (tenement number M53/1090) and West Creek borefield (tenement number L53/0150).

The principal activities planned for the Project include:

- Development and operation of a uranium mine encompassing the Lake Way and Centipede deposits;
- Construction and operation of a uranium ore processing, packing and handling facility;
- Development of the West Creek borefield to supply water to the Project;
- Support facilities including an accommodation village, mine administration buildings and workshops, haul roads, power generation and transmission facilities, communications systems and water and waste management;
- Transport of uranium product within Australia for export; and
- Rehabilitation and closure of the mine and other areas disturbed by the Project.

The proposed total area of disturbance required for the development of the Project over the planned 14-year-life-span would be approximately 1,530 hectares (ha) including infrastructure. This area predominantly comprises native vegetation, with the exception of minor areas of existing disturbance associated with roads and access tracks, stock holding and watering areas and previous mining activity in the Project locality (Outback Ecology Services 2010).
The life of the active mining phase of the Project is planned for 11 years, with the first five years of mining taking place at the Centipede deposit after which mining operations would transfer to the Lake Way deposit. The ore mined from both deposits would be processed at Centipede. Toro plans to backfill the mining voids at Centipede with waste rock and tailings from both mines over the life of the Project (RPS Aquaterra, 2010a).
2 Scope

This EMSD provides a reference for monitoring, reporting and auditing as necessary to minimise identified and potential environmental impacts of the Project. It is being submitted to the Environmental Protection Authority (EPA) with the Environmental Review and Management Programme (ERMP) as part of the environmental assessment and approvals process for the Project.

This EMSD has been prepared based on:
- Toro’s Environment Policy;
- Toro’s Indigenous Relations Policy;
- Relevant Commonwealth and Western Australian legislation;
- Relevant legal obligations;
- Identified potential direct and indirect environmental impacts from risk assessments;
- Consultants’ reports;
- Relevant permits and standards; and
- Toro’s commitment to continuous improvement.

This EMSD has been developed to:
- Outline the existing information available in relation to groundwater and surface water relevant to the Project Area;
- Identify and assess potential impacts on groundwater and surface water from Project activities;
- Describe proposed management and monitoring strategies;
- Demonstrate reporting, auditing and review mechanisms;
- Outline procedures for consultation and complaints; and
- Guide the development of other site specific plans and procedures relevant to the Project.

This EMSD covers the following elements of the Project:
- Construction at and mining of the Lake Way and Centipede deposits;
- Construction and operation of a processing, packing and handling facility;
- Development of the West Creek borefield and ensuing groundwater extractions; and
- General infrastructure including an accommodation village, mine administration buildings and workshops, haul roads, power generation and transmission facilities, communications systems and water and waste management.
3 Regulatory Requirements

3.1 Legislative Requirements
Toro would comply with all current Commonwealth and State legislation and regulations that apply to the water management aspects of the construction and operational phases of the Project. In relation to water management, the following legislation and regulations are applicable:

Commonwealth Legislation
- *Environment Protection and Biodiversity Conservation Act 1999*

Western Australian Legislation
- *Environmental Protection Act 1986*
- *Environmental Protection (Unauthorised Discharges) Regulations 2004*
- *Environmental Protection (Rural Landfill) Regulations 2002*
- *Rights in Water and Irrigation Act 1914*
- *Dangerous Goods Regulations 1992*
- *Contaminated Sites Act 2003*

3.2 Other Applicable Guidelines and Standards
The EMSD outlines the scope of the proposal and the potential impacts that have been identified by Toro. The risk assessment process is based upon the framework stated with the Australian Standard AS4360 titled ‘Risk Management’ along with the Guide HB203 titled ‘Environmental Risk Management - Principles and Process’. Risk assessments have been undertaken taking into consideration water standards and guidelines. Applicable guidelines and standards are provided below in Table 3.1.

<table>
<thead>
<tr>
<th>Agency</th>
<th>Documentation</th>
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<tbody>
<tr>
<td>Environmental Protection Authority (EPA)</td>
<td>Position Statement No. 4 – Environmental Protection of Wetlands (2004)</td>
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<tr>
<td>Department of Water (DoW)</td>
<td>State wide Policy No. 5 – Environmental water provisions policy for Western Australia (2000)</td>
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<td>Operational Policy No. 1.02 – Policy on water conservation/efficiency plans (2009)</td>
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<td>Operational Policy No. 5.12 – Hydrogeological reporting associated with a groundwater well licence (2009)</td>
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<td>Operational Policy No. 5.08 – Use of operating strategies in the water licensing process (2010)</td>
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<td>Pilbara water in mining guideline – draft for public comment (Water Resource Allocation Planning series, WRAP No. 32, February 2009)</td>
</tr>
<tr>
<td></td>
<td>Leading Practice Sustainable Development Program for the Mining Industry – Tailings Management (2007)</td>
</tr>
</tbody>
</table>
The following Toro documents should be read in conjunction with this EMSD:

- Weed Environmental Management Strategy;
- Cultural Heritage Management Plan;
- Stygofauna Environmental Management Strategy;
- Groundwater Dependent Vegetation Environmental Management Strategy; and
- Tailings Management Strategy and Conceptual Storage Design.

The 'Pilbara water in mining guideline - draft for public comment' (Water Resource Allocation Planning series, WRAP no. 32, Department of Water, February 2009) has been considered in preparing this EMSD. The process outlined in this guideline supports the assessment and issue of instruments under the Rights in Water and Irrigation Act 1914 (RIWI Act) such as:

- Section 26D licence to construct and alter a well;
- Section 5C licence to take water and manage its use; and
- Section 11/17/21A permit to interfere with bed and banks.

As per the requirements of the RIWI Act, a 26D Licence is required for the installation and testing of any groundwater bores/wells and a 5C Licence is required for the actual abstraction of water from any watercourse, wetland or underground source. The Department of Water (DoW) requires 5C Licence applications to be supplemented with an Operating Strategy prior to issuing any Groundwater Well Licence (GWL) and associated conditions. The DoW Operational policy 5.08 (Use of operating strategies in the water licensing process) and Operational policy 5.12 (Hydrogeological reporting associated with a groundwater well licence) would be followed in preparation of the Operating Strategy and GWL compliance reports.

As per the requirements of the Environmental Protection Act 1986 Part V (EP Act Part V), Works Approval(s) and subsequent Operating Licence(s) would be obtained from the Department of Environment and Conservation (DEC) for any acceptable discharges to the environment (e.g. in-pit tailings disposal, excess water disposal from mine dewatering). The DEC Works Approval and Licensing System guidelines would be followed in preparation of Works Approval applications and compliance reports.

As per the requirements of the Contaminated Sites Act 2003, any unauthorised discharges to the environment (e.g. accidental hydrocarbon or other hazardous substances spills) would be reported to the DEC. The DEC Contaminated Sites Management Series (reporting of known or suspected contaminated sites guideline) would be followed in reporting any known or suspected contaminated sites.
4 Related Toro Environmental Documents

The following Toro documents were taken into account in the completion of this EMSD:

- Chapters 1 and 2 of the Environmental Review and Management Programme (ERMP) (Toro, June 2011).
- Centipede Groundwater Impact Assessment (RPS Aquaterra, December 2010).
- Wiluna Uranium Project – Surface Hydrology Studies (RPS Aquaterra, September 2010).
- Wiluna Uranium Deposit – Water Supply Options (RPS Aquaterra, September 2010).
- West Creek Water Supply Groundwater Modelling (RPS Aquaterra, June 2010).
- Contaminant Transport Modelling for the Willuna Uranium Project – Centipede (SWC, February 2011).
- Groundwater Dependent Ecosystems (GDE) Management Plan (January 2011).
5 Surface Water Hydrology

5.1 Overview
Much of the Project Area is a relatively flat alluvial and colluvial plain, with a typical elevation of ~500mRL. Hydrology in the Project Area is dominated by Lake Way, a large playa that is about 36km long and up to 10km wide, with a surface area of some 245km\(^2\). Lake Way forms an internal drainage basin for an 11,000km\(^2\) catchment, including the Project Area. Two smaller playa lakes are also located within the Project Area:

- Lake Violet, located ~5km south of Wiluna. The Lake Violet playa is ~5km from east to west and 3km from north to south, with an area of ~19km\(^2\).
- Lake Uramurdah, located ~13km south-east of Wiluna, with an area of ~0.5km\(^2\) (RPS Aquaterra, 2010b).

In terms of major watercourses the Project Area is drained by the following:

- West Creek, which discharges into the north-western edge of the Lake Way playa. The Cockarrow and Freshwater tributaries drain the floodplains to the north and south of West Creek.
- Negrara Creek and tributaries, which discharge into the northern edge of Lake Way. The general drainage line of this creek through the Project Area is north-west to south-east for that portion north of Wiluna, before straightening to a north to south flowpath to Lake Way.
- Uramurdah Creek and tributaries, which flow in a general north-easterly to south-westerly direction, discharging into the north-east corner of Lake Way, and Lake Uramurdah.
- Kukububba Creek, which flows approximately north to south within the Project Area, discharging into Lake Uramurdah.
- Abercromby Creek, which appears to split about 6km east of Lake Way, with one branch continuing east and the other turning north and discharging into the lake to the north of the Centipede deposit (RPS Aquaterra, 2010b).

Toro has established an on-site weather station at Centipede to gain local variances if they exist between the Bureau of Meteorology data from Wiluna and the Wiluna airport. Data the weather station gathers includes rainfall, temperature, wind direction and speed along with barometric pressure.

Toro currently undertakes surface water sampling for assay in times of significant rainfall.

5.2 Rainfall
The mean annual rainfall for Wiluna is about 256mm but is highly variable, ranging from in excess of 700mm to less than 50mm. The highest rainfall is generally recorded in the first four months of the year, and particularly in February and March (RPS Aquaterra, 2010c). This part of the North East Goldfields region is subject to occasional tropical cyclones. Cyclone Bobby in 1995 is an example when about 230mm of rainfall was recorded at Wiluna from 19 to 27 February. Peak rainfall intensities recorded during this event were as high as 100mm/hour and resulted in flooding of Lake Way.

5.3 Evaporation
The annual average evaporation is 3,578mm, and monthly averages vary between 3.8mm/d in June and 16.2mm/d in January (RPS Aquaterra, 2010c). The data shows that evaporation is highest in the summer months from November to February. Mean monthly evaporation...
always exceeds mean monthly rainfall, while annual pan evaporation is typically one order of magnitude greater than annual rainfall (ibid).

5.4 Probable Maximum Precipitation
The 10,000-year (ARI) and probable maximum precipitation (PMP) rainfall events have been calculated for the Lake Way catchment, so that lake levels in extreme rainfall events could be estimated. The 72-hour PMP was estimated as 490mm (RPS Aquaterra, 2010c). For the location and size of the catchment area under consideration, the PMP has been assigned a probability of 1 in 10,000 years. Hence the 10,000-year ARI event is equivalent to the PMP at 490mm (ibid).

5.5 Salt Lakes and Lake Way
Salt lakes are a dominant and integral feature of the more arid areas of Western Australia. They go through a cycle of being wet for part of the year, and then to either a salt crust or dusty playa as they dry out. The wetting and drying cycle may be seasonal, grading into an episodic cycle (not usually predictable by season, where the wet period follows an exceptional wet winter or a tropical influence) (RPS Aquaterra, 2010c).

Large saline wetlands spend much of the time empty of water, but during periods of heavy rainfall they store extensive amounts of water - one of the more important functions of saline wetlands is flood storage and flood control. Most wetlands are areas of low water velocity, and therefore they encourage sediment deposition. Large lake surface areas mean that the mass of water evaporated is also large, as is the amount of brine seepage into the ground water (ibid). Wetlands also balance groundwater and surface water, and act as both groundwater recharge and discharge zones. Wetlands commonly act as reservoirs for salts - mostly sodium chloride, magnesium chloride and magnesium sulphate. The lakes in the Northern Goldfields rarely have a surface discharge route, and other than in exceptional rain events the water rarely moves beyond the immediate receiving lake (ibid).

5.5.1 Lake Way
Lake Way is typical of many salt lakes in inland Australia and receives intermittent inflows from parts or all of the surrounding catchment, with prevailing, longer periods of dry conditions. The catchment surface hydrology is characterised by episodic rainfall events that result in intermittent sheet run-off from the low relief and relatively shallow soil profiles and cause shallow and separate ponds in low areas of the lake. Major storms cause widespread run-off and flooding. The lake only contains significant volumes of water after heavy rainfall events (RPS Aquaterra, 2010c).

The lake is located low in the landscape, with a shallow watertable beneath its surface. During dry periods, Lake Way is believed to act as a regional sink for groundwater through evaporation. However, given the 30m drop in topographic elevation to Lake Maitland approx 45km away (<0.01% gradient), it is possible that groundwater may eventually flow towards the southeast (adopted from RPS Aquaterra, 2010c).

Large palaeo-drainage systems cross the area, interpreted from current topography as draining water from northwest to southeast. These incised palaeo-drainage systems have been largely infilled by sedimentary sands and clays. Typically, the position of these paleo-drainages is marked by loosely connected chains of salt lakes, of which Lake Way is one of the larger examples along the Carey drainage system (RPS Aquaterra, 2010c). Lake Way contains numerous islands, especially in the southern part, which together occupy some 15 per cent of the area bounded by its shoreline (ibid).
The lake is the first or most upstream salt lake of a salt lake chain/palaeo-river system extending to the southeast linking to Lake Maitland and Lake Carey. Typical bed elevations of the three major lakes are:

- Lake Way: RL490m
- Lake Maitland: RL460m
- Lake Carey: RL400m

Lake Way forms the drainage basin for a catchment of approximately 11,000km². This catchment’s surface elevation typically varies from about 490m AHD at the shore of the lake, to approximately 650m AHD in some parts of the upper reaches of the catchment. Within a 10km radius of the lake shore, the terrain is characterised by low relief, seldom rising more than 15m. Playa lake systems and saline alluvial systems form in these low areas where water accumulates after significant rainfall events and evaporates leaving salts and sediments on the lake’s surface. This flat relief extends a further 80km along the calcrete valley to the north-west of the lake (ibid).

### 5.5.2 Water Quality

Prior to rainfall, the lake typically has a thin (up to several centimetres), crusted salt layer over the red brown surface clay, as a result of evaporation. During rainfall, even with little or no run-off to the lake, the crusted salts are dissolved, with the consequence that the salinity of any surface water in the Lake will vary enormously. In general, major events, such as the run-off from Cyclone Bobby, would result in the formation of a large, brackish water body, which would gradually become saline and revert to salt crust due to evaporation (ibid).

Outback Ecology Services (2004) sampled 8 sites in Lake Way. The report included the following conclusions:

- Metals assayed in the surface waters were generally below detection level (with the exception of Arsenic which was slightly above detection at two sites);
- Total Organic Carbon (TOC) (a measure of organic matter) was in the range 2-10mg/L (common to most aquatic systems), except for one site located at a creek mouth which measured marginally higher (16mg/L) but within the regional groundwater TOC expectations;
- Total Nitrogen (TN) and Total Phosphate (TP) were low, ranging between 0.61-1.7mg/L and 0.03-0.10mg/L respectively compared to ANZECC (2000);
- At each of the seven inundated sites sampled (i.e. 20mm-180mm saturated depth), dissolved oxygen (DO) was measured as 8.2-9.7mg/L;
- The pH of the surface water ranged from slightly acidic to neutral (5.8-7.0), slightly lower than expected for inland waters; and
- Variations in salinity of temporary waters such as Lake Way can be considerable due to the changes in chemistry associated with wetting and hydro-periods. Measured electrical conductivities (used to determine salinity) on this occasion varied from 26,000 to 150,000µS/cm and all sites were classified as saline.
6 Hydrogeology

6.1 Regional Hydrogeology
The regional groundwater flow is directed towards Lake Way from all sides. Groundwater flows in the Project Area are maintained by recharge following rainfall though gradients near the lake. Significant recharge is likely to occur during rare periods of heavy rainfall, often associated with aftermaths of cyclones. Recharge occurs by direct infiltration of surface water through calcrite, sandy stream-beds and fractured bedrock outcrops. The remainder of rainfall is either evaporated, utilised by native vegetation and/or forms runoff to streams and salt lakes (RPS Aquaterra, 2010b). The main aquifer systems in the Project Area are:

- Low yielding, surficial alluvial and colluvial aquifers overlain by moderate to high yielding valley calcrite aquifers;
- Moderate to high yielding sand aquifers developed within palaeochannels;
- Fractured bedrock aquifers where permeability and porosity have been produced by fracturing; and
- Extremely low yielding playa deposits comprised of evaporates, clay and sand (ibid).

Groundwater levels are being monitored where possible from the same network of groundwater quality monitoring bores. Some of these bores are sealed around the installed pumps and cannot be accessed to ascertain water levels. There is no data on the volumes of water being extracted annually from these bores, nor any method to determine how long the bores have been pumped prior to water levels being taken. The data on water levels from these bores is useful to determine the range of current water level fluctuations due to water being extracted for stock and domestic requirements.

Another network of specifically constructed bores has been established (2010 Toro drilling bores) to specifically monitor water levels around the margins of the Centipede and Lake Way deposits. The data from these bores will be used to understand natural water level fluctuations in these areas due to localised rainfall and evapotranspiration. The longer term data collection would also be used to determine natural trends in groundwater levels. During mining operations the data collection would be used to verify the extent of water level drawdown at the margin of the mining activities and be compared with predicted modelled drawdowns due to dewatering from these excavations.

Groundwater quality is being monitored around Lake Way in specifically completed observation bores in addition to local stock and domestic supply bores.

6.1.1 Surficial alluvial-colluvial aquifers including Calcretes
Surficial alluvial-colluvial aquifers have a watertable of generally less than 5m below ground level (mbgl). The hydraulic conductivity of these aquifers is low with bore yields varying from 50 to 600m³/day (RPS Aquaterra, 2010b).

Calcrete forms localised, high-yielding aquifers due to secondary porosity and high permeability due to fractures. Calcrete generally occurs in the lower portions of the drainage system where the watertable is shallow (generally less than 5mbgl). Saturated thicknesses generally range from 0.5m to 24mm. The salinity of groundwater in calcrete is frequently brackish to saline. However it can be fresher soon after and where recharged directly from rainfall. Potential bore yields are reported to range between 100 and 4,400m³/day (ibid).
6.1.2 Sand aquifers within palaeochannels
Palaeochannel sediments contain the most important aquifers in the region, providing significant groundwater volumes though they are generally saline to hypersaline. The paleochannels usually, but not always, coincide with overlying alluvium or calcrete occurring along surficial stream channels. The paleochannels are incised into the underlying bedrock aquifer (ibid).

6.1.3 Fractured bedrock aquifers
Fractured bedrock aquifers consist of greenstones, granitoids and minor intrusives. Hydraulic characteristics are directly related to the fracture intensity, with lithology having limited control (ibid).

6.1.4 Playa deposits
Playa deposits occur at Lake Way and Lake Violet. These sediments are comprised of saline and gypsiferous evaporates, clay and sandy silt. It is expected that the permeability of these sediments is very low, although high enough to allow through-flow due to evaporation (ibid).

6.2 Centipede Deposit Aquifer Characteristics

6.2.1 Aquifer Thickness and Extent
The modelled Centipede deposit extends over two 1/250K scale geological maps (Figure 6.1). An unconfined calcrete aquifer extends some 30km from the Centipede deposit westwards up the Abercromby Creek to the ‘Just-It’ bore. Lithological information from mineral exploration holes at Centipede (Figure 6.2) indicates that the calcrete unit in the Project Area varies in thickness between 0.5m and 24m. At places, the calcrete is interbedded with other sedimentary units, particularly finer grained materials such as clay and/or silt, although thin layers of sand and gravels are also present (RPS Aquaterra, 2010a).

6.2.2 Calcrete Aquifer Parameters
Typical of many shallow calcrete aquifers, the hydraulic properties of the Centipede calcrete vary considerably across the deposit. Test results from studies within the Project Area are discussed in the Centipede Groundwater Impact Assessment report by RPS Aquaterra (2010a). The results of the pumping tests highlight the variability of hydraulic properties of the calcrete aquifer system. The hydraulic conductivity of this shallow, unconfined calcrete aquifer is generally high, varying between 160 and 800m/d (average ~500m/d). Similarly, the specific yield of the aquifer system is highly variable, with values ranging from 3 per cent to 25 per cent (ibid).

6.2.3 Groundwater Levels
Based on groundwater data from existing reports and the DoW records, static water levels in the calcrete aquifer are interpreted to lie between ~1 to 5mbgl depending on the elevation of the terrain. Groundwater elevations confirm very low gradients within the calcrete towards Lake Way, this being from the west, essentially following Abercromby Creek to the east, where it discharges to Lake Way. The Lake Way playa is considered to act as a groundwater retention area or ‘sump’, where groundwater is removed from the system via evaporation (ibid), as a normal part of the hydrologic cycle.

6.2.4 Calcrete Aquifer Recharge and Evapotranspiration
Direct groundwater recharge to the calcrete aquifer would be expected to occur in response to rainfall events. Published data suggests that recharge directly from rainfall or via
infiltration of runoff in areas of outcropping calcrite would constitute at least 1 per cent, possibly as much as 5 per cent, of total annual rainfall. Rainfall events in excess of 50mm over short time periods are expected to generate significant runoff that would rapidly infiltrate into the calcrite via solution through open pore spaces and cavities (ibid). Indirect recharge of the calcrite aquifer is also expected to take place via lateral inflow from the flanking saturated alluvial-colluvial sediments (ibid). Evapotranspiration would be expected to occur where groundwater levels are shallow or within the root zone, perhaps within 2 to 5m of the ground surface (ibid).

6.2.5 Groundwater Quality
The salinity of the groundwater at Centipede is highly variable, both laterally and vertically, but generally increases down gradient along the regional flow path. The salinity of groundwater in the calcrite aquifer in Abercromby Creek drainage system increases dramatically to the east, from 1,600mg/L TDS at Abercromby Well to an average of 150,000mg/L (range of 66,000 to 330,000mg/L) TDS at Centipede. Groundwater salinities also tend to increase with depth (ibid). The major ion and trace metal constituents of the groundwater from 2009-2010 sampling are presented in the Centipede Groundwater Impact Assessment Report (ibid).

6.2.6 Existing Groundwater Users
No significant abstraction takes place in the Project Area and nearby groundwater utilisation is limited to pumping for stock-watering purposes. However, a number of historical studies have identified the Abercromby palaeochannel aquifer system (Figure 6.1) as a likely water supply for other mining projects including the proposed Honeymoon Well nickel mine (approximately 6km to the south of the Centipede deposit) (RPS Aquaterra, 2010d).

6.3 Lake Way Deposit Aquifer Characteristics

6.3.1 Aquifer Thickness and Extent
An unconfined calcrite aquifer extends throughout the Lake Way deposit. The geological map indicates that this calcrite extends (with variable width) from West Creek across a broad area between Lake Violet and Lake Uramurdah in the north and Lake Way in the south (Figure 6.3). Drilling data from the proposed mine area provided by Toro indicates that the calcrite is interbedded with clastic sediments, particularly finer grained materials such as clay and/or silt, although coarser grits and gravels are also present. The thickness of the calcrite rich horizon is variable, ranging from approximately 4m to 14m, with an average thickness of approximately 10m. A review of the data suggests that the calcrite aquifer present within the Project Area is not underlain by a significant palaeochannel aquifer (RPS Aquaterra, 2010b).

6.3.2 Calcrite Aquifer Parameters
Test results from the Project Area include two dewatering tests conducted by Rockwater (1980) during a trial mining exercise in 1979. The results of these two tests suggested an average transmissivity of 1200m²/m/day and a specific yield of 0.017 for the calcrite. The report also suggests that the specific yield is unlikely to exceed 0.06 (RPS Aquaterra, 2010b), which is significantly lower than the values calculated for the Centipede calcrite.

Australian Groundwater Consultants (AGC, 1986) presented the results of pump-testing of production bores P18, P22 and P26 that tap the calcrite aquifer in the West Creek borefield located ~18 km northwest of the Lake Way deposit. Estimated transmissivity values were in
the range of 135 to 350m²/day (average 250m²/day) with specific yields of 3 to 8 per cent (average 5 per cent), respectively (ibid).

6.3.3 Calcrete Aquifer Recharge and Evapotranspiration
Published data suggests that recharge directly from rainfall or via infiltration of runoff in areas of outcropping calcrete would constitute at least 1 per cent, possibly as much as 5 per cent, of total rainfall. Rainfall events in excess of 50mm would generate significant runoff that would rapidly infiltrate into the calcrete via solution cavities (ibid).

Australian Groundwater Consultants (1986) found that localised recharge of the nearby West Creek calcrete aquifer system was only likely to occur following significant runoff events. Historical records, however, reveal several extended periods of five years or more without any significant runoff producing rainfall events. Cyclone Bobby is an example of a significant runoff event, when 250mm of rainfall was recorded at Wiluna from 19 to 27 February 1995. Following this event the salinity of the groundwater in the shallow calcrete aquifer showed changes in response to rainfall recharge. Over a period of nine months following this significant (and rare) event the salinity of groundwater from production bores P18 and P22 rose by 2,200 and 3,800mg/L, respectively. This rise in salinity may be due to flushing of salt from unsaturated zones of the soil/aquifer profile (RPS Aquaterra, 2010b). Evapotranspiration would be expected to occur where groundwater levels are shallow, perhaps within 2-5m of the ground surface (ibid).

6.3.4 Groundwater Levels and Flow within the Calcrete
Water levels in the calcrete aquifer are approximately 2-4mbgl. Groundwater elevations confirm that flow within the calcrete is from the north, essentially following Negrara Creek, and from the West Creek sub-catchment, where it discharges at Lake Way. Essentially Lake Way is considered to act as a ‘sump’, removing large volumes of groundwater from the system via evaporation (ibid).

6.3.5 Groundwater Quality
Information on the general quality of groundwater is published in various reports and is summarised in the RPS Aquaterra (2010b) report. The groundwater quality in the calcrete aquifer system at West Creek (Figure 6.3) is generally brackish, with measured salinities ranging between 2,000 to 3,500mg/L. In general, the groundwater salinity in the West Creek borefield increases downstream from the most north-westerly production bore, P26 (2,344mg/L TDS), to the most south-easterly borehole P62 (TDS 3,100mg/L TDS). Groundwater abstracted from the Apex Southern Borefield, which is at the bottom end of the West Creek drainage system, nearer Lake Way is brackish, with salinities averaging between 4,000 to 5,000mg/L (RPS Aquaterra, 2010b).

6.3.5.1 Existing Groundwater Users
Groundwater abstraction within the vicinity of the Project Area includes:

- Apex Minerals NL (Wiluna Gold Mine) Southern borefield, located approximately 12km north-west of the Lake Way deposit. This borefield taps the shallow calcrete aquifer, part of the West Creek drainage area. The borefield comprises five production bores, XP1 to XP5, which provided water to the Wiluna Gold Mine up until early 2008. It is understood that the borefield is currently not being utilised by Apex Gold. The bore construction details and hydrogeological logs for these bores could not be located. There is also no information available on the sustainability of the borefield, although the borefield was licensed to abstract up to a maximum of
1.13GL/year. Apex currently discharges to West Creek, which then discharges to the lake.

- Apex Minerals NL (Wiluna Gold Mine) currently obtains groundwater from the Eastern borefield, located approximately 5.8km to the north of Toro’s Lake Way deposit. This borefield comprises over twenty operational bores. The Groundwater Well Licence for the borefield authorised an annual abstraction of 1.5GL/annum.

- The Wiluna Town Water Supply (TWS) borefield, is located approximately 12km north of the Lake Way deposit and is adjacent to the Apex Eastern borefield. This borefield provides water to the Wiluna scheme and the Bondini Aboriginal community (Water Corporation, 2004). The borefield is operated by the WA Water Corporation and is reported to consist of two production bores, 6/01 and 10/01 that draw water from a shallow calcrete aquifer and one observation bore. The bores are screened between the depth of 3.3m and 21m and have static water levels generally ranging between 6m and 8 m bgl. It is reported that the Water Corporation is licensed to draw 120,000kL per annum from the borefield for public water supply purposes. Raw water from the borefield is reported to be of poor aesthetic quality with salinity approaching the guideline limit and hardness levels above the aesthetic guideline. The water is treated via a desalination unit before distribution. The raw water also contains naturally occurring nitrate at levels typically above the 2004 Australian Drinking Water Guidelines (ADWG) value.

- The West Creek borefield is located approximately 18km north-west of the Lake Way deposit. It was constructed to supply low salinity water to the Matilda (Southern Gold) Mine in the 1980s. Toro’s proposed West Creek borefield has been estimated (based on data from the existing borefield) to be able to supply just under 0.7GL/annum for an 11-year mine life. As such, alternative sources of water capable of delivering 1GL/annum need to be developed to meet the estimated total of 1.7GL/annum water demand for Toro’s general mine and processing plant requirements (RPS Aquaterra, 2010b).

The locations of the borefields discussed above are shown in Figure 6.3.
7 Site Water Balance

A schematic of the proposed site water balance for the Project includes dewatering of bore fields, use at the process plant and process water treatment, dust suppression and evaporation ponds. Water is planned to be recycled as much as possible to reduce volumes of extracted brackish to saline groundwater.

The proposed site water balance for the Project is displayed in Figure 7.1.
8 Potential Impacts

Potential surface water impacts from prolonged or intense rainfall events during the construction and operational phases include:

- In the mine and processing and access areas at Centipede and Lake Way, there would be changes to existing surface water flow patterns – with altered sheet-flow and drainage lines during flooding events;
- Changes to water quality in water courses downstream of the development/infrastructure areas;
- Ponding of water and growth of vegetation in low-lying areas (requiring attention to the design and location of roads, sediment basins and other infrastructure);
- Ponding of water upstream of constructed (long term) bunds or diversions leading to changes in vegetation characteristics, soil waterlogging and soil erosion;
- Increase in siltation (turbidity) of Lake Way from erosion of disturbed areas;
- Contamination at extremely low concentrations due to dilution, from spillage of process reagent or waste leachates; and
- Contamination at extremely low concentrations due to dilution, from discharge of chemicals, including hydrocarbons, reagents, (spill incidents).

Potential groundwater impacts during the construction and operational phases include:

- Localised lowering of watertable (aquifer drawdown) during dewatering to maintain dry mine pit conditions and in-pit tailings during 11-years of mining operations – Centipede would require dewatering for the full 11-years of mining operations, i.e. including the six years while the Lake Way deposit was mined and tailings continued to be disposed of in the Centipede pits;
- Localised aquifer drawdown from groundwater abstraction for mine water supply (West Creek borefield and other proposed water supply options);
- Possible effects on groundwater dependent ecosystems (GDEs), including stygofauna and vegetation, from aquifer drawdown related to mine dewatering and water supply borefield(s);
- Deterioration in groundwater quality at the West Creek borefield due to inflow of brackish or saline water from underlying ‘palaeochannel’ aquifer;
- Changes in groundwater quality in the localised area from Centipede in-pit tailings disposal (uncontrolled releases or seepage);
- Changes in groundwater quality from Lake Way deposit in-pit overburden infilling (seepage of waste leachates); and
- Contamination from discharge of chemicals, including hydrocarbons, reagents, etc. (spill incidents).

8.1 Interruption to existing surface water flow patterns

During flood events, surface water flow paths may be altered by the construction of infrastructure for the Project. Although not a Project-related impact, Toro recognises that management of natural flooding events would be required.

The floodplain is commonly defined as that portion of the river or lake that is prone to flooding from a 100-year ARI flood. The flood fringe is that part of the floodplain where proposed development (i.e. filling, bunding, etc.) is considered acceptable with regard to impact on flood level. Due to the large size of Lake Way, any development on the shore would not measurably increase flood levels in the lake (RPS Aquaterra, 2010c).
Both deposits are located within the floodplain of the lake, and would be potentially impacted by lake flooding. Protection bunding is therefore required along the mine site lake perimeter to protect pits from inundation. The proposed plant site at Centipede is located such that it would be above the nominal PMP lake flood level.

The surface levels adjacent to the required protection bunding vary, but are a minimum of about RL490.4m for both the Lake Way and Centipede deposits. The maximum predicted depths of water at the bund location in the 100-year ARI and PMP events are therefore 1.3m and 3.2m, respectively (RPS Aquaterra, 2010c).

Bunding would need to be constructed above the estimated flood levels, by way of freeboard provisions to cover possible water level variations above the modelled water levels, as well as settlement and erosion of the bunds. The suggested minimum freeboard height for protection of critical infrastructure is 1m. On this basis, maximum bund heights would be between 2.3m and 4.2m (depending on the selection of event to be protected against) (ibid).

Flow velocities past the bunds would be negligible with the possible exception of creek inflow zones. As a result, erosion and rip rap protection (for example) would generally not be required (ibid).

The risk of erosion and sedimentation from waste dumps is high, and the stability of dumps and their response to water on slope length is an important factor in characterising their physical safety. To minimise erosion on the outer faces of the dumps, appropriate battering of the face and contour drains would minimise sheet water flows and provide effective water management to benefit the growth of vegetation. With appropriate design of infrastructure and drainage for surface water flow management, impacts from such an alteration to surface water flow are considered to be minor.

8.2 Alterations to surface water runoff volumes and quality in water courses downstream of the development/infrastructure

Changes to surface water runoff volume and quality downstream of the development could occur once infrastructure has been built. As discussed above, building of Project infrastructure would require appropriate design for surface water flow management. Runoff would be designed to minimise undue erosion caused by the Project and its associated infrastructure and to provide safeguards to reduce the potential of contamination of watercourses and groundwater. If flood events were significant, concentrations of potential contaminants (e.g. hydrocarbons) would be diluted due to volumes of water to extremely low concentrations.

Flows of floodwater would be managed by the stormwater drainage provisions in the developed areas (i.e. ensuring bunding of areas where fuel and hazardous materials were used or stored). Impacts from reduction of surface water runoff volume and quality are considered to be low, as engineering design would take drainage, flow, and water quality into account.

8.3 Alteration to major creek flow patterns

The hydrology of the major creeks in the area (Abercromby, Negrara and Kukububba) was identified as potentially impacting the proposed mine sites. The creek catchments in the Project Area are shown in Figure 8.2 (ibid). Design discharges for the three catchments were calculated for both the 10-year and 100-year ARI (ibid). RPS Aquaterra (2010c)
calculated flood discharges over time (hydrographs), the rainfall excess runoff and routing this runoff through the catchment model.

8.3.1 Abercromby Creek
The creek flow splits into two branches about 6km upstream of Centipede, west of Lake Way. From this split, one branch continues east and the other heads north, discharging into the lake north of the deposits. This northern section of the creek does not impact the proposed mining operations (RPS Aquaterra, 2010c).

On the southern branch, the flood plain is typically 1km wide. Peak 100-year ARI flow depths in the main river channel are estimated to be 1-1.5m deep, with the average main channel flow velocities around 0.5m/s. The flood grade is one in 3000-4000. To check sensitivity, the model was run with 60 per cent of the flow (206m³/s) traversing the southern branch. This typically raised flood levels by about 0.3m (ibid).

The southernmost portion of the potential mine footprint lies over the main channel of the creek. As such, initial mining would require bunding to be located along the northern bank of the creek, excising some of the deposit to allow mining to the north. To access the remainder, the bunding would need to be moved and a flow diversion constructed, either to the south of the deposit or through the prior workings (ibid).

For the 100-year ARI flood event, the diversion channel width would need to be in the order of 100m wide. Alternatively, or in conjunction with bunding located at the split in the main channel, flow inland could direct more flow to the north and therefore temporarily reduce the flow peaks and hence the size of the diversion works required in the southern branch (ibid).

Appropriate engineering, design and management of potential impacts from alteration to flow in this southern branch of Abercromby Creek are considered to be achievable, resulting in minimal impacts.

8.3.2 Negrara Creek
The flood plain is typically 700m wide, but extending wider into an estuary about 1km from the lake discharge area, and then becoming more confined (narrower) prior to discharge into the lake (ibid). The Lake Way deposit lies about 1.5km from the creek line at its closest point. As such only minor bunding would be required at the closest point of the mine to give appropriate protection from flood flows occurring in the drainage line (ibid). With appropriate engineering design, impacts from such an alteration to creek flow patterns are considered to be minimal.

8.3.3 Kukububba Creek
The flood plain width varies along its length from about 500m to about 1,500m in sections where the creek is less confined. The Lake Way deposit extends along Kukububba Creek for about 2.5km and into adjacent hinterland for distances of up to 2.5km, west of this creek. The deposit also extends over the creek to the east, out into the lake (ibid). As such, initial mining would require bunding to be located along either or both sides of the creek channel.

8.4 Ponding of water and growth of invasive vegetation in low-lying areas
Ponding of water in low-lying areas or diversions may lead to changes in vegetation characteristics, soil waterlogging and soil erosion. Natural pooling of water may occur after
significant rainfall events, with the extent or volume of pooled water potentially affected by Project infrastructure, such as road culverts. Toro considers that any ponding that may occur due to its activities would not lead to invasive vegetation being established, as these periods of ponding would be short lived due to high evaporation rates.

Natural pooling of water may occur within the Project Area, but this is largely beyond the control of the operator, with the exception of areas with engineering alterations such as road culverts. Unnatural pooling of water should not occur within the Project Area. This is further discussed in the Weed Environmental Management Strategy. The risk of pooling of water within the Project Area leading to conditions conducive for the establishment of weeds is considered to be low.

8.5 Impact on downstream vegetation communities
Due to the comparatively large size of Lake Way, compared to the area proposed to be developed for the Project, any development on the shore would not measurably increase flood levels in the lake and therefore would have negligible impacts on both downstream water courses and vegetation communities. As each creek discharged into Lake Way, the bunding of the pits to protect workings from lake flood levels (in rare but significant flood events) would not restrict flows to nearby vegetation communities. Following mining, diversion channels could be constructed to divert creek flows through the previously worked mine areas to replicate pre mine conditions (ibid).

8.6 Ponding of Water in Upstream Areas
The deposits encroach into the floodplains of the creeks, in parts, and cross the main creek channel on occasions. The deposits would require bunding from the creeks to keep the workings free of creek floodwaters. Encroachment onto the flood plain would restrict flow (in significant flood events) and cause water levels to rise upstream. Ponding of water upstream of constructed bunds or diversions in the flood plains may lead to changes in vegetation characteristics in this area, soil waterlogging and soil erosion. The risk of pooling of water within the Project Area leading to conditions conducive to changes to vegetation, waterlogging and soil erosion is considered to be low due to the short periods of potential inundation and return to regular long dry periods.

8.7 Siltation of Lake Way
Surface water runoff from disturbed (operational) areas and stockpiles/dumps during intense or prolonged rain events could be sediment laden and require treatment in sediment basins to control erosion and the deposition of sediment downstream. Design elements around disturbed areas, such as sediment basins, would be installed where necessary. Flow velocities past the bunds would be negligible with the possible exception of creek inflow zones. As a result, there would be limited potential for erosion and rip rap protection would not generally be required.

8.8 Contamination from Spillage or Discharge
Runoff would be controlled to ensure it did not cause undue erosion and to guard against potential contamination of watercourses and groundwater. This flow would be handled by the stormwater drainage provisions in the developed areas (i.e. bunding of areas where fuel and hazardous materials were used or stored). Sediment basins are generally more effective when located close to the source of sediment, and when ‘clean water’ (i.e. runoff from undisturbed areas) is kept separate from sediment laden runoff from disturbed areas, so as to reduce the volume of water to be treated. Clean runoff could be discharged into
surrounding watercourses, while other dirty water was treated and may be re-used for dust suppression or other processes on site, or left to evaporate in-situ. Sedimentation basins could be designed to contain potential rainfall events over these disturbed areas.

If not managed appropriately, transport of contaminated soil material via surface water movement has the potential to impact on terrestrial fauna through drinking water sources. However, if a spill occurred during significant rainfall events that had ensuing flooding, the contaminants would be diluted, significantly reducing potential impacts on the local environment in the short and long term. Hydrocarbon and chemical spills would be cleaned up and remediated in a timely manner, minimising any soil contamination.

Toro’s plan is not to discharge groundwater from pit dewatering to the local drainage lines or the lake, but rather to use it for ore processing. Disposal of excess water is planned via a series of evaporation ponds.

External surface water (runoff/floodwater) would be bunded away from the pits. Direct precipitation over the pits during major rainfall events could produce too much water to practically dispose of on the site. This fresher water would require settlement followed by sampling and if within the range of quality comparable to natural discharge water, could be discharged into Lake Way. Approvals for any discharge would be required from the appropriate authorities (ibid). Impacts of discharge to the receiving environment would be minimal due to dilution from large volumes of water present if discharge was required.

8.9 Lowering of watertable (aquifer drawdown) during dewatering

8.9.1 Centipede Deposit

A numerical groundwater model covering an area of ~2,100km² (Figure 6.1), extending 39km south of the abandoned Matilda Mine (~10km north-west of the Centipede Deposit) and 54km to the west of the Lake Way outflow, was developed to assist with the prediction of mine dewatering requirements and potential mining impacts (RPS Aquaterra, 2010a). Two scenarios were run on the model:

- Prediction Run 1 simulated the mining without the use of proposed cut-off walls or barriers to reduce inflows into the open pits;
- Prediction Run 2 included the simulation of cut-off walls or barriers installed around and within the mine area to help control groundwater inflows and through flows.

The predictive model assumed that Centipede would require dewatering for the full 11-years of mining operations, i.e. including the 6-years while the Lake Way deposit was mined and tailings continued to be disposed of at Centipede (ibid).

Particle tracking was undertaken on Prediction Runs 1 and 2, to identify possible travel paths for solutes released during mining and after closure (ibid). Results are presented in this RPS Aquaterra report.

The outcome of the predictive modelling confirmed that there is a large difference in predicted total dewatering volumes between Run 1 and Run 2. This indicates that the permeability of the cut-off walls or barriers would have a significant bearing on dewatering rates within the walled pits, the total dewatering volume and the lateral extent of water level drawdown. Even for the no barrier case the dewatering required (5,500kL/day average) is not expected to pose high risks to successful mine dewatering for the period of pit excavation. Although the particle tracking does show that seepage would leave the mine site once water levels recovered after mine closure, the low permeability of the Lake Way
sediments east and northeast of the mine site means that any contaminants would move less than 1,500m after 1,000 years of seepage (ibid).

### 8.9.2 Lake Way Deposit
Similarly to Centipede, a groundwater model was developed for Lake Way. To assist with the prediction of mining impacts a numerical groundwater model and steady-state calibration model were developed prior to undertaking two prediction runs (ibid). The Lake Way mine plan was interpreted to identify relevant mining processes (dewatering, infilling with waste rock and closure).

- Prediction Run 1 simulated the mining, without the use of cut-off walls or barriers to help decrease inflow to the open pits;
- Prediction Run 2 included the simulation of cut-off walls or barriers installed around and within the mine area to help control groundwater inflows (ibid).

Particle tracking was undertaken on Prediction Runs 1 and 2, to identify possible travel paths for solutes released during mining (ibid).

There is a large difference in predicted dewatering volumes between Run 1 and Run 2. The results of the modelling indicate that the permeability of the cut-off walls or barriers would have a significant bearing on dewatering rates, the total dewatering volume and the lateral extent of drawdown. Even for the no barrier case the dewatering required (3,540kL/day average) is not expected to pose high risks to successful mine dewatering. Although the particle tracking does show that seepage would leave the mine site (after water levels recovered following cessation of mining), the low permeability of the sediments south of the mine site ensures that any contaminants would move less than 100m after 1,000 years of seepage (ibid).

### 8.10 Aquifer drawdown from groundwater abstraction for mine water supply
The ore process treatment plant to be located near the Centipede deposit is estimated to require up to 1.7GL/annum of water. The salinity of the feed water for processing is to be below 30 000mg/L (similar to sea water salinity) or have a total chloride concentration of less than 10 000mg/L. Using available data from bores in the area, the proposed West Creek borefield has been estimated to be able to supply just under 0.7GL/annum for the 11-year mine life while not unduly depleting the aquifer of water for the environment and current users. Given this scenario, alternative sources capable of delivering 1GL/annum saline water need to be developed (RPS Aquaterra, 2010d).

Figure 8.3 provides the locations of suitable quality groundwater supply options for the Project. In the Wiluna area, groundwater with the quality required is only likely to be found in shallow calcrite aquifer systems.

The calcrite aquifers at the Centipede and Lake Way deposits are potential water supplies, but their location (on the edge of Lake Way) means that the groundwater is saline to hypersaline (ibid).

#### 8.10.1 Centipede Deposit
The modelling drawdown at the mine sites with predicted 0.2m and 0.5m water level drawdown contours for Run 1 (without cut-off walls or barriers) and Run 2 (with cut-off walls or barriers) at the end of dewatering is presented in Figures 8.4 and 8.5, respectively.
Maximum water level drawdowns are predicted in the immediate mine area and decrease with distance from this area (RPS Aquaterra, 2010a).

For Run 1 without cut-off walls or barriers installed, after the end of mining and dewatering, the 0.2m drawdown contour is predicted to extend a maximum distance ~5.5km west-southwest towards Abercromby Well and ~6.5km east-northeast (beneath Lake Way). At the same time, the 0.5m drawdown contour is predicted to be much closer to the mine area, extending ~4km west-southwest and ~5km east-northeast, respectively (ibid).

For Run 2 with cut-off walls or barriers installed, after the end of mining the 0.2m and 0.5m water level drawdown contours are predicted to closely follow the outer perimeter of the two separate mining areas, with the exception of the 0.2m contour which is anticipated to extend up to 500m north-eastwards beneath Lake Way and ~1km to the southeast of the mine areas. The model results suggest that the implementation of an efficient system of cut-off walls or barriers has a significant impact on limiting the regional extent of groundwater drawdown as a result of dewatering (ibid).

8.10.2 Lake Way Deposit
Predicted drawdown modelling was also undertaken for the dewatering of the Lake Way deposit. Contours for Run 1 (without cut-off walls or barriers) and Run 2 (with cut-off walls or barriers) at the end of dewatering are presented in Figures 8.6 and 8.7, respectively.

For Run 1, at the end of mining, the 0.1m drawdown contour is predicted to extend ~5km northwest towards Lake Violet and 4km northeast to Lake Uramurdah. The 0.5m drawdown contour is predicted closer to the mined out area, extending some 1.5 to 2.5km away from the edge of the mining area.

This extent of modelled drawdown also provides confidence that the dewatering of the Lake Way deposit would not impact on the Town Water supply nor the closer bore field (Eastern borefield) supplying Apex Mine with water. The 0.5m drawdown contour is predicted closer to the mined out area and extending between 1.5km to 2.5km away from the edge of the mining area (RPS Aquaterra, 2010b).

For Run 2, at the end of mining, the 0.1m water level drawdown contour is predicted to extend a maximum distance of ~3.3km north-west towards Lake Violet and ~400m southwards beneath Lake Way. The 0.5m drawdown contour is predicted to follow the mining area to the north and east, and extend a maximum distance of 600m into Lake Way. Modelling results suggest that the implementation of cut-off walls or barriers would have a significant impact on limiting the extent of groundwater drawdown as a result of dewatering (ibid).

8.11 Possible effects on groundwater dependent ecosystems (GDEs), including stygofauna and vegetation, from aquifer drawdown
The abstraction of groundwater from aquifers could have an impact on stygofaunal populations. Many of the stygofaunal species identified to date are relatively widely distributed in the region. Although some species were only found in the Project Area during surveys, it is considered that the apparent restricted distributions are more likely to be an artefact of sampling failing to detect each species from outside the mining area and not a true depiction of these species having such restricted distributions (Outback Ecology Services 2011). This is particularly relevant at West Creek.
The potential for impacts to stygofauna as a consequence of groundwater abstraction are considered to be moderate. The projected rate of extraction and consequent reduction in the water table within the West Creek borefield have been modelled by RPS Aquaterra (2010a). The analysis predicts a reduction of 4m in the depth to groundwater in the borefield. To better understand how this compares to changes under natural conditions, data analysis is continuing. Rates of abstraction would be monitored to assess and minimise rates of change so that they better reflect natural variation.

The abstraction of groundwater from aquifers could have an impact on groundwater dependent vegetation (GDV). This is particularly relevant in the West Creek borefield, where the aquifer from which groundwater would be sourced is located under GDV, notably aquifers hosting *Eucalyptus camaldulensis*. The acceptable degree of change (including the time period of mining potentially being similar to some naturally occurring dry periods) to groundwater water levels should be determined by utilising a combination of assessments of environmental impacts to vegetation and community consultation on the impacts (Eamus *et al*., 2006). The potential for impacts to GDV as a consequence of groundwater abstraction is considered to be low to moderate.

### 8.12 Deterioration in groundwater quality at the West Creek borefield due to inflow of saline water from underlying ‘palaeochannel’ aquifer.

Extraction of groundwater from the existing West Creek borefield occurred between 1987 and 1989 by Chevron Exploration Corporation, and EON Metals NL for their gold mining operations. Asarco and Wiluna Gold Mines then operated these bores until 1997. Very sparse records are available on volumes extracted and water quality (RPS Aquaterra 2010d). Analysis of the limited data from these bores during the period of extraction by Resource Investigations (Report 1991) suggested that salinity of groundwater from these bores after prolonged extraction rose marginally.

### 8.13 Solute tracking from in-pit tailings disposal (uncontrolled releases or seepage).

Soil Water Consultants (SWC) were commissioned to investigate potential transport of soluble constituents from tailings waste rock that is planned to be backfilled into the mine voids of the proposed Centipede and Lake Way deposits. (Tailings would be disposed at Centipede, but not at Lake Way). The primary objective of this investigation was to identify the potential for elements to be released from the backfilled waste rock and tailings and to determine the distance they could be transported within the recovered groundwater aquifer (SWC, 2011a). The model simulations were run to represent the behaviour of backfilled wastes for a period of 1000 years following backfilling of the pit voids.

The orebody lies at or below the local watertable. The proposed perimeter cut-off walls or barriers to minimise water ingress during the mining operation would reduce the overall water flow through the TSF area (Knight Piésold, 2010). The solute transport modelling included model runs representing the behaviour of backfilled wastes under two scenarios: with cut-off walls or barriers in place and without cut-off walls or barriers.

#### 8.13.1 Centipede Deposit

In this solute transport study the transport of solutes including, uranium and arsenic, (U and As) within the recovered aquifer system at the Centipede deposit was modelled using 1D and 2D HYDRUS (SWC, 2011a). At this deposit both waste rock (primarily calcrete) and process residue would be backfilled into the mine void.
The transport modelling considered an initial concentration of 128mg/L of U being released from the backfilled waste rock. The concentration used in the model was calculated as a worst case scenario, assuming all U was released in a single event and that the surrounding aquifer materials had an adsorption coefficient ($K_F$) for U of $190\text{L}^{(1-n)}\text{mg}^{(1-n)/\text{kg}}$ ($K_D = 190\text{L/kg}$). The modelling showed that the maximum distance that U was likely to travel in 1,000 years and exceed the Department of Health (DoH) (2006) quality criteria for non-potable groundwater (i.e. 0.2mg/L) was 11.3m, in the case of no barrier walls installed and 6.4m if there were barrier walls. The U concentration was predicted to decrease below laboratory detection limits (0.001mg/L) at a distance of 14.2 and 8.7m, respectively (SWC, 2011a).

For arsenic (As), any released metal would likely be in the form of arsenate. Transport modelling using an assumed adsorption coefficient ($K_D$) of only 1.3L/kg (to simulate the low adsorption potential of the calcrete) predicted that the released As is expected to travel a maximum distance of 152m from the mine void in the no barrier scenario, and 69m with barriers installed, with levels exceeding the corresponding DoH (2006) quality criteria for non-potable groundwater (i.e. 0.05mg/L) over this distance. Concentrations below laboratory detection limits (0.001mg/L) are expected at distances of 198m and 104m for the two barrier scenarios (SWC, 2011a).

8.13.2 Lake Way Deposit

In this investigation the transport of uranium, cadmium and chromium (U, Cd and Cr) within the recovered aquifer system at the Lake Way deposit was modelled using 1D and 2D HYDRUS. At this deposit only waste rock (primarily calcrete) would be backfilled into the mine void. The waste rock likely to be backfilled into the Lake Way mine void generally would contain low concentrations of uranium, cadmium and chromium and based on laboratory test work, the solubility of these constituents in groundwater is low. Consequently, the potential for significant impact on the surrounding environment would be low (SWC, 2011b).

The transport modelling considered an initial concentration of 0.88mg/L of U being released from the backfilled waste rock. The concentration used in the model was calculated as a worst case scenario, assuming all U was released in a single event and that the surrounding aquifer materials had an adsorption coefficient ($K_F$) for U of $190\text{L}^{(1-n)}\text{mg}^{(1-n)/\text{kg}}$ ($K_D = 190\text{L/kg}$). The modelling showed the maximum distance that U was likely to travel in 1,000 years and exceed the DoH (2006) quality criteria for non-potable groundwater (i.e. 0.2mg/L) was 5.2m in the case of no cut-off walls or barriers installed, and 3.1m if there were cut-off walls or barriers. In addition, the U concentration was predicted to decrease below laboratory detection limits (0.001mg/L) at a distance of 13.1 and 9.8m, respectively (ibid).

Any released Cd would likely exist in an uncomplexed divalent oxidation state (i.e. Cd$^{2+}$) and consequently, it would experience considerable adsorption onto the predominantly negative or neutrally charged aquifer materials under alkaline conditions. Even under the worst case scenario where all leachable Cd was released as a single pulse, the concentration of Cd in the backfilled material would not exceed the corresponding DoH (2006) quality criteria of 0.02mg/L for non-potable water (ibid).

For Cr, any released metal would likely be in the form of negatively charged chromate (CrO$_4^{2-}$) or dichromate (Cr$_2$O$_7^{2-}$). Transport modelling using an assumed adsorption coefficient ($K_D$) of 7L/kg (to simulate the low adsorption potential of the calcrete) showed that the released Cr is expected to travel a maximum distance of 150m from the mine void in the no barrier scenario, and 80m with barriers installed, with levels exceeding 0.05mg/L over this distance. A concentration of 0.05 mg/L corresponds to the DoH guideline value for water used for non-potable purposes (for example bathing) and lies between the ANZECC...
water quality guideline for 90% and 80% protection of marine ecosystems. Cr concentrations below laboratory detection limits (0.001 mg/L) are expected at distances of 200m and 115m for the two barrier scenarios (ibid).

8.14 Contamination from Spillage or Discharge
If not managed appropriately, transport of contaminated water via surface water movement has the potential to impact on groundwater quality. However, if a spill occurred during significant rainfall events that resulted in flooding, the contaminants would be diluted, significantly reducing potential impacts on the local environment in the short and long term. There would be no potable water in the development/mine areas to be impacted upon.

There could be short term impacts on groundwater dependent fauna due to contamination of the phreatic zone and groundwater contact zone, but this is considered only possible after prolonged seepage or catastrophic spillage. Given the unlikelihood of such events occurring due to engineered storage (e.g. double lined/bunded fuel cells) and standard operating procedures, hydrocarbon and chemical spills would be identified and cleaned up and remediated in a timely manner. It is considered that any groundwater contamination in this area would have a minor environmental impact.
9 Environmental Objectives, Targets and Indicators

A series of management objectives, targets and indicators has been developed to manage potential and direct impacts of water management in relation to the Project.

Objectives: what Toro aims to achieve.

Targets: defined objective levels.

Indicators: measures, which are either quantitative or qualitative, to determine whether the objectives have been met.

The environmental objectives, targets and indicators as determined by Toro for groundwater and surface water management are shown in Table 9.1.

Table 9.1 – Environmental Objectives, Targets and Indicators

<table>
<thead>
<tr>
<th>Objectives</th>
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<tr>
<td>SURFACE WATER</td>
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<tr>
<td>Maintain surface water flow patterns in the areas where development is undertaken by Toro (i.e. natural drainage paths) so that environmental values are protected</td>
<td>Minimise impact on downstream watercourses and vegetation communities</td>
<td>Maintain surface water runoff volume in water courses downstream of the development / infrastructure as observed upstream of the development / infrastructure</td>
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<td>Greater soil erosion / sedimentation downstream of development / infrastructure than observed in similar terrain upstream of these Toro facilities</td>
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<td>Results of ongoing vegetation monitoring surveys compared to a “control” area of vegetation</td>
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<td>Siltation (turbidity) of Lake Way at points adjacent to Toro’s developments.</td>
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<td>Minimise ponding of water and growth of invasive vegetation in low-lying areas or areas upstream of constructed bunds or diversions</td>
<td>Ponding and waterlogging</td>
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<td>Soil erosion / sedimentation</td>
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<td>Changes in vegetation characteristics</td>
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<td>Maintain surface water quality in watercourses downstream of the operation</td>
<td>Zero incident reports of contamination to surrounding environment (i.e. surface water runoff from disturbed areas to natural drainage lines)</td>
<td>Incident reports of contamination or non-compliances (i.e. activities not undertaken in accordance with licence conditions (e.g. DEC and DoW))</td>
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<td>No release of hazardous substances produced during mining, transport or construction outside of containment facilities (i.e. ensure bunding of areas where fuel and hazardous materials are used or stored)</td>
<td>Surface water discharge records – regular sampling and analysis of discharge water – note trends on annual basis and identify “outliers” to norm</td>
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<td>Regulatory approval for all discharges into the environment (i.e. no discharges to the environment under normal operating conditions)</td>
<td>Groundwater and/or Lake Way water quality results from ongoing water quality monitoring programmes– note trends on annual basis and identify “outliers” to norm</td>
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<tr>
<td>GROUNDWATER</td>
<td>Abstraction rates at or below predicted sustainable abstraction rates and those allowed by the abstraction licence</td>
<td>Groundwater abstraction (flow meter readings) and water level monitoring records</td>
</tr>
<tr>
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<td>Vegetation condition monitoring results for areas within or adjacent to the dewatering area and water supply borefield(s)</td>
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<tr>
<td>Maintain groundwater quantity (watertable levels) so that environmental values are protected</td>
<td>No change in groundwater quality outside of historical ranges</td>
<td>Incident reports of contamination or non-compliances (i.e. activities not undertaken in accordance with licence conditions (e.g. DEC and DoW)</td>
</tr>
<tr>
<td></td>
<td>No release of hazardous substances outside of containment facilities (i.e. ensure bunding of areas where fuel and hazardous materials are used or stored)</td>
<td>Groundwater quality results from ongoing groundwater monitoring programmes</td>
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<td>All activities undertaken in accordance with licence conditions (e.g. DEC and DoW)</td>
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10 Management Strategies and Actions

10.1 Key Strategies
Detailed surface water and groundwater management strategies would be developed for the construction and operational phases of the Project. Documentation relevant to decommissioning would be developed during the operational phase. Documentation would include specific policies and standard operating procedures, and would be developed in consultation with the Department of Water (DoW) and Department of Environment and Conservation (DEC).

Management strategy objectives would be to:
- Identify potential environmental impacts on groundwater and surface water;
- Implement management and monitoring strategies; and
- Implement an appropriate review process and mechanisms.

10.2 Management Actions
Management actions, reporting and corrective actions are listed in Table 10.1 below.

<table>
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<th>Objective</th>
<th>Management Action</th>
<th>Reporting Mechanisms</th>
<th>Corrective Actions</th>
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<tr>
<td><strong>SURFACE WATER</strong></td>
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| Maintain surface water flow patterns (i.e. natural drainage paths) so that environmental values are protected | • Project facilities located to avoid disturbance where practicable  
• Natural drainages that converge towards the operational mining areas would be intercepted and redirected via a diversion channel to re-enter natural drainage system  
• Site drainage would be designed to ensure surface waters from operational areas were directed to an appropriate sedimentation pond to capture and remove entrained solids prior to release | • Monitoring of vegetation along creek/drainage lines via surveys  
• Monitoring of lake (Lake Way) water levels  
• Flood surveys on a regular basis (e.g. to ensure the facilities did not interrupt significant natural watercourses and storm events could be managed)  
• Inspections and audits | • Review of vegetation and water management plans, including monitoring programmes  
• Review of Standard operating procedures  
• Implementation of findings from review/reports |
| Maintain surface water quality in watercourses downstream of the operation | • Standard operating procedures (e.g. all hydrocarbons and hazardous materials would be stored in secure, bunded areas, and equipment would be serviced in a manner to minimise hydrocarbon spillage and in designated areas | • Monitoring of lake (Lake Way) water quality  
• Surface water discharge records  
• Ongoing water quality monitoring | • Review of vegetation and water management plans, including monitoring programmes  
• Review of |
<table>
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<th>Objective</th>
<th>Management Action</th>
<th>Reporting Mechanisms</th>
<th>Corrective Actions</th>
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</thead>
</table>
| WATER MANAGEMENT | equipped to contain oily waste)  
- Design & installation standards (e.g. drainage water from workshop and washdown areas would be directed via open drains and an oil separation unit (when required) to remove oily wastes in the drainage waters. The “cleaned” water would then be discharged to a settlement pond for evaporation and infiltration, and water storage facilities would be appropriately lined/bunded to prevent leakage) | programmes to provide a quantitative assessment of possible environmental impacts due to drainage discharge and to provide baseline data to assist in the review and improvement of operations  
- Inspections and audits  
- Incident reports | Contractor compliance and inductions  
- Review of Standard operating procedures  
- Implementation of findings from review/reports |
| GROUNDWATER | Comply with conditions of the groundwater abstraction licence(s)  
- Standard operating procedures (e.g. implement water recycling practices, with sustainable water use and water contamination included in the sites’ environmental awareness program)  
- Establishment of drawdown trigger levels for impact on surrounding users and environmental values (i.e. Lake Way and GDEs) | Monitoring of groundwater abstraction (flow meter readings and leakage detection systems) and water levels  
- Monitor potential impacts of altered groundwater levels and maintain acceptable levels (e.g. by altering the pumping regime and/or developing alternative supplementary water supplies)  
- Monitoring of vegetation condition within and adjacent to the dewatering and water supply areas  
- Inspections and audits  
- Incident reports | Review of vegetation and water management plans, including monitoring programmes  
- Review of Contractor compliance and inductions  
- Review of Standard operating procedures  
- Implementation of findings from review/reports |
<table>
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<tr>
<th>Objective</th>
<th>Management Action</th>
<th>Reporting Mechanisms</th>
<th>Corrective Actions</th>
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</table>
| Maintain groundwater quality by ensuring that emissions to groundwater do not adversely affect the environmental values, including preventing groundwater contamination | • Development and implementation of a Groundwater Operation Strategy for all groundwater activities undertaken in accordance with licence conditions (e.g. DEC and DoW)  
• Standard operating procedures (e.g. all hydrocarbons and hazardous materials would be stored in secure, bunded areas, and equipment would be serviced in a manner to minimise hydrocarbon spillage and in designated areas equipped to contain oily waste)  
• Ongoing water quality monitoring programmes would be established to provide a quantitative assessment of possible environmental impacts due to any discharges or seepage.  
• Implementation of Tailings Management Strategy, including monitoring (e.g. tailings composition, seepage) and maintenance (e.g. pipelines, embankment, toe drains) programme. | • Monitoring of groundwater quality (e.g. adjacent to pits, processing area, tailings storage facility, production bores, etc.)  
• Inspections and audits  
• Incident reports | • Review of water management plans, including monitoring programmes  
• Review of Contractor compliance and inductions  
• Review of standard operating procedures  
• Implementation of findings from review/reports |
11 References


**Glossary**

**Alluvium:** Sediments (clays, sands, gravels and other materials) deposited by flowing water. Deposits can be made by streams on river beds, floodplains, and alluvial fans.

**Analytical Model:** Equations that represent exact solutions to the hydraulic equation for one- or two-dimensional flow problems under broad simplifying assumptions, usually including aquifer homogeneity. They can be solved by hand, or by simple computer programs (e.g. Winflow, twodan), but do not allow for spatial or temporal variability. They are useful to provide rough approximations for many applications with little effort, as they usually do not involve calibration (site-specific monitoring data is often not available for these simple problems). This approach can suit most simple, low-complexity modelling studies.

**Aquifer:** Rock or sediment in a formation, group of formations, or part of a formation that is saturated and sufficiently permeable to transmit significant quantities of water to wells and springs. Aquifers generally occur in formations that can also store large volumes of water such as sands, gravels, limestone, sandstone, or highly fractured rocks.

**Aquifer, confined:** An aquifer that is overlain by a confining bed. The hydraulic conductivity of the confining bed is significantly lower than that of the aquifer.

**Aquifer, perched:** A region in the unsaturated zone where the soil may be locally saturated because it overlies a low-permeability unit.

**Aquifer, semi-confined:** An aquifer confined by a low-permeability layer that permits water to slowly flow through it. During pumping of the aquifer, recharge to the aquifer can occur across the confining layer. Also known as a leaky artesian or leaky confined aquifer.

**Aquifer, unconfined:** Also known as water-table and phreatic aquifer. An aquifer in which there are no confining beds between the zone of saturation and the surface. The watertable is the upper boundary of unconfined aquifers.

**Aquifer test:** See pumping test

**Artesian:** Groundwater which rises above the surface of the ground under its own pressure by way of a spring or when accessed by a bore.

**Artesian bores:** Bores having a static water level (head) above the top of the aquifer being tapped. If the head is above ground level, the bore is free-flowing unless capped.

**Baseflow:** The flow in rivers and streams that occurs in dry weather and usually from groundwater inflows.

**Bore (well):** A structure drilled (bore) or dug (well) below the surface to obtain water from an aquifer system.

**Calibration:** The process by which the independent variables (parameters) of a numerical model are adjusted, within realistic limits, to produce the best match between simulated and observed data (usually water-level values). This process involves refining the model representation of the hydrogeologic framework, hydraulic properties, and boundary conditions to achieve the desired degree of correspondence between the model simulations and observations of the groundwater flow system.

**Catchment:** The area of land drained by a river and its tributaries.

**Conceptual model:** A simplified and idealised representation (usually graphical) of the physical hydrogeologic setting and our hydrogeological understanding of the essential flow processes of the system. This includes the identification and description of the geologic and hydrologic framework, media type, hydraulic properties, sources and sinks, and important aquifer flow and surface-groundwater interaction processes.

**Confining layer:** A body of relatively impermeable material that is stratigraphically adjacent to one or more aquifers. It may lie above or below the aquifer.

**Discharge:** The volume of water flowing in a stream or through an aquifer past a specific point in a given period of time.

**Discharge area:** An area in which there are upward components of hydraulic head in the aquifer.

**Diversion:** Surface water diverted for use from the resources of a surface water river basin for supply to both within-basin and external basin consumers.
**Drawdown:** A lowering of the watertable of an unconfined aquifer, or of the potentiometric surface of a confined aquifer. Drawdown is the result of pumping of groundwater from wells.

**EC:** An acronym for electrical conductivity unit. 1 EC = 1 micro-siemens per centimetre, measured at 25°C. It is used as a measure of water salinity (see salinity below).

**Ephemeral watercourse:** A watercourse that does not flow all the time.

**Erosion:** The process in which a material is worn away by a stream of liquid (water) or air, often due to the presence of abrasive particles in the stream.

**Evapotranspiration:** The sum of evaporation and transpiration.

**Flood:** An overflow of water onto lands that are used or usable by man and not normally covered by water. Floods have two essential characteristics: The inundation of land is temporary; and the land is adjacent to and inundated by overflow from a river, stream, lake, or ocean.

**Flood, 100-year:** A 100-year flood does not refer to a flood that occurs once every 100 years, but to a flood level with a one percent chance of being equalled or exceeded in any given year.

**Flow regime:** The pattern of water flow in a river or stream. In undeveloped rivers and streams flow regimes are related to climatic conditions. In regulated rivers (i.e. dammed rivers), flow regimes are often altered from natural patterns.

**Gauging station:** A site on a stream, lake, reservoir or other body of water where observations and hydrologic data are obtained.

**Gigalitre (GL):** 1000 megalitres or 1000 million litres.

**Groundwater:** The water that occurs in pore spaces and fractures in rocks beneath the ground surface. Groundwater is contained in the following types of aquifer: unconfined, confined or artesian aquifer.

**Groundwater and surface water areas:** All the boundaries that are proclaimed under the Rights in Water and Irrigation Act 1914 and used for water allocation planning and management.

**Groundwater dependent ecosystems:** Ecosystems that are dependent on groundwater for their existence and health.

**Groundwater flow model:** An application of a mathematical model to represent a site-specific groundwater flow system.

**Groundwater Model:** An application of a mathematical model to represent a site-specific groundwater flow system. A groundwater model provides a scientific means to synthesise the available data into a numerical characterisation of a groundwater system. The model represents the groundwater system to an adequate level of detail, and provides a predictive tool to quantify the effects on the system of specified hydrological stresses.

**Hydrologic:** Relating to the distribution and movement of water.

**Hydraulic conductivity:** The rate at which water of a specified density and kinematic viscosity can move through a permeable medium (notionally equivalent to the permeability of an aquifer to fresh water).

**Hydraulic gradient:** The change in total head with a change in distance in a given direction which yields a maximum rate of decrease in head.

**Hydrograph:** A graph that shows some property of groundwater or surface water (usually head or flow) as a function of time.

**Hydrologic conditions:** A set of groundwater inflows, outflows, boundary conditions and hydraulic properties that causes potentiometric heads to adopt a distinct pattern.

**Impermeable layers:** Layers of rock that do not allow water to pass through them.

**Indicators:** Any physical, chemical or biological characteristic used as a measure of environmental, social or economic conditions.

**Infiltration:** The flow of water downward from the land surface into and through the upper soil layers.

**Inflows:** Surface water runoff and deep drainage to groundwater (groundwater recharge) and transfers into the water system (both surface and groundwater), for a defined area.
Model calibration: The process by which the independent variables (parameters) of a numerical model are adjusted, within realistic limits, to produce the best match between simulated and observed data (usually water-level values). This process involves refining the model representation of the hydrogeologic framework, hydraulic properties, and boundary conditions to achieve the desired degree of correspondence between the model simulations and observations of the groundwater flow system.

Numerical model: A model of groundwater flow in which the aquifer is described by numerical equations, with specified values for boundary conditions that are usually solved on a digital computer. In this approach, the continuous differential terms in the governing hydraulic flow equation are replaced by finite quantities. The computational power of the computer is used to solve the resulting algebraic equations by matrix arithmetic. In this way, problems with complex geometry, dynamic response effects and spatial and temporal variability may be solved accurately. This approach must be used in cases where the essential aquifer features form a complex system, and where surface-groundwater interaction is an important component (i.e. High complexity models).

Observation well: A non-pumping well used to observe the elevation of the watertable or the potentiometric surface. An observation well is generally of larger diameter than a piezometer and typically is screened or slotted throughout the thickness of the aquifer.

Peak flow: The maximum instantaneous discharge of a stream or river at a given location. It usually occurs at or near the time of maximum discharge.

pH: A measure of the concentration of free hydrogen ions and reported over a logarithmic scale of 1 to 14.

Permeability: The ability of a material to allow the passage of a liquid, such as water through rocks. Permeable materials, such as gravel and sand, allow water to move quickly through them, whereas impermeable material, such as clay, doesn’t allow water to flow freely.

Piezometer: A non-pumping well, generally of small diameter, that is used to measure the elevation of the watertable or potentiometric surface. A piezometer generally has a short well screen through which water can enter.

Porosity: The ratio of the volume of void spaces in a rock or sediment to the total volume of the rock or sediment.

Pumping rate: The rate water is pumped from well.

Pumping test: Also known as an aquifer test. A test made by pumping a well for a period of time at a measured rate and observing the change in hydraulic head in the aquifer. A pumping test may be used to determine the capacity of the well and the hydraulic characteristics of the aquifer.

Recharge: The process that replenishes groundwater, usually by rainfall infiltrating from the ground surface to the watertable and by river water entering the watertable or exposed aquifers. Includes the addition of water to an aquifer.

Recharge boundary: An aquifer system boundary that adds water to the aquifer. Streams and lakes are typically recharge boundaries.

Recoverable groundwater reserve: This is the volume of groundwater that is practically available and recoverable from the aquifer by a borefield. It is defined by prescribing a maximum drawdown in the aquifer not exceeding 70 per cent of the total aquifer thickness.

Regional groundwater systems: Extensive aquifers, which take longer than local systems to respond to increased groundwater recharge because their recharge and discharge sites are separated by large distances (>10 km), and/or they have a deep watertable. Unconfined aquifers with deep watertables that are part of regional flow systems may become, in effect, local flow systems if there is sufficient recharge to cause the watertable to rise close to the surface (<5m).

Runoff: The portion of rainfall that is not immediately absorbed into the soil and which becomes surface flow.

Saline water: Water that contains significant amounts of dissolved solids.
Salinity: The concentration of sodium chloride or dissolved salts in water, usually expressed in EC units or milligrams of total dissolved solids per litre (mg/l TDS). The conversion factor of 0.6 mg/l TDS = 1 EC unit is commonly used as an approximation.

Saturated zone: The zone in which the voids in the rock or soil are filled with water at a pressure greater than atmospheric. The watertable is the top of the saturated zone in an unconfined aquifer.

Sediment: Usually applied to material in suspension in water or recently deposited from suspension. In the plural the word is applied to all kinds of deposits from the waters of streams, lakes, or seas.

Sedimentary aquifers: These occur in consolidated sediments such as porous sandstones and conglomerates, in which water is stored in the intergranular pores, and limestone, in which water is stored in solution cavities and joints. These aquifers are generally located in sedimentary basins that are continuous over large areas and may be tens or hundreds of metres thick. In terms of quantity, they contain the largest groundwater resources.

Seepage: (1) The slow movement of water through small cracks, pores, interstices, etc., of a material into or out of a body of surface or subsurface water. (2) The loss of water by infiltration into the soil from a canal, ditches, laterals, watercourse, reservoir, storage facilities, or other body of water, or from a field.

Sensitivity analysis: The measurement of the uncertainty in a calibrated model as a function of uncertainty in estimates of aquifer parameters and boundary conditions.

Sheet flow: The flow that occurs overland in places where there are no defined channels, and the flood water spreads out over a large area at a uniform depth. This also referred to as overland flow.

Siltation: The deposition of sediments from water in rivers, streams and dams.

Simulation: One complete execution of a groundwater modelling program, including input and output.

Specific capacity: The ratio of the rate of discharge of water from the well to the drawdown of the water level in the well. Specific capacity should be described on the basis of the number of hours of pumping prior to the time the drawdown measurement is made. It will generally decrease with time as the drawdown increases.

Specific storage: The amount of water per unit volume of a saturated formation that is expelled from storage due to compression of the mineral skeleton and the pore water.

Specific yield: The ratio of the volume of water that a given mass of saturated soil or rock will yield by gravity to the volume of that mass.

Storage coefficient (storativity): The volume of water that a conductive unit will expel from storage per unit surface area per unit change in head. In a confined aquifer, it is computed as the product of specific storage and aquifer thickness. In an unconfined aquifer, it is equal to specific yield.

Stormwater: Rainfall that is collected after it has run off urban surfaces.

Stream: A general term for a body of flowing water; natural water course containing water at least part of the year. In hydrology, it is generally applied to the water flowing in a natural channel as distinct from a canal.

Streamflow: The water discharge that occurs in a natural channel. A more general term than runoff, streamflow may be applied to discharge whether or not it is affected by diversion or regulation.

Surface water: Water flowing or held in waterways or wetlands on the surface of the landscape.

Surficial (superficial) aquifers: These occur in alluvial sediments in river valleys, deltas, basins and coastal plains, in lake or lacustrine sediments, and in aeolian or wind-formed deposits. They are essentially unconsolidated clay, silt, sand, gravel, and limestone formations, mainly of quaternary age (under 1.8 million years). These deposits are easily exploited and are the major sources of freshwater groundwater when associated with larger river systems.
**Sustainable flow regime:** The limit on potentially divertible surface water that is allowed to be diverted from a resource after taking account of environmental values and making provision for environmental water needs.

**Total dissolved solids (TDS):** A measure of the salinity of water, usually expressed in milligrams per litre (mg/l). Sometimes TDS is referred to as total dissolved salts, or as TSS, total soluble salts. See also EC.

**Total available groundwater (total groundwater availability):** This is the total volume of groundwater that is potentially available. It is calculated by applying the aquifer specific yield to the saturated aquifer thickness.

**Transmissivity:** The rate at which water is transmitted through a unit width of aquifer of confining bed under a unit hydraulic gradient. The product of saturated thickness and hydraulic conductivity.

**Transpiration:** The loss of water vapour from plants.

**Tributary:** A smaller river or stream that flows into a larger river or stream. Usually, a number of smaller tributaries merge to form a river.

**Turbidity:** The amount of solid particles that are suspended in water and that cause light rays shining through the water to scatter. Thus, turbidity makes the water cloudy or even opaque in extreme cases. Turbidity is measured in nephelometric turbidity units (NTU).

**Unconfined aquifer:** An aquifer that contains the watertable and is normally exposed to the surface. Occasionally there may be a layer overlying this type of aquifer protecting it from the surface.

**Unsaturated zone:** Also known as the zone of aeration and the vadose zone. The zone between the land surface and the watertable. It includes the root zone, intermediate zone, and capillary fringe. The pore spaces contain water at less than atmospheric pressure, as well as air and other gases. Saturated bodies, such as perched groundwater, may exist in the unsaturated zone.

**Watercourse:** A river, stream or creek in which water flows in a natural channel, whether permanently or intermittently

**Watertable:** The saturated level of the unconfined groundwater. Wetlands in low-lying areas are often seasonal or permanent surface expressions of the watertable.

**Water quality:** A term used to describe the chemical, physical, and biological characteristics of water, usually in respect to its suitability for a particular purpose.

**Well:** Bore converted to final design.

**Well development:** The process whereby a well is pumped or surged to remove any fine material that may be blocking the well screen or the aquifer outside the well screen.

**Well efficiency:** The ratio of idealised drawdown in the well, where there are no losses resulting from well design and construction factors, to actual measured drawdown in the well.

**Well screen:** A tubular device with either slots, holes, gauze, or continuous-wire wrap; used at the end of a well casing to complete a well. The water enters the well through the well screen.

**Wetland:** A natural collection of water, whether permanent or temporary, on the surface of any land and includes: any lake, lagoon, swamp or marsh; and a natural collection of water that has been artificially altered, but does not include a watercourse.
Acronyms and abbreviations

**ANZECC**: Australian and New Zealand Environment and Conservation Council  
**ARI**: average recurrence interval  
**ARMCANZ**: Agriculture and Resource Management Council of Australia and New Zealand  
**AS**: Australian Standard  
**DEC**: Department of Environment and Conservation  
**EC**: electrical conductivity  
**EMP**: Environmental Management Plan  
**EPA**: Environmental Protection Authority  
**EP Act**: *Environmental Protection Act 1986*  
**EPBC Act**: *Environmental Protection and Biodiversity Conservation Act 1999*  
**ERMP**: Environmental Review and Management Program  
**DMP**: Department of Mines and Petroleum  
**DoH**: Department of Health  
**DoW**: Department of Water  
**DRET**: Department of Resources, Energy and Tourism  
**GDE**: groundwater dependant ecosystems  
**GWL**: Groundwater Well Licence  
**ha**: hectares  
**MbgL**: meters below ground level  
**PMP**: probable maximum precipitation  
**RIWI Act**: *Rights in Water and Irrigation Act 1914*  
**RL**: relative level  
**RMP**: Radiation Management Plan  
**Toro**: Toro Energy Limited  
**TDS**: total dissolved solids  
**TSF**: tailings storage facility  
**WMP**: Water Management Plan
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1 Introduction

This Groundwater Dependent Vegetation Environmental Management Strategy Document (EMSD) has been prepared by Toro Energy Limited (Toro) to describe management actions to be implemented during the construction and operational phases of the Wiluna Uranium Project (the Project), as well as providing target indicators to ascertain management success of waste (?) during both the construction and operation phases of the Project. A Groundwater Dependent Vegetation Management Plan for the decommissioning phase would be developed if required during the operational phase of the Project.

This EMSD describes how Toro would:

• Identify potential direct and indirect environmental impacts to Groundwater Dependent Vegetation (GDV) from risk assessments related to the proposed Project development;
• Provide environmental indicators, objectives and targets; and
• Implement management measures, methods and reporting, auditing and review.

1.1 Project Overview

The Wiluna Project is in the Murchison region of Western Australia, approximately 960km north east of Perth. It is based on mining two deposits: Centipede and Lake Way. The Centipede deposit is approximately 30km south of the town of Wiluna, and the Lake Way deposit is approximately 15km south of Wiluna. The total Project encompasses Centipede East (tenement number M 53/224), Centipede West (tenement numbers M 53/0113, P53/1355, P53/1356, P53/1357, P53/1396), Lake Way (tenement number M 53/1090) and West Creek borefield (tenement number L 53/0150).

The principal activities planned for the Project include:

• Development and operation of a uranium mine encompassing the Lake Way and Centipede deposits;
• Construction and operation of a uranium ore processing, packing and handling facility;
• Development of the West Creek borefield to supply water to the Project;
• Support facilities including an accommodation village, mine administration buildings and workshops, haul roads, power generation and transmission facilities, communications systems and water and waste management;
• Transport of uranium product within Australia for export; and
• Rehabilitation and closure of the mine and other areas disturbed by the Project.

The proposed total area of disturbance required for the development of the Project over the planned 14-year-life-span is approximately 1,530 hectares (ha) including infrastructure. This area predominantly comprises native vegetation, with the exception of minor areas of existing disturbance associated with roads and access tracks and previous mining activity in the Project locality (Outback Ecology Services, 2010).

This EMSD is part of a suite of plans that deal with other impacts and aspects of the Project. This EMSD is designed to assist Toro and its relevant contractors to undertake GDV management in a manner that is compliant with relevant legislation, and to ensure that GDV management would be done in a way that is safe and environmentally responsible. All management strategies would be periodically reviewed as part of Toro’s commitment to continuous improvement, and for their continued suitability to the Project, particularly during the operational phase.
2 Scope

This EMSD provides a reference for monitoring, reporting and auditing as necessary to minimise identified and potential negative environmental impacts of the Project.

This EMSD is being submitted to the Environmental Protection Authority (EPA) with the Environmental Review and Management Program (ERMP) as part of the environmental assessment and approvals process for the Project.

This EMSD has been prepared based on:
- Toro’s Environment Policy;
- Toro’s Indigenous Relations Policy;
- Relevant Commonwealth and Western Australian legislation;
- Other legal obligations;
- Identified potential direct and indirect environmental impacts from risk assessments;
- Consultants’ reports;
- Relevant permits and standards; and
- Toro’s commitment to continuous improvement.

This EMSD has been developed to:
- Outline the existing information available in relation to GDV relevant to the Project Area;
- Identify and assess potential impacts on GDV from Project activities;
- Describe proposed management and monitoring strategies;
- Demonstrate reporting, auditing and review mechanisms;
- Outline procedures for consultation and complaints; and
- Guide the development of other site specific plans and procedures relevant to the Project.

This EMSD covers the following elements of the Project:
- Construction at and mining of the Lake Way and Centipede deposits;
- Construction and operation of a processing, packing and handling facility;
- Development of the West Creek borefield; and
- General infrastructure including an accommodation village, mine administration buildings and workshops, haul roads, power generation and transmission facilities, communications systems and water and waste management.
3 Legislative Requirements

Toro would comply with all relevant legislation that applies to the GDV management aspects of the construction and operational phases of the Project. In relation to GDV management, the following legislation is applicable:

**Western Australian Legislation**
- *Environment Protection Act 1986*

3.1 Other Applicable Guidelines and Standards
This EMSD outlines the scope of the proposal and the potential impacts that have been identified by Toro. The risk assessment process is based upon the framework stated with the Australian Standard AS4360 titled ‘Risk Management’ along with the Guide HB203 titled ‘Environmental Risk Management — Principles and Process’.

The following Toro documents should be read in conjunction with this EMSD:
- Water Environmental Management Strategy; and

**Table 1 Western Australian Guidelines, Policies and Standards**

<table>
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<tbody>
<tr>
<td>Environmental Protection Authority</td>
<td>Guidance Statement No 6 – Rehabilitation of Terrestrial Ecosystems (2006)</td>
</tr>
</tbody>
</table>
4 Related Toro Environmental Documents

The following Toro documents were considered in the completion of this EMSD:

- Chapters 1 and 2 from the Environmental Review and Management Programme (ERMP) (Toro, June 2011)
- Interim Assessment of the Flora and Vegetation at the Toro Energy Wiluna Uranium Project: Lake Way, Centipede and Borefield (Niche Environmental Services, 2010)
5 Groundwater Dependent Vegetation

A groundwater-dependent ecosystem (GDE) is an ecosystem that requires access to groundwater so that ecological structure and function can be maintained (Murray et al., 2006). Within the broad definition of a GDE, there are three distinct groupings:

- Aquifer and cave ecosystems, which provide habitat for stygofauna;
- Ecosystems that are dependent on surface expressions of groundwater. These systems include rivers and streams, wetlands, mound-springs and floodplains; and
- Ecosystems that are dependent on subsurface groundwater. There is no surface expression of groundwater required in this class of GDE (Eamus et al., 2006).

The aquifer and cave ecosystems are recognised as habitat for fauna (Eamus et al., 2006; Humphrey et al., 2006) and whilst they may form part of the groundwater system associated with vegetation, they are not considered further in this Strategy. The remaining two systems are generally defined and discussed in relation to vegetation, but this is not indicative of an absence of fauna or other life forms (Eamus et al., 2006). Of the two remaining systems, the subsurface GDE class is considered to be relevant to this Strategy.

The dependency on groundwater of a species within a GDE can be defined as facultative and obligate (ibid). A GDE is considered to be obligate if, at the species level, the presence of a species is dependent upon access to continuous, seasonal or episodic access to groundwater (ibid). A GDE is considered to be facultative if a species uses groundwater when it is available, but does not demonstrate any loss of vegetative cover in the absence of groundwater (O’Grady et al., 2006). Defining whether a system is facultative or obligate is considered to be relevant to understanding how changes in groundwater access will impact the vegetation.

During surveys conducted by Niche Environmental Services (2011), a number of vegetation units were inferred as being GDV. The inference of dependency on groundwater was based on the criteria listed in Eamus et al. (2006). The GDV in the Project Area was considered to be reliant on the subsurface presence of groundwater, as defined in Eamus et al. (2006). This assertion is based on the following:

- The groundwater or capillary fringe above the water table is likely to be within the rooting depth of any of the vegetation;
- A proportion of the vegetation remains green and is likely to be physiologically active during extended dry periods;
- The vegetation associated with the subsurface groundwater is different, in terms of species composition and phenology, to the surrounding vegetation; and
- The annual use of water by vegetation is considered to be significantly greater than the annual rainfall.

No direct assessment to develop an understanding of the environmental water requirements and degree of dependency on groundwater of the GDV was undertaken. Accordingly, the status is being inferred.

The inferred GDV is located within the Centipede and Lake Way deposits and the West Creek borefield. The inferred GDV recorded during the surveys is detailed in Niche Environmental Services (2011). A summary of the inferred GDV, its location within the Project Area and inferred groundwater preference is provided in Table 2. The inferred groundwater preference is based on data provided by RPS Aquaterra (2010a, 2010b).
Table 2: Summary of Groundwater-dependent Vegetation in the Toro Energy Wiluna Uranium Project

<table>
<thead>
<tr>
<th>Vegetation unit</th>
<th>Location</th>
<th>Inferred groundwater preference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay Plains</td>
<td>Eucalyptus camaldulensis</td>
<td>Borefield</td>
</tr>
<tr>
<td>Open Woodland</td>
<td>over Acacia spp.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Brackish</td>
</tr>
<tr>
<td>Clay plains</td>
<td>Melaleuca interioris</td>
<td>Borefield</td>
</tr>
<tr>
<td>Low Forest B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Claypan</td>
<td>Frankenia spp. Dwarf Scrub</td>
<td>Lake Way</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Saline</td>
</tr>
<tr>
<td>Claypan</td>
<td>Tecticornia spp. Heath</td>
<td>Lake Way</td>
</tr>
<tr>
<td>Dwarf Scrub</td>
<td></td>
<td>Saline</td>
</tr>
<tr>
<td>Creekline</td>
<td>E. camaldulensis Woodland</td>
<td>Borefield</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Brackish</td>
</tr>
<tr>
<td>Drainage line</td>
<td>E. camaldulensis Woodland</td>
<td>Borefield</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Brackish</td>
</tr>
<tr>
<td>Fringing</td>
<td>M. xerophila Forest</td>
<td>Centipede and Lake Way</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Brackish</td>
</tr>
<tr>
<td>Salt lake</td>
<td>Frankenia spp. Dwarf Scrub</td>
<td>Lake Way</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Saline</td>
</tr>
<tr>
<td>Salt lake</td>
<td>Tecticornia spp. Heath</td>
<td>Centipede and Lake Way</td>
</tr>
<tr>
<td>Dwarf Scrub</td>
<td></td>
<td>Saline</td>
</tr>
</tbody>
</table>
6 Overview of potential impacts

GDV is susceptible to changes in the availability and quality of groundwater. GDV generally have an underlying requirement for water, known as an environmental water requirement (EWR). The EWR is the amount of water required for the maintenance of ecological attributes of GDEs (Eamus & Froend, 2006). The EWR can be determined using methods as defined in Eamus & Froend (2006). Determining the EWR of a GDE requires an understanding of the groundwater requirements for maintaining ecosystem features (ibid). EWRs have a spatial and temporal context and include quantity and duration of access to groundwater (ibid). In the absence of determination of EWRs, an accurate assessment of impacts to GDV as a consequence of changes in groundwater cannot be made.

Groundwater is considered to be critical for maintaining ecosystem processes such as flowering, seed set and germination as well as the establishment and development of seedlings (Eamus et al., 2006). However, it is important to determine the degree of dependency on groundwater, as this will affect how changes to groundwater availability affect species and GDV (ibid). Understanding the degree of dependency can be used as a guide to develop the safe limits for changes to groundwater (ibid).

A full assessment of impacts can only be made once baseline data for the GDV has been completed. The assessment should collect information in relation to the extent of use of groundwater, the degree of dependency and the current condition of vegetation. In particular, the degree of dependency on groundwater and potential impacts to changes in groundwater availability need to be understood, as this influences the potential scale of impacts. Based on the current knowledge of the GDV, there is one direct and three indirect impacts associated with the Project.

Direct impact:
- Clearing.

Indirect impacts:
- Groundwater abstraction;
- Drought; and
- Changes to groundwater characteristics.

6.1 Clearing
The main direct impact associated with GDV in the Project Area pertains to clearing. The extraction of the ore would require clearing within three GDVs, specifically the salt lake Tecticornia spp. Heath and Dwarf Scrub, the salt lake Frankenia spp. Dwarf Scrub and the Fringing Melaleuca xerophila Forest. In addition to this, there may be a need to clear other GDV for the development of Project-related infrastructure.

The potential for direct impacts due to clearing ranges from low to high. While the extent of clearing and location of infrastructure required for the Project would be planned to ensure that impacts to GDV would be minimised, the ore bodies are located under Tecticornia species vegetation units. These have been identified as GDV. The impacts to these units within the Project Area are considered to be high. There would also be clearing within the Frankenia vegetation units and the Melaleuca vegetation units in the Centipede and Lake Way deposits. Impacts to these units as a consequence of clearing are considered to be moderate. There is limited clearing planned that would affect other GDV in the Project Area. Therefore, impacts to these units are considered to be low.
6.2 Groundwater abstraction
The abstraction of groundwater from aquifers would potentially create an indirect impact on GDV. This is particularly relevant in the West Creek borefield, where the aquifer from which groundwater would be sourced is located under GDV, notably aquifers hosting *Eucalyptus camaldulensis*. The acceptable degree of change to groundwater levels should be determined by utilising a combination of assessments of environmental impacts to vegetation and community consultation on the impacts (Eamus et al., 2006).

The potential for impacts to GDV as a consequence of groundwater abstraction is considered to be low to moderate. The projected rate of extraction and consequent reduction in the water table within the borefield has been modelled by RPS Aquaterra (2010a, 2010b). The analysis predicts a reduction of 4m in the depth to groundwater in the borefield. To better understand how this compares to changes under natural conditions, data analysis is continuing.

6.3 Drought
Drought impacts on the availability of groundwater by altering recharge rates of aquifers. Where recharge rates are reduced as a consequence of drought, there may be a reduction in the quality and availability of groundwater. Longer term changes to recharge rates may result in changes to the depth at which groundwater is available, which may reduce the capacity of GDV to access the groundwater. The effects of drought may be magnified due to interactions with proposed rates of groundwater abstraction.

The potential for impacts due to drought are difficult to assess in detail. The characteristics of droughts, in relation to intensity and duration, are not uniform and are therefore not readily predicted. In the context of climate change, there is the potential that droughts may be longer than previously recorded. In this instance, drought impacts may be higher than currently predicted. To minimise impacts to GDV from the Project, monitoring of vegetation condition would be implemented and an assessment of requirements then made.

6.4 Changes to groundwater characteristics
Species using groundwater have evolved to utilise water within a range of conductivity and containing certain chemicals. Changes to the quality or characteristics of groundwater are noted as being important to GDEs (Eamus et al., 2006). The quality of groundwater in the Project Area has been assessed by RPS Aquaterra (2010a, 2010b). Given that this information is available, monitoring in relation to changes can be made over time. Once linked with the condition of vegetation, the impacts of changes will be better understood. Considerations in relation to changes to groundwater characteristics and the factors leading to changes, such as spills, are dealt with in the Water Management Strategy.

The use of any hydrocarbons or other potential contaminants would be managed according to regulatory and licence conditions and best practice. Compliance monitoring would be used to ensure that these were adhered to. In addition to this, there would be appropriate spill management procedures in place to manage any incidents that could lead to contamination of groundwater. By using the combination of these, it is predicted that the potential risk of changes to groundwater characteristics would be low.
7 Environmental Objectives, Targets and Indicators

A series of management objectives, targets and indicators have been developed to manage potential and direct impacts to fauna species in relation to the Project.

Objectives: what Toro aims to achieve.

Targets: defined objective levels.

Indicators: measures, which are either quantitative or qualitative, to determine whether the objectives have been met.

Objectives: Eamus (2009) lists two threats to GDEs; loss of habitat and loss of groundwater resources. Based on this, the overarching objective of this EMSD is to develop a framework to reduce these impacts to GDV during the development and operation of the mine. The objectives have been defined in relation to GDV only, and do not consider objectives in relation to changes in groundwater, as these are detailed in the Groundwater EMSD. The key objectives in relation to GDV are:

- Minimise clearing of GDV; and
- Maintain the condition of GDV located over aquifers from which groundwater would be extracted.

The environmental objectives, targets and indicators as determined by Toro for GDV management are shown in Table 3.

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Targets</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimise clearing of GDV</td>
<td>Clearing envelopes of GDV within the Project Area to be kept to the smallest extent. No unnecessary clearing of GDV to occur.</td>
<td>Clearing envelopes to be well defined and documented, with clearing undertaken only when required.</td>
</tr>
<tr>
<td>Maintain condition of GDV</td>
<td>Condition of GDV to be maintained to pre-disturbance level.</td>
<td>No evidence of a loss of condition of GDV that is within or close to areas where groundwater abstraction is occurring or where the potential for contamination to groundwater exists.</td>
</tr>
</tbody>
</table>
8 Management Strategies and Actions

8.1 Key strategies
Detailed GDV management documentation would be developed for the construction and operational phases of the Project. Documentation relevant to decommissioning would be developed during the operational phase. Documentation would include specific policies and standard operating procedures, and would be developed in collaboration with the Department of Environment and Conservation (DEC).

8.2 Management Actions
Management actions, reporting and corrective actions are listed in Table 4.

<table>
<thead>
<tr>
<th>Objective</th>
<th>Management Action</th>
<th>Reporting Mechanisms</th>
<th>Corrective Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimise clearing of GDV</td>
<td>‣ Standard operating procedures (e.g. GDV boundaries to be clearly defined with appropriate documentation, such as by using remote sensing).&lt;br&gt;‣ Clearing of GDV only to occur if no other option is available.</td>
<td>‣ Audits, vegetation surveys and inspections&lt;br&gt;‣ Incident reports</td>
<td>‣ Review audit and inspection reports.&lt;br&gt;‣ Review assessment process and clearing envelopes to ensure objective of minimal clearing is met.</td>
</tr>
<tr>
<td>Maintain condition of GDV</td>
<td>‣ Standard operating procedures</td>
<td>‣ Baseline and annual monitoring to be undertaken.&lt;br&gt;‣ Audit and inspections (including review of groundwater extraction volumes and climate data)</td>
<td>‣ Review audit and inspection reports (e.g. where negative changes to condition of vegetation are noted, review records of rates of extraction of groundwater and environmental conditions)</td>
</tr>
</tbody>
</table>
9 References


Glossary

**Facultative**: Able to exist under a range of environmental conditions, a specific factor is not essential.

**Groundwater-dependent ecosystem**: An ecosystem that is dependent upon access to groundwater to maintain ecosystem functions.

**Groundwater-dependent vegetation**: Vegetation that is dependent upon access to groundwater to maintain functional processes.

**Leaf area index**: The ratio of the total leaf area of the canopy to the ground area covered by the canopy.

**Obligate**: Able to exist and survive only under specific environmental conditions, a specific factor/s is/are required.

**Stomata**: Plural term for stoma, which are minute pores located on the epidermis of a leaf through which gases and water vapour pass.

**Stygofauna**: Fauna that reside within groundwater systems.

**Subsurface**: Below the surface of the ground.

**Water potential**: Refers to the tendency of water to move from one area to another, generally due to osmosis, gravity or mechanical pressure.
**Acronyms and abbreviations**

**EPA:** Environmental Protection Authority  
**GDE:** Groundwater-dependent ecosystem  
**GDV:** Groundwater-dependent vegetation  
**LAI:** Leaf area index  
**MODIS:** Moderate Resolution Imaging Spectroradiometer

**Figures**
Figure 1 Inferred groundwater-dependent vegetation within the proposed Toro Energy Wiluna Project borefield.
Figure 2: Inferred groundwater-dependent vegetation within the proposed Toro Energy Centipede project area
Figure 3 Inferred groundwater-dependent vegetation within the proposed Toro Energy Lake Way project area.
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<td><strong>Original Date:</strong></td>
<td>January 2011</td>
</tr>
<tr>
<td><strong>Author:</strong></td>
<td>R. Wedd</td>
</tr>
<tr>
<td><strong>Revision Date:</strong></td>
<td>July 2011</td>
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<tr>
<td><strong>Approved by:</strong></td>
<td>R. Dossor</td>
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</tbody>
</table>
1 Introduction

This Fauna Environmental Management Strategy Document (EMSD) has been prepared by Toro Energy Limited (Toro) to describe management actions to be implemented during the construction and operational phases of the Wiluna Uranium Project (the Project), as well as providing methods to determine fauna management success during the construction and operation of the Project. A Fauna Management Plan for the decommissioning phase would be developed if required during the operational phase of the Project.

This EMSD describes how Toro would:

- Comply with relevant legislation and standards for fauna management;
- Identify potential direct and indirect environmental impacts to fauna species;
- Provide environmental indicators, objectives and targets; and
- Implement management measures, methods and reporting, auditing and review.

This EMSD is part of a suite of plans that deal with impacts and aspects of the Project. This EMSD is designed to assist Toro employees and contractors to undertake fauna management in a manner that is compliant with relevant legislation, safe and environmentally responsible. All management plans and strategies would be periodically reviewed as part of Toro’s commitment to continuous improvement, and for their continued application to the Project, particularly during the operational phase.

1.1 Project Overview

The Wiluna Project is in the Murchison region of Western Australia, approximately 960km north east of Perth. It is based on mining two deposits: Centipede and Lake Way. The Centipede deposit is approximately 30km south of the town of Wiluna, and the Lake Way deposit is approximately 15km south of Wiluna. The total Project encompasses Centipede East (tenement number M 53/224), Centipede West (tenement numbers M 53/0113, P53/1355, P53/1356, P53/1357, P53/1396), Lake Way (tenement number M 53/1090) and the West Creek borefield (tenement number L 53/0150).

The principal activities planned for the Project include:

- Development and operation of a uranium mine encompassing the Lake Way and Centipede deposits;
- Construction and operation of a uranium ore processing, packing and handling facility;
- Development of the West Creek borefield to supply water to the Project;
- Support facilities including an accommodation village, mine administration buildings and workshops, haul roads, power generation and transmission facilities, communications systems and water and waste management;
- Transport of uranium product within Australia for export; and
- Rehabilitation and closure of the mine and other areas disturbed by the Project.

The proposed total area of disturbance required for the development of the Project over the planned 14-year-life-span would be approximately 1,530 hectares (ha) including infrastructure. This area predominantly comprises native vegetation, with the exception of minor existing disturbance associated with roads and access tracks and previous mining activity in the Project locality (Outback Ecology Services 2010).
2 Scope

This EMSD provides a reference for monitoring, reporting and auditing as necessary to minimise identified and potential environmental impacts of the Project.

This EMSD is being submitted to the Environmental Protection Authority (EPA) with the Environmental Review and Management Programme (ERMP) as part of the environmental assessment and approvals process for the Project.

This EMSD has been prepared based on:
- Toro’s Environment Policy;
- Toro’s Indigenous Relations Policy;
- Toro’s Occupational Health and Safety Policy;
- Relevant Commonwealth and Western Australian legislation;
- Other legal obligations;
- Identified potential direct and indirect environmental impacts from risk assessments;
- Consultants’ reports;
- Relevant permits and standards; and
- Toro’s commitment to continuous improvement.

This EMSD has been developed to:
- Outline the existing information available in relation to fauna species (both native and introduced) relevant to the Project Area;
- Identify and assess potential impacts on these species from Project activities;
- Describe proposed management and monitoring strategies;
- Demonstrate reporting, auditing and review mechanisms;
- Outline procedures for consultation and complaints; and
- Guide the development of other site specific plans and procedures relevant to the Project.

This EMSD covers the following phases of the Project:
- Construction and mining of the Lake Way and Centipede deposits;
- Construction and operation of a processing, packing and handling facility;
- Development of the West Creek borefield; and
- General infrastructure including an accommodation village, mine administration buildings and workshops, haul roads, power generation and transmission facilities, communications systems and water and waste management.
3 Legislative Requirements

Toro would comply with all relevant Commonwealth and State legislation and regulations that apply to the fauna management aspects of the construction and operational phases of the Project. In relation to fauna management, the following legislation is applicable:

**Commonwealth Legislation**

**Western Australian Legislation**
- *Agriculture and Related Resources Protection Act 1976;*
- *Environment Protection Act 1986;*

3.1 Other Applicable Guidelines and Standards

This EMSD outlines the scope of the proposal and the potential impacts that have been identified by Toro. The risk assessment process is based upon the framework stated with the Australian Standard AS4360 titled "Risk Management" along with the Guide HB203 titled "Environmental Risk Management — Principles and Process".

The following Toro documents should be read in conjunction with this EMSD:
- Weed Management Strategy;
- Fire Management Strategy;
- Cultural Heritage Management Plan;
- Groundwater Dependent Ecosystem Flora Management Strategy;
- Vegetation Clearing and Earthworks Management Strategy;
- Dust Management Strategy; and
- Water Management Strategy.

3.1.1 Western Australian guidelines, policies and standards

**Table 1. Western Australian Guidelines, Policies and Standards**

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<tr>
<td>Environmental Protection Authority</td>
<td>Guidance Statement No 8 (Draft) – Environmental Noise (2007)</td>
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<tr>
<td>Environmental Protection Authority</td>
<td>Guidance Statement No 19 – Environmental Offsets – Biodiversity (2008)</td>
</tr>
<tr>
<td>Environmental Protection Authority</td>
<td>Guidance Statement No 20 – Sampling of Short Range Endemic Invertebrate Fauna for Environmental Impact Assessment in Western Australia (2009)</td>
</tr>
</tbody>
</table>
4 Related Toro Environmental Documents

The following Toro documents were taken into account in the completion of this EMSD:

- Chapters 1 and 2 from the Environmental Review and Management Programme (ERMP) (Toro, June 2011).
5 Vertebrate Fauna Species

No threatened fauna species listed under the Commonwealth Environment Protection and Biodiversity Conservation Act, 1999 (EPBC Act) or Western Australian Wildlife Conservation Act, 1950 (WC Act), or Priority fauna species listed under the Western Australia Department of Environment and Conservation (DEC) Priority Species List, were recorded during surveys conducted in the Project Area, nor have been previously recorded in the Project Area.

Two conservation significant fauna species listed under the EPBC Act as Migratory were recorded within the Project Area during these surveys; the Rainbow Bee Eater (*Merops ornatus*) and Sharp-tailed Sandpiper (*Calidris acuminatus*). Based on database search results, available literature and findings of previous terrestrial fauna surveys, it is considered an additional 18 conservation significant fauna species could occur within the Project Area, comprising:

- Five species listed under the EPBC Act and WC Act: the Mulgara (*Dasycercus cristicauda* - Vulnerable and Schedule 1); Malleefowl (*Leipoa ocellata* - Vulnerable and Schedule 1); Slender-billed Thornbill (*Acanthiza iredalei iredalei* – Vulnerable); Major Mitchell’s Cockatoo (*Cacatua leadbeateri* - Schedule 4); and Peregrine Falcon (*Falco peregrinus* - Schedule 4)
- Four priority species listed under the Western Australia DEC Priority Species List: the Australian Bustard (*Ardeotis australis* - P4); Bush Stone-curlew (*Burhinus grallarius* - P4); the Grey Falcon (*Falco hypoleucos* - P4); and the Striated Grasswren (*Amytornis striatus striatus* – P4); and

This data represents the results of two fauna surveys conducted over the Project Area for Toro, a summary of terrestrial fauna species previously recorded in the Project Area and surrounds between 1978 and 2010 and a database search of available literature. A full species list from fauna surveys, and the report ‘Outback Ecology Services, 2010. Toro Energy Limited Wiluna Uranium Project, Terrestrial Fauna Assessment, September 2010, Draft Interim Report’ is for an Appendix to the ERMP.

5.1 Short Range Endemic Invertebrate Fauna

Three species have been recorded from within the Project Area, Aname MYG177, Kwonkan MYG175 (Figure 1) and Urodacus ‘yeelirrie’, although they have also been recorded at other regional sites. Urodacus ‘yeelirrie’ appears to be relatively common, and is known to occur at locations other than Lake Way. Aname MYG17 was recorded from a habitat that is widespread within the study area. From data collected to date (Outback Ecology Services, 2011), there are no known putative short range endemic (SRE) invertebrate fauna species which are restricted in their occurrence to the Project Area.

Habitats within the Project Area that have a moderate to high potential to support SRE species include Melaleuca Stands, Chenopod Floodplain and the Mallee/Mulga complex over Spinifex. The Melaleuca Stands habitat is fringing and has a patchy distribution around Lake Way and does not appear to be well represented out of the Project Area. The Chenopod Floodplain and the Mallee/Mulga complex over Spinifex habitats are moderately to well represented at the local scale outside of the Project Area (Outback Ecology Services, 2010).
6 Overview of potential impacts

Potential adverse direct and indirect impacts from the Project may include:

Direct:
- Habitat removal, loss and/or modification (including altered fire regimes);
- Deliberate interference with animals (e.g. collecting, shooting, hunting); and
- Interaction with vehicles.

Indirect:
- Noise and vibration;
- Light;
- Dust;
- Radionuclide concentration increase beyond natural background levels;
- Introduced flora;
- Introduced fauna; and
- Putrescible waste (e.g. food scraps) from accommodation camp and other facilities.

6.1 Habitat Removal, Loss and/or Modification
Clearing of vegetation would be a necessary part of Project development, and represent the most direct impact on the habitats and fauna assemblages present within the Project Area. Loss of habitat is listed as a key threatening process under the EPBC Act. Many animals may disperse to other areas during progressive clearing activities, although SRE invertebrate fauna species have relatively poor powers of dispersal and are therefore more likely to be directly impacted by clearing activities. The clearing process may displace some species. However, most of the 19 habitats present over the Project Area are widely represented throughout the region, so there is opportunity for displaced fauna to seek refuge in surrounding habitat outside the disturbance area. Loss of habitat is therefore not considered to be a significant risk to local faunal populations.

The greatest risk to fauna populations in relation to fire is likely to be from altered fire regimes. Fires cause habitat destruction, and species with relatively poor powers of dispersal such as SRE invertebrate fauna are more likely to be directly impacted by fire. However, as SRE invertebrate fauna are not considered to be restricted to the Project Area, fire is not considered to be a significant risk to populations.

No permanent water source is present within the Project Area. Dewatering of mining pits may involve the creation of artificial water bodies via pumping of groundwater from the pits to evaporation ponds. Additional artificial water bodies including process water dams and turkey’s nests may also be created as part of the Project. These may present a minor entrapment risk for vertebrate mammal species such as kangaroos (e.g. *Macropus robustus*, *M. rufus*) (Outback Ecology Services, 2010).

Permanent accumulation of saline water would not produce suitable waterbird habitat as this water would be hypersaline and above the tolerance range for the invertebrate fauna that form the basis of their diet (Bamford et al., 2008). Further, there are water bodies nearby that support a greater abundance and diversity of aquatic fauna, which represents a more important food source for waterbirds (e.g. Lake Violet, Uramurdah Claypan). (Outback Ecology Services, 2005).
6.2 Deliberate Interference with Animals
Deliberate interference with animals includes shooting, fauna collection (including eggs, skins and feathers) or deliberate disturbance. Management plans, policies and procedures would be implemented by Toro to ensure avoidance of deliberate interference with animals. Hunting by Traditional Owners occurs in the area (Niche 2011b), for example kangaroo and goanna. Access to the Project Area would be restricted at various times and locations. Deliberate interference is therefore not considered to represent a major impact to local faunal populations.

6.3 Interaction with Vehicles
Vehicle collisions typically only involve individual animals and are considered unlikely to have any lasting impact on a population.

6.4 Noise and Vibration
The development of the Project would generate noise and substantial vibration due to machinery, the operation of the processing plant, power plant, heavy and light vehicles and the general presence of people. General responses to noise across a wide variety of animal species range from interruptions in feeding and resting behaviour to complete abandonment of an area. Noise may lead to reduced population densities in small mammals, nest failure and decreased population densities in birds (Slabbekoorn & Ripmeester 2008) and abandoning of roost sites and a reduced hunting efficiency in bats due to disturbance of their echolocation system. Constant levels of noise also interfere with species communication. This is known as acoustic interference (Parris & Schneider 2009). Species that may be especially at risk of disturbed communication are those that use calls to communicate over larger distances such as the Bush Stone-curlew, which is a listed Priority 4 species (Outback Ecology Services, 2010).

The results of a noise assessment show that the noise from the proposed mine and processing plant is predicted to achieve compliance with the Environmental Protection (Noise) Regulations 1997 at all noise sensitive premises (Lloyd George Acoustics, 2011).

6.5 Light
The Project would result in an increase in exposure of fauna to artificial light. Artificial light from mining activities may have detrimental effects on resident bird, mammal and reptile species, as it may interfere with biological and behavioural activities that are governed by the length of day or photoperiod, including reproduction, dormancy, foraging and migration (Bradshaw & Holzapfel 2007, Le Corre et al. 2002). Light pollution has also been shown to interfere with timing of songbird choruses, potentially leading to reduction in breeding success or survival (Miller, 2006) (Outback Ecology Services, 2010). Unmanaged or poorly designed light sources may therefore have a negative impact on animals but with management it is considered unlikely that they would have any lasting impact on populations.

6.6 Dust
Impacts to fauna species from dust are indirect, through potential impacts to their habitat and vegetation. It is considered unlikely that dust impacts would have any lasting impact on a population.

6.7 Introduced Flora
Environmental weeds may be brought in by mobile mining equipment. By establishing and growing faster than native species, weeds can occupy niches that would otherwise be occupied by native species. Over time, the competitive interactions between weed and native species can result in the loss of native species (Niche 2011a). Weed invasion is widely recognised as having a
negative impact on fauna species as it can alter the composition and structure of vegetation communities. Invasion by non-native species typically results in declines in native plant species richness, but the response of fauna may be more complicated (Outback Ecology Services, 2010).

The invasive weed, *Acetosa vesicaria* (ruby dock) was recorded during surveys over the Centipede deposit. All other species of weeds recorded during the surveys within the Project Area were not identified as being environmental weeds or declared plants pursuant to Section 37 of the *Agriculture and Related Resources Protection Act*, 1976. There are other species with the potential to occur in the Project Area, based on known distribution and habitat preference. Critical amongst these are; *Tamarix aphylla* (athel pine); *Opuntia stricta* (prickly pear); *Cenchrus ciliaris* (buffel grass); and, *Eragrostis curvula* (Africa lovegrass). It should be noted that these species are not currently known from within the Project Area, but are considered to be species that, if introduced into the Project Area, would have the capacity to establish and thrive (Niche 2011a). The current known weed presence within the Project Area is considered unlikely to have any lasting impact on faunal populations.

6.8 **Introduced Fauna**

Introduced fauna cause fundamental changes to ecosystems, and have led to the decline and extinction of many species in Australia (Abbott, 2002; Burbidge & McKenzie 1989; Ford *et al.*, 2001; Short & Smith, 1994). Additionally, predation of native fauna by the fox and feral cat is listed as a key threatening process under the EPBC Act.

Eleven introduced fauna species have been recorded in the Project Area or within the region, as determined by database and literature searches, including the House Mouse (*Mus musculus*), Wild Dog (*Canis lupus dingo*), Feral Cat (*Felis catus*), Red Fox (*Vulpes vulpes*), European Rabbit (*Oryctolagus cuniculus*), Horse (*Equus caballus*), Donkey (*Equus asinus*), Dromedary Camel (*Camelus dromedarius*), Goat (*Capra hircus*), Sheep (*Ovis aries*) and European Cattle (*Bos taurus*). While several introduced herbivores are domesticated within the Study Area (European Cattle, Horse), other species are considered to be feral animals. Together, these introduced herbivores have been responsible for the widespread degradation of much of semi-arid Australia due to overgrazing (Morton, 1990), (Outback Ecology Services, 2010).

As these introduced species have been present for a considerable time, it is not considered that they will have a major impact on native populations within the Project Area.

6.9 **Putrescible Waste**

Development of the Project may provide additional resources or habitat (e.g. via an accommodation village or potential landfill) that may encourage feral animal activity and numbers that may adversely impact on populations of native fauna. Waste that is not managed appropriately has the potential to impact on local populations.
7 Environmental Objectives, Targets and Indicators

A series of management objectives, targets and indicators has been developed to manage potential and direct impacts to fauna species in relation to the Project.

Objectives: what Toro aims to achieve.

Targets: defined objective levels.

Indicators: measures which are either quantitative or qualitative, to determine whether the objectives have been met.

The environmental objectives, targets and indicators as determined by Toro for fauna management are shown in Table 2.

Table 2. Objectives, Target and Indicators

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Targets</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce habitat clearing</td>
<td>Minimise potential impacts to fauna habitat</td>
<td>No vegetation clearing outside of authorised areas</td>
</tr>
<tr>
<td>Minimise detrimental impacts of fires to fauna</td>
<td>Zero incident reports of fauna deaths/injuries from fire</td>
<td>Results of fauna surveys and people's observations</td>
</tr>
<tr>
<td>No deliberate interference with animals by Toro staff or contractors</td>
<td>Zero incident reports of fauna interference</td>
<td>Results of fauna surveys and people's observations</td>
</tr>
<tr>
<td>Minimise potential fauna and vehicle interactions</td>
<td>Zero incident reports of fauna to vehicle interactions</td>
<td>Results of fauna surveys</td>
</tr>
<tr>
<td>Minimise fauna egress to evaporation pond</td>
<td>Zero incident reports of fauna accessing evaporation pond</td>
<td>Results of fauna surveys</td>
</tr>
<tr>
<td>Minimise potential impacts to fauna from noise</td>
<td>No observable impact on fauna species during construction and operation</td>
<td>Results of fauna surveys</td>
</tr>
<tr>
<td>Light spillage to be minimised</td>
<td>No observable impact on fauna breeding behaviour</td>
<td>Results of fauna surveys</td>
</tr>
<tr>
<td>Minimise potential impacts from dust</td>
<td>No observable impact on fauna species during construction and operation</td>
<td>Results of fauna surveys</td>
</tr>
<tr>
<td>No net increase in radionuclide concentration in local fauna</td>
<td>No net increase in radionuclide concentration in local fauna</td>
<td>Results of laboratory analysis</td>
</tr>
<tr>
<td>Reduce impacts from introduced flora from Toro operations</td>
<td>No introduction of new weeds into the Project Area</td>
<td>No introduction of new weeds into the Project Area</td>
</tr>
<tr>
<td></td>
<td>No further spread of weeds within the Project Area</td>
<td>No further spread of weeds within the Project Area</td>
</tr>
<tr>
<td>Reduce impacts from introduced fauna as a result of Toro operations</td>
<td>No introduction of new introduced animal species into the Project Area</td>
<td>Results of fauna surveys and observations</td>
</tr>
<tr>
<td></td>
<td>Management of introduced animal species within the Project Area</td>
<td></td>
</tr>
<tr>
<td>Minimise potential impacts to fauna from waste generated onsite</td>
<td>No observable impact on fauna species during construction and operation</td>
<td>Results of fauna surveys and people observations</td>
</tr>
</tbody>
</table>
8 Management Strategies and Actions

8.1 Key strategies
Detailed fauna management documentation would be developed for the construction and operational phases of the Project. Documentation relevant to decommissioning would be developed during the operational phase. Documentation would include specific policies and standard operating procedures, and would be developed in collaboration with the Department of Environment and Conservation (DEC).

Management strategies and actions are discussed below in Section 8.2.

8.2 Management Actions
Management actions, reporting and corrective actions are listed below in Table 3:

Table 3. Management Actions

<table>
<thead>
<tr>
<th>Objective</th>
<th>Management Action</th>
<th>Reporting Mechanisms</th>
<th>Corrective Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce habitat clearing</td>
<td>‣ All significant fauna habitat to be identified, mapped and demarcated on site</td>
<td>‣ Monitoring of fauna via surveys</td>
<td>‣ Review of Vegetation Clearing and Soil Management Strategy; contractor compliance; inductions; and standard operating procedures</td>
</tr>
<tr>
<td></td>
<td>‣ Clearing of significant fauna habitat to be avoided or minimised</td>
<td>‣ Monitoring of habitat/vegetation via surveys</td>
<td>‣ Implementation of findings from review/reports</td>
</tr>
<tr>
<td></td>
<td>‣ No off-road driving unless in case of an emergency or permitted by the Environmental Officer</td>
<td>‣ Incident reports</td>
<td></td>
</tr>
<tr>
<td></td>
<td>‣ No unauthorised clearing of vegetation (as per Toro vegetation clearing procedure)</td>
<td>‣ Inspections and audits</td>
<td></td>
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<tr>
<td></td>
<td>‣ Retention of mature/large trees where practicable</td>
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<tr>
<td></td>
<td>‣ Progressive clearing of vegetation to allow fauna to disperse to other suitable areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>‣ Retention of fauna burrows where possible</td>
<td></td>
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<tr>
<td></td>
<td>‣ Standard operating procedures</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>‣ Undertake progressive rehabilitation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimise detrimental impacts of fires to fauna</td>
<td>Minimise potential fauna and vehicle interactions</td>
<td>No deliberate interference with animals by Toro staff or contractors</td>
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<td>-----------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>---------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>‣ Standard operating procedures (e.g. no campfires, no unauthorised fires)</td>
<td>‣ Employee/Contractor inductions</td>
<td>‣ Employee/Contractor inductions</td>
<td></td>
</tr>
<tr>
<td>‣ Employee/Contractor inductions</td>
<td>‣ Design standards</td>
<td>‣ Standard operating procedures</td>
<td></td>
</tr>
<tr>
<td>‣ Design standards</td>
<td>‣ Fire Management Strategy</td>
<td>‣ Incident reports</td>
<td></td>
</tr>
<tr>
<td>‣ Fire Management Strategy</td>
<td>‣ Permits to burn</td>
<td>‣ Incidents and audits</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>‣ People (e.g. visual observations)</td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>‣ Implementation of findings from incident reports, audits and inspections</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Any incidents that result in the injury or death of conservation significant species should be reported to the DEC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Specimens should be retained (i.e. stored in a freezer) for further examination by DEC or the Western Australian Museum.</td>
<td></td>
</tr>
</tbody>
</table>

Minimise potential fauna and vehicle interactions

- Employee/Contractor inductions
- Speed limits to be observed by all vehicles within the Project Area.
- Designated vehicle traffic routes
- Fences may be required in strategic areas where fauna are known to cross major transport

Incident reports
- Inspections and audits
- People (e.g. visual observations)

Implementation of findings from incident reports, audits and inspections
- Any incidents that result in the injury or death of conservation significant species should be reported to the DEC.

Specimens should be retained (i.e. stored in a freezer) for further examination by DEC or the Western Australian Museum.

Minimise potential fauna and vehicle interactions

- Employee/Contractor inductions
- Speed limits to be observed by all vehicles within the Project Area.
- Designated vehicle traffic routes
- Fences may be required in strategic areas where fauna are known to cross major transport

Incident reports
- Inspections and audits
- People (e.g. visual observations)

Implementation of findings from incident reports, audits and inspections
- Any incidents that result in the injury or death of conservation significant species should be reported to the DEC.

Specimens should be retained (i.e. stored in a freezer) for further examination by DEC or the Western Australian Museum.
<table>
<thead>
<tr>
<th>Area</th>
<th>Actions</th>
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<tbody>
<tr>
<td>routes</td>
<td>Specimens should be retained (i.e. stored in a freezer) for further examination by DEC or the Western Australian Museum.</td>
</tr>
<tr>
<td>Minimise fauna egress to evaporation pond</td>
<td>Scaring devices, Fauna egress points, Potential construction of fences/ netting</td>
</tr>
<tr>
<td></td>
<td>Inspections and audits, People (i.e. visual observations), Incident reports</td>
</tr>
<tr>
<td>Minimise noise levels</td>
<td>All vehicles, plant and machinery to be operated within appropriate noise standards and relevant guidelines</td>
</tr>
<tr>
<td></td>
<td>Monitoring introduced fauna via surveys, People (i.e. visual observations), Inspections and audits, Incident reports</td>
</tr>
<tr>
<td>Light spillage to be minimised</td>
<td>Design standards, Monitoring fauna via surveys, People (i.e. visual observations), Inspections and audits, Incident reports</td>
</tr>
<tr>
<td>Minimise potential impacts from dust</td>
<td>Standard operating procedures, No unauthorised clearing, Monitoring fauna via surveys</td>
</tr>
<tr>
<td></td>
<td>Inspections and audits, Monitoring fauna via surveys</td>
</tr>
</tbody>
</table>

**FAUNA**
<table>
<thead>
<tr>
<th><strong>Toro Energy Limited – Wiluna Uranium Project</strong></th>
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<tbody>
<tr>
<td><strong>FAUNA</strong></td>
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</tbody>
</table>

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<thead>
<tr>
<th><strong>Management Strategies</strong></th>
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</thead>
<tbody>
<tr>
<td>People (e.g. visual observations)</td>
</tr>
<tr>
<td>Management Strategies</td>
</tr>
<tr>
<td>Implementation of findings from reviews</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>No net increase in radionuclide concentration in local fauna</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Design standards</td>
</tr>
<tr>
<td>Laboratory analysis</td>
</tr>
<tr>
<td>Review of Radiation Management Plan</td>
</tr>
<tr>
<td>Implementation of findings from reviews</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Reduce impacts from introduced flora from Toro operations</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee/Contractor inductions</td>
</tr>
<tr>
<td>Contractor management (pre-cleaning of vehicles and machinery)</td>
</tr>
<tr>
<td>Designated wash-down area</td>
</tr>
<tr>
<td>Monitoring introduced flora via surveys</td>
</tr>
<tr>
<td>Review of Weed Management Strategy; contractor compliance; and standard operating procedures</td>
</tr>
<tr>
<td>Implementation of findings from review</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Reduce impacts from introduced fauna from Toro operations</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>No pets to be permitted on site</td>
</tr>
<tr>
<td>Feeding of any animal on site is to be prohibited</td>
</tr>
<tr>
<td>Introduced animal management procedures</td>
</tr>
<tr>
<td>Putrescible waste to be managed appropriately</td>
</tr>
<tr>
<td>Monitoring of introduced fauna via survey</td>
</tr>
<tr>
<td>Review of introduced animal management procedures; contractor compliance; and standard operating procedures</td>
</tr>
<tr>
<td>Implementation of findings from review (for example, may include active control of feral animals)</td>
</tr>
</tbody>
</table>
| Minimise potential impacts to fauna from waste generated onsite | • Putrescible waste to be managed appropriately  
• General waste (e.g. aluminium cans, glass bottles) disposed of appropriately  
• Waste Management Strategy | • Monitoring of introduced fauna via survey  
• People (e.g. visual observations)  
• Inspections and audits  
• Incident reports | • Review of Waste Management Strategy; contractor compliance; inductions; and standard operating procedures  
• Implementation of findings from review |
9 References


Glossary

**Short range endemic invertebrate fauna:** are species of terrestrial and aquatic invertebrate animals that typically occupy areas smaller than 10,000km².

**Acronyms and abbreviations**

- **CHMP:** Cultural Heritage Management Plan
- **DEC:** Department of Environment and Conservation
- **EMP:** Environmental Management Plan
- **EPA:** Environmental Protection Authority
- **EPBC Act:** *Environment Protection and Biodiversity Conservation Act, 1999*
- **Ha:** hectares
- **SOP:** Standard Operating Procedure
- **SRE:** Short range endemic invertebrate fauna
- **Toro:** Toro Energy Limited
- **WC Act:** Western Australian *Wildlife Conservation Act, 1950*
Figures

Figure 1. Kwonkan MYG175.
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<table>
<thead>
<tr>
<th>Title:</th>
<th>NOISE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department:</td>
<td>HSE</td>
</tr>
<tr>
<td>Version No:</td>
<td>1.0</td>
</tr>
<tr>
<td>Original Date:</td>
<td>January 2011</td>
</tr>
<tr>
<td>Author:</td>
<td>R. Wedd</td>
</tr>
<tr>
<td>Revision Date:</td>
<td>July 2011</td>
</tr>
<tr>
<td>Approved by:</td>
<td>R. Dossor</td>
</tr>
</tbody>
</table>
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1 Introduction

This Noise Environmental Management Strategy Document (EMSD) has been prepared by Toro Energy Limited (Toro) to describe management actions to be implemented during the construction and operational phases of the Wiluna Uranium Project (the Project), as well as providing methods to determine noise management success during the construction and operation of the project.

This EMSD describes how Toro would:
- Identify potential direct and indirect environmental impacts from risk assessments in relation to noise generation;
- Provide environmental indicators, objectives and targets; and
- Implement management measures, methods and reporting, auditing and review.

This EMSD is part of a suite of plans that deal with impacts and aspects of the Project. This EMSD is designed to assist Toro employees and contractors to undertake noise management in a manner that is compliant with relevant legislation, safe and environmentally responsible. All management plans and strategies would be periodically reviewed as part of Toro’s commitment to continuous improvement, and for their continued application to the Project, particularly during the operational phase.

1.1 Project Overview

The Wiluna Project is in the Murchison region of Western Australia, approximately 960km north east of Perth. It is based on mining two deposits: Centipede and Lake Way. The Centipede deposit is approximately 30km south of the town of Wiluna, and the Lake Way deposit is approximately 15 km south of Wiluna. The total Project encompasses Centipede East (tenement number M53/224), Centipede West (tenement numbers M53/0113, P53/1355, P53/1356, P53/1357, P53/1396), Lake Way (tenement number M53/1090) and West Creek borefield (tenement number L53/0150).

The principal activities planned for the Project include:
- Development and operation of a uranium mine encompassing the Lake Way and Centipede deposits;
- Construction and operation of a uranium ore processing, packing and handling facility;
- Development of the West Creek borefield to supply water to the Project;
- Support facilities including an accommodation village, mine administration buildings and workshops, haul roads, power generation and transmission facilities, communications systems and water and waste management;
- Transport of uranium product within Australia for export; and
- Rehabilitation and closure of the mine and other areas disturbed by the Project.

The proposed total area of disturbance required for the development of the Project over the planned 14-year-life-span is approximately 1,530 hectares (ha) including infrastructure. The Centipede deposit covers approximately 580ha, with its eastern boundary on the edge of the salt lake. The Lake Way deposit covers approximately 700ha on the northern sections of the lake system. The mineralisation for the Centipede and Lake Way deposits is typically contained within zones lying at between 1m and 15m below the land surface. The shallow nature and relatively broad areal extent of the deposits mean that open cut would be the most appropriate mining method. The mining method would use surface miners as the primary ore fleet and conventional excavators and/or scrapers for the waste mining. It is unlikely that drilling or blasting would be required for mining. Computer modelling
(undertaken by Lloyd George Acoustics, 2011) has been used to predict the noise levels from the Project.
2 Scope

This EMSD provides a reference for monitoring, reporting and auditing as necessary to minimise identified and potential environmental impacts of the Project. It is being submitted to the Environmental Protection Authority (EPA) with the Environmental Review and Management Programme (ERMP) as part of the environmental assessment and approvals process for the Project.

This EMSD has been prepared based on:
- Toro’s Environment Policy;
- Toro’s Indigenous Relations Policy;
- Toro’s Occupational Health and Safety Policy;
- Relevant Commonwealth and Western Australian legislation;
- Other legal obligations;
- Identified potential direct and indirect environmental impacts from risk assessments;
- Consultants’ reports;
- Relevant permits and standards; and
- Toro’s commitment to continuous improvement.

This EMSD has been developed to:
- Demonstrate how Toro intends to minimise the potential impact of noise generating activities associated with the construction and operational phases of the Project;
- Describe proposed monitoring activities;
- Describe noise management controls for the life of the Project;
- Demonstrate reporting, auditing and review mechanisms;
- Provide a procedure for dealing with emergency events;
- Outline procedures for consultation and complaints; and
- Guide the development of other site specific plans and procedures relevant to the Project.

This EMSD covers the following elements of the Project:
- Construction and mining of the Lake Way and Centipede deposits;
- Construction and operation of a processing, packing and handling facility;
- Development of the West Creek borefield; and
- General infrastructure including an accommodation village, mine administration buildings and workshops, haul roads, power generation and transmission facilities, communications systems and water and waste management.
3 Legislative Requirements

Toro would comply with all relevant legislation and regulations that apply to the noise and vibration management aspects of the construction and operational phases of the Project. In relation to noise management, the following legislation and regulations are applicable:

**Western Australian Legislation**
- Environment Protection Act 1986;
- Environmental Protection (Noise) Regulations 1997;
- Mining Act 1978;

3.1 Other Applicable Guidelines and Standards
This EMSD outlines the scope of the proposal and the potential impacts that have been identified by Toro. The risk assessment process is based upon the framework stated with the Australian Standard AS4360 titled ‘Risk Management’ along with the Guide HB203 titled ‘Environmental Risk Management — Principles and Process’.

The following Toro documents should be read in conjunction with this EMSD:
- Fauna Environmental Management Strategy; and
- Dust Environmental Management Strategy.
4 Related Toro Environmental Documents

The following Toro documents were considered in the completion of this EMSD:

- Chapters 1 and 2 from the Environmental Review and Management Programme, (Toro, June 2011)
5 Noise Assessment

The Project is located within a rural area. As there are no other noise producing industries in the vicinity, the noise from the Project would not be considered to significantly contribute to a level of noise exceeding the assigned level, which is a prescribed standard (Lloyd George Acoustics, 2011).

Mining would occur continuously (e.g. on a 24 hour operational basis). Modelling (ibid) indicates that the noise at the sensitive premises from individual items of plant would be very low, and that any annoying noise characteristics, in particular tonality, would not be detectible and/or constitute any discernable impact to the nearest receptors.

The results of this assessment show that the noise from the Project is predicted to achieve compliance with the Environmental Protection (Noise) Regulations 1997 at all noise sensitive premises (see Figure 1). In addition, the noise at the construction and accommodation camps is predicted to be very low and therefore within acceptable levels (Lloyd George Acoustics, 2011).

During construction and operation, noise generating activities, which may have negative environmental impacts would include:

- Construction of access and haul roads;
- Building of infrastructure;
- Traffic to and from site (general traffic such as contractors, staff and suppliers);
- Excavating and clearing;
- Plant operation (milling and processing);
- Accommodation village operation; and
- Ore transportation (road trains).

Source sound power levels would include equipment and machinery such as:

- Vermeer surface miner;
- CAT D10 dozers;
- CAT 777 haul packs;
- CAT 922 front end loaders;
- CAT 980 front end loaders;
- CAT 16G graders;
- Road trains;
- Water carts;
- Mill;
- Large process pumps;
- Screens;
- Small process pumps;
- Compressors;
- Gas powered generators;
- Dust collectors; and
- Process plant loaders.
6 Overview of potential impacts

The noise modelling assessment indicates that noise from the proposed mine and processing plant will achieve compliance with the *Environmental Protection (Noise) Regulations 1997* at all noise sensitive premises. The noise at the construction and accommodation camps is predicted to be very low and therefore within acceptable levels (Lloyd George Acoustics, 2011). As a result, any potential negative impacts to the environment are considered to be minor. However, there is the potential for local fauna to be affected by Project related noise and vibration.

6.1 Noise and Vibration

The development of the Project is likely to generate constant noise and substantial vibration due to the operation of machinery, the processing plant, power plant, heavy and light vehicles and the general presence of people. General responses to noise across a wide variety of animal species range from interruptions in feeding and resting behaviour to complete abandonment of an area. Noise may lead to reduced population densities in small mammals, nest failure and decreased population densities in birds (Slabbekoorn & Ripmeester, 2008) and abandoning of roost sites and a reduced hunting efficiency in bats due to disturbance of their echolocation system. Constant levels of noise also interfere with species communication. This is known as acoustic interference (Parris & Schneider 2009). Species that may be especially at risk of disturbed communication are those that use calls to communicate over larger distances such as the Bush Stone-curlew, which is a listed Priority 4 species (Outback Ecology Services, 2010).

The results of a noise assessment show that the noise from the Project is predicted to achieve compliance with the *Environmental Protection (Noise) Regulations 1997* at all noise sensitive premises (Lloyd George Acoustics, 2011).
7 Environmental Objectives, Targets and Indicators

A series of management objectives, targets and indicators has been developed to manage identified and potential impacts to fauna.

Objectives: what Toro aims to achieve.

Targets: defined objective levels.

Indicators: measures, which are either quantitative or qualitative, to determine whether the objectives have been met.

The environmental objectives, targets and indicators as determined by Toro for fauna management are shown in Table 1.

Table 1. Objectives, Target and Indicators

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Targets</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimise potential impacts to fauna from noise</td>
<td>No observable impact on fauna species during construction and operation</td>
<td>Results of fauna surveys</td>
</tr>
</tbody>
</table>
8 Management Strategies and Actions

8.1 Key strategies
Detailed noise management documentation would be developed for the construction and operational phases of the Project. Documentation relevant to decommissioning would be developed during the operational phase. Documentation would include specific policies and standard operating procedures.

Management strategies and actions are discussed below in Section 8.2.

8.2 Management Actions
Management actions, reporting and corrective actions are listed below in Table 2:

Table 2. Management Actions

<table>
<thead>
<tr>
<th>Objective</th>
<th>Management Action</th>
<th>Reporting Mechanisms</th>
<th>Corrective Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise levels to be minimised</td>
<td>All vehicles, plant and machinery to be operated within appropriate noise standards and relevant guidelines</td>
<td>Monitoring of fauna via surveys</td>
<td>Review of Fauna Management Strategy</td>
</tr>
<tr>
<td></td>
<td>All vehicles, plant and machinery to be maintained and regularly serviced</td>
<td>People (ie visual observations)</td>
<td>Review of maintenance routines</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inspections and audits</td>
<td>Implementation of findings from review</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Incident reports</td>
<td>Repair damaged or failed components (vehicle; machinery; plant)</td>
</tr>
</tbody>
</table>
9 References


Acronyms and abbreviations

DEC: Department of Environment and Conservation.
EPA: Environmental Protection Authority
Ha: hectares
SOP: Standard Operating Procedure
Toro: Toro Energy Limited
Figures

Figure 1. Nearest receptors.
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<table>
<thead>
<tr>
<th>Title:</th>
<th>RADIOACTIVE WASTE MANAGEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department:</td>
<td>HSE</td>
</tr>
<tr>
<td>Version No:</td>
<td>1.0</td>
</tr>
<tr>
<td>Original Date:</td>
<td>January 2011</td>
</tr>
<tr>
<td>Author:</td>
<td>K. Taylor</td>
</tr>
<tr>
<td>Revision Date:</td>
<td>July 2011</td>
</tr>
<tr>
<td>Approved by:</td>
<td>R. Dossor</td>
</tr>
</tbody>
</table>
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I Introduction

This Radioactive Waste Environmental Management Strategy Document (EMSD) has been prepared by Toro Energy Limited (Toro) to describe the radioactive waste management systems that would be implemented during the construction and operational phases of the Wiluna Uranium Project (the Project) to minimise their impact on the environment, and the monitoring programmes to demonstrate the success of these systems. A Radioactive Waste Management Plan for the decommissioning phase would be developed if required during the operational phase of the Project.

This EMSD describes how Toro would –
- Comply with relevant legislation and standards for radioactive waste management;
- Identify potential direct and indirect environmental impacts from radioactive waste;
- Provide environmental indicators, objectives and targets; and
- Implement management measures, methods and reporting, auditing and review.

This EMSD is part of a suite of plans that deal with impacts and aspects of the Project. It is designed to assist Toro employees and contractors to undertake radioactive waste management in a manner that is compliant with relevant legislation, safe and environmentally responsible. All management strategies would be periodically reviewed as part of Toro’s commitment to continuous improvement, and for their continued application to the Project, particularly during the operational phase.

1.1 Project Overview

The Wiluna Project is in the Murchison region of Western Australia, approximately 960km north east of Perth. It is based on mining two deposits: Centipede and Lake Way. The Centipede deposit is approximately 30km south of the town of Wiluna and the Lake Way deposit is approximately 15 km south of Wiluna. The total Project encompasses Centipede East (tenement number M 53/224), Centipede West (tenement numbers M 53/0113, P53/1355, P53/1356, P53/1357, P53/1396), Lake Way (M 53/1090) and the West Creek borefield (tenement number L 53/0150).

The principal activities planned for the Project include:
- Development and operation of a uranium mine encompassing the Lake Way and Centipede deposits;
- Construction and operation of a uranium ore processing, packing and handling facility;
- Development of the West Creek borefield to supply water to the Project;
- Support facilities including an accommodation village, mine administration buildings and workshops, haul roads, power generation and transmission facilities, communications systems and water and waste management;
- Transport of uranium product within Australia for export; and
- Rehabilitation and closure of the mine and other areas disturbed by the Project.

The proposed total area of disturbance required for the development of the Project over the planned 14-year-life-span is approximately 1,530 hectares (ha) including infrastructure.
2 Scope

This EMSD provides a reference for monitoring, reporting and auditing as necessary to
minimise identified and potential environmental impacts of the Project.

This EMSD is being submitted to the Environmental Protection Authority (EPA) with the
Environmental Review and Management Programme (ERMP) as part of the environmental
assessment and approvals process for the Project.

This EMSD has been prepared based on:
• Toro’s Environment Policy;
• Toro’s Indigenous Relations Policy;
• Toro’s Occupational Health and Safety Policy;
• Relevant Commonwealth and Western Australian legislation;
• Other legal obligations;
• Identified potential direct and indirect environmental impacts from risk assessments;
• Consultants’ reports;
• Relevant permits and standards; and
• Toro’s commitment to continuous improvement.

This EMSD has been developed to:
• Outline the existing information available in relation to radioactive waste relevant to
  the Project Area;
• Identify and assess potential impacts of the creation of radioactive waste during
  Project activities;
• Describe proposed management and monitoring strategies;
• Demonstrate reporting, auditing and review mechanisms;
• Outline procedures for consultation and complaints; and
• Guide the development of other site specific plans and procedures relevant to the
  Project.

This EMSD covers the following phases of the Project:
• Construction and mining of the Lake Way and Centipede deposits;
• Construction and operation of a processing, packing and handling facility;
• Development of the West Creek borefield; and
• General infrastructure including an accommodation village, mine administration
  buildings and workshops, haul roads, power generation and transmission facilities,
  communications systems and water and waste management.

The wastes relevant to this EMSD that would be generated during the operation of the
Project are as follows:

Liquid Waste Streams
• Tailings liquor;
• Stormwater;
• Waste from routine operations (e.g.shower and wash water from ablutions and
  equipment cleaning water);
• Seepage from operations;
• Unplanned releases of liquids; and
• Runoff from the delineated mining area.
Solid Wastes
- Tailings and waste rock;
- Sediment runoff from stockpiles during rainfall events;
- Contaminated equipment such as pumps and valves;
- Contaminated clothing such as overalls, gloves, and boots; and
- Soil contaminated by spilled radioactive materials.

Airborne Wastes
- Radon gas (and radon decay products);
- Radioactive dust;
- Process evaporation; and
- Power and steam generation off gas.
3 Legislative Requirements

Toro would comply with all relevant Commonwealth and State legislation and regulations that apply to the radioactive waste management aspects of the construction and operational phases of the Project. In relation to radioactive waste management, the following legislation and regulations are applicable:

**Commonwealth Legislation**

**Western Australian Legislation**
- *Mining Act 1978;*
- *Nuclear Waste Storage (Prohibitions) Act 1999;*
- *Radiation Safety Act 1975;*
- *Radiation Safety (General Regulations) 1983;*

Toro would construct and operate the Project facilities utilising best practicable technology, as defined by Part 16 of the Western Australian Department of Mines and Petroleum (DMP), *Mine Safety and Inspection Regulations 1995.*
4  Overview of potential impacts

4.1  Introduction
The overall radiological impacts of the operation at Lake Way and Centipede are related directly to workers, members of the public and the environment.

4.2  Radionuclides in Airborne Dust
Potential sources of radioactive dusts from operations are:

- dust from mining of ore;
- dust from ore stockpiles, ore transfer processes, crushing, road haulage and conveyors systems;
- fugitive dust from tailings deposits;
- transport systems in mill area (conveyors etc); and
- uranium oxide drier and packaging area.

The impacts from radionuclides in dusts have been calculated from air quality modelling and experiences at other operating uranium mines and shown to be low due to design controls and management practices.

4.3  Radon and the decay products of radon (RDP)
Sources of radon include:

- mining of ore;
- stockpiles;
- ore processing; and
- tailings management and disposal.

The impacts from radon arise from the decay products (RDP), which are generally directly proportional to the radon concentrations. Modelling has shown that the incremental radon (and therefore RDP) concentrations at the closest permanently occupied communities are low, being less than one thirtieth of the member of the public dose limit.

4.4  Gamma
The main sources of gamma radiation from the proposed operation are:

- stockpiles;
- tailings;
- uranium; and
- process materials.

All materials are to be contained within the general Project Area. Accordingly, gamma radiation from the Project is not expected to be detectable beyond the Project boundary. While environmental levels of gamma radiation are expected to be negligible, occupational exposures have the potential to be of significance and have been assessed. Management of occupational exposures is considered in the Radiation Management Plan.
4.5 Radionuclides in Soil
The radionuclide concentrations in soils may change through spillages or through long term dust deposition.

Spills have not been considered in the assessment of environmental impact, as operational procedures would ensure that all spillages would be immediately cleaned up and not contribute to long term changes in soil concentrations.

Over time, dust deposited from emissions from the Project would accumulate in the local soil, leading to increases in the pre-existing radionuclide concentrations. The impact of long term dust deposition from the Project on soils was estimated from the air quality modelling, which showed that changes in natural levels would be approximately 3 per cent after 15 years.

4.6 Waterborne Emissions
Radionuclides in water can lead to radiation exposure to the environment or to humans when consumed.

The Lake Way region groundwater is unsuitable for human or stock consumption due to its relatively high salinity and therefore human and animal exposure to radionuclides in the groundwater is highly unlikely.

Additional radionuclides may enter the groundwater from various sources including seepage from tailings storage facilities, seepage from the pit and water infiltration through the stockpiles into groundwater.

Groundwater modelling shows that movement of groundwater from the mine area is limited. During mining there would be an induced and natural groundwater flow towards the mine as a result of active dewatering. Being a drainage basin, groundwater would also tend to flow back towards the lake system, thereby preventing groundwater flowing away from the mine.

Test work has shown that the radionuclides have low solubility and do not migrate with seepage.

Overall, the limited spread of seepage, the direction of groundwater flow, the low solubility of the radionuclides and the limited exposure pathways from groundwater indicate that the impacts would be low.

4.7 Emissions during transport of Uranium Oxide Concentrate (UOC)
The transport of UOC is a closely regulated activity with strict requirements for packaging, labelling, emergency response and management. Airborne emissions from the routine transport of the material are non-existent, although low levels of gamma radiation would be detected close to the containers. The gamma levels are reported externally on all containers.
4.8 Summary of Radiological Impacts

The human and environmental radiological impacts of Toro’s operations at Lake Way and Centipede would be low.
5 Environmental Objectives, Targets and Indicators

The objectives of this EMSD and the assessment criteria are described in the following table:

Table 1. Assessment criteria.

<table>
<thead>
<tr>
<th>Component</th>
<th>Objective</th>
<th>Assessment Criteria</th>
<th>Applicable Waste Stream</th>
</tr>
</thead>
</table>
| Radioactive Process Material Spillage | No adverse impacts to health of the public from exposure to radiation from Wiluna Project from spillages during transport | Radiation doses to members of the public less than 1 mSv/y above natural background. | • Unplanned release of liquors  
• Soil contaminated by spills of radioactive material |
| Radioactive Emissions           | No adverse impacts to health of members of the public from exposure to radiation from Wiluna Project from emissions during operation | Radiation doses to members of the public less than 1mSv/y above natural background. | • Radon gas  
• Radioactive dust |
| Containment of Tailings and Mine Rock | Maintain structural integrity of the mine rock stockpiles and tailings facility | No unplanned structural failures to the stockpiles or tailings facility | • Tailings liquor  
• Tailings and waste rock |
| Major storage seepage           | No significant adverse impacts to ecological communities as a result of seepage from the stockpiles or tailings facility | No loss of native vegetation outside bunded Tailings Storage Facility (TSF) as a result of seepage from the TSF. | • Seepage from operations |
| Radioactive Waste               | No adverse impacts to health of members of the public from exposure to radiation from Wiluna Project Operations. | Radiation doses to members of the public less than 1mSv/y above natural background. | • Waste from routine operations  
• Contaminated equipment  
• Contaminated clothing |
| Stormwater                      | No adverse impacts to health of members of the public from exposure to radiation from Wiluna Project Operations | No unplanned release of water from the mine or processing area | • Runoff from mining area  
• Sediment runoff  
• Stormwater |
6 Management Strategies and Actions

The aim of the waste management system is to ensure that the objectives are met through either specific design controls or management measures. The effectiveness of the controls would be determined through the ongoing monitoring program. Where the objectives are not being achieved, appropriate measures would be implemented.

In addition to outlining controls for the identified radiological impacts, this EMSD also outlines mitigation measures for unforeseen events (termed key risks in this document).

Each of the design features adopted has utilised best practicable technology (BPT) as defined in Part 16 of the DMP Mine Safety and Inspection Regulations 1995. BPT has been determined by referring to the DMP NORM(?) guidelines for recommended controls and incorporating leading practice design from other operations where possible.

6.1 Stormwater Management
All rainfall landing within the plant area would be collected and directed to a sediment sump, one of the ponds or left to evaporate.

6.2 Seepage Management
Seepage from the tailings and waste rock stockpiles has been modelled and shown to be low.

6.3 Spillages and waste water
The process has been designed with bunds, liners and slopes such that all wash down water or spillages would be captured and directed to the sediment sump or one of the ponds.

6.4 Tailings residue
Tailings would be placed into the mined out voids of the Centipede deposit. After they have dried out sufficiently they would be covered with a layer of waste rock and rehabilitated. Seepage from the tailings is expected to be low due to the settling and drying of the tailings and the positive flow of water into the tailings. Modelling shows that there would be limited spread of minerals from the stored tailings.

Seepage from the residue has been assumed to be minimal due to both the mineralogy of the ore and the carbonate leaching system utilised.

6.5 General solid wastes
The general solid wastes would be cleaned, checked for radioactive contamination and if clean, disposed of in a general landfill.

Items that cannot be cleaned of radioactive contamination to below 0.4Bq cm² would be temporarily stored in 205L drums in a dedicated location that was clearly sign posted. Items that cannot be placed into 205L drums would be placed on an appropriate impervious material to prevent soil contamination. This facility would be bunded to prevent rainfall runoff.

Final disposal of all items with radioactive contamination would be in the mined out pit or purpose built landfill site.
7 Management Plan

Design controls, management controls and monitoring are listed in Table 2.

Table 2. Management Plan

<table>
<thead>
<tr>
<th>Project Component (and relevant waste stream)</th>
<th>Design Controls</th>
<th>Management Controls</th>
<th>Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radioactive Process Material Spillage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Unplanned release of liquids</td>
<td>• Plant designed to best practice</td>
<td>• Minimise dry cleaning of spillages to prevent dust</td>
<td>• All spills reported and investigated to prevent recurrence</td>
</tr>
<tr>
<td>• Soil contaminated by spilled radioactive material</td>
<td>• Plant design to incorporate appropriate bunding (with sumps) and adequate hose points to contain spillages</td>
<td>• Spills control kits available in readily accessible areas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Plant designed for ease of access for small earthmoving equipment (such as bobcat) for ease of cleanup</td>
<td>• Spills response procedure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Minimise dry cleaning of spillages to prevent dust</td>
<td>• Operator training</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Spills control kits available in readily accessible areas</td>
<td>• Supervisor training</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Spills response procedure</td>
<td>• Approved disposal procedure for contaminated soil (eg; disposal in tailings facility or reprocessing)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Operator training</td>
<td>• Operator training</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Supervisor training</td>
<td>• Approved disposal procedure for contaminated soil (eg; disposal in tailings facility or reprocessing)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Approved disposal procedure for contaminated soil (eg; disposal in tailings facility or reprocessing)</td>
<td>• Immediate cleanup of all spillages</td>
<td></td>
</tr>
<tr>
<td>Radioactive Emissions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Radon gas</td>
<td>• Design standards to minimise dust generation (to include dust extraction of transfer points, covered conveyors, scrubbing systems)</td>
<td>• Standard operating procedures (e.g. access to the tailings surface during drying will be minimized to prevent dusting)</td>
<td>• Dust and radon monitoring at key environmental locations</td>
</tr>
<tr>
<td>• Radioactive dust</td>
<td>• Subaqueous tailings disposal to minimise radon and dust emission</td>
<td>• Regular supervisor inspection of all dust controls</td>
<td>• Operator dust monitoring</td>
</tr>
<tr>
<td></td>
<td>• Stockpiles to remain damp to minimise dusting</td>
<td>• Immediate cleanup of all spillages</td>
<td>• Maintenance schedule for all extraction systems</td>
</tr>
<tr>
<td>Containment of Tailings and Mine Rock</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Tailings liquor</td>
<td>• Approved design standards for both tailings disposal and waste rock stockpiles</td>
<td>• Standard operating procedures (e.g. placement of tailings and waste rock as per schedule, placement recorded, volume and waste type recorded)</td>
<td>• Long-term monitoring – including volume of tailings disposed, volume of liquid disposed</td>
</tr>
<tr>
<td>• Tailings solid</td>
<td>• Tailings to be disposed in pit then covered</td>
<td>• Regular inspection of the facilities</td>
<td>• Maintenance of a water balance</td>
</tr>
<tr>
<td></td>
<td>• The nominal 1m cover would be placed as rapidly as possible</td>
<td>• Regular daily inspection of tailings pipeline</td>
<td>• Quality assurance procedures during construction</td>
</tr>
<tr>
<td></td>
<td>• The tailings pipeline would be within a protected corridor that ran for the entire length of the pipeline, with leak detection</td>
<td>• Monitored pressure drop across the pipeline flow via the process control system</td>
<td>• Maintenance of register of other material disposed in tailings facility.</td>
</tr>
<tr>
<td></td>
<td>• Monitored pressure drop across the pipeline flow via the process control system</td>
<td>• Procedure for release of tailings from pipeline (includes quick cleanup, and reporting)</td>
<td>• Monitor radionuclides content (238U and 226Ra) of mine water used for dust suppression.</td>
</tr>
<tr>
<td></td>
<td>• Procedure for release of tailings from pipeline (includes quick cleanup, and reporting)</td>
<td>• Monitored pressure drop across the pipeline flow via the process control system</td>
<td>• Monitor tailings pore pressures monthly.</td>
</tr>
<tr>
<td></td>
<td>• Procedure for release of tailings from pipeline (includes quick cleanup, and reporting)</td>
<td>• Immediate cleanup of all spillages</td>
<td>• Monitor rate of rise of tailings in each TSF</td>
</tr>
<tr>
<td></td>
<td>• Monitor rate of rise of tailings in each TSF</td>
<td>• Immediate cleanup of all spillages</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Monitor rate of rise of tailings in each TSF</td>
<td>• Immediate cleanup of all spillages</td>
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<td></td>
<td>• Monitor rate of rise of tailings in each TSF</td>
<td>• Immediate cleanup of all spillages</td>
<td></td>
</tr>
<tr>
<td>Project Component (and relevant waste stream)</td>
<td>Design Controls</td>
<td>Management Controls</td>
<td>Monitoring</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>-----------------</td>
<td>---------------------</td>
<td>------------</td>
</tr>
<tr>
<td><strong>Major Storage Seepage</strong>&lt;br&gt;• Seepage from operations</td>
<td>• Installation of groundwater curtain to reduce groundwater flow during operations&lt;br&gt;• Design standard for tailings facility to minimise seepage&lt;br&gt;• Installation of prepared base and clay perimeter walls for tailings facility&lt;br&gt;• Prepared compacted base for stockpiles</td>
<td>• Maintaining a water balance&lt;br&gt;• Minimise any free standing liquor prior to the base having a consolidated layer of tailings</td>
<td>Cell annually.</td>
</tr>
<tr>
<td><strong>Radioactive Waste</strong>&lt;br&gt;• Waste from routine operations&lt;br&gt;• Contaminated equipment&lt;br&gt;• Contaminated clothing</td>
<td>• Establishment of dedicated low level radioactive waste disposal area within mine lease&lt;br&gt;• Accumulated low level waste to be disposed in tailings facility at end of mine life&lt;br&gt;• Installation of self contained decontamination facility&lt;br&gt;• Installation of wheel and undercarriage wash for vehicles&lt;br&gt;• Installation of onsite change rooms and laundry for workers clothes</td>
<td>• Policy to decontaminate where practicable rather than disposal&lt;br&gt;• Establishment of an identification process to determine waste material suitable for decontamination&lt;br&gt;• Contaminated soils to be treated or disposed in tailings facility&lt;br&gt;• Radiation check on all material leaving the site&lt;br&gt;• Low level radioactive waste (e.g. laboratory waste and used personal protective equipment from workers in the uranium packing area) securely stored and then disposed of to the tailings facility.</td>
<td>Establish a register of all low level radioactive waste&lt;br&gt;• Annual review of procedures</td>
</tr>
<tr>
<td><strong>Stormwater</strong>&lt;br&gt;• Runoff from the delineated mining area&lt;br&gt;• Sediment runoff from stockpiles&lt;br&gt;• Stormwater</td>
<td>• Processing facility designed to contain a 1 in 100 year rainfall event with stormwater contained and directed to settling ponds and sediment traps&lt;br&gt;• Establishment of diversion bunds so that natural surface water flows diverted around operations</td>
<td>• Maintenance of stormwater control facilities</td>
<td>Monitor natural water flows</td>
</tr>
</tbody>
</table>
8 Risk Management

For this EMSD, risk events are those events that are not predicted and therefore are probabilistic in nature – that is, there is only a chance that they may occur. Table 3 provides an outline of the key risks and mitigation measures.

Table 3. Key risks and mitigation measures

<table>
<thead>
<tr>
<th>Potential Risk</th>
<th>Likelihood</th>
<th>Cause</th>
<th>Mitigation measures</th>
</tr>
</thead>
</table>
| Unplanned release of material from tailings system (either; accidental release / spill, overflow, wall failure) | Low | Design, construction and ongoing operation does not incorporate adequate controls for:  
- Wall or line failure  
- Underdrain collection system failure  
- Failure of base system  
- Unexpectedly high seepage rate  
- Excessive rainfall  
- Geotechnical failure. | • Clear sustainability design outcomes  
• Continuous check and verification processes during design, construction and operation phases of the Project to ensure sustainable design outcomes are achieved |
| Excessive seepage from tailings | Low | Failure of clay liner during operations or clay liner dries and cracks prior to tailings placement | • Monitoring of groundwater during tailings deposition  
• Quality assurance during clay liner construction |
| Excessive dusting from stockpiles | Low | Poor rock placement during operations, excessive handling of material, material too dry | • Monitor dust levels  
• Ensure stockpiles are moist (use of water sprays if necessary)  
• Ensure highest levels of controls on mineralised ore stockpiles |
| Failure to successfully rehabilitate tailings at closure resulting in exposed tailings | Low | Design does not incorporate adequate controls for:  
- soil erosion  
- water infiltration | • Robust geotechnical design  
• Correct execution of design requirements  
• Quality assurance system during closure |
9 Environmental radiation management programme

The proposed environmental monitoring programme is in table 4. The programme is indicative as it is subject to approval by the appropriate authority.

It would be the responsibility of the site Radiation Safety Officer (RSO) to ensure that all monitoring required under this programme was completed. Radiation monitoring would only be conducted by appropriately trained and qualified personnel—details of this training would be fully documented.

All radiation monitoring equipment would be calibrated annually back to a known source. This calibration would be undertaken by an external service provider. In addition, routine maintenance and calibration checks would be performed on the instruments by the Radiation Safety Officer or the Officer’s delegate.

The Radiation Safety Officer would be required to investigate all abnormal events and report the details to the General Manager. Any abnormal event that resulted in the failure of a waste management system would be reported to the relevant regulatory authority.

This EMSD would be reviewed every two years as part of the review of the Radiation Management Plan. An audit of the waste management system would be conducted annually and included in the report to the State Mining Engineer.

Table 4. Environmental Monitoring Programme

<table>
<thead>
<tr>
<th>Type of Monitoring</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meteorological data</td>
<td>Continuous</td>
</tr>
<tr>
<td>Radon concentrations</td>
<td>Continuous at environmental monitoring sites</td>
</tr>
<tr>
<td>RDP concentrations</td>
<td>Continuous at environmental monitoring sites</td>
</tr>
<tr>
<td>Flora and fauna</td>
<td>Baseline and every 5 years</td>
</tr>
<tr>
<td>Airborne dust</td>
<td>Continuous high volume samplers</td>
</tr>
<tr>
<td></td>
<td>Low volume sampling</td>
</tr>
<tr>
<td></td>
<td>Passive dust deposition collection</td>
</tr>
<tr>
<td>Water Sampling</td>
<td>Quarterly sampling from network of groundwater bores</td>
</tr>
<tr>
<td></td>
<td>Opportunistic surface water sampling</td>
</tr>
<tr>
<td>Gamma radiation</td>
<td>Annual environmental survey</td>
</tr>
<tr>
<td>Member of the public dose assessment</td>
<td>Annual dose assessment</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Title:</th>
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</tr>
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<tr>
<td>Department:</td>
<td>HSE</td>
</tr>
<tr>
<td>Version No:</td>
<td>1.0</td>
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<tr>
<td>Original Date:</td>
<td>January 2011</td>
</tr>
<tr>
<td>Author:</td>
<td>R. Wedd</td>
</tr>
<tr>
<td>Revision Date:</td>
<td>July 2011</td>
</tr>
<tr>
<td>Approved by:</td>
<td>R. Dossor</td>
</tr>
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</table>
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1 Introduction

This Waste Environmental Management Strategy Document (EMSD) has been prepared by Toro Energy Limited (Toro) to describe management actions to be implemented during the construction and operational phases of the Wiluna Uranium Project (the Project), as well as providing target indicators to ascertain the success of waste management during the construction and operation of the Project.

This EMSD describes how Toro would:
- Comply with relevant legislation and standards for transportation, storage, use and disposal of waste;
- Identify potential direct and indirect environmental impacts from waste management to the environment;
- Provide environmental indicators, objectives and targets; and
- Implement management measures, methods and reporting, auditing and review.

This EMSD is part of a suite of plans that deal with impacts and aspects of the Project. This EMSD is designed to assist Toro employees and contractors to undertake waste management in a manner that is compliant with relevant legislation, safe and environmentally responsible. All management plans and strategies would be periodically reviewed as part of Toro’s commitment to continuous improvement, and for their continued application to the Project, particularly during the operational phase.

This EMSD includes liquid and solid hazardous wastes such as:
- Batteries;
- Solvents, absorbents and various chemicals;
- Tailings material;
- Industrial waste such as grease, fuel and oils (hydrocarbons), oil filters and paints;
- Fluorescent tubes;
- Liquid waste such as effluent; and

non-hazardous wastes such as:
- Concrete and scrap metal;
- Domestic;
- Kitchen waste (food);
- Green waste (e.g. plant material generated from clearing activities); and
- Wood, glass, plastics and cardboard.

This EMSD does not include the monitoring or management of radioactive waste. A separate management strategy specifically for radioactive waste has been developed.

1.1 Project Overview

The Wiluna Project is in the Murchison region of Western Australia, approximately 960km north east of Perth. It is based on mining two deposits: Centipede and Lake Way. The Centipede deposit is approximately 30km south of the town of Wiluna, and the Lake Way deposit is approximately 15 km south of Wiluna. The total Project encompasses Centipede East (tenement number M 53/224), Centipede West (tenement numbers M 53/0113, P53/1355, P53/1356, P53/1357, P53/1396), Lake Way (tenement number M 53/1090) and West Creek Borefield (tenement number L 53/0150).

The principal activities planned for the Project include:
- Development and operation of a uranium mine encompassing the Lake Way and Centipede deposits;
Construction and operation of a uranium ore processing, packing and handling facility;
Development of the West Creek borefield to supply water to the Project;
Support facilities including an accommodation village, mine administration buildings and workshops, haul roads, power generation and transmission facilities, communications systems and water and waste management;
Transport of uranium product within Australia for export; and
Rehabilitation and closure of the mine and other areas disturbed by the Project.

The proposed total area of disturbance required for the development of the Project over the planned 14-year-life-span is approximately 1,530 hectares (ha). The amounts and types of waste produced would vary throughout the mine life cycle. It is anticipated that greater amounts of general waste would be generated during the construction and decommissioning phases of the Project (due to infrastructure waste such as scrap metal, concrete etc), with the operational phase generating liquid hazardous waste and solid waste (such as domestic and putrescible waste).

A purpose built landfill facility would be constructed near the accommodation village. Liquid wastes from the village and construction camp would be managed by purpose built septic systems.
2 Scope

This EMSD provides a reference for monitoring, reporting and auditing as necessary to minimise identified and potential environmental impacts of the Project. It is being submitted to the Environmental Protection Authority (EPA) with the Environmental Review and Management Programme (ERMP) as part of the environmental assessment and approvals process for the Project.

This EMSD has been prepared based on:
- Toro’s Environment Policy;
- Toro’s Occupational Health and Safety Policy;
- Relevant Commonwealth and Western Australian legislation;
- Other legal obligations;
- Identified potential direct and indirect environmental impacts from risk assessments;
- Consultants’ reports;
- Relevant permits and standards; and
- Toro’s commitment to continuous improvement.

This EMSD has been developed to:
- Demonstrate how Toro intends to minimise the potential impact of waste generating activities associated with the construction and operational phases of the Project;
- Describe proposed monitoring activities;
- Describe waste generation controls and strategies for the life of the Project;
- Demonstrate reporting, auditing and review mechanisms;
- Provide a procedure for dealing with emergency events;
- Outline procedures for consultation and complaints; and
- Guide the development of other site specific plans and procedures relevant to the Project.

This EMSD covers the following areas of the Project:
- Construction and mining of the Lake Way and Centipede deposits;
- Construction and operation of a processing, packing and handling facility;
- Development of the West Creek borefield; and
- General infrastructure including an accommodation village, mine administration buildings and workshops, haul roads, power generation and transmission facilities, communications systems and water and waste management.

An Emergency Response Plan would be prepared to outline the emergency response to hazardous waste leakage/spillage during product storage and transport.

2.1 Project Waste Sources

Hydrocarbons and various chemicals and reagents are an essential part of mining projects. However, if stored and used incorrectly, they have the potential to cause impacts to the environment. Hazardous waste includes:
- Batteries;
- Solvents, absorbents and various chemicals;
- Tailings material;
- Liquid waste such as effluent;
- Industrial waste such as grease, fuel and oils (hydrocarbons), oil filters and paints; and
- Fluorescent tubes.
Non-hazardous wastes include:
- Concrete and scrap metal;
- Domestic;
- Kitchen waste (food);
- Green waste (e.g. plant material generated from clearing activities); and
- Wood, glass, plastics and cardboard.
3 Legislative Requirements

Toro would comply with all relevant Commonwealth and State legislation and regulations that apply to waste management aspects of the construction and operational phases of the Project.

Commonwealth Legislation

- Energy Efficiency Opportunities Act 2006 (and Regulations 2006);
- Environment Protection and Biodiversity Conservation Act 1999;

Western Australian Legislation

- Conservation and Land Management Act 1984;
- Contaminated Sites Act 2003;
- Dangerous Goods Safety Act 2004 (and Regulations 2004);
- Environment Protection Act 1986;
- Mining Act 1978;
- Mines, Safety and Inspection Act 1994 (and Regulations 1995);
- Soil and Land Conservation Act 1945;
- Waterways Conservation Act 1945.

3.1 Other Applicable Guidelines, Policies and Standards

This EMSD outlines the scope of the proposal and the potential impacts that have been identified by Toro. The risk assessment process is based upon the framework stated with the Australian Standard AS4360 titled ‘Risk Management’ along with the Guide HB203 titled ‘Environmental Risk Management — Principles and Process’.

The following Toro documents should be read in conjunction with this EMSD:

- Weed Environmental Management Strategy;
- Fauna Environmental Management Strategy;
- Fire Environmental Management Strategy;
- Cultural Heritage Management Plan;
- Groundwater Dependent Vegetation Environmental Management Strategy;
- Vegetation Clearing and Soils Environmental Management Strategy;
- Dust Environmental Management Strategy;
- Water Environmental Management Strategy.
### Table 1. Western Australian Guidelines, Policies and Standards

<table>
<thead>
<tr>
<th>Organization</th>
<th>Document Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Protection Authority</td>
<td>Environmental Protection Authority Position Statement No 6 – Towards Sustainability (2004)</td>
</tr>
<tr>
<td>Environmental Protection Authority</td>
<td>Environmental Protection Authority Position Statement No 7 - Principles of Environmental Protection (2004)</td>
</tr>
<tr>
<td>Environmental Protection Authority</td>
<td>Environmental Protection Authority Guidance Statement No 2 – Guidance for Risk Assessment and Management: Offsite individual risk from hazardous industrial plant (2000b)</td>
</tr>
<tr>
<td>Environmental Protection Authority</td>
<td>Environmental Protection Authority Guidance Statement No 12 – Minimising Greenhouse Gases (2002)</td>
</tr>
<tr>
<td>Environmental Protection Authority</td>
<td>Environmental Protection Authority Guidance Statement No 18 – Prevention of Air Quality Impacts from Land Development Sites (2000)</td>
</tr>
<tr>
<td>Environmental Protection Authority</td>
<td>Draft State Environmental (Ambient Air) Policy (2009)</td>
</tr>
<tr>
<td>Environmental Protection Authority</td>
<td>Draft Environmental Assessment Guideline for managing the impacts of dust and associated contaminants from land development sites, contaminated sites and remediation and other related activities (2009)</td>
</tr>
<tr>
<td>Environment Protection and Heritage Council</td>
<td>National Environmental Protection Measure for Ambient Air Quality (2003)</td>
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</table>
4 Related Toro Environmental Documents

The following Toro documents were considered in the completion of this EMSD:

- Chapters 1 and 2 from the Environmental Review and Management Programme (ERMP) (Toro Energy Limited, June 2011).
- Groundwater Dependant Ecosystems (GDE) Management Strategy (January 2011).
- Centipede Groundwater Impact Assessment (RPS Aquaterra, December 2010).
- Wiluna Uranium Deposit – Water Supply Options (RPS Aquaterra, September 2010).
- West Creek Water Supply Groundwater Modelling (RPS Aquaterra, September 2010).
- Wiluna Uranium Project – Surface Hydrology Studies (RPS Aquaterra, September 2010).
5 Overview of potential impacts

Waste generating activities (including storage and disposal) would include:

- Soil and vegetation from clearing activities;
- Construction of facilities (offices, accommodation, power supply, water supply, and process plant);
- Operation of facilities and infrastructure (greenhouse gases, hydrocarbon and chemical spills);
- Servicing and maintenance of vehicles and plant (hydrocarbon spills and general waste such as old parts and packaging);
- Domestic waste from construction and operation;
- General office waste (paper, cardboard, printer cartridges and light globes);
- Putrescible waste during construction and operation;
- Use of water in accommodation facilities (toilets, showers and washing machine use);
- Processing resulting in tailings waste during operation; and
- Evaporation pond operation.

Potential impacts (which may be from minor/negligible to significant) during the construction and operation of the mine would include the following:

- Habitat loss from fires from inappropriately managed stockpiles of vegetation;
- Injury or death to fauna from fires from inappropriately managed stockpiles of vegetation;
- Greenhouse gas emissions from stockpiled vegetation;
- Loss of seedbank from inappropriately managed soil stockpiles;
- Injury or death to local fauna from inappropriate general waste management (e.g. aluminium cans and general construction waste);
- Soil and/or groundwater contamination from hydrocarbon and/or chemical spills;
- Impacts to local fauna (short range endemics (SRE) and stygofauna) from potential soil and/or groundwater contamination from hydrocarbon and/or chemical spills;
- Impacts to local fauna from potential increases to introduced fauna from inappropriate putrescible waste management;
- Loss of pregnant liquor solution (PLS) into sub-soil and/or ground water from the evaporation pond and emission of radon gas and aerosols from pond surface;
- Loss of tails from the Tailings Storage Facility (TSF) into sub-soil, loss of tailings solution into ground water (beyond design seepage rate), loss of tails (liquid or solids to groundwater and emission of radon gas from drying and exposed tails/dust); and
- Impacts on rehabilitation management and success.

5.1 Habitat loss from fires from inappropriately managed stockpiles of vegetation

Clearing of vegetation would be an unavoidable part of Project development and represent the most direct impact on the habitats and fauna assemblages present within the Project Area. Loss of habitat is listed as a key threatening process under the Environment Protection and Biodiversity Conservation Act (Cth). Many animals may disperse to other areas during progressive clearing activities, although SRE invertebrate fauna species have relatively poor powers of dispersal and are therefore more likely to be directly impacted by clearing activities. Some species may be displaced by clearing processes. However, most of the 19 habitats present over the Project Area are widely represented throughout the region, so there is opportunity for displaced fauna to seek refuge in surrounding habitat outside areas of disturbance. Loss of habitat from fire is therefore not considered to be a significant risk to local fauna populations.
5.2 **Injury or death to fauna from fires from inappropriately managed stockpiles of vegetation**
The greatest risk to fauna populations in relation to fire is likely to be from altered fire regimes. Fires cause habitat destruction, and species with relatively poor powers of dispersal such as SRE invertebrate fauna are more likely to be directly impacted by fire. As SRE invertebrate fauna are not considered to be restricted to the Project Area, fire is not considered to be a significant risk to populations.

5.3 **Greenhouse gas emission from stockpiled vegetation**
Given the types of vegetation and the amount that would be required to be cleared, it is considered that impacts to the environment from greenhouse gas emissions from stockpiled vegetation would be minor. With the implementation of appropriate waste management procedures (such as mulching of green waste) it is expected that any impact would be further minimised.

5.4 **Loss of seedbank from inappropriately managed soil stockpiles**
Loss of seedbank material would have an adverse impact on rehabilitation of the Project Area (both progressive and at closure). Vegetation and topsoil would be stockpiled separately to ensure maximum reuse of these resources in subsequent rehabilitation. Topsoil stockpiles would not exceed 2m in height, and where possible topsoil would be stripped and placed directly onto completed backfill and rehabilitation earthworks. With appropriate management procedures in place, it is considered that loss of seedbank material would have a minor environmental impact.

5.5 **Injury or death to local fauna from inappropriate general waste management**
General waste, such as cigarette butts, aluminium cans and food wrappings and general construction waste (such as empty containers and wrappings), if not disposed of appropriately, may cause death or injury to fauna. Such incidents typically would only involve individual animals and are considered unlikely to have any lasting impact on a population.

5.6 **Soil and/or groundwater contamination from hydrocarbon and/or chemical spills**
Soils may become contaminated through hydrocarbon and chemical spills. Contaminated soils would be temporarily stored on site and disposed of at a suitably licensed waste disposal facility. If cleaned up and remediated in a timely manner, it is considered that soil contamination would have a minor environmental impact. However, if not managed appropriately, contaminated soils may impact the environment through impacts on plant-available water (PAW) thereby potentially affecting plant growth and heavy metal uptake, impacts on ground dwelling fauna (such as SREs) and soil bacteria, and contamination may travel further through the groundwater system and affect stygofaunal populations. Transport of contaminated soil material via surface water movement has the potential to impact on terrestrial fauna through drinking water sources.

Impacts to groundwater are discussed separately within the Water Management Strategy Document.

5.7 **Impacts to local fauna (SRE invertebrates and stygofauna) from potential soil and/or groundwater contamination from hydrocarbon and/or chemical spills**
Spills of hazardous materials such as from hydrocarbons and various chemicals, may have an impact on SRE invertebrate species and subterranean faunal populations such as stygofauna if spills are not cleaned up in a timely fashion and contaminants enter the groundwater. With
appropriate spills procedures in place, it is considered unlikely that any such spills during construction and operation of the mine would have any significant impacts to subterranean faunal populations.

A separate Stygofauna Management Strategy has been developed.

5.8 Impacts to local fauna from potential increases to introduced fauna from inappropriate putrescible waste management
Development of the Project may provide additional resources or habitat (e.g. via an accommodation village or potential landfill) that may encourage feral animal activity and numbers that may adversely impact on populations of native fauna. Waste that is not managed appropriately has the potential to have an impact on local populations.

5.9 Loss of Pregnant Liquor Solution (PLS) into sub-soil and/or ground water from the evaporation pond and emission of Radon gas and aerosols from pond surface
Soils may become contaminated through loss of PLS. This may happen through failure of a clay liner and membrane (due to design or installation defect, unexpected geology, wave damage, exposure of drying and damage to membrane during maintenance or clean-out). Monitoring bores would be installed, with flow and seepage rates monitored. Recovery bores may be required if seepage rates beyond design criteria are detected.

If detected and remediated in a timely manner, it is considered that soil contamination through loss of PLS would have a minor environmental impact. Impacts to groundwater are discussed separately within the Water Management Strategy.

Radon does not provide a direct significant source of radiation exposure. However, its gaseous nature means that it is able to diffuse from materials, disperse into the atmosphere and move, therefore making it a transport mechanism for the more hazardous radon decay products (Toro Energy Ltd. 2011). Impacts to the receiving environment from radon gas from the pond surface are considered to be low.

5.10 Loss of tails from the Tailings Storage Facility (TSF) into sub-soil, loss of tailing solution into ground water (beyond design seepage rate), loss of tails (liquid or solids to groundwater and emission of Radon gas from drying and exposed tails/dust)
The Centipede and Lake Way deposits are at or below the local water table. Thus the groundwater is already moving through the ore and it has already had an impact on the local groundwater. Use of proposed groundwater low permeability barriers would reduce the overall water flow through the TSF.

The purpose of the low permeability barriers is primarily to retard the movement of any residual radionuclides or other critical components, which may have been mobilised due to the processing of the ore rather than prevention of water flow. For each cell the water level prior to the commencement of deposition would be matched to the surrounding groundwater level and thus minimal seepage would occur. During the operation, as a result of deposition of tailings, the water level would rise and some seepage would occur. On completion of deposition the facility would be allowed to dry and the water level would reduce back to approximately equivalent to the surrounding water level and seepage would reduce to effectively zero. The current groundwater modelling indicates that the local groundwater flow is largely towards the
lake so it is expected that any seepage from the facility would be locally confined (Knight Piésold, 2010).

For the bulk of the deposition into the active cell the tailings would be below water or close to 100 per cent saturated. Thus it is anticipated that dusting would be a controllable issue (ibid).

Radon does not provide a direct significant source of radiation exposure. However, its gaseous nature means that it is able to diffuse from materials, disperse into the atmosphere and move, therefore making it a transport mechanism for the more hazardous radon decay products (Toro Energy Ltd. 2011). Impacts to the receiving environment from radon gas from drying and exposed ore are considered to be low.

5.11 Impacts to rehabilitation management and success
Potential impacts from waste on rehabilitation management and subsequent success are wide-ranging. As discussed above, each of the potential impacts such as soil contamination, groundwater and surface water contamination, impacts to local flora and fauna all have the potential to affect rehabilitation success of the mine. Toro has prepared a separate Closure and Rehabilitation Management Plan to address these issues.
6 Environmental Objectives, Targets and Indicators

A series of management objectives, targets and indicators has been developed to manage potential and direct impacts of waste management in relation to the Project.

Objectives: what Toro aims to achieve.

Targets: defined objective levels.

Indicators: measures, which are either quantitative or qualitative, to determine whether the objectives have been met.

The environmental objectives, targets and indicators as determined by Toro for waste management are shown in Table 2.

Table 2. Objectives, Targets and Indicators

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Targets</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimise waste generation, maximise material reuse where practicable and waste managed appropriately</td>
<td>Minimise landfill volume or material sent to waste storage facilities. Identify waste streams. Identify material streams suitable for recycling.</td>
<td>Monitoring to show no negative impacts to the environment. Waste management audit results. Recycling program audit/monitoring results.</td>
</tr>
<tr>
<td>Minimise loss of containment of PLS from the evaporation pond</td>
<td>Minimise PLS impacts to groundwater and subsoil.</td>
<td>Monitoring to show no negative impacts to the environment</td>
</tr>
<tr>
<td>Minimise Radon gas and aerosol emissions from the evaporation pond</td>
<td>Minimise Radon gas and aerosol emissions to the environment.</td>
<td>Monitoring to show no negative impacts to the environment</td>
</tr>
<tr>
<td>Minimise loss of tailings solution into subsoil and groundwater from TSF</td>
<td>Minimise impacts of tailings solution into subsoil and groundwater.</td>
<td>Monitoring to show no negative impacts to the environment</td>
</tr>
<tr>
<td>Minimise dust from drying of filled TSF cells</td>
<td>Minimise dust</td>
<td>Dust monitoring results</td>
</tr>
<tr>
<td>Minimise Radon gas emissions from TSF</td>
<td>Minimise Radon gas emission to the environment</td>
<td>Monitoring to show no negative impacts to the environment</td>
</tr>
<tr>
<td>Minimise loss of containment of hydrocarbons</td>
<td>No hydrocarbons entering the environment</td>
<td>Monitoring to show no negative impacts to the environment</td>
</tr>
<tr>
<td>Ensure any hydrocarbon/chemical spills are managed with minimal impact to the environment</td>
<td>All staff trained in spill prevention and response</td>
<td>All spills managed in accordance with procedures</td>
</tr>
<tr>
<td>Impacted soils from hydrocarbon/chemical spills rehabilitated</td>
<td>All contaminated soils rehabilitated</td>
<td>Contaminated soils and rehabilitation register</td>
</tr>
</tbody>
</table>
7 Management Strategies and Actions

7.1 Key strategies
Detailed waste management documentation would be developed for the construction and operational phases of the Project. Documentation relevant to decommissioning would be developed if required during the operational phase. Documentation would include specific policies and standard operating procedures, and would be developed in collaboration with the Department of Health and the Wiluna Shire.

7.2 Management Actions
Management actions, reporting and corrective actions are listed below:

Table 3. Management Actions

<table>
<thead>
<tr>
<th>Objective</th>
<th>Management Action</th>
<th>Reporting Mechanisms</th>
<th>Corrective Actions</th>
</tr>
</thead>
</table>
| Minimise waste generation, maximise material reuse where practicable and waste managed appropriately | ✈ Standard operating procedures (such as destination, date, volume and waste type would be recorded)  
✈ Identify waste streams  
✈ Identify material streams suitable for recycling  
✈ Organic material generated on site would be re-used on site  
✈ Maintenance routines | ✈ People (if present)  
✈ Incident report  
✈ Inspection & audit | ✈ Review of audit reports  
✈ Implement findings of reports |
| Minimise loss of containment of process fluids and/or slurry; or reagents | ✈ Design & installation standards  
✈ Standard operating procedures (including monitoring and maintenance routines)  
✈ Vehicle standards  
✈ Spill kits | ✈ People (if present)  
✈ Incident report  
✈ Process instruments & alarm(s)  
✈ Inspections & audits  
✈ Pump current draws  
✈ Metal balance | ✈ Bunds (with sumps)  
✈ E-stop  
✈ Flange guards for high temperature circuits (above 65 °C)  
✈ Repair damaged or failed components  
✈ Spills response procedure  
✈ Any contaminated soils remediated |
| Minimise Radon gas and aerosol emissions from the evaporation pond and the Tailings Storage Facility (TSF) | ✈ Design & installation standards (e.g. Bunds)  
✈ Standard operating procedures  
✈ Maintenance routines | ✈ People (if present)  
✈ Monitoring for Radon | ✈ Review of standard operating procedures and maintenance routines |
<table>
<thead>
<tr>
<th>Minimise loss of tailings solution into subsoil and groundwater from TSF</th>
<th>Inductions</th>
<th>People (if present)</th>
<th>Review of audit reports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design &amp; installation standards (e.g. the tailings pipeline would be contained within a bund)</td>
<td>Standard operating procedures (e.g. monitoring). These would include:</td>
<td>Incident report</td>
<td>Implement findings of reports</td>
</tr>
<tr>
<td>• Short-term operation monitoring – this includes items such as offtake location, whether pipe joints are leaking, etc.;</td>
<td>• Compliance monitoring</td>
<td>Inspection &amp; audit.</td>
<td></td>
</tr>
<tr>
<td>• Long-term performance monitoring</td>
<td>• Solids tonnage to the TSF.</td>
<td>• Water volume to the TSF.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Rainfall and evaporation at the TSF.</td>
<td>• Water levels in each active cell.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Monitoring of tailings moisture contents and densities, and survey of the tailings beach; and</td>
<td>• Supernatant pond locations, which would be conducted quarterly.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Minimise dust from drying of filled TSF cells</th>
<th>Inductions</th>
<th>People (if present)</th>
<th>Review of audit reports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design &amp; installation standards (e.g. the nominal minimum 1m cover would be placed as rapidly as possible)</td>
<td>Standard operating procedures (e.g. access to the surface during drying would be minimised thus preventing breakup of the surface and/or any salt crust and dust monitoring)</td>
<td>Incident report</td>
<td>Implement findings of reports</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Minimise loss of containment of hydrocarbons</th>
<th>Inductions</th>
<th>People (if present)</th>
<th>Repair damaged or failed components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design &amp; installation standards of storage, handling and transfer infrastructure</td>
<td>Standard operating</td>
<td>Incident report</td>
<td>Review of audit reports</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inspection &amp; audit</td>
<td>Implement findings</td>
</tr>
<tr>
<td>Ensure any hydrocarbon/chemical spills are managed with minimal impact to the environment</td>
<td>Design &amp; installation standards (e.g. spillage containment and recovery designs)</td>
<td>People (if present)</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Standard operating procedures (e.g. spill response and remediation)</td>
<td>Incident report</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maintenance routines</td>
<td>Inspection &amp; audit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Spill kits</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inductions and training</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impacted soils from hydrocarbon/chemical spills rehabilitated</td>
<td>Standard operating procedures (e.g. removal and remediation)</td>
<td>Inspection &amp; audit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inductions and training</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Any contaminated soils remediated
- Implement findings of reports (e.g. spills response procedure may require adjusting or additional training may be required)
- Review of audit reports
- Inspections and audits
- Any contaminated soils remediated
8 References


Glossary

Biopolymer barrier: a barrier for engineering purposes, which is generated from renewable natural sources, is often biodegradable and not toxic to produce.
Hydrocarbons: an organic compound consisting of only carbon and hydrogen, examples being grease, fuel and oils.
Pregnant liquor solution: a solution of dissolved substance in a liquid.
Radionuclide: an isotope that undergoes radioactive decay.
Radon gas: a radioactive, colourless, odourless, tasteless noble gas, occurring naturally as the decay product of radium.
Short range endemic invertebrate fauna: are species of terrestrial and aquatic invertebrate animals, which typically occupy areas smaller that 10,000km².
Stygofauna: are any fauna that live within groundwater systems, such as caves and aquifers.

Acronyms and abbreviations

CHMP: Cultural Heritage Management Plan
DEC: Department of Environment and Conservation.
EMP: Environmental Management Plan
EPA: Environmental Protection Authority
EPBC Act: Environmental Protection and Biodiversity Conservation Act, 1999
ha: hectares
km: kilometres
PAW: Plant available water
SOP: Standard Operating Procedure
SRE: Short range endemic invertebrate fauna
Toro: Toro Energy Limited
TSF: Tailings Storage Facility
<table>
<thead>
<tr>
<th>Title:</th>
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</tr>
</thead>
<tbody>
<tr>
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<td>R. Wedd</td>
</tr>
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Introduction

This Fire Environmental Management Strategy Document (EMSD) has been prepared by Toro Energy Limited (Toro) to describe management actions to be implemented during the construction and operational phases of the Wiluna Uranium Project (the Project), as well as providing methods to determine fire management success during the construction and operation of the Project. A Fire Management Plan for the decommissioning phase would be developed if required during the operational phase of the Project.

This EMSD describes how Toro would:
- Comply with relevant legislation and standards for fire management;
- Identify potential direct and indirect environmental impacts from fire management;
- Provide environmental indicators, objectives and targets; and
- Implement management measures, methods and reporting, auditing and review.

This EMSD is part of a suite of plans that deal with impacts and aspects of the Project. This EMSD is designed to assist Toro employees and contractors to undertake fire management in a manner that is compliant with relevant legislation, safe and environmentally responsible. All management plans and strategies would be periodically reviewed as part of Toro’s commitment to continuous improvement, and for their continued application to the Project, particularly during the operational phase.

1.1 Project Overview

The Wiluna Project is in the Murchison region of Western Australia, approximately 960km north east of Perth. It is based on mining two deposits: Centipede and Lake Way. The Centipede deposit is approximately 30km south of the town of Wiluna, and the Lake Way deposit is approximately 15km south of Wiluna. The total Project encompasses Centipede East deposit (M 53/224), Centipede West (tenement numbers M 53/0113, P53/1355, P53/1356, P53/1357, P53/1396), Lake Way deposit (tenement number M 53/1090) and the West Creek borefield (tenement number L 53/0150).

The principal components of the Project include:
- Construction and operation of a uranium mine encompassing the Lake Way and Centipede deposits;
- Construction and operation of an ore processing, packaging and handling facility;
- Development of the West Creek borefield to supply water to the Project;
- Support facilities including an accommodation village, mine administration buildings and workshops, haul roads, power generation and transmission facilities, communications systems and water and waste management;
- Transport of uranium product within Australia for export; and
- Rehabilitation and closure of the mine and other areas disturbed by the Project.

The Project Area is wholly within the Wiluna Shire.

Fires are a natural part of the landscape in this region, with spinifex grasslands particularly prone to bushfires. Spinifex grasslands are a component of the Project Area (see Figure 1). Fires in the region occur from natural occurrences, such as lightning strike, and accidental causes, such as from tourist activities (unmanaged campfires). Prescribed burns are undertaken by the Department of Environment and Conservation (DEC) on an annual basis. Local pastoralists maintain access tracks, wells and fences to assist fire management, and may occasionally burn for the promotion of new growth for stock feed.
Traditional burning by Aboriginal people may take place periodically, with various plants used for food and cultural purposes (Niche 2011b). Toro has an Indigenous Relations Policy for the Project that encourages the use of traditional knowledge and skills in relation to land management.

The construction of access and haul roads (through clearing of vegetation and vehicle use), construction and operation associated with mining infrastructure and development of the mine site would require fire management activities. Various operational activities would also require appropriate fire management activities (such as hot work activities and construction of any further access roads).

Work is ongoing to place the vegetation within the Project Area into a regional context. This information will be used to better determine the conservation significance of any vegetation that may be present. The current regional survey work has provided information in relation to the local distribution of some vegetation, and further work is to be undertaken (Niche 2010). As more information becomes available, potential impacts to poorly conserved vegetation can be appropriately assessed and managed. Weeds are present in the Project Area, providing a potential fuel load. Toro has developed a separate Weed Management Strategy Document, which needs to be considered in conjunction with this EMSD. Flora and fauna, which may be fire sensitive species, are also discussed in separate management strategies.

DEC is preparing a Draft Fire Management Plan for the Lorna Glen area, which, although approximately 170km north-east of Wiluna, will have relevance for the Project Area. Once this plan is finalised, it will be used to develop a more detailed Fire Management Strategy for the Project.
2 Scope

This EMSD provides a reference for monitoring, reporting and auditing as necessary to minimise identified and potential environmental impacts of the Project. It is being submitted to the Environmental Protection Authority (EPA) with the Environmental Review and Management Programme (ERMP) as part of the environmental assessment and approvals process for the Project.

This EMSD has been prepared based on:
- Toro’s Environment Policy;
- Toro’s Indigenous Relations Policy;
- Toro’s Occupational Health and Safety Policy;
- Relevant Commonwealth and Western Australian legislation;
- Other legal obligations;
- Identified potential direct and indirect environmental impacts from risk assessments;
- Relevant permits and standards;
- Information from the Fire and State Emergency Services Authority of Western Australia and consultation with the Department of Environment and Conservation; and
- Toro’s commitment to continuous improvement.

This EMSD has been developed to:
- Demonstrate how Toro intends to minimise the potential impact of fire management activities associated with the construction and operational phases of the Project;
- Describe proposed monitoring activities;
- Describe fire management controls for the life of the Project;
- Demonstrate reporting, auditing and review mechanisms;
- Provide a procedure for dealing with emergency events;
- Outline procedures for consultation and complaints; and
- Guide the development of other site specific plans and procedures relevant to the Project.

This EMSD covers the following elements of the Project:
- Construction and mining of the Lake Way and Centipede deposits;
- Construction and operation of a processing, packing and handling facility;
- Development of the West Creek borefield; and
- General infrastructure including an accommodation village, mine administration buildings and workshops, haul roads, power generation and transmission facilities, communications systems and water and waste management.
3 Legislative Requirements

Toro would comply with all relevant Commonwealth and State legislation and regulations that apply to fire management aspects of the construction and operational phases of the Project.

Commonwealth Legislation
- Environment Protection and Biodiversity Conservation Act 1999;

Western Australian Legislation
- Bushfires Act 1954;
- Conservation and Land Management Act 1984;
- Dangerous Goods Safety Act 2004 (and Regulations 2004);
- Environment Protection Act 1986;
- Environmental Protection (Clearing of Native Vegetation) Regulation 2004;
- Mining Act 1978;

3.1 Other Applicable Guidelines and Standards
This EMSD outlines the scope of the proposal and the potential impacts that have been identified by Toro. The risk assessment process is based upon the framework stated with the Australian Standard AS4360 titled ‘Risk Management’ along with the Guide HB203 titled ‘Environmental Risk Management — Principles and Process’.

The following Toro documents should be read in conjunction with this EMSD:
- Weed Management Strategy;
- Fauna Management Strategy;
- Cultural Heritage Management Plan;
- Groundwater Dependent Ecosystem Flora Management Strategy;
- Vegetation Clearing and Earthworks Management Strategy;
- Dust Management Strategy;
- Water Management Strategy.

3.1.1 Australian/New Zealand Standards
As well as the standards, guidelines and policies listed below, Toro would also adhere to the Building Code of Australia in relation to the construction of the accommodation and all other mine site infrastructure.
Table 1. Australian and New Zealand Standards

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1221 (NZS)</td>
<td>Fire hose reels</td>
</tr>
<tr>
<td>1603</td>
<td>Automatic fire detectors</td>
</tr>
<tr>
<td>1841 (NZS)</td>
<td>Portable fire extinguishers</td>
</tr>
<tr>
<td>1940-1993</td>
<td>Storage &amp; handling of flammable &amp; combustible liquids</td>
</tr>
<tr>
<td>2419</td>
<td>Fire hydrants</td>
</tr>
<tr>
<td>2792</td>
<td>Fire hoses</td>
</tr>
<tr>
<td>3504 (NZS)</td>
<td>Fire blankets</td>
</tr>
<tr>
<td>3786</td>
<td>Smoke alarms</td>
</tr>
<tr>
<td>4265</td>
<td>Wheeled fire extinguishers</td>
</tr>
</tbody>
</table>

3.1.2 Western Australian guidelines, policies and standards

Table 2. Western Australian Guidelines, Policies and Standards

<table>
<thead>
<tr>
<th>Authority</th>
<th>Position Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Protection Authority</td>
<td>Position Statement No 5 – Environmental Protection and Ecological Sustainability of Rangelands in Western Australia (2004)</td>
</tr>
<tr>
<td>Environmental Protection Authority</td>
<td>Position Statement No 6 – Towards Sustainability (2004)</td>
</tr>
<tr>
<td>Environmental Protection Authority</td>
<td>Position Statement No 7 - Principles of Environmental Protection (2004)</td>
</tr>
<tr>
<td>Environmental Protection Authority</td>
<td>Position Statement No 9 – Environmental Offsets (2006)</td>
</tr>
<tr>
<td>Environmental Protection Authority</td>
<td>Guidance Statement No 12 – Minimising Greenhouse Gases (2002)</td>
</tr>
<tr>
<td>Environmental Protection Authority</td>
<td>Draft State Environmental (Ambient Air) Policy (2009)</td>
</tr>
<tr>
<td>Environment Protection and Heritage Council</td>
<td>National Environmental Protection Measure for Ambient Air Quality (2003)</td>
</tr>
</tbody>
</table>

3.1.3 Fire and Emergency Services Authority (FESA) guidelines

- Bush Fires in the North of Australia
- Evaporative Air Conditioners and Bush Fires
- Guidelines for Operating Private Equipment at Fires
- Managing Smoke from Planned Burning
- Arson - Is your business at risk?
- Preparing for Emergency Evacuations at the Workplace
- Static Water Supplies and Hard Suction Connections
- Fire extinguishers in the workplace
4 Related Toro Environmental Documents

The following Toro documents were considered in completing this EMSD:

- Chapters 1 and 2 from the Environmental Review and Management Programme (ERMP) (Toro, June 2011)
- Interim Assessment of the Flora and Vegetation at the Toro Energy Wiluna Uranium Project: Lake Way, Centipede and Borefield (Niche Environmental Services. 2010)
- Wiluna Project Weed Management Plan - Draft (Niche Environmental Services. 2011a)
5 Overview of potential impacts

From the DEC's Principles of Fire Management in Spinifex Grasslands (www.dec.wa.gov.au 2010), fire management in this region should be both precautionary and adaptive, considering the requirements of both fire sensitive (habitat specific) and fire maintained communities and species in order to optimise biodiversity conservation outcomes. The DEC also states that due to the vastness of this region and the scarcity of regional resources, proactive fire management including fire suppression and prescribed burning should focus on areas of high conservation value and on high value built and cultural assets (ibid). Maintaining regional fire response capacity is of high importance in this region.

Activities that would require fire management include:
- Clearing of vegetation for construction of mine infrastructure (including roads);
- Creation of firebreaks around mine infrastructure;
- Hot work activities (e.g. welding);
- Electrical works and equipment maintenance;
- Vehicle maintenance (e.g. friction of parts and dry vegetation under the vehicle);
- Smoking (contractors and employees);
- Prescribed burning (if required);
- Potential spontaneous combustion (e.g. from slow oxidation of oily materials); and
- Maintaining firebreaks along neighbouring properties.

Potential impacts from fires associated with the Project could include the following:
- Fauna injuries or death;
- Emission of greenhouse gases;
- Affects on local biodiversity (loss of habitat);
- Changes to vegetative communities;
- Loss of vegetation for Aboriginal food sources and cultural uses;
- Damage to items or areas of cultural significance; and
- Impacts to rehabilitation management and success.

Although not a Project-related impact, one activity that Toro would be vigilant in monitoring would be arson activities, which could pose a threat to the environment, workers and mining activities and infrastructure.

5.1 Fauna injuries or death
The greatest risk to fauna populations in relation to fire is likely to be from altered fire regimes. Fires cause habitat destruction, and species with relatively poor powers of dispersal such as Short Range Endemic (SRE) invertebrate fauna are more likely to be directly impacted by fire. Many animals may disperse to other areas during fire events. As SRE invertebrate fauna are not considered to be restricted to the Project Area, fire is not considered to be a significant risk to populations.

5.2 Emission of greenhouse gases
When fires burn, greenhouse emissions are released into the atmosphere. With appropriate fire management and minimising any alteration to the natural fire regimes, greenhouse emissions would not be a significant impact from Toro’s operations.

5.3 Affects on local biodiversity (loss of habitat)
Loss of habitat is listed as a key threatening process under the Environment Protection and Biodiversity Conservation Act. Some species may be displaced by fire events from loss of
habitat. However, most of the 19 habitats present over the Project Area are widely represented throughout the region, so there is opportunity for displaced fauna to seek refuge in surrounding habitat outside the disturbance area. Loss of habitat is therefore not considered to be a significant risk from fire events.

5.4 Changes to vegetative communities
Altered fire regimes may cause changes to vegetative communities, both in the short and long-term. Loss of seedbank material may be caused from loss of reproductively viable vegetation (such as mature trees). Loss of seedbank material may have impacts on local floristic diversity and future rehabilitation requirements. Fires may destroy some seed material, but may also stimulate others to germinate. With appropriate management of these issues, and given that most of the vegetation communities are well represented in the region, it is not considered that seedbank loss or changes to vegetative communities from fire events would have a significant impact on local flora communities or future rehabilitation efforts.

5.5 Loss of vegetation for Aboriginal food sources and cultural uses
The potential impacts to culturally important plant species in the proposed area of disturbance were assessed during the surveys over the Centipede and Lake Way deposits. The impacts to individual species were considered to be minimal from a conservation perspective, with all species recorded during the surveys noted as being either locally common or widespread in Western Australia (Niche 2011b).

5.6 Potential impact on items or areas of Aboriginal cultural significance
The impact of fire on the species *Hakea francisiana* could be significant because of the limited availability of trees with a large enough bole (required to form items such as shields, woomeras, boomerangs or carrying trays). While this species was recorded in a number of locations within and adjacent to the Project Area during the bush tucker surveys, the number of large specimens observed was uncommon. Given that the species requires a large bole to be of any cultural use, the removal of any large trees would potentially constitute a significant cultural impact. Maintaining knowledge of the technique of manufacture and ensuring that the traditional usage of the artefacts is passed on is of cultural importance. Trees of the correct size are sought so that young children can be shown how these items are manufactured and have the historic importance of these artefacts detailed (Niche 2011b). Large trees may be impacted upon from fire events.

5.7 Impacts to rehabilitation management and success
Fire has the potential to impact significantly on rehabilitated areas. With appropriate fire management, and given that most of the vegetation communities are well represented in the region, it is not considered that seedbank loss or changes to vegetative communities from fire events would have a significant impact on local flora communities or to future rehabilitation efforts.
6 Environmental Objectives, Targets and Indicators

The environmental objectives, targets and indicators as determined by Toro for fire management are shown in Table 3.

Table 3. Objectives, targets and indicators.

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Targets</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimise non-prescribed fire occurrences</td>
<td>Zero incidents of un-prescribed burning by Project personnel/contractors</td>
<td>No significant impacts to the environment</td>
</tr>
<tr>
<td>Exclusion of fires from rehabilitated areas</td>
<td>No fires in rehabilitated area</td>
<td>Number of fires in rehabilitated areas</td>
</tr>
<tr>
<td>No unauthorised fires from Toro activities</td>
<td>No unauthorised fires from Toro activities</td>
<td>Number of fires onsite</td>
</tr>
<tr>
<td>Manage prescribed burns with minimal impact on the environment</td>
<td>Minimal impacts to the environment from prescribed burns.</td>
<td>Management actions completed</td>
</tr>
<tr>
<td>No burning of waste material/landfill</td>
<td>Zero incidents of waste burning by Project personnel/contractors</td>
<td>Number of fires in landfill/waste areas</td>
</tr>
</tbody>
</table>
7 Management Strategies and Actions

7.1 Key strategies
Detailed fire management documentation would be developed for the construction and operational phases of the Project. Documentation relevant to decommissioning would be developed during the operational phase. This would include specific policies and standard operating procedures (SOPs), and would be developed in collaboration with the Fire and Emergency Services Authority of Western Australia, the DEC and interested communities and stakeholders.

7.2 Management Actions
Management actions, reporting and corrective actions are listed below:

Table 4. Management Actions

<table>
<thead>
<tr>
<th>Objective</th>
<th>Management Action</th>
<th>Reporting Mechanisms</th>
<th>Corrective Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimise non-prescribed fire occurrences</td>
<td>Design &amp; installation standards (e.g. buffer zones around hot-work areas, firebreaks, all buildings would be fitted with fire extinguishers)</td>
<td>People (if present)</td>
<td>Repair damaged or failed components</td>
</tr>
<tr>
<td></td>
<td>Standard operating procedures and permits (e.g. Hot Work)</td>
<td>Incident report</td>
<td>Fire response procedure</td>
</tr>
<tr>
<td></td>
<td>Emergency Response Plan</td>
<td>Inspection &amp; audit</td>
<td>Training</td>
</tr>
<tr>
<td></td>
<td>Adequate water storage onsite for fire suppression purposes</td>
<td>Compliance Register</td>
<td>Implement findings of audits</td>
</tr>
<tr>
<td></td>
<td>Fire bans and restrictions</td>
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<td></td>
<td>Maintenance routines (e.g. all fire and electrical equipment would be checked on a regular basis and maintained to the current Australian standards)</td>
<td></td>
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<tr>
<td></td>
<td>Waste management to reduce fire hazard potential</td>
<td></td>
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<tr>
<td>Exclusion of fires from rehabilitated areas</td>
<td>People (if present)</td>
<td>Fire response procedure</td>
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<td>-------------------------------------------</td>
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<tr>
<td>Vehicle standards (e.g. all site vehicles to be regularly inspected and serviced to reduce potential of fire from engines and exhaust systems. Site vehicles to be fitted with fire fighting equipment to Australian Standards)</td>
<td>Incident report</td>
<td>Training</td>
<td></td>
</tr>
<tr>
<td>Inductions (in relation to fire hazards/safety requirements/potential hazards)</td>
<td>Inspection &amp; audit</td>
<td>Implement findings of audits</td>
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</tr>
<tr>
<td>Fire drills</td>
<td>Stakeholder engagement (local traditional owners, neighbouring property owners and DEC)</td>
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</tr>
<tr>
<td>Maintenance routines</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Manage prescribed burns with minimal affect to the environment</th>
<th>People (if present)</th>
<th>Review procedures</th>
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<tbody>
<tr>
<td>Carry out prescribed burns as required (patch burning is preferred by DEC)</td>
<td>Incident report</td>
<td>Implement findings from reports/audits</td>
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<tr>
<td>Consultation with DEC/stakeholders/ FESA/local fire officer</td>
<td>Inspection &amp; audit</td>
<td></td>
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<td>permits</td>
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<td>permits</td>
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<tr>
<td>No burning of waste material/landfill</td>
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<td>People (if present)</td>
</tr>
<tr>
<td>Design &amp; installation standards (e.g.</td>
<td></td>
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<tr>
<td>appropriate stockpiling of cleared</td>
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<td>Incident report</td>
</tr>
<tr>
<td>vegetative matter)</td>
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<td>Inspection &amp; audit</td>
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<td>Standard operating procedures</td>
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<td>Maintenance routines</td>
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<tr>
<td>Inductions (in relation to fire hazards/safety</td>
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<td>requirements/hazards</td>
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</tbody>
</table>
8 References


**Glossary**

**Groundwater Dependent Ecosystem Flora:** Vegetation communities that require a supply of groundwater to maintain their structure and function.

**Acronyms and abbreviations**

**CHMP:** Cultural Heritage Management Plan  
**DEC:** Department of Environment and Conservation  
**EMP:** Environmental Management Plan  
**EPA:** Environmental Protection Authority  
**FESA:** Fire and Emergency Services Authority of Western Australia.  
**SOP:** Standard Operating Procedure  
**Toro:** Toro Energy Limited
Figures

Figure 1. Spinifex grassland near minesite.
<table>
<thead>
<tr>
<th>Title:</th>
<th>STYGOFUAHA</th>
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<td>Author:</td>
<td>R. Wedd</td>
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<tr>
<td>Revision Date:</td>
<td>July 2011</td>
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<td>Approved by:</td>
<td>R. Dossor</td>
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1 Introduction

This Stygofauna Environmental Management Strategy Document (EMSD) has been prepared by Toro Energy Limited (Toro) to describe management actions to be implemented during the construction and operational phases of the Wiluna Uranium Project (the Project), as well as providing target indicators to ascertain the success of managing impacts on stygofaunal populations during both the construction and operation of the Project.

This EMSD describes how Toro would:

- Comply with relevant legislation and standards in relation to stygofauna management;
- Identify potential direct and indirect environmental impacts from the Project on stygofaunal communities;
- Provide environmental indicators, objectives and targets; and
- Implement management measures, methods and reporting, auditing and review.

This EMSD is part of a suite of plans that deal with impacts and aspects of the Project. This EMSD is designed to assist Toro employees and contractors to undertake stygofauna management in a manner that is compliant with relevant legislation, safe and environmentally responsible. All management strategies and plans would be periodically reviewed as part of Toro’s commitment to continuous improvement, and for their continued application to the Project, particularly during the operational phase.

1.1 Project Overview

The Wiluna Project is in the Murchison region of Western Australia, approximately 960km north east of Perth. It is based on mining two deposits: Centipede and Lake Way. The Centipede deposit is approximately 30km south of the town of Wiluna and the Lake Way deposit is approximately 15km south of Wiluna. The total Project encompasses Centipede East (tenement number M53/224), Centipede West (tenement numbers M53/0113, P53/1355, P53/1356, P53/1357, P53/1396), Lake Way (M53/1090) and West Creek borefield (tenement number L53/0150).

The principal activities planned for the Project include:

- Development and operation of a uranium mine encompassing the Lake Way and Centipede deposits;
- Construction and operation of a uranium ore processing, packing and handling facility;
- Development of the West Creek borefield to supply water to the Project;
- Support facilities including an accommodation village, mine administration buildings and workshops, haul roads, power generation and transmission facilities, communications systems and water and waste management;
- Transport of uranium product within Australia for export; and
- Rehabilitation and closure of the mine and other areas disturbed by the Project.

The proposed total area of disturbance required for the development of the Project over the planned 14-year-life-span would be approximately 1,530 hectares (ha). This area predominantly comprises native vegetation, with the exception of minor areas of existing disturbance associated with roads and access tracks and previous mining activity in the Project locality (Outback Ecology Services 2010).
This EMSD has been developed to consider stygofaunal populations. Troglofauna are present in the Project Area and the results from survey data (Outback Ecology Services 2011) are presented below.

Four of the nine species detected at the Centipede deposit were found only in that area. The absence of habitat considered suitable for troglofauna (such as calcretes with reasonably interconnected and humid subterranean air filled voids) in the floodplain areas suggests these species are more likely to be soil dwelling fauna (edaphobites) and not obligate inhabitants of subterranean environments (troglobites), which are more likely to have restricted distributions. The reasonable likelihood that these species occupy a soil fauna ecological niche, coupled with the adjacent and relatively widespread extent of the floodplain habitat fringing the Lake Way playa, suggests that these species are likely to be more widely distributed and not restricted to the immediate vicinity of the sites in the mine development area from which they were detected.

Nine troglomorphic species were recorded at the Lake Way deposit encompassing Uramurdah calcrete. All but one of these species, Haloniscus sp. OES6 (Isopoda), were found to occur outside the area surveyed. Because of the ecological niche likely to be occupied and the relatively widespread extent of floodplain habitat at Lake Way, it is considered unlikely that Haloniscus sp. OES6 would be restricted to the mine development area only.

From this information, it is considered that it is highly unlikely that the Project would impact on regional populations and so troglofauna are not considered further in this EMSD. If new data from future surveys indicates that there may be species specific to the Project Area that may be impacted upon, then this document would be updated to include any additional faunal group.
2 Scope

This EMSD provides a reference for monitoring, reporting and auditing as necessary to minimise identified and potential negative environmental impacts of the Project. This EMSD is being submitted to the Environmental Protection Authority (EPA) with the Environmental Review and Management Programme (ERMP) as part of the environmental assessment and approvals process.

This EMSD has been prepared based on:

• Toro’s Environmental Policy;
• Toro’s Occupational Health and Safety Policy;
• Relevant Commonwealth and Western Australian legislation;
• Other legal obligations;
• Identified potential direct and indirect environmental impacts from risk assessments;
• Consultants’ reports;
• Relevant permits and standards; and
• Toro’s commitment to continuous improvement.

This EMSD has been developed to:

• Demonstrate how Toro intends to minimise the potential impact of activities associated with the construction and operational phases of the Project on the regional stygofaunal populations;
• Describe proposed monitoring activities;
• Describe stygofauna management controls for the life of the Project;
• Demonstrate reporting, auditing and review mechanisms;
• Provide a procedure for dealing with emergency events;
• Outline procedures for consultation and complaints; and
• Guide the development of other site specific plans and procedures relevant to the Project.

This EMSD covers the following areas of the Project:

• Construction and mining of the Lake Way and Centipede deposits;
• Construction and operation of a processing, packing and handling facility;
• Development of the West Creek borefield; and
• General infrastructure including an accommodation village, mine administration buildings and workshops, haul roads, power generation and transmission facilities, communications systems and water and waste management.
3 Legislative Requirements

Toro would comply with all relevant Commonwealth and State legislation that applies to the stygofaunal management aspects of the construction and operational phases of the Project.

Commonwealth Legislation

- *Environment and Protection and Biodiversity Conservation Act 1999*;

Western Australian Legislation

- *Contaminated Sites Act 2003*;
- *Environment Protection Act 1986*;
- *Rights in Water and Irrigation Act 1914*;
- *Waterways Conservation Act 1945*;
- *Wildlife Conservation Act 1950*;

This EMSD outlines the scope of the proposal and the potential impacts that have been identified by Toro. The risk assessment process is based upon the framework stated with the Australian Standard AS4360 titled ‘Risk Management’ along with the Guide HB203 titled ‘Environmental Risk Management — Principles and Process’.

The following Toro documents should be read in conjunction with this EMSD:

- Fauna Management Strategy;
- Groundwater Dependent Ecosystem Flora Management Strategy; and
- Water Management Strategy.

### Table 1. Western Australian Guidelines, Policies and Standards

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<td>Mine void water resource issues in Western Australia (2003)</td>
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<td>Department of Water</td>
<td>State-wide Policy No 5 – Environmental water provisions policy for Western Australia (2000)</td>
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4 Related Toro Environmental Documents

The following Toro documents were considered in the completion of this EMSD:

- Chapters 1 and 2 from the Environmental Review and Management Programme (ERMP) (Toro, June 2011).
- Groundwater Dependant Ecosystems (GDE) Management Strategy (January 2011).
- Centipede Groundwater Impact Assessment (RPS Aquaterra, December 2010).
- Wiluna Uranium Deposit – Water Supply Options (RPS Aquaterra, September 2010).
- West Creek Water Supply Groundwater Modelling (RPS Aquaterra, September 2010).
5  Subterranean Fauna

The subterranean fauna study undertaken by Outback Ecology Services (2011) for the Project involved three Priority 1 Priority Ecological Communities (PEC) calcrete systems, the Hinkler, Lake Violet and Uramurdah calcretes. The three calcretes are all located relatively close to one another on the northern and western boundaries of Lake Way in the northern sector of the Carey paleodrainage channel. The study provided further knowledge of the diversity and distribution of subterranean faunal assemblages at a more local and finer spatial scale that will contribute to a greater understanding of the diversity and distribution patterns of subterranean fauna on a regional scale.

The Project proposes to mine uranium associated with the Hinkler and Uramurdah calcrete systems from the Centipede and Lake Way deposits respectively, and develop the West Creek borefield in the north western region of the Lake Violet calcrete (RPS Aquaterra 2010) to extract a portion of the Project’s mining and processing water requirements.

In total, 2,809 invertebrate specimens from more than 20 orders were collected by 159 stygofauna net haul samples from 104 drill holes across all areas, of which 2,495 specimens represented 50 stygofaunal taxa. The greatest abundance of stygofauna was recorded at Centipede from the Hinkler calcrete with 1,440 individuals representing 26 taxa from nine orders. Sampling at the Lake Way deposit involving Lake Violet and Uramurdah calcretes recorded a much lower abundance with 433 individuals but represented a comparable level of diversity with 23 taxa. West Creek recorded a higher abundance than Lake Way with 622 individuals but species richness was lower with 21 taxa collected (Outback Ecology Services, 2011).

Many of the stygofaunal species identified to date are relatively widely distributed in the region. Although some species were only found within the Project Area during surveys, it is considered that the apparent restricted distributions are more likely to be an artefact of sampling failing to detect each species from outside the Project Area and not a true depiction of these species having such restricted distributions (Outback Ecology Services, 2011). This is particularly relevant at West Creek.

5.1  Centipede

A total of 75 samples from 64 holes were collected over three rounds of sampling in July 2007, November 2009 and August 2010 (Outback Ecology Services, 2011). Of the 23 stygofauna species collected at Centipede (excluding Oligochaeta taxa), 13 species (56.5 per cent) were demonstrated to have relatively widespread distributions, having been collected from other calcrete systems as part of this study or previous stygofauna surveys conducted in the Northern Yilgarn. Of the remaining 10 species detected only from the Hinkler calcrete to date, three species (Bathynellacea: Brevisomabathyrella sp. SAM2; Copepoda: Schizopera sp. TK4 and S. TK7) have not yet been recorded from outside the Centipede deposit. One species is currently undescribed, the cyclopoid copepod Ameiropsyllus sp. TK1. As noted in Outback Ecology Services (2011), this undescribed species is not restricted to Centipede, having also been collected from the groundwaters of Lake Maitland.

The wider distribution patterns of more than 10 other species also detected in, but not confined to, the Centipede deposit indicate the much wider occurrence of suitable habitat and the absence of a barrier to dispersal that would likely prevent Brevisomabathyrella sp. SAM2, Schizopera sp. TK4 or S. TK7 from occurring outside the area to be mined. Instead, the apparent restricted distributions are more likely to be an artefact of sampling failing to detect each species from outside the mining area and not a true depiction of these species
having such restricted distributions. Both copepod species *Schizopera* sp. TK4 and *S*. TK7 may also occur from the Barwedgee calcrete near Lake Maitland, 72km to the south east (Outback Ecology Services, 2011).

5.1.1. Water Quality
Basic water quality parameters (pH, salinity, temperature, dissolved oxygen) and standing water levels were measured at each of the bores sampled during the stygofauna assessment. Groundwater pH at Centipede ranged from slightly acidic (<6.5) to alkaline (>7.5) *sensu* (Foged 1978), with the majority of records across the habitat types exceeding pH 7. While stygofauna communities are known to be rich in calcareous environments, where the pH generally ranges between 7.2 - 8.2 (Humphreys, 2008), work on stygal ostracods has documented specimens from groundwaters with values as low as pH 4.40 (Reeves et al., 2007). This suggests that the pH of groundwater at Centipede is generally suitable for stygofauna and may be conducive to rich stygal assemblages (Outback Ecology Services, 2011).

Analysis by Outback Ecology Services (2011) suggests that there were differences in the basic water quality of the three habitat types. The floodplain sites were generally characterised by higher salinities (electrical conductivities) and slightly lower pH values than the western Hinkler Well calcrete bores, with the eastern Hinkler Well calcrete bores typically displaying more intermediate values.

5.2 Lake Way
A total of 47 samples from 29 holes were collected over four rounds of sampling in November 2009, March, May and August 2010. Of the 20 stygofauna species collected from the Lake Violet and Uramurda calcretes as part of the survey of the Lake Way deposit (excluding Oligochaeta taxa), 12 species (60 per cent) have relatively widespread distributions, having been collected from other calcrete systems and/or the West Creek borefield area as part of this study or previous stygofauna surveys conducted in the Northern Yilgarn. One species (Copepoda: *Kinnecaris* sp. TK2), represented by a single specimen, was detected from inside the Lake Way deposit only.

As was the case for Centipede mentioned above, the wider distribution patterns of 10 other species also detected in but not confined to the Lake Way deposit provides an indication of the much wider occurrence of suitable habitat and the absence of a barrier that would likely prevent *Kinnecaris* sp. TK2 from occurring outside the area to be mined. Instead, the apparent restricted distribution is more likely to be the failure of sampling to detect *Kinnecaris* sp. TK2 from outside the mining area and is not a true depiction of this species having such restricted distributions (Outback Ecology Services, 2011).

5.3 West Creek Borefield
A total of 46 samples from 16 holes were collected over five rounds of sampling in November 2009, May, August, and November 2010. Of the 17 stygofauna species collected from the proposed West Creek borefield area (excluding Oligochaeta taxa), 9 species (53 per cent) have been collected from other calcrete systems as part of this study or previous stygofauna surveys conducted in the northern Yilgarn. The remaining seven species were not detected in this study from outside the modelled drawdown zones. The maximum modelled drawdowns range from:
- 2m for *Brevisomabathynella* sp. SAM4, *Chiltoniidae* sp. SAM2 and *Parabathynellidae* sp. OES13,
• 3m for *Brevisomabathynella* sp. SAM3 and *Paramelitidae* sp. SAM1,
• 4m for *Kennecaris* sp. TK1 and *Parapseudoleptomesochra* sp. TK2.

The sampling conducted at West Creek for stygofauna satisfied the minimum sampling requirements recommended by the EPA (2007).

5.3.1. Water Quality

Basic water quality parameters (pH, salinity, temperature, dissolved oxygen) and standing water levels were measured at each of the bores sampled during the stygofauna assessment. Groundwater pH at the Lake Way deposit and West Creek borefield area ranged from a minimum of 6.89 to a maximum of 9.03, recorded from bores at the Uramurdah calcrete and Lake Violet calcrete respectively, with the majority of values ranging between pH 7 and 8. As noted for Centipede, the pH of groundwaters in the Lake Way deposit and West Creek borefield are unlikely to restrict stygal communities (Outback Ecology Services, 2011).

Analysis by Outback Ecology Services (2011) indicated that there were differences in the basic water quality of the habitat types. The Uramurdah floodplain and calcrete areas tended to have higher salinities and slightly lower pH values than the West Creek alluvium and Lake Violet calcrete (encompassing the West Creek borefield area).
6 Overview of Potential Impacts

Potential direct and indirect impacts from the Project may include:

Direct:
- Groundwater abstraction;
- Dewatering during mining;
- Contamination of groundwater (e.g. through chemical spills or discharges);
- Changes to groundwater characteristics.

Indirect:
- Radionuclide concentration increase beyond natural background levels;
- Drought (although not a Project related impact, it may have an impact in combination with groundwater abstraction).

6.1 Groundwater abstraction

The abstraction of groundwater from aquifers could have an impact on stygofaunal populations. Many of the stygofaunal species identified to date are relatively widely distributed in the region (Outback Ecology Services, 2011). Although some species were only found in the Project Area during surveys, it is considered that the apparent restricted distributions are more likely to be an artefact of sampling failing to detect each species from outside the areas to be mined and not a true depiction of these species having such restricted distributions (Outback Ecology Services, 2011). This is particularly relevant at West Creek.

The potential for impacts to stygofauna as a consequence of groundwater abstraction are considered to be moderate. The projected rate of extraction and consequent reduction in the water table within the borefield have been modelled by RPS Aquaterra (2010a). The analysis predicts a reduction of 4m in the depth to groundwater in the borefield. To better understand how this compares to changes under natural conditions, data analysis is continuing. Rates of abstraction would be monitored to assess and minimise rates of change so that they better reflect natural variation.

6.2 Dewatering during mining

Dewatering has the potential to impact on stygofaunal communities. Predictive modelling (RPS Aquaterra, 2010a) has been undertaken to ascertain predicted total dewatering volumes during the life of mine. Prediction Run 1 simulated the mining, without the use of cut-off walls to help decrease inflow to the open pits, whilst Prediction Run 2 included the simulation of cut-off walls installed around and within the mine area to help control groundwater inflows (RPS Aquaterra, 2010b).

There is a large difference in predicted dewatering volumes between Run 1 and Run 2. The results of the modelling indicate that the permeability of the cut-off walls will have a significant bearing on dewatering rates, the total dewatering volume and the lateral extent of drawdown. The mine plan is to install cut-off walls so as to minimise the amount of water to be pumped and therefore reduce the lateral extent of the predicted drawdown.

As many of the stygofaunal species identified to date are relatively widely distributed in the region, it is considered that dewatering may have impacts to communities within the Project Area, but not on the species diversity and distribution in the region.
6.3 Contamination of groundwater
There may be short term impacts on groundwater dependant fauna such as stygofauna due to contamination of the phreatic zone and groundwater contact zone, but this is considered only possible after prolonged seepage or catastrophic spillage. Given the unlikelihood of such events occurring due to engineered storage (e.g. double lined/bunded fuel cells) and standard operating procedures, hydrocarbon and chemical spills would be identified and cleaned up and remediated in a timely manner. It is considered that groundwater contamination in this area would be a minor environmental impact.

6.4 Changes to groundwater characteristics
Species using groundwater have evolved to utilise water within a range of conductivity and containing certain chemicals. Changes to the quality or characteristics of groundwater are noted as being important to GDEs (Eamus et al., 2006). The quality of groundwater in the borefield and Lake Way deposit has been assessed by RPS Aquaterra (2010a, 2010b). Given that this information is available, monitoring in relation to changes can be made over time. Considerations in relation to changes to groundwater characteristics and the factors leading to changes are discussed in the Water Management Strategy.

Given the apparently wide range of tolerance levels shown by the stygoauna survey results (Outback Ecology Services, 2011) to groundwater characteristics, it is predicted that the potential risk of changes to groundwater characteristics on populations is low.

6.5 Radionuclide concentration increase beyond natural background levels
The potential pathways for radionuclide transportation into the groundwater would include excessive seepage from the tailings storage facility or from unplanned release of material from the tailings system (such as accidental release/spills, overflow or wall failure). Risk assessments to date indicate that the likelihood of either scenario occurring is low. Both scenarios are discussed in the Radioactive Waste Management Plan, which includes likely causes and mitigation measures.

It is considered therefore that impacts to stygofauna from potential increases in radionuclide concentrations beyond natural background levels would be negligible.

6.6 Drought
Drought impacts on the availability of groundwater by altering recharge rates of aquifers. Where recharge rates are reduced as a consequence of drought, there may be a reduction in the quality and availability of groundwater. Longer term changes to recharge rates may result in changes to the depth at which groundwater is available, which may reduce the capacity of stygofauna to access the groundwater.

The potential for impacts due to drought are difficult to assess in detail. The characteristics of droughts, in relation to intensity and duration are not uniform and are therefore not readily predicted. By using data collected during the life of mine, drought impacts, if noted, would be monitored.

Drought, although not a Project-related impact, is identified as a potentially threatening process to the stygofaunal communities in the Project Area. In combination with abstraction of groundwater from aquifers, drought could have an impact on stygofaunal populations. Rates of abstraction would be monitored to assess and minimise rates of change.
7 Environmental Objectives, Targets and Indicators

A series of management objectives, targets and indicators has been developed to manage potential impacts to stygofauna management in relation to the Project.

Objectives: what Toro aims to achieve.

Targets: defined objective levels.

Indicators: measures, which are either quantitative or qualitative, to determine whether the objectives have been met.

The environmental objectives, targets and indicators as determined by Toro for stygofaunal management are shown in Table 2.

Table 2. Objectives, Targets and Indicators

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<td>Reduce impacts of groundwater drawdown on stygofauna</td>
<td>No negative impacts to stygofauna communities. Minimise groundwater extraction. Reuse groundwater where possible in operations. Compliance with Water Licence conditions.</td>
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<tr>
<td>Reduce impacts of changes to groundwater quality during mining on stygofauna</td>
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</tr>
<tr>
<td>Reduce impacts to stygofaunal communities from mine dewatering activities</td>
<td>Cut-off wall success for dewatering. No long-term negative impacts to stygofauna from dewatering activities.</td>
<td>Monitoring results</td>
</tr>
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8 Management Strategies and Actions

8.1 Key strategies
Detailed stygofauna management documentation would be developed for the construction and operational phases of the Project. Documentation relevant to decommissioning would be developed during the operational phase. Documentation would include specific policies and standard operating procedures, and would be developed in consultation with the Department of Conservation (DEC).

Management strategies and actions are discussed below in Section 8.2.

8.2 Management Actions
Management actions, reporting and corrective actions are listed below:

Table 3. Management Actions

<table>
<thead>
<tr>
<th>Objective</th>
<th>Management Action</th>
<th>Reporting Mechanisms</th>
<th>Corrective Actions</th>
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| Maintain abundance and diversity of species | ▸ Water Management Strategy  
▸ Standard operating procedures (e.g. compliance with Water Licence conditions) | ▸ Groundwater monitoring  
▸ Stygofauna surveys  
▸ Incident reports  
▸ Inspections and audits | ▸ Review of Water Management Strategy;  
▸ Implementation of findings from review/reports |
| Reduce impacts of groundwater drawdown on stygofauna | ▸ Water Management Strategy  
▸ Standard operating procedures (e.g. compliance with Water Licence conditions) | ▸ Groundwater monitoring (including drawdown zone of influence)  
▸ Stygofauna surveys  
▸ Incident reports  
▸ Inspections and audits | ▸ Review of Water Management Strategy;  
▸ contractor compliance;  
▸ standard operating procedures  
▸ Implementation of findings from review/reports |
| Reduce impacts of changes to groundwater quality on stygofauna | ▸ Water Management Strategy  
▸ Design & installation standards  
▸ Standard operating procedures | ▸ Groundwater monitoring  
▸ Stygofauna surveys  
▸ Incident reports  
▸ Inspections and audits | ▸ Review of Water Management Strategy;  
▸ contractor compliance;  
▸ standard operating procedures  
▸ Implementation of findings from review/reports |
| Reduce impacts to stygofaunal communities from mine dewatering activities | Design & installation standards (e.g. cut-off wall success for dewatering) | Groundwater monitoring  
Stygofauna surveys  
Incident reports  
Inspections and audits | Review of Water Management Strategy; contractor compliance; and standard operating procedures  
Implementation of findings from review/reports |
9 References


**Glossary**

**Cyclopoid copepod:** a marine or freshwater crustacean of the subclass Copepoda, which has an elongated body, a single, central eye which is light sensitive and a forked tail.

**Edaphobites:** soil dwelling fauna.

**Groundwater dependent ecosystem:** An ecosystem that is dependent upon access to groundwater to maintain ecosystem functions.

**Invertebrate:** animals lacking vertebrae.

**Obligate:** Able to exist and survive only under specific environmental conditions, a specific factor/s is/are required.

**Ostracod:** any minute crustacean of the mainly freshwater subclass Ostracoda in which the body is enclosed in a transparent two-valved carapace.

**Palaeodrainage channel:** ancient drainage channel.

**Phreatic zone:** or zone of saturation, is the area in an aquifer, below the water table, in which relatively all pores and fractures are saturated with water. The phreatic zone may fluctuate with changes of season and during wet and dry periods.

**Radionuclide:** a radionuclide is an atom with an unstable nucleus, which is a nucleus characterised by excess energy which is available to be imparted either to a newly-created radiation particle within the nucleus, or else to an atomic electron.

**Stygal:** pertaining to groundwater habitat or biota.

**Stygofauna:** Fauna that reside within groundwater systems.

**Troglobite:** an obligate terrestrial species of subterranean habitats.

**Troglofauna:** a general term for terrestrial subterranean fauna.

**Acronyms and abbreviations**

**DEC:** Department of Environment and Conservation.

**EMP:** Environmental Management Plan

**EPA:** Environmental Protection Authority

**EPBC Act:** *Environmental Protection and Biodiversity Conservation Act, 1999*

**Ha:** hectares

**PEC:** Priority Ecological Communities

**SOP:** Standard Operating Procedure

**Toro:** Toro Energy Limited
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Introduction

This Radiation Management Plan forms part of the Environmental Management Strategy Documents (EMSD) that have been prepared by Toro Energy Limited (Toro) and describes the radiation management systems that would be implemented during the construction and operational phases of the Wiluna Uranium Project (the Project). This document provides an overview of the key radiation management strategies and systems based on the discussions provided in the ERMP. A more detailed plan would be submitted for approval to the appropriate authority, prior to operations commencing.

Toro has produced separate management strategies for radioactive waste and the transport of radioactive products from the Wiluna Uranium Project.

This EMSD describes how Toro would –

- Comply with relevant legislation and standards for radiation management;
- Manage potential radiation exposure to the workers and the public; and
- Implement management measures, methods and reporting, auditing and review.

This EMSD is part of a suite of plans that deal with impacts and aspects of the Project. It is designed to assist Toro employees and contractors to manage radiation exposure in a manner that is compliant with relevant legislation, safe and environmentally responsible. All management strategies would be periodically reviewed as part of Toro’s commitment to continuous improvement, and for their continued application to the Project, particularly during the operational phase.

1.1 Project Overview

The Wiluna Project is in the Murchison region of Western Australia, approximately 960km north-east of Perth. It is based on mining two deposits: Centipede and Lake Way. The Centipede deposit is approximately 30km south of the town of Wiluna, and the Lake Way deposit is approximately 15km south of Wiluna. The total Project encompasses Centipede East (tenement number M 53/224), Centipede West (tenement numbers M53/0113, P53/1355, P53/1356, P53/1357, P53/1396), Lake Way (M 53/1090) and the West Creek borefield (tenement number L 53/0150).

The principal activities planned for the Project include:

- Development and operation of a uranium mine encompassing the Lake Way and Centipede deposits;
- Construction and operation of a uranium ore processing, packing and handling facility;
- Development of the West Creek borefield to supply water to the Project;
- Support facilities including an accommodation village, mine administration buildings and workshops, haul roads, power generation and transmission facilities, communications systems and water and waste management;
- Transport of uranium product within Australia for export; and
- Rehabilitation and closure of the mine and other areas disturbed by the Project.

The proposed total area of disturbance required for the development of the Project over the planned 14-year-life-span is approximately 1,530 hectares (ha) including infrastructure.
2 Scope

This EMSD provides a reference for monitoring, reporting and auditing as necessary to minimise identified and potential environmental impacts of the Project.

This EMSD is being submitted to the Environmental Protection Authority (EPA) with the Environmental Review and Management Programme (ERMP) as part of the environmental assessment and approvals process for the Project.

This EMSD has been prepared based on:
- Toro’s Environment Policy;
- Toro’s Indigenous Relations Policy;
- Toro’s Occupational Health and Safety Policy;
- Relevant Commonwealth and Western Australian legislation;
- Other legal obligations;
- Identified potential direct and indirect environmental impacts from risk assessments;
- Consultants’ reports;
- Relevant permits and standards; and
- Toro’s commitment to continuous improvement.

This EMSD has been developed to:
- Provide an overview of the system for radiological protection;
- Identify and assess potential radiological impacts of the Project;
- Describe proposed management and monitoring strategies for radiation protection;
- Describe the general radiological control mechanisms;
- Outline reporting, auditing and review mechanisms; and
- Guide the development of other site specific plans and procedures relevant to the Project.

This EMSD covers the following phases of the Project:
- Construction at and mining of the Lake Way and Centipede deposits;
- Construction and operation of a processing, packing and handling facility;
- Development of the West Creek borefield; and
- General infrastructure including an accommodation village, mine administration buildings and workshops, haul roads, power generation and transmission facilities, communications systems and water and waste management.
3 Legislative Requirements

Toro would comply with all relevant Commonwealth and State legislation and regulations that apply to the radiation protection aspects of the construction and operational phases of the Project. In relation to radiation protection, the following legislation and regulations are applicable:

**Commonwealth Legislation**

**Western Australian Legislation**
- Mining Act 1978;
- Mines, Safety and Inspection Act 1994 (and Regulations 1995);
- Nuclear Waste Storage (Prohibitions) Act 1999;
- Radiation Safety Act 1975;
- Radiation Safety (General Regulations) 1983;

Toro would construct and operate the Project facilities utilising best practicable technology, as defined by Part 16 of the Western Australian Department of Mines and Petroleum (DMP), Mine Safety and Inspection Regulations 1995, and would also note any applicable Guidelines published by the DMP.

The primary national standards in Australia related to uranium production are:
- Recommendations for Limiting Exposure to Ionising Radiation (ARPANSA 1995/2002)

These codes are adopted in all the State and Territory jurisdictions in Australia and are consistent with the recommendations of the International Commission on Radiological Protection (ICRP) (1991, 2007) and the International Atomic Energy Agency (IAEA) 1996 Basic Safety Standard.
4  Overview of potential impacts

4.1  Radiological Dose Assessment
The human radiation exposure pathways that have been identified for the construction and operation of the Project are as follows:

- irradiation by gamma radiation
- inhalation of decay products of radon
- inhalation of radionuclides in airborne dust and
- ingestion of radionuclides.

Occupational exposure to radiation would be assessed by determining doses to the different work groups (miners, plant workers, transport workers and final product handlers). For the public, the critical groups have been identified as people living in the following locations:

- Wiluna Township;
- Bondini Reserve;
- Nganganawili Community;
- Millbillillie Station;
- Lake Way Station;
- Apex Village;
- Toro Energy Construction Camp; and
- Toro Energy Operations Camp.

4.2  Radionuclides in Airborne Dust
There are a number of radiological dust sources that result from the mining and processing of uranium ores.

The following sources of dust from the mining operations have been identified:

- dust from mining of ore;
- dust from ore stockpiles; and
- ore transfer processes, crushing, road haulage and conveyor systems.

Processing of ore generates dust from the following sources:

- fugitive dust from tailings deposits;
- transport systems in mill area (conveyors etc); and
- uranium oxide drier and packaging area.

The mining at Lake Way and Centipede would generate low levels of dust. This is because the mined material would generally be damp, and dust suppression would be used when necessary to keep dust levels low. Dust levels in the plant would be low due to the process material being mainly wet or damp and the operational and engineering controls put in place.

An annual dust dose of 0.32 mSv/y may be expected for mine workers, and the average dust dose for process plant workers is estimated to be 0.64 mSv/y.
4.3 The decay products of radon (RDP)

The RDP impact is determined directly from the radon impact modelling. The RDP doses have been determined by modelling the mine as an open pit and estimating the release rate of radon into the mine. The ventilation rate of the open pit is then predicted by atmospheric modelling.

Radon sources include:
- mining of ore;
- stockpiles;
- ore processing; and
- tailings management and disposal.

Based on conservative modelling assumptions, the estimated average RDP dose for a miner would be 3.8 mSv/y, and for workers in the processing plant the calculated occupational RDP dose is expected to be 0.05 mSv/y.

4.4 Gamma

The main sources of gamma radiation from the proposed operation are:
- stockpiles;
- tailings;
- uranium; and
- process materials.

Estimates of gamma radiation exposure have been based on two sources; information from other operational uranium mines and estimates from first principles. For a full work year the theoretical maximum exposure would be 3.9 mSv/y. However, this figure does not take into account the shielding afforded by the mining equipment. Based on gamma radiation levels observed in other open-cut uranium mines, it is estimated that miners would on average receive 1 mSv/y from gamma radiation.

Estimates of gamma doses for processing plant workers are based on doses from uranium processing facilities elsewhere. It is expected that doses in the processing plant would be similar to these levels and in the order of 1-2 mSv/y average dose.

4.5 Emissions During Transport of Uranium Oxide Concentrate (UOC)

Final product uranium would be trucked interstate for export either through the Port of Adelaide or Darwin. Truck drivers would be exposed to low levels of gamma radiation for the duration of the trip. Gamma radiation measurements in truck cabins transporting uranium oxide would be on average, 1 µSv/h. For a 36 hour trip between Wiluna and Port Adelaide, this equates to 36 µSv. A driver may make up to 12 of these trips per year giving a total dose of approximately 0.5 mSv/y.
4.6 Radiation Doses to the Public
The most exposed public group are residents of the Toro camp. People living full time at this location could be exposed to up to 0.033 mSv/y. Residents of Wiluna are expected to receive less than 0.022 mSv/y when mining is occurring at Lake Way.

Summary of Radiological Impacts

<table>
<thead>
<tr>
<th></th>
<th>Expected Impact</th>
<th>Limit/Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workers Doses</td>
<td>5mSv/y</td>
<td>20mSv/y</td>
</tr>
<tr>
<td>Member of Public Doses</td>
<td>&lt; 0.1mSv/y</td>
<td>1mSv/y</td>
</tr>
</tbody>
</table>

Radiation doses to both workers and members of the public from the operation are expected to be well below internationally accepted limits.
5 Objectives, Targets and Indicators

Toro’s radiological objectives are to ensure that doses to workers and the public never exceed the recognised annual radiation limits (as outlined in ARPANSA 2005) as follows:

- Radiation doses to designated workers less than 20 mSv/y above natural background; and
- Radiation doses to members of the public less than 1 mSv/y above natural background.

Toro bases its radiation protection philosophy and approach on the internationally accepted guidelines of the ICRP and the IAEA (ICRP 2007, IAEA 1996) which have been adopted in Australia, either through state based legislation or through the ARPANSA series of radiation related Codes of Practices.

The ICRP is recognised as the pre-eminent international authority on radiation protection and has recommended a “system of dose limitation” that has been widely adopted overseas and in Australia. The system has three key elements:

- Justification – a practice involving exposure to radiation should only be adopted if the benefits of the practice outweigh the risks associated with the radiation exposure;
- Optimisation – radiation doses received should be as low as reasonably achievable, taking into account economic and social factors (the ALARA principle); and
- Limitation – individuals should not receive radiation doses greater than the recommended limits.

Optimisation is generally considered to be the most effective means of radiological control.
6 Management Strategies and Actions

6.1 Overall Approach
Radiation emissions and exposures are just one of many hazards associated with the mining and processing of radioactive ores that is routinely managed. Like all other hazards, radiation can be effectively managed in both the design stage and in operations. Ideally, hazards are primarily controlled through design and then further reduced through operational management systems.

The overall approach by Toro towards the management of radiation is consistent with the recommendations of the ICRP, in particular, the principle of ALARA. Proper and appropriate implementation of the ALARA principle is an important means of managing radiation. In this section, the management and control of radiation is described within the broader context of ALARA.

6.2 ALARA in Design
Detailed design of the proposed pits and processing facilities has yet to occur. However, Toro has considered radiation protection at this early stage of the Project in two primary ways;

- the establishment of radiation design criteria for the Project; and
- a preliminary radiation risk assessment.

The design criteria are fundamental instructions to design engineers that require final verification by appropriately qualified radiation protection personnel, and include such measures as:

- All tanks and process vessels that contain radioactive process material must be concrete bunded with hose-down facilities and sumps;
- All liquid spillages must be able to be cleaned up when wet, water outlets must be provided to ensure this;
- Where there is the possibility for large spillages, access must be provided to allow bobcats or similar to effect cleanup;
- Where there is dry process material that cannot be cleaned up with hoses and water, vacuum systems will be installed to affect cleanup;
- All process materials transfer points must be covered and active ventilation should be utilised;
- Dust extraction systems will be designed to ensure ease of maintenance (to minimise exposures);
- Wet scrubbing systems should be used; and
- For uranium product there must be specific design requirements developed in consultation with a qualified Radiation Safety Officer.

Toro additionally undertook a radiation risk review of design of the Project, which resulted in a set of mandatory control measures. The work is summarised in Table 1.
Table 1: Radiological Risk Review

<table>
<thead>
<tr>
<th>Area and Process</th>
<th>Radiological risk Considerations</th>
<th>Mandatory Control/Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining – Ore removal/movements</td>
<td>Generation of dust from loading or haul roads</td>
<td>Provision of water sprays to minimise dust and regular watering of haul roads</td>
</tr>
<tr>
<td>Mining – Mining</td>
<td>Build up of RDP concentration during still or inversion conditions</td>
<td>Real time RDP monitoring equipment fitted to all mining equipment fitted with filtered air conditioners. Air conditioned vehicles would be required to operate with windows closed at all times. Routine maintenance program for air conditioning units.</td>
</tr>
<tr>
<td>Mining - Stockpiles</td>
<td>Dusting of stockpiles</td>
<td>Adequate water sprays or chemical suppressants. Use of a water cart to control dust. Design limits for stockpile heights.</td>
</tr>
<tr>
<td>Transport of material</td>
<td>Dust generation</td>
<td>Covering of haul trucks when trucking from the Lake Way deposit to the processing plant</td>
</tr>
<tr>
<td>Processing – Tanks</td>
<td>Spillage leading to loss of control materials</td>
<td>All tanks bunded with adequate cleanup systems (i.e. sloped floors to sump, concrete, access for bobcat)</td>
</tr>
<tr>
<td>Crushing and Screening</td>
<td>Dust generation</td>
<td>Installation of a dust enclosure and water sprays for tipping to grizzly. Dust extraction on conveyors and transfer points.</td>
</tr>
<tr>
<td>Processing – Product packing</td>
<td>Exposure to UOC</td>
<td>Dedicated best practice control system based on automation, containment, dust control and ease of cleanup.</td>
</tr>
<tr>
<td>Processing – Laboratory</td>
<td>Radioactive water and waste</td>
<td>Appropriate nominated area for disposal.</td>
</tr>
<tr>
<td>Processing – Workforce etc</td>
<td>Spread of contamination</td>
<td>Clean/dirty change-rooms to be installed. Wheel wash for all vehicles leaving the site. Certain vehicles to remain on site at all times (mining).</td>
</tr>
</tbody>
</table>

Within the broader plant, radiation controls would include:
- Controlled access to the site, and around the site, through security swipe cards;
- Vehicle wheel wash at main gate;
- Change rooms for all radiation workers at the site, requiring workers to change into overalls when entering the sites and to shower and change prior to leaving the site;
- Lunch and control rooms would have wash facilities;
- A decontamination facility would be installed including high pressure hose and sump with wash water recycled to the mill;
- Plant would be designed with multiple hose mounts, sumps for spillage collection and concrete bunding;
- The tailings pipeline would have leak detection and be bunded its entire length to contain any spillages; and
• All equipment and materials leaving site would be required to be tested for radioactive contamination and issued a radiation clearance before they could be removed from site.

An on site laboratory would undertake sample preparation, analytical and metallurgical work with all the wastes recycled to the process plant or disposed to tailings.

6.3 ALARA in Operation
Operational ALARA would include the following:
• Training of all workers (including inductions and regular retraining);
• Additional specialised training for product handlers, supervisors and others;
• Controlled access to the whole of the working area with further controls for certain areas of the plant;
• Review of design modifications from a radiological perspective; and
• Operational procedures;
  o use of clean/dirty procedures
  o establishment of Radiation Work Procedures (RWP) for specific tasks such as any work in the final product shed
  o strict procedures for equipment or materials leaving the designated radiation areas and
  o investigative monitoring results to identify anomalies, and implement remedial measures as required.
7 Operational and Administrative Control

7.1 Overarching systems

Toro would implement a series of controls for radiation protection. The Project would be divided into designated and non-designated areas for the administrative control of radiation exposure to staff. Those working in designated areas would be those who had contact with radioactive ores as part of their everyday work and would be monitored regularly.

As required under relevant legislation, all workers would receive a pre-employment medical, and then regular medical check-ups throughout their employment with Toro. Workers’ dose and radiation monitoring records would be collected and maintained in accordance with relevant requirements. Dose records would be made available to the Australian National Dose Register. In addition, Toro would make dose and monitoring records available to the Western Australia Boswell system.

7.2 Training

Training of all personnel in the principles of radiation protection would be undertaken as part of the site induction, refresher training would be conducted once every 12 months. All personnel would be issued with a copy of the Radiation Workers Handbook published jointly by the Australian Uranium Association and the Australian Government Department of Resources, Energy and Tourism.

Signed records of Inductions would be kept by Toro. Additional radiation safety briefings may be given as the occasion arises, e.g. as Toolbox Meeting topics, to reinforce personal monitoring, dust control, spillage control and site clearance control measures. The dates of these safety briefings would be recorded along with identifying information on attendees.

An outline of the employee induction program is provided below:

- ionising radiation—types, quantities and units;
- biological effects of radiation exposures;
- natural background radiation—terrestrial gamma radiation, cosmic radiation, natural radionuclides in water and food and radon and radon daughters;
- radiation protection standards and regulations, including employee responsibilities;
- basic concepts of radiation monitors used on exploration sites;
- potential health risks associated with ionising radiation;
- safe working methods and techniques;
- use of protective equipment and clothing;
- importance and means of dust suppression;
- reporting of unusual occurrences;
- proper use, operation and care of personal monitoring equipment;
- importance of personal hygiene in limiting intake of radioactive materials;
- need for notification of any health problem; and
- procedures for handling spills of radioactive materials.

7.3 Records management and reporting

Radiation records collated as part of the operation of this plan would include:

- Results of monitoring conducted, recorded on specially made pro-formas;
- Induction and other training records;
- Radiation dose records;
• Abnormal events;
• Records of any inspection or audits;
• Quality assurance calibrations and checks; and
• Personnel details.

All radiation related records detailed in this RMP would be kept initially at the Wiluna Project site then transferred to Toro’s Perth Project office for archiving.

Radiation monitoring results and any radiation dose assessments would be recorded and reported to the individual, management and to the relevant regulatory agency at the completion of the Project. Radiation dose records for each worker would be kept for the duration of their employment and for as long as relevant legislation requires.
8 Monitoring and Management

8.1 Radiation Monitoring

8.1.1 Introduction
Occupational and environmental radiation monitoring is undertaken to fulfil a number of different functions:

- Provision of data and information to assess the adequacy and effectiveness of radiation protection systems;
- Provision of information for radiation dose assessment;
- To identify trends or changes in conditions; and
- To investigate possible exposure situations.

This section outlines the methods and systems for effective radiation monitoring and provides an indicative monitoring program that would be subject to approval by the appropriate authorities.

8.1.2 Methods
Table 2 provides an outline of the aspects to be monitored and the method of monitoring.

Table 2: Methods of Monitoring

<table>
<thead>
<tr>
<th>Radiation</th>
<th>Method</th>
<th>Primary Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gamma</td>
<td>Personal TLDs</td>
<td>Dose assessment</td>
</tr>
<tr>
<td></td>
<td>Locational dose rate measurements using hand held gamma radiation monitors</td>
<td>Operational control</td>
</tr>
<tr>
<td></td>
<td>Environmental gamma monitor</td>
<td>To identify changes</td>
</tr>
<tr>
<td>Radon</td>
<td>Continuous real time environmental sampling</td>
<td>To identify changes</td>
</tr>
<tr>
<td></td>
<td>Passive radon detectors for radon concentrations</td>
<td>To identify changes</td>
</tr>
<tr>
<td></td>
<td>Charcoal cups for radon emanation</td>
<td></td>
</tr>
<tr>
<td>RDP</td>
<td>Continuous real time samplers</td>
<td>Dose assessment</td>
</tr>
<tr>
<td></td>
<td>Spot sampling</td>
<td>Dose assessment</td>
</tr>
<tr>
<td>Dust</td>
<td>Personal dust pumps</td>
<td>Dose assessment</td>
</tr>
<tr>
<td></td>
<td>Microvol dust pumps</td>
<td>To identify changes</td>
</tr>
<tr>
<td></td>
<td>High volume dust pumps</td>
<td>To determine changes in radiation levels</td>
</tr>
<tr>
<td></td>
<td>Dust deposition gauges</td>
<td>To determine changes in radiation levels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dose assessment and impacts on non human biota</td>
</tr>
<tr>
<td>Radionuclides in water</td>
<td>Grab sampling opportunistically following rainfall events, then radionuclide analysis</td>
<td>To determine changes in radiation levels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Public Dose assessment</td>
</tr>
<tr>
<td></td>
<td>Borehole sampling, then radionuclide analysis</td>
<td>To determine changes in radiation levels</td>
</tr>
<tr>
<td>Radionuclides in soil, flora and fauna</td>
<td>Sampling of soils, flora and fauna, then radiometric analysis</td>
<td>To determine changes in radiation levels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Public Dose assessment and doses to non human biota</td>
</tr>
</tbody>
</table>
The support system for the monitoring program would also include:

- recognised sampling methodologies that were documented and regularly reviewed;
- routine instrument calibration programs, including auditing of calibration sources;
- instrument maintenance and repair programs;
- the purchase and use of appropriate monitoring equipment;
- provision of appropriately trained and qualified monitoring personnel;
- review of new equipment; and
- regular external audits of monitoring program and system.

8.1.3 **Generic Environmental Radiation Monitoring Program**

The Environmental radiation monitoring program that was implemented to collect background and baseline information would continue during the operational phase. The proposed key environmental monitoring is outlined below.

- **Meteorological data collection** at the meteorological station would be continued.
- **Radon concentrations**
  - Real time continuous radon concentration monitoring would continue at the environmental monitoring sites.
- **RDP Concentrations**
  - Real time RDP monitoring would continue at the environmental monitoring sites.
- **Flora and fauna**
  - Vegetation would be sampled every 5 years and analysed for radionuclides using the same species and the same general locations as those used in pre-mining studies.
  - Fauna sampling and analysis would occur and the program would be developed in conjunction with the Traditional Owners.
- **Airborne Dust sampling**
  - Environmental dust would be measured using high-volume and low-volume samplers and passive dust deposition gauges.
  - Dust filters would be weighed to provide monthly trends of dust levels and filters would be composited for radionuclide analysis.
  - Low-volume filters would be analysed to provide an indication of total long-lived alpha radiation in air. Passive dust would be analysed for radionuclides on a quarterly basis.
- **Water Sampling**
  - A network of monitoring bores would be sampled quarterly and analysed for radionuclides and other constituents.
  - Opportunistic surface water sampling would occur following significant rainfall events.
- **Gamma Radiation**
  - Annual environmental gamma surveys would be conducted, focussing on the localities of critical groups.

Development and finalisation of the operational monitoring programme would be in consultation with the relevant regulatory agencies.

8.1.4 **Generic Occupational Radiation Monitoring Programme**

The final occupational monitoring programme would be detailed in the approved Radiation Management Plan. It is anticipated that the overall radiation monitoring would consist of two main objectives - dose assessment monitoring and operational control monitoring. The proposed radiation measurements and frequency of sampling are shown in Tables 3 and 4.
Table 3: Proposed radiation monitoring programme A – Dose Assessment Monitoring Program

<table>
<thead>
<tr>
<th>Radiation Exposure Pathway</th>
<th>Mine area</th>
<th>Mill Area</th>
<th>Product Packers</th>
<th>Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gamma radiation</td>
<td>Quarterly TLD badges</td>
<td>Quarterly TLD badges</td>
<td>Quarterly TLD badges</td>
<td>Area TLD badge</td>
</tr>
<tr>
<td>Airborne dust</td>
<td>Weekly sampling in mine area</td>
<td>Fortnightly personal samples in each plant area</td>
<td>Personal samples each packing session</td>
<td>Fortnightly area samples</td>
</tr>
<tr>
<td>Radon Decay Products</td>
<td>Continuous RDP sampling in work areas each month</td>
<td>Weekly grab samples in each plant area</td>
<td>(included in general mill area sampling)</td>
<td>Monthly grab sample</td>
</tr>
</tbody>
</table>

Table 4: Proposed radiation monitoring programme B – Operational Management Monitoring Program

<table>
<thead>
<tr>
<th>Radiation Exposure Pathway</th>
<th>Mine area</th>
<th>Mill Area</th>
<th>Product Packers</th>
<th>Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gamma radiation</td>
<td>Weekly gamma spot samples in each work area</td>
<td>Monthly gamma survey of mill area</td>
<td>(as part of Mill area survey)</td>
<td>N/A</td>
</tr>
<tr>
<td>Surface Contamination</td>
<td>Weekly survey in change rooms and crib rooms</td>
<td>Weekly survey in change rooms and crib rooms</td>
<td>(as part of Mill area survey)</td>
<td>Monthly survey in office</td>
</tr>
<tr>
<td>Airborne dust</td>
<td>Weekly samples on mining equipment</td>
<td>Weekly samples in: • crushing/grinding • leach • tailings</td>
<td>Area dust sampling during all drumming operations</td>
<td>N/A</td>
</tr>
<tr>
<td>Radon Decay Products</td>
<td>Real time continuous RDP monitoring in pit</td>
<td>Real time continuous RDP monitoring at various locations</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

8.1.5 Calculating Doses

There are standardised methods for calculating occupational radiation doses, which are based on the recommendations of the ICRP.

In general “dose” is a standardised measure of radiation detriment or harm, and is usually measured in Sieverts (Sv)-the recognised occupational dose limit is 20 mSv/y. As noted
earlier, there are different ways that radiation doses can be received, such as gamma irradiation, dust inhalation and ingestion, and the dose depends upon a number of factors (such as solubility class of the dust through to type of radiation through to chemical characteristics of the material). The dose incorporates all these factors to produce one measure of radiation detriment.

A simplified model of assessment for radiation exposure is as follows:
- radiation is emitted;
- a receptor (human or non-human) is exposed to the radiation;
- a measurement of exposure is made;
- the mechanism of exposure (inhalation, ingestion, etc) and the form of exposure is factored; and
- standardised conversion factors are utilised to determine a dose.

The method for calculating doses for workers is outlined in the Western Australian uranium mining guidelines and is consistent with the national Mining Code (ARPANSA 2005) and the internationally accepted methods defined by the ICRP.

8.1.6 Radiation Protection Resources
Toro would employ an appropriately qualified Radiation Safety Officer (RSO) who would be part of the operation management team and directly influence the day to day operation of the mine site.

The RSO would be provided with support staff and sufficient resources in order to achieve the requirements of the Radiation Management Plan including monitoring. The RSO would also have opportunities to obtain higher qualifications and remain abreast of the latest developments in radiation safety.

8.1.7 Action Levels
Toro has established an operational control management system based on the results of the routine monitoring results as shown in Table 5.

**Table 5: Exposure Action Levels and Actions**

<table>
<thead>
<tr>
<th>Radiation</th>
<th>Action Level</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gamma</td>
<td>10µSv/h</td>
<td>Investigate. Remove personnel from area if necessary and placement of inert material to shield or cleanup up if spillage is present, then remonitor.</td>
</tr>
<tr>
<td>RDP</td>
<td>7µJ/m³</td>
<td>Monitor inside of equipment. If above action level, consider removal of personnel from area</td>
</tr>
<tr>
<td>Dust</td>
<td>10mg/m³</td>
<td>Identify source and suppress (e.g. water suppression)</td>
</tr>
<tr>
<td>TLD - (quarterly result)</td>
<td>1mSv</td>
<td>Investigate and identify source. Redesign workplace to reduce exposure.</td>
</tr>
</tbody>
</table>
It should be noted that a comprehensive RMP will be developed and submitted to the relevant regulatory authorities for approval at an appropriate time prior to any activities occurring. The aim of this document is to provide a broad overview of the elements of the RMP.
9 References

<table>
<thead>
<tr>
<th>Reference</th>
<th>Description</th>
</tr>
</thead>
</table>
# WILUNA URANIUM PROJECT, TORO ENERGY LIMITED:
## DRAFT ABORIGINAL CULTURAL HERITAGE MANAGEMENT PLAN

<table>
<thead>
<tr>
<th><strong>Activity:</strong></th>
<th>Wiluna Uranium Project located near Wiluna in the Shire of Wiluna, Western Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Company:</strong></td>
<td>Toro Energy Limited</td>
</tr>
<tr>
<td><strong>Person in authority:</strong></td>
<td>Richard Yeeles, Approvals and Community Director, Wiluna Uranium Project</td>
</tr>
<tr>
<td><strong>Name of cultural heritage advisor:</strong></td>
<td>John Gleason</td>
</tr>
<tr>
<td><strong>Date of completion:</strong></td>
<td>June 2011</td>
</tr>
</tbody>
</table>
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I Executive Summary

Toro Energy Limited (Toro) is seeking the approval of the Australian and Western Australian Governments to develop the Wiluna Uranium Project (the Project) located near Wiluna, Western Australia. The Project would involve mining up to about two million tonnes of mineralised ore per year over an anticipated mine life of up to 14 years, producing up to 1200 tonnes per annum of uranium oxide concentrate.

The Project is based on mining two deposits, Centipede and Lake Way. Centipede is approximately 30 km south of Wiluna, and would be mined first. Lake Way is approximately 15 km south east of Wiluna.

The Project also would involve associated processing plant and support infrastructure and the transport of product within Australia for export. The principal components of the Project are:

- Construction and operation of a uranium mine;
- Construction and operation of an ore processing, packing and handling facility;
- Support facilities including an accommodation village, water supply from a local borefield, haul roads, power generation and transmission facilities, communications systems and water and waste management;
- Transport of the product to Adelaide and Darwin for export; and
- Rehabilitation and closure of the mine and other areas disturbed by mining and related activities

The Project Area is located within the Lake Way and Millbillillie pastoral leases, south and south east of Wiluna.

Subject to government and company board approvals, Toro would begin construction of the Project during 2012 with first production in 2013.

Since 2007 Toro has been evaluating the Project, including further exploration of the ore body. Prior to the ground disturbance necessitated by this exploration, Toro undertook a review of available information about the cultural heritage of the area and heritage surveys in the field. This followed consultation with Traditional Owners who may have an interest in the Project area and the representative body for the region pursuant to the Native Title Act 1993, Central Desert Native Title Services (CDNTS). Through its regular attendance at meetings of the Traditional Owners, Toro has kept them informed of its plans and any impacts they may have on cultural heritage.

Toro’s Managing Director, Mr Greg Hall, has attended meetings of the Traditional Owners and instructed his Project management team to maintain regular consultation with them. This consultation has included visits to the Project Area by Traditional Owners and also to operating mines in Western Australia and South Australia, arranged by Toro, to allow the Traditional Owners to familiarise themselves with potential impacts, including on their cultural heritage. Toro has provided funds to the Traditional Owners to enable them to obtain their own independent advice on environmental and radiation issues. In 2010, CDNTS and Toro executed a Memorandum of Understanding for cultural heritage mapping of the entire Project Area. Some of this cultural mapping was undertaken during the last quarter of 2010 with the balance to be completed in 2011. Toro will review this Draft Cultural Heritage Management Plan (Draft CHMP) after the cultural mapping has been completed and Toro has been advised of the outcomes.
Toro has proposed to CDNTS the negotiation of a mining agreement that would include a protocol for the management of all cultural heritage issues arising with construction and execution of the Project.

The final Cultural Heritage Management Plan will be used by the management and employees of Toro and its contractors, sub-contractors and consultants as a basis for ensuring continuing compliance with all applicable laws and regulations relating to Aboriginal heritage. It will also ensure compliance with all relevant company policies and, in general, to make certain that Toro conducts its activities in a manner that is fully respectful of the wishes of Traditional Owners, particularly for the protection of their cultural heritage.

Toro notes the advice in *Aboriginal Cultural Heritage Management Plan* – template document prepared by the Department of Indigenous Affairs (DIA) (Version 1) October 2009, that a CHMP ‘can be devised and implemented at any stage in the history of the development of an area’ and that ‘ideally, this would begin at exploration level.’ The Wiluna Uranium Project is currently in the government assessment and approvals phase, meaning final decisions about Project configuration which may impact on cultural heritage cannot yet be made. Accordingly, some of the commitments given by Toro in this Draft CHMP are statements of intention, while further information about cultural heritage will continue to be sought to revise and enhance the Draft CHMP as the Project proceeds towards construction and execution so that the final Plan complies with the requirements of the DIA and Toro’s commitments to the Traditional Owners relating to the management of their cultural heritage.
2 Introduction and Purpose

This Draft CHMP is Toro’s commitment to the management and protection of Aboriginal cultural heritage in the Wiluna Uranium Project Area in a manner which respects the wishes of Aboriginal people through ensuring continuous consultation with them during Project planning, construction, execution, closure and rehabilitation and in relation to any other activities Toro may undertake in the Wiluna region. It also seeks to ensure that Toro’s work is conducted in full compliance with all applicable laws and regulations relating to Aboriginal heritage.

Toro has adopted the following Indigenous Relations policy for the Wiluna Uranium Project:

Toro Energy will respect the culture of Indigenous people in our Project Area by:

- Involving them in discussions about our Project planning, implementation, operations, closure and rehabilitation;
- Sharing information in a manner which best meets their needs;
- Explaining how risks are to be managed;
- Developing a Heritage Management Plan to minimise Project impacts and ensure continuing protection of cultural heritage sites;
- Encouraging the use of their knowledge and skills in land management;
- Supporting their cultural, social and economic aspirations through training, employment and business development opportunities; and
- Ensuring all our employees and contractors receive cultural awareness training.

Construction of the Wiluna Project would involve ground disturbing activity through the establishment of a mine, processing plant and associated infrastructure that may impact on Aboriginal heritage. A Project Management team with expertise in the development and management of indigenous relations has been appointed. The team also possesses experience in the management of cultural heritage issues associated with the construction and operation of other mines in Australia, including uranium mines. The Project team includes an Approvals and Community Director with the specific accountability to Toro’s Managing Director for all aspects of indigenous relations, including cultural heritage. The Managing Director has authorised this Plan on the advice of the Approvals and Community Director.

The final Cultural Heritage Management Plan will be used by all Toro employees and contractors, sub-contractors and consultants involved in the planning, construction, operation, closure and rehabilitation of the Wiluna Project and for any other activities Toro may undertake in the Wiluna region. It will be followed in the management of all visitors to the Project site. It will inform and instruct Toro’s management on all aspects of cultural heritage management. It has been developed in consultation with Traditional Owners so that they are aware of Toro’s intentions and can contribute to the effective implementation of the Cultural Heritage Management Plan and hold Toro accountable for it.

Map 1 in section 12 identifies the location of the Project. It is based on mining two known deposits, Centipede, which would be mined first, and Lake Way. The Project is located to the south and south east of the town of Wiluna. The Centipede deposit is about 30 kilometres south of Wiluna and Lake Way is about 15 kilometres south east of the town.

The Centipede deposit is predominantly within mining tenement M53/224, covering an area approximately 4 kilometres long and up to 1.5 kilometres wide on the west side of Lake Way, while the Lake Way deposit is within MLA53/1090 and has an areal extent of approximately 4 kilometres long by 2.5 kilometres wide on the north side of Lake Way. A mining lease application, M53/1090, has been submitted for the Lake Way deposit. Toro
holds the uranium rights over these tenements. The land on which the Project would be established is Crown Land.

Both the Lake Way pastoral lease (3114/1164) and the Millbillillie pastoral lease (3114/1260) over which the Project lies, are stocked with cattle. Toro acquired these leases in late 2010 from Oz Minerals Agincourt & Wiluna Exploration Pty Ltd, a wholly owned subsidiary of Album Investment Pte Limited, registered in Singapore and ultimately a subsidiary of China MinMetals Non-ferrous Metals Co. Ltd (MMG).

There are two native title claims over the Project Area – the Wiluna claim (Wiluna Native Title Determination Application WAD 6164/98) and the Tarlpa claim (Tarlpa Native Title Determination Application WAD 248/07).
3 Abbreviations

- ACMC    Aboriginal Cultural Material Committee
- AHA     Aboriginal Heritage Act 1972 (WA)
- ASNO    Australian Safeguards and Non-Proliferation Office
- CCD     counter current decant
- CDNTS   Central Desert Native Title Services
- CHMP    Cultural Heritage Management Plan
- DIA     Department of Indigenous Affairs (WA)
- DSEWPC  Department of Sustainability, Environment, Water, Population and Communities (Cth)
- EPA     Environmental Protection Authority (WA)
- EPBC Act Environmental Protection and Biodiversity Conservation Act 1999 (Cth)
- ERMP    Environmental Review and Management Programme
- ESD     Environmental Scoping Document
- HDPE    high density polyethylene
- ICRP    International Commission on Radiological Protection
- MMG     China MinMetals Non-ferrous Metals Company Limited
- MOU     Memorandum of Understanding
- Project Wiluna Uranium Project
- Toro    Toro Energy Limited
- WA      Western Australia
4 Relevant Legislation


The Western Australian and Australian governments have agreed to a coordinated environmental assessment process. A single ERMP that satisfies the requirements of each jurisdiction is required under this process.

Toro is preparing the ERMP in accordance with the EPA and DSEWPC guidelines as set out in the Environmental Scoping Document (ESD).

The ESD describes the key elements of the Project for which Toro is seeking approval under Section 38 of the *Environmental Protection Act* 1986 and serves as the basis for the preparation of the ERMP. A draft ESD was on public exhibition for a two week period from 21 June 2010. As a result of comments received, including from the DIA and other government and non-government submitters, Toro reviewed the draft ESD and received approval from the EPA in August 2010 to proceed to the preparation of the ERMP. The ERMP will be on public exhibition for a 14 week period during 2011, subject to approval by the EPA. It will include a description of the cultural heritage values that may be impacted by the Project and how such impacts would be managed and mitigated. It will also identify heritage sites recorded in the Project Area so far and registered with the DIA, and indicate how Toro proposes to manage cultural heritage issues related to the construction, execution closure and rehabilitation of the Project. The ERMP will also advise the status of consultation with Traditional Owners and how indigenous relations would be managed during the construction, execution, closure and rehabilitation phases.

Where in the construction, execution, closure or rehabilitation of the Project, Toro is unable to avoid disturbance to Aboriginal heritage sites, it would make application for approval for such disturbance under the AHA. Before doing so, Toro would engage in consultation with Traditional Owners with an interest in the matter.

To ensure that Toro is aware of all cultural heritage issues associated with the construction, execution, closure and rehabilitation phases of the Project, Toro is working with the Traditional Owners and CDNTS on cultural mapping of the Project Area, including the conduct of further ethnographic and archaeological surveys. The information provided by these surveys would be incorporated in any applications to the DIA pursuant to section 18 of the AHA as well as in a review of this Draft CHMP.
5 Extent of Activity Covered by the Management Plan

The Project Area is located in the Shire of Wiluna in the sparsely populated Murchison region of Western Australia’s Mid West.

The town of Wiluna, located 960 km north east of Perth, is the principal centre in the Shire. The town lies along the Goldfields Highway which connects Wiluna to Leinster and to Meekatharra. Wiluna township is the gateway to the Canning Stock Route. The Gunbarrel Highway extends from Wiluna to Alice Springs. The nearest regional centre to Wiluna is Kalgoorlie (population 28,000, located 540 km south southeast of Wiluna).

The mining industry is currently the largest employer in the Wiluna Shire, accounting for about 43 per cent of all jobs.

Many heritage surveys have been carried out in the Wiluna region in the past. As a result, registered DIA sites which occur within current tenements which may form part of the Project are listed in the table below.

<table>
<thead>
<tr>
<th>Tenement Number</th>
<th>DIA Registered Site ID</th>
<th>Description – Type of Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>M53/224</td>
<td>2435</td>
<td>Artefacts/Scatter</td>
</tr>
<tr>
<td>E53/1287; P53/1355; P53/1372; P53/1373; M53/113; M53/147; M53/796</td>
<td>2617</td>
<td>Mythological</td>
</tr>
<tr>
<td>E53/1287; P53/1357; P53/1396; P53/1397</td>
<td>20786</td>
<td>Mythological</td>
</tr>
<tr>
<td>E53/1287; P53/1356; P53/1357; P53/1396; P53/1397</td>
<td>20787</td>
<td>Mythological</td>
</tr>
<tr>
<td>M53/113</td>
<td>2434</td>
<td>Artefacts/Scatter</td>
</tr>
<tr>
<td>M53/224</td>
<td>2435</td>
<td>Artefacts/Scatter</td>
</tr>
<tr>
<td>M53/113; P53/1355</td>
<td>2440</td>
<td>Artefacts/Scatter</td>
</tr>
<tr>
<td>M53/113; P53/1396</td>
<td>2441</td>
<td>Artefacts/Scatter</td>
</tr>
<tr>
<td>E53/1132</td>
<td>2611</td>
<td>Mythological, Artefacts/Scatter</td>
</tr>
<tr>
<td>E53/1132</td>
<td>2614</td>
<td>Artefacts/Scatter</td>
</tr>
<tr>
<td>E53/1132</td>
<td>2616</td>
<td>Artefacts/Scatter</td>
</tr>
<tr>
<td>E53/1132</td>
<td>2701</td>
<td>Ceremonial, Mythological</td>
</tr>
<tr>
<td>L53/150</td>
<td>2009</td>
<td>Artefacts/Scatter</td>
</tr>
<tr>
<td>L53/150</td>
<td>2010</td>
<td>Artefacts/Scatter</td>
</tr>
<tr>
<td>L53/150</td>
<td>2149</td>
<td>Mythological</td>
</tr>
<tr>
<td>L53/150</td>
<td>19361</td>
<td>Ceremonial, Mythological</td>
</tr>
</tbody>
</table>

It is not yet known whether any of the sites listed in the table above would need to be disturbed to allow construction and execution of the Project. The ERMP for the Project will include a discussion of Aboriginal heritage within the Project Area and the methods used for heritage surveys as a basis for analysing the current status of heritage values and how they may be affected by Project implementation.
6 Statement of Significance

6.1 Assessment of Significance

Of the 15 Aboriginal sites or potential sites recorded on the DIA Aboriginal sites register within or potentially within the Project Area, eight are listed as archaeological (artefacts), six are described as ethnographic (mythological/ceremonial) and 1 is recorded as ethnographic (mythological)-archaeological (artefacts). Seven of the 15 DIA Site Files are ‘closed access’. Further information about the 15 sites is provided below and they are shown on Map 2 in section 12:

<table>
<thead>
<tr>
<th>Site ID</th>
<th>Status</th>
<th>Access</th>
<th>Site Name</th>
<th>Site Type</th>
<th>Project Area (Tenement/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>P</td>
<td>O</td>
<td>Wiluna South 1</td>
<td>Artefacts/Scatter</td>
<td>L53/150</td>
</tr>
<tr>
<td>2010</td>
<td>P</td>
<td>O</td>
<td>Wiluna South 2</td>
<td>Artefacts/Scatter</td>
<td>L53/150</td>
</tr>
<tr>
<td>2149</td>
<td>I</td>
<td>C</td>
<td>Tjilla</td>
<td>Mythological</td>
<td>L53/150</td>
</tr>
<tr>
<td>19361</td>
<td>I</td>
<td>C</td>
<td>Butchers Well</td>
<td>Ceremonial, Mythological</td>
<td>L53/150</td>
</tr>
<tr>
<td>2611</td>
<td>I</td>
<td>C</td>
<td>Uramurday Claypan</td>
<td>Mythological Artefacts/Scatter</td>
<td>E53/1132</td>
</tr>
<tr>
<td>2614</td>
<td>I</td>
<td>O</td>
<td>Area D</td>
<td>Artefacts/Scatter</td>
<td>E53/1132</td>
</tr>
<tr>
<td>2616</td>
<td>I</td>
<td>O</td>
<td>Contemporary Artefacts</td>
<td>Artefacts/Scatter</td>
<td>E53/1132</td>
</tr>
<tr>
<td>2701</td>
<td>P</td>
<td>C</td>
<td>Yuruwari</td>
<td>Ceremonial/Mythological</td>
<td>E53/1132</td>
</tr>
<tr>
<td>2440</td>
<td>P</td>
<td>O</td>
<td>Lake Way 5</td>
<td>Artefacts/Scatter</td>
<td>M53/113, P53/1355</td>
</tr>
<tr>
<td>2441</td>
<td>I</td>
<td>O</td>
<td>Lake Way 6</td>
<td>Artefacts/Scatter</td>
<td>M53/113, P53/1396</td>
</tr>
<tr>
<td>2617</td>
<td>L</td>
<td>C</td>
<td>Yapukarumpi</td>
<td>Mythological</td>
<td>E53/1287, P53/1355, P53/1372, P53/1373, M53/113, M53/147, M53/796</td>
</tr>
<tr>
<td>20786</td>
<td>S</td>
<td>C</td>
<td>Tel/01 Abercrombie Creek</td>
<td>Mythological</td>
<td>E53/1287, P53/1357, P53/1396, P53/1397</td>
</tr>
<tr>
<td>20787</td>
<td>S</td>
<td>C</td>
<td>Tel/02 Abercrombie Creek</td>
<td>Mythological</td>
<td>E53/1287, P53/1356, P53/1357, P53/1396, P53/1397</td>
</tr>
<tr>
<td>2434</td>
<td>S</td>
<td>O</td>
<td>Lake Way Find 1</td>
<td>Artefacts/Scatter</td>
<td>M53/113</td>
</tr>
<tr>
<td>2435</td>
<td>S</td>
<td>O</td>
<td>Lake Way Find 2</td>
<td>Artefacts/Scatter</td>
<td>M53/224</td>
</tr>
</tbody>
</table>

Status
‘S’ – Stored data (location has been determined not to be an Aboriginal site)
‘I’ – Insufficient information (to determine location or if it is an Aboriginal site)
‘L’ – Lodged (an application to determine whether an Aboriginal site occurs)
‘P’ – Permanent register (location has been evaluated as an Aboriginal site)

Access
‘O’ – Open Access DIA site file (available to review)
‘C’ – Closed Access DIA site file (not available)

Sites ID 2434 and 2435 have been determined by the Aboriginal Cultural Material Committee (ACMC) to be ‘not heritage sites.’
6.1.1 Site ID 2009 – Wiluna South 1

Site ID 2009 is documented in O’Connor & Veth, (1984), Report of the Survey for Aboriginal Sites at the Asarco (Australia) Pty Ltd Gold Exploration Lease, Wiluna (DIA report ID 18114). The report is ‘closed access’ and was unavailable to review.

Site ID 2009 is described in an extract from the report contained on the DIA Site File as ‘a low density, sparse scatter of stone artefacts’ (100 artefacts within an area with dimensions of 20 m N/S x 50 m E/W) comprising mostly ‘silicified silts’ occurring ‘on the margin of a tree/shrub line merging onto samphire flats on the Western periphery of the Lake Violet drainage system.’ The artefacts are described in the report as including ‘blade cores’, ‘bladelets’ and a ‘small tula-like adze.’ The Site File states that the location is naturally eroded.

The site is located ‘450 m south of Butchers Well.’ The spatial information contained on the Site File shows that the site is probably outside the Project Area (to the east of the most eastern point in the L53/150 portion of the Project Area).

The site is recorded on the Site File as being of ‘Average’ significance. There is no recommendation about the site’s research potential contained on the Site File. It has been evaluated as a heritage site under Sections 5 and 39 of the AHA by the ACMC.

6.1.2 Site ID 2010 – Wiluna South 2

Site ID 2010 is documented in O’Connor & Veth, (1984) Report of the Survey for Aboriginal Sites at the Asarco (Australia) Pty Ltd Gold Exploration Lease, Wiluna (DIA report ID 18114). The report is ‘closed access’ and was unavailable to review.

The site is described on the Site File as ‘a low density, sparse scatter of stone artefacts’ (over 40 artefacts within an area with dimensions 30 m N/S x 20 m E/W) comprising mostly ‘silicified silts’ occurring in the same environment as Site ID 2009 (Section 8.1.1) and about 100 m west of Site ID 2009. The spatial information contained on the Site File shows that the site is probably outside of the Project Area (to the east of the most eastern point in the L53/150 portion of the Project Area).

The artefacts are described in the report as including ‘several burren adzes, one steep-sided scraper, a notched scraper and a possible elouera.’ About 20 (50%) of the artefacts are described as having undergone secondary modification.

The site is recorded on the Site File as being of ‘Average’ significance. There is no recommendation about further research potential contained on the Site File. It has been evaluated as a heritage site under Sections 5 and 39 of the AHA by the ACMC.

6.1.3 Site ID 2149 – Tjilla

The DIA Site File is ‘closed’ and there is little information available about this potential heritage site. The heritage register records ‘Insufficient Information.’ This could mean that there is insufficient spatial information to determine the location of the site or there is insufficient information to determine if it is a site.

Potential Site ID 2149 is referred to in Goode, (2003) A Site Avoidance Field Survey Report of the Proposed Leinster to Wiluna Optic Fibre Route, Gascoyne District, Western Australia (DIA report ID 20642) where it is stated that the site ‘includes the West Creek system’. Goode states that the custodians (the Ngalia group) of the potential site did not grant permission to access the closed Site File.
A tjilla is a carpet snake and stories/songlines attributing the genesis of significant creeks to snakes are a common theme in the regional mythological landscape. The potential site is the whole of the ‘West Creek system.’ The Creek runs through the centre of the L53/150 portion of the Project Area. There is no indication about the relative significance of the potential heritage site in the available documentation.

No artefacts are described as a component of Site ID 2149.

6.1.4 Site ID 19361 – Butchers Well
The DIA Site File is ‘closed’ and there is no information available. It is recorded as ‘Lodged’ and there is no record of the potential site being evaluated as a site by the ACMC. Butchers Well is the name of a current or former pastoral bore or well and possibly occurs to the east of L53/150 and outside the Project Area.

No artefacts are described as a component of Site ID 19361.

6.1.5 Site ID 2611 – Uramurdah Claypan
The DIA Site File is ‘closed’ and there is little information available. The heritage register records ‘Insufficient Information.’ This could mean that there is insufficient spatial information to determine the location of the site or there is insufficient information to determine if it is a site.

The Uramurdah Claypan landscape feature (also known as Uramurdah Lake) is well defined on maps and satellite imagery. The southern portion of the claypan has an impact on northern portions of the E53/1132 part of the Project Area.

Potential Site ID 2611 is referred to in Anthropos Australis (1994) *The Report of an Aboriginal Heritage Survey of the Southern Section (Wiluna to Kambalda) Goldfields Gas Transmission Pipeline Route and Corridor, Western Australia – Volumes 1 and 2* (DIA report ID 103665) and according to the report it was originally identified in Bindon & Robinson, (1978) *A Survey for Aboriginal Sites near Lake Way, Wiluna, Western Australia* (DIA report ID 17255). The Bindon & Robinson report is ‘closed access’ and was not available to review. A note in Anthropos Australis (1994: p. 164) states that the ‘Site File is missing.’

The Anthropos Australia (1994) report describes the potential site as a place along mythological tracks. There is a women’s version and a men’s version. The 1994 report indicates that the mythological themes attributed to the potential site are significantly different to those described by Bindon & Robinson. The version described by Bindon & Robinson concerns the activities of mythological entities associated with the principal male cult. The mythological themes described by Anthropos Australis are of lesser totemic significance.

Potential Site ID 2611 is recorded on the heritage register as having an archaeological component (stone artefacts) but the Anthropos Australis (1994) report states that ‘no archaeological material was noted on the perimeter of the claypan’. However, there was a reasonable prediction that stone artefacts would occur along the margins of creeks flowing into the claypan and in sand dunes along the boundary of the claypan feature.
6.1.6 Site ID 2614 – Area D

Site ID 2614 is referred to in Anthropos Australis (1994) The Report of an Aboriginal Heritage Survey of the Southern Section (Wiluna to Kambalda) Goldfields Gas Transmission Pipeline route and Corridor, Western Australia Volumes 1 and 2 (DIA report ID 103665) and according to the report it was originally identified in Bindon & Robinson, (1978) A Survey for Aboriginal Sites near Lake Way, Wiluna, Western Australia (DIA report ID 17255). The Bindon & Robinson report is ‘closed access’ and was not available to review.

There is no description of the site contained in the heritage register Site File. The Site File states that there is ‘Insufficient Information’ to determine and verify the location of the potential site. However, it probably occurs in the southern portion of the ES3/1132 part of the Project Area.

There is no indication on the Site File about the site’s significance and no information to evaluate and assess significance. There is no recommendation about the site’s research potential contained on the Site File.

6.1.7 Site ID 2616 – Contemporary Artefacts

Site ID 2616 is referred to in Anthropos Australis (1994) The Report of an Aboriginal Heritage Survey of the Southern Section (Wiluna to Kambalda) Goldfields Gas Transmission Pipeline Route and Corridor, Western Australia – Volumes 1 and 2 (DIA report ID 103665) and according to the report it was originally identified in Bindon & Robinson, (1978) A Survey for Aboriginal Sites near Lake Way, Wiluna, Western Australia (DIA report ID 17255). The Bindon & Robinson report is ‘closed access’ and was not available to review.

There is no description of the site contained in the Site File. The artefacts are described as ‘wood and metal.’ The Site File states that there is ‘insufficient information’ to determine and verify the location of the potential site. However, the location is probably outside the Project Area (east and north of the north-east corner of the ES3/1132 portion of the Project Area).

There is no information about the artefacts (other than they are wood and metal) on which to base an assessment of the site’s significance and no evaluation or assessment of their significance is contained in the available reports.

6.1.8 Site ID 2701 – Yuruwari

The DIA Site File is ‘closed’ and there is little information available. Potential Site ID 2701 is described in Anthopos Australis (1994) The Report of an Aboriginal Heritage Survey of the Southern Section (Wiluna to Kambalda) Goldfields Gas Transmission Pipeline Route and Corridor, Western Australia – Volumes 1 and 2 (DIA report ID 103665) and according to the report it was originally identified in Bindon & Robinson, (1978) A Survey for Aboriginal Sites near Lake Way, Wiluna, Western Australia (DIA report ID 17255). The Bindon & Robinson (1978) report is ‘closed access’ and was not available to review.

According to Anthopos Australia (1994) Site ID 2701 was previously recorded as comprising three elements including Site ID 2611 Uramurdah Claypan (see 6.1.5 above). The other two elements are ‘Tjururda Thicket’ (located in the vicinity of GDA Z 51 coordinates 237950mE x 7048964mN – ‘western border’ and 238117mE x 704895mN – ‘eastern border’) and the length of Uramurdah Creek (at 237957mE x 7049150mN). Uramurdah Creek runs through central eastern portions of the ES3/1132 portion of the Project Area. The 1994 report points out that the mythological themes attributed to the potential site are...
significantly different to those described in by Bindon & Robinson. The version described by Bindon & Robinson concerns the activities of mythological entities associated with the principal male cult. The mythological themes described by Anthropos Australis are of lesser totemic significance.

Potential site ID 2611 is recorded as having an archaeological component (stone artefacts) but the Anthropos Australis report states that ‘no archaeological material was noted on the perimeter of the claypan.’ No description of any archaeological material was found during the assessment. However, there is a reasonable prediction that stone artefacts would occur along the margins of Uramdurdah Creek flowing into Uramurdah claypan and in sand dunes along the boundary of the claypan feature.

Other than referring to the apparent variation in the specific themes of the mythological significance over about 15 years (from 1978 to 1994) there is no information on which to base an evaluation or assessment of the anthropological or contemporary ethnographic significance of the location.

6.1.9 Site ID 2434 – Lake Way Find 1
Site ID 2434 was identified by Hingley & Kirby, (1980) Survey for Aboriginal Sites: Lake Way, South Wiluna, Western Australia (DIA report ID 18040). The Hingley & Kirby report is ‘closed access’ and was not available for review. The site is described as comprising two stone artefacts.

The DIA Site File records the location as being of ‘minor’ significance and states that the ACMC determined that the location was not a heritage site (ACMC Resolution number ID 3080).

6.1.10 Site ID 2435 – Lake Way Find 2
Site ID 2435 was identified by Hingley & Kirby (1980) Survey for Aboriginal Sites: Lake Way, South Wiluna, Western Australia (DIA report ID 18040). The Hingley & Kirby report is ‘closed access’ and was not available for review. The site is described as comprising one stone artefact.

The DIA Site File records the location as being of ‘minor’ significance and states that the ACMC determined that the location was not a heritage site (ACMC Resolution number ID 3080).

6.1.11 Site ID 2440 – Lake Way 5
Site ID 2440 is documented in Hingley & Kirby, (1980) Survey for Aboriginal Sites: Lake Way, South Wiluna, Western Australia (DIA report ID 18040). The Hingley & Kirby report is ‘closed access’ and was not available for review.

According to the DIA Site File, stone artefacts occur on the ‘north-western portion of a small claypan two kilometres north-east of Abercrombie Well.’ The location is within the Project Area. According to an extract from the Hingley & Kirby report contained on the Site File, there are about 50 individual artefacts over an area measuring 150m x 100m comprising mostly quartz.
The site is recorded as being of ‘Mediocre to Average’ significance. It is recorded on the
heritage register as ‘Permanent’ and thus has been evaluated as a heritage site by the ACMC.
There is no recommendation about future research potential contained on the Site File.

6.1.12 Site ID 2441 – Lake Way 6
Site ID 2441 is documented in Hingley & Kirby, (1980) Survey for Aboriginal Sites: Lake Way,
South Wiluna, Western Australia (DIA report ID 18040). The Hingley & Kirby report is ‘closed
access’ and was not available for review.

According to the DIA Site File, stone artefacts occur on ‘flat, open floodplain, three-hundred
metres from the northern bank of a creek which enters Lake Way about three and a half
kilometres to the east of the site.’ The location of the site is inside the Project Area.

The artefacts are distributed over an area measuring 140m x 70m and comprise mostly
quartz. The heritage register records that there is ‘insufficient information’ and there is
insufficient spatial information to accurately determine the location of the site.

The site is recorded as being of ‘Average’ significance. There is no recommendation about
further research potential contained on the Site File.

6.1.13 Site ID 2617 – Yapukarumpi
The DIA Site File is ‘closed’ and there is little information available. The site is recorded as
‘Lodged” but there is no record of its potential as a site being evaluated.

The heritage register describes the location as a ‘plant resource and water source’. The
site’s location is inside the Project Area.

Artefacts are described as a component of Site ID 2617.

6.1.14 Site ID 20786 Tel/01 – Abercrombie Creek
The DIA site file is ‘closed’ and there is little information available. It is recorded as ‘Stored
Data.’

Potential Site ID 20786 was identified in Parker, (2003) Aboriginal Heritage Survey of a
Proposed Optic Fibre Cable Route from Wiluna to Leinster (DIA report ID 20643). According to
the report Site ID 20786 is part of a ‘dreaming that extended through the region’ and
coincides with a wash or floodway in the immediate vicinity of Abercrombie Well. It is not
clear whether the potential heritage site is the creek or a particular feature on the creek.
The report states that the area has been heavily disturbed. The potential site’s location is
inside the Project Area.

Because the location of the potential site is clearly recorded in the immediate vicinity of
242613mE x 7007722mN, (and is known) it is likely that the site has ‘Stored data’ status
because there was insufficient detail in the site’s description for it to be evaluated by the
ACMC to determine whether or not it is a site.
6.1.15 Site ID 20787 Tel/02 – Abercrombie Well

The DIA Site File is ‘closed’ and there is little information available. It is recorded as ‘Stored Data.’ Potential Site ID 20787 was identified in Parker, (2003) Aboriginal Heritage Survey of a Proposed Optic Fibre Cable Route from Wiluna to Leinster (DIA report ID 20643). According to the report Site ID 20787 is a ‘caved-in feature that was originally a Ngalia rock hole associated with the Tjukurrpa of the creek.’

The Parker report states that this feature was ‘converted to a government well and, with the construction of the highway, the whole area was bulldozed and the site destroyed.’ (p. 14) The location of the potential site is inside the Project Area.

Because the location of the potential site is clearly recorded in the immediate vicinity of 231587mE x 702613mN, (and is known) it is likely that the site has ‘Stored Data’ status because there was insufficient detail in the site’s description for it to be evaluated by the ACMC to determine whether or not it is a site. It also could be that the ‘Stored data’ status occurs because it has been destroyed.

6.2 Statement of Significance

Assessment of the significance of all sites is based on criteria outlined in the Burra Charter (International Council on Monuments and Sites (1984)) and Sections 5 and 39 of the AHA. Archaeological material is also assessed making reference to criteria in Bowdler (1984), Archaeological Significance as a Mutable Quality in Sullivan & Bowdler (eds) Site Surveys and Significance Assessment in Australian Archaeology, Department of Prehistory, RSrPACs, Australian National University, Canberra, pp 1-9; and in Pearson & Sullivan (1995) Looking After Places. The Basics of Heritage Planning for Managers, Landowners and Administrators – Melbourne University Press, Carlton.

This statement of significance was prepared by a qualified heritage practitioner, Mr John Gleason BA MSc (anth.) of Gleason and Associates Pty Ltd. A general assessment and evaluation is presented and specific statements of significance are made for each of the 15 potential heritage sites.

Under the Burra Charter, cultural significance is assessed under aesthetic, historic, scientific or social values – past, present or future. None of the archaeological material as described in the reports and on the respective DIA Site Files is likely to hold scientific or ethnographic (social) significance to indigenous people although any contemporary ethnographic significance is being evaluated and assessed in consultation with the indigenous community. At least three of the recorded sites of potential ethnographic (mythological) significance (Sites ID 2149, Tjilla, 2611, Uramurda Claypan and 2701 Uramurda Creek) are distinctive water features and are of some aesthetic value within a desert environment, especially after rare prolonged heavy rain. In the regional setting which includes Lake Way and Lake Violet, the drainage features comprising the ethnographic sites are comparatively minor and the presence of nearby major salt lake features likely diminishes the overall aesthetic significance of minor waterways. The social values of the site locations are unremarkable.

Under Section 5 of the AHA a heritage site is defined as:

- A place of importance and significance where persons have left any object, natural or artificial, used or made or adapted for use for any purpose connected with traditional life;
- Any sacred, ritual or ceremonial sites of importance;
- Any places of historical, anthropological, archaeological or ethnographic interest because it is important to the State; and/or
• Any place where objects are stored.

Section 39 of the AHA contains criteria for assessing relative significance by evaluating:
• Existing use or significance attributed under relevant Aboriginal custom;
• Former or reputed use or significance which may be attributed upon the basis of tradition, historical association or Aboriginal sentiment;
• Potential anthropological, archaeological or ethnographic interest;
• Aesthetic values; and
• Associated sacred beliefs and ritual or ceremonial usage are primary considerations.

Of the 15 potential heritage sites within or in proximity to the Project Area, only four have apparently been formally evaluated and assessed by the ACMC as heritage sites under Sections 5 and 39 of the AHA. (Sites ID 2009, 2010, 2701 and 2440). Two of the 15 potential heritage sites (Sites ID 2434 and 2435) have been evaluated and assessed by the ACMC as 'not heritage sites'.

Archaeological Sites

The issue of archaeological heritage site significance has been discussed extensively by Bowdler (1984) and Pearson & Sullivan (1995). Despite differences in approaches used by heritage practitioners, there is general consensus on the basis for assigning scientific (or archaeological) significance to sites and areas. Sites (or complexes of sites) are generally regarded as having high scientific or archaeological significance if they satisfy at least one of the following criteria:
• Rare (or possibly unique) in a local, regional or national context;
• A good example, which is representative of a particular site type (a criterion which generally excludes severely disturbed sites where the initial value has been compromised);
• A site with high research potential, able to provide answers to contemporary and relevant research questions; and
• A site with particular characteristics (including aesthetic value or visual impact) that makes it a good example to use for educational or public awareness purposes.

There are three potential archaeological heritage sites within the Project area (Sites ID 2614, 2440 and 2441) and one potential archaeological site that is probably outside (Site ID 2616). Two of the four potential archaeological sites (Sites ID 2614 and 2616) may have been ‘collected’ and the locations of the two places where the artefacts were first identified is uncertain. The remaining two archaeological sites (Sites ID 2440 and 2441) are ‘claypan artefact scatters’ and likely occur in their locations as a result of human agency and water drainage.

The artefact assemblages (low density claypan artefact scatters) are common in the Goldfields region. Because they are usually affected by the movement of water as well as human agency, further scientific research options are limited. None of the potential archaeological heritage sites are likely to be stratified. Little significant information about indigenous land use patterns can be anticipated from further research.

The raw material used (quartz and cherts) is not exotic in the region. Within the Project Area no tools are described at any of the potential archaeological sites and the small amount of retouched artefacts offers little scope for research into tool making techniques. The potential sites are of limited educational or public awareness value.
Ethnographic Sites

Seven of the potential heritage sites which may be in the Project Area are recorded as being of mythological and/or ceremonial significance. There are no artefact components to six of the seven potential sites (Site ID 2617 is recorded on the heritage register as having artefacts). Two of the seven potential heritage sites of ethnographic significance are described in the DIA Site Files as being destroyed (Sites ID 20786 and 20787).

One of the seven potential heritage sites has been evaluated, assessed and registered as ‘Permanent’ (Site ID 2701). The other six are recorded as either ‘Stored data’ (Sites ID 20786 and 20787), ‘insufficient information’ (Sites ID 2149 and 2611) or ‘Lodged’ (Sites ID 19361 and 2617).

Although the significance of the seven locations can only be assessed in further consultation with the relevant indigenous people, the available documentation for three of the potential sites (Sites ID 2149, 20786 and 20787) suggests that they were recorded as ethnographic sites as a result of consultation with a relatively few people (Parker 2003). The themes of the ‘Dreaming’ track associated with the three sites are not ‘secret/sacred’ and for men only and seem to concern the activities of the water creative serpent. This is a common mythological motif in the Goldfields region.

The available information concerning the single site of ethnographic significance recorded as ‘Permanent’ on the heritage register (Site ID 2701) as well as Site ID 2611 (which is described as a component of Site ID 2701) is the Anthropos Australis (1994) report. There is conflict about the mythological significance of the two ethnographic heritage sites. Where previously (Bindon & Robinson, 1978), the location apparently was associated with and created by ‘Two Men’, the Anthropos Australis (1994) report states that the locations are sites along two different and less significant myths and no creative aspect is documented.

Of the two remaining potential sites of ethnographic heritage significance (Sites ID 2617 and 19361), Site ID 2617 is recorded as a plant and water source. There is no information available about Site ID 19361.

Because most of the ethnographic sites are either recorded in consultation with few people or contain conflicting information, the potential anthropological interest is diminished. The conflicting information about Sites 2611 and 2701 suggests conflicting sacred beliefs. There is no documentation suggesting that the locations are associated with traditional or contemporary ritual and ceremonial use. Where specific information about the mythological themes associated with the potential sites is documented, it does not include secret or sacred aspects.

Having regard to the limited information available, none of the archaeological sites are likely to be of special scientific or other significance and none of the seven locations in the Project Area recorded as ethnographically significant are likely to be of regional importance and/or high mythological, ritual or ceremonial significance.
Statements of Significance

6.2.1 Site ID 2009 – Wiluna South 1

Archaeological/Scientific Significance
Regionally, artefact assemblages such as Site ID 2009 are not unique or rare. They are common around the periphery of salt lakes and large claypans throughout the Goldfields. The material used (cherts) is typical and not exotic in the region.

It is likely that the site ID 2009 artefacts have been deposited by the action of running water as well as potential human activity. No knapping event or formed tools are described and Site ID 2009 does not appear to be a good example of a traditional habitation area.

The site is described as being eroded and its location on a drainage channel means that there is little potential for further scientific research. Because the artefacts have likely been moved from their original disposition (by water drainage) sourcing the origin of the material used will not likely add significantly to an understanding of traditional land use patterns. The site is not likely to be stratified and trenching such a sparse scatter will not likely answer important research questions. Because the site is common, sparse and eroded (and subject to further eroding), it does not have outstanding characteristics and high values as an educational tool or subject of public awareness.

Ethnographic Significance
Site ID 2009 does not contain any artefacts likely to have any contemporary mythological, ceremonial or ritual significance, or to have been traditionally used for ceremonies or rituals. The stone artefact material is likely to be of little anthropological interest with most of the elements comprising refuse from previous tool making and little raw material for further use.

There are some Indigenous people who consider all examples of stone artefacts (regardless of whether actual tools are present) as ethnographically significant. The degree of significance can only be evaluated and assessed in consultation with the relevant Indigenous people.

6.2.2 Site ID 2010 – Wiluna South 2

Archaeological/Scientific Significance
Regionally, artefact assemblages such as Site ID 2010 are not unique or rare. They are common around the periphery of salt lakes and large claypans throughout the Goldfields. The material used (cherts) is not exotic in the region. Processes of secondary modification are reported for a number of artefacts but there does not appear to be any outstanding potential for adding to the understanding of tool making techniques.

It is likely that the Site ID 2010 artefacts have been deposited by the action of running water as well as potential human activity. Only individual artefacts are described with no evidence of a knapping event. Site ID 2010 does not appear to be a good example of a traditional habitation area.

The site is described as being eroded and its location on a drainage tract means that there is little potential for further scientific research. Because at least some of the artefacts have likely been moved from their original disposition (by water drainage) sourcing the origin of the material used will not likely add significantly to an understanding of traditional land use. The site is not likely to be stratified and trenching such a sparse scatter would probably not answer important research questions. Because the site is common, sparse and eroded (and...
subject to further eroding) it does not have outstanding characteristics and high values as an educational tool or subject of public awareness.

**Ethnographic Significance**
Site ID 2010 does not contain any artefacts likely to have any contemporary mythological, ceremonial or ritual significance, or to have been traditionally used for ceremonies or rituals. The stone artefact material is likely to be of little anthropological interest with most of the elements comprising refuse from previous tool making and no raw material for further use. There are some indigenous people who consider examples of stone artefacts (regardless of whether actual tools are present) as ethnographically significant. The degree of significance can only be evaluated and assessed in consultation with the relevant Indigenous people.

6.2.3 Site ID 2149 – Tjilla

**Ethnographic Significance**
There is not enough information available to assess the potential anthropological significance of Site ID 2149. Contemporary ethnographic significance of site ID 2149 can only be evaluated and assessed in consultation with the relevant Indigenous people.

Judging from the comments made in Goode (2003), it is possible that only individuals associated with one group have any knowledge of the mythological significance of the potential site. Because the mythological significance of West Creek might not be recognised by a large number of people from the vicinity, its regional anthropological significance is diminished.

6.2.4 Site ID 19361 – Butchers Well

**Ethnographic Significance**
There is not enough information available to assess the anthropological significance of potential Site ID 19361. Contemporary ethnographic significance can only be evaluated and assessed in consultation with the relevant Indigenous people.

6.2.5 Site ID 2611 – Uramurdah Claypan

**Ethnographic Significance**
There is not enough information available to assess the anthropological significance of potential Site ID 2611. There is a variation in the mythological themes described as being associated with the potential site from 1978 (Bindon & Robinson 1978) to 1994 (Anthropos Australis 1994). This variation is significant because the earlier mythology concerned an association with ‘strong’ male ritual and the latter did not. Because the claypan is a distinctive regional landscape feature it is probable that the potential site has gone through a process of revision. If the earlier version is traditionally correct and the latter version is not then it may be that the site previously had a ‘secret/sacred’ component that is no longer relevant. In such a case the anthropological research potential of the site is diminished.

The Anthropos Australis (1994) report describes the version of the mythology documented by Bindon & Robinson (1978) as including an event responsible for the genesis of the landscape feature. In the latter versions, no event is described that accounts for the feature itself but instead simply refers to mythological events that happened at the location. World changing mythology, especially when it is associated with ‘strong’ male themes, is more significant than the non-world changing activities described in the 1994 accounts.
Contemporary ethnographic significance can only be evaluated and assessed in consultation with the relevant indigenous people.

6.2.6 Site ID 2614 – Area D

**Archaeological/Scientific Significance**
The Anthropos Australis (1994) report suggests that the artefacts from the potential site have been ‘collected by Bindon & Shannon’ (p. 164). If it is the case that the artefacts were removed in 1978, then the original location of the artefacts is possibly not a heritage site. If there is no information about where the artefacts were found before they were removed, there is little or no scientific significance that can be ascribed to the location.

**Ethnographic Significance**
If Site ID 2614 does not now contain any artefacts it is unlikely to have any contemporary ethnographic significance.

6.2.7 Site ID 2616 – Contemporary Artefacts

**Archaeological/Scientific Significance**
Wood and metal indigenous artefacts are rarely described in contemporary archaeological reports for the Goldfields and are likely to have a reasonably high research potential. The Anthropos Australis (1994) report describes the potential site as having been ‘collected by Bindon & Shannon’ (p. 164). If this is the case and the removed artefacts are contemporary wood and metal objects then the original location of the artefacts is possibly not the heritage site. Accordingly, there is little or no scientific significance than can be ascribed to the location.

**Ethnographic Significance**
Metal artefacts are unlikely to have been used extensively in traditional ceremonial or ritual activities. If Site ID 2616 does not contain any artefacts then the original location where they occurred is unlikely to have any anthropological or contemporary ethnographic significance.

6.2.8 Site ID 2701 - Yuruwari

**Ethnographic Significance**
There is not enough information available to assess the anthropological or ethnographic significance of potential Site ID 2701. Because there is a significant variation in the mythological themes described as being associated with the potential site from 1978 to 1994, and because the creek and the claypan are distinctive regional landscape features, it is probable that the potential site has gone through a process of revision and this diminishes anthropological research significance.

The Anthropos Australis (1994) report describes the version of the mythology documented by Bindon & Robinson (1978) as including an event responsible for the genesis of the landscape feature. In the latter version no event is described that accounts for the feature itself but instead simply refers to mythological events that happened at the location.

World changing mythology, especially when it is associated with ‘strong’ male themes (‘Two Men’) is more significant than non-world changing activities described in the 1994 accounts.

Contemporary ethnographic significance can only be established in consultation with the relevant Indigenous people.
6.2.9 Site ID 2434 – Lake Way Find 1

Archaeological/Scientific Significance
Regionally, individual isolated stone artefacts are common and in certain environments they are ubiquitous. These latter conditions are likely to be found along creek beds and floodplains in the vicinity of Lake Way. The material used (quartz and chert) is typical and not exotic in the region. There is likely to be little scope for further research on an isolated find in the environment of Lake Way. Because Site ID 2434 has been determined not to be a heritage site no Section 18 notice is required should there be a need to disturb the location.

Ethnographic Significance
Individual isolated stone artefacts might be considered culturally significant by some people in the indigenous community. A process for managing any identified isolated finds will be developed in consultation with the local Indigenous community.

6.2.10 Site ID 2435 – Lake Way Find 2

Archaeological/Scientific Significance
Regionally, individual isolated stone artefacts are common and in certain environments they are ubiquitous. These latter conditions are likely to be found along creek beds and floodplains in the vicinity of Lake Way. The material used (quartz and chert) is typical and not exotic in the region. There is likely to be little scope for further research on an isolated find in the environment of Lake Way. Because Site ID 2435 has been determined not to be a heritage site no Section 18 Notice is required before there is disturbance to the location.

Ethnographic Significance
Individual isolated stone artefacts might be considered culturally significant by some people in the indigenous community. A process for managing any identified isolated finds will be developed in consultation with the local Indigenous community.

6.2.11 Site ID 2440 – Lake Way 5

Archaeological/Scientific Significance
Regionally, claypan artefact scatters such as Site ID 2440 are not unique or rare in the Goldfields. The material used (quartz) is not exotic in the region. Processes of secondary modification of the stone artefacts are not reported.

It is likely that the Site ID 2440 artefacts have been deposited by the action of running water as well as human activity. Only individual artefacts are described and there is no evidence of a knapping event. Site ID 2440 does not appear to be a good example of a traditional habitation area.

There is no recommendation about further research potential contained on the site file. The site is not likely to be stratified and trenching such a sparse claypan scatter will not likely answer important research questions. From the limited information presented the artefact scatter does not have outstanding characteristics and high values as an educational tool or subject of public awareness.

Ethnographic Significance
Site ID 2440 does not contain any artefacts likely to have any contemporary mythological, ceremonial or ritual significance, or to have been traditionally used for ceremonies or rituals.
The stone artefact material apparently does not contain any formed tools and is of little anthropological interest.

There are some indigenous people who consider all examples of stone artefacts (regardless of whether actual tools are present) as ethnographically significant. The degree of significance can only be established in consultation with the relevant Indigenous people.

6.2.12 Site ID 2441 – Lake Way 6

Archaeological/Scientific Significance
Regionally, floodplain artefact scatters such as Site ID 2441 are not unique or rare in the Goldfields. The material used (quartz) is not exotic in the region. Processes of secondary modification of the stone artefacts are not reported.

It is likely that the Site ID 2441 artefacts have been deposited by the action of running water as well as human activity. Only individual artefacts are described and there is no evidence of a knapping event. Site ID 2441 does not appear to be a good example of a traditional habitation area.

There is no recommendation about further research potential contained on the Site File. The site is not likely to be stratified and trenching such a scatter will not likely answer important research questions. From the limited information presented the artefact scatter does not have outstanding characteristics and high values as an educational tool or subject of public awareness.

Ethnographic Significance
Site ID 2441 does not contain any artefacts likely to have any contemporary mythological, ceremonial or ritual significance or to have been traditionally used for ceremonies or rituals. The stone artefact material does not include any formed tools and is of little anthropological interest.

There are some indigenous people who consider all examples of stone artefacts (regardless of whether actual tools are present) as ethnographically significant. The degree of significance can only be established in consultation with the relevant Indigenous people.

6.2.13 Site ID 2617 – Yapukarumpi

Archaeological/Ethnographic Significance
There is not enough information available to assess the anthropological significance of potential Site ID 2617, a ‘plant resource and water source.’ An important plant resource might have been the location of ‘increase ceremonies.’

Contemporary ethnographic significance can only be established in consultation with the relevant Indigenous people.

6.2.14 Site ID 20786 Tel/01 – Abercrombie Creek

Ethnographic Significance
There is not enough information available to assess the anthropological significance of potential Site ID 20786. Judging from comments made in Goode, (2003), it is possible that only individuals associated with one group have any knowledge of the mythological significance of the potential site.

Because the location has apparently been severely disturbed or destroyed, the potential site’s regional anthropological significance is diminished.
Contemporary ethnographic significance of Site ID 20786 can only be evaluated and assessed in consultation with the relevant Indigenous people.

6.2.15 Site ID 20787 Tel/02 – Abercrombie Well

**Ethnographic Significance**

There is not enough information available to assess the anthropological significance of potential Site ID 20787. Judging from comments made in Goode, (2003), it is possible that only individuals associated with one group have any knowledge of the mythological significance of the potential site. Because the location has apparently been severely disturbed or destroyed, the potential site’s regional anthropological significance is diminished.

Contemporary ethnographic significance of Site ID 20787 can only be evaluated and assessed in consultation with the relevant Indigenous people.
7 Activity Description

7.1 Key Project Characteristics

The following table identifies key Project characteristics –

<table>
<thead>
<tr>
<th>PROJECT ELEMENT</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational purpose</td>
<td>Mining of uranium mineralised ore and production of uranium oxide concentrate over a nominal project life of up to 14 years, based on current resources</td>
</tr>
<tr>
<td>Mining method</td>
<td>Open pit, using surface miners and excavators. No blasting is required</td>
</tr>
<tr>
<td>Estimated ground disturbance</td>
<td>~ 1530 hectares</td>
</tr>
<tr>
<td>Processing method</td>
<td>Crushing and grinding followed by agitated alkaline leach (in vessels) and direct uranium precipitation</td>
</tr>
<tr>
<td>Power requirement</td>
<td>Up to 12 megawatts of on-site diesel or gas power generation</td>
</tr>
<tr>
<td>Water requirement</td>
<td>Up to 2.5 gigalitres per annum sourced from an underground aquifer</td>
</tr>
<tr>
<td>Access</td>
<td>Access to mine operations would be by the existing Goldfields and Gunbarrel highways. The existing Wiluna airport would be used for fly in – fly out employees and contractors</td>
</tr>
</tbody>
</table>

7.1.1. Site preparation

Site preparation would consist of the progressive clearing of vegetation and topsoil prior to mining and processing activities. Vegetation and topsoil would be stockpiled separately to ensure maximum reuse of these resources in subsequent rehabilitation.

7.1.2. Mining

The uranium mineralisation for both resources is typically contained within a mineralised zone lying at a depth between 1 metre and 15 metres below surface. The ore body varies in thickness up to a maximum thickness of about 6.5 metres. The mineralised zones are laterally extensive but vertically can be irregular, with some areas of very low grade or barren material occurring within the overall mineralised zone. The shallow nature and relatively broad areal extent of the resource means that it would be mined by an open pit method. The mining method selected is based on surface miners as the primary ore fleet and conventional excavators for the waste mining. Surface miners are continuously operating precision machines, well suited to mining of relatively low strength materials. They offer particular advantages in situations where variable ore grades necessitate selective excavation to segregate mineralised and non-mineralised materials. Mining would occur in a 24-hour operation with ore mining being undertaken on day shift and waste mining being completed predominantly on night shift. Ore mining would be achieved using the surface miner to cut 0.25 metre benches in ore. A loader would be used to place the ore into mine trucks. Waste mining would be completed on 1 metre to 2 metre benches using excavators and mine trucks. Both the Centipede and Lake Way deposits are ‘free-digging’ and require no pre-drilling or blasting. The ore mining rate would ramp up over one year to approximately 2 million tonnes per annum. At Centipede this would require about 6 million tonnes per annum of waste rock to be moved. At Lake Way about 8 million tonnes of waste rock would be mined.
7.1.3. **Soil and waste rock management**

Surface soil cover would be stripped and stockpiled separately to be placed over the areas of backfilled pits as part of ongoing rehabilitation. Non-mineralised overburden and waste rock would either be stockpiled next to the pit being mined or backfilled into suitable nearby mined out areas.

7.1.4. **Dewatering**

Much of the uranium resource occurs at or below the water table and dewatering of the open pits would be required. The water table is typically between 0.5 metres and 5 metres below the natural ground surface. The groundwater is contained within the shallow sediments of the delta environment and is very saline, about three times the salinity of seawater. The groundwater quality typically becomes less saline with distance away from the lake. To minimise the amount of water to be pumped from the pits, Toro proposes to develop water barriers either as compacted, backfilled perimeter trenches or by creating a low permeable barrier around the pit void. Trenches would be dug with an excavator and the material from the trenches backfilled and compacted into the trench. Bentonite (a type of clay mineral) or a similar product may be added to reduce the permeability of the barrier if required.

7.1.5. **Water**

The total water requirement for the Project is estimated to be up to 2.5 gigalitres per annum. A water treatment plant would be required to produce about 32 cubic metres per hour of demineralised water for steam generation. About 5 cubic metres per hour of potable-quality water would be required for product washing and for camp and plant amenities. The high quality water would be generated by a small reverse osmosis plant. It is proposed to refurbish and upgrade a disused borefield at West Creek on Miscellaneous Licence L53/150, approximately 10 kilometres southwest of Wiluna, as the primary water supply for the Project. Other areas of potential water supply are being investigated.

7.1.6. **Processing**

Ore from the mine would be delivered by truck to a milling circuit comprising a single semi-autonomous grinding mill operating in closed circuit with classifying cyclones to produce a grinding circuit product. Cyclone overflow would flow by gravity to the leach feed thickener then be pumped to the leach circuit. Leaching of the slurry would be undertaken at normal atmospheric pressure in a series of five mechanically agitated leach tanks. Steam would be injected into the tanks to heat and maintain the slurry at the operating temperature of 95 degrees Centigrade. Leaching would be undertaken in alkaline conditions by the addition of sodium carbonate. A residence time of 18 hours would be required to obtain a leach uranium recovery in excess of 90%. The leached slurry would be pumped into the counter current decant (CCD) thickeners for recovery of leach solution and washing of leach residue solids. A seven stage CCD circuit would be used to recover leach solution. Solution flow would be counter current to solids flow. Underflow from the final stage of the CCD would be pumped to the Tailings Storage Facility. The CCD circuit would be designed as a split wash circuit to minimise overall plant water requirements. A portion of the CCD overflow would be pumped to the plant via the evaporation pond, which would evaporate excess solution for water balance purposes. Pregnant liquor solution would be recovered from the evaporation pond and pumped to a pin bed clarifier. The clarified solution would be heated to 85 degrees Centigrade and uranium would be recovered as uranium oxide via a process that would begin with the precipitation of sodium diuranate using sodium hydroxide. The
solution would be returned to the CCD via a carbonation process where carbon dioxide from the power station exhaust gases is captured and dissolved to enhance the extraction process. The sodium diuranate precipitate would be re-dissolved in sulphuric acid. Uranium would be precipitated from the solution by the addition of hydrogen peroxide then sodium hydroxide to precipitate uranyl peroxide. The barren circuit would be returned to the leach circuit. The dried uranium oxide product would be cooled and packed from the storage hopper into plastic lined steel drums.

7.1.7. Product transport

It is proposed to truck product from the Project site to Adelaide for export shipment or for railing on to Darwin for shipment. Toro’s plans for transport of product include Emergency Response procedures to deal with any incident. The handling, storage and transport of radioactive material as part of mining and processing operations within Australia is managed and regulated in strict accordance with Federal, State and Territory Acts, Regulations, Codes of Practice and Guidelines. Toro would prepare a Radiation Transport Plan as required by the Code of Practice for the Safe Transport of Radioactive Material. Product transport would comply with this Code and other applicable Acts and Regulations. While the International Atomic Energy Agency's enhanced Regulations for the Safe Transport of Radioactive Material are not yet incorporated in Western Australian legislation, Toro also would comply with those regulations. Packages used for the transport of radioactive materials are designed to retain their integrity during the various conditions that may be encountered while they are being transported. Product would be sealed in 205 litre steel drums which would be weighed and labelled. Each drum would be sealed with a secure seal and identified with a unique number prior to being stacked and strapped within a shipping container. Radiation clearance checks would be performed inside and outside the containers prior to removal from the Mining Lease and the results recorded. Up to five shipping containers per month would be transported using road and/or rail infrastructure to port facilities in Adelaide and Darwin. The Australian Safeguards and Non-Proliferation Office (ASNO) contributes to the development and operation of International Atomic Energy Agency safeguards and strengthening of the international nuclear non-proliferation regime. ASNO is responsible for the issuing of permits for the transport of product along approved routes from the departure point in Australia.

7.1.8. Supporting infrastructure

Toro expects that the following ancillary infrastructure would be required during Project construction and operation –

- A power station of up to 12 megawatt capacity
- A water supply borefield (nominally 2.5 gigalitres per annum)
- Communications towers to support telephone and computer linkages
- Workforce accommodation and amenities areas
- Septic waste treatment and disposal facilities
- Access/haul roads
- Laydown areas
- Water storage ponds, evaporation ponds, water pipeline and a reverse osmosis plant
7.1.9. Workforce

A permanent accommodation village for an operations workforce of up to 170 personnel would be required. A temporary accommodation village for up to 350 construction personnel would also be required.

7.1.10. Waste management

The main solid wastes arising from Project implementation would include –

- Non-mineralised overburden
- Tailings from which uranium has been extracted
- Solid by-product from the direct precipitation of uranium
- Salt from water evaporation ponds
- Waste materials that have been used in the process and may have been exposed to radioactive material (for example, gloves, oil filters, used parts etc)
- General non-hazardous rubbish and septage from the mine accommodation and operations areas

Non-mineralised overburden and tailings would be returned to the pit voids as part of the progressive mine rehabilitation. A comprehensive waste management plan addressing management of both radioactive and non-radioactive wastes has been submitted as part of the ERMP. Precipitate from the process plant would be disposed of in purpose-built containment cells to a licensed off-site facility if it is unsuitable for on-site containment. Saline residues from evaporation ponds (including salt from the reject water produced by the reverse osmosis plant) may require encapsulation in purpose-built cells. Domestic solid wastes would be recycled to the extent practicable. Non-recyclable materials would be disposed of to a purpose-built landfill located near the accommodation village, or would be disposed of at the Shire landfill. Septage would be treated by means of a proprietary treatment plant and disposed of in accordance with Shire of Wiluna and WA Department of Health requirements.

7.1.11. Rehabilitation and closure

Toro proposes a mine with a nominal operational life of 14 years. The approximate area of disturbance that would result from Project implementation is 1530 hectares. Most of this area comprises native vegetation, except for minor areas of existing disturbance associated with existing roads and access tracks and some existing cleared areas from previous mining trials (by others) in the Project locality. Clearing and rehabilitation would be carried out progressively, in the manner of a strip mining operation, with voids created by mining being progressively backfilled using residue and overburden from active mine pits. The maximum operational footprint at any one time would be less than 300 hectares. Initially, mining would take place at Centipede. After about five years, mining would be relocated to the Lake Way operations area. At cessation of mining all plant would be removed from the site and final land forming and revegetation would be completed in accordance with a government approved mine closure and rehabilitation plan. In doing so, to the extent of any impact Toro would seek to restore the Project Area’s cultural heritage values. This would be done through consultation with the Traditional Owners.
7.2 Impact Assessment

Toro completed a systematic aspects and impacts analysis to identify potential impacts on a range of environmental factors of constructing and operating the Wiluna Project. This identified a need for additional investigations or testing to enable the assessment of the potential impacts of the proposal or to allow management strategies to control impacts to be defined.

Key studies included desk and field studies for –
- Terrestrial fauna, including short range endemic invertebrates
- Subterranean fauna
- Flora and vegetation, including bush tucker
- Soils and landforms

Modelling and field studies, including monitoring of field trials, were carried out to evaluate the potential impacts of Project implementation on –
- Air quality
- Surface water
- Groundwater

All investigations have been carried out in accordance with EPA guidelines or with other relevant standards or codes of practice. The results of the further investigations are presented in the ERMP and will be used as the basis for assessing the potential environmental aspects of the proposal and devising management responses and monitoring strategies.

Of particular relevance to cultural heritage, the further studies have included –
- Further heritage surveys and cultural mapping of the Project Area
- Assessment of impacts on any Aboriginal sites of significance in accordance with EPA Guideline 41, including on sites associated with natural water features and groundwater dependent eco-systems
- The potential ecotoxicological effects of radionuclides or other contaminants on non-human biota to consider effects on animals in the food chain
- Survey of bush tucker foods to identify what plants are important to local gatherers of bush tucker and to evaluate the potential for exposure of people or animals to contaminants as a result of consumption of bush foods


In addition, Toro would make use of international standards as the basis for its systems of radiation management. The International Commission on Radiological Protection (ICRP) is the primary international body for radiation protection and regularly publishes guidelines in the form of formal recommendations. The most recent recommendations are contained in ICRP 103 and apply the overarching principles of –
- Justification
- Optimisation
- Limitation

Potential radiation exposures to the public as a result of implementing the Project are assessed and described in the ERMP. The assessment includes the identification of all
potential source terms. Throughout the Project life, monitoring of radiation levels at key locations would ensure that Member of Public radiation doses are calculated and submitted to government regulators. The dose estimation methods and dose conversion factors used would be those provided in relevant guidelines issued by the ICRP.

The effect of radiation on the biological environment has been assessed as per the general requirements of ICRP publication number 108 (Environmental Protection: the Concept and Use of Reference Animals and Plants) and other emerging internationally recognised practices. This assessment forms part of the documentation supplied with the ERMP.

Because of the scale of the Project, its ongoing consultation with Traditional Owners and plans for Project closure and rehabilitation, Toro does not consider that the Project would have any long term major adverse impact on the integrity or significance of the heritage landscape.
8 Summary of Consultation

Based on its review of available heritage information, Toro initiated consultation in 2007 with Aboriginal people who may hold relevant cultural heritage knowledge. This included contact with Central Desert Native Title Services (CDNTS) as the representative body for the Wiluna area pursuant to the Native Title Act 1993.

CDNTS was incorporated in 2007 to provide a native title service in the Central Desert region. CDNTS represents the Wiluna and Tarlpa native title claimant groups which have registered native title claims over the Project Area (Native Title Determination Application WAD 6164/98 (Wiluna) – Native Title Determination Application WAD 248/07 (Tarlpa). CDNTS has advised Toro that ‘in our view, and based on all of our anthropological research including but not limited to the extensive research conducted in this area by Dr Lee Sackett over a number of years, there are no other people outside of these claim groups that can speak about the ‘Aboriginal cultural heritage values’ of the proposed Wiluna Project.’ (Communication to Toro from CDNTS – 6 August 2010).

Since the Wiluna Project was referred for government assessment in October 2009, Toro’s continuing consultation with Traditional Owners has included the following –

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 November 2009</td>
<td>Meeting with Wiluna and Tarlpa native title claimants at Wiluna to provide a progress report on Project</td>
</tr>
<tr>
<td>3 March 2010</td>
<td>Meeting with Wiluna and Tarlpa native title claimants at Wiluna to provide a progress report on Project and discuss concerns about impacts on groundwater, bush tucker and cultural heritage</td>
</tr>
<tr>
<td>27 April 2010</td>
<td>An independent radiation specialist attended a meeting of Wiluna and Tarlpa native title claimants to discuss radiation issues. Toro provided funding to CDNTS to commission the specialist for this purpose</td>
</tr>
<tr>
<td>11 May 2010</td>
<td>Toro hosted 10 Wiluna and Tarlpa native title claimants and two representatives of CDNTS on a visit to the Doral Mineral Sands mine near Busselton, Western Australia. The scale and impact of mining at Wiluna would be similar to that at Doral Mineral Sands</td>
</tr>
<tr>
<td>12 May 2010</td>
<td>Toro hosted 10 Wiluna and Tarlpa native title claimants and two representatives of CDNTS on a visit to the Beverley uranium mine site in northern South Australia. The scale of the processing plant at Wiluna would be similar to that at Beverley. Management of the Beverley mine also provided information on radiation management and protection and the Wiluna and Tarlpa native title claimants were able to have their own discussions with Traditional Owners with an interest in the Beverley mine about issues associated with the impacts of uranium mining</td>
</tr>
<tr>
<td>27 July 2010</td>
<td>Toro hosted a visit to the Wiluna Project site by more than 40 Wiluna and Tarlpa native title claimants to provide information about Project plans including the commencement of a resource test pit. Toro provided a barbecue lunch during the visit</td>
</tr>
</tbody>
</table>
### Cultural Mapping

<table>
<thead>
<tr>
<th>Date Range</th>
<th>Activity Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-18 October 2010</td>
<td>Cultural Mapping at the Wiluna Project site by the Wiluna and Tarlpa native title claimants based on a proposed Project configuration provided by Toro</td>
</tr>
<tr>
<td>17 November and 3 and 23 December 2010, 14 January, 16 March, 14 and 15 April 2011</td>
<td>Meetings in Perth and Wiluna with CDNTS and Traditional Owners to discuss the outcomes of Cultural Mapping so far</td>
</tr>
</tbody>
</table>

In developing plans to manage Aboriginal cultural heritage Toro has consulted –

- DIA (Christine Lewis – christine.lewis@dia.wa.gov.au)
- EPA (Ray Claudius – ray.claudius@epa.wa.gov.au)
- DSEWPC (Lachlan Wilkinson – lachlan.wilkinson@environment.gov.au)
- CDNTS (Michelle Alexander – michellealexander@centraldesert.org.au)
- Aboriginal people with cultural knowledge of the Project Area
- The Wiluna Shire (Samantha Tarling, CEO – ceo@wiluna.wa.gov.au)

The Toro contact for events related to the Draft CHMP is Richard Yeeles (richard.yeeles@toroenergy.com.au) – telephone 08 9214 2100 – fax 08 9226 2958.

In relation to its consultation with relevant Indigenous people, as well as undertaking its own Project specific consultation Toro has also participated in industry initiatives to provide information about uranium mining and its impacts to local and regional communities. This has included participation in public forums in Kalgoorlie, Wiluna, Leonora, Laverton and Menzies which have been attended by representatives of local Indigenous communities.
9 Summary of Heritage Work Conducted

Over time, many heritage surveys have been undertaken in the Wiluna region. They have led to the registration with the DIA of the sites identified in Section 7 of this Draft CHMP. Toro holds other tenements in the Wiluna region on which it may undertake exploration in the future. The table below lists all of Toro’s tenements in the Wiluna region and DIA registered sites on each tenement.

<table>
<thead>
<tr>
<th>Tenement Details</th>
<th>Sites</th>
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<tr>
<td>L53/150 (water)</td>
<td>2009; 2010; 2149; 19361</td>
</tr>
<tr>
<td>M53/1090 (Wiluna application)</td>
<td>2614; 2701</td>
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<tr>
<td>M53/224 (Centipede)</td>
<td>2435</td>
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<tr>
<td>M53/336 (Norilsk tenement – access road)</td>
<td>No sites</td>
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<td>M53/693 (Norilsk tenement – access road)</td>
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<td>E53/1132</td>
<td>2611; 2614; 2616; 2701</td>
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<td>E53/1287</td>
<td>1462; 2539; 2617; 2717; 2718; 16060; 20786; 20787</td>
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<td>E53/1288</td>
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<td>E53/1296</td>
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<td>M53/113</td>
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<td>M53/121</td>
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<td>M53/122</td>
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<td>M53/147</td>
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<td>M53/253</td>
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<td>M53/45</td>
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<td>M53/49</td>
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<td>M53/796</td>
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<td>M53/798</td>
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<td>M53/910</td>
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<tr>
<td>P53/1369</td>
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<tr>
<td>P53/1370</td>
<td>2614; 2701</td>
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<tr>
<td>P53/1371</td>
<td>2701</td>
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<td>P53/1372</td>
<td>2617</td>
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<td>P53/1373</td>
<td>2436; 2617</td>
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<tr>
<td>P53/1374</td>
<td>2717; 16060</td>
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<tr>
<td>P53/1396</td>
<td>2441; 20786; 20787</td>
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<tr>
<td>P53/1397</td>
<td>20786; 20787</td>
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The following reports contain information about the sites referred to in the table above.

<table>
<thead>
<tr>
<th>DIA REPORT NUMBER</th>
<th>CATALOGUE NUMBER</th>
<th>TITLE</th>
<th>AUTHOR</th>
<th>DATE</th>
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<tbody>
<tr>
<td>17891</td>
<td>HSR GM 1975 LAY</td>
<td>A Report on Field Trip to Area north of Meekatharra, August 1975</td>
<td>R Layton</td>
<td>1975</td>
</tr>
<tr>
<td>17225</td>
<td>HSR G 1979 BIN</td>
<td>A survey for Aboriginal sites near lake Way, Wiluna, Western Australia</td>
<td>P Bindon</td>
<td>1979</td>
</tr>
<tr>
<td>18040</td>
<td>HSR G 1980 KIR</td>
<td>Survey for Aboriginal sites: Lake Way, Wiluna, Western Australia</td>
<td>I Kirby</td>
<td>1980</td>
</tr>
<tr>
<td>18114</td>
<td>HSR G 1984 OCO (OWE)</td>
<td>Report of the survey for Aboriginal sites at the Asarco (Aust.) Pty Ltd gold exploration lease, Wiluna</td>
<td>R O’Connor</td>
<td>1984</td>
</tr>
<tr>
<td>17267</td>
<td>HSR G 1985 OCO</td>
<td>Report on the survey for Aboriginal sites at the Chevron Exploration Corporation Project, Wiluna, WA</td>
<td>R O’Connor</td>
<td>1985</td>
</tr>
<tr>
<td>17077</td>
<td>HSR G 1990 VET</td>
<td>Report of an archaeological survey of Wiluna mine site and Lake Way pipeline, south of Wiluna, Western Australia</td>
<td>P Veth</td>
<td>1990</td>
</tr>
<tr>
<td>21712</td>
<td>HSR G 1992 OCO</td>
<td>Report on a survey for Aboriginal sites at the Honeymoon Well prospect, near Wiluna</td>
<td>R O’Connor</td>
<td>1992</td>
</tr>
<tr>
<td>21041</td>
<td>HSR G 1993 QUA</td>
<td>Report on a preliminary investigation for Aboriginal sites; Uramurrah and Lake Way Project areas, Wiluna</td>
<td>G Quartermaine</td>
<td>1993</td>
</tr>
<tr>
<td>18542</td>
<td>HSR P 1994 GOL</td>
<td>Proposed Ggt Gas Pipeline: route &amp; topographical features open access sites</td>
<td>Goldfield Gas Transmission Pty Ltd</td>
<td>1994</td>
</tr>
<tr>
<td>REPORT TITLE</td>
<td>AUTHOR</td>
<td>COMPANY REQUESTING SURVEY</td>
<td>DATE</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
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<td>------</td>
<td></td>
</tr>
<tr>
<td>Report on a survey for Aboriginal sites at the Scuddles Project, Yalgoo</td>
<td>R O’Connor, G Quartermaine and CC Bodney</td>
<td>Murchison Zinc Company Pty Ltd</td>
<td>May 1988</td>
<td></td>
</tr>
<tr>
<td>An archaeological and ethnographic survey of the Mount McClure lease area</td>
<td>G Wright and B Veitch</td>
<td>Cyprus Minerals Australia</td>
<td>January 1989</td>
<td></td>
</tr>
<tr>
<td>Report of a further archaeological and ethnographic survey at Mount McClure, anomalies 28, 35, 51 and 53, north of Leinster, Western Australia</td>
<td>P Veth, B Veitch, C Stokes and G Wright</td>
<td>Arimco Minerals</td>
<td>May 1990</td>
<td></td>
</tr>
<tr>
<td>Ethnographic and Archaeological Survey of Jundee Prospect, East of Wiluna, Western Australia</td>
<td>P Veth and G Wright</td>
<td>ASARCO (Aust.) Pty Ltd</td>
<td>July 1990</td>
<td></td>
</tr>
<tr>
<td>Report on a survey for Aboriginal sites, Nimary Bore Project, Wiluna</td>
<td>R O’Connor and G Quartermaine</td>
<td>Hunter Resources Limited</td>
<td>November 1990</td>
<td></td>
</tr>
<tr>
<td>Report of an ethnographic survey of Jundee Soak Site, east of Wiluna, Western Australia</td>
<td>K Macintyre and B Dobson</td>
<td>ASARCO (Aust.) Pty Ltd</td>
<td>October 1992</td>
<td></td>
</tr>
</tbody>
</table>

In addition, Toro is aware of the following other survey reports having been prepared in the Wiluna region prior to its acquisition of tenements in the region.
<table>
<thead>
<tr>
<th>Survey Description</th>
<th>Authors</th>
<th>Company</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Report of a survey for Aboriginal sites at the Barwidgee Project</td>
<td>K Macintyre, B Dobson, C J Mattner and G Quartermaine</td>
<td>ASARCO (Aust.) Pty Ltd</td>
<td>March 1993</td>
</tr>
<tr>
<td>Report of an Ethnographic Survey for Aboriginal sites at the Jundee Project, Barwidgee South and Barwidgee North</td>
<td>Macintyre, Dobson and Associates Pty Ltd</td>
<td>Great Central Mines NL</td>
<td>April 1993</td>
</tr>
<tr>
<td>Report on an Archaeological survey for Aboriginal sites, Gossan Hill Project</td>
<td>G Quartermaine</td>
<td>Murchison Zinc Company</td>
<td>June 1993</td>
</tr>
<tr>
<td>Report on a preliminary investigation for Aboriginal sites, Uramurdah and Lake Way project areas, Wiluna</td>
<td>R O’Connor and G Quartermaine</td>
<td>Eagle Mining Corporation NL</td>
<td>December 1993</td>
</tr>
<tr>
<td>Report on an Archaeological survey at the Horse Well Project, north east of Wiluna</td>
<td>Quartermaine Consultants</td>
<td>Eagle Mining Corporation NL</td>
<td>January 1994</td>
</tr>
<tr>
<td>Report of an Ethnographic survey of the Horse Well prospect near Lake Nabberu</td>
<td>R O’Connor</td>
<td>Eagle Mining Corporation NL</td>
<td>March 1994</td>
</tr>
<tr>
<td>Addendum to report on an Archaeological survey for Aboriginal sites, Gossan Hill Project</td>
<td>G Dawkes</td>
<td>Murchison Zinc Company</td>
<td>August 1996</td>
</tr>
<tr>
<td>Report on an Ethnographic and Archaeological survey for Aboriginal sites at the Mandilla Well project area on mining leases ML 37/654 and ML 37/655, Yandal Station, north of Leinster, Western Australia</td>
<td>Macintyre, Dobson and Associates Pty Ltd</td>
<td>Great Central Mines NL</td>
<td>October 1996</td>
</tr>
<tr>
<td>Report of an Ethnographic and Archaeological survey at Mount Joel north of Bronzewing</td>
<td>Macintyre, Dobson and Associates Pty Ltd and J Harris</td>
<td>Great Central Mines NL</td>
<td>April 1997</td>
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<td>Wiluna Gold Mine lateral archaeological survey</td>
<td>D Lantzke</td>
<td>AGL</td>
<td>June 1997</td>
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<td>Report on an Ethnographic survey for Aboriginal heritage at Mount McClure Gold Mine</td>
<td>Dr B Machin</td>
<td>Arminco Mining Pty Ltd</td>
<td>October 1997</td>
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<tr>
<td>Report Title</td>
<td>Author(s)</td>
<td>Main Contractor</td>
<td>Date</td>
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<tr>
<td>An Archaeological survey of exploration and mining leases at the Mount McClure Gold Mine</td>
<td>W G Martinick &amp; Associates Pty Ltd</td>
<td>Arminco Mining Pty Ltd</td>
<td>October 1997</td>
</tr>
<tr>
<td>Aboriginal cultural heritage survey of the Mount McClure Project Area by members of the Ngalia Heritage Research Council and Koara and Harris Native Title claimants</td>
<td>Martinick McNulty Pty Ltd</td>
<td>Arminco Mining Pty Ltd</td>
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<tr>
<td>Summary Report on Native Title and Heritage matters, Mount McClure Gold Mine and surrounding tenements</td>
<td>R Gordine</td>
<td>Arminco Mining Pty Ltd</td>
<td>March 1999</td>
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<td>Report of an Ethnographic survey at the Mount McClure Project Area</td>
<td>Macintyre, Dobson and Associates Pty Ltd</td>
<td>Arminco Mining Pty Ltd</td>
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<td>Aboriginal Heritage survey – Lake Way and Barwidgee areas</td>
<td>R Chown and Dr B Machin</td>
<td>Normandy Yandal Operations Ltd</td>
<td>August 2001</td>
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<td>An Ethnographic survey of Aboriginal heritage sites within Lake Way and Barwidgee Areas (Lake Way North, Little Diorite Well and Shady Well survey areas)</td>
<td>G H Pitt</td>
<td>Normandy Exploration Pty Ltd</td>
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<td>An Ethnographic survey of Aboriginal heritage sites within Lake Way and Barwidgee Areas (Mandilla Well North and East Honeymoon Well survey areas)</td>
<td>G H Pitt</td>
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<td>Preliminary advice on an Aboriginal heritage assessment of the Lake Way Project areas, North Eastern Goldfields, Western Australia</td>
<td>D de Gand</td>
<td>Agincourt Resources Ltd</td>
<td>October 2004</td>
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<tr>
<td>Heritage survey report of Perseverance Galaxy North, Ward Well and Matilda exploration areas and Tenement 53/1003</td>
<td>B Kruse</td>
<td>Agincourt Resources Ltd</td>
<td>October 2004</td>
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<td>Report on Aboriginal heritage assessment of the Lake Way Project areas, North Eastern Goldfields, Western Australia</td>
<td>D de Gand</td>
<td>Agincourt Resources Ltd</td>
<td>March 2005</td>
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</tbody>
</table>
Based on its review of available heritage information, immediately following its initial acquisition in 2007 of tenements in the Wiluna region, Toro initiated its own consultation with Aboriginal people who may hold relevant cultural knowledge. This included contact with CDNTS as the representative body for the region pursuant to the *Native Title Act 1993*. The following table provides a summary of heritage surveys undertaken in the Project Area since 2007.

<table>
<thead>
<tr>
<th>Date of Survey</th>
<th>Purpose</th>
<th>Number of Traditional Owner informants</th>
<th>Date and title of survey report (Consultant anthropologist)</th>
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<td>1 and 2 November 2009</td>
<td>Work Programme Survey for groundwater exploration on tenement L53/150; further exploration of the Centipede deposit (E53/1168; E53/1132; E53/1288; P53/1350; P53/1370; P53/1369; M53/121; M53/49; M53/45)</td>
<td>7</td>
<td>Heritage Survey Report – Work Program Survey for Toro Energy Ltd – L53/150 Water Licence, Centipede Deposit, Lake Way Deposit – November 2009 (David Raftery)</td>
</tr>
</tbody>
</table>
Toro Energy Limited – Wiluna Uranium Project

Toro Energy Limited – Wiluna Uranium Project

ABORIGINAL CULTURAL HERITAGE MANAGEMENT PLAN

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| 22 and 23 April 2010 | Work Program Survey to clear areas for Core Farm facility on tenement M53/113; a meteorological station on M53/224; 20 soil test pits on P53/1355; P53/1356; P53/1357; P53/1396; E53/1132; M53/113; M53/224; L53/150 | 7 | Heritage Survey Report – Work Program Survey for Toro Energy Ltd, P53/1355; P53/1356; P53/1357; P53/1396; E53/1132; M53/113; M53/224; L53/150, conducted between the 22nd April 2010 and the 23 April 2010 – May 2010 (Jeremy Maling) |

Toro has also undertaken ‘bush tucker’ surveys with Traditional Owners to assess existing traditional uses of the Project Area’s fauna and flora and how they may be affected by the Project. Toro will continue to discuss with the Traditional Owners management strategies to minimize any impacts on uses of the Project Area for cultural purposes.

In April 2010, Toro and CDNTS, authorised by the Wiluna and Tarlpa native title claimant groups, executed an Exploration and Feasibility Agreement. The purpose of the Agreement was to establish procedures under which heritage survey and recording work would be undertaken in the Project area during the exploration and feasibility phases. The agreed procedures include the provision of information, the conduct, funding and reporting of surveys and continuing consultation.

In September 2010, Toro and CDNTS executed a Memorandum of Understanding (MOU) to establish a Cultural Heritage Management Plan.

Under the MOU, Toro agreed to –

- Fund the Cultural Heritage Management Plan including the development of a comprehensive cultural heritage map of the Project area through further ethnographic and archaeological surveys.

The MOU provides that –

- The Cultural Heritage Management Plan shall be developed following extensive consultations by Central Desert with the Tarlpa and Wiluna claimants and will involve the development of a comprehensive cultural heritage map of the proposed Wiluna Uranium Project Area and areas that may be culturally affected by the Wiluna Uranium Project, including the roll out of comprehensive ethnographic and archaeological surveys;
- The consultation and survey process for cultural mapping is a confidential and internal process between the Tarlpa and Wiluna Claimants and Central Desert and all information and data collected remains in the ownership and control of the Tarlpa and Wiluna claimants;
- Processes and principles underlying the development and implementation of the CHMP shall be undertaken in accordance with the Scoping Document attached as Annexure 3; and
- The HMP shall be available for use by Toro for the planning and implementation of the Wiluna Uranium Project to ensure that any requirements or recommendations of the CHMP are complied with.

Annexure 3 to the MOU provides as follows –

The Heritage Management Plan will be developed through a two-stage process as detailed below –

1. Cultural Mapping Consultation
As part of the Cultural Mapping Consultation, comprehensive ethnographic and archaeological surveys shall be conducted by the Tarlpa and Wiluna Claimants over the area of the proposed Wiluna Uranium Project and areas that may be culturally affected by the proposed Wiluna Project.

These ethnographic and archaeological surveys shall be conducted on the assumption that ‘maximum impact’ exploration and mining will occur within the outline area of the Wiluna Uranium Project. An assessment of maximum impact exploration and mining takes into account all potential mining operations including all infrastructure requirements associated with mining operations.

In order to assist the Native Title Party in understanding what ‘maximum impact’ exploration may entail, Toro Energy shall provide to Central Desert a ‘Program of Works’ providing a detailed description of the proposed exploration, mining and associated infrastructure that may be required in relation to the Wiluna Uranium Project. A comprehensive Program of Works package is fundamental in ensuring that Central Desert and their Consultants are able to obtain informed advice and instructions from the Tarlpa and Wiluna Claimants during the Cultural Mapping Consultation process.

Central Desert shall engage anthropological and archaeological consultants to undertake the ethnographic and archaeological surveys. Each consultant shall be briefed by Central Desert and will in turn relay specific information to the survey team in order to ensure that the Tarlpa and Wiluna Claimants have a clear understanding of Toro Energy’s proposed activities at the Wiluna Uranium Project.

The Program of Works shall include:
- Topographic maps/satellite imagery on a 1:100,000 scale showing an outline of the proposed Wiluna Uranium Project area;
- Details of the proposed exploration, mining and infrastructure requirements within the proposed Wiluna Project area in digital format, preferably in shapefile format (.shp) including a note of the relevant projection and datum;
- If relevant, the vertices of the proposed Wiluna Uranium Project in x and y coordinates, including a note of the relevant projection and datum, preferably in GDA94;
- A detailed description of the nature of the proposed exploration, mining and infrastructure, including but not limited to the proposed processing techniques, types of equipment, infrastructure and vehicles to be used;
- A detailed description of the nature of rehabilitation practices during the process of mining and after the life of the proposed Wiluna Uranium Project;
- Any proposed usage of existing aquifers or water basins within and around the Wiluna Uranium Project Area;
- Photographs or diagrams to illustrate the above listed matters;
- An estimate of the timeframe of the existence of the proposed Wiluna Uranium Project mine; and
- If Toro Energy are able, an audiovisual presentation that may assist the Tarlpa and Wiluna Claimants in further understanding any of the above matters that can be viewed by the survey teams prior to commencing the Ethnographic and Archaeological surveys.

The ethnographic and archaeological surveys shall be conducted in two stages. The methodology utilised in each of the surveys will identify in detail all cultural information in relation to the proposed Wiluna Uranium Project. Confidentiality and Intellectual Property of all information and data collected during the cultural mapping consultation will remain with the Tarlpa and Wiluna Claimants.
a) Ethnographic Surveys
Ethnographic surveys shall comprise a male and female anthropologist, Central Desert’s Liaison Officer and the survey team. The survey team will comprise eight to 10 Tarlpa and Wiluna Claimants with a combination of men and women as required.
Prior to the commencement of the Ethnographic surveys, the anthropologists will undertake desktop research to elicit any information relating to previous heritage surveys, site or ethnographic recordings and other relevant historical material relating to the survey area. This desktop information will be considered by Central Desert in the development of the cultural map of the proposed Wiluna Uranium Project.

Central Desert estimates that three weeks will be required for the conduct of the Ethnographic Survey. This will include the initial desktop research, an on-site ethnographic survey or the proposed Wiluna Project Area and any additional post-survey consultation or discussion with the Consultant/s and Tarlpa and Wiluna Claimants.

b) Archaeological Surveys
The archaeological surveys will comprise one or two archaeologists, Central Desert’s Liaison Officer and the survey team. The survey team will comprise both men and women.
Prior to the commencement of the archaeological surveys, the archaeologist/s will undertake desktop research relating to site recordings and other relevant historical records relating to the survey area. This desktop information will be considered by Central Desert in the development of the cultural map of the proposed Wiluna Uranium Project.

Central Desert estimate that the rollout of the archaeological surveys will take up to six months, depending on the ultimate footprint of the Wiluna Uranium Project area. This timeframe takes into account the intensity of the methodology required for the archaeological surveys, the need to rotate survey teams over this period as well as occupational health and safety requirements for the archaeologists in conducting this type of field work.

2. Development and Finalisation of Heritage Management Plan
Following completion of the above cultural mapping consultation, the Native Title Party will, in consultation with Toro Energy, develop a Heritage Management Plan in relation to the proposed Wiluna Uranium Project.

The finalised Heritage Management Plan will be dependent on the results of the cultural mapping consultation, and will be subject to instructions from the Native Title Party but may include some of the following:

2.1 Detailed management strategies for protecting Aboriginal Objects or Areas of Cultural significance, including any required gender restrictions
2.2 Processes for dealing with the interaction of Aboriginal Objects or Areas of Cultural Significance and proposed mine activities
2.3 Processes for culturally appropriate consultations between Toro Energy and the Native Title Parties
2.4 Procedures for monitoring or inspection of Aboriginal Objects or Areas of Cultural Significance’ (Memorandum of Understanding between Toro Energy Limited and Central Desert Native Title Services for the establishment of a Heritage Management Plan and Radiation Education Program – executed on 24 September 2010)

Following provision of the Program of Works and mapping and other information referred to above, the on-site ethnographic survey was conducted between 12 and 18 October 2010. The outcomes were discussed at a meeting of the Wiluna and Tarlpa Claimants at Wiluna on 8-9 December 2010. As a result, CDNTS at a meeting with Toro on 23 December 2010,
provided Toro with a map depicting the results of historic and contemporary ethnographic research. The map includes areas and locations of cultural significance to the Wiluna and Tarlpa Claimants and DIA registered sites under the AHA. Toro is using this map to assist in further consideration of a Project configuration. The archaeological component of the Plan will be undertaken during 2011. Toro will review this Draft CHMP after completion of the cultural mapping and advice from CDNTS about its outcomes.
10 Cultural Heritage Management Commitments

The MOU referred to in Section 9 commits Toro to the preparation and implementation of a final Cultural Heritage Management Plan for the Project Area which would ensure the management and protection of Aboriginal cultural heritage in a manner which respects the wishes of the Aboriginal people. The objectives of the Cultural Heritage Management Plan would be achieved through ensuring continuous consultation with Aboriginal people during Project planning, construction, execution, closure and rehabilitation and in relation to any other activities Toro may undertake in the Wiluna region.

The Cultural Heritage Management Plan would seek to ensure that Toro’s activities are undertaken in full compliance with all applicable laws and regulations relating to Aboriginal cultural heritage.

The MOU records that if Toro is able to satisfy the Wiluna and Tarlpa Claimants concerns in relation to the protection of heritage and management of radiation, they would enter into further discussions with Toro about the progression of a Mine Agreement.

Following a meeting of the claimants on 6 October 2010, CDNTS provided Toro with a list of questions about radiation and other potential impacts of the Project. Toro provided a comprehensive written response to CDNTS on 27 November 2010.

Toro remains in discussion with CDNTS about the negotiation of a comprehensive mining agreement which would provide for the management of all cultural heritage issues arising during the construction and operation of the Project, including site monitoring, protection and where necessary, mitigation and salvage work. Toro would also propose that the agreement establish procedures for on-going consultation between the parties during the life of the Project, including in relation to its closure and rehabilitation, the provision of cross cultural awareness training to the construction and operational workforces and action to be taken in the event of the unanticipated discovery of cultural material remains. In its closure and rehabilitation planning, Toro would seek to ensure, in consultation with Traditional Owners, that the area remained an aboriginal cultural resource.

10.1 On-going Protection of Cultural Heritage Sites

Toro would appoint a Community Relations Manager prior to commencement of construction of the Project. The Manager would be responsible for all day to day consultation with Traditional Owners and also would ensure the continuing implementation of the Cultural Heritage Management Plan during Project construction, execution, closure and rehabilitation including that –

- All Toro employees and contractors are aware of their obligations not to interfere with items of Aboriginal Cultural Heritage
- All cultural heritage sites in the Project Area are appropriately identified to employees and contractors who may be working in the vicinity of them
- No ground disturbance work is undertaken before a site permit is signed confirming that no items of Aboriginal Cultural Heritage will be affected
- Traditional Owners will have the opportunity to regularly monitor Toro’s compliance with the CHMP
10.2 Cross Cultural Awareness

Toro would provide cross cultural awareness training to all its employees, contractors, subcontractors and consultants engaged on the Project. Toro has already conducted a cross cultural awareness programme for its Project team delivered by Kepa Kurl Pty Ltd.

The training emphasises respect for Aboriginal cultural heritage and the need to ensure heritage sites and places are protected. Through the training, all Project personnel would be:

- Aware of Aboriginal traditions and culture and the behaviours needed to respect such traditions and culture
- Able to develop relationships between Aboriginal and non-Aboriginal people based on mutual respect and trust
- Informed about the CHMP and their responsibility to comply with all of its requirements

10.3 Unanticipated discovery of cultural material remains

It is possible that during the construction and operational phases of the Project, cultural material remains may be discovered. Should this happen, the Cultural Heritage Management Plan would require an immediate cessation of work that could impact on the materials while further investigations are undertaken.

10.4 Managing impacts on cultural heritage

To the extent possible, Toro would seek to ensure its activities avoid any impact on Aboriginal cultural heritage. Where that is not possible, it would seek to minimise any impact through the Project’s configuration and operation and in particular, to locate Project infrastructure so that cultural heritage is avoided by any direct or indirect activity. Project planning is not sufficiently advanced at this stage to identify whether it will be necessary to make any sites the subject of a notice under Section 18 of the AHA, but if this does became necessary Toro would:

- Avoid as much of the Aboriginal cultural heritage as possible
- Ensure all consents and approvals are sought in consultation with Traditional Owners and complied with
- Where requested to do so, implement site salvaging work and any other reasonable mitigation measures in consultation with Traditional Owners, including in relation to the custody and management of any cultural material salvaged and removed.

It is estimated that between 2007 and the present, Toro has invested $520,000 in Cultural Heritage Management including heritage surveys, cultural mapping and consultation with Traditional Owners. Further cultural mapping and the negotiation of a mining agreement with a focus on cultural heritage protection and management is estimated to cost an additional $500,000 prior to Project execution.

During Project execution, work focused on heritage protection and management is estimated to cost an annual $250,000.
11 Permits/Protocols and Key Considerations

The Project has an existing internal permit for ground disturbance work that would be enhanced as work progressed to the construction and operational phases to ensure –

- The Community Relations Manager is a signatory to the provisions of the permit relating to ground disturbance to ensure that all laws, regulations and commitments in relation to cultural heritage are complied with
- All site protection measures such as avoidance and fencing are maintained

Through the proposed Mining Agreement to be negotiated with Traditional Owners, Toro would propose provisions including –

- Regular consultation between Toro and Traditional Owners on Project issues of interest or concern, including advice on Project schedule and major milestones and mechanisms to ensure timely and full information is provided
- Timely notification to Traditional Owners of any incident in the Project Area that may have an impact on public health and safety
- Timely notification to Traditional Owners, and to the DIA, of any unanticipated discovery of cultural material
- The opportunity for Traditional Owners to be involved in the monitoring of Project impacts and to audit them against predicted outcomes, including those relating to cultural heritage
- Regular review of the Cultural Heritage Management Plan, including procedures to deal with any breach of its terms
- A disputes resolution mechanism
- Arrangements for Traditional Owners to maintain access to heritage sites in the Project Area during and after Project execution, closure and rehabilitation
- Arrangements for managing information that may be deemed confidential by the Traditional Owners, Toro, or both parties
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Anthropos Australis (1994) The Report of an Aboriginal Heritage Survey of the Southern Section (Wiluna to Kambalda) Goldfields Transmission Pipeline Route and Corridor, Western Australia, Volumes 1 and 2


Goode, B., (2003) A site avoidance field survey report of the proposed Leinster to Wiluna optic fibre route, Gascoyne District, WA


Parker, R., (2003) Aboriginal Heritage Survey of a proposed optic fibre cable route from Wiluna to Leinster

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TRANSPORT MANAGEMENT PLAN

Uranium Oxide Concentrate (UOC)
**Document Information**

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<th>Description</th>
<th>Issue Date</th>
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**Revision History**

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<td>B</td>
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<td>28 Apr 11</td>
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<td>C</td>
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<td>3 Jun 11</td>
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1  Purpose and context

1.1  Guidance note in relation to this plan
This Transport Management Plan (TMP) has been prepared as a preliminary draft that will be progressively developed and finalised for assessment by relevant government regulators for the transport of Uranium Oxide Concentrate (UOC) from the Wiluna Uranium Project in Western Australia.

1.2  The Wiluna Uranium Project
Toro Energy Limited (Toro) proposes to develop the Project located near Wiluna, Western Australia. The Project would involve mining and processing of up to about 2 million tonnes of mineralised ore per year over an anticipated mine life of up to 14 years, producing the equivalent of about 1200 tonnes per annum of UOC.

The Project is located approximately 520km north of Kalgoorlie via the sealed Goldfields Highway between Kalgoorlie and Wiluna.

1.3  Purpose
The purpose of the TMP is to document the framework that Toro plans to adopt for the safe transport of UOC in 20ft General Purpose (GP) containers from the Project to an Australian port for export shipment.

The TMP applies consistent systems and procedures for product transportation from the Project. In doing so, it establishes the framework for the operational requirements of the TMP, taking into account transport safety requirements set by both Toro and regulatory authorities.

1.4  Objective
The TMP sets out arrangements to ensure the safety of the;
- community,
- environment,
- infrastructure and property during the transport process.

This objective is achieved by:
- Correctly packed drums, secured in 20 ft GP containers,
- Use of routes approved by the Australian Safeguards and Non-Proliferation Office (ASNO) between the Project site and nominated Australian export port(s) of Port Adelaide, South Australia and East Arm, Darwin,
- Toro management systems and controls for the transport activities.

1.5  Volumes
The planned production for the Project is about 1200 tonnes per annum of UOC. Based on approximately 19 tonnes of product per 20ft GP container with container weights being additional, on average, this volume of UOC equates to 5 x 20ft GP containers per month using double trailer (38 tonnes of UOC per truck) and single trailer road trains (19 tonnes of UOC). Subject to customer requirements, production and grade mix, the actual volumes of UOC being transported would vary on a month to month basis.
2 Scope

2.1 Scope of the TMP
The TMP applies to uranium peroxide concentrate in the form of UO$_4$H$_2$O$_2$ (hereafter UOC) packed in 205 litre drums in 20 ft GP containers at the Project site in ASNO approved storage areas for transport, either by road or rail to the nominated port(s) for export from Australia.

The scope of this TMP covers the transport of UOC consignments originating at the Project for:
- Road transport to Port Adelaide in South Australia (SA)
- Rail transport from Adelaide, SA to the East Arm facilities at the Port of Darwin, Northern Territory (NT).
- Sea freight from either Port Adelaide or Port of Darwin to International customer(s)$^1$.

UOC is classified as a dangerous good and would be transported as UN2912, Class 7 – Radioactive Substances, LSA-1. The requirements for the transport of UOC consignments are established by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) in the Code of Practice for the Safe Transport of Radioactive Material, latest edition 2008 (The Code).

2.2 Abbreviations & Definitions
The definitions and abbreviations listed below in Table 2-1 Abbreviations and Definitions are used throughout this document.

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>20 ft GP</td>
<td>20ft General Purpose container with minimum external dimensions 6.1m(l) x 2.4m(w) x 2.4m (h)</td>
</tr>
<tr>
<td>ADGC</td>
<td>Australian Dangerous Goods Code</td>
</tr>
</tbody>
</table>
| ALARA   | The As Low As Reasonably Achievable (ALARA) principle is defined as$^2$:
  the source related process to keep the likelihood of incurring exposures (where these are not certain to be received), the number of people exposed, and the magnitude of individual doses as low as reasonably achievable, taking economic and societal factors into account |
| AMSA    | Australian Maritime Safety Authority is the Australian Competent Authority responsible for all safety aspects associated with the carriage of radioactive substances on land and at sea |
| ASNO    | Australian Safeguards and Non-Proliferation Office                          |
| ARPANSA | Australian Radiation Protection and Nuclear Safety Agency                    |

$^1$ The sea freight component is not included in this draft TMP; it will be completed prior to seeking formal approvals to transport UOC from the Australian Government.

<table>
<thead>
<tr>
<th><strong>ARTC</strong></th>
<th>Australian Rail Track Corporation</th>
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<td><strong>CCTV</strong></td>
<td>Closed circuit television</td>
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<tr>
<td>Competent Authority</td>
<td>Regulatory authority which administers the various statutory regulations covering transport of radioactive materials and controls emergency action in the event of an incident</td>
</tr>
<tr>
<td><strong>C-TPAT</strong></td>
<td>Customs-Trade Partnership Against Terrorism</td>
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<tr>
<td><strong>IAEA</strong></td>
<td>International Atomic Energy Agency</td>
</tr>
<tr>
<td><strong>LEMC</strong></td>
<td>Local Emergency Management Committee</td>
</tr>
<tr>
<td><strong>LSA</strong></td>
<td>Low specific activity material is radioactive material, which by its nature has a limited specific activity, or radioactive material for which limits of estimated average specific activity apply. External shielding materials surrounding the LSA material must not be considered in determining the estimated average specific activity</td>
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<tr>
<td><strong>NT</strong></td>
<td>Northern Territory</td>
</tr>
<tr>
<td><strong>UN</strong></td>
<td>United Nations</td>
</tr>
<tr>
<td><strong>UOC</strong></td>
<td>Uranium oxide concentrate</td>
</tr>
<tr>
<td><strong>Radioactive material</strong></td>
<td>In this document, any material such as UOC, product and exploration samples with greater than 1 Becquerel/gram (bq/g) (approx 80 ppm uranium) is considered a radioactive material.</td>
</tr>
<tr>
<td><strong>SA</strong></td>
<td>South Australia</td>
</tr>
<tr>
<td><strong>SDS</strong></td>
<td>Safety Data Sheet (previously referred to as Material Safety Data Sheet)</td>
</tr>
<tr>
<td>The Code</td>
<td><em>Code of Practice for the Safe Transport of Radioactive Material, 2008, Radiation Protection Series No. 21, ARPANSA, Canberra</em></td>
</tr>
<tr>
<td>The Project</td>
<td>Wiluna Uranium Project</td>
</tr>
<tr>
<td><strong>TMP</strong></td>
<td>Transport Management Plan</td>
</tr>
<tr>
<td><strong>Toro</strong></td>
<td>Toro Energy Limited</td>
</tr>
<tr>
<td><strong>Transport Index</strong></td>
<td>The maximum radiation level at 1m from any external surface of the package (uSv/h divided by 10) and rounded up to the first decimal place to determine the transport index</td>
</tr>
<tr>
<td><strong>TSP</strong></td>
<td>Transport Service Provider</td>
</tr>
</tbody>
</table>
| **Vehicle**    | As defined in paragraph 247 (page 15) of the *Code of Practice for Safe Transport of Radioactive Materials:*  
… shall mean a road vehicle (including an articulated vehicle, i.e. a tractor and semi- trailer combination) or railroad car or railway wagon. Each trailer shall be considered as a separate vehicle.  |
| **WA**         | Western Australia                  |
3 Legislation: Transport of Radioactive Material

3.1 Introduction

As a signatory to the commitments contained in the Nuclear Non Proliferation Treaty administered by the International Atomic Energy Agency (IAEA), the Australian Government has maintained a comprehensive uranium export policy for over 30 years. As part of this policy, the sale of Australian uranium is only approved for peaceful purposes.

This section provides an overview of how UOC exports are managed under Australian law and international regulatory regimes.

The section finishes with a summary of the permits required by each of the entities involved in transporting UOC.

3.2 Regulatory Requirements

The following provides a preliminary list of referenced legislation and regulations across Australian, State and Territory governments. The list would be expanded and completed with internal Toro management system documentation to support the approval process prior to the commencement of UOC consignments.

The TMP adopts the position that the latest edition of any Australian, State and Territory Act or Regulation would apply to all radioactive materials at the time of transport. In the case of any international regulatory regimes, such as those produced by the IAEA, the latest edition of those documents would apply to this TMP even if it may not have been adopted in Australian law by relevant jurisdictions at the time of shipment.

3.2.1 Commonwealth of Australia

- Australian Radiation Protection and Nuclear Safety Act (1998)
- Nuclear Non-Proliferation (Safeguards) Act 1987
- Customs Act 1901
- Customs (Prohibited Exports) Regulations 1958
- Code of Practice for the Safe Transport of Radioactive Materials 2008
- ARPANSA, Code of Practice for the Safe Transport of Radioactive Material 2008
- ARPANSA, Code of Practice, Security of Radioactive Sources, Radiation Protection Series 11
- Australian Standard AS 3846-1998 The handling and transport of dangerous cargoes in port areas.

3 Referred to as the ‘Transport Code’ under the South Australian Radiation Protection and Control Act Regulations
3.2.2 Western Australia
The following regulatory instruments cover road transport from the Project site to the WA/SA border:

3.2.3 South Australia
The following regulatory instruments cover road transport from the WA/SA border to Port Adelaide, and/or rail movement from Adelaide to the NT/SA border:
- Rail Safety (General) Regulations.

3.2.4 Northern Territory
The following regulatory instruments are relevant to the rail transport route from the SA/NT border to the Port of Darwin, East Arm wharf:
- Radioactive Ores and Concentrates (Packaging and Transport) Regulations.
- Darwin Port Corporation Act.
- Darwin Port (Handling and Transport of Dangerous Cargoes) By-laws.

3.2.5 Permits
In relation to this TMP, under the Nuclear Non-Proliferation (Safeguards) Act 1987, ASNO would issue permits to the various parties involved in the movement of UOC to either Possess Nuclear Material (PN) or Transport Nuclear Material (TN) to approved parties. As well as ASNO permits, Western Australia and the Northern Territory require additional licences to be held for the transport of UOC in their respective jurisdictions.

Table 3-1 provides a summary of the permits and licences required to transport UOC. All permits and approvals must be in place before any movement of UOC material from the Project could occur.
Table 3-1 Permits for the transport of UOC in Australia

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Permit/Licence</th>
<th>Description</th>
<th>Permit holder</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASNO</td>
<td>Permit to Possess Nuclear Material (PN)</td>
<td>Mine, produce, store and handle nuclear material</td>
<td>• Toro</td>
</tr>
<tr>
<td>ASNO</td>
<td>Permit to Transport Nuclear Material (TN)</td>
<td>Transport nuclear material along approved routes including physical protection</td>
<td>Transport service provider such as:</td>
</tr>
<tr>
<td>ASNO</td>
<td>Permit to Possess Nuclear Material (PN)</td>
<td>Transit storage and handling nuclear material</td>
<td>Transport service provider such as:</td>
</tr>
<tr>
<td>ASO 112 –</td>
<td>Application to create a new approved location</td>
<td>Storage location approvals on an ongoing basis</td>
<td>Toro</td>
</tr>
<tr>
<td>ASO 113 –</td>
<td>Application to approve a new (or variation to a current) transport plan</td>
<td>Road and rail transport route approvals to permit holders to allow shipments to occur on an ongoing basis</td>
<td>Transport service provider such as:</td>
</tr>
<tr>
<td>Western Australia</td>
<td>Licence in respect of radioactive substances</td>
<td>Comply with the requirements as set out in the issued licence</td>
<td>Nominated individual(s) within the appointed transport service provider</td>
</tr>
<tr>
<td>South Australia</td>
<td>Transport Management plan</td>
<td>SA Cabinet approved transport plan for UOC consignments</td>
<td>• Toro</td>
</tr>
<tr>
<td>Northern Territory</td>
<td>Licence to transport radioactive material</td>
<td>Comply with the requirements as set out in the issued licence</td>
<td>Transport service provider such as:</td>
</tr>
</tbody>
</table>

Transport service provider such as:
- Toro
- Road operator
- Rail operator
Toro would secure all relevant licences and permits covering land and sea freight to nominated customer(s) destinations as these become known.
4 Relationship and responsibilities of Parties

4.1 Introduction
This section sets out the relationships, roles and responsibilities that would be either directly or indirectly involved in transportation of product from the Project to the ports of Adelaide and Darwin.

4.2 Roles and responsibilities

4.2.1 The Wiluna Uranium Project
The Project would be responsible for:

- The implementation and maintenance of this TMP;
- All aspects associated with the approvals for and management of the TMP;
- Compliance with all aspects associated with the transport of UOC from the Project to the ASNO approved facilities in either Adelaide or the Port of Darwin, along an approved transport route as set out in relevant permits;
- Having an appropriate Emergency Response Plan and emergency response procedures in place to respond to any incident during the transport process and testing of such procedures on a regular basis;
- Selecting, appointing and managing contractors, at its discretion, for part or all of the operations described in this TMP;
- Maintaining relationships with Australian, State and Territory government agencies and authorities associated with the road or rail transport of UOC consignments; and
- Providing a briefing to Emergency Services organisations prior to the transport of UOC, on the transport and emergency response arrangements with respect to UOC consignments.

4.2.2 Transport freight service provider(s)
The transport freight service provider (TSP) contracted directly to Toro, would have the responsibility to:

- Provide all services associated with the transportation of UOC by road and/or rail, including maintaining all road equipment (prime movers and trailers) to manufacturers' specifications agreed during the TSP selection process;
- Secure and maintain all necessary permits and approvals from Australian, State and Territory regulators to carry UOC;
- Implement a training program for all staff and contractors(s) that provides formal training on the properties and correct handling of UOC consignments and details the appropriate incident response procedures;
- Implement appropriate Emergency Response procedures in the event of an incident involving a UOC consignment whilst under its control;
- Comply with the procedures described in this TMP and any other Australian, State or Territory government code(s) or regulation(s) including OHS, Fatigue Management and Chain of Responsibility laws;
• Comply with all Australian, State and Territory road and rail regulations, procedures and codes of practice applicable at the time to the task of transporting UOC; and

• Provide appropriate documentation and an emergency response folder in an identifiable location within the cabin of each road truck or locomotive.

4.2.3 Australian, State and Territory governments
Australian, State and Territory government regulators have the responsibility to:

• Administer appropriate legislation and regulations that contain provisions, both directly and indirectly to prevent accidents and reduce risks in storing, handling and transporting UOC;

• Issue valid permits, approvals and conditions to transport and store radioactive materials that are consistent with their respective legislative and regulatory obligations;

• Maintain adequate emergency services incident management capabilities and resources to respond to and protect public health and safety in the event of an incident involving the transport of radioactive materials;

• Monitor and determine that clean-ups have been completed to adequate environmental standards in the event of any incident; and

• Ensure community awareness of emergency response plans and capabilities in the event of an incident involving UOC.

4.3 Cross reference of roles and responsibilities within the TMP
A summary of the key roles and responsibilities as presented within this TMP is summarised in Table 4-1 Cross reference of roles and responsibilities.

Table 4-1 Cross reference of roles and responsibilities

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Task</th>
<th>Relevant section</th>
<th>Responsible party</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approved routes</td>
<td>Nomination of transport routes from the Project site to nominated export port(s)</td>
<td>6.4.1</td>
<td>• ASNO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Toro</td>
</tr>
<tr>
<td>Incident management</td>
<td>Development of an emergency response plan</td>
<td>7.1 – 7.5</td>
<td>• Australian State and Territory governments</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Toro</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Transport service provider</td>
</tr>
<tr>
<td>Incident response kit</td>
<td>Kit(s) to accompany each transport movement including the maintenance of items in the kit</td>
<td>6.3.4</td>
<td>• Transport service provider</td>
</tr>
<tr>
<td>Issuing of permits and licences for</td>
<td>Secure and maintain appropriate permits and licences to possess,</td>
<td>3.3, 4.2.3</td>
<td>• Australian State and Territory</td>
</tr>
<tr>
<td>Category</td>
<td>Description</td>
<td>Page Range</td>
<td>Responsible Parties</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Transport of UOC</td>
<td>Transport and handle UOC</td>
<td></td>
<td>Toro, Transport service provider</td>
</tr>
<tr>
<td>Management systems</td>
<td>Review, update and overall management of TMP</td>
<td>8.2 - 8.4, 8.7 - 8.9</td>
<td>Toro</td>
</tr>
<tr>
<td>Monitoring systems</td>
<td>Collection and reporting of monitoring programs associated with UOC transport</td>
<td>8.6</td>
<td>Toro</td>
</tr>
<tr>
<td>On route activities</td>
<td>Management, monitoring and reporting covering route communications, storage access and security</td>
<td>6.4.2 – 6.4.3</td>
<td>Toro, Transport service provider</td>
</tr>
<tr>
<td>Packaging, marking and labelling</td>
<td>Application of appropriate packaging, labels and placarding for transporting • drums and 20 ft GP containers</td>
<td>6.2, 6.3.1</td>
<td>Toro, Transport service provider</td>
</tr>
<tr>
<td>Security</td>
<td>Development and implementation of security measures for transport of UOC</td>
<td>6.4, 8.3</td>
<td>Toro, Transport service provider</td>
</tr>
<tr>
<td>Separation and segregation</td>
<td>Maintain appropriate separation and segregation distances to other dangerous and hazardous materials</td>
<td>5.6</td>
<td>Transport service provider</td>
</tr>
<tr>
<td>Surface contamination</td>
<td>Compliance with Code of Practice for drum and 20 ft GP container for non-fixed surface contamination</td>
<td>6.3.3</td>
<td>Toro</td>
</tr>
<tr>
<td>Training</td>
<td>Coordination of a training program and matrix</td>
<td>8.5</td>
<td>Toro, Emergency Services, Transport Service Provider</td>
</tr>
</tbody>
</table>
5 Basis of the Transport Methodology

5.1 Code of Practice for Safe Transport of Radioactive Material

The ARPANSA ‘Code of Practice for Safe Transport of Radioactive Material’ Edition 2008 (The Code) provides the guidelines and various requirements for the transportation of all radioactive substances including UOC. These guidelines are incorporated in Australian, State and Territory laws and regulations as set out in Section 3 – Legislation: Transport of Radioactive Material.

Toro would transport UOC from the Project on public roads and rail systems based on the methodology outlined in this section of the TMP.

5.2 Community engagement

UOC is one of many hazardous materials regularly transported around Australia. It is a hazard if ingested or inhaled in large quantities over extended periods of time.

Toro maintains an open dialogue with all communities and stakeholders along the proposed transport routes to increase the understanding and awareness of the systems and procedures adopted by Toro. These systems and procedures have been developed to protect the community, employees and contractors for both routine operations, and in the event of an incident, to minimise the risk of radiation exposure and provide protection during the transport of UOC.

5.3 The ALARA principle

The Code incorporates the as low as reasonably achievable (ALARA) principle. ALARA focuses on protecting communities and the environment by reducing any exposure to radiation associated with the transport of UOC consignments from the Project site.

Across the transport solution, ALARA is achieved by maintaining public radiation exposure levels well below the annual public dose limits set by Australian legislation of 1 millisievert (mSv) per year.

The four main means to minimise radiation exposure have been incorporated into the transport solution for the movement of UOC. They are:

- Shielding – use of 205 litre drums and 20ft GP containers to block or reduce radiation;
- Time – limiting the time UOC consignments are being transported between approved facilities;
- Distance – maintaining safe distances between workers or communities along the approved transport routes; and
- Amount – monthly transport movements coordinated with the quantity of UOC material being held in storage.

These four means have been incorporated into proposed arrangements for the transport of UOC from the Project.
5.4 Uranium Oxide Concentrate (UOC)
The UOC transported would be a yellow (ref. Photo 5-1 Uranium Oxide Concentrate), solid material classified as follows:

- **United Nations (UN) Number**: 2912
- **Class**: 7 (Radioactive Material)
- **Correct Shipping Name**: Radioactive Material Low Specific Activity (LSA-I), non fissile or fissile-excepted
- **Packaging Group**: Industrial Packaging (IP) – I

Photo 5-1 Uranium Oxide Concentrate

5.5 Road Vehicle Combinations
The movement of UOC consignments from the Project site would be undertaken using either a double trailer or single trailer road train configuration that has the capacity to carry 2 x 20ft GPs or 1 x 20ft GP loaded with UOC for road transport to Adelaide, South Australia.

In line with the objective of the TMP (see Section 1.3), for each movement of UOC from the Project, the following requirements would be met:

- A minimum of two trucks would travel together at all times along the approved transport route (see Section 6.4);
- Each truck would have two drivers sharing the driving responsibilities so as to avoid extended breaks during the journey; and
- Security and communication protocols would apply throughout the journey (see Sections 6.4.2 and 8.3).

5.6 Separation distances
Consistent with the Australian Dangerous Goods Code (ADGC) requirements, separation distances between UOC containers and other dangerous goods or certain types of rolling stock must comply with the following requirements as outlined in Table 5-1 Minimum transport separation distances and Table 5-2, Minimum rail separation distances.
### Table 5-1 Minimum transport separation distances

<table>
<thead>
<tr>
<th>Class</th>
<th>Dangerous good</th>
<th>Minimum distance (metres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Explosives</td>
<td>24</td>
</tr>
<tr>
<td>2</td>
<td>Gases</td>
<td>24</td>
</tr>
<tr>
<td>3</td>
<td>Flammable liquids</td>
<td>12</td>
</tr>
<tr>
<td>4</td>
<td>Flammable solids</td>
<td>12</td>
</tr>
<tr>
<td>5</td>
<td>Oxidizing and organic substances</td>
<td>12</td>
</tr>
<tr>
<td>6</td>
<td>Toxic poisonous and infectious substances</td>
<td>12</td>
</tr>
<tr>
<td>8</td>
<td>Corrosive substances</td>
<td>12</td>
</tr>
<tr>
<td>9</td>
<td>Miscellaneous dangerous substances</td>
<td>12</td>
</tr>
</tbody>
</table>

### Table 5-2 Minimum rail separation distances

<table>
<thead>
<tr>
<th>Rolling stock</th>
<th>Minimum distance (metres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locomotive in power</td>
<td>24</td>
</tr>
<tr>
<td>Guards van</td>
<td>24</td>
</tr>
<tr>
<td>Wagon loaded with logs, rails, beams and without bulk head</td>
<td>24</td>
</tr>
<tr>
<td>Passenger carriage</td>
<td>24</td>
</tr>
<tr>
<td>Operating refrigerated container</td>
<td>12</td>
</tr>
</tbody>
</table>
6 The transport process

6.1 Introduction
The transport process from the Project site to Port Adelaide (road) and to the East Arm Wharf at the Port of Darwin (a combination of road and rail services) can be divided into three phases, namely:
1. Project Site Based Activities
2. Pre-Site Departure Activities
3. Transport Activities

This section provides a description of the tasks that are included in each of the phases across the transport process. As mentioned in Section 1.4 it is anticipated that there would be a monthly consignment consisting of 5 x 20ft GP loaded with UOC as follows;
- 2 x double trailer road trains loaded with 2 x 20ft GPs each. A total of 4 x 20ft GP containers.
- 1 x single trailer road train loaded with 1 x 20ft GP.

Any lifting between road, rail and storage facilities would be undertaken at approved locations where the TSP would have relevant ASNO approvals to manage UOC consignments on behalf of Toro.

6.2 Project Site Activities

6.2.1 Marking - drums
The outside of the package (i.e. individual 205 litre drums of UOC in each container) would be clearly marked with the gross mass and net mass. The marking would be legible and durable, as required by the ADGC.

Individual drums would be labelled as per the Code and the ADGC, (namely Class 7, UN2912, III –Yellow).

6.2.2 Packaging
As per the Code, under routine transport conditions there would be no loss of UOC material or loss of shielding resulting in radiation exposure.

Prior to packaging, each 20 ft GP container would be inspected by the Project to verify the container is fit for purpose, i.e. fit to carry UOC.

UOC consignments from the Project would have three levels of containment and encapsulation, with the product being:
- Packed in Industrial Packaging Type I (IP –I) 205 litre steel drums with up to 64 drums per container;
- Secured and packed using an acceptable packing design with Corex strapping (Cordlash CC105) approved by the relevant Competent Authority, Australian Maritime Safety Authority (AMSA); and
- Loaded and locked in a 20 ft GP container conforming to ISO 1496 and lined with plastic sheeting.
An example of the proposed packing method is shown in Photo 6-1 Packing Methods for UOC.

**Photo 6-1 Packing Methods for UOC**

6.3 Pre-Site Departure Tasks

6.3.1 Labelling and placarding – containers and vehicles

Correct labels must be attached to all external walls and doors of the 20 ft GP container as required under both the Code and ADGC (Class 7, UN2912, III -Yellow) when loaded with export material from the Project site.

In addition, UN 3077, Environmentally Hazardous Substance, Solid, Not Otherwise Specified (NOS) is also required. Examples of the required labels are shown in Figure 6-1 Placards applied to each UOC 20ft GP container.

**Figure 6-1 Placards applied to each UOC 20ft GP container**

![Placards applied to each UOC 20ft GP container]

The Class 7 label showing UN2912 (normally a trefoil with half yellow, half white with black lettering) can be substituted with a rectangular label with black writing on an orange background as shown in Figure 6-2 Alternate label for Class 7.

**Figure 6-2 Alternate label for Class 7**

![Alternate label for Class 7]

The Transport Index would be measured and used to determine radiation exposure during transport for each 20ft GP container. The Transport Index (TI) is an indicative measure of the potential gamma radiation level at 1 metre for each 20ft GP container and recorded on the radioactive III trefoil. The index shall not exceed 10 metres.
The road vehicle (see Section 5.5.1) used to transport the 20 ft GP containers would be marked with a placard using the Class 7/UN 2912 label as required under the Code and ADGC. All labels would be removed from the 20ft GP containers when radioactive material is unloaded at the final destination.

6.3.2 Container door security

An overview of security requirements that would be captured in a security plan relevant to the transport of UOC is presented in Section 8.3 and should be read in conjunction with this section.

At the Project site, in a secure ASNO approved area, the UOC drums would be packed and secured in 20ft GP containers. The doors of the containers would then be sealed with consecutively numbered bolt type seals. The seal numbers would be recorded on all transport documents.

Bolt seals would comply with C-TPAT and ISO 17712 standards that meet current ASNO standards as part of the security plan for the movement of UOC from the Project site.

Figure 6-3 Bolt security seal

The bolt security seals used would comply with Customs-Trade Partnership Against Terrorism (C-TPAT) and ISO 17712 standards that meet current ASNO standards as part of the security plan for the movement of UOC from the Project site.

6.3.3 Controls for surface contamination

Under routine transport conditions as set out in the the Code, the non-fixed surface contamination (i.e. radioactive substances, dust particles or similar that can be wiped or washed off) on the external surfaces of the 20 ft container shall not exceed the following:

- 4 Bq/cm$^2$ for beta and gamma emitters and low toxicity alpha emitters.
- 0.4 Bq/cm$^2$ for all other alpha emitters.

Before departing from the Project site, the external surfaces of the 20ft GP containers and the truck would be checked by appropriately trained personnel to ensure surface contamination was below the limits specified above.
6.3.4 Incident Spill Kits

During all transport activities an incident response kit would accompany the 20 ft GP containers packed with UOC. The lead road vehicle would carry the incident response kit while, in the case of rail transport, the kit would be loaded on to the train in a location determined to be appropriate.

The kit has been designed to assist in safe and efficient containment in the initial stages of a UOC spill during transport. The kit would include, but not be limited to, the following items:

- Personnel Protective Equipment (PPE);
- Emergency Position Indicating Radio Beacons (EPIRB);
- Personal hygiene materials;
- Workplace first aid kit;
- Dolphin torch and batteries;
- Traffic management devices (i.e. advance warning and hazard signage, traffic cones);
- Containment equipment (i.e. heavy duty plastic sheeting, tarpaulins, pegs and mallet, bags to be filled for bunding, barrier mesh, gaffer/flagging tape, disposable bags for used clothing and other disposable equipment);
- Recovery equipment (e.g. shovels/scoops/brooms/vacuum equipment); and
- a copy of the Emergency Response Plan.

The spill kits would be held and maintained by the TSP. Appropriate procedures would be developed to ensure that the contents of the kits were checked on a regular basis to ensure they were maintained and ready for use at any time during the transport of UOC.

6.4 Transport Activities

6.4.1 Approved routes

For road movements from the Project site to Adelaide, the interstate road transport solution would follow ASNO approved transport routes as presented in Table 6-1 Overview of approved routes along with Figure 6-4 Transport Route from the Project to Adelaide, SA

Table 6-1 Overview of approved routes

<table>
<thead>
<tr>
<th>Mode</th>
<th>Origin</th>
<th>Destination</th>
<th>ASNO approved route</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road</td>
<td>Wiluna Project site or Adelaide rail terminal</td>
<td>Port Adelaide or Adelaide rail terminal</td>
<td></td>
</tr>
</tbody>
</table>
- Private road to the Goldfields Highway.  
- Goldfields Highway to Norseman via Leonora, Menzies, Kambalda.  
- Eyre Highway from Norseman to Port Augusta.  
- Princes Highway (National Route 1) from Port Augusta to Adelaide |
| Rail | Port Adelaide or Adelaide rail terminal | Darwin approved transit facility such as NQX at Berrimah, Darwin | Adelaide to Tarcoola on the Australian Rail Track Corporation (ARTC) network then via Alice Springs, Katherine to the Darwin rail terminal on the Freightlink controlled rail track. |
| Road                                      | Darwin approved transit facility such as NQX at Berrimah | East Arm Wharf, Port of Darwin | O’Sullivan Circuit then Berrimah Road to the East Arm Wharf at the Port of Darwin |
Figure 6-4 Transport Route from the Project to Adelaide, SA
Prior to departure from the Project site the nominated Project Officer(s) would determine the availability of the transport route by assessments including:

- The Australian Bureau of Meteorology website for:
  - weather maps and forecasts of weather conditions en route
  - any weather warnings as issued or in place at the time
  - State or Territory emergency services community warnings or advice in force at the time.
- Any other sources of relevant information.

If, in the opinion of the nominated officer(s), a factor or factors may prevent the movement of UOC along the approved transport route as planned, road transport would be delayed until a more appropriate time was identified.

Under instruction from the respective State/Territory police, emergency services and/or approved regulatory officers, alternate routes could be requested or required from time to time to complete the delivery of the consignment to the approved destinations of Adelaide, and the East Arm Wharf, Port of Darwin.

If an alternative route was required to complete the planned journey of the UOC consignments from the Project site, the TSP and Toro would assess the impact of the required changes to the approved transport route to ensure that safety and compliance regulations were not compromised. If an alternative route was required, Toro would advise the relevant Australian, State or Territory authorities of the change in the approved route. Where a consignment or recovered material from an incident was required to be returned to the Project site, such movements would retrace the approved route to return to the Project site.

6.4.2 Communications & security during transport
The TMP requires timely, accurate and up-to-date communications between all parties involved in transporting UOC.

An overview of the en route communications arrangements is summarised below.

6.4.2.1 Road transport
All road vehicles (See Section 1.4) used to transport UOC from the Project site to Adelaide would:

- At all times travel in combinations of at least two trucks which would remain in close proximity throughout the journey;
- Use two trained drivers per truck with all necessary licenses to complete the direct service stopping only to refuel and for driver meal breaks at designated locations along the approved transport route;
- As a minimum, be outfitted with equipment to communicate quickly, efficiently and reliably with an operational base. This could include two-way radios and satellite phones; and
- Have a global positioning system (GPS) fitted to each prime mover.

A GPS fitted to each truck would provide three main security functions that are outlined below:
1. A duress pendant or similar device would be provided to each driver so that if he/she was involved in an en route incident, the pendant may be pressed within 50 m of the vehicle and a duress message would be triggered.

2. Out-of-zone requirements (also known as a geo-fence) around the approved road or rail transport routes would be defined, and if a vehicle moved outside these zones (see Section 6.4) or travelled in an alternative direction, a back to base alarm would be generated.

3. En route checking (with automatic updates, duress alarms etc through to an authorised user website) would display the location of vehicles during their journey at both the Project main security gate and TSP operational centre.

6.4.2.2 Rail transport

The rail track infrastructure owners, ARTC (Adelaide – Tarcoola) and Freightlink (Tarcoola – Darwin) operate Central Train Control (CTC) centres for their respective rail line sections of the train journey between Adelaide and Darwin. CTC manages the planning, movement and scheduling of TSP train services between Adelaide and Darwin.

Manned 24 hours, 365 days per year, the CTCs provide communications between train control and train crew for:

1. Train operating orders ensuring safety by sequencing train movements
2. Knowledge of train locations throughout the rail journey
3. Single point of contact with a single frequency for emergencies, train to train communication.

Throughout the rail journey between Adelaide and Darwin, the CTCs and train drivers have established procedures and protocols in place to maintain communications and provide up to date information on train movement.

6.4.3 Transit storage during transport

An overview of security requirements that would be captured in a security plan relevant to the transport of UOC is presented in Section 8.3 and should be read in conjunction with this section.

UOC would be stored in designated secure transit areas that have been approved and licensed by ASNO and/or the relevant State or Territory regulator. Depending on operational requirements, additional secure transit areas may be needed to support the planned transport process which would be subject to ASNO and/or the relevant State or Territory regulatory approvals and permits at that time.

The Port Adelaide Terminal and the NQX facility at Berrimah, Darwin are both ASNO licensed secure areas for the storage of UOC in 20 ft GP containers. Security measures in place at these facilities include, but are not limited to:

- Chain mesh fencing and locked gates to restrict the movement in and out of the storage location
- CCTV
- Appropriate lighting
- Continuous monitoring (i.e. 24 hours a day, seven days a week)
- Other measures deemed appropriate to restrict, prevent and detect unauthorised access.
Access to the port area at Port Adelaide and the East Arm Wharf, Port of Darwin is controlled under maritime security legislation and would be coordinated with the respective port authorities.

All employees, contractors and visitors would be inducted and undertake the appropriate training in the key requirements of the site management system for storing UOC. A site security pass would only be issued to approved personnel.

Visitors would be allowed to enter the site once formal documentation and authorisation had been provided to the site gatehouse. Visitors would be issued with a temporary site pass (to be returned on exit) and would be escorted at all times while in the facility.
7 Incident Management

7.1 Introduction
This section provides a summary of the arrangements associated with an incident involving the transport of UOC consignments from the Project.

A separate Toro Emergency Response Plan (ERP) would be developed for any transport accident involving UOC. The ERP would cover in more detail:

- Purpose and scope of the ERP
- Roles and responsibilities under the ERP
- Incident classification, notification and incident response escalation procedure
- Preparedness requirements.

7.2 Toro crisis and emergency management overview
Toro has a corporate Crisis and Emergency Management Plan (CEMP) that provides levels of protection for life and property, and recovery assistance in the event of an incident, emergency or crisis situation associated with the Project.

The CEMP provides the foundation for maintaining preparedness and establishing policies in the event of an incident or emergency situation by outlining threshold for:

- Assessing the magnitude of and prioritising incident, emergency or crisis situations;
- Escalation of an incident to an emergency or crisis situation;
- Activating Incident Management (IMT), Emergency Management (EMT) and Crisis Management (CMT) teams depending on incident, emergency or crisis situations;
- Notifying Project and Toro executive management;
- Procedures for notification and activation of Incident Management, Emergency Management and Crisis Management teams;
- Roles and responsibilities of all IMT, EMT and CMT members; and
- Guidelines and checklists to facilitate an effective and organised response.
Figure 7-1 Crisis and Emergency Management plan (CEMP) – shows the structure of the Toro CEMP.

7.3 In the event of an incident

In the event of an incident involving a consignment of UOC whilst being transported to either Adelaide or Darwin, the initial responses to be adopted at the incident would include:

- Assessing the incident;
- Gathering facts;
- Notifying emergency services as required;
- Toro Management prioritising the need for rescue, life-saving, first aid, fire control and control of any other hazards;
- If product had escaped both its steel drum and shipping container, using a response kit in the immediate containment of any spill;
- Isolating the incident area with barricades to exclude members of the public for at least 25 m in all directions;
- Keeping unauthorised people away from the vehicles until emergency services or Project personnel arrived;
- Advising people at the incident site to remain upwind and be aware of dust.
- Upon arrival emergency services establishing a 70m zone around the incident site; and
- Escalating the incident as necessary, by following any instructions provided by emergency services personnel.
7.4 Safety precautions

UOC has a slight chemical toxicity. It is weakly radioactive and is only a potential health hazard if inhaled or ingested. Provided precautions are taken to avoid inhalation or ingestion, any spilt UOC would not present a health hazard.

In the event of loss of containment resulting from a transport accident, the main exposure for personnel in attendance is likely to occur through inhaling suspended material (dust). Similar to other spills involving dangerous goods, the use of correct PPE (i.e. dust mask and gloves) and restricting the time spent working around the spilt material would reduce the risk of radiation exposure.

The affected area should be suitably controlled and segregated, and access to enter or remain in the area should be restricted. Qualified persons such as emergency services representatives would take control of the incident and supervise the response operation, including the salvage operation.

7.5 Emergency management and response

IMPORTANT NOTE: The loss of containment and the presence of radioactive material should not prevent qualified persons such as emergency services personnel from undertaking rescue operations such as attending injured person(s) or fighting fires.

Emergency planning and preparedness for responding to a transport incident involving UOC is similar to that required when responding to transport incidents involving other types of dangerous goods such as flammables, explosives, and corrosives.

As the emergency services in the respective State and Territory (i.e. police, State Emergency Service, fire brigade, ambulance service and volunteer emergency services) or other agency personnel are the first line of response, they already have emergency plans that deal with dangerous goods as defined in the ADGC. The Toro emergency plan for dealing with UOC would conform and integrate as closely as possible with procedures for dealing with other transport incidents involving other classes of dangerous goods. This would include provisions for notifying local, state, territory and/or other Australian authorities.

Any incident involving a loss of containment or damage to a container of UOC would be reported to Australian and State/Territory governments as soon as practicable after the incident. The Project would provide qualified representatives to provide specific expertise to on-site personnel regarding radiation, contamination issues, recovery, and rehabilitation matters associated with a transport incident.

When responding to transport incidents involving radioactive material, the main steps involved are as follows:

- Rescue injured personnel and provide any emergency first aid/medical attention required.
- Evacuate non-essential personnel and members of the community.
- Use respiratory protection, protective clothing and eyewear as outlined in the Safety Data Sheet (SDS) for UOC to reduce the possibility of inhaling radioactive material.
- Minimise the time spent nearby and maximise the distance to any spilt UOC.
- Control fires and other common consequences of transport accidents.
- Identify any other associated hazards (e.g. other dangerous goods such as fuel spills, electrical sources) and establish a controlled cordoned-off area.
- Control and prevent any additional spread of radioactive contamination.
- Recover the radioactive material, packaging and transport equipment.
• Quarantine people who may have come in contact with the material, decontaminate personnel and recover contaminated material (i.e. PPE, clothing) for correct disposal.
• Decontaminate equipment in preparation for rail and/or road transport.
• Decontaminate and restore the surrounding environment to an acceptable standard.
8 Management system

8.1 Procedures
In consultation with the TSP, specific working procedures and process documents would be developed to control the various tasks associated with UOC consignments as described in Section 6 and would be aligned to support the TMP objectives (See Section 1.4).

8.2 Documentation
The transport documentation for each UOC consignment would include certificates and permits (see Section 3.3) to be lodged with:
- Australian, State and Territory government agencies.
- TSP.
- Destination country government agencies.
- Competent authorities in countries through which UOC consignments may pass en route to the final destination.

All documentation for each shipment would be stored in accordance with Toro document control procedures.

8.3 Security during transport
The objective of transport security is to prevent unauthorised personnel from acquiring radioactive material such as UOC while it is in transit.

The IAEA has a code of conduct for the security of radioactive material (See Security in the Transport of Radioactive Materials). The IAEA code addresses prudent management practices, and basic and enhanced security levels.

The Security in the Transport of Radioactive Material Code, (IAEA Nuclear Security Series No. 9, 2008) defines security levels based on the radioactivity levels of the contents of a single package of the material being transported. UOC is classified as LSA-I and requires prudent security management practices to be implemented.

The transport of UOC, including the transfers between transport modes from the Project to the nominated export ports of Port Adelaide, and East Arm Wharf, Port of Darwin, occurs in the public domain. While in transit, delays such as modal transfers and waiting times would be kept to a minimum to minimise the risk of unauthorised access, unexplained loss or theft, or other malicious acts.

A security plan that complies with Australian regulatory requirements and achieves the above objectives would be developed, implemented, periodically reviewed, and communicated to all relevant parties associated with transporting UOC from the Project site. The security plan would:
- Allocate responsibilities for security.
- Specify measures to provide advanced transport notification (where required), monitor shipments and maintain records of material transported.
- Include a review of operations and an assessment of vulnerability.
- Specify measures used to reduce security risks (e.g driver vetting and security checks).
- Include procedures for reporting and dealing with security threats, breaches and incidents.
• Provide threat information on an ongoing basis and actions to be taken in the event of a change in threat level (this is and would continue to be provided by ASNO).
• Include provisions for evaluating, testing, reviewing and updating the security plan.
• Outline measures to secure information and limit distribution of sensitive information.
• Ensure appropriate emergency response and security contingency plans are in place for accidents, breakdowns or any other delays along the approved transport route.

The objectives of the security plan are to:
• Deter, detect and delay unauthorised access to the material while it is being transported or stored outside the Project site.
• Prevent any attempted theft or malicious act while the material is being transported or stored.
• Enable an appropriate response and allow recovery or contingencies to commence promptly.

8.4 Residual risks
The main risks identified for UOC transport related activities are:
• Injury to personnel during loading.
• Road Transport safety.
• Loss of control leading to a loss of containment.
• Security risks.

A risk assessment was completed for the proposed transport of UOC from the Project site to the nominated Australian export ports. The results are provided in Table 8-1 Risk Assessment for transport of UOC.

8.5 Training
Training programs would be established by Toro and coordinated across all relevant organisations likely to be involved in transporting UOC. Regular refresher programs would be conducted to maintain the proficiency of all personnel.

The TMP supplements organisational training aimed at specific target groups, which includes training presentations on:
• Radiation training and awareness for transport workers involved in transporting, handling, storing or loading UOC onto road, rail or shipping vessels.
• Radiation training and awareness for the respective State and Territory emergency services (i.e. State Emergency Service, fire brigade, ambulance service and volunteer emergency services) or other agency personnel involved in the initial response to an incident involving UOC.
• Emergency response and cleanup of spilt UOC material for emergency services personnel.

The training focuses on providing participants with awareness regarding:
• Requirements relating to the safe handling, storage and transportation of Class 7 radioactive materials.
• The characteristics of UOC.
• Radiation safety protection requirements, first aid and personal safety.
<table>
<thead>
<tr>
<th>Risk Issue</th>
<th>Description</th>
<th>Causes</th>
<th>Likelihood</th>
<th>Consequence</th>
<th>Mitigation and Controls</th>
<th>Residual Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injury to personnel during loading and unloading</td>
<td>Injury to personnel during loading and unloading</td>
<td>1. Mobile plant/light vehicle/truck and human interaction 2. Equipment failure 3. Fit for work 4. Operator Error/ Rule Breach</td>
<td>Low</td>
<td>Low-Medium</td>
<td>• Administrative and contractual controls. • Inspection and preventative maintenance systems. • Training for securing loads.</td>
<td>Low</td>
</tr>
<tr>
<td>Road transport safety</td>
<td>Unpaved road incidents; 1. Collision 2. Roll-over / hitting infrastructure 3. Leaving road</td>
<td>Accident or collision due to 1. Vehicle congestion in towns/on route 2. Environmental conditions (poor visibility such as sun/fog, wet, bushfires) 3. Condition of road (i.e. wet, slippery, black spots) 4. Fatigue/fitness for work</td>
<td>Low</td>
<td>Low-Medium</td>
<td>• Preferred contractor, audits, licensing compliance. • Transport management plan, driver training for unsealed roads. • Compliance with chain of responsibility/fatigue management regulations. • Regular road maintenance to reduce dust and maintain road condition.</td>
<td>Low</td>
</tr>
</tbody>
</table>
### Failure

6. Level crossing collision with Mega/Toro road vehicles (causing fatality and/or loss of containment)

### Procedures

- Administrative procedures (In-vehicle and on-route monitoring systems, pre-start and packaging/vehicle loading audits)

### Security Risks

<table>
<thead>
<tr>
<th>Risk</th>
<th>Frequency</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unauthorised access</td>
<td>Low-Medium</td>
<td>High</td>
</tr>
<tr>
<td>Malicious Intervention</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd party (terrorism)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vandalism/sabotage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protesters/blockades</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Theft</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Response

- Transport and security plan
- Police intervention, driver training
- Service provider management
- Federal Govt intervention
- Monitoring NGO website protest activity

### Notes

- Low – Medium
8.6 Monitoring systems: objectives and assessment criteria

Ongoing monitoring and performance systems would be established to determine the effectiveness of the transport solution and radiation protection for workers and the community.

Such systems would be continually reviewed to ensure the information being collected was relevant and identified areas of concern that may need additional or increased control/mitigation strategies. Table 8-2 Assessment criteria sets out the objectives and assessment criteria associated with the transport of UOC from the Project.

Table 8-2 Assessment criteria

<table>
<thead>
<tr>
<th>Item</th>
<th>Objective</th>
<th>Assessment criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the event of a spill, management of exposure to UOC</td>
<td>No adverse impacts to health of employees or the public from exposure to radiation from UOC.</td>
<td>Radiation doses to members of the public and emergency services are less than 1 mSv/y above background.</td>
</tr>
<tr>
<td>In the event of a non-conformance with the TMP</td>
<td>Regular auditing of the TMP to identify any non-conformances as outlined in Section 8.9</td>
<td>Audit outcomes with non-conformances addressed and closed out within agreed time frames.</td>
</tr>
</tbody>
</table>
| Performance monitoring | Establishment, data capture and regular reporting of transport indicators relating to compliance with permit and contract conditions | Performance indicators including:  
  - Communications.  
  - Compliance with Permits and Chain of Responsibility.  
  - Documentation.  
  - Driver fatigue management.  
  - Incidents.  
  - Safe loading practices.  
  - Scheduling.  
  - Speed compliance.  
  - Vehicle safety. |

8.7 Change Management

As part of the Project management system this TMP would be reviewed and updated as necessary to reflect the ongoing Project transport requirements for UOC.

Being a controlled document within the management system any changes to the TMP would be managed in accordance with the change management process to transition the TMP from the current state to a desired future state.

8.8 Inconsistencies

Where any inconsistencies arise between the procedures or policies stipulated in this TMP, and the procedures of government regulators or other relevant parties to the TMP, such inconsistencies would be identified, addressed, resolved and corrected by the Project as soon as possible.
8.9 Review of the transport plan

As part of the Toro Management System the TMP would be comprehensively evaluated and reviewed by inspections, audits and other methods as appropriate to ensure that the ongoing:

- Compliance with all regulatory obligations.
- Operations associated with the transport task.
- Were under control and produced results to satisfy Toro’s management and quality objectives.

The TMP would be modified as required to take account of changes in procedures, organisation and personnel changes and to ensure the accuracy and relevance of the TMP to both the operational and regulatory environment.
9 References


WILUNA URANIUM PROJECT

Inbound and Outbound Transport Requirements
### Document Information

<table>
<thead>
<tr>
<th>Current Revision</th>
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<tbody>
<tr>
<td><strong>Rev. No.</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Issue Date</strong></td>
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<td><strong>Document No.</strong></td>
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### Revision History

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<th>Detail</th>
<th>Date</th>
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<tr>
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<td>First Draft of Document</td>
<td>12 May 11</td>
</tr>
<tr>
<td>0</td>
<td>Issued for Use</td>
<td>18 May 11</td>
</tr>
<tr>
<td>1.0</td>
<td>Revised Issue</td>
<td>10 Jul 11</td>
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</table>
I Executive Summary

Toro Energy Limited (Toro) proposes to develop the Wiluna Uranium Project (the Project), located approximately 960km northeast of Perth in the Murchison region of Western Australia. The Project has lodged an Environmental Review and Management Programme (ERMP) with the Office of the Environmental Protection Authority (EPA) of Western Australia. As part of its assessment of the impacts of the Project, Toro commissioned an analysis of the inbound and outbound transport requirements for the life of the Project.

An overview is provided of the existing major transport network covering roads, rail lines and airports in the vicinity of the Project that are potentially available to support the transport requirements of the Project. A summary of the existing traffic conditions along each of the major roads that could be used by the Project is provided.

A transport profile has been developed for the Project covering the Construction phase (Year 2013), Production phase (Years 2014 to 2027), De-commissioning phase (Year 2028) and On-going site monitoring (Year 2029 onwards).

The key findings from an assessment of the Project’s transport requirements and impacts on the road network are:

- The estimated transport requirements converted to annual average daily traffic (AADT) for the profile life have been established for each of the Project phases at the traffic count point of the Goldfields Highway and proposed Project Area access road;
  - construction (27 AADT),
  - operations (12 AADT)
  - De-commissioning (10 AADT)
  - On-going site monitoring phase (<1 AADT)

- The construction phase transport requirements would increase traffic volumes on the Goldfields Highway by, respectively, 9 per cent between Leinster and 17 per cent between Wiluna and the proposed Project access road (worst case).

- Across the remaining Project phases, the Project’s transport requirements using the road network between Perth, Kalgoorlie-Boulder to Leinster and Kalgoorlie-Boulder to the Western Australian/South Australian border would not be affected as the increased transport requirements:
  - are within the accepted 5 per cent variation of daily traffic flow
  - retain the existing Levels of Service (LoS) at Level C for other road users.

- The Project would work collaboratively with Main Roads Western Australia (MRWA) on location, design, layout and construction to secure necessary approvals for the proposed T-intersection between the Goldfields Highway and the Project Area access road.

- Opportunities for fly in/out services along with bus services to support local and regional employment would continue to be investigated during detailed Project planning.
2 Introduction

2.1 Background
Toro Energy Limited (Toro) proposes to develop the Wiluna Uranium Project (the Project), located approximately 30km south of Wiluna in the Murchison region of Western Australia.

The Project has lodged an Environmental Review and Management Programme (ERMP) with the Office of the Environmental Protection Authority (EPA) of Western Australia.

To support government assessment of the Project, Toro has commissioned this analysis of the inbound and outbound transport requirements for the Project’s life commencing with the Construction phase and concluding with On-going site monitoring after the Operations and De-commissioning phases have been completed.

2.2 Scope
The scope of this analysis is to:
- Determine the inbound and outbound transport requirements for the Project across the Project phases of construction, operations, de-commissioning and on-going site monitoring;
- Document existing major road, rail and airport facilities potentially available to support the Project’s transport requirements across the Project phases; and
- Describe the proposed transport routes and relevant issues for each of the Project phases.

2.3 Reference Documents
- Toro Project estimates from meetings with project staff
- Austroads Standards and Guidelines.
3 Existing Transport Infrastructure

3.1 Introduction
This section provides a brief description of the Project location in the Murchison region of Western Australia.

An overview is provided of the existing major transport network covering roads, rail lines and airports in the vicinity of the Project that are potentially available to support the transport requirements of the Project.

A summary of the existing traffic conditions along each of the major roads, which could be used by the Project, is also provided.

3.2 The Wiluna Project
The Project Area is approximately 125km north of Leinster via the sealed Goldfields Highway between Kalgoorlie-Boulder and Wiluna. The Project comprises two deposits, Lake Way and Centipede, respectively 15km and 30km south of Wiluna. The Centipede deposit would be mined first for a period of about five years, followed by the Lake Way deposit. The ore would be processed at a plant near the Centipede deposit. A dedicated haul road would be established to truck ore between the Lake Way deposit and the processing plant.

Access to the Project Area would be via an unpaved road from the Goldfields Highway to the processing plant and Centipede deposit (Project Area access road).

Figure 3-1 shows the location of the Wiluna Uranium Project site.
Figure 3-1 Wiluna Uranium Project Location

(Source: Wiluna Uranium Project)

3.3 Existing Transport Network

Figure 3-2 locates the Project Area in the region and its relationship to the existing transport network.
Figure 3-2 Existing Transport Network
3.3.1 Road Network

There are four major roads under the control of Main Roads of WA (MRWA) that are proposed to be used by the Project, covering transport movements to and from the Project site (see Figure 3-2). The MRWA controlled roads are summarised in Table 3-1. These roads support the agricultural, mining and other regional activities that form part of the Western Australian Restricted Access Network (RAV), which enables double and triple trailer road train movements.

Table 3-1 Major Road Network in the vicinity of the Project

<table>
<thead>
<tr>
<th>Route number</th>
<th>Road Name</th>
<th>Description</th>
<th>Community Centres along the route</th>
</tr>
</thead>
<tbody>
<tr>
<td>H049</td>
<td>Goldfields Highway</td>
<td>Mostly unsealed two lane road between Meekatharra and Wiluna, thereafter sealed to Esperance.</td>
<td>Wiluna, Leinster, Leonora, Menzies, Kalgoorlie-Boulder, East &amp; West Kambalda, Norseman</td>
</tr>
<tr>
<td>H006</td>
<td>Great Northern Highway</td>
<td>Two lane sealed with passing pays between Perth and the northern region of Western Australia.</td>
<td>Mount Magnet Meekatharra Newman</td>
</tr>
<tr>
<td>M069</td>
<td>Mount Magnet–Leinster Road</td>
<td>A two lane sealed road that connects the Great Northern Highway at Mt Magnet with the Goldfields Highway to the east.</td>
<td>Mt Magnet Sandstone Agnew</td>
</tr>
</tbody>
</table>
| H3           | Eyre Highway                       | A two lane sealed road that links Norseman with Port Augusta in South Australia across the Nullarbor Plain. | Road houses along the route between Norseman and Western Australian/South Australian border include;  
  ➢ Balladonia  
  ➢ Caiguna  
  ➢ Cocklebiddy  
  ➢ Madura Pass  
  ➢ Mundrabilla  
  ➢ Eucla |

Included in Appendix 1 are photographs of typical examples of the major road network covering:

- Conditions along the Goldfields Highway (see Photo 1) and views of the townships of Wiluna (Photo 2), Leonora (Photo 3) and Menzies (Photo 4); and
- Views along the Eyre Highway (Photo 5) with examples of the associated infrastructure of Royal Flying Doctor Service road airstrip (Photos 6 and 7), typical roadhouse (Photo 8) and road signage (Photo 9).
3.3.2 Rail network

The nearest rail line to the Project terminates at Leonora, approximately 260km to the south (see Figure 3-2).

At Leonora, the standard gauge rail line supports regular freight rail services for bulk and containerised materials to Kalgoorlie-Boulder (about 260km), Kalgoorlie-Boulder to Esperance (about 380km), and Kalgoorlie-Boulder to the Perth metropolitan area (about 640km). At Kalgoorlie-Boulder, the interstate Trans Australian rail line provides rail services to and from eastern state capital cities.

The ownership of the rail track in Western Australia is split between Westnet and the Australian Rail Track Corporation (ARTC). Westnet leases the rail infrastructure west of Kalgoorlie–Boulder and the line to Leonora from the Western Australian Government. The Trans Australian rail line to the east of Kalgoorlie-Boulder is owned and managed by the ARTC.

The Project includes the option of transporting Uranium Oxide Concentrate (UOC) by rail from Port Adelaide in South Australia to the East Arm Wharf, Port of Darwin, for export. For UOC consignments which may be exported from the East Arm Wharf, Port of Darwin in the Northern Territory, the existing rail line between Adelaide – Tarcoola, South Australia and onto the Port of Darwin is held on a long-term lease and is operated by Freightlink Pty Ltd. FreightLink was recently purchased by Genesse & Wyoming Australia.

3.3.3 Airports and passenger services

Perth airport, located 12km from the Perth central business district, supports Western Australia’s international, interstate and intra-state flights. The owners of the airport, Westralia Airports Corporation Pty Ltd, recently reported for the 2009–2010 year that the airport handled 118,168 aircraft landings and take-offs, with 7.47 million domestic passengers and 2.99 million international passengers.

There are two airports with sealed runways near the Project. These are at Wiluna (30km by road to the north) and the private Mt Keith airport (approximately 60km by road to the south) operated by BHP Billiton. The Wiluna airport handles regular charter and commuter passenger services operated by carriers such as Network Aviation and Skipper Aviation (three times per week) using turbo propeller aircraft. Alliance Airlines fly to Mt Keith using Fokker 100 aircraft.

The major regional airport is at Kalgoorlie-Boulder and is capable of handling jet aircraft such as Boeing 737’s that provide regular intrastate and interstate flights.

3.4 Traffic Volumes

MRWA maintains a number of traffic count locations across its road network measuring traffic flow. This information is used to determine the average annual daily traffic (AADT), which represents the bi-directional vehicle traffic on a road divided by 365 days. AADT is a useful measure of how busy a road averaged over a 24-hour period.

1 The rail line between Adelaide and Tarcoola, SA is the same section of rail track of the Trans Australian rail line connecting Adelaide to Perth.
Based on Austroads vehicle classifications, Table 3-2 provides a summary of the AADT on the major road network of interest to the Project for Classes 1 to 2 (Light Vehicles) and Classes 3 to 12 (Heavy Vehicles).

### Table 3-2 AADT for major roads of interest to the Project

<table>
<thead>
<tr>
<th>Road Name</th>
<th>Section</th>
<th>AADT</th>
<th>Light Vehicles</th>
<th>Heavy Vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goldfields Highway</td>
<td>Wiluna to proposed Project Area access road</td>
<td>75</td>
<td>53</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Proposed Project Area access road to Leinster</td>
<td>149</td>
<td>75</td>
<td>74</td>
</tr>
<tr>
<td></td>
<td>Leinster to Leonora</td>
<td>374</td>
<td>216</td>
<td>158</td>
</tr>
<tr>
<td></td>
<td>Leonora to Kalgoorlie-Boulder</td>
<td>482</td>
<td>308</td>
<td>174</td>
</tr>
<tr>
<td></td>
<td>Kalgoorlie-Boulder to Kambalda</td>
<td>5389</td>
<td>4605</td>
<td>773</td>
</tr>
<tr>
<td></td>
<td>Kambalda to Norseman</td>
<td>668</td>
<td>431</td>
<td>237</td>
</tr>
<tr>
<td>Great Northern Highway</td>
<td>Mount Magnet to Wubin</td>
<td>555</td>
<td>340</td>
<td>215</td>
</tr>
<tr>
<td>Mount Magnet–Leinster Road</td>
<td>Mount Magnet to Leinster</td>
<td>271</td>
<td>156</td>
<td>115</td>
</tr>
<tr>
<td>Eyre Highway</td>
<td>Norseman to WA/SA border</td>
<td>558</td>
<td>349</td>
<td>209</td>
</tr>
</tbody>
</table>
4  The Project Transport Profile

4.1  Introduction

Based on information provided by the Project, a transport profile has been developed for the Project covering the Construction phase (Year 2013), Production phase (Years 2014 to 2027) De-commissioning phase (Year 2028) and On-going site monitoring (Year 2029 onwards).

The document Toro Trip Planning & Commodity Estimates Base Case (see Appendix 3, Trip Planning & Commodity Estimates) contains the basis of design and supporting information used to create the transport profile.

In conjunction with Appendix 3, this section provides an overview of the basis of design for the Project transport profile for passenger and freight movements.

4.2  Basis of Design for Transport Activities

The basis of design for the Project is the “stick build on site” methodology where the Project processing plant, building requirements and associated infrastructure are constructed on the Project site, piece by piece.

The major activities identified for the Project were categorised to represent the various transport tasks across the construction, operations, de-commissioning and on-going site monitoring phases, occurring between years 2013 to 2029. They include:

- Construction activities (includes workforce movements to and from the Project site);
- Mining equipment;
- Construction equipment and administration;
- Vehicles, trucks and buses (includes operational workforce movements to and from the Project site);
- Operations (raw materials, chemicals and general freight) and exports (UOC);
- De-commissioning traffic at the end of the operations phase of the Project; and
- On-going site monitoring activities of the Project site.

4.3  Battery Limits

- The off site external battery limits for the proposed transport operation are:
- Diesel – at the outlet valve of the fuel loading facility in Kalgoorlie-Boulder;
- Sulphuric Acid – at the outlet valve of the BHP Billiton’s Nickel West Kalgoorlie Nickel Smelter;
- Sodium Hydroxide and Sodium Carbonate - at the outlet valve of the nominated supplier’s loading facilities within Perth city limits;
- Mining/Construction Equipment – will be subject to contractual terms with the nominated supplier(s) in Perth/Kwinana city limits;
- Other inbound freight – typically collected “Ex works basis” in Perth/Kwinana city limits for transport to the Project site by an appointed Project transport service provider; and
- UOC – road, rail and sea transport to the nominated customer converter facility as contracted by the Project via Adelaide or Darwin.
4.4 Assumptions
The excel file in Appendix 3 contains the Assumptions worksheet along with base data provided by the Project used to create the transport profile.

The major assumptions for the transport profile are summarised below:

- The transport period for workforce and freight movements is from Year 2013 to 2029 split between:
  - Construction phase – Year 2013.
  - Operations phase – Years 2014 to 2027.
  - Decommissioning phase – Year 2028
  - On-going site monitoring – Year 2029 onwards
- Deliveries to site are on a continuous 24 hour, 7-day basis for 350 days per annum, which allows for major holidays such as Christmas/New Year and Easter so as to minimise interactions with major public holiday traffic periods;
- Traffic count point is the intersection of the Project Area access road with the Goldfields Highway;
- Non-residential workforce movements are fly in/out via Wiluna airport and there is a daily bus service connecting the airport with the Project site. The bus service will coincide with flight arrivals and departures;
- Truck utilisation of 40 tonnes unless specified otherwise (i.e. using double trailer road trains);
- De-commissioning phase activities would equate to 10 per cent of ongoing operations and production phase inbound volumes and 50 per cent of bus fleet movements; and
- On-going site monitoring includes an allowance for a light vehicle movement once per week between Wiluna and the Project site.

4.5 Construction Phase
The major construction, mining and workforce transport related estimates during the construction period are summarised in Table 4-1
Table 4-1 Construction Phase Profile

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantities transported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel (litres)</td>
<td>880,000</td>
</tr>
<tr>
<td>Loose construction items (freight tonnes)</td>
<td>20,000</td>
</tr>
<tr>
<td>Construction Steel (tonnes)</td>
<td>10,000</td>
</tr>
<tr>
<td>Cement (tonnes)</td>
<td>600</td>
</tr>
<tr>
<td>Camp facilities (portable building)</td>
<td>190</td>
</tr>
<tr>
<td>Mining Equipment Fleet (road deliveries from Perth)</td>
<td>69</td>
</tr>
<tr>
<td>Workforce Movements to/from Wiluna (annual trips)</td>
<td>270</td>
</tr>
</tbody>
</table>

4.6 Operations Phase

The worksheet “Base Case Commodity Volumes” in Appendix 3, Trip Planning & Commodity Estimates, provides the estimated tonnages for operational requirements. The requirements for the operations phase are estimated at approximately 43,500 tpa. Summarised in Table 4-2 are the major operations phase commodities planned for the Project.

Table 4-2 Operations Phase Commodity Estimates

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Volume (per annum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel requirements (range across the Project):</td>
<td>4.1 – 9.6m litres</td>
</tr>
<tr>
<td>Sodium Carbonate</td>
<td>18,000 tonnes</td>
</tr>
<tr>
<td>Sodium Hydroxide</td>
<td>16,500 tonnes</td>
</tr>
<tr>
<td>General Freight</td>
<td>700 tonnes</td>
</tr>
<tr>
<td>Hydrogen Peroxide</td>
<td>600 tonnes</td>
</tr>
<tr>
<td>Flocculants</td>
<td>500 tonnes</td>
</tr>
<tr>
<td>Mining Consumables</td>
<td>500 tonnes</td>
</tr>
<tr>
<td>Grinding Media</td>
<td>500 tonnes</td>
</tr>
<tr>
<td>Sulphuric Acid</td>
<td>200 tonnes</td>
</tr>
<tr>
<td>UOC</td>
<td>1,200 tonnes</td>
</tr>
</tbody>
</table>

As per the Australian Dangerous Goods Code (ADGC), all Dangerous and Hazardous goods used by the Project (as listed in Table 4-2) would be transported in accordance with relevant Commonwealth and Western Australian legislation and regulations applying at the time of delivery to the Project.

4.7 Transport Profile

Using the construction, operations, de-commissioning and on-going site monitoring phase requirements as described above, the AADT was determined to establish a transport profile.
(see Figure 4-1). The profile is based on the assumption of double trailer road trains at the traffic count point of the Goldfields Highway and access road to the Project Area covering the Project’s deliveries to and from the Project site.

As indicated in Figure 4-1, the peak traffic volume for the Project occurs during the construction phase, which is at approximately 27 AADT. Similarly, the AADT during the operations phase of the Project is estimated to be 12 AADT while de-commissioning traffic volumes were estimated to be 10 AADT and <1 AADT for the on-going site monitoring phase.

The Project traffic flows have been established by transport route and associated traffic volumes (AADT) have been determined for construction (See Figure 4-2), operations (See Figure 4-3), de-commissioning (see Figure 4-4) and the on-going site monitoring phases (See Figure 4-5) covering the life of the Project.
Figure 4-1 Wiluna Uranium Project - Traffic Volume Profile

AADT

- Construction
- Operations
- De-comissioning
- On-going site monitoring
Figure 4-2 Construction Traffic: Transport Routes & Volumes (AADT)
Figure 4-3 Operations Traffic: Transport Routes & Volumes (AADT)
Figure 4-4 De-commissioning Traffic: Transport Routes & Volumes (AADT)
Figure 4-5 On-going site monitoring: Transport Routes & Volumes (AADT)
5 Transport Assessment

5.1 Introduction

From the information and identified transport routes in Section 4, the likely effects of the Project transport requirements using the existing transport network across the four Project phases are discussed.

The section compares the Project’s transport requirements to determine likely effects to Levels of Service (LoS) to the existing traffic flows as shown in Section 3 using the road network.

The section concludes with a discussion about the transport effects at the intersection of the Goldfields Highway and access road to the Project Area along with the transport requirements associated with the Project workforce movements.

5.2 Effects of the Project’s transport requirements on the road network

The likely effects of the Project’s transport profile across the construction, operations, decommissioning and on-going site monitoring phases may change the Level of Service (LoS) for each of the proposed transport routes. LoS is a ranking system associating traffic conditions from ‘free-flow’ conditions (Level A) to ‘forced flow’ conditions (Level F - heavily congested) along a given route.

The major roads in the vicinity of the Project Area are predominantly sealed, two lane roads (See Table 3-1). Table 3-1 The AustRoads Guide to Traffic Management Part 3: Traffic Studies and Analysis 2008 states typical capacity of a rural two-lane road as operating at a LoS C whereby the traffic operates at a stable flow with some limitations to speed and manoeuvrability as there are various communities in which the roads pass through and sight distances given the terrain may restrict overtaking manoeuvres as well as traffic flow. With LoS C, the capacity for such roads is a rate of up to 1,190 passenger car units per hour in both directions.

Allowing for daily fluctuations in traffic volumes (changes within 5 per cent are considered to be contained within the daily fluctuation), the LoS on roads shown in Table 3-1 would be expected to operate at LoS C (or higher) and well within capacity. The effects of the Project’s transport requirements along the proposed roads would be those instances where outcomes equal or exceed 5 per cent of the existing AADT.

The key traffic data provided in Table 3-2 and Figure 4-1 to Figure 4-5 is combined to determine the effects of the Project’s transport profile on the existing road transport network across all four phases (See Table 5-1).
### Table 5-1 Effects of the Project’s transport profile

<table>
<thead>
<tr>
<th>Origin Point</th>
<th>Road Name</th>
<th>Section</th>
<th>Existing road traffic conditions</th>
<th>Project transport volumes (AADT)</th>
<th>% change in AADT</th>
<th>Potential changes to Los conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Existing traffic traffic conditions</td>
<td>Transport volumes (AADT)</td>
<td>% change in AADT</td>
<td>Potential changes to Los conditions</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>AADT</td>
<td>LoS</td>
<td>Construction</td>
<td>Operations</td>
</tr>
<tr>
<td>Kalgoorlie - Boulder</td>
<td>Goldfields Highway</td>
<td>Kalgoorlie-Boulder to Leonora</td>
<td>482</td>
<td>C</td>
<td>1</td>
<td>&lt; 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leonora to Leinster</td>
<td>374</td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perth</td>
<td>Great Northern Highway</td>
<td>Wubin to Mount Magnet</td>
<td>555</td>
<td>C</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mount Magnet to Leinster</td>
<td>271</td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leinster</td>
<td>Goldfields Highway</td>
<td>Leinster - proposed access road</td>
<td>149</td>
<td>C</td>
<td>14</td>
<td>6</td>
</tr>
<tr>
<td>Wiluna</td>
<td>Goldfields Highway</td>
<td>Wiluna - proposed access</td>
<td>75</td>
<td>C</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td>Norseman</td>
<td>Eyre Highway</td>
<td>Norseman to WA/SA Border</td>
<td>558</td>
<td>C</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td>Total transport profile</td>
<td></td>
<td></td>
<td>27</td>
<td>12</td>
<td>10</td>
<td>&lt;1</td>
</tr>
</tbody>
</table>

**TRANSPORT PROFILE**
5.3 Effects of Project’s transport profile

5.3.1 Major roads

Table 5-1 Effects of the Project’s transport profile - provides a comparison of the existing AADT and LoS with the estimated AADT increase and percentage increase for each of the major roads identified for use by the Project.

Across all four phases of the Project, the transport requirements to and from the Project site would not significantly impact the existing LoS across the proposed road network. The LoS across the road network is anticipated to remain at LoS C throughout the Project life.

The Goldfields Highway between Leinster and Wiluna would experience increases in traffic flow due to the Project’s transport requirements. During the construction phase (worst case) it is anticipated there would be a 9 per cent increase in traffic flows for traffic originating from Leinster with a 17 per cent increase for Wiluna originating traffic on the Goldfields Highway. Once the construction phase had been completed it is anticipated that thereafter transport requirements would reduce. Any increase would be contained to 4 per cent, which is within the accepted 5 per cent variation of daily traffic flow.

Across the remainder of the road network the percentage increases in traffic flow across the majority of the road network are anticipated to be less than 1 per cent, with the worst case being the Great Northern Highway and Mt Magnet – Leinster Road in the construction phase of the Project where an increase of less than 4 per cent is anticipated. This would be within the accepted 5 per cent variation of daily traffic flow.

The existing low traffic volume on the Goldfields Highway between Leinster and Wiluna along this section of the highway magnifies the effect of the Project’s transport requirements. Despite the increase in AADT on this section of the Goldfields Highway the LoS for this section remains at Level C as the Project’s transport requirements, during the construction phase equates to less than a 1 per cent increase in the 1190 vehicle movements for Level C categorisation.

While the major effect of the Project’s transport requirements would be primarily in the planned year for the construction phase, the Project would further investigate management strategies during detailed planning such as;

- the use of triple trailer road trains (the transport profile is based on double trailer road trains); and
- scheduling movement to avoid peak times and reduce congestion of transport deliveries.

The use of such management strategies is anticipated to minimise the effects of the Project’s transport requirements on this section as well as across the road network.

5.3.2 Intersection of the Goldfields Highway and access road to the Project.

The access road to the Project Area would create a new intersection with the Goldfields Highway south of Wiluna. The Project is planning to construct an unsealed two way access road connecting the Project Area with the Goldfields Highway. This would require the construction and installation of a T-intersection configuration and layout with the Goldfields Highway. The access road to the Project Area would be in an easterly direction (i.e. the access road would be on the right side of the Goldfields Highway heading north to Wiluna). Formal discussions with MRWA have yet to take place as to the exact location and alignment of the proposed T-intersection with the Goldfields Highway. The location of the
T-intersection would be identified as Project planning progresses and would be established in conjunction with MRWA to ensure adequate sight distances in either direction of the intersection are retained along the Goldfields Highway as well as other safety requirements for existing road users approaching the proposed intersection.

The proposed T-intersection would be designed and constructed with appropriate road signage by the Project to comply with MRWA technical standards and layout requirements (see Appendix 4) to allow for double and triple trailer road train movements between the Goldfields Highway and the Project Area access road.

The Project would also consult with MRWA on requirements for:

- slip lanes and turning lanes for turning or merging traffic through the intersection;
- extent of a sealed surface around the intersection and along the Project Area access road; and
- location of an inspection bay for removal of dust or mud from vehicles travelling along the Project Area access road prior to entering the Goldfields Highway.

5.3.3 Transport services for the Project workforce

To support fly-in/fly-out arrangements for Toro staff and contractors during the construction, operations and de-commissioning phases of the Project, a bus service would operate from the Wiluna airport to the Project site. The on-going site monitoring phase would be supported by a light vehicle to travel between Wiluna and the Project site.

Project workforce planning includes the potential for recruitment locally and regionally to be supported by the availability of bus services. The transport profile presented (See Section 4) has not included this potential transport requirement, as the likely volumes are not anticipated to significantly affect the findings or existing traffic flows presented in this section.

The Project is planning to work closely with existing airlines servicing Wiluna to provide seat availability on existing air services and opportunities for additional flights if required to meet the Project requirements for workforce movements.
6 Key Findings

The key findings from the Project’s transport design and effects are:

- The estimated transport requirements converted to AADT for the profile life have been established for each of the Project phases at the traffic count point of the Goldfields Highway and Project Area access road:
  - construction (27 AADT);
  - operations (12 AADT);
  - De-commissioning (10 AADT); and
  - On-going site monitoring phase (<1 AADT).

- The construction phase transport requirements would increase traffic volumes on the Goldfields Highway by respectively, 9 per cent between Leinster and 17 per cent between Wiluna and the Project Area access road (worst case).

- Across the remaining Project phases, the Project’s transport requirements using the road network between Perth, Kalgoorlie-Boulder to Leinster and Kalgoorlie-Boulder to the Western Australia /South Australia border would not be affected as the increased transport requirements:
  - are within the accepted 5% variation of daily traffic flow; and
  - retain the existing Levels of Service (LoS) at Level C for other road users.

- The Project would work collaboratively with MRWA on location, design, layout and construction issues to secure necessary approvals for the proposed T-intersection with the Goldfields Highway and access road to the Project Area.

- Opportunities for fly in/ fly out services along with bus services to support local and regional employment will be investigated during detailed Project planning.
7 Appendices
Appendix 1

Photographs of major road network
Photo 1  Typical view along the Goldfields Highway

(Source: A Irving)

Photo 2  View of Wiluna township

(Source: A Irving)
Photo 3  View of Leonora township

(Source: A Irving)

Photo 4  View of Menzies township

(Source: A Irving)
Eyre Highway Photos

Photo 5  Road view along the Eyre Highway

(Source: A Irving)

Photo 6  RFDS road air strip

(Source: A Irving)
Photo 7  Start of Wiluna airstrip

(Source: A Irving)

Photo 8  Border Village roadhouse

(Source: A Irving)

Photo 9  Road signage

(Source: A Irving)
Appendix 2

Austroads Vehicle Classification
## AUSTRoads Vehicle Classification System

<table>
<thead>
<tr>
<th>Length (indicative)</th>
<th>Vehicle Type</th>
<th>AUSTRoads Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Short</strong> up to 10.5m</td>
<td>Light Vehicles</td>
<td></td>
</tr>
<tr>
<td>1 or 2 axes</td>
<td>Short</td>
<td>$d_{1} \leq 3.2m$ and $axes = 2$</td>
</tr>
<tr>
<td>3.4 or 6 axes</td>
<td>Steel - Trailers, Caravan, Bikes, etc</td>
<td>$d_{1} \leq 1.2m$, $d_{2} \leq 3.2m$, $d_{1} \leq 3.2m$, $d_{2} \leq 2.1m$ and $axes = 3$ or 6</td>
</tr>
<tr>
<td><strong>Medium</strong> 6.5m to 14.6m</td>
<td>Mixed</td>
<td></td>
</tr>
<tr>
<td>2 axes</td>
<td>Two Axle Truck or Bus</td>
<td>$d_{1} \leq 3.2m$ and $axes = 2$</td>
</tr>
<tr>
<td>3 axes</td>
<td>Three Axle Truck or Bus</td>
<td>$axes = 3$ and $groups = 2$</td>
</tr>
<tr>
<td>&gt; 3 axes</td>
<td>Four Axle Truck</td>
<td>$axes = 4$ and $groups = 2$</td>
</tr>
<tr>
<td><strong>Long</strong> 11.5m to 18.6m</td>
<td>Mixed</td>
<td></td>
</tr>
<tr>
<td>3 axes</td>
<td>Three Axle Articulated</td>
<td>$d_{1} \leq 3.2m$, $axes = 3$ and $groups = 3$</td>
</tr>
<tr>
<td>4 axes</td>
<td>Four Axle Articulated</td>
<td>$d_{2} \leq 2.1m$ or $d_{1} \leq 3.2m$ and $axes = 4$ and $groups = 2$</td>
</tr>
<tr>
<td>5 axes</td>
<td>Five Axle Articulated</td>
<td>$d_{2} \leq 2.1m$ or $d_{1} \leq 3.2m$ and $axes = 5$ and $groups = 2$</td>
</tr>
<tr>
<td>&gt; 6 axes</td>
<td>Six Axle Articulated</td>
<td>$axes = 6$ and $groups = 2$ or $axes = 6$ and $groups = 3$</td>
</tr>
<tr>
<td><strong>Medium Combination</strong> 17.2m to 25.5m</td>
<td>Double or Heavy Articulated</td>
<td>$axes = 6$ and $groups = 6$</td>
</tr>
<tr>
<td>&gt; 6 axes</td>
<td>Double Road Train</td>
<td>$axes = 6$ and $groups = 6$</td>
</tr>
<tr>
<td><strong>Large Combination</strong> Over 33.2m</td>
<td>Triple Road Train</td>
<td>$groups = 6$ and $axes = 6$</td>
</tr>
</tbody>
</table>

**Definitions:**
- **Group:** Axle group, where additional axles are less than 2.1m apart
- **Axes:** Number of axle groups
- **Axes:** Number of axles (maximum axle-spacing of 10.3m)
- $d_{1}$: Distance between first and second axle
- $d_{2}$: Distance between second and third axle
Appendix 3

Trip Planning & Commodity Estimates
## Wiluna Uranium Project - Assumptions & Definitions

<table>
<thead>
<tr>
<th>ITEM</th>
<th>ASSUMPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project Time line</strong></td>
<td>Transport profile created for the 15 years including construction &amp; Decommission program</td>
</tr>
<tr>
<td>(1) Construction</td>
<td>2013</td>
</tr>
<tr>
<td>(2) Production</td>
<td>2014 to 2027</td>
</tr>
<tr>
<td>(3) Decommission</td>
<td>2028</td>
</tr>
<tr>
<td>Year</td>
<td>Calendar Year (Jan-Dec)</td>
</tr>
<tr>
<td><strong>Available Activity</strong></td>
<td></td>
</tr>
<tr>
<td>(1) Weeks/pa</td>
<td>50</td>
</tr>
<tr>
<td>(2) Days/Week</td>
<td>7</td>
</tr>
<tr>
<td>(3) Days/year</td>
<td>350</td>
</tr>
<tr>
<td><strong>Traffic Count Location</strong></td>
<td>Entry from Goldfields Highway &amp; access road to the Wiluna Uranium Project</td>
</tr>
<tr>
<td><strong>Truck Design</strong></td>
<td></td>
</tr>
<tr>
<td>A or B Double Prime Mover/trailer combinations</td>
<td></td>
</tr>
<tr>
<td>Pipes &amp; Structural Steel - 10 metric tonnes per A or B double</td>
<td></td>
</tr>
<tr>
<td>Everything else - 20 Freight Tonnes A or B double</td>
<td></td>
</tr>
<tr>
<td><strong>Construction Items</strong></td>
<td>Delivered in 2013</td>
</tr>
<tr>
<td>10,000 tonnes - steel</td>
<td></td>
</tr>
<tr>
<td>9,000 cbm cement</td>
<td></td>
</tr>
<tr>
<td>20,000 F/tonnes - general Freight</td>
<td></td>
</tr>
<tr>
<td><strong>Camp Requirements</strong></td>
<td>150 pre-fab building estimated at 14m (l) x 3m (w) x 3m (h) + 25% for Admin etc</td>
</tr>
<tr>
<td><strong>Camp Location - Construction/Operations</strong></td>
<td>Wiluna Uranium Project Site</td>
</tr>
<tr>
<td><strong>Workforce Movements</strong></td>
<td>Daily bus movement to/from Wiluna Airport to connect with a daily flight per day 5 day/week</td>
</tr>
<tr>
<td><strong>Basis of Construction</strong></td>
<td>Stick Build on site. No allowance for Offsite construction/Fabrication</td>
</tr>
<tr>
<td><strong>Mining Fleet</strong></td>
<td>Position in 2013, Fleet not replaced and after 10 years use retained on site</td>
</tr>
<tr>
<td><strong>Light Vehicles - Construction</strong></td>
<td>Fleet of 20 - individually delivered at start and returned at finish of construction</td>
</tr>
<tr>
<td><strong>Light Vehicles - Production</strong></td>
<td>Fleet of 10</td>
</tr>
<tr>
<td>Delivered 4 per truck in 2104</td>
<td></td>
</tr>
<tr>
<td>Vehicles Replaced very 5 years</td>
<td></td>
</tr>
<tr>
<td>20% counted for daily travel to/from Wiluna Uranium Project site</td>
<td></td>
</tr>
<tr>
<td><strong>Bus Fleet - Construction/Operations</strong></td>
<td>1 Bus replaced after 5 years used</td>
</tr>
<tr>
<td>Counted as 1 truck movement when being delivered/returned from WUP site</td>
<td></td>
</tr>
<tr>
<td>1 round trip per weekday Wiluna Project Site/Wiluba Airport (ie bus remains on site and starts/finishes journey)</td>
<td></td>
</tr>
<tr>
<td><strong>Cranes - Construction</strong></td>
<td>3 x 150t (3 truck per crane)</td>
</tr>
<tr>
<td>2 x 300t (12 trucks per crane)</td>
<td></td>
</tr>
<tr>
<td>1 x 800t (24 trucks with counterweights filled at site)</td>
<td></td>
</tr>
<tr>
<td><strong>Cranes - Production</strong></td>
<td>1 x 150t (1 truck per crane)</td>
</tr>
<tr>
<td><strong>Heavy Vehicles - Construction</strong></td>
<td>Fleet - 10 trucks, forklifts etc individually delivered at start and returned at finish of construction</td>
</tr>
<tr>
<td><strong>Heavy Vehicles - Production</strong></td>
<td>Fleet - 1 truck individually delivered at start and returned at finish</td>
</tr>
<tr>
<td>1 truck used daily to/from Wiluna</td>
<td></td>
</tr>
<tr>
<td>Vehicles Replaced very 5 years</td>
<td></td>
</tr>
<tr>
<td>Counted as 1 truck movement when being delivered/returned from Wiluna Uranium project</td>
<td></td>
</tr>
<tr>
<td><strong>De-commissioning</strong></td>
<td>10% of inbound volumes + Vehicle traffic cover buses etc</td>
</tr>
<tr>
<td>Item</td>
<td>Assumption</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>-------------------------------------------------</td>
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<td>Production Quantity (mtpa)</td>
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</tr>
<tr>
<td>Diesel (litres/tonne)</td>
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<tr>
<td>Grinding Media (tpa)</td>
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<td>Consumables (Oils &amp; Lubs, Spares etc) (t/week)</td>
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<tr>
<td>Flocculant - CCD (tpa)</td>
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<tr>
<td>General Freight (t/day)</td>
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<td>Hydrogen Peroxide (tpa)</td>
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<td>SAG Mill Liners (tpa)</td>
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<tr>
<td>Sodium Bicarbonate (tpa)</td>
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</tr>
<tr>
<td>Sodium Carbonate (tpa)</td>
<td>18000</td>
</tr>
<tr>
<td>Sodium Hydroxide (tpa)</td>
<td>16500</td>
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<tr>
<td>Sulphuric Acid (tpa)</td>
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</tr>
<tr>
<td>Uranium Oxide Concentrate (tpa)</td>
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<tr>
<td>Camp Consumables (ie food, linen etc)</td>
<td>1 round trip deliveries (Kal/Wiluna Uranium project) per week.</td>
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<tr>
<td>Toro Fuel Estimate (litres/pa)</td>
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</tr>
<tr>
<td>Diesel - Construction</td>
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<tr>
<td>Diesel - Communication</td>
<td>600000</td>
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<td>Diesel - Power Generation</td>
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<tr>
<td>Diesel - Construction Transport (LV, Buses, trucks etc)</td>
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<tr>
<td>Diesel - Mining + Transport (LV, Buses, trucks etc)</td>
<td>See Base commodity</td>
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</table>
## Wiluna Uranium Project: Base Case - Estimated Vehicle Movements - All Road Traffic

### Version 2 - 20th May 2011

| AREA | ACTIVITY | ITEM | DATES OF MONITORING | CAPACITY | PANELS & IMPACTS | ESTIMATED MOVEMENTS | TONNES | MOVEMENTS | TONNES | MOVEMENTS | TONNES | MOVEMENTS | TONNES | MOVEMENTS | TONNES | MOVEMENTS | TONNES | MOVEMENTS | TONNES | MOVEMENTS |
|------|----------|------|---------------------|----------|-----------------|---------------------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|
|      |          |      |                     |          |                 |                     |        |           |        |           |        |           |        |           |        |           |        |           |        |           |        |           |        |           |        |           |
## Wiluna Uranium Project: Base Case - Estimated Vehicle Movements - All Road Traffic
### Version 2 - 20th May 2011

### Table: Estimated Vehicle Movements - All Road Traffic

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<thead>
<tr>
<th>Option</th>
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<td></td>
<td>Activity</td>
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<tr>
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<td>Item</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td></td>
<td>Tonne, Tonne Per Year, Tonne per 5 Days</td>
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#### CONSTRUCTION ACTIVITIES

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<tr>
<td>Camp + related materials</td>
<td>105,000 Tonne, 50 Tonne Per Week</td>
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<td>Ongoing Operational Requirements</td>
<td>3,000 Tonne</td>
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<tr>
<td></td>
<td>2,000 Tonne</td>
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<tr>
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<td>1,000 Tonne</td>
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#### MINING EQUIPMENT

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<th>Item</th>
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<td>Steel</td>
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<td>Cement</td>
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<tr>
<td>Construction items</td>
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<tr>
<td>General Freight</td>
<td>7,000 Tonne</td>
</tr>
<tr>
<td>Hydrogen Peroxide</td>
<td>500 Tonne</td>
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<tr>
<td>Sodium Carbonate</td>
<td>16,500 Tonne</td>
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<tr>
<td>Sulphuric Acid</td>
<td>45,570 Tonne</td>
</tr>
<tr>
<td>Flocculant CCD</td>
<td>2 Tonne</td>
</tr>
<tr>
<td></td>
<td>15 Tonne</td>
</tr>
<tr>
<td></td>
<td>2 Tonne</td>
</tr>
<tr>
<td></td>
<td>18,000 Tonne</td>
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#### CONSTRUCTION EQUIPMENT & ADMIN (LOOSE)

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<tr>
<th>Item</th>
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<tbody>
<tr>
<td>Dozers</td>
<td>38 Tonne</td>
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<tr>
<td>Grader</td>
<td>38 Tonne</td>
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<td>Miner Vermeer</td>
<td>100 Tonne</td>
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<td>Cat 980 Loader</td>
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<td>Road Trains</td>
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<tr>
<td>Light Vehicles</td>
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<tr>
<td>Self propelled &amp; counted as</td>
<td>15 Tonne</td>
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<tr>
<td>Construction workers</td>
<td>1,070 Tonne</td>
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<tr>
<td>Buses</td>
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<tr>
<td>Heavy Vechiles</td>
<td>1,070 Tonne</td>
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<tr>
<td>Light Vehicles</td>
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<tr>
<td>Cellar Mediterranean</td>
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<tr>
<td>Light Vehicles</td>
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#### CONSTRUCTION EQUIPMENT & ADMIN (DE-COMISSIONING)

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<tr>
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<tr>
<td>De-comissioning</td>
<td>1,235 Tonne</td>
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<tr>
<td>Export</td>
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<tr>
<td>De-comissioning</td>
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#### TOTAL

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<tr>
<td>Total Yrs</td>
<td>543 Tonne</td>
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<tr>
<td>Total Tonne per Year</td>
<td>46,744 Tonne</td>
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## Wiluna Uranium Project - Commodity List

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<th>Revision</th>
<th>Year</th>
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<tbody>
<tr>
<td><strong>WUP Flows</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Imports: To WUP</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diesel</td>
<td>Tonnes</td>
<td>Wiluna Uranium Project</td>
<td>1</td>
<td>748  4,760 3,655 3,485 3,655 3,655 3,995 8,075</td>
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<tr>
<td>Grinding Media</td>
<td>Tonnes</td>
<td>Wiluna Uranium Project</td>
<td>1</td>
<td>500  500 500 500 500 500 500 500</td>
</tr>
<tr>
<td>Consumables (Oils &amp; Lubs, Spares etc)</td>
<td>Tonnes</td>
<td>Wiluna Uranium Project</td>
<td>1</td>
<td>500  500 500 500 500 500 500 500</td>
</tr>
<tr>
<td>Flocculant - CCD</td>
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<tr>
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<td>60   60  60  60  60  60  60  60</td>
</tr>
<tr>
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<tr>
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<td>Tonnes</td>
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<td>1</td>
<td>16,500 16,500 16,500 16,500 16,500 16,500 16,500 16,500</td>
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<tr>
<td>Sulphuric Acid</td>
<td>Tonnes</td>
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<td>200  200 200 200 200 200 200 200</td>
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<tr>
<td><strong>Total Imports to WUP</strong></td>
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<td></td>
<td></td>
<td>748  42,340 41,235 41,065 41,235 41,235 41,575 45,655</td>
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<td><strong>Exports: from WUP</strong></td>
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<td><strong>Total Exports from WUP</strong></td>
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<td>1,200 1,200 1,200 1,200 1,200 1,200 1,200 1,200</td>
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<tr>
<td><strong>WUP Grand Total: Imports &amp; Exports</strong></td>
<td></td>
<td></td>
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<td>748  43,540 42,435 42,265 42,435 42,435 42,775 46,855</td>
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## Wiluna Uranium Project - Commodity List

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<thead>
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<td></td>
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<tr>
<td><strong>Imports: To WUP</strong></td>
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<tr>
<td>Diesel</td>
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<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
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</tr>
<tr>
<td>Consumables (Oils &amp; Lubs, Spares etc)</td>
<td>Tonnes</td>
<td>Wiluna Uranium Project</td>
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<td></td>
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<tr>
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<tr>
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<td>Hydrogen Peroxide</td>
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<td>Sodium Bicarbonate</td>
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<td></td>
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<td>200</td>
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<tr>
<td><strong>Exports: from WUP</strong></td>
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Production & Ongoing Operations

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## Wiluna Uranium Project - Fuel Estimate

### Wiluna Uranium Project Flows

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</tr>
</thead>
<tbody>
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</tr>
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<td>Diesel - Communication</td>
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<td>6,700,000</td>
<td>5,000,000</td>
<td>3,500,000</td>
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<td>7,300,000</td>
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Appendix 4

MRWA T-intersection drawing
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# Mine Closure and Rehabilitation

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<td>HSE</td>
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<tr>
<td>Version No.</td>
<td>1.0</td>
</tr>
<tr>
<td>Original Date</td>
<td>June 2011</td>
</tr>
<tr>
<td>Author</td>
<td>L Chandler, C Currie</td>
</tr>
<tr>
<td>Revision Date</td>
<td>10 July 2011</td>
</tr>
<tr>
<td>Approved by</td>
<td>R. Dossor</td>
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## Tenements

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<td>M53/122</td>
<td>M53/1090a</td>
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## Submitted by

Toro Energy Limited
35 Ventnor Avenue
WEST PERTH WA 6005
+61 8 9213 214 2100
info@toroenergy.com.au
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<td>Y</td>
<td>Required by OEPA as part of documentation for ERMP.</td>
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<td>Does the project summary include;</td>
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<td>Section 1.4 and 1.5. See also ERMP (to which this plan is appended) for information on the background and the history of the project.</td>
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<td>• Location of the project;</td>
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<td>• Comprehensive site plan(s);</td>
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<td>• Background information on the history and status of the project.</td>
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<td>Has a consolidated summary or register of closure obligations and commitments been included?</td>
<td>Y</td>
<td>Appendix A</td>
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<td>8</td>
<td>Has information relevant to mine closure been collected for each domain or feature (including</td>
<td>Y</td>
<td>Described in detail in ERMP, to which this plan is appended.</td>
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<td>Has a gap analysis been conducted to determine if further information is required in relation to</td>
<td>Y</td>
<td>Refer closure task list, Appendix C.</td>
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<td>Y</td>
<td>Section 4 – additional detail on stakeholder consultation is provided in the ERMP.</td>
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<td>Section 5</td>
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<td>design diagram?</td>
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<td>13</td>
<td>Does the MCP identify all potential (or pre-existing) environmental legacies, which may restrict the post mining land use (including contaminated sites)?</td>
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<td>Have the process, methodology and rationale been provided to justify identification and management of the issues?</td>
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<td>Section 6, Appendix B</td>
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<td>Closure criteria</td>
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<td>Closure financial provision</td>
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<tr>
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<td>Does the reviewed MCP include a summary of closure implementation strategies and activities for the proposed operations or for the site?</td>
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<td>Appendix B</td>
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<td>Does the MCP include a closure work program for each domain or feature?</td>
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<td>Appendix B</td>
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<tr>
<td>22</td>
<td>Have site layout plans been provided to clearly show each type of disturbance?</td>
<td>Y</td>
<td>Level of detail supplied appropriate stage of project. Additional information to be supplied in revised MCP used as basis for bonding.</td>
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<tr>
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<td>Does the MCP contain a schedule of research and trial activities?</td>
<td>Y</td>
<td>Close task register, Appendix C</td>
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<td>24</td>
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<td>Does the mine closure plan contain a description of management strategies including systems, and processes for the retention of mine records?</td>
<td>Y</td>
<td>Section 11</td>
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Corporate Endorsement:

I hereby certify that to the best of my knowledge, the information within this Mine Closure Plan and checklist is true and correct and addresses all the requirements of the Guidelines for the Preparation of a Mine Closure Plan approved by the Director General of Mines.

Name: Richard Dossor

Position: Project Director

Signed:  

Date: 10 June 2011

(NB: The corporate endorsement must be given by a senior representative from the tenement holder / operating company, for example the Registered Mine Manager or higher).
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Appendix A  Legal obligations register (closure and rehabilitation)

Appendix B  Closure risk assessment

Appendix C  Closure task register
Definitions

**Care and maintenance** – Period following temporary cessation of operations when infrastructure remains largely intact and the site continues to be managed.

**Closure** - the point at which operations cease and plant and infrastructure are removed. It includes decommissioning, rehabilitation and monitoring and typically culminates in tenement relinquishment.

**Closure planning** – A process that extends over the mine life cycle and continues until final tenement relinquishment.

**Completion criteria** Qualitative or quantitative standards of performance used to measure the success or otherwise of rehabilitation actions required for closure of a site.

**Controlled area** an area to which access is subject to control and in which employees are required to follow specific procedures aimed at controlling exposure to radiation.

**Decommissioning** – The process that begins near or at the cessation of mineral production and ends with the removal of all unwanted infrastructure and services.

**Disturbance** Any process resulting in substantial damage to the biotic and abiotic properties of ecosystems. Disturbance results in reduction in biodiversity and alteration to soils, landforms and hydrology.

**Domain** A group of landform(s) or infrastructure that have similar rehabilitation and closure requirements and objectives.

**Ecosystem processes** Interconnected processes that sustain the biodiversity of ecosystems, and drive the self-directed development of that ecosystem. Such processes involve all components of ecosystems, biotic and abiotic and include nutrient cycling/conservation, maintenance of appropriate hydrological regimes, soil quality, etc.

**Ecosystem services** Particular dynamic aspects of ecosystems that provide requirements for biotic and abiotic components. In a narrow sense, ecosystem services are defined “as goods and services that are provided by or are attributes of ecosystems which benefit humans” (Eamus et al. 2005).

**Environment** means living things, their physical, biological and social surroundings, and interactions between all of these. The social component of the environment includes the aesthetic, cultural, economic and social aspects that may directly affect or be affected by changes to the physical or biological environment.

**Keystone species** Species with a major role supporting other species by providing food, shelter or habitat. These often are canopy of dominant species in ecosystems.

**Local provenance** Material used to propagate plants (most often seed) collected from a narrowly defined geographic area, which closely matches the plant community types and physical environment where it is to be used (see provenance).

**Reference ecosystem** Ecosystem or landscape units used to provide a model for planning a restoration project. Measurements from reference systems (fixed reference points or plots where biodiversity is measured) are normally used to set appropriate levels measurable targets for rehabilitation projects.

**Rehabilitation** In restoration ecology rehabilitation (reclamation) is normally defined as a process where disturbed land is returned to a stable, productive and self-sustaining condition, taking future
land use into account. This process differs from the narrower definition of restoration by not aspiring to fully replace all of the original components of an ecosystem.

**Relinquishment** – Formal approval by the relevant regulating authority indicating that the completion criteria for the mine have been met to the satisfaction of the authority.

**Remediation** To clean up or manage the effects of contamination of soil or water.

**Restoration** Ecological restoration is distinguished from rehabilitation as the process of fully repairing the composition, structure, function and dynamics of pre-existing indigenous ecosystems.

**Revegetation** Return vegetation (indigenous or otherwise) to an area.

**Stakeholder** – A person, group or organisation with the potential to affect or be affected by the process or outcome of mine closure.

**Supervised area** an area in which working conditions are kept under review but in which special procedures to control exposure to radiation are not normally necessary.
### Acronyms and abbreviations

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<td>CCD</td>
<td>Counter Current Decantation</td>
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<td>CDNTS</td>
<td>Central Desert Native Title Services</td>
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<tr>
<td>DEC</td>
<td>Department of Environment and Conservation</td>
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<td>DSEWPC</td>
<td>Department of Sustainability, Environment, Water, Population and Communities (Commonwealth)</td>
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<td>Department of Indigenous Affairs</td>
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<td>DITR</td>
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<td>Environmental Management Strategy Document</td>
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<td>Environmental Management System</td>
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<td>Environmental Scoping Document</td>
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<td>GDA</td>
<td>Geocentric Datum of Australia</td>
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<td>GDV</td>
<td>Groundwater Dependent Vegetation</td>
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<td>Goldfields Gas Transmission pipeline</td>
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<td>MCP</td>
<td>Mine Closure Plan</td>
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<tr>
<td>Mtpa</td>
<td>Million tonnes per annum</td>
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<td>µm</td>
<td>Micrometres (or microns)</td>
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<td>Office of the Environmental Protection Authority</td>
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<td>OES</td>
<td>Outback Ecology Services</td>
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<td>Occupational Health Safety and Environment</td>
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<td>pH</td>
<td>Degree of alkalinity/acidity</td>
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<td>ROM</td>
<td>Run-of-mine</td>
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<td>SAG</td>
<td>Semi-Autogenous Grinding</td>
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<td>SDU</td>
<td>Sodium Diuranate</td>
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<td>SRE</td>
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<td>Total Dissolved Solids</td>
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<td>Threatened Ecological Community</td>
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<td>TSF</td>
<td>Tailings Storage Facility</td>
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<td>TSP</td>
<td>Total Suspended Particulates</td>
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<td>UOC</td>
<td>Uranium oxide concentrate</td>
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1 Introduction
The Wiluna Uranium Project (the Project) comprises a proposed open pit uranium mine, processing plant and associated infrastructure approximately 960km north-east of Perth, near the town of Wiluna, in Western Australia.

1.1 Purpose
This Conceptual Mine Closure and Rehabilitation Plan (Plan) has been prepared to guide Toro Energy Limited (Toro) in aspects of the Wiluna uranium project, which may affect the attainment of mine rehabilitation and closure outcomes. The plan identifies strategies to reduce impacts to the post-mining environment through the application of appropriate and effective planning, design and risk management. This plan is preliminary in nature and, accordingly, does not provide detailed prescriptions of how the rehabilitation and closure outcomes will be achieved.

This plan is being submitted to the Office of the Environmental Protection Authority (OEPA) and to the Department of Mines and Petroleum (DMP) as part of the pre-mining approvals process for the Wiluna Uranium Mine proposal.

The aims of the document are to:
- describe Toro’s vision for the post-mining environment in the project area, including a set of closure and rehabilitation objectives;
- stimulate discussion amongst stakeholders who may wish to contribute to Toro’s closure and rehabilitation planning;
- identify key environmental and social risks associated with planned or unplanned closure of the project;
- describe how key closure risks will be avoided or managed;
- identify measures by which Toro proposes to track its progress towards its closure and rehabilitation targets;
- propose a schedule for the further development of mine rehabilitation and closure planning beyond this initial phase; and
- satisfy government requirements for formally documenting Toro’s mine closure framework in a manner consistent with EPA/DMP guidelines (EPA/DMP, 2011).

1.2 Scope
This plan applies to the activities of Toro and its contractors throughout the life of the Wiluna uranium project (including the post-mining phase). The closure and rehabilitation objectives and strategies described in the plan address both planned and unplanned closure events, including temporary closure (“care and maintenance”), other than planned maintenance shut down events.
1.3  **Key Contact Details**

Toro (ABN 48 117 127 590) is an Australian uranium explorer and project developer. The key contact for this proposal is:

Mr Richard Dossor, Project Director – Wiluna Project  
Ph: + 61 8 9214 2100  
Fax: + 61 8 9226 2958  
Email: info@toroenergy.com.au

Toro’s head office is in Adelaide, South Australia:  
Toro Energy Limited  
3 Boskenna Avenue  
NORWOOD, SA 5067  
Ph: + 61 8 8132 5600  
Fax: + 61 8 8362 6655  

1.4  **Project Setting**

The Wiluna area is semi-arid with hot, dry summers and mild, dry winters. The land in the project area is characterised by gently sloping sand plains, dunes and alluvial flats. Lake Way is the most significant geomorphic feature in the locality. Most of the Lake Way playa is extremely flat-lying, with elevations varying between 490 and 491mRL. There are a number of gypsiferous dunes, which appear as small islands within the playa. The islands are generally elliptical in plan, and predominantly oriented along a northeasterly to southwesterly axis. The dimensions of the islands typically do not exceed 3km long x 1km wide. The maximum elevation of the island landforms above the surrounding surface of the playa generally does not exceed about 8m and slopes are in the order of 0.005 to 0.01m/m.

There are no permanent watercourses in the Project area. Intermittent surface water flows occur after heavy falls normally associated with cyclonic rains, which typically occur between January and March.

In the proposed mining areas groundwater occurs at shallow depth – typically at a depth of about 2m below ground level. The quality of water in shallow, unconfined alluvial and calcrete aquifers is variable, ranging from brackish (TDS ~3000 mg/L) to hypersaline (TDS >100,000 mg/L). The salinity of the groundwater in the Project Area generally increases down gradient (that is, salinity increases the closer one gets to Lake Way). Groundwater salinities also tend to increase with depth. No large-scale abstraction takes place in close proximity to the Project Area, although there are pastoral, municipal and industrial groundwater users in the wider region.

The Project Area is located over three land systems, of which the Carnegie and the Cunya land systems are the most common. The Carnegie land system represents the Lake Way salt lake and fringing saline alluvial plains and surrounding sand dunes. The Cunya land system represents the calcrete earths and platforms adjacent to Lake Way, which support halophytic shrublands and open Mulga woodlands further from the lake’s edge. The Violet land system represents the plains and low rises adjacent to Lake Way, located in the areas to the west of the Centipede deposit, in the general locality of the proposed plant site.

Soil textures in the Project Area ranged from clayey sand to clay. However, the majority of soils were classed as clayey sands, sandy loams or sandy clay loams. Soils underlain by calcrete at shallow depth typically contained a high proportion of gravel-sized (or coarser) rock fragments. Most soils tested during baseline characterisation were non-dispersive, although some showed a tendency to hard-setting or formation of crusts.
The soils in the Project Area show a wide range of permeabilities, with estimated values of saturated hydraulic conductivity spanning three orders of magnitude (from about 3 mm/hr to over 300 mm/hr). The range of plant-available water (per cent volume) values measured in soils from the Project Area is considered to be low to moderate (in the range of 15 per cent to about 25 per cent), which is typical of the soils of the region.

Soil pH values were predominantly alkaline, but ranged between pH 5.4 (acidic) to 9.4 (strongly alkaline). Soil salinity ranged from non-saline to extremely saline. Soil salinity tended to increase with depth. The majority of the soils assessed within the area of the Centipede deposit were classified as non-sodic. The majority of soils sampled were very low in organic carbon and had low to moderate levels of plant-available nutrients. Soil concentrations of trace metals were typically low, although background vanadium concentrations are high (exceeding DEC ‘environmental investigation levels”) in some parts of the Project Area. The baseline soils investigations did not identify any “legacy” sites within the Project footprint that are likely to constrain the post-mining use of land in the project area. However, increases in sediment arsenic levels were noted in a mine dewatering discharge area associated with mining operations at a location to the north of the proposed Project area. Details are provided in the ERMP.

Vegetation is dominated by mulga woodlands, hummock grasslands, saltbush and samphire shrublands. Minor areas of potentially groundwater dependent vegetation have been identified along drainage lines. Some of the lake fringe vegetation (Tecticornia species) has also been provisionally classified as groundwater dependent.

The vegetation provides fauna habitat for a range of terrestrial vertebrates. Surveys in the Project Area have identified 31 mammal species of which 20 are native, 105 bird species, 75 reptiles, and five amphibians. They do not include any threatened or priority species. Local calcretes are an important habitat for stygofauna and troglofauna.

The Project would be developed within the Lake Way and Millbillillie pastoral leases, both of which are held by Toro.

Wiluna occupies an important position in Aboriginal culture, with almost 40 per cent of the town’s population claiming Aboriginal descent. It is traditionally a major Law centre and plays a central role at Law time with people travelling from as far away as Docker River in the Northern Territory to conduct rituals in and around Wiluna. Archaeological and ethnographic sites in the Project Area provide evidence of traditional Aboriginal use of the land.

1.5 Project Overview
The Wiluna Uranium Project would involve the development of a uranium mine (in two deposits), associated processing plant and support infrastructure and the transport of product within Australia for export to international markets.

The Wiluna Project is located approximately 15km to south-east of the town of Wiluna and 960km to the north-east of Perth, in the Murchison region of Western Australia. The Project would involve mining the Lake Way and Centipede deposits. These are located, respectively, 15km south-east and 30km south of Wiluna (Figure 1). The mining and miscellaneous tenements that form part of the Wiluna Project are:

- MS3/45
- MS3/49
- MS3/113
- MS3/121
- MS3/122
- MS3/123
- MS3/147
- MS3/1090a
- MS3/124
- L53/150
- L53/157a
- L53/224
Given the shallow nature of the deposits, Toro proposes an open-pit mine using surface miners and conventional excavators. Processing would be carried out using a conventional agitated leach method. The process plant would include a grinding mill, mechanically agitated leach tanks and solution thickeners, it would aim to produce up to 1,200 tonnes per annum of uranium oxide concentrate over an anticipated mine life of up to 14 years. Tailings would be progressively stored in mined out pit voids and covered via backfilling.

The area of land that would be disturbed by mining and related activities is about 1,530 hectares over the life of the project.
Figure 1  Project location.
Figure 2  Project footprint: Centipede operations area, plant, roads and village.
Figure 3  Project footprint: Lake Way operations area and roads.
The principal activities planned for the Project include:

- Development and operation of a uranium mine encompassing the Lake Way and Centipede deposits;
- Construction and operation of a uranium ore processing, packing and handling facility;
- Re-development of the existing borefield to supply water to the Project;
- Support facilities including an accommodation village, mine administration buildings and workshops, haul roads, power generation and transmission facilities, water supply pipeline, communications systems and water and waste management;
- Transport of uranium product within Australia for export; and
- Rehabilitation and closure of the mine and other areas disturbed by the Project.
In order to plan and monitor its environmental management and rehabilitation activities, Toro has designated eight “management domains”, which broadly align with the key project activities described above:

1. Lake Way pit void and stockpiles (overburden, topsoil).
2. Centipede pit void, in-pit tailings storage area and stockpiles.
3. Access roads, haul roads and laydown areas (does not include ROM pad or any stockpiled mineralised materials).
4. “Controlled” areas of plant, including evaporation pond, ROM and mineralised material.
5. “Supervised” areas of plant.
6. Accommodation village.
7. Borefield and water distribution pipelines.
8. Evaporation ponds if not on mine path (not including process liquor pond).

1.6 Key Mine Components

1.6.1 Mining

The mineralisation for the Centipede and Lake Way deposits is between 1m and 15m below the land surface with the ore body varying in thickness up to about 6.5m. Because of the shallow nature of the deposits, surface miners and conventional excavators would do the open pit mining. Surface miners are tracked vehicles with cutting drums, which can break up very thin layers of material. It is unlikely drilling and blasting would be required. Because much of the uranium resource occurs at or below the water table in both deposits, dewatering of the open pits would be required. Water barriers would be installed to minimise the amount of water that would have to be pumped from the pits. Water from pit dewatering will be used in ore processing or in other mining applications, such as dust control. Ore will be transported in trucks via dedicated haulage roads to the processing plant close to the Centipede deposit.

The waste rock arising from mining is non-acid forming. Waste material above the ore zones (overburden) would be mined by either excavators and off highway dump trucks or scrapers. Ore mining would be achieved using the surface miner to cut approximately 0.25m benches in ore. The ore mining rate would ramp up over one year to approximately 1.3Mtpa. At Centipede this would require approximately 5Mtpa of waste rock to be moved in the first year and 2.7Mtpa for the following 4 years. At Lake Way, approximately 9Mtpa of waste rock would be mined in the first 3 years (Years 6 to 12) of mining. The total movement of material then would decrease to the end of the life of the mine.

Storage areas for topsoil and waste rock would be cleared adjacent to the mining areas. Non-mineralised overburden and waste rock would be stockpiled next to the pit until there was sufficient mined out void to allow direct backfill. Stockpiled waste would be separated into several categories to allow for selective placement during rehabilitation earthworks. Figure 5 and Figure 6 show the most likely sequence of the mine’s progression from mining through to rehabilitation, subject to detailed geological interpretation and operational requirements.
Figure 5 Proposed mining sequence – Centipede operations area (schematic).
1.6.2 Processing

At the processing plant a Semi-Autogenous Grinding mill (SAG) would reduce the ore particles to a \( P_{80} \) of about 400 \( \mu m \) (i.e. 80 per cent of the feedstock is of a particle size smaller than 400\( \mu m \)). Following grinding, a hydrocyclone would be used to sort the ore, prior to it being fed into the leach thickener.
Leaching of the thickened slurry would be performed at normal atmospheric pressure or at a low pressure in a series of mechanically agitated leach tanks. Steam would be injected into the insulated tanks to heat and maintain the slurry at the required operating temperatures, which may range from 90 to 120 degrees Celsius. Leaching would be undertaken in alkaline conditions by the addition of sodium carbonate. The leached slurry would then report to the counter current decantation (CCD) thickeners for recovery of leach solution. Underflow from the final stage of the CCD would be pumped to the Tailings Storage Facility (TSF).

The CCD overflow or filtrate, pregnant leach solution (PLS), containing the recovered uranium in solution, would be pumped to the plant via a lined evaporation pond. PLS would be recovered from the evaporation pond and pumped to a Pin Bed Clarifier. The clarified solution would be heated to approximately 85 degrees Celsius and uranium would be recovered as uranium oxide via a process that would begin with the precipitation of sodium diuranate (SDU) using sodium hydroxide.

The SDU precipitate would be re-dissolved using sulphuric acid. Any remaining vanadium in the solution would be removed by adjusting the solution pH to precipitate the aqueous vanadium and then separating the vanadium from the uranium rich solution by filtration. Uranium would be precipitated from the solution by the addition first of hydrogen peroxide and then sodium hydroxide to precipitate uranyl peroxide. The barren solution would be returned to the leach circuit.

The product slurry would be dewatered, centrifuged, dried and cooled before packaging in 205L plastic lined, steel drums. The drums would be weighed, labelled, loaded onto pallets, wrapped and placed into a shipping container for despatch from site by road transport. The details of each drum would be documented in accordance with regulatory requirements prior to despatch.

1.6.3 Water Supply
The total water demand for the Project is estimated at up to 2.5GLpa. Toro proposes to refurbish and upgrade a disused borefield at West Creek, approximately 10km south west of Wiluna, as the major source of water for processing and other needs, this will be supplemented with water from pit dewatering. A water treatment plant is required to produce approximately 32kL/hr of demineralised water for steam generation. In addition, approximately 5kL/hr of potable-quality water (<1000, mg/L TDS) will be required for product washing and for plant and camp amenities, this water would be generated via a reverse osmosis plant.

1.6.4 Energy Supply
The Dampier to Kalgoorlie Goldfields Gas Transmission (GGT) pipeline runs a short distance to the east of Lake Way and within 28km of the proposed plant location. The GGT has sufficient capacity and existing gas suppliers have sufficient quantities of gas to meet the energy demands of the project. Toro is currently conducting investigations into options for supply of gas to its plant. The current preferred option is to truck gas from a compression station southeast of Wiluna to the plant, although pipeline options are also being evaluated. The trucking option would involve approximately four truck movements per day. Backup diesel power generation would be maintained to cater for emergency power generation and to ensure security of production in the event that gas supply is interrupted.

1.6.5 Workforce Accommodation
Approximately 165 employees and contractors would be required during the operational phase of the Project. Management and professional roles will be filled by Toro staff whilst mining will be carried out via a mining contractor. Employees and contractors will be housed at the Project village, although some additional housing may be provided for operational managers and employees in Wiluna.
1.6.6 Transport
During the construction phase, some pre-assembled modules would be partly or fully constructed off-site and transported to site for final assembly. Movement of these items would likely occur along the transport route between Perth and Wiluna, via Kalgoorlie. Processing reagents and other materials required for the operational phase are also likely to be transported along this route.

Toro proposes to transport product by road to Adelaide for shipment from Port Adelaide or transfer to rail for movement to the Port of Darwin. The trucks would travel the Goldfields Highway to Kalgoorlie before moving east on the Eyre and Princess Highways. Some product may be railed from Adelaide to the Port of Darwin depending on the availability of shipping. Toro would also continue to evaluate the potential to transfer product from road to rail should a proposed intermodal facility at Parkeston, 5km east of Kalgoorlie, be developed during the life of the mine.

1.6.7 Decommissioning and Mine Rehabilitation
The Project is expected to have an operating life of up to 14 years (not including the construction and post-closure phases). At the end of its useful life, the processing plant would be decommissioned, dismantled and either buried in mined out voids or removed. Mined areas would be recontoured and rehabilitated in accordance with a future version of this Mine Closure and Rehabilitation Plan. Rehabilitation works would include demonstrating that areas disturbed by mining met agreed safety and environmental quality standards.

In the lead up to closure, reuse and recycling opportunities for fixed and mobile plant and infrastructure would be considered. This could include removal of selected equipment for use by a third party, or leaving some equipment or infrastructure (for example, water supply bores, power transmission infrastructure or access roads) in situ for alternative uses such as for pastoral or community purposes. Where no feasible or practicable alternatives were identified, the Project components would be decommissioned.

Typically, decommissioning activities could include –
- Decommissioning mining and processing facilities;
- Decommissioning water and power supply infrastructure; and
- Removal of accommodation and site office infrastructure.

All waste would either be returned to mine voids or be used to cover completed in-pit tailings storage facilities. At closure the surface topography would be similar to the pre-mining landscape. All mineralised wastes, including tailings, would ultimately be deposited below the natural grade of the land. Toro’s experience with backfilling waste rock in approved resource test pits indicates that there is minimal increase in the volume of mined material following excavation. This is likely due to the reduction in void space that occurs during mechanical handling of the vuggy calcrete that hosts the ore.

At Centipede some of the mined out pit would be used for tailings storage. Mining operations would start up to a year ahead of processing to allow for construction of tailings storage cells within the pit. As sections of the pit were mined out, a perimeter wall would be constructed inside the pit. Internal walls also would be constructed to allow for better water and settling management. These walls would be constructed in compacted layers from waste material. Tailings would be deposited into the cells from multiple points around the perimeter. Excess water would either be returned to the process plant or evaporated. As shown in Figure 7 and Figure 8, the wall would sit inside the pit enabling a perimeter drain to be constructed. This would facilitate monitoring and management of any seepage from the stored tailings. Once the tailings had dried sufficiently to operate machinery on them safely, they would be capped with waste rock material and rehabilitated to a form similar to the surrounding landforms.
Figure 7  Schematic of tailings storage facility (cross section).
Small portions of the ore body encroach into the southern branch of Abercromby Creek. When possible, sections of ore underlying the creek bed would be mined out in the dry season and backfilled immediately to re-establish the original profile of the creek bed. However, it will be necessary to provide flood protection bunds to prevent water ingress into the pit and to eliminate the potential for entrainment of backfilled materials or water from the pit void, should a flood occur during active mining or backfilling. The bund that would form the external walls of the tailings cell would be constructed along the perimeter of the creek to protect the mining and tailings operations from potential flooding and to preserve the capacity of the creek to handle a large rainfall event. The wall would be reinforced with rock armour to protect it from erosion.

Once the tailings cell had been filled and capped with non-mineralised waste, the shoreline of the creek would be rehabilitated to a form similar to the original creek bed so that there would be no lasting impact on the upstream environment (Figure 9).
At the Lake Way operations area, the waste rock would be placed back into the pit voids at similar elevations and slopes to the original topography. Backfilling would commence and continue through to the end of the mine, minimising the rehandling of waste and the time that the mining area was open. No tailings would be placed in the Lake Way pit void. As the ore-bearing material from Lake Way will either be converted to product or disposed of tailings in the Centipede pit void, the final land surface in the Lake Way operations area will ultimately be slightly lower than the original land.
surface. To compensate, the lake shoreline (lowest point in the topography) would be extended northward (Figure 10).

Figure 10  Lake Way operations area: post-mining land configuration (indicative).

As a portion of the Lake Way orebody is on the Uramurdah Creek floodplain, provision would be made to prevent flooding of the mine workings if a significant rainfall event should occur. As mining approached the creek, bunding would be constructed along the banks to prevent any inrush of water.
into the mining area. Following the completion of mining and backfilling adjacent to the creek, a temporary creek diversion, with bunding, would be established over the backfill. Mining could then progress through the creek. As the mining void was backfilled the creek line and surrounding areas would be re-established at a similar grade and location to the original creek line.

Surface disturbances would be rehabilitated and no stockpiles or elevated landforms would remain. Figure 11 illustrates how the expected land forms would be contoured and shows that similar profiles and slope angles to the original profiles would be created.

Figure 11  Schematic showing mining near Uramurdah Creek and temporary diversion.
2 Identification of Closure Obligations and Commitments

2.1 Statutory requirements
Closure and rehabilitation of the Wiluna uranium project must, as a minimum, satisfy general requirements set out in the following legislation:

- Environmental Protection Act 1986
- Contaminated Sites Act 2003
- Mining Act 1978
- Mines Safety and Inspection Act 1994
- Dangerous Goods Safety Act 2004
- Radiation Safety Act 1975
- Radiation Safety (Transport of Radioactive Substances) Regulations 2002

In addition, Toro has specific closure and rehabilitation obligations arising out of approvals issued under State and Commonwealth legislation. A register of project-specific requirements is provided in Appendix A (Obligations Register – Mine Rehabilitation and Closure).

2.2 Government and industry guidelines, policies and standards
The methods by which closure and rehabilitation outcomes may be achieved and the standards by which closure planning, design and implementation will be assessed are described in a range of guidelines and related publications, including:

- Mine Closure and Completion, Leading Practice Sustainable Development Program for the Mining Industry (Department of Industry Tourism and Resources, 2006a)
- Mine Rehabilitation, Leading Practice Sustainable Development Program for the Mining Industry (Department of Industry Tourism and Resources, 2006b)
- Guidance Statement No 6 – Rehabilitation of Terrestrial Ecosystems (EPA, 2006)
- Guideline 18: Rehabilitation requirements for mining projects (Queensland Department of Environment and Resource Management, 2008)
- Environmental Assessment Guideline No 4 -Towards Outcome Based Conditions (EPA, 2009)
- Draft Guidelines for Preparing Mine Closure Plans (EPA/DMP, 2011)

This Plan has been prepared in accordance with the draft Guidelines for Preparing Mine Closure Plans (EPA/DMP, May 2011) and also reflects the approaches recommended in the other guidelines listed above.

2.3 Toro corporate requirements
Toro is committed to good governance principles, including the recognition and management of risk (Toro corporate governance statement: http://www.toroenergy.com.au/governance.html, November 2010). The company has established the following policies, which are applicable to the planning and implementation of mine closure:

- Health & Safety Policy – WIL-HSE-POL-001;
- Environment Policy;
- Community Policy; and
- Indigenous Relations Policy.
This mine closure plan is one of a suite of interrelated plans and procedures that together support Toro’s Health, Safety and Environment Management System. The following documents may also contain information relevant to mine closure design, planning and implementation:

- Radioactive Waste Management Strategy;
- Tailings Operating Manual;
- Water Management Strategy;
- Vegetation Clearing and Soil Management Strategy;
- Waste Management Strategy;
- Erosion Monitoring Procedure;
- Soil and Overburden Classification Procedure; and
- Closure Provisioning Calculation Method.

Toro has established an obligations register to enable it to monitor its compliance with all legal obligations and commitments arising from the Wiluna Project. At the time of preparing this conceptual closure plan, Toro’s legal obligations and commitments relating to mine closure and rehabilitation were chiefly those arising from:

- Mining proposal (Reg ID 21674) and addenda (Reg ID 24204, Reg ID 28041) approved in relation to pre-mining works carried out at Tenement M53/224;
- Tenement conditions for tenements on which exploration activities (programmes of works) have been approved; and
- DEC works approval and draft licence conditions for a dewatering trial to be carried out in June 2011.

A number of commitments relating to closure have been made in the draft ERMP and associated scoping document. These have been provisionally included in the Closure Obligations Register (Appendix A), but will need to be confirmed following the completion of the public comments period of the ERMP and review of the ERMP by State and Commonwealth agencies.

The closure obligations register will be reviewed and updated by Toro on an annual basis.
3 Collection and Analysis of Closure Data
The key physical and biological information required for mine closure implementation and to evaluate Toro’s success in attaining is summarised in Table 1.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Why required</th>
<th>How acquired</th>
<th>How held / reviewed / reported</th>
</tr>
</thead>
</table>
| Topography | • To demonstrate that landforms will be compatible with pre-mining environment  
• To show that surface flow paths closely match pre-mining hydrology | Lidar survey and ground-based surveys | CAD files  
Data to be reviewed at least 3-yearly as part of mine closure plan review |
| Erosion | • To refine cover design | Ground-based surveys of transects | Annual and event-based surveys  
Results to be reviewed at least 3-yearly as part of mine closure plan review |
| Extent of ground disturbance and rehabilitation | • To demonstrate compliance with approval conditions  
• To provide basis for closure cost estimates | Ground-based and aerial surveys | Reviewed and reported annually in AER |
| Soil chemistry and radiochemistry | • To demonstrate that concentrations of trace elements, radionuclides and salts in soils affected by mining activities are compatible with the proposed post-mining land uses. | Baseline soils surveys (Outback Ecology, 2007 and 2011)  
Toro geochemical data and archived geological samples from exploration sampling | Hard copy and electronic reports  
Access database (backed up in Toro head office)  
Results to be reviewed at least 3-yearly as part of mine closure plan review |
| Soil and mine waste chemical (ESP, EC, pH) and physical characteristics and quantities | • Provides basis for identifying soil groupings requiring separate storage and management  
• Allows estimation of quantities available for constructing tailings cover systems | Baseline soils surveys (Outback Ecology, 2007 and 2011)  
Knight-Piésold conceptual tailings containment design (June 2011)  
6-monthly soil and | Hard copy and electronic reports  
Reviewed annually during preparation of AER |
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Why required</th>
<th>How acquired</th>
<th>How held / reviewed / reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Provides records of quantities and age of topsoil to be used in mine rehabilitation</td>
<td>mine waste testing and quantity inventory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groundwater elevation</td>
<td>• To assess groundwater flow in proximity to waste storages including evidence of effectiveness of perimeter barriers and evidence of integrity of tailings containment system</td>
<td>Monthly groundwater monitoring</td>
<td>Reviewed at least annually as part of AER and annual aquifer review</td>
</tr>
<tr>
<td>Groundwater quality</td>
<td>• To verify performance of waste disposal facilities</td>
<td>Quarterly groundwater monitoring</td>
<td>Reviewed at least annually as part of AER and annual aquifer review</td>
</tr>
</tbody>
</table>
| Climate data, especially rainfall, wind speed and direction and evaporation | • Information required for interpretation of erosion monitoring (wind or water erosion) and groundwater monitoring  
• To provide context for evaluation of vegetation monitoring data. | BoM data from Wiluna  
Site-based records of rainfall, wind speed and direction, temperature and evaporation. | Reviewed at least annually as part of AER and annual aquifer review |
| Vegetation density and diversity              | • To evaluate progress towards ecosystem restoration                         | Annual monitoring of quadrats                         | Reviewed annually during preparation of AER         |
| Vegetation condition                          | • To assess response of vegetation in rehabilitated areas to environmental stressors. | Review of seasonal multi-spectral satellite data and/or ground-based surveillance. | Reviewed and reported annually in AER             |
| Weed occurrence                               | • To assess ecosystem health                                                 | Annual weed surveys                                   | Reviewed and reported annually in AER             |
| Soil invertebrate biomass and diversity       | • To assess ecosystem health                                                 | 6-monthly sampling of soil meso- and macro-invertebrates. | Reviewed and reported annually in AER             |
| Tailings quantities and density               | • To check capacity of mine voids to contain wastes                           | Daily log of tailings discharge                        | Reviewed and reported annually in tailings review report. |
| Quantity and quality of seepage from          | • To confirm integrity of containment systems                                | Continuous recording of quantities                     | Reviewed weekly  
Reported annually                                     |
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Why required</th>
<th>How acquired</th>
<th>How held / reviewed / reported</th>
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</thead>
<tbody>
<tr>
<td>underdrainage systems (PLS storages)</td>
<td></td>
<td>If seepage present, event-based testing of quality</td>
<td></td>
</tr>
<tr>
<td>Tailings pore fluid quality</td>
<td>• To enable refinement of solute transport model.</td>
<td>Quarterly and event-based sampling and testing.</td>
<td>Review annually Update seepage model 3-yearly as part of closure plan review</td>
</tr>
<tr>
<td>Radiation</td>
<td>• To confirm effectiveness of cover system</td>
<td>As described in the Radiation Management Plan</td>
<td>As described in the Radiation Management Plan</td>
</tr>
</tbody>
</table>
4 Stakeholder Consultation

Toro initiated its stakeholder consultation programme immediately after it acquired its interest in the Wiluna Uranium Project in 2007 and there has been comprehensive stakeholder consultation since the Project was referred to government assessment in October 2009. The purpose of the consultation so far has been to identify issues that could be considered as part of the process of investigating Project alternatives and to assist in design and assessment of Project options.

4.1 Identification of Stakeholders

Toro’s consultation has covered government agencies, individuals, Indigenous organisations, the residents of Wiluna, Leonora, Laverton, Menzies and Kalgoorlie and non-government organisations. Toro has undertaken its own Project specific consultation in Wiluna and the wider region and has also participated in industry initiatives to provide information to local and regional communities about the Project and more general issues associated with uranium mining. This has included participation in community forums in Kalgoorlie, Wiluna, Leonora, Laverton and Menzies.

Toro has consulted Traditional Owners through their representative body, Central Desert Native Title Services (CDNTS). Toro has proposed the negotiation of a mining agreement with the Wiluna and Tarlpa native title claim groups. Outside this process it has engaged with other Aboriginal people. Toro maintains a consultation register. Details of consultation carried out to June 2011 were provide in Toro’s ERMP (2011). A list of the key stakeholders that have been identified by Toro is shown in Table 2.

Table 2 Key stakeholders

<table>
<thead>
<tr>
<th>Category</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government</td>
<td>Western Australian and Commonwealth Ministers and senior advisers</td>
</tr>
<tr>
<td></td>
<td>State and Commonwealth Government Departments and Agencies (Departmental and Agency heads and their senior reports)</td>
</tr>
<tr>
<td></td>
<td>Local Government representatives (Shires of Wiluna, Leonora, Laverton and Menzies and City of Kalgoorlie)</td>
</tr>
<tr>
<td>Non-government organisations and service providers</td>
<td>Community groups</td>
</tr>
<tr>
<td></td>
<td>Environmental groups</td>
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<tr>
<td></td>
<td>Private service providers</td>
</tr>
<tr>
<td>Industry and business</td>
<td>Local and regional industries and businesses (including mining companies)</td>
</tr>
<tr>
<td></td>
<td>Regional economic development boards</td>
</tr>
<tr>
<td></td>
<td>Industry organisations</td>
</tr>
<tr>
<td>Aboriginal groups</td>
<td>Native Title claimant groups</td>
</tr>
<tr>
<td></td>
<td>Other Aboriginal people claiming an interest in the Project</td>
</tr>
<tr>
<td>Landholders</td>
<td>Pastoral lease holders and managers</td>
</tr>
<tr>
<td>General public</td>
<td>Local</td>
</tr>
<tr>
<td></td>
<td>Regional</td>
</tr>
<tr>
<td></td>
<td>State</td>
</tr>
<tr>
<td></td>
<td>Non-government organisations</td>
</tr>
</tbody>
</table>
4.2 Consultation Process
The main steps in the initial consultation were to identify key communities and stakeholders and develop and implement a consultation programme appropriate to the scale of the Project and its impacts and benefits. A list of communities and key stakeholders (as per Table 2) was developed in the early stages of planning the Project and has been reviewed and expanded as consultation developed.

A particular effort has been made to engage the Wiluna Aboriginal community. This has included Toro’s participation in meetings of Traditional Owners, regular meetings between Toro and their representative body, Toro arranging for the Traditional Owners to secure independent advice on radiation and environmental matters, and Toro arranging visits to other mine sites by representatives of the Traditional Owners. This has been in addition to cultural heritage surveys undertaken in the Project Area.

The overall initial consultation programme was designed to ensure understanding of the scope of the Project, to discuss Project options and to provide opportunities for continuing community and stakeholder feedback so that reactions and concerns could be identified and addressed at an early stage. In doing so, Toro sought to establish a quality and transparency to its consultation, which would:

- Encourage communities and stakeholders to communicate their issues and concerns to the company so that they could be considered in the design of the Project;
- Demonstrate Toro’s desire to be pro-active and to respond to and follow up issues and concerns in a timely manner;
- Establish collaboration between Toro and the Wiluna community, in particular to foster mutual respect and trust and ensure mutually beneficial outcomes; and
- Provide a framework for on-going consultation during the construction, operating and rehabilitation phases of the Project.

Communications tools ranged from information sheets to public meetings, general information briefings and individual meetings and personal interviews with community representatives and stakeholders to discuss specific issues.

4.3 Ongoing Consultation
Toro has an office in Wiluna from which it manages local and regional community and stakeholder consultation as well as site activities. A Toro representative has specific responsibilities to manage day-to-day contact with the Wiluna community, including regular meetings with staff of the Wiluna Shire. The company representative also manages Toro’s input to the Wiluna Regional Partnership Agreement and the continuing development of its Indigenous training and employment program.

Consultation on mine closure and rehabilitation matters is one element of Toro’s Community and Stakeholder Consultation Program. The Consultation Program includes:

<table>
<thead>
<tr>
<th>Relevant communities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wiluna</td>
</tr>
<tr>
<td>Leonora</td>
</tr>
<tr>
<td>Laverton</td>
</tr>
<tr>
<td>Menzies</td>
</tr>
<tr>
<td>Kalgoorlie</td>
</tr>
</tbody>
</table>
• Maintaining a register of contact with the communities and stakeholders most likely to be affected by Project implementation or closure;
• Informing all those on the communities and stakeholder register of planned Project milestones including revisions to, and implementation of, closure and rehabilitation plans; and
• Regular community and stakeholder reporting would be provided on operational, environmental and social performance.

Toro would commit to the following specific methods to keep communities and stakeholders informed on mine closure and rehabilitation issues (in addition to any reporting obligations to government):

• The establishment of a Toro office in Wiluna at which the Community Relations Manager would be readily accessible;
• A quarterly newsletter;
• A half yearly briefing of members of the Wiluna Shire Council by senior Toro management;
• A half yearly briefing of representatives of the Traditional Owners by senior Toro management;
• A Community Issues Procedure to ensure prompt and documented responses to all issues (including those related to closure) raised with Toro, available for government review;
• An annual open day at site for the local community;
• An annual site visit for Non-government Organisation representatives;
• An annual report posted on Toro’s website on operational, environmental and social performance – such report to be externally audited every three years; and
• Regular provision of information to the local and regional press and media.

Toro would involve representatives of the local community in the monitoring of predicted operational impacts, as a means of transparently demonstrating the effectiveness of mine rehabilitation practices.
5 **Post-Mining Land Use and Closure Objectives**

5.1 **Post-closure land uses**

Mine closure and rehabilitation objectives must be defined in the context of proposed or likely land uses in the post-mining period. Apart from mining, the current land uses in the Shire of Wiluna include pastoral activities, customary uses (hunting, food gathering, ceremony) by traditional owners and some tourism. The Wiluna uranium project lies within the Lake Way and Millbillillie pastoral leases.

In preparing this Conceptual Mine Closure Plan, Toro has assumed that after cessation of mining land within the project area will revert to pastoral use and customary Indigenous uses, in combination with “ecosystem services”. It is possible that some current uses (for example grazing of livestock) may be temporarily or permanently excluded from the project area after mine closure, in order to protect re-established ecosystems. Details of the future use of land within the tenements that form part of the Wiluna project will be determined in consultation with relevant stakeholders (including, but not limited to pastoralists, local government authorities, Native Title holders) and the land will be reinstated to a condition compatible with the agreed post-mining use. Toro has not made provision for future use of the project area for storage of imported radioactive wastes.

5.2 **Closure goals and objectives**

Toro’s overall goals in relation to mine closure and rehabilitation are to ensure that land disturbed by Toro’s activities is:

- safe to both humans and wildlife;
- non-polluting;
- geotechnically and erosionally stable; and
- suitable for agreed post-mining land uses.

Toro will conduct its closure and rehabilitation activities in a way that is socially responsible and which demonstrates respect for the community in which it operates. Through consultation with stakeholders, Toro has identified the following specific objectives for mine closure and rehabilitation:

- “no surprises” in notifying employees and suppliers about mine closure timing and process;
- local stakeholders will have the skills and resources to take an active role in monitoring rehabilitation outcomes in the post-closure period;
- post-mining concentrations of metals, salts and radionuclides in soils and groundwater outside any engineered waste containment structures will be within the range of naturally occurring levels that existed in the project area pre-mining;
- vegetation communities in areas disturbed by mining will be demonstrably similar to natural ecosystems in the Wiluna area (especially where native vegetation is the proposed land use);
- surface water flow patterns will be returned to a condition that closely approximates pre-mining conditions where there has been a temporary surface water diversion;
- rehabilitated land will blend in visually with the surrounding undisturbed land; and
- Toro will aim to complete relinquishment of tenure within 10 years after cessation of mining.

The management actions required to achieve environmental and social objectives may vary for areas that are used for different purposes during the active life of the mine. Although the overall goals are the same (safe, non-polluting, stable), the work required to achieve those goals will be different for each of the management domains defined in Section 1.4.
6 Identification and Management of Closure Issues

6.1 Risk-based assessment of closure issues

In order to systematically identify and assess potential mine rehabilitation and closure issues associated with the Wiluna Project, Toro has carried out an aspects and impacts analysis and a risk assessment of closure impacts on a domain-by-domain basis.

The analysis of likelihood and consequence was carried out after developing specific impact criteria for each environmental value or factor (noise, dust, flora, fauna, water quality, etc). Impact criteria were defined in consultation with a wide range of technical specialists and took into account current government policy and established environmental standards (where they existed). A special effort was made to define impact criteria that are measureable, scientifically robust and unambiguous. The impact criteria used in conducting the risk assessment are provided in Appendix B

Many potentially significant risks have already been eliminated through design decisions taken during project development, for example the decision to backfill pit voids and to place all mineralised materials below the land surface at closure.

A range of environmental impacts were assessed as having “high risk” in terms of their potential to affect the attainment of closure objectives or to result in severe consequences relating to regulatory compliance or public perception. The risk matrix used to categorise risk events is provided in Appendix B. A summary of the “high risk” events relevant to mine rehabilitation and closure is presented in Table 3.

Table 3 Potentially high risk impacts (mine closure and rehabilitation)

<table>
<thead>
<tr>
<th>Domain</th>
<th>Risk Description</th>
<th>Proposed Controls</th>
</tr>
</thead>
</table>
| West Creek borefield   | Groundwater drawdown during water abstraction causes localised, persistent damage to vegetation, resulting in change in vegetation abundance or extent of groundwater dependent vegetation. | • Construct additional bores to reduce likelihood of overlapping drawdown cones  
   |                                                                     | • Seek additional brackish water source prior to project commencement         
   |                                                                     | • Conduct further research to establish ecological water requirements of vegetation |
|                        | Groundwater drawdown during water abstraction causes decline of subterranean fauna assemblage within localised zone where the range of the assemblage is not known to exist outside of the impact area. | • Maintain at least 60 per cent aquifer saturation during borefield operation.  
   |                                                                     | • Seek additional brackish water source prior to project commencement         |
|                        | Excessive pumping at borefield results in salinisation of shallow aquifer due to upwelling of deeper saline groundwater | • Strictly enforce water abstraction limits  
   |                                                                     | • Conduct regular monitoring of groundwater quality                         
<p>|                                                                     | • Seek additional brackish water source prior to project commencement         |</p>
<table>
<thead>
<tr>
<th>Domain</th>
<th>Risk Description</th>
<th>Proposed Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake Way and Centipede mining operations</td>
<td>Entrainment of water or sediment from disturbed areas during extreme flow event</td>
<td>• Limit exposed surface area and implement progressive rehabilitation as soon as</td>
</tr>
<tr>
<td>area</td>
<td>(&gt;1 in 100 year flood)</td>
<td>practical</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Provide bunding to exclude runoff from potentially contaminated areas.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Design drainage system to contain at least 1 in 100 year storm event during</td>
</tr>
<tr>
<td></td>
<td></td>
<td>operations phase of project</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Store all tailings and mineralised wastes below ground level.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Establish and maintain database of lake sediment and groundwater geochemistry.</td>
</tr>
<tr>
<td>Lake Way and Centipede mining areas</td>
<td>Contamination of shallow soils by metals or radionuclides as a result of poor</td>
<td>• Limit exposed surface area and implement progressive rehabilitation as soon as</td>
</tr>
<tr>
<td></td>
<td>dust control during operational life of mine</td>
<td>practical</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Control speed limits on haul roads and in mine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Provide dust suppression on haul roads, stockpiles and tailings storage as</td>
</tr>
<tr>
<td></td>
<td></td>
<td>required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Conduct routine radiometric surveys and dust monitoring during operating phase</td>
</tr>
<tr>
<td>Pit dewatering results in persistent or</td>
<td>persistent or permanent loss of abundance in groundwater dependent ecosystems</td>
<td>of project</td>
</tr>
<tr>
<td>permanent loss of abundance in</td>
<td></td>
<td>• Install vertical barriers around pit to minimise extent of drawdown.</td>
</tr>
<tr>
<td>groundwater dependent ecosystems</td>
<td></td>
<td>• Conduct further research into ecological water requirements, conservation status</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and rehabilitation requirements of lake fringe vegetation.</td>
</tr>
<tr>
<td>Processing plant</td>
<td>Undetected seepage from process water storage (including evaporation pond)</td>
<td>• Provide engineered containment systems with leak detection.</td>
</tr>
<tr>
<td></td>
<td>results in groundwater contamination.</td>
<td></td>
</tr>
<tr>
<td>Catastrophic loss of containment from process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ponds (for example during extreme flood</td>
<td></td>
<td>• Position processing facilities outside flood zone</td>
</tr>
<tr>
<td>event) results in release of process liquids</td>
<td></td>
<td>• Provide bunding compatible with at least 1 in 100 year storm</td>
</tr>
<tr>
<td>and contamination of lake sediment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Backfilled Centipede pit void</td>
<td>Discernible increase in radioactivity of surface soils at mine closure constrains</td>
<td>• Complete comprehensive radiation surveys as part of site decommissioning to</td>
</tr>
<tr>
<td></td>
<td>post-mining land uses</td>
<td>ensure that no mineralised material remains exposed at closure.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Conduct regular monitoring of tailings pore fluid during operational phase of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>project to refine cover design</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Conduct trials of cover system before finalising design</td>
</tr>
<tr>
<td>Domain</td>
<td>Risk Description</td>
<td>Proposed Controls</td>
</tr>
<tr>
<td>--------</td>
<td>-----------------</td>
<td>-------------------</td>
</tr>
</tbody>
</table>
| backfilled areas. | Unable to rehabilitate backfilled void because low tailings density prevents access by earthmoving plant. | • Complete further geotechnical testing of tailings prior to project commencement  
• Carry out regular testing of tailings density during operations  
• Regularly review storage volumes and waste inventory |
| Insufficient materials available to construct effective cover system. | | • Maintain materials inventory and review annually  
• Use information as basis for updating closure plan |
| Seepage of metals or radionuclides from backfilled wastes results in groundwater contamination. | | • Monitor tailings pore water fluid and groundwater  
• Periodically update seepage model |
| All operations areas and support facilities | Improper disposal of mineralised or contaminated materials | • Implement Radioactive Waste Management Plan  
• Implement Hazardous Waste Management Plan  
• Conduct periodic audits and contamination surveys |
Development of Completion Criteria

The main effect of implementing the Wiluna project arises from the direct disturbance of approximately 1,530ha of land. Other potentially significant impacts (described in the ERMP) include:

- temporary changes in groundwater levels in areas from which groundwater is abstracted for water supply and pit dewatering;
- alteration in soil quality as a result of mechanical disturbance or release of salts, radionuclides or trace elements from mining activities;
- alteration to surface water flow;
- reshaping of the land surface in the Centipede and Lake Way mining operations areas;
- on-site disposal of tailings and other wastes from mining activities; and
- socio-economic changes in the Wiluna community, including increased employment opportunities and skills development.

At cessation of mining and processing it will be necessary to demonstrate that the biophysical environment has been restored to a safe, stable, non-polluting condition which supports the target post-closure landuses. Toro has defined a preliminary list of closure criteria and indicators that will be used to monitor and evaluate the effectiveness of its closure and rehabilitation activities. These are summarised in Table 4.
### Table 4 Provisional completion criteria and indicators

<table>
<thead>
<tr>
<th>Factor</th>
<th>Closure Objectives</th>
<th>Indicators</th>
<th>Preliminary Completion Criteria</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Flora and vegetation</strong></td>
<td>- Rehabilitated areas will be revegetated to the extent that they display similar species diversity to pre-mining conditions and analog sites&lt;br&gt;- Response of vegetation to environmental stressors (such as drought) will approach that of vegetation in agreed control sites.</td>
<td>- Species diversity&lt;br&gt;- Vegetation density&lt;br&gt;- Weed occurrence&lt;br&gt;- Vegetation health</td>
<td>- 60-80% of pre-mining taxa have been re-established the decommissioned mine areas.&lt;br&gt;- Vegetation density similar to pre-mining density in same location, or to agreed analog location.&lt;br&gt;- Weed occurrence (types and frequency) similar to pre-mining density in same location, or to agreed analog location.&lt;br&gt;- Response to changed water availability similar to agreed analog sites.</td>
<td>Annual surveys (quadrats)&lt;br&gt;Annual weed surveys&lt;br&gt;Periodic review of multi-spectral data, timed to capture significant climatic events</td>
</tr>
<tr>
<td><strong>Landform stability</strong></td>
<td>- Rehabilitated areas show no evidence of gullyng or significant sheet erosion following intense storm events&lt;br&gt;- Backfilled areas can be safely trafficked by light vehicles and do not result persistent ponding of water</td>
<td>- Frequency and size of rills and gullies&lt;br&gt;- Quantity of sediment collected in settling ponds and other drainage structures.&lt;br&gt;- Occurence of soil crusts</td>
<td>- Surface stability measures (as described Landform Function Analysis) show increasing trend and are comparable to analog sites having similar soil types.&lt;br&gt;- No erosion features deep enough to penetrate the full depth of the plant growth medium of any cover system.</td>
<td>Annual and event based erosion surveys (transects)</td>
</tr>
<tr>
<td>Factor</td>
<td>Closure Objectives</td>
<td>Indicators</td>
<td>Preliminary Completion Criteria</td>
<td>Measurement</td>
</tr>
<tr>
<td>------------------------</td>
<td>------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Soil quality</td>
<td>• Contamination status of soils mined areas does not differ to pre-mining status</td>
<td>• Concentrations of trace elements, radionuclides, total salts</td>
<td>• Mean concentration of radionuclides, metals and salts in upper 1 metre of soil does not exceed pre-mining mean plus 1 standard deviation from the mean</td>
<td>Soil characterisation in accordance with sampling and analysis plan to be agreed with DEC and DMP</td>
</tr>
<tr>
<td></td>
<td>• Soils are compatible with agreed post-mining land uses</td>
<td>• Bulk density and plant available water</td>
<td>• Bulk density and plant available water content in soils to maximum depth of 1m are similar to pre-mining condition or to condition of agreed analog</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landforms and drainage</td>
<td>• The post-mining landform will blend with the surrounding terrain</td>
<td>• Scale and form of post-mining landforms</td>
<td>• No above ground storage of mineralised materials</td>
<td>Groundbased topographic surveys</td>
</tr>
<tr>
<td></td>
<td>• The direction and rate of surface water flows will not be materially different to pre-mining flows</td>
<td>• Location and hydrological attributes of drainage features</td>
<td>• Maximum height and scale to built landforms to resemble existing “islands” on Lake Way</td>
<td>Lidar data (for regional scale topographic and drainage information)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surface water</td>
<td>• Turbidity and chemical characteristics of runoff from rehabilitated areas are similar to runoff from agreed analog sites</td>
<td>Suspended solids, EC, pH and trace elements in unfiltered runoff samples</td>
<td>Insufficient surface water data are currently available to specify a completion criterion</td>
<td>Event based monitoring at agreed monitoring locations</td>
</tr>
<tr>
<td>Factor</td>
<td>Closure Objectives</td>
<td>Indicators</td>
<td>Preliminary Completion Criteria</td>
<td>Measurement</td>
</tr>
<tr>
<td>-------------</td>
<td>------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------</td>
</tr>
<tr>
<td>Fauna</td>
<td>• Natural recolonisation of disturbed areas by vertebrate and invertebrate fauna</td>
<td>• Biomass and diversity of soil meso and macrofauna</td>
<td>Demonstrable increase in biomass and diversity of soil meso and macrofauna overtime</td>
<td>Six-monthly sampling and annual review of soil invertebrates</td>
</tr>
<tr>
<td></td>
<td>• No evidence of accumulation of trace elements or radionuclides in invertebrates</td>
<td>• Concentrations of trace elements and radionuclides in invertebrate fauna</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radiation</td>
<td>• Post-mining radiation levels will be compatible with agreed post-mining land uses</td>
<td>Post-closure radiation levels in environmental media</td>
<td>Annual radiation dose to members of the public does not exceed 1mS/yr</td>
<td>Ground-based radiation surveys Sampling and testing of environmental media</td>
</tr>
</tbody>
</table>
8 Financial Provision for Closure

Toro has prepared a preliminary closure cost estimate using the New South Wales Department of Primary Industry (NSW DPI) rehabilitation and closure cost spreadsheet. The costing template can be downloaded from the NSW DPI website ([www.dpi.nsw.gov.au/Rehabilitation-Cost-Calculation-Tool-V1.7.xls](http://www.dpi.nsw.gov.au/Rehabilitation-Cost-Calculation-Tool-V1.7.xls)). In preparing its preliminary closure cost estimate, Toro took into account volumes, areas and quantities developed by mining studies and the Wiluna preliminary feasibility and optimisation study. Unit prices for each of the closure activities were calculated from the NSW spreadsheet base cost and were escalated for time. Recent local cost information was used where available from the pre-feasibility study or optimisation study.

The areas or domains included in the estimate include:
- process plant and infrastructure areas;
- evaporation pond area;
- accommodation village and associated facilities (e.g. sewage disposal area);
- Centipede tailings dam; and
- Lake Way mine pit and creek diversions.

In addition to the capital and operating costs arising from site decommissioning, clean up and rehabilitation, the preliminary closure cost estimate makes provision for third party project management. The closure cost estimate includes a provision for post-closure environmental monitoring in all domains. An allowance of 5 per cent of the cost of closure at each domain has been assumed for the cost of environmental monitoring in at least the first 10 years of the post-closure period. That is, if the cost to rehabilitate a domain is estimated at $1 million, a provision of $50,000 has been made for monitoring of the domain subsequent to closure.

Toro will review its closure cost provisioning prior to ground disturbing works, as part of documentation supplied in a mining proposal to be submitted to the Department of Mines and Petroleum. The closure cost estimate will be reviewed and audited at least 3-yearly, as part of Toro’s regular review of its mine closure plan.

In accordance with the DMP/EPA Guidelines for Preparing Mine Closure Plans (May, 2011), Toro has not attached a copy of its preliminary closure cost estimate to this initial closure plan. The closure cost estimate will be provided to the Department of Mines and Petroleum upon request.
9 Closure Implementation

9.1 Key strategies and closure actions
Through the risk-based assessment of mine closure and rehabilitation risks, Toro has identified seven key strategies to support its attainment of closure objectives. The strategies are mainly preventative, rather than restorative: they aim to avoid impacts, which will add to the cost, complexity or duration of site decommissioning and rehabilitation works. The key closure strategies are:

1. **Minimisation of disturbance**: temporary disturbance to be located on mine path to the extent practicable; use of existing disturbed areas for access roads and lay down areas. Rehabilitation to be carried out progressively.
2. **Appropriate storage of hazardous materials**: ensure that fuels, reagents and process liquids are stored and transferred in accordance with best practice. Carry out routine checks to ensure integrity of containment systems. Conduct periodic contamination assessments.
3. **Below ground waste disposal**: at closure mineralised materials are to be disposed of below ground level. Land surface to be regraded to resemble pre-mining topography. Focus on materials quantities and volume control throughout life of project.
4. **Minimisation of water abstraction, use and storage**: Water abstraction is to be minimised through use of perimeter barriers and recovery of pit de-watering water in ore treatment process.
5. **Segregation of materials**: Careful segregation of saline and less saline materials and mineralised/ non-mineralised wastes to be a key focus of mine planning.
6. **Development and practical demonstration of local capability in land restoration and protection**: Implement weed hygiene practices, collection and storage of local provenance propagules, field trials of barrier systems and rehabilitation methods throughout the life of mine to demonstrate the effectiveness of rehabilitation prescriptions.
7. **Encourage local stakeholder participation**: Seek the views and input of local stakeholders to develop meaningful completion criteria. Invite local participation in surveillance activities aimed at testing the effectiveness of mine rehabilitation practices.

The specific management actions required to implement these strategies have been documented in a Closure Task Register (Appendix C).

9.2 Management accountabilities
Management accountabilities for mine closure and rehabilitation are summarised in Table 5. Role descriptions and organisational charts reflecting key rehabilitation and closure accountabilities will be prepared prior to the commencement of ground disturbing works.
### Table 5  Mine closure and rehabilitation accountabilities

<table>
<thead>
<tr>
<th>ROLE</th>
<th>RESPONSIBILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toro senior management</td>
<td>• Allocate resources for mine closure and rehabilitation design, implementation and monitoring</td>
</tr>
<tr>
<td></td>
<td>• Annual review of closure provisioning</td>
</tr>
<tr>
<td></td>
<td>• Participate in and respond to periodic independent environment audits (including closure liability review)</td>
</tr>
<tr>
<td></td>
<td>• Sign off on annual compliance reports to DMP, OEPA, DEC</td>
</tr>
<tr>
<td></td>
<td>• Authorise adoption or revision of closure criteria</td>
</tr>
<tr>
<td>Mine Manager</td>
<td>• On-site management and responsibility of the Project, Toro employees and Contractors</td>
</tr>
<tr>
<td></td>
<td>• Incorporate key closure strategies in mine planning and design</td>
</tr>
<tr>
<td>Community Relations Manager</td>
<td>• Continuing community consultation and communication of information</td>
</tr>
<tr>
<td></td>
<td>• Coordinate and support local community involvement in monitoring</td>
</tr>
<tr>
<td>OHS&amp;E Manager</td>
<td>• Onsite responsibility for implementation of environmental policies, procedures and systems</td>
</tr>
<tr>
<td></td>
<td>• Ensure Obligations Register is implemented and maintained</td>
</tr>
<tr>
<td></td>
<td>• Periodically review and update closure standards to ensure compatibility with legislation and corporate requirements</td>
</tr>
<tr>
<td></td>
<td>• Ensure compliance with all environmental policies, procedures and systems by Contractors, Toro staff and visitors to site</td>
</tr>
<tr>
<td></td>
<td>• Liaise with stakeholders</td>
</tr>
<tr>
<td></td>
<td>• Schedule and participate in periodic internal and third party audits (site contamination, closure liability, etc)</td>
</tr>
<tr>
<td></td>
<td>• Conduct three yearly review of Mine Closure and Rehabilitation Plan</td>
</tr>
<tr>
<td>Environmental Superintendent and officers</td>
<td>• Induct staff, contractors and visitors to site about the requirements of this EMP</td>
</tr>
<tr>
<td></td>
<td>• Annually review and update Closure Task Register</td>
</tr>
<tr>
<td></td>
<td>• Maintain and update materials inventories and environmental databases</td>
</tr>
<tr>
<td></td>
<td>• Record non-conformances, incidents and complaints on the Compliance Register and document how issues raised have been resolved</td>
</tr>
<tr>
<td></td>
<td>• Schedule and prepare progress reports on mine rehabilitation trials and other research</td>
</tr>
<tr>
<td></td>
<td>• Coordinate environmental audits and ongoing monitoring to verify compliance</td>
</tr>
</tbody>
</table>
| Contractors                      | • Carry out work in accordance with this Closure Plan  
|                                | • Acquire data and maintain records needed to support implementation of this Plan  
|                                | • Train staff (as required) so that work is carried out to comply with requirements of the EMP  
| All other Toro personnel and site visitors | • Comply with all relevant site procedures and policies  |
10 Closure Monitoring and Maintenance

Closure monitoring will build on information collected during baseline environmental surveys and routine operational monitoring. Details of routine operational monitoring conducted for the purpose of on-going assessment of project impacts on radiation hazard, air quality, vegetation, groundwater, surface water and other environmental aspects of the project are presented in the relevant Toro environmental management strategies and are not described in detail in this plan.

Table 6 Preliminary monitoring schedule (mine rehabilitation)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Monitored parameters</th>
<th>Monitoring method</th>
<th>Monitoring frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flora and vegetation</td>
<td>• Species diversity</td>
<td>• Transect and quadrat-based ground surveys</td>
<td>• Annual surveys (quadrats / transects)</td>
</tr>
<tr>
<td></td>
<td>• Vegetation density</td>
<td>• Ground-based photographic records</td>
<td>• Annual weed surveys</td>
</tr>
<tr>
<td></td>
<td>• Weed occurrence</td>
<td>• Satellite imagery (multi-spectral)</td>
<td>• Periodic review of multi-spectral data, timed to capture significant climatic events</td>
</tr>
<tr>
<td></td>
<td>• Vegetation health</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landform stability</td>
<td>• Frequency and size of rills and gullies</td>
<td>• Surface stability measures (as described Landform Function Analysis)</td>
<td>• Annual and event based erosion surveys (transects)</td>
</tr>
<tr>
<td></td>
<td>• Quantity of sediment collected in settling ponds and other Drainage structures</td>
<td>• Ground-based surveys of rill frequency, form and size.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Occurrence of soil crusts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil quality</td>
<td>• Concentrations of trace elements, radionuclides, total salts</td>
<td>• Sample collection and analysis in accordance with DEC guidelines (2001), Australian Soil and Land Survey Handbook (McDonald et al. 1998), McKenzie et al (2002) and relevant Australian Standards.</td>
<td>• Minimum three-yearly (Format?)</td>
</tr>
<tr>
<td></td>
<td>• Bulk density and plant available water</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• Other parameters (eg hydrocarbons) for targeted contamination assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disturbance</td>
<td>• Disturbance footprints</td>
<td>• Ground based topographic surveys (for footprint and volume estimation)</td>
<td>• Quarterly data acquisition; annual review</td>
</tr>
<tr>
<td></td>
<td>• Waste/soils quantities</td>
<td>• Lidar data (for regional scale topographic and drainage information)</td>
<td></td>
</tr>
<tr>
<td>Fauna</td>
<td>• Biomass and</td>
<td>• Project specific method to be</td>
<td>• Six-monthly</td>
</tr>
</tbody>
</table>
During the operating life of the mine routine mine rehabilitation monitoring will be carried out by Toro staff and selected specialist contractors. All environmental and safety monitoring will be conducted in accordance with procedures documented in Toro’s ISO9001/ISO14001-consistent management system. Regular internal audits of the quality system will be scheduled by the Manager OHSE and monitored by senior Toro management. Independent external audit of mine closure performance and provisioning will be conducted no less than 3-yearly and will be completed in a timeframe that aligns with Toro’s 3-yearly review of its Mine Closure Plan.

Annual assessment of closure outcomes, including trends in rehabilitation performance, will be conducted by the Manager, OHSE as part of Toro’s reporting obligations under the Environmental Protection Act 1986 and the Mining Act 1978. Where required, technical assessments, which form the basis of closure performance evaluation will be certified by appropriately qualified engineers or scientists.

Toro is committed to involving local stakeholders in environmental surveillance activities. To that end, Toro actively seeks to employ local people and to build capacity in areas that support on-going monitoring and maintenance of environmental and safety aspects of Toro’s operations. By developing local skills and resources, Toro envisages that the local stakeholders will continue to take an active role in mine rehabilitation and related land care activities into the post-closure period. This is not only a cost effective approach, but will also help to extend the social and economic benefits of the Project beyond the active life of the mine. Use of local skills recognises the special interests of regional stakeholders and will help to maintain a consistent approach to land management.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Monitored parameters</th>
<th>Monitoring method</th>
<th>Monitoring frequency</th>
</tr>
</thead>
</table>
Management of information and data
Information and data required for implementing and evaluating mine rehabilitation and closure will be held in electronic format at the Wiluna operations site, with daily back-up of records in Toro’s Adelaide head office. Annual environmental reports and statutory compliance reports will be provided in the formats stipulated by the relevant agencies. Summaries of monitoring results required for annual compliance reporting will be supplied to regulatory agencies and made publicly available through Toro’s website.

As part of its stakeholder consultation, Toro will develop a plain-language format “environmental report card” to provide information on mine rehabilitation and other environmental results in an accessible format.

Toro will encourage the Wiluna community and other stakeholders to take advantage of opportunities to inspect rehabilitation works and other land management activities during annual open days.
12 References


Guidance Statement No 6 – Rehabilitation of Terrestrial Ecosystems (EPA, 2006)


Environmental Protection Authority (2009). Environmental Assessment Guideline No 4 - Towards Outcome Based Conditions


APPENDIX A – OBLIGATIONS REGISTER
The lessee notifying the holder of any underground pastoral or grazing lease by telephone or in person, or by registered post if contact cannot be made, prior to undertaking airborne geophysical surveys or any ground disturbing activities utilizing equipment such as scrapers, graders, bulldozers, backhoes, drilling rigs, water carrying equipment or other mechanised equipment.

The lessee or transferee, as the case may be, shall within thirty (30) days of receiving written notification off - the - grace of the Licence, or registration of a transferee introducing a new licensee, advise, by registered post, the holder of any underground pastoral or grazing lease details of the grant or transfer.

The lessee with the consent of the District Mining Engineer, will determine by the District Inspector of Mines; and on such areas cleared of natural vegetation, to stop all work and take the necessary steps or actions to be determined by the District Inspector of Mines, and on such areas cleared of natural growth by the holder or any of its agents, the holder shall plant trees and shrubs or any other plant as shall conform to the general pattern and type of growth in the area and as directed by the Environmental Officer, Department of Industry and Resources and properly maintain same until the Environmental Officer advises otherwise; unless the Minister responsible for the Mining Act LGHT orders otherwise.

The lessee submitting a plan of proposed operations and measures to safeguard the environment to the Director, Environment, DoIR for assessment and written approval prior to commencing any development or construction.

The rights of ingress and egress from Miscellaneous Licence 13/21, 22, 23, 24, 31, 42, 43 and (other) being at all times preserved to the licence; and no interference with the purpose or installations connected to the licence.

The removal of topsoil during mining shall be limited to the area determined by the District Mining Engineer; and on such areas cleared of natural growth by the holder or any of its agents, the holder shall plant trees and shrubs or any other plant as shall conform to the general pattern and type of growth in the area and as directed by the Environmental Officer, Department of Industry and Resources and properly maintain same until the Environmental Officer advises otherwise; unless the Minister responsible for the Mining Act LGHT orders otherwise.

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Social performance – such report to be externally audited every three years. An annual report posted on Toro’s web site on operational, environmental and funding for agreed community development interests.

Through negotiation of a mining agreement with Traditional Owners, provision of long term performance of the facility and refine future embankment lift levels and Long-term performance monitoring – this includes such items as residue and water movement and monitoring bores for contamination.

Compliance monitoring – this includes items such as checking survey pins for whether pipe joints are leaking.

Short-term operation monitoring – this includes items such as offtake location, review systems.

Implement management measures, methods and reporting and auditing and Provide environmental indicators, objectives and targets. Toro management to the environment. Identify potential direct and indirect environmental impacts from waste Closure and rehabilitation plan strategies implemented. Toro Monitoring program implemented which should include a number of undisturbed Direct return of topsoil where possible. Toro Consultation with traditional owners;

Ground disturbance to be minimised to reduce the impact on our resources, natural rehabilitation. Comply with all tenement conditions and to security plug and backfill to surface all drill holes and remove all sample bags within 6 months of drilling. Recommends to implement internal compliance audit programme. Decontamination report required. Report to include baseline and post-drilling radiation levels, before and after drilling photographs, samples buried in surpax (>1.3m) or down drill holes, drill holes securely plugged, mitigation areas, tracks rehabilitated and access blocked, upheaved and undisturbed areas. Toro Tenement Condition

Decontamination of water from the mine immediately in backfilling operations. Two Documented Commitment

Indemnify and protect progressive rehabilitation including revegetation. Toro Documented Commitment

Maintain monitoring results in an electronic data management system. Toro Documented Commitment

Provide environmental indicators, objectives and targets. Toro Documented Commitment

Integrate progressive rehabilitation. Toro Documented Commitment

Project facilities strategically located to avoid disturbance where practicable. Toro Documented Commitment

Implement water quality monitoring programmes will be established to provide a quantitative assessment of possible environmental impacts due to drainage discharge and to provide baseline data to assist in the review and improvement of operations.

Provide potential impacts of altered groundwater levels and maintain acceptable levels by altering the pumping regime and/or developing alternative supplementary water supplies.

Establishment of drawdown triggers for impact on surrounding, users and environmental values (e.g. Lake Way and GOGOs) Two Documented Commitment

Implementation of water quality monitoring programmes will be established to provide a quantitative assessment of possible environmental impacts due to any discharges for management.

The number one metres cowl will be planned as rapidly as possible. Toro Documented Commitment

Monitoring of rate of rise of tailings in each TSF cell annually. Toro Documented Commitment

Accommodated low level water to be disposed in tailings facility at end of mine life Toro Documented Commitment

Ability to decontaminate where practicable other than disposal Toro Documented Commitment

Establishment of an identification process to determine waste material suitable for decontamination Toro Documented Commitment

Contaminated soils to be tested or disposed in tailings facility Toro Documented Commitment

Repairs to spoilage locations to be undertaken on maps and registers Toro Documented Commitment

Material other uses for topsoil to be investigated to avoid long term stockpiling Toro Documented Commitment

Conduct prompt and progressive rehabilitation including revegetation. Toro Documented Commitment

Long-term performance monitoring – this includes such items as residue and water movement and monitoring bores for contamination.

Daily performance monitoring – this includes such items as residue and water level surveys and water flow measurements, etc., which are used to monitor the long term performance of the facility and further enhance embankment lift levels and freeboard safety.

Performance of a timing agreement with Traditional Owners, provision of funding for agreed community development interests.

All annual report posted on Toro’s web site on operational, environmental and social performance – such report to be externally audited every three years. Toro Documented Commitment

Lake Way pit void and stockpiles (overburden, topsoil) Toro Documented Commitment

Centipede pit void, in-pit tailings storage area and stockpiles Toro Documented Commitment

Access roads, head roads and laydown areas (does not include ROM pad or any stockpiled material) Toro Documented Commitment

Locations of plant, including evaporation pond, ROM and mineralised material Toro Documented Commitment

Supervised areas of plant Toro Documented Commitment

Accommodation village Toro Documented Commitment

Borefield and water distribution pipelines Toro Documented Commitment

Evaporation ponds if not on mine path (not including process liquor pond) Toro Documented Commitment

Domain

Condition/Commitment

Source

Toro Energy Limited

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<table>
<thead>
<tr>
<th>Aspect/Activity</th>
<th>Event</th>
<th>Event Cause</th>
<th>Event Impact</th>
<th>Likelihood</th>
<th>Consequence</th>
<th>Risk Rating</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetation fails to emerge</td>
<td>Insufficient seed bank storage in topsoil</td>
<td>Erosion, loss of O-horizon, failure to meet closure objectives for vegetation; reduced visual amenity</td>
<td>3 3</td>
<td>Medium</td>
<td>Seed collection of local provenance species</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Poor handling/storing of viable topsoil</td>
<td>Erosion, loss of O-horizon, failure to meet closure objectives for vegetation; reduced visual amenity</td>
<td>3 3</td>
<td>Medium</td>
<td>Establish and monitor soil handling procedures</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Erosion</td>
<td>Erosion, loss of O-horizon, failure to meet closure objectives for vegetation; reduced visual amenity</td>
<td>2 3</td>
<td>Medium</td>
<td>Landscape contouring to prevent erosion; design cover system to prevent erosion.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drought</td>
<td>Erosion</td>
<td>Erosion, loss of O-horizon, failure to meet closure objectives for vegetation; reduced visual amenity</td>
<td>3 3</td>
<td>Medium</td>
<td>Progressive rehabilitation, it required, reseeding to be carried out following adequate rain event.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor handling/storing of viable topsoil; Mixing of good/poor quality topsoil</td>
<td>Insufficient backfill material</td>
<td>Creation of permanent water holding void</td>
<td>2 3</td>
<td>Medium</td>
<td>Provide fencing to exclude livestock and other herbivores? AY says fencing not likely</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Loss of key soil properties (nutrients, soil water etc.)</td>
<td>Instability of pit wall</td>
<td>3 3</td>
<td>Medium</td>
<td>Progressive rehabilitation, if required, reseeding to be carried out following adequate rain event.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grazing by herbivores</td>
<td>Grazing by herbivores</td>
<td>Erosion, loss of O-horizon, failure to meet closure objectives for vegetation; reduced visual amenity</td>
<td>3 3</td>
<td>Medium</td>
<td>Provide fencing to exclude livestock and other herbivores? AY says fencing not likely</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire</td>
<td>Mine activities (hot works, driving) causes fire</td>
<td>Widespread damage to vegetation</td>
<td>4 2</td>
<td>Medium</td>
<td>Implement and maintain hot work permit system. Maintain fire response capability within operational areas.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unsatisfactory vegetation abundance/diversity</td>
<td>Insufficient seed collection/distribution during rehabilitation</td>
<td>Restored site not returned to previous levels of habitat complexity/health.</td>
<td>3 3</td>
<td>Medium</td>
<td>Progressive rehabilitation, if required, reseeding to be carried out following adequate rain event.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spread of undesirable species (weeds)</td>
<td>Movement of mobile plant and materials through operational area</td>
<td>Reduced local diversity and increased abundance of invasive species.</td>
<td>3 3</td>
<td>Medium</td>
<td>Implementation of a weed management plan; carry out annual weed survey and control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regrowth fails to survive</td>
<td>Insufficient seed bank storage in topsoil</td>
<td>Failure to detect &amp; segregate affected topsoil</td>
<td>3 3</td>
<td>Medium</td>
<td>Implementation of a weed management plan;  Careful control of soil inventory.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Animal interaction with mine pit voids</td>
<td>Improper/inadequate bunding or defilling of mine pit voids</td>
<td>Accidental injury/death to fauna</td>
<td>2 2</td>
<td>Low</td>
<td>Secure and appropriate bunding and or fencing around pit voids.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human interaction with mine pit voids</td>
<td>Improper/inadequate bunding or defilling of mine pit voids</td>
<td>Accidental injury/death to humans</td>
<td>2 4</td>
<td>Medium</td>
<td>Secure and appropriate bunding and or fencing around pit voids. (No pit void will remain post-closure).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instability of pit wall</td>
<td>Inappropriate batter angles; inadequate control of water pressure</td>
<td>Wall collapse</td>
<td>2 4</td>
<td>Medium</td>
<td>Regular monitoring of wall condition and piezometric pressures; review of pit design by qualified engineer.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creation of permanent water holding void</td>
<td>Insufficient backfill material</td>
<td>Altered landscapes</td>
<td>2 4</td>
<td>Medium</td>
<td>Progressive rehabilitation, Maintain and regularly review materials inventory.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discharge of water and/or sediment from pit void.</td>
<td>Site flooding due to high rainfall</td>
<td>Contamination outside project footprint</td>
<td>2 5</td>
<td>High</td>
<td>No voids will remain at closure. Risk relates to temporary closure or operations phase of project. All bunding and storage facilities capable of dealing with 1 in 100 yr flood events</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generation of dust</td>
<td>Insufficient dust suppression at topsoil storage piles (lift from dry waste piles)</td>
<td>Detrimental health effects to humans</td>
<td>2 2</td>
<td>Low</td>
<td>Implement dust management plan</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Insufficient dust suppression at topsoil storage piles (lift from dry waste piles)</td>
<td>Dusting of surrounding flora</td>
<td>2 2</td>
<td>Low</td>
<td>Implement dust management plan</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Ore extraction above the water table</td>
<td>Detrimental health effects to flora and fauna</td>
<td>2 3</td>
<td>Medium</td>
<td>Implement dust management plan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stochastic events (dust storms)</td>
<td>Non-compliance with statutory requirements</td>
<td>Consequence relates to risk of statutory non-compliance or public perception, not to environmental impact. Design dust monitoring programme to provide sufficient data to differentiate between operational emissions and natural events</td>
<td>4 4</td>
<td>High</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lift off from haul roads (insufficient suppression)</td>
<td>Dusting of surrounding flora</td>
<td>Provide adequate dust suppression on haul roads.</td>
<td>4 2</td>
<td>Medium</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Lift off from haul roads (excessive speeds)</td>
<td>Dusting of surrounding flora</td>
<td>Enforce speed limits on haul roads.</td>
<td>3 3</td>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lift off from uncovered loads</td>
<td>Dusting of surrounding flora</td>
<td></td>
<td>2 2</td>
<td>Low</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excessive tipping heights</td>
<td>Dusting of flora surrounding dumps</td>
<td></td>
<td>2 1</td>
<td>Low</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inadequate rehabilitation/revegetation</td>
<td>Increased susceptibility to dust storms</td>
<td></td>
<td>3 3</td>
<td>Medium</td>
<td>Progressive rehabilitation, if required, reseeding or placement of armouring to be carried out.</td>
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</tr>
<tr>
<td>Stochastic events (dust storms)</td>
<td>Detrimental health effects to humans</td>
<td></td>
<td>4 1</td>
<td>Low</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Ore extraction above the water table</td>
<td>Bioaccumulation of radionuclides in vegetation outside the project footprint</td>
<td></td>
<td>3 3</td>
<td>Medium</td>
<td>Implement dust management plan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transportation of mined and processed uranium ore</td>
<td>Detrimental health effects to flora and fauna</td>
<td></td>
<td>2 3</td>
<td>Medium</td>
<td>Implement dust management plan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aspect/Activity</td>
<td>Event</td>
<td>Event Cause</td>
<td>Event Impact</td>
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<tr>
<td>Spread of radionuclide particulate matter</td>
<td>Improper disposal of mineralised waste</td>
<td>Occupational health affects to humans</td>
<td>2</td>
<td>1</td>
<td>Low</td>
<td>Consequence relates to risk of statutory non-compliance or public perception, not to environmental impact. Radiometric survey of operations area prior to placement of non-mineralised cover to ensure no remaining mineralised material.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improper disposal of mineralised waste</td>
<td>Breach of legislation</td>
<td>2</td>
<td>5</td>
<td>High</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Seepage of metals or radionuclides into groundwater</td>
<td>Increased mobility of elements in waste rock as a result of mechanical disturbance</td>
<td>1</td>
<td>4</td>
<td>Medium</td>
<td>Consequence rating relates to corporate reputation - not to biophysical impacts. Conduct routine groundwater monitoring and periodically review solute transport model.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acid mine drainage</td>
<td>Oxidation of sulfide minerals in wall of pit or in waste rock backfill</td>
<td>1</td>
<td>3</td>
<td>Low</td>
<td>Periodic review of waste mineralogy and chemistry.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Evaporative concentration of water in pit voids; disposal of 80brines or evaporation pond residue.</td>
<td>Contamination of groundwater (reduction in beneficial use)</td>
<td>2</td>
<td>4</td>
<td>Medium</td>
<td>Conduct routine groundwater monitoring and periodically review solute transport model.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Modified frequency or duration of surface inundation.</td>
<td>Alterations to natural flow as a result of earthworks</td>
<td>3</td>
<td>2</td>
<td>Medium</td>
<td>Avoid disruption of surface drainage where possible; reinstate pre-mining flow regimes as part of progressive mine rehabilitation.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Native fauna drinks from contaminated surface water in pit void or evaporation ponds</td>
<td>Storage of water in areas accessible to fauna</td>
<td>1</td>
<td>2</td>
<td>Low</td>
<td>Minimise water recovery and return to plant; if necessary provide bird deterrent devices near evaporation ponds.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Surface flows mobilising sediment from disturbed areas</td>
<td>High rainfall</td>
<td>4</td>
<td>4</td>
<td>Medium</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discharge of water and/or sediment from pit void</td>
<td>Site flooding due to high rainfall</td>
<td>2</td>
<td>5</td>
<td>High</td>
<td>Consequence rating relates to corporate reputation - not to biophysical impacts. All bunding and storage facilities capable of dealing with 1 in 50 or flood events.</td>
<td></td>
</tr>
<tr>
<td>Activity: Haulage of ore</td>
<td>Slippage or dust lift off from haul trucks</td>
<td>Excessive speed, overfilling, dry ore</td>
<td>3</td>
<td>3</td>
<td>Medium</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vehicle contact with fauna</td>
<td>Fauna access to haul road</td>
<td>3</td>
<td>2</td>
<td>Medium</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vegetation fails to emerge</td>
<td>Insufficient seed bank storage in topsoil</td>
<td>3</td>
<td>3</td>
<td>Medium</td>
<td>Seed collection of local provenance species.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Poor handling/storing of viable topsoil: Mixing of good/poor quality topsoil</td>
<td>Erosion, loss of O-horizon, failure to meet closure objectives for vegetation; reduced visual amenity</td>
<td>3</td>
<td>3</td>
<td>Medium</td>
<td>Establish and monitor soil handling procedures.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Erosion</td>
<td>Erosion, loss of O-horizon, failure to meet closure objectives for vegetation; reduced visual amenity</td>
<td>3</td>
<td>3</td>
<td>Medium</td>
<td>Landscape contouring to prevent erosion; design cover system to prevent erosion.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Drought</td>
<td>Erosion, loss of O-horizon, failure to meet closure objectives for vegetation; reduced visual amenity</td>
<td>3</td>
<td>3</td>
<td>Medium</td>
<td>Progressive rehabilitation. If required, reseeding to be carried out following adequate rain event.</td>
<td></td>
</tr>
<tr>
<td>Activity: Re-establishment of native vegetation</td>
<td>Poor handling/storing of viable topsoil: Mixing of good/poor quality topsoil</td>
<td>Erosion, loss of O-horizon, failure to meet closure objectives for vegetation; reduced visual amenity</td>
<td>3</td>
<td>3</td>
<td>Medium</td>
<td>Establish and monitor soil handling procedures.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Loss of key soil properties (nutrients, soil water etc.)</td>
<td>Erosion, loss of O-horizon, failure to meet closure objectives for vegetation; reduced visual amenity</td>
<td>3</td>
<td>3</td>
<td>Medium</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Drought</td>
<td>Erosion, loss of O-horizon, failure to meet closure objectives for vegetation; reduced visual amenity</td>
<td>3</td>
<td>3</td>
<td>Medium</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Grazing by herbivores</td>
<td>Erosion, loss of O-horizon, failure to meet closure objectives for vegetation; reduced visual amenity</td>
<td>4</td>
<td>2</td>
<td>Medium</td>
<td>Provide fencing to exclude livestock and other herbivores. At least fencing not likely.</td>
<td></td>
</tr>
<tr>
<td>Event</td>
<td>Event Cause</td>
<td>Event Impact</td>
<td>Likelihood</td>
<td>Consequence</td>
<td>Risk Rating</td>
<td>Control</td>
<td></td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>Fire</td>
<td>Mine activities (hot works, drilling) causes fire</td>
<td>Widespread damage to vegetation</td>
<td>2</td>
<td>4</td>
<td>Medium</td>
<td>Implement and maintain hot work permit system. Maintain fire response capability within operational areas.</td>
<td></td>
</tr>
<tr>
<td>Unsatisfactory vegetation abundance/diversity</td>
<td>Uncontrolled vegetation growth</td>
<td>Soil erosion and reduced biodiversity</td>
<td>3</td>
<td>3</td>
<td>Medium</td>
<td>Progressive rehabilitation, if required, reseeding to be carried out following adequate rain event.</td>
<td></td>
</tr>
<tr>
<td>Spread of undesirable species (weed)</td>
<td>Movement of mobile plant and materials through operational area</td>
<td>Reduced local diversity and increased abundance of invasive species</td>
<td>3</td>
<td>3</td>
<td>Medium</td>
<td>Implementation of a weed management plan; carry out annual weed survey and control.</td>
<td></td>
</tr>
<tr>
<td>Animal interaction with mine pit voids</td>
<td>Improper bunding or delineating of mine pit voids</td>
<td>Accidental injury/death to fauna</td>
<td>2</td>
<td>2</td>
<td>Low</td>
<td>Secure and appropriate bunding and fencing around pit voids.</td>
<td></td>
</tr>
<tr>
<td>Human interaction with mine pit voids</td>
<td>Improper bunding or delineating of mine pit voids</td>
<td>Accidental injury/death to humans</td>
<td>2</td>
<td>4</td>
<td>Medium</td>
<td>Secure and appropriate bunding and fencing around pit voids.</td>
<td></td>
</tr>
<tr>
<td>Discharge of water and/or sediment from pit void</td>
<td>Insufficient backfill material</td>
<td>Altered landscapes</td>
<td>2</td>
<td>4</td>
<td>Medium</td>
<td>Progressive rehabilitation. Maintain and regularly review materials inventory.</td>
<td></td>
</tr>
<tr>
<td>Generation of dust</td>
<td>Stochastic events (dust storms)</td>
<td>Non-compliance with statutory requirements</td>
<td>4</td>
<td>4</td>
<td>High</td>
<td>Monitoring can help to detect large dust events.</td>
<td></td>
</tr>
<tr>
<td>Lift off from haul roads (insufficient suppression)</td>
<td>Ousting of surrounding flora</td>
<td>Detrimental health effects to flora</td>
<td>2</td>
<td>2</td>
<td>Low</td>
<td>Implement dust management plan.</td>
<td></td>
</tr>
<tr>
<td>Lift off from uncovered loads</td>
<td>Ousting of surrounding flora</td>
<td>Detrimental health effects to flora</td>
<td>2</td>
<td>2</td>
<td>Low</td>
<td>Implement dust management plan.</td>
<td></td>
</tr>
<tr>
<td>Inadequate tipping heights</td>
<td>Ousting of flora surrounding dumps</td>
<td>Detrimental health effects to flora</td>
<td>2</td>
<td>1</td>
<td>Low</td>
<td>Progressive rehabilitation. If required, reseeding or placement of armouring to be carried out.</td>
<td></td>
</tr>
<tr>
<td>Sp成就的 radionuclides into groundwater</td>
<td>Ore extraction above the water table</td>
<td>Bioaccumulation of radionuclides in vegetation outside the project footprint</td>
<td>3</td>
<td>3</td>
<td>Medium</td>
<td>Implement dust management plan.</td>
<td></td>
</tr>
<tr>
<td>Transportation of mixed and processed uranium ore</td>
<td>Detrimental health effects to flora and fauna</td>
<td>Detrimental health effects to flora and fauna</td>
<td>1</td>
<td>4</td>
<td>Medium</td>
<td>Implement dust management plan.</td>
<td></td>
</tr>
<tr>
<td>Improper disposal of mineralised waste</td>
<td>Breach of regulatory requirements</td>
<td>Detrimental health effects to fauna</td>
<td>2</td>
<td>5</td>
<td>High</td>
<td>Radiative survey of operations area prior to placement of non-mineralised cover to ensure no remaining mineralised material.</td>
<td></td>
</tr>
<tr>
<td>Improper disposal of mineralised waste</td>
<td>Detrimental health effects to fauna</td>
<td>Detrimental health effects to fauna</td>
<td>2</td>
<td>5</td>
<td>Low</td>
<td>Design dust monitoring program to provide sufficient data to differentiate between operational emissions and natural events.</td>
<td></td>
</tr>
<tr>
<td>Evaporation ponds dry completely</td>
<td>Contamination of soils outside operational area</td>
<td>Contamination of soils outside operational area</td>
<td>2</td>
<td>4</td>
<td>Medium</td>
<td>Minimise quantity of water that needs to be disposed of in evaporation ponds; implement dust management plan.</td>
<td></td>
</tr>
</tbody>
</table>

**Risk Assessment - Closure Plan**

**Event:** Mine activity (hot works, drilling) causes fire

**Event Cause:** Widespread damage to vegetation

**Event Impact:** Loss of priority ecological communities (subterranean fauna)

**Likelihood:** Medium

**Consequence:** Conduct additional subterranean fauna sampling to confirm regional occurrence of subterranean fauna; minimise water abstraction by installing perimeter barriers.

**Risk Rating:** Medium

**Control:**

- Conduct additional subterranean fauna sampling to confirm regional occurrence of subterranean fauna; minimise water abstraction by installing perimeter barriers.
- Implement additional research to establish nature of water dependency of local vegetation; minimise water abstraction by installing perimeter barriers.
- Conduct routine groundwater monitoring and periodically review solute transport model.
- Monitor formation water and water groundwater; periodically update seepage model.
<table>
<thead>
<tr>
<th>Event</th>
<th>Event Cause</th>
<th>Event Impact</th>
<th>Likelihood</th>
<th>Consequence</th>
<th>Risk Rating</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seepage of metals or radionuclides into groundwater</td>
<td>Breach or bypassing of containment system</td>
<td>Reduction in beneficial use of groundwater; accumulation of contaminants in biota</td>
<td>2</td>
<td>Medium</td>
<td>Monitor tailings pore water fluid and groundwater; periodically update and verify seepage models.</td>
<td></td>
</tr>
<tr>
<td>Acid mine drainage</td>
<td>Oxidation of sulphide minerals in wall of pit or in waste rock backfill</td>
<td>Change in groundwater acidity, potential to increase mobility of trace elements in mine waste</td>
<td>1</td>
<td>Low</td>
<td>Periodic review of waste mineralogy and chemistry.</td>
<td></td>
</tr>
<tr>
<td>Seepage of metals or radionuclides into groundwater</td>
<td>Loss of containment or contaminant behaviour not conforming to model.</td>
<td>Exceed regulatory limits</td>
<td>1</td>
<td>High</td>
<td>Consequence relates to regulatory breach, not impact on environment. Establish comprehensive and reliable monitoring system.</td>
<td></td>
</tr>
<tr>
<td>Modified frequency or duration of surface inundation.</td>
<td>Alterations to natural flow as a result of earthworks</td>
<td>Altered landscapes and habitat composition; Reduced flows to rivers and streams and recharge areas</td>
<td>2</td>
<td>Low</td>
<td>Avoid disruption of surface drainage where possible; reintegrate pre-mining flow regimes as part of progressive mine rehabilitation.</td>
<td></td>
</tr>
<tr>
<td>Native fauna drinks from contaminated surface water in pit void or evaporation ponds</td>
<td>Storage of water in areas accessible to fauna</td>
<td>Harm/death caused to fauna</td>
<td>2</td>
<td>Low</td>
<td>Maximise water recovery and return to plant; if necessary provide bird deterrent devices near evaporation ponds.</td>
<td></td>
</tr>
<tr>
<td>Discharge of water and/or sediment from pit void</td>
<td>Site flooding due to high rainfall</td>
<td>Contamination outside project footprint</td>
<td>5</td>
<td>High</td>
<td>Consequence relates to potential regulatory breach and public perception, not impact on environment. All bunding and storage facilities capable of dealing with 1 in 100 yr flood events.</td>
<td></td>
</tr>
<tr>
<td>Upward migration of metals or radionuclides through cover system</td>
<td>Inappropriate design or construction of cover system</td>
<td>Bioaccumulation of contaminants in soil and vegetation</td>
<td>3</td>
<td>Medium</td>
<td>Conduct regular monitoring of tailings pore fluid during operating life of mine to assess risk. Conduct trials of cover system before finalising design.</td>
<td></td>
</tr>
<tr>
<td>Unable to rehabilitate backfilled tailings</td>
<td>Low density of tailings prevents trafficking by earthmoving plant.</td>
<td>Continuing exposure of tailings, risk of access by wildlife, radon emissions, dust emissions</td>
<td>3</td>
<td>Medium</td>
<td>Complete further geotechnical testing of tailings prior to project commencement; carry out regular testing of tailings density during operations.</td>
<td></td>
</tr>
<tr>
<td>Insufficient volume to store tailings below grade</td>
<td>Tailings density lower than predicted.</td>
<td>Continuing exposure of tailings, risk of access by wildlife, radon emissions, dust emissions; increased risk of erosion.</td>
<td>2</td>
<td>Medium</td>
<td>Complete further geotechnical testing of tailings prior to project commencement; carry out regular testing of tailings density during operations. Regularly review storage volumes and waste inventory.</td>
<td></td>
</tr>
<tr>
<td>Spillage of ore from haul truck</td>
<td>Excessive speed, overfilling, dry ore</td>
<td>Release of mineralised material to the environment</td>
<td>3</td>
<td>Medium</td>
<td>Implement and maintain emergency response procedures.</td>
<td></td>
</tr>
<tr>
<td>Vehicle contact with fauna</td>
<td>Fauna access to haul road</td>
<td>Fauna death</td>
<td>3</td>
<td>High</td>
<td>Enforce speed limits on haul roads; monitor and report on fauna injuries/deaths.</td>
<td></td>
</tr>
<tr>
<td>Spillage of ore from stockpile</td>
<td>Vehicle roll over</td>
<td>Release of mineralised material to the environment</td>
<td>3</td>
<td>Medium</td>
<td>Implement and maintain emergency response procedures.</td>
<td></td>
</tr>
<tr>
<td>Soil contamination</td>
<td>Accidental spillage during transport</td>
<td>Radiation levels above background (localised)</td>
<td>3</td>
<td>Medium</td>
<td>Enforce speed limits; do not overfill trucks; conduct periodic checks of haul roads for spillage.</td>
<td></td>
</tr>
</tbody>
</table>

**Risk Assessment - Closure Plan**

- **Activity:** Tailings storage
  - Insufficient volume to store tailings below grade
  - Insufficient depth of cover over the tailings
  - Inadequate drainage
  - Inadequate dust suppression
  - Release of radionuclides to the atmosphere

- **Activity:** Haulage of ore
  - Spillage or debris lift off from haul trucks
  - Vehicle contact with fauna

- **Activity:** Construction and use of haul roads and laydown areas
  - Surface compaction due to vehicle movements
  - Limited or unsatisfactory rehabilitation
  - Insufficient topsoil for rehabilitation
  - Vehicle accidents during ore transportation
  - Soil contamination

**Domain:** Access roads, haul roads and laydown areas (does not include ROM pad or any stockpiled product or contaminated materials).
<table>
<thead>
<tr>
<th>Aspect/Activity</th>
<th>Event</th>
<th>Event Cause</th>
<th>Event Impact</th>
<th>Likelihood</th>
<th>Consequence</th>
<th>Risk Rating</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vehicle contact with fauna</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Loss of particulate matter (dust) during transportation</td>
<td>Radiation levels above background (localised)</td>
<td></td>
<td>3</td>
<td>2</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fauna death</td>
<td></td>
<td></td>
<td>3</td>
<td>2</td>
<td>Medium</td>
<td>Enforce speed limits on haul roads; monitor and report on fauna injuries/death.</td>
</tr>
<tr>
<td><strong>Dust release along haul road</strong></td>
<td>Lift off from haul roads (insufficient suppression)</td>
<td>Dusting of surrounding flora</td>
<td></td>
<td>4</td>
<td>2</td>
<td>Medium</td>
<td>Provide adequate dust suppression on haul roads.</td>
</tr>
<tr>
<td></td>
<td>Lift off from haul roads (excessive speeds)</td>
<td>Dusting of surrounding flora</td>
<td></td>
<td>3</td>
<td>3</td>
<td>Medium</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Enforce speed limits on haul roads.</td>
</tr>
<tr>
<td><strong>Spillage of oils or reagents</strong></td>
<td>Inadequate storage or funding</td>
<td>Soil and/or groundwater contamination</td>
<td></td>
<td>3</td>
<td>3</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td><strong>Compaction of soils in paved/traffic areas</strong></td>
<td>Required engineering compaction for plant</td>
<td>Difficulty in re-establishing vegetation</td>
<td></td>
<td>5</td>
<td>2</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td><strong>Altered surface hydrology</strong></td>
<td>Placement of fill or plant drainage</td>
<td>Altered vegetation through creation of water &quot;shadow&quot; or increased ponding</td>
<td></td>
<td>3</td>
<td>2</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td><strong>Unsuitable for post mining land use</strong></td>
<td>Remaining infrastructure or footings</td>
<td>Constraint on future use of land for agreed post-mining uses</td>
<td></td>
<td>2</td>
<td>2</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td><strong>Aspect: ROM pad</strong></td>
<td>Spread of contaminants around ROM pad during operation</td>
<td>Soil contamination</td>
<td></td>
<td>3</td>
<td>3</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td><strong>Aspect: Processing plant</strong></td>
<td>Buried structure remains on site</td>
<td>Unsuitable for post mining land use</td>
<td></td>
<td>3</td>
<td>3</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td><strong>Aspect: Evaporation pond</strong></td>
<td>Seepage or leaking from evaporation pond</td>
<td>Contamination of groundwater</td>
<td></td>
<td>2</td>
<td>5</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pooling of water above or in proximity to evaporation pond</td>
<td>Contamination of surface water</td>
<td></td>
<td>3</td>
<td>2</td>
<td>Medium</td>
<td>Site drainage would be designed to redirect clean water flows to the natural drainage system.</td>
</tr>
<tr>
<td></td>
<td>Leaks from distribution pipes between pond and plant</td>
<td>Contamination of soil</td>
<td></td>
<td>3</td>
<td>3</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fauna injury as a result of contact/consumption of pregnant liquor solution</td>
<td>Fauna attracted to permanent water storage</td>
<td>Fauna poisoning</td>
<td>3</td>
<td>3</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fauna entrapment in PLS</td>
<td>Fauna attracted to permanent water storage</td>
<td>Fauna death</td>
<td>3</td>
<td>3</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overtopping of PLS pond</td>
<td>Extreme flood event</td>
<td>Soil/water pollution</td>
<td>2</td>
<td>5</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Failure of pond embankment</td>
<td>Geotechnical failure of embankments</td>
<td>Soil/water pollution</td>
<td>1</td>
<td>5</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td><strong>Activity: Packaging of uranium product</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Accumulation of radioactive residue on machinery</td>
<td>Use of machinery in ore processing during mine operation</td>
<td></td>
<td>3</td>
<td>3</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Site contamination</td>
<td>Breakages during packaging</td>
<td>Localised radiation levels above background</td>
<td>3</td>
<td>3</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td><strong>Activity: Disposal of contaminated equipment</strong></td>
<td>Decommissioned contaminated equipment remains onsite</td>
<td>Improper mine closure</td>
<td>Reduced visual amenity</td>
<td>2</td>
<td>3</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Burning of contaminated equipment</td>
<td>No appropriate offsite waste disposal sites available</td>
<td>Constraint on future use of land for agreed post-mining uses</td>
<td>3</td>
<td>3</td>
<td>Medium</td>
<td>Keep records of burial of radioactive waste locations and document on tenement/land title.</td>
</tr>
<tr>
<td></td>
<td>Inappropriate disposal of evaporation pond lining or other decommissioning wastes</td>
<td>Inefficient capacity in mine pit for storage</td>
<td>Increased potential for contamination due to disposal elsewhere</td>
<td>2</td>
<td>3</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td><strong>Activity: Accommodation infrastructure (dorms &amp; offices)</strong></td>
<td>Unsuitable for post mining land use</td>
<td>Remaining infrastructure or footings</td>
<td>Constraint on future use of land for agreed post-mining uses</td>
<td>2</td>
<td>2</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td><strong>Aspect: Associated sewerage, electrical</strong></td>
<td>Village infrastructure left on site</td>
<td>Village related infrastructure (septic, comms. towers etc.) left behind upon mine closure</td>
<td>Reduced visual amenity</td>
<td>3</td>
<td>1</td>
<td>Low</td>
<td></td>
</tr>
</tbody>
</table>
### Risk Assessment - Closure Plan

<table>
<thead>
<tr>
<th>Aspect/Activity</th>
<th>Event</th>
<th>Event Cause</th>
<th>Event Impact</th>
<th>Likelihood</th>
<th>Consequence</th>
<th>Risk Rating</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reduced local habitat quality</strong></td>
<td>Breakdown of village sewage system over time</td>
<td>Localised site contaminations</td>
<td>3</td>
<td>3</td>
<td>Medium</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Vegetation fails to emerge</strong></td>
<td>Compacted or damaged soils due to repeated vehicle access</td>
<td>Increased susceptibility to erosion</td>
<td>3</td>
<td>3</td>
<td>Medium</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Altered surface water flows</strong></td>
<td>Increased impermeable surfaces</td>
<td>Stagnant surficial water bodies</td>
<td>2</td>
<td>2</td>
<td>Low</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Putrescible waste dump</strong></td>
<td>Failure to sufficiently cover putrescible waste dump</td>
<td>Increased attraction of fauna</td>
<td>3</td>
<td>2</td>
<td>Medium</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Landfill leachate contaminates groundwater</strong></td>
<td>Inappropriate siting, management or operation of putrescible landfill</td>
<td>Reduced beneficial use of groundwater</td>
<td>2</td>
<td>4</td>
<td>Medium</td>
<td>Develop landfill in accordance with published standards and Shire requirements</td>
<td></td>
</tr>
<tr>
<td><strong>Observing impacts on flora or vegetation</strong></td>
<td>Groundwater abstraction for run of mine purposes</td>
<td>Reduced health of vegetation complexes</td>
<td>3</td>
<td>4</td>
<td>High</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Reduction in level of groundwater table</strong></td>
<td>Excessive water withdrawal</td>
<td>Loss of subterranean fauna due to habitat decline</td>
<td>3</td>
<td>4</td>
<td>High</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Salinisation of shallow aquifer</strong></td>
<td>Overpumping of shallow aquifer</td>
<td>Reduction in beneficial use of groundwater</td>
<td>3</td>
<td>4</td>
<td>High</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Immediate ground area disturbance</strong></td>
<td>Installation of bores and or pumping facilities</td>
<td>Reduced habitat availability</td>
<td>4</td>
<td>1</td>
<td>Low</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Associated land clearing</strong></td>
<td>Land works (clearing and earthworks) associated with the installation of the distribution pipes</td>
<td>Habitat fragmentation</td>
<td>3</td>
<td>2</td>
<td>Medium</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX B – ENVIRONMENTAL CONSEQUENCE CRITERIA AND RISK MATRIX
<table>
<thead>
<tr>
<th>Environmental issues checklist - for risk workshop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake Way pit void and stockpiles (overburden, topsoil)</td>
</tr>
<tr>
<td>Centipede pit void, in-pit tailings storage area and stockpiles</td>
</tr>
<tr>
<td>Access roads, haul roads and laydown areas (does not include ROM pad or any stockpiled mineralised materials)</td>
</tr>
<tr>
<td>&quot;Controlled&quot; sections of plant, including evaporation pond, ROM and mineralised material</td>
</tr>
<tr>
<td>&quot;Supervised&quot; sections of plant</td>
</tr>
<tr>
<td>Accommodation village</td>
</tr>
<tr>
<td>Borefield and water distribution pipelines</td>
</tr>
<tr>
<td>Evaporation ponds on mine path (including process liquor pond)</td>
</tr>
<tr>
<td>Notes</td>
</tr>
<tr>
<td>Dust</td>
</tr>
<tr>
<td>Erosion, sedimentation</td>
</tr>
<tr>
<td>Soil or water quality (Hydrocarbons / reagents storage or use)</td>
</tr>
<tr>
<td>Soil or water quality (storage of wastes)</td>
</tr>
<tr>
<td>Soil or water quality (process liquids or ore)</td>
</tr>
<tr>
<td>Waste storage includes: waste rock, tailings, workshop wastes, domestic waste from accommodation village, demolition waste.</td>
</tr>
<tr>
<td>Mineralogy of overburden and ore shows no likelihood of acid mine drainage or asbestiform minerals</td>
</tr>
<tr>
<td>Water quality - pit voids, ponds</td>
</tr>
<tr>
<td>Subsidence, land stability</td>
</tr>
<tr>
<td>Public safety</td>
</tr>
<tr>
<td>Landscape amenity</td>
</tr>
<tr>
<td>Revegetation</td>
</tr>
<tr>
<td>Weeds</td>
</tr>
<tr>
<td>Groundwater dependent ecosystems</td>
</tr>
<tr>
<td>Radiation</td>
</tr>
<tr>
<td>Alteration of surface hydrology</td>
</tr>
<tr>
<td>Alteration of subsurface flows or water levels</td>
</tr>
<tr>
<td>Consequence</td>
</tr>
<tr>
<td>-------------</td>
</tr>
<tr>
<td>Almost certain 5</td>
</tr>
<tr>
<td>Very serious to catastrophic 5</td>
</tr>
<tr>
<td>Major 4</td>
</tr>
<tr>
<td>Moderate 3</td>
</tr>
<tr>
<td>Minor 2</td>
</tr>
<tr>
<td>Negligible 1</td>
</tr>
</tbody>
</table>
### Consequence definitions - environmental impacts

<table>
<thead>
<tr>
<th>Weighting</th>
<th>Affected</th>
<th>Moderate</th>
<th>Very severe</th>
<th>Environmental index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groundwater quality</td>
<td>No change to pre-mining water quality</td>
<td>Localised, short term change to water quality: does not affect beneficial use.</td>
<td>Widespread, short term change to water quality: does not affect beneficial use.</td>
<td>Permanent change in water quality, resulting in reduction in beneficial use, but not requiring active remediation.</td>
</tr>
<tr>
<td>Hydrogeology</td>
<td>No change to pre-mining water levels or flow regime.</td>
<td>Localised, short term change in groundwater levels or flow regime.</td>
<td>Widespread, short term change to groundwater levels and/or flow regime does not result in permanent impacts to existing users (including groundwater-dependent ecosystems).</td>
<td>Localised or persistent changes to ground water levels and/or flow regime results in permanent impacts to existing users (including groundwater-dependent ecosystems).</td>
</tr>
<tr>
<td>Surface water quality</td>
<td>No change to pre-mining water quality</td>
<td>Localised, short term change to surface water levels or flow regime, resulting in temporary increased or reversible changes to riparian ecosystems.</td>
<td>Widespread, but reversible changes to surface water flow regimes, resulting in increased erosion or changes to riparian ecosystems.</td>
<td>Permanent, but localised, changes to surface water flow regimes, resulting in irreversible changes to riparian or lake ecosystems.</td>
</tr>
<tr>
<td>Surface hydrology</td>
<td>No change to pre-mining water levels or flow regime.</td>
<td>Localised, short term change in surface water levels or flow regime, resulting in temporary increased or reversible changes to riparian ecosystems.</td>
<td>Widespread, but reversible changes to surface water flow regimes, resulting in increased erosion or changes to riparian ecosystems.</td>
<td>Permanent, but localised, changes to surface water flow regimes, resulting in irreversible changes to riparian or lake ecosystems.</td>
</tr>
<tr>
<td>Conservation significant flora, vegetation or ecosystems</td>
<td>No change in abundance or distribution of conservation significant species or ecosystems.</td>
<td>Localised, short term change in abundance or distribution of conservation significant species or ecosystems.</td>
<td>Widespread, but not resulting in altered conservation status.</td>
<td>Alteration in abundance or distribution of conservation significant species or ecosystems, resulting in altered conservation status.</td>
</tr>
<tr>
<td>Fauna and vegetation - no priority, DRF or conservation significance at local or regional scale</td>
<td>No change in abundance or distribution of conservation significant species or ecosystems.</td>
<td>Localised, short term change to flora/vegetation abundance or extent: no active rehabilitation required to restore.</td>
<td>Widespread, but not resulting in altered conservation status.</td>
<td>Alteration in abundance or distribution of conservation significant species or ecosystems, but not resulting in altered conservation status.</td>
</tr>
<tr>
<td>Conservation significant flora (terrestrial and subterranean) - includes short term endemism and ecosystems</td>
<td>No change in abundance or distribution of conservation significant species or ecosystems.</td>
<td>Localised, short term change to flora/vegetation abundance or extent: no active rehabilitation required to restore.</td>
<td>Widespread, but not resulting in altered conservation status.</td>
<td>Alteration in abundance or distribution of conservation significant species or ecosystems, resulting in altered conservation status.</td>
</tr>
<tr>
<td>Fauna (terrestrial and subterranean) - not priority, of conservation significance at local or regional scale</td>
<td>No change in fauna diversity at an abundance.</td>
<td>Localised, short term alteration to fauna diversity to an abundance.</td>
<td>Widespread and persistent alteration to fauna diversity or abundance.</td>
<td>Permanent alteration of fauna diversity and abundance.</td>
</tr>
<tr>
<td>Soils</td>
<td>Air change of not quality within or surrounding the approved operational footprint that would alter the beneficial uses or conservation status of the site, compared to the pre-mining location.</td>
<td>Localised changes to soil quality or physical condition, but no remediation required to use land for agreed post-mining land uses.</td>
<td>Guideline changes to soil quality or physical condition requiring remedial works to make land suitable for agreed post-mining land use.</td>
<td>Widespread, persistent alteration to soil quality or vegetation health. (Relates to dust attributable to Toro operations.)</td>
</tr>
<tr>
<td>Landforms</td>
<td>No changes to pre-mining landforms.</td>
<td>Localised changes to landforms which do not require remediation in order to implement agreed post-mining land uses.</td>
<td>Guideline changes to landforms (including drainage patterns) requiring remedial works to make land suitable for agreed post-mining land use.</td>
<td>Pronounced alteration of local landforms (including drainage patterns), necessitating extensive investigation and remediation to ensure land is suitable for agreed post-mining landuses.</td>
</tr>
<tr>
<td>Air quality (PM10, TSP, NOx, SO2)</td>
<td>Air quality parameters at all sensitive locations do not exceed 15% of the relevant NEPM or WHO guideline values for PM10, TSP, NOx or SO2 in ambient air.</td>
<td>Air quality parameters routinely fall in range of 50% to 55% of the relevant NEPM or WHO ambient air quality guideline values.</td>
<td>Air quality parameters routinely fall in range of 50% to 85% of the relevant NEPM or WHO ambient air quality guideline values.</td>
<td>Air quality parameters exceed relevant NEPM or WHO ambient air quality guideline values more than once per year.</td>
</tr>
<tr>
<td>Air quality (deposited dust)</td>
<td>Dust deposition outside approved disturbance footprint &lt;5g/m2/mo. (Relates to dust attributable to Toro operations.)</td>
<td>Dust deposition outside approved disturbance footprint of range of 0.5 to 1g/m2/mo. (Relates to dust attributable to Toro operations.)</td>
<td>Dust deposition outside approved disturbance footprint of range of 0.5 to 1g/m2/mo. (Relates to dust attributable to Toro operations.)</td>
<td>Dust deposition outside approved disturbance footprint of range of 0.5 to 1g/m2/mo. (Relates to dust attributable to Toro operations.)</td>
</tr>
<tr>
<td>Noise</td>
<td>No noise complaints and no exceedance of Noise Regulations or licence limits.</td>
<td>Occasional complaints, but no exceedance of Noise Regulations or licence limits.</td>
<td>Frequent or ongoing noise complaints.</td>
<td>Breach of Noise Regulations or licence limits, rectified through operational changes.</td>
</tr>
<tr>
<td>Public health and safety (radiation)</td>
<td>No discernible adverse impact on public health and safety.</td>
<td>Minor health impact.</td>
<td>Widespread health impact.</td>
<td>Infringing on community’s right to a healthy environment.</td>
</tr>
<tr>
<td>Cultural values, including heritage values</td>
<td>No discernible adverse impact on cultural values.</td>
<td>Perturbations to cultural site(s) required: consent obtained from stakeholders prior to disturbance.</td>
<td>Accidental damage to cultural values: able to be remediated with minimal effort.</td>
<td>Accidental damage to significant site or cultural values requiring substantial effort and/or compensation to stakeholders.</td>
</tr>
<tr>
<td>Regulatory compliance</td>
<td>No non-compliance with regulatory requirements</td>
<td>Non-compliance with Toro procedures, but not sufficient to result in breach any environmental regulations.</td>
<td>Demonstrated or potential non-compliance which could attract a Tier 2 penalty under the EP Act.</td>
<td>Demonstrated or potential non-compliance which could attract a Tier 3 penalty under the EP Act.</td>
</tr>
<tr>
<td>Corporate reputation (social and environmental)</td>
<td>No adverse effect on reputation</td>
<td>Damage to reputation at site level; raised in parliament or media at state level.</td>
<td>Damage to reputation at national level; raised in parliament or national media</td>
<td>Damage to corporate reputation at international level; raised in international media; suspension or withdrawal of operating licence; loss of customer confidence</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>71</td>
<td>72</td>
<td>73</td>
<td>74</td>
<td>75</td>
<td></td>
</tr>
</tbody>
</table>

**Definitions**

- **Localised**: Impact is confined to the approved project disturbance footprint
- **Widespread**: Impact extends outside the approved project disturbance footprint
- **Short term**: Effect lasts for up to 5 years after cessation of the disturbance event
- **Permanent**: Effect lasts for more than 5 years after cessation of the disturbance event
- **Irreversible**: Impact cannot be reversed through remedial works.
APPENDIX C – MINE CLOSURE TASK REGISTER
Prior to start of ground-disturbing works

- Conduct closure site assessment
- Define impact criteria
- Define and maintain obligations register
- Collect baseline meteorological data for use in water balance, seepage & erosion assessment, air modelling
- Baseline soils and vegetation mapping, including weed survey
- Commence soils seedbank trials (ECDU)
- Baseline soils and waste rock chemical and physical characterisation
- Topographic survey
- Baseline radiation monitoring
- Establish baseline dust monitoring network
- Define mining and rehabilitation schedule
- Baseline groundwater monitoring
- Preliminary drainage design and flood analysis
- Prepare preliminary cost estimate
- Undertake preliminary contamination assessment in Apex discharge area
- Stakeholder consultation
- Training of staff
- Stakeholder capacity building

Prior to start of ground-disturbing works

- Review and document organisational accountabilities for closure and rehabilitation. Communicate requirements to staff and contractors
- Develop rehabilitation specification for construction works and include in contract conditions.
- Prepare report of "controlled" and "supervised" areas of plant
- Design field rehab experiment and purchase materials
- Collect seed for use in field rehab trials
- Agree programme for characterising ecological water requirements of groundwater dependent veg.
- Train field staff to recognise reportable weeds
- Implement seed hygiene procedure
- Include seed specification in earthworks contracts
- Document seed mix tests for various rehabilitation areas and schedule seed collection
- Review, test and consider offset requirements
- Establish materials inventory
- Physical characterisation of tailings
- Geochanical characterisation of tailings and waste rock
- Undertake investigations to support detailed design of PLS pond, processing plant and waste storage facilities
- Prepare tailings containment and cover strategy
- Prepare tailings operation strategy in accordance with DMP guidelines
- Field testing of perimeter barriers
- Independent expert review of hydrogeological modelling and seepage modelling
- Further characterisation of subterranean fauna in groundwater draindown areas
- Identify access sites for use in closure assessment
- Define programme for monitoring soil stability, soil fauna and vegetation re-establishment in rehab areas

Prior to submission of ERMP

- Define management domains
- Define impact criteria
- Conduct closure site assessment
- Define and maintain obligations register
- Collect baseline meteorological data for use in water balance, seepage & erosion assessment, air modelling
- Baseline soils and vegetation mapping, including weed survey
- Commence soils seedbank trials (ECDU)
- Baseline soils and waste rock chemical and physical characterisation
- Topographic survey
- Baseline radiation monitoring
- Establish baseline dust monitoring network
- Define mining and rehabilitation schedule
- Baseline groundwater monitoring
- Preliminary drainage design and flood analysis
- Prepare preliminary cost estimate
- Undertake preliminary contamination assessment in Apex discharge area
- Stakeholder consultation
- Training of staff
- Stakeholder capacity building

Geotechnical investigations to support detailed design of PLS pond, processing plant and waste storage facilities

- Geochanical characterisation of tailings and waste rock
- Undertake investigations to support detailed design of PLS pond, processing plant and waste storage facilities
- Prepare tailings containment and cover strategy
- Prepare tailings operation strategy in accordance with DMP guidelines
- Field testing of perimeter barriers
- Independent expert review of hydrogeological modelling and seepage modelling
- Further characterisation of subterranean fauna in groundwater draindown areas
- Identify access sites for use in closure assessment

Notable milestones:
- Literature review of soil meso- and macro-fauna as rehab indicators initiated.
## Mine Rehabilitation and Closure Task Register

<table>
<thead>
<tr>
<th>Current status and information gaps</th>
<th>Mine Rehabilitation and Closure Task Register</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consult with local stakeholders on programme to demonstrate rehabilitation success</td>
<td>X</td>
</tr>
<tr>
<td>Prepare template reports for annual reporting to WMP, OEPA, DEC, DoW</td>
<td>X</td>
</tr>
<tr>
<td>Unnecessary baseline monitoring procedures and provide training to relevant staff</td>
<td>X</td>
</tr>
<tr>
<td>Prepare schedule for specialist site surveys</td>
<td>X</td>
</tr>
</tbody>
</table>

**Progressive rehabilitation works during operations** *(includes performance monitoring)*

<table>
<thead>
<tr>
<th>Current status and information gaps</th>
<th>Mine Rehabilitation and Closure Task Register</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual survey of disturbed and rehabilitated areas</td>
<td>X</td>
</tr>
<tr>
<td>Annual compliance reports to OEPA, DEC, DMP</td>
<td>X</td>
</tr>
<tr>
<td>Annual benching report and aquifer review</td>
<td>X X</td>
</tr>
<tr>
<td>Review closure cost estimate</td>
<td>X</td>
</tr>
<tr>
<td>Review materials quantities database</td>
<td>X</td>
</tr>
<tr>
<td>Update geomatics database for sites &amp; wastes, using quarterly test results</td>
<td>X</td>
</tr>
<tr>
<td>Review routine radiation, groundwater &amp; air quality data and incorporate in compliance reports (as defined in relevant management strategies)</td>
<td>X</td>
</tr>
<tr>
<td>Review specialist survey schedule, review budgets for consultant work, issue purchase orders</td>
<td>X</td>
</tr>
<tr>
<td>Schedule annual stakeholder site inspections</td>
<td>X</td>
</tr>
<tr>
<td>Schedule regulatory site inspections</td>
<td>X</td>
</tr>
<tr>
<td>Three-yearly closure plan review</td>
<td>X</td>
</tr>
</tbody>
</table>

**Decommissioning tasks**

<table>
<thead>
<tr>
<th>Current status and information gaps</th>
<th>Mine Rehabilitation and Closure Task Register</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communicate closure programme to internal and external stakeholders</td>
<td>X</td>
</tr>
<tr>
<td>Prepare assets list</td>
<td>X</td>
</tr>
<tr>
<td>Check status of closure task list</td>
<td>X</td>
</tr>
<tr>
<td>Review disturbance and rehabilitation areas and materials inventory</td>
<td>X</td>
</tr>
<tr>
<td>Update closure accountabilities</td>
<td>X</td>
</tr>
<tr>
<td>Conduct site contamination survey and prepare clean up schedule</td>
<td>X</td>
</tr>
<tr>
<td>Review closure cost provisioning</td>
<td>X</td>
</tr>
</tbody>
</table>

**Post-closure monitoring & maintenance**

<table>
<thead>
<tr>
<th>Current status and information gaps</th>
<th>Mine Rehabilitation and Closure Task Register</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual inspection of cover integrity (tailings and waste storages)</td>
<td>X X X X</td>
</tr>
<tr>
<td>Groundwater quality and level monitoring</td>
<td>X X X X</td>
</tr>
<tr>
<td>Fauna, soil, vegetation</td>
<td>X</td>
</tr>
</tbody>
</table>

**Unplanned closure / temporary shut down**

<table>
<thead>
<tr>
<th>Current status and information gaps</th>
<th>Mine Rehabilitation and Closure Task Register</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implement emergency/contractor communications strategy</td>
<td>X</td>
</tr>
<tr>
<td>Review site safety and security</td>
<td>X</td>
</tr>
<tr>
<td>Review closure cost provisioning</td>
<td>X</td>
</tr>
<tr>
<td>Review disturbance and rehabilitation areas and materials inventory</td>
<td>X</td>
</tr>
<tr>
<td>Review monitoring and reporting requirements</td>
<td>X</td>
</tr>
<tr>
<td>Conduct closure environmental safety audit, including (but not limited to) radiation survey</td>
<td>X</td>
</tr>
</tbody>
</table>

Note: Research activities and trials are indicated by green shading.