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1 INTRODUCTION

Toro Energy Limited (Toro) is proposing the development of a uranium mine, associated processing plant and support infrastructure and the transport of product within Australia for export to bring uranium to international markets. The location of the proposal is near Wiluna, about 960 kilometres north-east of Perth, Western Australia.

The Project is subject to environmental approval by the Western Australian Government under the Environmental Protection Act 1986. As part of this approvals process, Toro has previously submitted an Environmental Scoping Document and an Environmental Management and Review Programme (ERMP) to the Western Australian Environmental Protection Authority (EPA). This Response to Submissions completes the documentation Toro Energy Limited (Toro) has provided to assist the EPA’s assessment of Toro’s Wiluna Uranium Project (the Project).

1.1 Executive Summary

This Response to Submissions has been prepared to address issues raised in the 48 written submissions which were received by the EPA during the public consultation period of the ERMP, as well as feedback from the EPA itself on the key environmental factors arising in the assessment of the Project. In particular, Toro has provided information which has enhanced the reports contained in the ERMP in the key environmental aspects of:

- tailings and mine closure;
- water supply, mine dewatering and groundwater management;
- radiation management and transport;
- flora and fauna impacts with particular reference to Tecticornia and stygofauna; and
- Aboriginal and cultural heritage.

A number of other environmental aspects including surface water, air quality, and social aspects were also raised in the public submissions, and responses to these issues are also provided. Some issues raised in public submissions are outside the scope of the ERMP, and are not addressed in this document.

Further information that has been provided to the EPA since the public consultation period closed is provided in the Appendices to this Response to Submissions. This includes clarification and re-presentation of information contained in technical reports attached to the ERMP, as well as the results of ongoing monitoring studies that are being conducted as part of Toro’s comprehensive environmental management programme.

Mine Closure, Tailings and Rehabilitation

Toro presented a Draft Mine Closure and Rehabilitation Plan in the ERMP and is continuing to develop the Plan consistent with the WA EPA and WA DMP’s Guidelines for Preparing Mine Closure Plans, 2011.

Toro’s proposal would result in the direct disturbance of about 1,530 hectares of land. All impacts of mining would be localised. In project execution, Toro would seek to minimise land disturbance and undertake progressive rehabilitation of disturbed areas. Disturbed areas would be recontoured to blend in with the surrounding landscape. The form, soil and vegetation types used in rehabilitation design would mimic the pre-mining landscape. No large or high waste landforms or open pits would remain after mining with all disturbed areas being returned, as close as practicable, to the original topography.

After completion of mining, mineralised wastes including tailings would be placed in the pit voids below ground level. Mined out voids at Centipede would store tailings produced from the processing of ore from both the Centipede and Lake Way deposits.
Each tailings cell would be covered with inert rock to a planned depth of at least two metres, including a compacted ‘radiation control layer’ to minimise radon emanation.

The tailings would have low permeability, indicating very low seepage rates. Metallurgical test work shows that radionuclides predominantly remain within the solids fraction of the tailings, with about 0.3 per cent reporting to the liquor fraction. At closure, uranium and other trace elements in groundwater beyond the perimeter of disturbance would not exceed concentrations in the pre-mining environment. Modelling of radionuclide mobilisation into the surrounding groundwater over 1,000 and 10,000 years indicates that contaminants will move less than 25 metres from the base of the tailings facility. As a result of the local hydrological conditions, groundwater flows would be through the surrounding lithology rather than through the tailings mass itself.

Toro’s final Mine Closure and Rehabilitation Plan would be developed to ensure that radiation levels in the areas of its operations were consistent with pre-mining levels. It would undertake a review of the Plan and submit the outcomes to the WA DMP every three years.

**Groundwater and Water Supply**

The proposal has identified water supply to the Project from the generally brackish groundwater in West Creek borefield and a highly saline supply from mine dewatering of aquifers in the Centipede and Lake Way mining areas.

Toro has proposed the annual extraction of 0.7 GL per annum from West Creek as a sustainable strategy for the life of the Project. This is consistent with extraction by previous users of the borefield and Toro’s strategy has been assessed as ‘conservative’ by an independent expert. The maximum drawdown of 4 metres would occur over about 10 per cent of the drawdown zone and reduce rapidly to 0.5 metres.

To ensure safe mining and limit water ingress in the Centipede and Lake Way the mining areas, Toro would install barriers to control groundwater flow. Toro has undertaken trials to demonstrate the viability and effectiveness of water barriers during mine dewatering.

The barriers trialled were compacted backfill and high-density polyethylene (HDPE) liner. Compacted clay resulted in reduction of water inflow of up to 40 per cent in calcrete areas and 80 per cent in clay areas, and HDPE liner reduced inflow by up to 25 per cent.

The mining areas would be constructed in separate ‘cells’ each with its own water barrier. In the event of a breach of water barrier in any one cell, additional barriers would be established outside the failed section to contain any excess water. There would be no discharge of water from the Project Area during normal operation.

With these barriers installed, up to 1.3 GL per annum would be available from mine dewatering for operational use. The high salinity of groundwater sourced from mine dewatering has proven not to be an obstacle to the use of this water in the processing circuit. As a result, Toro would bring forward the dewatering of the Lake Way mining area to Year 3 of operations to meet short-term water demand. Combined with the available supply from West Creek this water supply would meet the water requirements for the start of production.

Where the Project’s water demand is not able to be met by the water sources documented in this assessment, additional water sources would be investigated. Any additional source would be referred to the EPA if, as a result of additional ecosystem, flora and fauna investigation, impacts were considered to be environmentally significant.

The Response to Submissions identifies a range of local supply options that Toro is considering, should it become necessary to augment supply from West Creek and mine dewatering.
The impacts of groundwater drawdown on flora, fauna and their habitats would be localised near production bores within West Creek borefield and at the Centipede and Lake Way mining areas. Project implementation would not result in any significant impacts on environmental values or other beneficial use of groundwater in the Project Area either during the active life of the mine or following closure.

Toro would continue to enhance its understanding of local hydrogeological systems through a combination of modelling and monitoring during the operational life of the Project.

**Radiation**

Toro aims to minimise radiation exposure to workers, contractors and members of the public. Modelling predicts that exposure levels would be very low and well under internationally accepted limits.

The average exposure to a mine worker would be less than one quarter of the public limit or 0.25 mSv per year. Public exposures to the nearest residents to the Project would be about one-twentieth of the public exposure limit or 0.05 mSv per year, which is barely detectable (if at all) above background radiation levels.

Management measures to maintain radiation at these levels would include:

- Adoption of the ‘As Low as Reasonably Achievable’ principle in dose management;
- Minimising dust from operations through progressive rehabilitation;
- Best practice control systems for processing, product packing and transport; and
- Effective monitoring, Emergency Response and Security Plans.

Predicted radiation doses to members of the public along the transport route would be extremely low and well under the statutory limit. An assessment has also demonstrated that the Project would not have any adverse radiological impact on non-human biota.

As detailed Project design proceeds, Toro would continue to develop its Radiation Management Plan and Radioactive Waste Management Plan in consultation with the relevant government agencies.

**Transport**

Toro would transport all product by road to Adelaide for shipment from Port Adelaide, or rail to Darwin for shipment from the Port of Darwin.

Toro would adopt procedures followed by uranium mines in South Australia and the Northern Territory for more than twenty years, which have resulted in uranium being transported by road and rail without incident.

Toro would consult with Main Roads Western Australia and other relevant government and emergency services authorities on its Transport Management, Risk Management and Emergency Response Plans. Toro also commits to consult with the Council of the City of Kalgoorlie-Boulder and other key stakeholders on the Transport Management Plan and work with other uranium project proponents on transport matters, including emergency response.

Toro would establish and coordinate training programmes with government agencies and organisations likely to be involved in the transport of product, to include radiation and emergency response.
Subterranean and Terrestrial Fauna

Studies of subterranean fauna by Toro have substantially increased the state of knowledge of species diversity in the Project Area and markedly improved information available from previous published studies conducted by the Western Australian Museum. Ongoing studies have continued since the ERMP was submitted, which have demonstrated extensive habitats exist for stygofauna in the region surrounding Lake Way.

As a result, it is predicted that Project implementation would have a very modest to negligible impact on subterranean fauna. With groundwater barriers in place and effective, less than five per cent of any Priority Ecological Communities lie within the Project footprint. No priority or listed Species are impacted by the Project. The Project would not result in any unacceptable impacts on the species present or affect the abundance and distribution of subterranean fauna at a regional scale.

Toro would develop a Groundwater Monitoring and Management Plan to include acceptable limits for groundwater drawdown to limit any impact on stygofauna habitats.

For terrestrial fauna, the main potential impact would be removal or fragmentation of habitat through land disturbance and vegetation clearance. Disturbance and clearance activities would be progressive, to allow fauna species to establish habitat in other areas. Most of the 19 fauna habitats present in the Project Area are widely represented throughout the region. No putative Short Range Endemic species are restricted in their known occurrence to the Project Area.

There are no Threatened Fauna Species under the Environment Protection and Biodiversity Conservation Act 1999 (Cth) or the Wildlife Conservation Act 1950 (WA) in the Project Area, nor any Priority Fauna Species listed under the WA DEC’s Priority Species List.

Flora and Vegetation

Project implementation would be unlikely to alter the conservation status of any vegetation communities and would not significantly impact any flora currently recognised as having conservation significance.

No declared rare flora or threatened ecological communities are known to occur in the Project Area.

Impact management would include minimising land clearance, controlling groundwater drawdown through barriers in the mining areas, limiting dust by progressive clearance and integrating clearing and rehabilitation schedules, and strict enforcement and monitoring of groundwater use.

In the West Creek borefield, the impact on groundwater dependent vegetation as a consequence of groundwater abstraction would be low to moderate because the maximum draw down of four metres would occur over only about 10 per cent of the total drawdown zone and reduce rapidly to 0.5 metres. Toro would limit its extraction from West Creek to no more than the historic rate of 0.7 GL per annum, with vegetation having previously successfully survived or recovered from this rate.

Information from the Western Australian Herbarium shows that a number of Tecticornia specimens collected and reported in the ERMP were unable to be identified due to a lack of seeds and flowers and the taxonomic uncertainty that exists for Tecticornia across Western Australia. Toro would commit to further studies into the distribution, occurrence, habitat and propagation of Tecticornia during the Project implementation.
Aboriginal and Cultural Heritage

Toro has consulted with Indigenous people of the region based on advice from, and in accordance with, the wishes of Traditional Owners, Native Title Claimants and their representative body.

Toro would endeavour to avoid any impact on Aboriginal cultural heritage and has committed to preparing an Aboriginal Cultural Heritage Management Plan in the ERMP. Reports on cultural heritage surveys that have been undertaken to date for the ERMP are culturally significant and sensitive and remain the property of the Native Title claimants consistent with the Memorandum of Understanding.

Toro is also committed to undertaking further bush tucker surveys, environmental and radiation monitoring with the involvement of the Traditional Owners as part of our ongoing environmental programmes.

Toro has commenced negotiation of a mining agreement with Traditional Owners that would include commitments to cultural heritage protection; funding of community development projects; training, employment and business development; on-going consultation with Aboriginal people through the life of the Project; and cross cultural awareness training for all employees and contractors.

Toro would continue to comply with all legislation applying to the protection of Aboriginal cultural heritage.

Surface Water

None of the watercourses or drainage lines in the Project Area flow naturally year round and any requirement to discharge water would be associated with prolonged or intense rainfall events. Bunding would be designed and constructed to accommodate at least the maximum one in 100 year rainfall event. In the event of extreme flooding requiring water to be discharged from site, there would be high dilution within a short distance. Discharge would only occur if the water complied with criteria to ensure there was no adverse environmental impact.

Air Quality

The air emissions requiring management would be particulates, specific constituent metals or radionuclides in airborne dusts, radon gas and oxides of nitrogen, sulphur and carbon from burning of fossil fuels. Baseline studies and modelling of potential impacts on air quality have found the Project is unlikely to exceed any air quality standard at sensitive receptors. The ERMP identifies a range of design and operational controls to ensure emissions comply with all relevant standards and guidelines.

Social Impacts

The Project is located in the Wiluna Shire in Western Australia that hosts a number of existing working operations throughout the region. Toro would seek to work with government and the Wiluna Shire to manage social impacts arising from the Project, such as integrating contractors and employees into the community.

The continuing growth of the mining industry in the region provides the opportunity for collaboration by industry participants to maximise the benefits of their presence to local residents. This is already occurring through the activities of the Wiluna Regional Partnership Agreement but could be enhanced in a number of ways that Toro would pursue including:

- sharing information with the community about the environment of the region which companies prepare for government assessment and monitoring purposes;
• initiating regional research on aspects such as radiological impacts on the environment and sharing outcomes with the public;
• collaboration on meeting workforce requirements to assist government and other agencies to identify needs and make local and regional training programmes more viable, increasing the likelihood that employment for new operations can be sourced locally and regionally;
• supporting local and regional businesses;
• protecting Aboriginal cultural heritage; and
• supporting Aboriginal community development.
1.2 Proposal

In the 1970s, uranium was discovered in two deposits (the Centipede and Lake Way deposits) at Lake Way in Western Australia, about 960 kilometres north east of Perth and close to the town of Wiluna.

Toro Energy Limited (Toro) has held the tenements on which the Centipede and Lake Way deposits are located since 2007, and has developed a proposal for mining them as the Wiluna Uranium Project (the Project), detailed in the Environmental Review and Management Programme (ERMP).

The Project includes development of a uranium mine, associated processing plant and support infrastructure and the transport of product within Australia for export to bring uranium to international markets.

1.3 Purpose and Scope of Document

This document provides Toro’s response to key issues raised in public and government agency submissions in relation to the ERMP.

The document meets the WA EPA Guidelines for Preparing a Public Environmental Review/Environmental Review and Management Programme (2007) and meets the requirements of the Environmental Impact Assessment (EP Act, Part IV Division 1) Administrative Procedures (2002) (updated in 2010); and attends to the following requirements:

- prepare a summary of the pertinent issues raised in public and government agency submissions;
- respond in writing to the summary of issues and any other issues the WA EPA may consider need to be addressed; and
- amend the proposal and change environmental commitments where appropriate.

In reviewing the submissions and preparing responses, Toro ensured that all comments received from individuals, organisations and government agencies about the ERMP were subject to careful consideration.

As a result of this consideration, Toro has reviewed the original plans and programmes outlined in the ERMP to address these issues. These changes are outlined in this Response to Submissions in the appropriate section. On some key aspects, Toro has undertaken further studies to enhance the understanding of the issues being raised. Reports of these studies – specifically tailings and mine closure, subterranean fauna (Stygofauna) and groundwater dependent vegetation (Tecticornia sp.) are provided in the Appendices relating to each specific topic.

1.4 Response to Submissions

A total of 48 submissions were received from public and government agencies during the public review phase of the ERMP. From these 48 submissions, around 300 issues were related to the Project, and are addressed in the Response to Submissions. Issues have been grouped according to the Project Proposal, Environmental and Indigenous & Culture Heritage Issues, and Community Consultation issues to minimise duplication and repetition. The most commonly raised issues were:

- water supply requirements and groundwater management;
- management of mine closure and rehabilitation;
• tailings management;
• risk of long-term contamination to Lake Way;
• groundwater impacts on subterranean fauna and groundwater dependent vegetation;
• management of radiation risk to the public and workers during the mining phase;
• managing risks when transporting product from mine to port; and
• management of cultural heritage issues.

There were 18 issues identified outside the scope of the ERMP.

The issues and responses are identified in this document according to the aspect of the ERMP to which it refers. The submissions which raised the issues have also been identified by number only (as some submissions were provided anonymously).
2 ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The Project is subject to environmental approval from the Western Australian Government under the Environmental Protection Act 1986 (EP Act). The Project also triggers assessment as a nuclear action under the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act). Assessment of the Project is conducted by the WA EPA under a bilateral agreement with the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWP), which has determined the Project is a “controlled action”.

The WA EPA set the level of assessment at an Environmental Review and Management Programme (ERMP). The ERMP describes the Project and its likely effects on the environment (Toro 2011a) and was released in July 2011 for a statutory fourteen-week public review period closing on 31 October 2011. Submissions on the ERMP were received from members of the public, government agencies, academia, Traditional Owners and other stakeholders. Access was provided through public viewings, the Toro website, and public information days held in Kalgoorlie, Menzies, Leonora and Wiluna.

Forty-eight written submissions were received during the public review period. Of these, 33 were ‘unique submissions’ and 15 were form letters (duplicate submissions). If a form letter included a new issue it was acknowledged and treated as a new submission. Submission 17 (numbering provided by the WA EPA) was superseded by submission 39 from the same submitter.

During the public review period the documentation was accessed on Toro’s website on 462 occasions. Toro also received 16 requests from individuals or organisations for the ERMP documentation.

A number of issues were raised directly regarding the ERMP distribution, structure and the nature of the ERMP document itself. The process of the assessment of the proposal was also questioned, and some issues are directed to government. These issues are addressed in Section 7 of this Response to Submissions.

A number of issues were identified pertaining to the assessment process, as listed below. Toro’s response to each issue is also provided.

Toro acknowledges all groups and individuals who forwarded submissions as part of the environmental impact assessment process.

Issue:

There was criticism of Toro’s Disclaimer in the ERMP to the effect that government should refuse to assess Toro’s application until such time as the company has fully verified the accuracy and completeness of the application and accepted responsibility for it.

Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 19, 23, 24, 28, 29, 31, 34, 38, 40, 42

Response:

Toro provides legal disclaimers on documents of this type under legal advice. It does not affect the veracity of the information provided in the ERMP.
Issue:

A submitter claimed that in response to a number of requests, Toro had failed to provide a copy of the ERMP.

Submission: 39

Response:

Toro provided copies of the ERMP to all persons who requested the document. The ERMP was available in all forms and at all locations required by the WA EPA and was consistent with the Environmental Scoping Document (ESD) and ERMP public consultation process.

Issue

It was suggested that many of the figures, graphs, diagrams and maps within the ERMP were too blurred, small or both, to be legible with the type size in some places miniscule and republication of the document was requested in a more legible form.

Submission: 39

Response:

Toro acknowledges that there were a number of editorial aspects of the ERMP that could be improved, but does not believe that the content of the ERMP is diminished by these minor aspects. Toro maintains that re-publication of the ERMP is not required.

Issue:

It was suggested that Toro had failed to ‘acquire, synthesise and discuss a high standard of baseline surveys (e.g. extent of samples, breadth of analyses etc) especially with respect to aspects such as climate, radon emanation, flood frequency, soil and water quality etc.’

Submission: 32

Response:

Toro prepared the ERMP to comply with the requirements of the ESD approved by the Western Australian and Australian Governments. The scope and methods adopted in the baseline studies were consistent with relevant WA EPA guidance statements, or where no such guidance statements existed, with other relevant standards as cited in the reports.

Since 2007, Toro has conducted a wide range of baseline studies in the Project Area. Copies of the technical reports arising from these studies were presented as appendices to the ERMP.

Issue:

It was suggested the baseline evaluations in the ERMP should be verified by an independent body to ensure their accuracy.

Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13, 14, 15, 19, 21, 23, 25, 28, 31
Response:

Independent peer review of some key studies has been undertaken as part of the ERMP process. The review of the ERMP by the WA EPA also provides independent assessment of the evaluations in the ERMP.

Issue:

It was suggested that the Environmental Management Strategy Documents (EMSDs) should be reviewed at more regular intervals than five years. (ERMP Part 2 p1-13)

Submission 39

Response:

Toro would review the EMSDs in accordance with ISO 14001, when relevant new information becomes available, or as a minimum, at least every five years.

Community and stakeholder comments and suggestions would be taken into account in reviewing Toro’s EMSDs.
### 3 PROJECT CHARACTERISTICS

<table>
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<th>Project Element</th>
<th>Description</th>
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<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>Project location</td>
<td>Approximately 550 km north of Kalgoorlie and between 15 and 30 km south of Wiluna</td>
</tr>
<tr>
<td>Life of mine</td>
<td>14 years (includes construction, operations and closure)</td>
</tr>
<tr>
<td>Annual production</td>
<td>Up to 1,200 tonnes uranium oxide concentrate</td>
</tr>
<tr>
<td>Nature of Mineralisation</td>
<td>Shallow depth deposit to 12 m below surface, predominantly carnotite</td>
</tr>
<tr>
<td>Estimated disturbance area</td>
<td>Approximately 1530 hectares</td>
</tr>
<tr>
<td>Mining method</td>
<td>Open pit using surface miners and heavy machinery with in-pit barriers to manage groundwater flow</td>
</tr>
<tr>
<td>Mining depth</td>
<td>Up to 15 m</td>
</tr>
<tr>
<td>Dewatering rate</td>
<td>No cut-off barriers ~ 5500 kL/day</td>
</tr>
<tr>
<td></td>
<td>With cut-off barriers (100 per cent effective) ~ 2300 kL/day</td>
</tr>
<tr>
<td>Processing method</td>
<td>Crushing and grinding followed by elevated temperature (92°C) agitated alkaline leach (in tanks), solid/liquid separation and direct precipitation of uranium oxide concentrate</td>
</tr>
<tr>
<td>Main process and fuels</td>
<td>Sodium carbonate and sodium bicarbonate (reagents), sulphuric acid (for pH control), hydrogen peroxide, sodium hydroxide, diesel fuel and natural gas</td>
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<tr>
<td>Water requirement</td>
<td>Up to 2.5 GLpa, sourced from underground aquifer(s). Approximately 0.7 GLpa of fresh to brackish water sourced from the West Creek borefield. The balance would comprise saline or hypersaline water from pit dewatering and where required other local aquifer supply.</td>
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<tr>
<td>Power requirement</td>
<td>Up to 12 MW of on-site diesel or gas powered generation</td>
</tr>
<tr>
<td>Tailings</td>
<td>In-pit, below grade disposal. Total tailings volume from the Centipede and Lake Way deposits ~ 9.1 million cubic metres, allowing for 20 per cent swelling of the ore.</td>
</tr>
<tr>
<td>Waste</td>
<td>Overburden to be temporarily stored adjacent to pit, then backfilled into void</td>
</tr>
<tr>
<td>Access</td>
<td>By the existing Goldfields Highway. Access to the Project Area would be from an unpaved road intersecting the Goldfields Highway about 30 kilometres south of Wiluna. A purpose built haul road would link the Centipede and Lake Way mines (approximately 30 km) to the processing plant.</td>
</tr>
<tr>
<td>Aerodrome</td>
<td>The existing Wiluna airport would be used for fly-in fly-out personnel and delivery of supplies</td>
</tr>
<tr>
<td>Product transport</td>
<td>By road via Goldfields Highway and other existing roads to Adelaide and by rail between Adelaide and Darwin</td>
</tr>
<tr>
<td>Mine rehabilitation</td>
<td>Land would be contoured to blend with local terrain and revegetated using local provenance species.</td>
</tr>
<tr>
<td>Other key infrastructure elements</td>
<td>Accommodation village, water supply borefield and associated pipeline, power lines, communications infrastructure</td>
</tr>
<tr>
<td>Workforce</td>
<td>Construction – up to 350 Operations – up to 170</td>
</tr>
</tbody>
</table>

Table 1: KEY PROJECT CHARACTERISTICS
There have been no significant modifications to the proposal made by Toro following the release of the ERMP. Additional information provided includes:

- nature of the mineralisation;
- tailings volume, physical and chemical characterisation and leachability;
- dewatering rate and installation of in-pit barriers to manage groundwater flow; and
- nature of stygofauna and tecticornia distribution; and
- other key infrastructure elements.

This draws on information already provided in the ERMP.
4   ABOUT THE PROJECT

4.1  Toro’s tenements in the Wiluna Region

Issue:

Because Toro has other tenements in the region, Toro was requested to:

1. disclose its intentions about mine tenements beyond the Centipede and Lake Way deposits;
2. define if a new application would be submitted to incorporate mining on other tenements; and
3. confirm Toro’s position on whether it intends to pursue the development of a centralised processing hub for uranium with other companies, as it was suggested that the impacts would increase in the areas of ore transport, tailings management, water and the surrounding environment.

Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 13, 14, 15, 24, 31, 34, 40, 42

Response:

While Toro continues to assess opportunities for growth, including assessing the economics of resources identified in regional deposits, the current plans focus on the development of the Centipede and Lake Way deposits.

The scope of this assessment extends only to impacts as a result of mining the Centipede and Lake Way deposits and establishment of the infrastructure necessary to support mining and processing of these deposits. Should the WA EPA approve the proposal, the approval would apply only to the mining and processing of the Centipede and Lake Way deposits. Should Toro consider developing other deposits, a separate assessment process and government approvals would be initiated including undertaking further assessment of environmental impacts and community and stakeholder consultation.

4.2  The nature of uranium mining and its regulation

Issue:

It was suggested that uranium mining is different from other mining because it is radioactive and poses an unacceptable risk to the public.

It was further suggested there was no safe way to mine and process uranium 5.2 kilometres from the nearest residents in Wiluna.

Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13, 14, 15, 19, 21, 23, 38, 39

Response:

Toro acknowledges that because uranium mining has not been undertaken in Western Australia before, there is heightened sensitivity to levels of public risk.

Toro is committed to conducting safe mining practices and has considered the health risks to the public.
As referenced in Table 80 of the ERMP, predicted radiation exposure levels to the public are negligible. The estimated public dose in Wiluna would be less than one twentieth of the accepted public dose limit of one millisievert per year. Uranium oxide concentrate produced at mines in Australia is mildly radioactive with average doses to workers being less than 5 mSv/year, well within the regulatory annual limit of 20 mSv/year.

The Project would achieve workers’ radiation dose and public doses similar to all Australian operating uranium mines, which are well within regulatory limits. Toro maintains that the radiological impacts of the Project to the public would be negligible.

**Issue:**

It was claimed that existing uranium mines in Australia were responsible for many breaches of environmental and workers safety requirements. In justification, a 2003 report by the Senate References and Legislation Committee was cited, which found ‘a pattern of under-performance and non-compliance’, many gaps in knowledge and an absence of reliable data on which to measure the extent of the industry’s environmental impacts. Another submitter rejected the assertion in the ERMP that uranium mining and milling had occurred safely in Australia for almost 60 years, citing the use of Australian produced uranium in atom bomb tests at Maralinga and Monte Bello and alleged unsafe practices at currently operating mines in Australia.

**Submission:** 1, 2, 3, 4, 5, 6, 8, 9, 10, 13, 14, 15, 25, 28, 29, 32, 34, 38, 39

**Response:**

Toro maintains the position that ‘uranium mining and milling have occurred safely in Australia for almost 60 years’ (ERMP Part 1. p 2-6).

Toro is committed to conducting safe mining practices and has considered the health and safety risks to the public and the workforce.

As referenced in Table 80 of the ERMP, radiation exposure levels to the public would be negligible, as the estimated public dose in Wiluna is less than one twentieth of the accepted public dose limit of 1 mSv/year.

Uranium oxide concentrate produced at mines in Australia is mildly radioactive with average doses to workers being less than 5 mSv/year, well within the regulatory annual limit of 20 mSv/year.

The Project would achieve workers’ radiation dose and public doses similar to all Australian operating uranium mines, which are well within regulatory limits. Toro maintains that the radiological impacts of the Project to the public would be minimal.

The Senate Report referred to in the submissions related to regulation of uranium mines in the Northern Territory and South Australia. In the same report, some members of the Committee also stated that ‘the environmental monitoring and management regimes of all four mines investigated have met the legislative and regulative requirements with no environmental impacts being experienced by the surrounding biosphere’.

With respect to safety performance of the Australian uranium mining industry, both the Ranger Mine in the Northern Territory and the Olympic Dam mine in South Australia recorded an All Injury Frequency Rate (AIFR) of about half the average rate recorded by the Australian mining industry as a whole. Further, the current AIFR rate at Ranger is 3.55 per million hours (Energy Resources Australia Ltd – 2010 Annual Report) and at Olympic Dam, 5.61 per million hours based on the latest information available. These rates have more than halved since 2006.
4.3 Mining & Geology

**Issue:**

*It was suggested that contradictory information was presented in the ERMP about the quantity of ore to be processed. This referred to the ERMP Part 1 (pp. 2-19 to 2-21, Figures 3 and 4 and Table 4) with the submitter claiming a contradiction between the Figures and the Table.*

**Submission: 32**

**Response:**

The quantity of ore to be processed would be up to 1.8 million tonnes per annum and the total volume of material moved (including both ore and waste) would be an average of 7.5 million tonnes per annum (mtpa), and would be up to 10.1 mtpa, as outlined in ERMP Part 1 (pp. 2-19 to 2-21).

Table 4 identifies the combined resource at Centipede and Lake Way at the time the ERMP was published and is defined as 20.21 million tonnes.

Tonnes mined are expected to vary based on grade and levels of waste. Figures 3 and 4 (ERMP pp 2-19 and 2-20) identify the total tonnes of material to be moved each year.

In accordance with normal industry practice, Toro would continue to revise the resource as new drilling and geological information becomes available for interpretation and would comply with all public disclosure requirements.

**Issue:**

*Clarification was sought of the strip ratio. It was suggested that the ERMP Part 1. p. 2-20 indicated a strip ratio of about 5 but a more recent public statement by Toro put it at 3.9.*

**Submission: 32**

**Response:**

The information in Table 4 of the ERMP shows 12.5 million tonnes of ore and 55.9 million tonnes of waste resulting in a total material mined of 68.4 million tonnes and a strip ratio of 4.4:1. As shown in Figure 3 of the ERMP this ratio varies each year with the maximum ratio in years 6 to 9.

**Issue:**

*It was suggested that bunding would be required for all mine infrastructure including ore stockpiles for water and flood management.*

**Submission: 20, 41**

**Response:**

The site area drainage would be designed to meet a one in 100-year storm event and would channel all stormwater run-off from the run of mine and ore stockpile areas to a suitably sized retention pond within the bunded area of the mining footprint. Stormwater would then either be recycled into the process plant or evaporated.
Bunding design would be further addressed in the final engineering design and the Mining Proposal to be submitted to the WA DMP.

**Issue:**

*Information was requested on the storage to be used for mineralised material excavated but not processed through the plant.*

**Submission:** 7

**Response:**

Waste rock would be separated into several categories (sub soil, clay, calcrete, mineralised and non-mineralised) to be used during rehabilitation, including the capping or burial of mineralised materials.

As outlined in ERMP Part 1, Section 2.5.6 the low level mineralised waste material (which is below the economic cut off) would be stockpiled adjacent to the pit void until there was sufficient capacity for it to be placed back into the void and covered with non-mineralised waste rock.

At the Lake Way deposit the mineralised waste rock would be placed directly back into mined out areas, and covered with non-mineralised material.

At the Centipede deposit, mineralised waste would either be returned to the pit, or stockpiled until the tailings had consolidated sufficiently to be covered with waste material and rehabilitated. In this case, the low level mineralised material would be placed on the consolidated tailings, and then covered with layers of non-mineralised material, followed by topsoil to complete rehabilitation. Rehabilitation would occur progressively throughout the mining operation.

Temporary waste stockpiles would be constructed near the pits and all storm water run-off would be collected in perimeter drains and directed towards the mine. No large or high waste landforms would remain after mining, with all disturbed areas being returned, as close as practicable, to the original topography.

Mined mineralised material (run of mine ore) which is awaiting processing may be temporarily stored in bunded stockpiles above ground in order to achieve constant grade and quality to the processing circuit. Any runoff would be collected to be re-used in the processing plant or evaporated.

**Issue:**

*It was pointed out that because a calcrete uranium deposit had not been mined previously in Australia, and the only such deposit being mined anywhere in the world (Langer Henrich in Namibia) had many start-up problems and failed to meet production targets, there was a lack of expertise and experience in engineering and mine design for these deposits, requiring a closer examination for potential risks to the environment and human health. It was further suggested that processing ore from such a deposit requires a larger process plant, energy and water and would generate more emissions.*

*It was also suggested that Toro lacks the necessary expertise to properly design, build, operate and decommission a calcrete uranium process plant.*

**Submission:** 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13, 14, 15, 19, 21, 23, 25, 28, 29, 31, 32, 34, 40
Response:

Toro’s Project team and consultants represent well over 200 years of collective experience in uranium mine project development and operations, including processing. This includes involvement at a senior level at three currently operating mines in South Australia and the Northern Territory. Toro has also obtained independent technical reviews of the key studies undertaken to support preparation of the ERMP.

As part of its due diligence process, Toro has undertaken a thorough feasibility study, and drawn on individuals with extensive experience and technical expertise in uranium, and calcrete style uranium mineralisation. This includes engineering, mining and processing professionals.

The extraction process for uranium in calcrete uses alkaline agitated leaching as the primary means of dissolving the uranium, which is then recovered following a solid/liquid separation phase, ion exchange precipitation and calcining. Since the publication of the ERMP Toro has undertaken a pilot scale alkaline agitated leaching trial using material from the Centipede deposit and this has confirmed the parameters and processes proposed for this Project. For its Definitive Feasibility Study (DFS), Toro has engaged a company with extensive expertise and experience in uranium extraction and alkaline leaching processes, including experience at Trekkopje (a calcrete style deposit) in Namibia.

Issue:

A cross section was requested through the Centipede and Lake Way deposits to show the mineralisation and host sediments (ERMP Part 1 p. 4-27).

Submission: 48

Response:

The cross sections requested are shown below in Figure 1 and Figure 2.
Figure 1: CENTIPEDE - TYPICAL CROSS SECTION
Figure 2: LAKE WAY - TYPICAL CROSS SECTION
4.4 Processing

**Issue:**

Toro was requested to give a commitment to the types of safety analysis methodology to be used during the various phases of process plant design and to confirm that the plant would be designed to the appropriate standards.

**Submission:** 7

**Response:**

Toro has committed to designing the processing plant to the appropriate standards. Australian Standard engineering, HAZOP and HAZAN and design and peer reviews would be conducted with maximum diligence at all times and across all phases of the processing plant design.

**Issue:**

It was suggested that because Toro plans to export product in the form of \( \text{UO}_4.2\text{H}_2\text{O} \) containing slightly less uranium by weight than the more standard \( \text{U}_3\text{O}_8 \) extracted through the acid leach process (70 per cent compared to 85 per cent) this means a greater bulk of product would be transported to meet buyer demand.

**Submission:** 40

**Response:**

Toro has transport management plans in place to minimise risks and impacts. Producing \( \text{UO}_4.2\text{H}_2\text{O} \) instead of \( \text{U}_3\text{O}_8 \) would result in one additional container being shipped every two months. This would not affect the number of truck movements on an annual basis.

**Issue:**

Information was requested about whether, apart from vanadium, there were likely to be any other elements precipitated from sodium diuranate in the processing circuit.

**Submission:** 7

**Response:**

There would be no other elements precipitated separately from sodium diuranate during processing. Three output streams would be produced from the processing circuit:

1. An insoluble residue that consists mainly of U, V, Na, S, Mg, Fe, Ca and Al. This product is recycled back into the processing circuit at the head of the leach process. All other elements report to the tailings stream;
2. Vanadium in the form of polyvanadate which is combined into the tailings stream; and
3. The final product uranyl peroxide (\( \text{UO}_4.2\text{H}_2\text{O} \)).
**Issue:**

*It was suggested that the level of total dissolved solids in the process water was relatively high. Accordingly, it was asked whether there was likely to be any precipitation or deposition of scale within the vessels or pipework and could this include radioactive elements such as radium.*

**Submission: 7**

**Response:**

As with all metalliferous processing circuits, it is very likely that over time, scale would deposit in pipework.

Test work to date indicates that the alkaline leach process is very selective towards leaching of uranium and against leaching of radionuclides such as radium. All elements other than uranium are expected to report to the tailings stream.

Scale removal from the processing circuit and disposal within the tailings stream would be undertaken at regular intervals to protect the efficiency of the processing operation, and in line with safety and environmental best practice.

**Issue:**

*Toro was asked to provide information on the leachability of metals and metalloids in the vanadium rich sludge produced after carbonate leaching of uranium from carnotite ore.*

**Submission: 44**

**Response:**

Metals and metalloids that report to the vanadium rich sludge during dissolution of sodium diuranate (SDU) are very low due to the low solubility under the conditions used to recover the uranium from the sludge.

The results of testwork undertaken as part of the pilot plant trials confirm that the solubility, and hence the leachability, of other metals and metalloids present in the vanadium sludge is less than 3 per cent, resulting in both low quantities and concentrations of metals other than vanadium.

Uranium would be present in this sludge at up to two times the quantity of vanadium which would precipitate in the form of poly vanadates. Because of the significant quantity of uranium, the sludge would be reprocessed by leaching with caustic soda. During the process, the uranium would precipitate as SDU while the vanadium remained in solution. The solubility of other metals present in the vanadium would be very low under the conditions used to recover the uranium from the sludge. Accordingly, the vanadium solution produced would be low in quantity and concentration of metals other than vanadium.

**Issue:**

*Further information was requested on size, location and other aspects of the evaporation pond (ERMP Part 2. pp. 5-4 to 5-51):*

- the dimension of the pond;
- the volume and characteristics of the liquids to be handled;
- the approach to operating the facility; and
- whether the pond would be located in the pit.
 Submission: 20, 33, 48

Response:

The pond would cover an area of approximately 200,000 square metres and be located close to the process plant and would not be located within the pit voids. The purpose of the pond is to increase the uranium concentration of the pregnant liquor solution (PLS) through evaporation.

The PLS pond would be constructed in compartments and include underdrainage and leak detection. Freeboard would be provided to accommodate heavy rainfall events. The pond would hold a solution produced from the leaching of ore with sodium carbonate at a temperature of about 90 ° Centigrade. The selective nature of the alkaline leach process results in a solution that contains very low concentrations of all trace elements other than the target element of uranium and lesser amounts of vanadium. The pond would have a pH of about 10.5 and contain between 300 and 400 parts per million (ppm) of uranium in the form of sodium uranyl tricarbonate. The primary constituents of the solution are sodium carbonate at about 35 g/L, sodium bicarbonate at about 5 g/L and other salts such as sodium chloride and sodium sulphate which could account for another 100 g/L.

Detailed engineering design and operational parameters would be provided in the Mining Proposal and Project Management Plan to be submitted to the WA DMP.

Issue:

Further information was sought on means to detect any leaks from the evaporation pond:

- the sensitivity of the detection system;
- how much solution could be lost before a leak was detected;
- once a leak was detected, the measures to seal it to prevent further leakage to groundwater; and
- the quantity of radionuclides that could leak before detection.

Submission: 33

Response:

The PLS evaporation pond would be constructed in compartments, each with an underdrainage, liner and leak detection system that would allow early and rapid detection of any leaks. In the event of a leak being detected, the affected compartment would be isolated and the contents of the compartment quickly pumped into the remaining compartments to allow for repairs. The solution in the pond would have a pH of about 10.5 and contain between 300 and 400 ppm uranium in the form of sodium uranyl tricarbonate.

Given that the PLS contains product (uranium), the PLS evaporation pond would be designed to minimise any losses through leakage. The quantity of uranium that could leak prior to detection is therefore expected to be minimal.

Issue:

Further information was sought on the impact of a large rainfall event on the evaporation pond:

- would the pond overflow in an extreme event or following a series of extreme events;
- what would the impact of an overflow be; and
- what is the back-up or plan for mitigation in the event that the pond does overflow.
**Submission: 33**

Response:

The pond would be constructed with sufficient freeboard to contain the one in 100 ARI, 72 hour storm event as discussed in the ERMP Part 1. pp. 4-37 and 6-56. This is consistent with design criteria established by the WA DMP.

**Issue:**

*Clarification was requested on the reference to holding dams (ERMP Part 1. p. 2-29) as distinct from evaporation ponds and the Tailings Storage Facility.*

**Submission: 48**

Response:

Small water holding dams would be constructed close to the processing plant and in the mine path to reduce land disturbance area. The water would be pumped from the Project’s water source. The DFS final engineering design phase would determine the location, size and details of the holding dams and would form part of the Mining Proposal to the WA DMP for approval.

**Issue:**

*Clarification was sought of statements about the creation of artificial water bodies including process water dams and turkeys nests as they suggest insufficient information is known about Project water requirements. (ERMP Part 2. p. 7-8)*

**Submission: 48**

Response:

No artificial dams, water bodies or ‘turkey’s nests’ would be created outside the protective bund surrounding the mining area and process plant.
5 ENVIRONMENTAL ISSUES

5.1 Groundwater

5.1.1 Water Supply

Issue:
Questions were raised about sourcing of water for the Project. It was suggested that the West Creek borefield had marginal quantity and quality of water for the Project and may not yield sufficient water to service the entire proposal. It was stated that the total water requirement was up to 2.5 gigalitres (billion litres) per annum or 6.8 million litres per day, the same amount 9000 households would use, but that the application did not contain a full and comprehensive plan on where Toro would access this amount of water.

Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13, 14, 15, 19, 21, 23, 24, 25, 31, 34, 39, 40, 48

Response:
The total maximum water demand for the Project is estimated at up to 2.5 gigalitres per annum, as outlined in Part 1 of the ERMP Sections 2.5.9 and 8.4.2. Toro is continuing to explore options for reducing this requirement.

The majority of the water supply would be hypersaline water from mine dewatering. The average annualised dewatering rate over the life of the Project would be a maximum of 1.3 GL per annum for 14 years duration (maximum life of Project). The maximum dewatering rate is 2.0 GL per annum in the first year and the minimum is 0.3GL per annum in year 12. This assumes water barriers are in place but do not affect the water yield. (i.e. maximum groundwater drawdown impact, which is what has been modelled in Appendix G of the ERMP).

Mine dewatering would be augmented with brackish groundwater from West Creek borefield (a maximum abstraction of 0.7 GL per annum). Modelling indicates that the water requirements for the Project would be met for the first two years of operation using both of these water sources, after which there would be a shortfall in available water (Table 2).

As indicated in the ERMP, additional sources of water would be identified prior to the commencement of the Project. One alternative is to bring forward dewatering of the Lake Way deposit from Year 6 to Year 3, thereby filling the short-term shortfall. This, combined with supplies sourced from alternative borefields, will meet the water requirements for the life of the mine. Appendix A to the Response to Submissions discusses potential options for additional water supply.

Development of any additional source of water would be referred to the WA EPA if the proposed development had the potential to give rise to significant and environmental impacts as set out in the Environmental Impact Assessment Administrative Procedures (2010).
**Table 2: WATER AVAILABILITY FOR WILUNA PROJECT**

<table>
<thead>
<tr>
<th>Year*</th>
<th>Mine Dewatering (GLpa)</th>
<th>West Creek GLpa</th>
<th>Available from identified sources GLpa</th>
<th>Balance from unidentified sources GLpa</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Max</td>
<td>Min</td>
<td>Max</td>
<td>Min</td>
</tr>
<tr>
<td>1</td>
<td>2.0</td>
<td>0.6</td>
<td>0.7</td>
<td>2.70</td>
</tr>
<tr>
<td>2</td>
<td>1.8</td>
<td>0.8</td>
<td>0.7</td>
<td>2.50</td>
</tr>
<tr>
<td>3</td>
<td>1.0</td>
<td>0.1</td>
<td>0.7</td>
<td>1.70</td>
</tr>
<tr>
<td>4</td>
<td>0.7</td>
<td>0.1</td>
<td>0.7</td>
<td>1.40</td>
</tr>
<tr>
<td>5</td>
<td>1.1</td>
<td>0.4</td>
<td>0.7</td>
<td>1.80</td>
</tr>
<tr>
<td>6</td>
<td>1.3</td>
<td>0.3</td>
<td>0.7</td>
<td>2.00</td>
</tr>
<tr>
<td>7</td>
<td>1.7</td>
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<td>8</td>
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<td>0.5</td>
<td>0.7</td>
<td>2.40</td>
</tr>
<tr>
<td>9</td>
<td>1.7</td>
<td>0.7</td>
<td>0.7</td>
<td>2.40</td>
</tr>
<tr>
<td>10</td>
<td>1.0</td>
<td>0.3</td>
<td>0.7</td>
<td>1.70</td>
</tr>
<tr>
<td>11</td>
<td>0.9</td>
<td>0.5</td>
<td>0.7</td>
<td>1.60</td>
</tr>
<tr>
<td>12</td>
<td>0.3</td>
<td>0.1</td>
<td>0.7</td>
<td>1.00</td>
</tr>
<tr>
<td>Total</td>
<td>15.0</td>
<td>4.8</td>
<td>8.4</td>
<td>23.45</td>
</tr>
</tbody>
</table>

Average GL per annum 1.3 0.4

* Modelling has been completed for only 12 years of project life, as the predicted mine life is between 10 – 14 years dependent on ore grade.

**Issue:**

An indication was sought about whether the Project’s water requirement could be changed or if an alternative water source existed to supplement the West Creek borefield to meet Toro’s water requirements.

**Submission: 48**

**Response:**

Toro continues to explore options for reducing its water requirements.

Toro has completed desktop studies to investigate possible additional supplies of water to supplement the water available from West Creek and from pit dewatering (Aquaterra, 2010). The desktop studies have focused on identifying, and have chiefly identified, relatively low salinity water. More saline water is likely to be available in the region but has not been documented in investigations because most mineral processing operations in the region require low salinity water. Based on the desktop studies referred to above, Toro is very confident it would confirm an additional, sustainable and environmentally acceptable water supply for the duration of the Project.

As indicated in the ERMP, additional sources of water would be identified for assessment prior to the commencement of the Project. Appendix A to the Response to Submissions discusses potential options for additional water supply.
Issue:

It was suggested that the Project would be very water intensive compared with other Australian uranium mines, with Wiluna using four times as much water as Olympic Dam per tonne of uranium.

Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13, 14, 15, 19, 21, 23, 24, 25, 31, 34, 39, 40, 48

Response:

The comparison between Olympic Dam’s water use and this Project’s water use, is incorrect. Table 3 shows the comparison of water use for Olympic Dam’s expanded operations (documented in the South Australian government’s assessment report for the proposed Olympic Dam expansion, September 2011) with water use for the Project (ERMP Section 2.5.9 p. 2-34).

<table>
<thead>
<tr>
<th></th>
<th>Total water demand GLpa</th>
<th>Water intensity per tonne/ore processed</th>
<th>Water intensity per product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olympic Dam</td>
<td>80.3</td>
<td>1.1</td>
<td>4.3</td>
</tr>
<tr>
<td>Wiluna Project</td>
<td>2.5</td>
<td>1.9</td>
<td>2.1</td>
</tr>
</tbody>
</table>

Table 3: WATER USE AND INTENSITY FOR WILUNA & OLYMPIC DAM

The difference in water use relates primarily to the different ore extraction processes used at Olympic Dam (acid extraction) and Wiluna (bicarbonate extraction).

Valid comparisons of the water intensity of the Project with other existing mines in Australia are difficult because of the different scales of operation, different mining and ore processing techniques, different product lines (especially where multiple products come from one ore stream) and climatic factors.

Open cut metalliferous mines in Western Australia typically require between one and two tonnes of water for each tonne of ore processed. Further, the quality of the water used varies considerably. Toro’s ‘intensity’ of water use is similar to other metalliferous mines recently assessed by the WA EPA and the Project’s absolute water demand (2.5 GL per annum) is modest. In addition, the quality of water that can be used in Toro’s process is considerably more saline than water used by most other mining operations.

Issue:

It was suggested that the amount of raw water taken out of the surrounding environment each day would be significantly greater than the amount of water that is recycled (ERMP Part 2. p. 5-44 (Site Water Balance)).

Submission: 39
Response:

Where possible water would be recycled in the processing circuit. However, overall, the Project is a net user of water. Seventy-four per cent of the water losses are through evaporation from tailings and process water, with the remainder consumed in dust suppression and domestic uses. There are no discharges during routine operations.

In conventional operations, water is often reclaimed from water stored within the tailings storage facilities (TSF). However, the tailings produced by the Project’s operation would have a low moisture content so that no pond would form on the tailings storage. The amount of water that is likely to be produced through tailings consolidation is substantially less than the evaporative demand throughout the year. Although this means that water is not available for recycling, it also means that the potential for seepage losses from the tailings storage facility is very low.

Issue:

Further information was sought about water quality. (ERMP Part 2. p. 5-1)

Submission: 48

Response:

The quality of water at West Creek borefield is not suitable for potable use. It has Total Dissolved Solids (TDS) of approximately 2,000 to 4,000 parts per million. Water to be obtained from mine dewatering would vary in quality with TDS levels between 30 000 and 100 000 parts per million.

Issue:

It was suggested that the specific yield of 0.2 (Appendix G of the ERMP Section 3.6) used for published resource estimations was contradictory to Section 2.14 where the palaeochannel sand is confined, because a value of specific yield is for an unconfined aquifer. A reference for the specific yield was requested and clarification if the palaeochannel sand was a confined or unconfined aquifer and to which sediment or aquifer the value of specific yield related.

Submission: 48

Response:

Toro agrees that the term ‘specific yield’ should be used only in relation to unconfined aquifers, not confined aquifers. The terminology was used in a work by Johnson et al (1999).

Palaeochannel aquifers are generally confined. While a value of 0.2 per cent would be typical of an unconfined aquifer, it is outside the range of values for a confined aquifer. The specific yield value cited was taken from Johnson et al (1999).

Issue:

A reference of aquifer test analysis was requested for hydraulic conductivity and specific yield values and for them to be put in context with regional values (Appendix G of the ERMP Section 3.7).
Submission: 48

Response:

Appendix G of the ERMP Section 3.7 shows a permeability range of 1 to 40 metres per day (m/d) for ‘palaeochannel sand aquifers’, as reported by Johnson et al (1999, p 20 and Figure 2). These values were derived from pumping tests conducted at several locations along the Carey regional palaeo-drainage system. These values indicate the likely range of values for the ‘palaeochannel sand aquifers’ within the region. The hydraulic conductivity values of 3 to 4 m/d (estimated from pumping test-derived values reported by Woodward-Clyde (1992)) are presented as values more typical of the palaeochannel aquifer system passing beneath the eastern margin of Lake Way.

5.1.2 Mine dewatering

Issue:

Toro was asked to provide an assessment of the potential for uranium mobilisation as a result of pit dewatering and the disposal of sludges containing soluble carbonates.

Submission: 44

Response:

Technical studies of the potential for uranium (and other solute) mobilisation from process residue disposed of in the pit voids are described in Appendix G of the ERMP. Test work recently conducted by the Australian Nuclear Science and Technology Organisation (ANSTO) has verified the low solubility of radionuclides in the ore, apart from any uranium which has a higher solubility. The test work shows that the long-lived radionuclides (Th-230, Ra-226, Po-210 and Pb-210) remain predominately in the solids phase of the tailings with very low quantities (about 0.3 per cent) reporting to the liquor phase. Approximately 5 per cent of the remaining uranium reports to the tailings liquor. The test work also shows that uranium concentrations in tailings from the agitated leach circuit are typically less than half the concentrations present in the heap leach tailings (as per the data available in the ERMP).

Issue:

Further information was sought on the function and impact of the groundwater protection mechanisms as follows:

- The preferred structure and its effectiveness, including monitoring;
- The immediate and long term impacts on groundwater;
- Mitigation measures in the event the controls and management measures do not perform or operate as anticipated;
- The physical groundwater controls to be used to prevent seepage beyond the mining areas;
- Whether Toro would remove the groundwater protection mechanisms at closure;
- The risk to adjacent water quality in the event that the mechanisms are removed;
- The long term impacts on groundwater in the event that the mechanisms are left in place after closure; and
- Details of Toro’s assessment of removal versus retention.

Submission: 33
Response:

Toro would construct water barriers around the perimeter of each mining block. These are described in Section 3.3 of Response to Submissions. Site based trials indicate that two different types of barrier can reduce groundwater inflow between 20 per cent (high-density polyethylene in calcrete material) and 80 per cent (compacted clay in clay dominant material).

The immediate and medium-term impacts on the groundwater as a result of these barriers would be a gradual reduction in the groundwater level. The rate of reduction would depend on the barrier effectiveness and the rate of dewatering in the adjacent mining block. Appendix G of the ERMP shows a prediction of the drawdown based on how effective the barriers are. In the long-term, the groundwater would return to its original level whether or not the barriers were removed at the end of the mining operation. Toro would not propose to remove the water barriers following the closure of the mine.

5.1.3 Groundwater characteristics

Issue:

A visual presentation of groundwater levels (ERMP Part 1. pp. 4.48 to 4.49) was requested in either cross-sections or plan view to enable a better understanding of groundwater flow and hydraulic gradients driving the flow.

Submission: 32

Response:

Plans showing measured groundwater levels and modelled steady state groundwater contours in the Centipede and Lake Way mining areas are shown in Figure 17 and Figure 14 of the RPS Aquaterra reports respectively (Appendix G of the ERMP, Centipede Report and Lake Way Report). The reports also include plots showing the correlation between predicted and measured groundwater levels (Figure 16 in the Centipede Report and Figure 13 in the Lake Way Report). The contours of the groundwater levels show the groundwater flow directions.

Issue:

It was suggested there was no presentation of groundwater levels (ERMP Part 1. pp. 4.49 to 4.50) which could be used to illustrate recharge events and this was crucial to an understanding of both the magnitude and frequency of recharge. It was also stated that it was crucial that groundwater in different aquifer types was monitored using piezometers and online data loggers at least daily (or sub daily) to ensure that recharge events were properly monitored and could be more accurately assessed. Manual measurement of groundwater levels was also proposed at least monthly to confirm piezometric values to inform design of the covers of the final landform and to document recharge behaviour and the hydrologic cycle of the Lake Way region.

Submission: 32

Response:

Hydrogeological baseline studies for the Centipede and Lake Way operations areas (Appendix G of the ERMP) discuss groundwater recharge and recovery of groundwater levels at the completion of mining. Modelled scenarios consider groundwater recovery both with and without perimeter groundwater barriers.
Toro has purchased thirty data loggers which would be placed in the Project Area to enable continuous recording of changes in groundwater levels. Periodic manual monitoring and sampling of groundwater would be carried out in accordance with WA DoW’s hydrogeological reporting guidelines.

**Issue:**

The mean was requested for data presented in Table 44 (ERMP Part 1. p. 4-52). It was suggested that the ANZECC-ARMCANZ guideline values for the protection of fresh and marine water and the National Health and Medical Research Council Australian Drinking Water Standards should also be included.

**Submission: 32**

**Response:**

The mean concentration of uranium in samples from the Project Area was about 0.050 mg/L (ERMP Part 1. p. 4-52).

The National Health and Medical Research Council Australian Drinking Water Standards are not relevant to a water source with a salinity level that is typically twice that of seawater. The ANZECC-ARMCANZ guidelines for fresh and marine waters are also not directly relevant to groundwater, although Toro has had regard to these guidelines in devising a Project specific groundwater assessment framework.

**Issue:**

Toro was requested to provide the analysis plots of the drawdown and constant discharge tests undertaken at Centipede during April and May 2010. (Appendix G of the ERMP Section 3.2.4)

**Submission: 48**

**Response:**

A summary of this information is provided in Appendix G of the ERMP. The more detailed information requested would be provided directly to the submitter.

**Issue:**

Inclusion of hydrogeological cross-sections or block diagrams of the Project Area was requested to help visualise the geological framework and hydrological processes of the Groundwater Flow Modelling Guide. This should show boundaries, geological framework, hydrological framework and stresses and human induced factors. It was requested that at least two hydrogeological cross-sections orientated SW-NE across Lake Way and at least one hydrogeological cross-section orientated NW-SE along Lake Way be provided (Appendix G of the ERMP Section 3.1).

**Submission: 48**

**Response**

A schematic geological block model of the Lake Way regional geology is defined in Figure 3. Cross-sections through the Centipede and Lake Way deposits are also shown in Section 3.3 of this Response to Submissions.
Figure 3: SCHEMATIC GEOLOGICAL BLOCK MODEL OF THE LAKE WAY REGION
**Issue:**

An explanation was sought of why groundwater inflow from the north through the deep palaeochannel (layer 5) was simulated by an elevation of 490mRL (Appendix G of the ERMP Section 4.4.1).

**Submission: 48**

**Response:**

The general direction of groundwater flow within the Centipede study area is from west to east towards Lake Way. The conceptual model for the area suggests that groundwater generally flows into the study area from the west (Abercromby palaeochannel) and also from the north via the deeper Lake Way palaeochannel.

The locations of the fixed head boundaries are shown in Figure 5, as well as Figures 7 to 11 of the RPS Aquaterra report for the Centipede area (Appendix G of the ERMP). Groundwater inflow from the west of the model is simulated by a fixed head boundary assigned an elevation of 511mRL in all model layers. This elevation is consistent with WA DoW monitoring data of this area. Groundwater inflow from the north through the deep palaeochannel (layer five) is simulated by a fixed head boundary assigned an elevation of 490mRL. Groundwater outflow through the Lake Way palaeochannel in layer five is simulated by a fixed head outflow boundary assigned an elevation of 488mRL, consistent with limited groundwater level data.

The 490mRL level was selected to be consistent with the model’s Lake Way palaeochannel outflow fixed head boundary (refer Section 4.4.1 and Figure 5 of Lake Way Report (Appendix G of the ERMP). It is also consistent with the estimated regional hydraulic gradient, and analytical estimates of likely flow in the palaeochannel.

**Issue:**

Information was sought for Abercromby Well and Warrens Bore as follows (Appendix G of ERMP Section 5.4.3):

- In use or abandoned;
- If in use, all available details including geological log, bore construction details, aquifer details, depth to water, bore yield and groundwater quality; and
- Use – potable, stock, mining.

**Submission: 48**

**Response:**

Abercromby Well is a shallow 1m x 2m pastoral well, originally drilled to a depth of approximately 3m. WA DoW records indicate that the well intersects limestone and sand and has delivered water at a rate of about 49 kL/day. The TDS of water from the well is 1990 mg/L. The well is still used intermittently for pastoral purposes. Water levels in the well are highly variable. In early 2011 part of the well caved in, reducing the effective depth to about 2.5m.

Warrens Bore is a shallow bore to the west of the Millbillillie pastoral station. No details are available about the bore construction, current usage or water quality.
Issue:

Information was sought for Tullock Well as follows (Appendix G of ERMP Section 5.4.6):

- In use or abandoned;
- If in use, provide all available details including geological log, well construction details, aquifer details, depth to water, well yield and groundwater quality; and
- Use – potable, stock, mining; and
- A statement describing if the hydraulic conductivity of 500m/day is realistic for the deltaic body of calcrete in the Centipede mine area.

Submission: 48

Response:

The latest information available from WA DoW data indicates the Tullock well is ‘operating’. It is being used for stock water on Lake Way pastoral lease. The well has approximate dimensions of 1m x 2m. The WA DoW’s database describes the lithology of the well as ‘calcrete and limestone, greenstone and shale’. A single water quality record from the WA DoW from 1971 reports the salinity of the well as 2250 mg/L TDS.

Toro does not consider 500 m/d to be a typical value of the hydraulic conductivity of the deltaic calcrete body at Centipede. However, costean and bore testing at certain locations indicated hydraulic conductivity values ranging from 300 to 600 m/d (Appendix G of the ERMP, Section 3.2.4.). It is thought that these values occur in discrete zones where calcrete dissolution is enhanced (karst development). The hydrogeological model sensitivity analysis included a run using a hydraulic conductivity of 500m/d so Toro could assess the impact of dewatering on these relatively small zones (Appendix G of the ERMP Section 5.4.6).

Issue:

Further information was sought about a number of bores identified in Figures 1.3 and 4.9 as monitoring/observation bores (Appendix G of the ERMP):

- Status – in use or abandoned;
- If in use, provide all available details including geological log, bore construction details, aquifer details, depth to water, bore yield and groundwater quality; and
- Use – potable, stock, mining.

Submission: 48

Response:

Limited information is available from the WA DoW on the status and ownership of the bores shown in Figures 1.3 and 4.9, with the exception of the P-bores located in the West Creek borefield. The Apex bores XP1-5 belong to Wiluna Gold Mine and it is understood that they are not currently being used. The locations and depths to water of the holes shown on these figures were obtained from the WA DoW’s groundwater database.

Issue:

It was suggested that the conceptual understanding of the calcrete aquifer at the West Creek borefield should be supplemented with targeted hydraulic testing to better define the hydraulic conductivity and storage parameters (Appendix G of the ERMP Section 4.8).
Submission: 48

Response:

The West Creek water supply report (Aquaterra, 2010a) in Appendix G of the ERMP Section 4.8 outlines the limitations of the modelling. It also highlights the sensitivity of the model results to variations in the hydraulic characteristics of the West Creek calcrite aquifer.

During 1985 to 1987, pumping tests were carried out on five of the original production bores and the estimated hydraulic parameters are presented in Table 2.1 (p. 27) of the Aquaterra report. These values were taken into account when setting up the hydrogeological model. The sensitivity analysis focussed on assessing both the variability of the hydraulic conductivity and the specific yield of the calcrite aquifer (Appendix G of the ERMP, Section 4.6 Run 1 and Run 2). Toro considers that the model predictions presented are reasonable and have been based on reliable hydraulic testing.

5.1.4 Groundwater impacts

Issue:

More information, investigation and reassessment was sought on the impact of groundwater abstraction and the required Ecological Water Requirements to protect the identified significant environmental values, including monitoring strategies during and post abstraction of water for the Project. It was requested that prior to environmental approval, Toro be required to present the groundwater drawdown contours from revised and updated groundwater modelling on sensitive biological receptors, in particular the priority ecological communities (stygofauna) and groundwater dependent vegetation communities that may be affected, and provide an assessment of the potential risks from the proposal to these receptors. Proportional impact tables were sought for significant vegetation such as Tecticornia spp. vegetation.

Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13, 14, 15, 20, 33, 44

Response:

The potential impacts of groundwater abstraction are outlined in the ERMP Part 1 Sections 6.7, 6.8 and 6.10. The potential impacts of groundwater relate principally to groundwater drawdown near production bores within the West Creek borefield and to groundwater drawdown near the Centipede and Lake Way pits.

The ERMP Part 2, Sections 5 and 6 outline the strategies for managing the impacts of groundwater drawdown and cater specifically for protecting groundwater dependent vegetation. Groundwater monitoring is ongoing, and further groundwater modelling would be undertaken during detailed engineering design.

Reassessment of potential impacts on groundwater dependent biota is not necessary due to the conservative assumptions within the impact assessments already undertaken.

Issue:

Further hydrological studies were requested before Project environmental approval on the impacts of the borefield and dewatering for the mining areas, as well as investigations into low permeability cut off walls to be used to control groundwater inflow, to clarify the likely extent of groundwater drawdown. It was also requested that the hydrological studies be peer reviewed. Another submitter stated that as well as a clear understanding of the impacts of water drawdown and dewatering cones over both the Centipede and Lake Way deposits, this should also cover impacts from potential mining on other tenements held by Nova and Toro in the region and also the...
cumulative water impacts of uranium mining in the immediate vicinity by Zeus Uranium Pty Ltd, Aura Energy, Avoca Resources Limited and Emergent Resources Limited.

Submission: 42, 44

Response:

The baseline hydrogeological studies carried out by Toro (Appendix G of the ERMP) provide a clear description of the potential groundwater drawdown that could result from the Project’s implementation. The modelling completed for the Lake Way and Centipede mining areas included sensitivity analyses of possible barrier performance, ranging from completely ineffective to 100 per cent effective.

Hydrogeological studies and model predictions for the West Creek borefield match well with historic groundwater level data, against which the model was calibrated (Appendix G of the ERMP).

The hydrogeological assessment has been independently peer reviewed (Rockwater, 2011) and the reviewer described Toro’s proposed water abstraction for the West Creek borefield as ‘conservative’ and stated that the hydrogeological assessment was ‘reliable and consistent with the available information’. The reviewer found no significant shortcomings in the work carried out on behalf of Toro.

Toro is continuing to undertake groundwater monitoring and modelling as part of the detailed engineering design.

Even under a worst case scenario, the drawdown cones do not encroach on areas exploited by existing water users in the district (including other mining operations, the Shire of Wiluna, or pastoral leaseholders).

Toro’s water requirements are a minor contributor to the regional water demand and the cumulative impact is regarded as minimal. The allocation of water in Western Australia is managed by the WA DoW and any requests for abstraction of water associated with the Project have to be approved under the Rights in Water and Irrigation Act (1914). The WA DoW is actively developing new water allocation policies, as outlined in its discussion paper released in September 2011.

The assessment in the ERMP is confined to the Centipede and Lake Way deposits, and does not cover other tenements held by Toro. Toro is not in a position to be able to assess the impact of mining by the other companies named by the submitter.

Issue:

Additional hydrogeological investigations and testing (including detailed numerical modelling) of geometry, hydraulic characteristics and flow and solute dynamics of the aquifer systems and testing were recommended if the Project is approved to move to the next stage. It was claimed that the Project posed a significant risk of contaminating aquatic ecosystems with changes in water chemistry, including the mobilisation of radioactive compounds, with the ERMP unclear on how Toro would manage groundwater contaminated by solutes and potential movement to the surface during evapotranspiration. Further information was sought on the impacts that shifted solutes may have on the environment and how Toro would monitor and manage potential impacts. It was also suggested that the ERMP did not fully acknowledge or address the risks during mining and after decommissioning of contaminating groundwater in the area directly affected by mining and the larger catchment area.

Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 13, 14, 15, 19, 21, 23, 27, 29, 31, 33, 34, 39
Response:

The potential impacts of mining, and particularly the impact of in-pit disposal of process residue on groundwater quality, are addressed in the ERMP Part 1 Section 6-7. Details of the contaminant fate and transport modelling are provided in Appendix G of the ERMP.

Tests on tailings and natural sub-surface materials at Lake Way, together with contaminant fate and transport modelling, show that even in the absence of any engineered containment system (such as liners), the potential area of seepage from tailings back into the pits would be very restricted.

Using very conservative assumptions, the radius within which uranium concentrations in groundwater would exceed published ‘No Observed Effect Levels’ for aquatic invertebrates, is less than about 25 metres from the mine pit perimeter. The concentrations of uranium and trace elements in any backfilled tailings would be below the concentrations of unmined materials. Further, the 1,000 year contaminant fate and transport model predicted that no discernible changes to groundwater quality would occur outside Toro’s proposed operational area.

Toro would establish a comprehensive groundwater monitoring network at the Centipede and Lake Way mining sites which would include water quality monitoring holes located directly downstream of the mining areas (on the edge of Lake Way). In relation to potential contamination of groundwater after decommissioning, Toro would develop a Radioactive Waste Management Plan for the decommissioning phase and submit it to regulatory authorities in compliance with the Code of Practice and Safety Guide for Radiation Protection in Mining and Mineral Processing (ARPANSA 2005) and Western Australian legislation.

Issue:

Quantification was requested of the statement that ‘analysis of the limited data from these bores during the period of extraction by Resource Investigations suggested that salinity of groundwater from these bores after prolonged extraction rose marginally.’ (ERMP Part 2. p. 5-26)

Submission: 48

Response:

Changes in groundwater salinity during historic use of the West Creek borefield are depicted graphically in Figure 1.5 of the Aquaterra report (2010a) on the hydrogeology of West Creek. (Appendix G of the ERMP).

Issue:

An explanation was sought of how the adsorption coefficient was derived (ERMP Part 2. p. 5-27) to assess metal release at Lake Way and whether it took into consideration the composition of the soils in the area.

Submission: 48

Response:

The adsorption coefficient ($K_D$) for uranium was derived from laboratory tests conducted on subsurface materials from the Centipede site. Sensitivity analyses were conducted using a range of results from the United States Environmental Protection Agency (US EPA) lookup tables (Appendix G of the ERMP, Soil Water Consultants report of July 2011). The value calculated from Toro’s tests falls at the lower end of the sorption values, and the
assumptions regarding metal release are therefore conservative. The composition of the subsurface materials in the area was taken into account.

**Issue:**

*There was criticism of the presentation of the groundwater modelling (ERMP Part 1 pp. 6-61 to 6-63). It was claimed that using text alone fails to explain and communicate the magnitude of the area involved, the drawdowns, impacts and how these relate to critical features such as creeks and Lake Way. It was also claimed there was no calibration of the model and the main body of the ERMP should have included greater citation of the RPS Aquaterra studies provided in Appendix G to the ERMP and especially some key illustrative figures to make it easier to understand and review the groundwater impacts.*

**Submission: 32**

**Response:**

Detailed information on baseline groundwater studies (including an explanation of hydrogeological model calibration) is provided in Appendix G of the ERMP.

**Issue:**

*Information was requested on whether additional test work had been conducted following the change in processing technology on the solubility and migration with seepage of radionuclides (Appendix G of the ERMP Section 4.6).*

**Submission: 30**

**Response:**

Test work conducted by the Australian Nuclear Science and Technology Organisation (ANSTO) has verified the low solubility of radionuclides in the ore, apart from any uranium which has a higher solubility.

For the tailings, the test work was undertaken on the bench scale trial and shows that the long-lived radionuclides (Th-230, Ra-226, Po-210 and Pb-210) remain predominantly as solid tailings with very low quantities (about 0.3 per cent) being liquid tailings. Approximately 5 per cent of the uranium in the tailings would be in liquid form. These results are confirmed by further tests undertaken with pilot plant material. The most conservative situation (or worst case) is that liquid in the tailings could permeate through the solid tailings and seep from the Tailings Storage Facility. If that were to occur, the concentrations of long-lived radionuclides, at a maximum, would be similar to the concentrations in the liquid tailings. Further details are provided in Appendix C.

The test work also shows that metal concentrations in the Project’s tailings are typically less than half of the concentrations present in the heap leach tailings (this data is available in the ERMP). This is due to the efficiency of the agitated leach process proposed for the Project. In the case of uranium, the average concentration of total uranium in the agitated leach tailings is about 65 mg/kg compared to 126 mg/kg in the heap leach tailings. Further testing on these materials is reported in Appendix C.

**Issue:**

*Additional adsorption experiments were requested to assess groundwater impact in the Lake Way and Centipede mining areas, particularly to determine the adsorptive properties of the sand and clay within the calcrete (Appendix G of ERMP Section 6.2).*
**Submission: 48**

**Response:**

Additional laboratory testing to determine the adsorptive properties of the sand, clay and calcrete surrounding the mining operations areas has been undertaken. Results of this work are reported in Appendix C and indicate that uranium mobilisation in the surrounding geological environment is very low.

**Issue:**

*More information was requested about the predicted uranium species to be released at the Centipede and Lake Way deposits (Appendix G of the ERMP Section 6.4).*

**Submission: 48**

**Response:**

Groundwater pH and redox potential are the key variables that dictate the chemical forms and behaviours of metals in places such as tailings and sediment pore solutions. In the Project Area, uranium is present exclusively as carnotite bound as the uranyl (UO$_2^{2+}$) ion in the 6$^+$ (U(VI)) valency state. Whilst uranium can exist in other reduced valency states, the near-surface environments of Centipede and Lake Way, which are oxidising, mean that U(VI) is the only form that can be found.

The solubility of carnotite is very low, approximately 0.2-0.3 μM uranium within the pH range of groundwater in the Project Area. The uranyl ion released into solution easily hydrolyses to form a range of complexes, dependent upon pH and solution composition. As a strong Lewis acid, uranyl complexes preferentially with hard Lewis bases such as OH$^-$ and CO$_3^{2-}$ which are ubiquitous in open systems covering the pH ranges likely to occur near the Lake Way playa. Speciation modelling of uranium was undertaken at an ambient partial pressure of CO$_2$ (p[CO$_2$] = 3.6) and at a concentration ten times higher (p[CO$_2$] = 2.6). At p[CO$_2$] = 3.6 and pH>6.2 showing the majority of uranium in solution is present as carbonate complexes (Langmuir, 1978) in a combination of zero- or negatively charged forms, namely UO$_2$CO$_3$\(^0\), UO$_2$(CO$_3$)$_2^{2-}$ and UO$_2$(CO$_3$)$_4^{4-}$.

Additional adsorption experiments are currently in progress, which would test the adsorptive capacities of the sand and clay as well as the calcrete material.

**Issue:**

*Toro was asked to quantify the statements ‘short term impacts’ and ‘in a timely manner’ in relation to groundwater dependent fauna and the clean-up of seepage of spills of chemicals or hydrocarbons. (ERMP Part 2. p. 5-28)*

**Submission: 48**

**Response:**

Toro would adhere to guidance in the following:

- ANZECC Australian Drinking Water Guidelines 2004;
- The *Environment Protection Act 1986* (WA); and
- ISO 14001 Management System.
Management programmes to be implemented during the construction and operational phases would provide for immediate responses to any chemical or hydrocarbon spills. Any spills would be localised and confined to bunded and lined areas because only small quantities would be handled at any one time.

In the event of diesel spills for example, any contaminated soils would be stored on-site prior to disposal at a suitably licensed waste disposal facility. As discussed in the Stygofauna Environmental Management Strategy (ERMP Part 2. p. 12-12) there may be impacts on groundwater dependent fauna due to contamination of the phreatic zone and groundwater contact zone. However this is considered only possible after a prolonged or catastrophic spill. It is unlikely such events would occur because of engineered storage, standard operating procedures and the small quantities being handled. Hydrocarbon and chemical spills would be identified and cleaned up as soon as any impact (observed or monitored) became apparent.

**Issue**

*Quantified data was requested to support the statement that the potential for impacts to groundwater dependent vegetation as a consequence of groundwater abstraction was considered to be low to moderate (ERMP Part 2. p. 5-26).*

*It was also claimed that the assessment of impacts on groundwater dependent vegetation was inadequate (ERMP Part 2. p. 6-7).*

**Submission: 39, 48**

**Response:**

The predicted drawdown zones are provided in Appendix G of the ERMP. The maximum drawdown of four metres is predicted to occur over a limited area (10 per cent of the total draw down zone) with draw down rapidly reducing to 0.5 metres for the remainder of the impact area.

Toro has adopted a conservative approach to water abstraction. It has limited the proposed amount of water to be taken from West Creek to an amount that has previously been removed without any harm to the vegetation dependent upon the creek water.

Data loggers have been installed in the West Creek area and elsewhere in the Project Area to enable continued monitoring of groundwater dynamics. This would allow Toro to prepare a water management plan to ensure protection of water dependent vegetation prior to commissioning the West Creek borefield.

**Issue:**

*It was proposed that if the Project is deemed to be environmentally acceptable, a condition be placed on the Project to ensure the long-term conservation of significant groundwater dependent vegetation, in particular the Tecticornia spp. vegetation.*

**Submission: 44**

**Response:**

The *Tecticornia* vegetation which is found extensively around the margins of Lake Way is not classified as of conservation significance. While this type of vegetation is generally restricted to specific habitats, there are a number of habitats hosting *Tecticornia* in the surrounding landscape at Lake Way (ERMP Part 1 Section 4.9), as shown in Figure 4 and Appendix F.
Figure 4: UNNAMED TECTICORNIA

TORO ENERGY LIMITED

SECTION 5.1: ENVIRONMENTAL ISSUES / GROUNDWATER
Issue:

It was proposed that if the Project is deemed to be environmentally acceptable, Toro be required to set limits on the extent of impacts of groundwater drawdown on groundwater dependent vegetation and then implement a monitoring program to ensure such impacts do not extend beyond the agreed limits. The monitoring program should include appropriate triggers and management actions developed in consultation with the WA DEC, and ecophysiological parameters of vegetation to assess changes in health prior to vegetation decline.

It was further proposed that a condition be placed on the proposal in relation to:

- Limiting groundwater impacts in relation to changes in groundwater quality/characteristics including an agreed maximum groundwater drawdown extent and propagation; and
- Monitoring changes in groundwater quality/characteristics, including drawdown extent and health of groundwater dependent ecosystems to ensure that impacts of the proposal are within acceptable limits.

Submission: 44

Response:

Toro has already committed to developing a detailed management plan for groundwater dependent vegetation prior to the commencement of Project construction (ERMP Part 2. pp. 6-1 to 6-17). The WA DEC would be consulted during the development of the management and monitoring programme for water dependent vegetation.

Further, Toro would establish a comprehensive groundwater monitoring network at the Centipede and Lake Way mining sites and at the West Creek borefield which would include water quality monitoring holes. Toro has purchased thirty data loggers which would be deployed in the Project Area to enable continuous recording of changes in groundwater levels. Periodic manual monitoring and sampling of groundwater would be carried out in accordance with WA DoW hydrogeological reporting guidelines.

Issue:

It was claimed that Toro had failed to take into account drought in its assessment of the impacts of its abstraction of groundwater (ERMP Part 2. p. 6-10).

Submission: 39

Response:

Baseline hydrogeological studies of the West Creek borefield specifically included a review of groundwater behaviour during the period that the borefield was used in the past (between 1988 and 1997). Five of the ten years for which historic water abstraction and/or groundwater data were available had below average annual rainfall. One year (1991) recorded only 99.5 mm of rain, compared to the long term average value of about 256 mm/year. The proposed abstraction rate from West Creek (up to 0.7 GL per annum) is designed to ensure sustainable water abstraction, even during drought conditions.

Issue:

Reference was made to the statement (ERMP Part 1 p. 16-31) that there would be a temporary change in groundwater levels in areas from which groundwater is extracted for water supply and pit dewatering with the
submitter asking, how long is ‘temporary’ and whether Toro could guarantee the groundwater levels would ever return to pre-mining levels.

Submission: 39

Response:

Modelling on the recovery of groundwater levels is discussed in Appendix G of the ERMP in Sections 5.4.4 and 5.4.5.
5.2 Surface water

Issue:

It was suggested that contrary to Toro’s assertion in the ERMP, Lake Way and Lake Marmion were connected by surface water flow following the passage of Cyclone Bobby.

Submission: 34

Response:

Lake Marmion is located approximately 340 kilometres south/south east of Lake Way. It does not lie along the same palaeochannel drainage system or in the same surface water catchment as Lake Way (Johnston et al, 1999). Aerial imagery taken following Cyclone Bobby shows that the two lakes were not connected. Toro does not believe that the systems have been connected during any recent historic flow events.

Issue:

It was suggested that the ERMP had given no recognition to the major February 2011 flood in the Wiluna region.

Submission: 32

Response:

Toro has taken major storm or flood events into account. The baseline surface hydrology studies conducted by RPS Aquaterra (ERMP Appendix G) specifically examined the risk of major flood events.

Rainfall records from both the Bureau of Meteorology Station at Wiluna and from Toro’s own weather station show that none of the storm events in February 2011 exceeded the one in 10 return interval event.

Issue:

It was suggested that there is a cation/anion imbalance in Table 38 in the ERMP Part 1. p. 4-39 and it was asked whether the missing anion was sulphate.

Submission: 7

Response:

There is no cation imbalance. Table 38 relates to total (not exchangeable) salts in shallow sediment.

The typical concentration of sulphate in shallow lake sediments at Lake Way varies widely, but can be as high as 38 per cent (380,000 mg/kg). A more typical value is between 7 per cent and 8 per cent (70,000 to 80,000 mg/kg). Such high values are not surprising in an environment characterised by copi (gypseous) dune formations. This amount of sulphate would readily explain the anionic shortfall.
**Issue:**

It was suggested that during flooding, the presence of biological blooms and the more regular thin salt crusts on Lake Way indicate the lake is biologically productive but Toro in its assessment had not shown any data on aquatic macro invertebrates high endemicity, or ecological cross sections. It was stated that this must be addressed and required a clear commitment and demonstrated capacity to restore the lake to its current level of biological diversity and health following any mining activity.

**Submission: 34**

**Response:**

Lake Way has a surface area (defined as surface below RL491 m AHD) of approximately 165 square kilometres. Toro’s proposed disturbance footprint on the playa is approximately 1.3 square kilometres, or in the order of 0.8 per cent of the lake surface. The proposed disturbance (and subsequent rehabilitation) of less than 1 per cent of an environment which is notable for its homogeneity, is unlikely to result in any ecologically significant impacts.

**Issue:**

Further information was sought on the management of impacts on surface water, creeks and the riparian environment:

- What are the controls for mining through the creek bed; and
- Further details on the substrate and stream morphological changes to result from redirecting creek bed(s) for construction and mining.

**Submission: 33**

**Response:**

The location of the mine disturbance footprint relative to drainage lines in the Centipede and Lake Way mining areas was shown in the ERMP Part 1 Figures 7 and 8 (pp. 2-24 to 2-25). The ERMP Part 1 Section 6.6.4 discusses the potential impacts of Project implementation on surface water flows and on the biota influenced by surface water flows. Technical detail of the surface water impact assessment is provided in ERMP Appendix G.

The effects of disturbance on the creek habitat are expected to be temporary. Any mining encroachment onto the flood plain would require bunding to prevent potential inundation of the workings. A diversion/bunding channel would also be required to divert the channel around the active mining area. The bunding and diversions associated with mining across the creek would be designed to prevent the ‘backwater effects’ so that upstream flood levels in the creek would not rise unduly. Toro is committed to constructing bunding and temporary diversions as required to enable mining to be undertaken at the same time as protecting the surface water drainage requirements.

Most biota inhabiting stream/riverine environments are opportunistic colonisers, only moving into an area following inundation (i.e. they have mobile adult stages for this purpose). Following completion of mine rehabilitation works, the creek habitat would be restored to a condition approximating its pre-mining condition.
Issue:

Information was sought on ions that may leach from waste rock and impact the salt lake such as magnesium, sulphate and calcium:

- What is the risk of delivering changed quantities of these materials to areas adjacent to the mining operation and how would this be monitored and managed; and
- What consideration has been given to metalliferous drainage; asbestiform and other fibrous minerals; non-target metals and target metal residues in mine wastes; dispersive and sodic materials; assessment and characterisation of materials including static and kinetic testing for acid-based accounting and metals leaching.

Submission: 33

Response:

The process tailings and any mineralised waste would be contained within the tailings and waste disposal areas within the pit voids. Mineralised waste would be capped with non-mineralised material to control dust and radon emanation as explained in Response to Submissions Appendix C, Section 6. Non-target metals and target metal residues would therefore be contained within these structures. As no acids are to be used in the leaching process, an acid based accounting system is not proposed.

Issue:

Toro was asked to commit to undertaking sampling of aquatic biota in surface water on Lake Way after a 1:20 year rainfall event or after a 72 hour rainfall event.

Submission: 44

Response:

During the operations phase of the Project, Toro commits to sampling of the aquatic biota following large rainfall events, providing the lake can be accessed safely and without damage to the environment.

Issue:

It was suggested that a study of the paths of known tropical cyclones between 1901 and 1977 had indicated three dissipating tropical cyclones per 10 years can be expected in the near vicinity of the Project but the ERMP only makes limited reference to the impacts of water from cyclonic depositions when this is one of the greatest threats to the proposal. It was suggested that before any uranium mines proceeded in the lake systems that predominate the area, design parameters must be established that deal with any potential increase in water flow throughput and provide a management program consistent with the long term hazard parameters of the waste. Another submitter suggested that Toro had not indicated how it could manage extreme winds or high rapid rainfall such as the kind that occurred at Lake Way.
**Submission: 39, 42**

**Response:**

Extreme weather events such as those proposed in the submissions were specifically included in the surface water assessment and management design outlined in Appendix G of the ERMP. The drainage systems and cover designs for the in-pit tailings facility would also be designed to accommodate the probable maximum storm event calculated in accordance with approved Australian engineering methods. The probable maximum storm event is equivalent to a 1 in 10,000 year event.

Rainfall intensity-frequency-duration (IFD) data was used to calculate the creek flooding, pit flooding and other surface run-off estimates presented in ERMP Appendix G (‘Australian Rainfall and Runoff’, Institution of Engineers, Australia 1998). Large scale flooding in Lake Way is achieved only after substantial and prolonged major rainfall events of perhaps greater than 100mm. While rainfall from dissipating tropical cyclones can be extremely heavy, as instanced by rainfall events in February 2011, such events are less substantial and have been considered as probabilities in surface water management of mine sites.

**Issue:**

*Clarification was sought of the statement (ERMP Part 1. p. 6-60) that there would be sufficient on-site storage to hold rainfall runoff from significant rainfall events, as this seemed to be contrary to statements elsewhere in the ERMP that there may be a need to apply for water discharge licences.*

**Submission: 48**

**Response:**

As discussed in the ERMP Part 1. Section 6.6, a protective bund would be constructed to contain a one in 100 year rainfall event with adequate freeboard above predicted flood levels. Sufficient storage to hold these volumes would be available within the mine pit voids and water retention storage areas on the forward mine path.

No routine discharge to the surface water system is proposed. A water discharge licence would only be required where a rainfall event greater than the one in 100 year event occurs that would exceed all available storage capacity. In such a case, Toro would seek a one-off approval for the discharge after collecting and testing samples to demonstrate that the proposed discharge would not adversely affect surface water quality.

**Issue:**

*It was stated that except for siltation the ERMP (ERMP Part 1. p 6-54 to 6.60) did not address potential impacts from reduced surface water quality. Toro was requested to consider and discuss such impacts.*

**Submission: 48**

**Response:**

There is very limited potential for adverse impacts on surface water as a result of Project implementation as there are no permanent creeks or other surface water bodies in proximity to the proposed mining or ore processing areas.

All operational areas would be bunded to accommodate at least the maximum one in 100 year rainfall event, so that surface water would not enter in the event of flooding and any spillage of fuels or reagents would be
contained. Surface run off from rainfall incident within the bunded areas would be retained in pit voids and/or retention ponds and used in mining or processing applications.

No routine discharge to the surface water system is proposed.
5.3 Mine closure

5.3.1 Tailings Storage Facility

Issue:

Further detailed information was requested to support the feasibility of in pit disposal of tailings and to demonstrate how tailings would be managed throughout the life of the Project and through rehabilitation:

- Further information on the preparatory works to be completed on the pit prior to receiving tailings;
- Detailed information on the materials and methods used to construct the tailings cells including the permeability of materials proposed to be used;
- Depth of tailings; and
- Depth/extent of covering.

It was questioned whether there was a precedent that demonstrated that such shallow deposition/covering was a safe and acceptable practice.

It was also claimed that the ERMP failed to accurately quantify and discuss tailings risks and management, particularly in relation to:

- Cell wall design (physical stability, permeability);
- No justification of the types of soils to be used for the walls such as low permeability clays and whether they are present in sufficient quantities to build the walls over the entire life of the Centipede pit;
- No lining of the base (there is no point in the entire ERMP where Toro outlines its plans to line the base of the individual tailings cells with a low permeability material);
- No thorough description of the long term risks of seepage;
- Poorly presented and discussed groundwater and solute transport modelling;
- No figures or diagrams provided to document and explain relative groundwater levels in the surrounding aquifers with respect to water levels in the rehabilitated tailings; and
- Only minimal justification of the expected water chemistry of the tailings pore waters and the geochemistry of the interaction of tailings water with surrounding soils and aquifers.

It was further claimed that given the failure to present wall designs and no lining of the base, the current modelling studies cannot be considered representative of final long term tailings management requirements and the solute transport studies therefore should be entirely re-done because any release of radioactive tailings into the environment was unacceptable and should be addressed before any consideration of approval is given.

Submission: 32, 34, 48

Response:

Further test work has been undertaken by Toro in response to these submissions to secure an understanding of the design and management parameters for tailings. In addition to the tailings test work, a conceptual design of the Tailings Storage Facility (TSF), including materials of construction properties, embankment design, wall and base preparation, construction methods, existing and predicted future groundwater levels and capping design has been undertaken. Reports on the conceptual design of the TSF are provided in Appendix C to the Response to Submissions. These include recommendations for;

- groundwater movement monitoring;
• seepage modelling;
• 300mm compacted clay liner;
• cell wall and bund construction (including materials);
• tailings characteristics (physical and chemical);
• tailings leachability and seepage geochemistry; and
• tailings cover design.

The long term risks of seepage are addressed elsewhere in this Response to Submissions document (ref Section 5.1.4).

**Issue:**

*It was suggested that there was potential for groundwater upwelling into tailings and that there could be issues with consolidation if the tailings could not dry sufficiently with implications for mine closure.*

**Submission: 20**

**Response:**

Permeability tests undertaken on representative samples of process tailings, as derived from the pilot test work programme, have determined that the in-situ tailings have very low permeabilities in the range $2 \times 10^{-8} \text{ m/s}$ to $8 \times 10^{-9} \text{ m/s}$.

After closure, the water table would be expected to recover to its original levels and groundwater flows returned to their original configuration. Given the tailings permeability would be generally lower than the surrounding natural geology, groundwater flows would tend to move preferentially through the surrounding materials rather than through the tailings mass itself. (Refer Appendix C).

**Issue:**

*Toro was asked if it had a contingency plan in the event the tailings volume is greater than the area of the mine voids. It was suggested that an above ground tailings dam may be necessary because of the ore to tailings ratios and a seven per cent expansion rate of disturbed and beneficiated ores. It was also claimed that as Toro now owned additional tenements in the Wiluna region, the Centipede pit would be incapable of being a tailings repository for all of the mining planned by Toro.*

**Submission: 26, 32, 34, 42**

**Response**

As shown in Table 4 below, the mine plan provides for a total mined volume of approximately 15.5 million cubic metres (MBCM) at Centipede, of which 12 MBCM would be available for tailings storage. Approximately 20 per cent of the total mined volume (3 MBCM) would be set aside and not used for tailings disposal to provide operational flexibility that allows for the construction of cell walls and to allow backfilling along the creek lines with non-mineralised material. 12 MBCM thus remains available for tailings storage.

The combined tailings volume requirement from the Centipede and Lake Way deposits, allowing for 20 per cent swelling of the ore, would be 9.1 MBCM. This provides a surplus of 2.9 MBCM, or 32 per cent spare capacity as a contingency for tailings storage.

Consequently, there would be no requirement for above ground storage of tailings.
Source/ Physicals | MBCM (Million cubic metres) | Capacity, MBCM (Million cubic metres)
--- | --- | ---
Waste Mined @ Centipede | 11.9 | 
Ore Mined @ Centipede | 3.6 | 
Total Mining at Centipede | 15.5 | 15.5
Less sand dunes and other high points | -0.5 | 15.0
Less 20 per cent for TSF walls, backfilling creek | -3.0 | 
Capacity available for tailings | 
Ore Mined @ Centipede | 3.6 | 
Ore Mined @ Lakeway | 4.0 | 
Total Ore Processed (Tailings deposited) | 7.6 | 
Add 20 per cent swell | 1.5 | 9.1
Capacity required for tailings | 
**Excess Capacity** | 
**Excess Capacity per cent** | 32 per cent

| **Table 4 : CAPACITY FOR TAILINGS DEPOSITION** |

The current proposal only relates to the storage of tailings generated from the mining of the Centipede and Lake Way deposits. Other tenements in the Wiluna region held by Toro require further detailed studies and technical work to determine their economics. If Toro were to seek approval to mine these other tenements, a separate proposal for environmental and mining approval assessment would be submitted.

**Issue:**

*It was suggested that pit tailings should not be located within or too near creek discharge areas as severe scouring could occur during major storm events posing operational and closure risks.*

**Submission: 20**

**Response:**

Storage of tailings below ground eliminates the risk of scouring. Once the creek along the southern edge of the Centipede deposit has been mined, it would be backfilled with waste and appropriately engineered bunding would be established to protect future mining and tailings management from potential flooding.

**Issue:**

*It was suggested that disposal and management options for excess pit/seepage water be further investigated to avoid using the Tailings Storage Facility (TSF) for water disposal.*

**Submission: 20, 41**

**Response:**

The TSF would not be used for water disposal.
**Issue:**

*It was suggested the mean average rainfall in the area had increased by 15 mm in the past 33 years and that accordingly, rainfall could further increase significantly during the 10,000 years of storage required for the radioactive tailings, making it inappropriate to place any such material in an environment under threat of compromise.*

**Submission: 42**

**Response:**

Records from the Bureau of Meteorology monitoring station at Wiluna do not show any pattern towards increasing rainfall in the past 33 years (see Figure 5).

![Figure 5: BUREAU OF METEOROLOGY RAINFALL RECORDS FOR WILUNA (113 YEARS)](chart)

At closure, the drainage systems and cover designs for the in-pit tailings facility would be designed to accommodate the probable maximum storm event.
**Issue:**

Further information was sought about the covering to be provided for the tailings after they are disposed of in the pit voids:

- The nature of the material to be used and the design of the tailings cap;
- Whether the capping materials have been tested to ensure they are not dispersive or sodic;
- How the cap would be constructed to ensure that the roots of vegetation cannot penetrate down to the tailings;
- How the upward migration of salts containing contaminants would be prevented;
- How the cap would be constructed to prevent the release of radon gas, including an assurance to Aboriginal people that their country would not be contaminated by radon progeny; and
- The possibility of plants used for ‘bush tucker’ growing on the tailings after closure, with the risk of radioactive or other substances being taken up by bush tucker plants then being eaten by Aboriginal people.

**Submission: 26**

**Response:**

The tailings cap would have multiple layers including:

- A radiation control layer;
- Shaping layer;
- Capillary break layer;
- Surface shedding layer; and
- Growth medium and topsoil layer.

Further information about the composition and nature of the source materials is provided in Appendix C.

The release of radon from tailings in the mining industry is well understood. An appropriate cover thickness to reduce radon release to levels acceptable to regulatory authorities would be provided, which would include taking into account the depth of root penetration of bush tucker species to minimise the risk of root penetration into tailings.

Tailings would be disposed of below the saline water table where root penetration is unlikely. Ore bodies in the region are generally very shallow so there is already the likelihood that roots of bush tucker food species intrude into ore zones, including those with radioactive minerals present. It also should be noted that even without mining, radon is being released from shallow ore bodies in the region.

Baseline testing of soils at the Centipede and Lake Way deposits has found that soils in the Project Area are typically non-sodic (Outback Ecology, 2011). The susceptibility of soils to dispersion varied and it would be necessary as part of the closure design and planning to ensure that shallow layers of the cover system are constructed using non-dispersive materials.

**Issue:**

It was stated that further detailed studies regarding tailings composition, management strategies and closure/rehabilitation strategies were required (Appendix D Section 8.4.4).

**Submission: 48**
Response:

Toro has undertaken additional testwork in response to these questions. The test work indicates the tailings tend to hold water and only release it slowly. This would have impacts on the management of tailings as follows:

i) The rate of supernatant release (even in winter) would be lower than the evaporation rate so there would be minimal to no supernatant run off. As a result, water would only be present on the surface of the facility after rain events and all of this water would be rainwater. This also means that there would be minimal supernatant for release as seepage;

ii) The permeability of the tailings at a density of about 0.7 tonnes/cubic metre was measured at about $2 \times 10^{-8} \text{ m/s}$. Additional modelling has shown that at higher densities of about 0.9 tonnes/cubic metre this reduces further to about $8 \times 10^{-9} \text{ m/s}$. The tailings modelling indicates densities in the range of 1 to 1.2 tonnes/cubic metre could be achieved in the facility indicating the permeability of the tailings could be expected to be below the values measured in the test work;

iii) Strength versus moisture content test work indicates that after a period of drying (weeks to months only) the tailings are strong enough to allow placement of cover materials so rehabilitation of the facility could commence within a relatively short time after termination of deposition; and

iv) After closure, the water table would be expected to recover to its original level over a period of time. However, even after the water table recovered and groundwater flows returned to their original configuration, the tailings permeability would be generally lower than the surrounding materials. Accordingly, local groundwater flows would tend to move through the surrounding materials rather than through the tailings mass itself.

More information is available in relation to the properties of the process tailings and the tailings storage facility design in Appendix C.

Issue:

Further detailed information was requested on test work and geochemical and groundwater modelling to confirm the statement (ERMP Part 1.p. 8-13) that contaminants would stay bound to solids.

Submission: 48

Response:

Additional leachability testing of tailings (using the Australian Standard Leaching Procedure) is being undertaken. Data obtained on various components of Toro’s process stream are presented in Figure 6.

The figure shows that key constituents of uranium ore (including uranium, thorium, strontium and vanadium) are present at several orders of magnitude in process solids, compared to the process liquor.

More information on the tailings performance is provided in Appendix C.
Figure 6: CONSTITUENTS OF PROCESS STREAM

**Issue:**

It was suggested that the statement that seepage from the tailings and waste rock stockpiles had been modelled and shown to be low (ERMP Part 2. p. 9-11) should be demonstrated with seepage modelling studies in the document.

**Submission: 48**

**Response:**

Recent test work conducted by the Australian Nuclear Science and Technology Organisation verifies the low solubility of radionuclides in the ore apart from uranium which has a higher solubility. For the tailings, the test work clearly shows that long lived radionuclides (Th-230, Ra-226, Po-210 and Pb-210) remain predominantly in the solids phase of the tailings with very low quantities (about 0.3 per cent) reporting to the liquor phase. Approximately 5 per cent of the remaining uranium reports to the tailings liquor. The most conservative situation (or worst case) is that tailings liquor could permeate through the tailings and end up being the solution that could seep from the Tailings Storage Facility. If that were to occur, the concentration of long lived radionuclides, at a maximum, would be similar to the concentrations in the tailings liquor.

**Issue:**

Because of the low average rainfall for the Wiluna area, it was suggested that it should be clearly demonstrated that dust would be minimised in the event that a water cover over the tailings mass cannot be maintained (ERMP Part 2. p. 9-12).
**Submission: 48**

**Response:**

The tailings would have a high clay content and test work to date shows they would have a reasonable level of cohesive strength. In addition to this, tailings hold water and dry slowly with test work indicating moisture content of up to 80 per cent likely in the field. This is equivalent to saturation levels of between 75 and 90 per cent. Typically dusting requires the tailings to be dried to lower levels of saturation for it to become an issue.

The test work demonstrated that during the drying process a salt crust did not develop and that there was little potential for dusting resulting from salt particle break up. The surface of the air-drying and strength testing samples was competent and showed no signs of the presence of loose material. On the basis of these observations, it is considered unlikely that dust loss from the tailings would be a significant issue.

More detailed information regarding the physical properties of the process tailings is available in Appendix C.

**Issue:**

Clarification was sought of whether a compacted layer of waste material would be required to prevent downward seepage of water from the tailings cells. (ERMP Part 2. p. 16-13)

**Submission: 48**

**Response:**

The permeability of the tailings at a density of about 0.7 tonnes/cubic metre was measured at about $2 \times 10^{-8}$ m/s. Additional modelling has shown that at higher densities of about 0.9 tonnes/cubic metre this reduces to around $8 \times 10^{-9}$ m/s. The tailings modelling indicates densities in the range of 1 to 1.2 tonnes/cubic metre could be achieved in the facility indicating the permeability of the tailings could be expected to be below the values measured in the test work. Accordingly, it is expected that the tailings would have sufficiently low in-situ permeability as to make any liner system redundant.

However, as noted in Appendix C, to address the concerns raised through the public submissions, Toro plans to provide for a clay base to be constructed in the mined voids. Where in situ clay is present, the base of each tailings cell would be scarified, moisture conditioned if required and compacted prior to the commencement of tailings deposition. Where insufficient clay is present, clay will be imported from elsewhere in the mining footprint to form an impermeable base. More details on the in-pit tailings facility design is provided in Appendix C.

**Issue:**

Reference was made to the statement (ERMP Part 2. p.16-31) that there would be a ‘temporary change in groundwater levels in areas from which groundwater is abstracted for water supply and pit dewatering’ with the submitter asking, how long is ‘temporary’ and whether Toro could guarantee the groundwater levels would ever return to pre-mining levels.

**Submission: 39**

**Response:**

Modelling on the recovery of groundwater levels was undertaken and the results, including impacts and recovery, are discussed in Appendix G of the ERMP in Sections 5.4.4 and 5.4.5.
5.3.2 Waste Management

Issue

Further information was sought on the method for disposal of plant and equipment that is used until the completion of the Project. It was also pointed out that with progressive rehabilitation there would be limited void space left at the completion of the Project which could cause problems in obtaining the surface topography required and also lead to high concentration of plant and equipment in the one void space (ERMP Part 2. p. 16-13).

Submission: 48

Response:

At the end of mine life, sufficient void space and non-mineralised waste would be retained to enable disposal of contaminated material from the processing plant and equipment.

Disposal would be consistent with Toro’s Radioactive Waste Management Plan for the operational and decommissioning phases. This would be developed and submitted to the appropriate regulatory authorities as required by the Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (ARPANSA 2005), and Western Australian legislation and regulations.

The Plan would reflect normal practice that mechanical plant and equipment would be decontaminated and checked for radiation levels before being removed from site. This has been successfully implemented at other operations, including as part of the decommissioning of the former Kalgoorlie uranium research facility. Western Australia has an established framework for the clean-up of sites where naturally occurring radioactive materials have been stored or processed (NORM Guideline 4.2, 2010). Toro would be committed to minimising disposal of materials on site. It would maximise recycling and re-use of material.

Toro’s Radioactive Waste Management Plan also would include details of how Toro would deal with plant that was unable to be decontaminated below the level which would allow it to be removed from site. To prevent inappropriate third party access to such material and illicit recovery, Toro would consider issues such as rendering plant unusable.

Issue:

Information was sought on the types of material and quantities to be disposed of by burial in pit voids at closure because it cannot be decontaminated, and potential impacts from such burial on groundwater and management of third party access. It was suggested that at closure, Toro may be tempted to bury all plant and equipment in pit voids so it can leave the site as quickly as possible with lower costs, instead of committing to minimise the amount of decontaminated material to be buried on-site. Another submitter asked if the dismantled processing plant were to be removed from site, where would it go and whether there was any precedent for such off-site disposal from a uranium mine.

Submission: 33, 34
Response:

Toro would develop a Radioactive Waste Management Plan for the operational and decommissioning phases and submit it to the appropriate regulatory authorities as required by the Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (ARPANSA 2005) and Western Australian legislation and regulations.

The Plan would reflect normal practice – i.e. mechanical plant and equipment would be decontaminated and checked for radiation levels before being removed from site. This has been successfully implemented at other operations, including as part of the decommissioning of the former Kalgoorlie uranium research facility by BHP Billiton. Western Australia has an established framework for the clean-up of sites where naturally occurring radioactive materials have been stored or processed (NORM Guideline 4.2, 2010). Toro would be committed to minimising disposal of materials on site. It would maximise recycling and re-use of material.

Toro’s Radioactive Waste Management Plan would also include details of how Toro would deal with plant that was unable to be decontaminated below the level which would allow it to be removed from site. To prevent inappropriate third party access to such material and illicit recovery, Toro would consider issues such as rendering plant unusable.

Issue:

Reference was made to the statement (ERMP Part 2. p.16-31) that ‘on-site disposal of tailings and other wastes from mining activities’ would have to be managed by the Project with the submitter asking what the ‘other wastes’ meant.

Submission: 39

Response:

As discussed in the Waste Environmental Management Strategy in the ERMP Part 2. pp. 10-5 to 10-6, wastes from the Project would include:

- Batteries;
- Solvents, absorbents and various chemicals;
- Liquid waste such as effluent;
- Industrial waste such as grease, fuel and oils, oil filters and paints;
- Fluorescent tubes;
- Concrete and scrap metal;
- Domestic waste;
- Kitchen waste (food);
- Green waste (plant material generated from clearing activities); and
- Wood, glass, plastic and cardboard.

5.3.3 Closure and Rehabilitation

Issue:

It was suggested that the closure plan provided in the ERMP required more detail and that when the company submitted its Mining Proposal for the approval of the WA DMP, the plan should include:
Further detailed investigations and geotechnical designs were also sought to ensure that groundwater ingress into the Tailings Storage Facility did not impact on its safe, stable and effective operation and future closure.

Another submitter questioned the commitment that ‘rehabilitation works would include demonstrating that areas disturbed by mining met agreed safety and environmental standards’ and asked with whom the standards would be agreed, suggesting that they should be detailed and quantified wherever possible as a precondition to WA EPA assessment of the ERMP.

**Submission: 20, 26, 34, 41**

**Response:**

Toro would submit a revised and more detailed version of its closure plan with its Mining Proposal to the WA DMP. The revised plan would include detailed strategies and commitments for unexpected closure and care and maintenance; details on chemical interaction of plant/waste/tailings with lake sediments/lake water; and closure of the Tailings Storage Facility.

The procedure proposed by Toro for development and periodic review of its closure plan is consistent with normal administrative procedures in Western Australia and specifically conforms with WA EPA/DMP guidelines. Updated versions of the closure plan would be submitted to the WA DMP (as required by the *Mining Act 1978*) for review and approval.

Rehabilitation outcomes (and the performance indicators related to the outcomes) would take into account input from and consultation with a range of stakeholders including Traditional Owners, pastoral landholders, Local Government and WA and Federal government agencies including the WA DEC, the WA DIA, the Radiological Council, the WA DMP and the Department of Sustainability, Environment, Water, Population and Communities (DSEWPC). Ultimately, the WA DMP would be the agency that would assess Toro’s detailed closure plan. Both the Office of the WA EPA and the WA DMP would receive Toro’s annual compliance and performance reports which would include updates on the status of Toro’s progressive rehabilitation activities.

In the event of unplanned mine closure, Toro would implement relevant components of its mine closure plan. Short term actions following any business interruption expected to last longer than six months would include a review of site security procedures to prevent unauthorised access to site; a review and reconciliation of rehabilitation provisioning (funds available for mine closure and rehabilitation); updating the site materials inventory (quantities of materials held in stockpiles); audits of site drainage, containment systems (including tailings impoundments) and rehabilitation works. Results of these assessments would be used in conducting a risk review. Following consultation with relevant government agencies and other stakeholders on the results of the risk assessment, Toro would either move to a care and maintenance programme or would commence implementation of its closure plan. Additional details of Toro’s approach to unplanned closure events would be provided in the detailed closure plan that would be submitted to the DMP with Toro’s Mining Proposal.
Issue:

Concern was expressed about the reference to ‘analog ’ (ERMP Part 2, p. 16-32) in the context of rehabilitation with the submitter claiming this was inadequate and that the entire area disturbed must be returned to a condition no worse than its pre-mining state.

Submission: 39

Response:

As stated in the ERMP Part 1, p. 2-19, at closure Toro would return the surface topography as close as practicable to the pre-mining landscape.

Issue:

The link to the spread sheet for the costing template for mine closure was requested. (ERMP Part 2 p. 16-35)

Submission: 48

Response:

The link would be provided to the submitter.

Issue:

It was suggested that Toro should disclose the preliminary closure cost estimate for further public consultation and that Toro should be required to lodge a bond or bank guarantee to cover all of the costs of a potential clean up/remediation.

Submission: 39

Response:

Toro would comply with all legislative and regulatory requirements in relation to mine closure and rehabilitation, including those associated with consultation, funding of closure and rehabilitation.

Issue:

It was suggested that Western Australia should have the benefit of learning from mistakes in the Northern Territory in uranium mine closure and rehabilitation. The Rum Jungle mine was said to be ‘Australia’s worst uranium mining disaster’ where, although mining ended more than 50 years ago, successive attempts at rehabilitation had failed, raising questions about whether sufficient environmental protection could ever be guaranteed. There were also claims that no uranium mine anywhere in the world had ever been properly rehabilitated to the point where radiological conditions were stable such that no ongoing monitoring and maintenance was required. Toro was asked if it could provide an example where a uranium tailings dam had been successfully closed and rehabilitated and where vegetation on the tailings was allowed to be used safely as pasture for stock. If this isn’t possible, it was asked how a fence around the tailings could be maintained in perpetuity.

Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 19, 21, 23, 25, 26, 28, 31, 34, 40
Response

Mining and mineral processing occurred at Rum Jungle between 1954 and 1971.

Rehabilitation was undertaken in the 1980s but subsequent studies documented gradual deterioration of the work undertaken. In light of this and advances in best practice standards in mine closure and rehabilitation, the Northern Territory and Federal Governments in 2009 entered into a four year National Partnership Agreement on management of the site.

Another example of uranium mine rehabilitation in the Northern Territory is more directly comparable with the Wiluna Uranium Project. The Nabarlek mine operated in the Alligator Rivers Region between 1979 and 1989 and was de-commissioned in 1994/95. A significant feature of the operation was the return of tailings directly to the mined out pit. The rehabilitation objective was to establish a landscape that matched as closely as possible the surrounding areas and would permit traditional hunting and gathering activities to be pursued. It is important to note the geographic and environmental condition differences between Nabarlek and Wiluna, including the tropical (i.e. monsoonal) nature of the seasons at Nabarlek and the arid desert conditions at Wiluna.

There have been many cases internationally where previously abandoned mine and mill sites have been remediated to a satisfactory standard, with monitoring continuing to demonstrate closure success. For example, uranium was previously mined at over 210 sites in France. These sites are now part of a reclamation project between the French Government and AREVA. Each site involves about 20 national and international scientific expert organisations in various environmental, geological and radiological studies.

In Germany, uranium mining operations were discontinued after unification. Some mines were located in densely populated regions. WISMUT GmbH was formed in 1991 to decommission uranium mining and processing facilities and rehabilitate sites in the world’s largest single mining rehabilitation project. It is due for completion in 2015. After being underway for 20 years, the remediation of the mine sites is reaching a successful conclusion. Each site has its own set of characteristics and environmental variables.

Issue:

It was claimed that the long term environmental hazards from radioactive mine waste and potential costs to government and taxpayers could be significant. As a minimum, it was proposed that the standard in rehabilitation and closure for the Wiluna Project should be the same as for the Ranger Uranium Mine in the Northern Territory requiring effective physical, chemical, biological and radiological isolation from surrounding ecosystems for at least 10,000 years, with this being a condition of approval. If this were not done, it was suggested there was a risk of contamination of groundwater with dissolved radioactive materials; dispersal of radioactive dust into water, plants, animals, fish and humans; and release of radon gas into the air which would deposit radon progeny on the ground for hundreds of kilometres around. It was stated that the closure plan seemed to be based on the expectation that closure would be achieved with relinquishment of tenements after ten years, but there would be a need for ongoing monitoring and maintenance to ensure the tailings and other hazardous materials were sealed up and isolated in perpetuity. There would also be a need for ongoing radiation monitoring. It was expected that Toro would both commit and demonstrate a matching financial and technical capacity to ongoing monitoring until the tailings posed no risk to the environment in line with the precautionary principle and intergenerational equity which Toro claims to have as an underlying environmental principle.

Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 19, 21, 23, 24, 26, 28, 29, 31, 32, 34, 39, 40
Response:

The industry applies world’s best practice in designing and building tailings storage facilities and continually improves its knowledge and practices. All aspects of the Project would be best practice and would comply with the WA DMP/WA EPA Guidelines for Preparing Mine Closure Plans (June 2011).

Management of mine waste (or tailings) at uranium mine sites uses well known and well practised principles to isolate the material from the surrounding environment, as evidenced by the practices at Olympic Dam and Ranger uranium mines.

While uranium tailings can be mildly radioactive, the radioactivity of tailings is always less than that of the ore which contained the uranium in the first place. Mining the ore does not increase the radioactivity. Extracting uranium from the rest of the material in the ore reduces the radioactivity to around 80 per cent of its original level.

The process tailings and mineralised waste rock at the Project would be deposited within the pit voids and isolated from the surrounding environment as outlined in Appendix C, which describes the design, construction and operation of the tailings storage facility.

Toro has conducted further laboratory testing and modelling to evaluate the likely short term and long term behaviour of tailings. This work has demonstrated that the very low permeability of the tailings, the presence of a clay liner, the low release of radionuclides and the low groundwater flow rate mean that the potential impacts to the environment are low.

Toro’s existing closure plan already includes financial provision for the ongoing monitoring of groundwater, integrity of cover systems and other appropriate monitoring to verify the predicted behaviour of the residue storage system. In line with our commitment to compliance with the requirements of the DMP, Toro would prepare detailed design work and submit a mine closure proposal for approval.

Issue:

It was suggested that the statement in the ERMP that ‘at closure the surface topography would be similar to the pre-mining landscape’ was not supported with qualitative data or evidence and should be ignored until such time as Toro supplied the WA EPA with sufficient information and evidence to back it up.

Submission: 34

Response:

Contour drawings showing proposed ‘before’ and ‘after’ land configurations were provided in the conceptual closure plan in the ERMP Part 2 p. 16-1 to 16-48. Land elevations would be independently verified throughout Project implementation.

Issue:

Further information was requested about vegetation within the drainage lines and whether this vegetation would be reinstated in the lines that are redirected or moved. (ERMP Part 2. p. 16-3)

Submission: 48
Response:

Toro would seek to reinstate vegetation that existed prior to the commencement of mining and to a state that resembles, as closely as practicable, its original state.

**Issue:**

Questions were raised about Toro’s failure to make any specific commitment to using existing radiation levels in the region as the target for closure and rehabilitation. It was argued that because the broader Wiluna region is not elevated in radiation at all, Toro should use these natural levels as quantitative targets for rehabilitation standards in radon emanation rates, gamma radiation, radon progeny in air, heavy metals and radionuclides in soils, water and biota. It was also claimed that Toro must present more comprehensive sampling and analyses of soils, waters, air quality and natural radionuclides to properly and accurately document the pre-mining status and support rigorous rehabilitation targets.

**Submission: 1,2,3,4,5,6,8,9,10,11,13,14,15,32,34**

Response:

Extensive background radiation monitoring has been undertaken in the Project Area and the results are provided in the ERMP Part 1. Sections 4.3 and 4.4. Toro would be committed to returning the environment to its pre-mining status and to complying with all applicable legislative and regulatory requirements, including meeting relevant radiation dose limits.

Toro would ensure that radiation levels in the areas of its operations were consistent with pre-mining levels.

**Issue:**

Questions were raised about whether taxpayers would have to cover the cost of the rehabilitation of the Wiluna Project site. It was suggested that this had happened at many uranium mines overseas and the WA EPA was asked to ensure that such cost shifting would not be repeated in Western Australia. It was also questioned whether a financial risk assessment had been carried out to determine the likely costs of the site clean-up and maintenance versus the value of the mining operation, including a scenario where rehabilitation failed and why Toro had not provided an estimate of rehabilitation costs in the ERMP.

**Submission: 21, 23, 26, 31, 32, 34, 39, 40**

Response:

Toro has estimated mine closure costs using the nationally recognised estimation tool developed by the New South Wales Department of Mines. This tool has been designed to minimise potential liabilities to the State in the event of default on rehabilitation obligations. The tool estimates closure costs for the whole of mine life disturbance. In addition to calculating costs of machinery, materials and labour, the costing tool includes:

- Project management costs;
- Monitoring costs; and
- Contingency.

The security that would be required to provide funds to address possible long term maintenance requirements can be adjusted as required, based on annual reviews of Toro’s performance, a process which is in line with industry best practice.
Toro’s commitment to verifying best practices is demonstrated through a current field rehabilitation trial in areas on its tenements disturbed by previous tenement holders. This early rehabilitation trial would review the effectiveness of Toro’s rehabilitation practices and allow Toro to refine its closure cost estimate.

Toro would review its closure liability annually, consistent with good governance principles. As with all WA mining operations, Toro would commit to a detailed review of the Mine Closure and Rehabilitation Plan triennially with the outcomes submitted to the WA DMP.
5.4 Radiation

Issue:

It was suggested that there was a lack of basic radiation information in the ERMP, making it very difficult for a layperson to have an understanding of the detail provided in the ERMP.

Submission: 33

Response:

Toro appreciates that radiation is a technical subject matter and elements are difficult to define without technical language and scientific evidence. However, Toro aims to help all stakeholders understand the technical aspects and risks, and accordingly Appendix D to the Response to Submissions provides an overview on basic radiation, safe exposure levels, risks and management of those risks.

Issue:

Information was requested on the meaning of regional natural background radiation levels being ‘above average’ in the context of public health; whether this meant that people in the region were more at risk from the operation and whether the higher natural levels transfer to animals and plants and therefore into bush tucker, and the impact on bush tucker of dust or radionuclide fallout.

Submission: 33

Response

Many areas of the globe have regions of elevated background radiation. This is not unusual and it does not imply higher health risks for people in any such region. The levels observed in the Wiluna region are within the range of naturally occurring levels observed elsewhere in the world (UNSCEAR 2000).

ERMP Part 1. Section 4.4.1 identifies that individuals living in the Wiluna region would have higher exposure levels to natural background radiation than the “average person” (individuals not living in close proximity to the region). The same applies to flora and fauna.

Dose assessment is based on radiation impacts from the Project. Therefore the naturally occurring background levels are not included when making a dose assessment (hence the statement that Project impacts are based on radiation levels above natural background levels). The dose assessment shown in the ERMP Part 1 Section 6.2.6 and Appendix D of the ERMP indicates that Project doses would remain well below the accepted limit.

Issue:

It was suggested that Toro had wrongly claimed the Wiluna region generally had naturally elevated radiation and enhanced concentrations of uranium, because this is contradicted by information in the ERMP. Further support for this contention was said to be in Table 32 (ERMP Part 1. p 4-24) relating to radionuclide concentrations in soils.

Submission: 19, 21, 23, 28, 31, 32, 34
Response:

Within the broader Wiluna region, there are a number of areas, particularly in the vicinity of shallow uranium ore deposits, where dose rates are higher than average Australian values as discussed in the ERMP Part 1. Section 4.4.1. Surrounding these, there are areas where dose rates are also elevated. In the remainder of the region, dose rates are generally consistent with average Australian levels.

In relation to Table 32, there is no suggestion that the uranium content of the soils in the area is not ‘natural.’ Table 32 gives an ‘average’ soil uranium content of 50 Bq/kg, equivalent to approximately 4mg/kg, compared with the 2.7mg/kg ‘crustal average’ referred to by the submitter.

Conversion between mass of uranium and activity of uranium is done using the specific activity of U238, which is 12,500 Bq/g (note that specific activity is obtained from the inverse of the half life of U238 multiplied by the natural log of 2 (Cember 2008)).

Therefore 1 gram of U238 is equivalent to 12,500Bq and 4 mg is equivalent to 50 Bq.

Issue:

Information was sought for gamma measurements on the limits of detection of equipment used and how it impacts measurements made at low doses. Clarification was also sought on whether the gamma dose rates quoted and reported include the cosmic radiation component. (ERMP Part 1 pp. 4-7 to 4-12)

Submission: 48

Response:

Between 2006-2010 Toro commissioned a series of studies to understand gamma radiation levels in the area.

In 2006, levels were monitored by using a Health Physics Meter (Cypher Model 5000) with a Geiger-Mueller (GM) detection probe. This is an integrating detector, which means that it is very sensitive, having a lower level of detection dependent upon the integration period. It is recognised as a competent piece of monitoring equipment used for background gamma monitoring.

For later measurements, Toro’s own equipment (Automess 6150AD6/H dose rate meter, with limits of detection of 0.1 μSv/h (analog mode) and 0.01 μSv/h (digital mode)), was used. These instruments detect cosmic gamma radiation.

A further aerial radiometric survey was undertaken in 2010. However the raw data does not include gamma from cosmic radiation. A correction was made to the data to enable comparable results from both surveys. This was outlined in ERMP Part 1. Section 4.4.1 and states that the cosmic radiation ‘factor’ (quoted by UNSCEAR to be approximately .035 μSv/h) was added to the aerial results and included in the subsequent analysis.

Issue:

Clarification was sought of whether the units used for gamma radiation (ERMP Part 1, p 4-7) are micro-Sieverts per hour, assume a conversion factor from micro-Grays per hour or unity (or 1) or another value (e.g. adults, children or infants).

Submission: 32
Response:

A conversion factor of one was used for micro-Grays to micro-Sieverts as this is the most conservative for adults, children and infants.

Issue:

Clarification was sought about why thorium-228 was included in Table 21 (ERMP Part 1 p. 4-13) when it is not part of the uranium decay chain for either uranium-238 or uranium-235. It was also questioned whether the results presented in the table could be inaccurate because of the small mass of dust obtained and the difficulty in analytical testing of such samples.

Submission: 32

Response:

Thorium-230 and Thorium-228 are listed in Table 21. Thorium-230 is part of the uranium decay chain. Thorium-228 is from the Thorium-232 decay chain and was provided for information.

The results presented in the table are accurate despite the sample size. Sample size may affect the lower level of detection, but not the accuracy of the results. Air/dust sampling is continuing and would continue for the duration of the Project.

Radiation detection is generally very sensitive, and depends upon the size of the sample being analysed. Therefore, results are usually quite accurate. However as the sample gets smaller, the ability to detect radiation above natural background levels decreases.

Issue:

It was claimed that the highly variable concentrations of radon in the Wiluna region presented in the ERMP (ERMP Part 1 pp.4-14 – 4-18 and p.4-20 Figure 26) fail to acknowledge the critical meteorological processes which govern radon and radon progeny behaviour as it has been well known in the region for at least three decades that radon and its progeny can vary in activity by two or even three orders of magnitude. It was further suggested that as the mine would expose a major tonnage and area of mineralised material to the atmosphere, the radon load emanating into the immediate environment would substantially increase compared to pre-mining rates, leaving the workers on site at risk of higher than usual radiation exposures when there are thermal inversions and radon progeny reach 100 to 1000 times higher activities in shallow air, but the ERMP fails to address this risk in a thorough scientific manner.

Submission: 32

Response:

The role of critical meteorological processes such as shallow atmospheric inversion in the build up of high radon and radon daughter concentrations is well understood and discussed in the ERMP Part 1. Section 4.4.3 and in Appendix D. The submitter correctly identifies that the variability in atmospheric radon concentration is a naturally occurring phenomenon which has been observed over at least three decades in the region. This is also stated in the ERMP Part 1. Section 4.4.3.1.
The effect of meteorological processes has been incorporated in the ERMP in the air quality modelling that was undertaken to estimate the average radon concentration increment due to the operations.

In addition, the impacts of radon concentration build up in the operating pits where mineralised material is exposed were discussed in the ERMP Part 1. Section 6.1.4.4. and in Appendix D. This demonstrates that even under inversion conditions, annual dose rates to miners as a result of the inversion would be less than one quarter of the internationally accepted limit of 20 mSv/y.

**Issue:**

*Further detailed information was sought on sampling frequency for the radon monitoring results from August 2007 – March 2009:*

- Was the sampling conducted quarterly; and
- Did it cover a full seasonal cycle and if so, show the seasonal cycle of airborne radon concentrations measured at Wiluna or show Table 5 from Appendix C (in Appendix D) in the main document.

**Submission: 48**

**Response:**

The results from radon monitoring surveys conducted from August 2007 – March 2009, identified in ERMP Part 1, Section 4.4.3.1 were conducted on a quarterly basis to cover the full seasonal cycle.

Toro is committed to ongoing radon monitoring and to that end, sampling continues. Appendix D to the ERMP provides more recent results. This sampling is also conducted on a quarterly basis.

**Issue:**

*It was suggested that Toro’s presentation of radon emanation data (ERMP Part 1. p. 4-17) was not precise enough to allow a consideration of baseline values in setting rehabilitation targets and assessing longer term impacts due to mining.*

**Submission: 32**

**Response:**

The emanation data is accurate to one significant figure and is defined by the method used to analyse the samples. The data provides a broad measure of radon emanation from the region and is, importantly, consistent with the results of earlier sampling shown in Table 26 (ERMP Part 1. p. 4-17).

**Issue:**

*It was suggested that there was no means to monitor workers for radon gas inhalation and that because the gas was colourless, odourless and easily dispersed by air movement, there would be no way to contain or draw it away from workers in an open cut mine such as that proposed by Toro.*

**Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 13, 14, 15, 21, 40**
Response:

Radon and the decay products of radon are readily measured. In Appendix D of the ERMP, Toro has provided results from radiation detection equipment which measures radon and radon decay products. Other sampling methods include passive radon monitors (which Toro uses – see Appendix D of the ERMP) and grab sampling which Toro uses for instantaneous measurement of radon decay product concentrations.

The techniques for monitoring and assessing worker exposure to radon and its decay products are well established and Toro uses standard methods recommended by the International Commission on Radiological Protection and adopted in Australia through the Mining Code (ARPANSA 2005). Toro’s implementation of the standard is described in Appendix D of the ERMP.

Issue:

It was suggested that Figure 24 (ERMP Part 1. p. 4-18) is wrong since it excludes bismuth-210, polonium-210 and lead-206, and was a severe error because polonium-210 can be a major contributor to internal radiation dose (e.g. the copper smelter at Olympic Dam).

Submission: 32

Response:

Polonium-210, lead-210 and bismuth-210 are not generally considered to be radon decay products when assessing dose from the inhalation of radon decay products. However, their impact is taken into account when assessing dose from the inhalation of the longer lived radionuclides present in the air or dusts.

Issue:

Additional data was requested to show a full seasonal cycle of Radon Daughter Product concentration measurements. (ERMP Part 1. pp. 4-19 to 4-20)

Submission: 48

Response:

Toro is committed to continuing to monitor radon and radon daughter products (RDP), and has continued to undertake studies following the submission of the ERMP. Appendix D to the ERMP provides initial results of the passive radon monitoring conducted in the region and additional passive radon monitoring results are, on average, consistent with the initial results. The results are in Table 5 below.
### Table 5: PASSIVE RADON MONITORING RESULTS

These naturally occurring radon concentrations are higher than average radon concentrations for the broader region of 27 Bq/m³ (based on active sampling) and results of earlier Australian Atomic Energy Commission monitoring reported in the original 1981 EIS (Lancaster 1981), but are within the variability of the analytical techniques. They provide a broad indication of radon concentrations only.

Appendix D of the ERMP identifies the naturally occurring radon and RDP concentrations which also demonstrate the diurnal and seasonal variation in levels observed in other detailed studies in the region. Ongoing radon decay product monitoring is continuing in the region and the results are consistent with those provided in Appendix D of the ERMP (Table 2.5). The summary results are indicated in Table 6 below.

<table>
<thead>
<tr>
<th>AREA</th>
<th>Winter 2010 Bq/m³</th>
<th>Spring 2010 Bq/m³</th>
<th>Summer/Autumn 2011 Bq/m³</th>
<th>Annual Average Bq/m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close to Lake Way</td>
<td>46</td>
<td>67</td>
<td>26</td>
<td>46</td>
</tr>
<tr>
<td>North West of Lake Way</td>
<td>33</td>
<td>51</td>
<td>20</td>
<td>35</td>
</tr>
<tr>
<td>South East of Lake Way</td>
<td>27</td>
<td>41</td>
<td>13</td>
<td>27</td>
</tr>
<tr>
<td>Broad area average</td>
<td>35</td>
<td>53</td>
<td>20</td>
<td>36</td>
</tr>
</tbody>
</table>

### Table 6: RADON DAUGHTER PRODUCT MONITORING RESULTS

Toro would continue to undertake Radon and RDP concentration measurements on a seasonal basis.

**Issue:**

*It was suggested that the comment that 'there is no pathway or potential exposure to people or livestock' (ERMP Part 1. p. 4-21) from groundwater contamination fails to account for risks or leaks from process water ponds and the Tailings Storage Facility, and that there was no context for this type of risk, such as cross-referencing to later sub-sections on the hydrogeology and groundwater resources of the Lake Way and Centipede deposits.*

**Submission: 32**

TORO ENERGY LIMITED
Response:

This section of the ERMP (Part 1. p. 4-21) describes the very high salinity levels of the groundwater (up to 100,000 ppm TDS), which is regarded as unsuitable for human or stock consumption. The likelihood of sourcing the groundwater for consumption is therefore very low which effectively reduces the risk of a potential exposure pathway.

In addition, the current groundwater resources passing through the Centipede and Lake Way deposits contain naturally occurring radionuclides which provide a natural pathway for radionuclide exposure.

The behaviour of radionuclides in groundwater and the contamination risks are outlined in the responses on groundwater in Section 5.1 of the Response to Submissions.

Groundwater modelling (Aquaterra 2010 a and b) indicates that movement of groundwater from the mine area is limited due to the natural drainage flows, and during mining there is likely to be an induced groundwater flow towards the mine as a result of active dewatering such that the risk of groundwater contamination beyond the mining footprint is low.

Issue:

It was suggested that uranium concentrations in Table 29 (ERMP Part 1. pp 4-21) provide no reference or comparison to relevant drinking water standards or limits to protect freshwater or marine ecosystems, given that uranium concentrations in production bores are significant with respect to relevant water quality standards.

Submission: 32

Response:

The information in Table 29 refers to production bores which may supply water for the processing plant. This supply is hypersaline and not fit for human consumption (ANZECC 2004). Accordingly, drinking water standards and those to protect freshwater or marine ecosystems are not relevant.

Issue:

Clarification was sought on which types of water bodies have been sampled for radionuclides in surface water (ERMP Part 1. pp. 4-21 to 4-22):

- Were some of the permanent waterholes in the region sampled after rain events; and
- Did the collection focus on surface water in smaller depressions after a rainfall event and if so, why were those puddles sampled.

Submission: 48

Response:

Permanent water holes in the region were not sampled because, as noted in the ERMP Part 1, Section 4.4.6.2 they are rare in the region.

Due to the arid environment of Wiluna, there is little standing surface water in the region. Surface water samples were taken opportunistically in 2010 after rainfall events with uranium levels shown to be less than 0.08 Bq/L. This is discussed in the ERMP Part 1. Sections 4.7 and 6.6 and in Appendix G.
Issue:

A request was made to clarify if the activity concentrations reported in Table 30 (ERMP Part 1. p. 4-22) were from surface water collected on top of the Centipede deposit or concentrations of rainwater, and whether they were down-gradient or up-gradient of both the Centipede and Lake Way deposits. It was also suggested that down-gradient samples should be collected if they have not already been, and compared with up gradient water samples.

Submission: 48

Response:

The sample reported in Table 30 (ERMP Part 1. p. 4-22) was collected from the lake bed near the Centipede deposit immediately following a rainfall event and sent for analysis of the long-lived radionuclides. This was down-gradient of both the Centipede and Lake Way deposits and down flow from a local approved groundwater discharge from the ore zone.

As part of its ongoing monitoring programme, Toro would take up-gradient samples for comparative analysis.

Issue:

Toro was asked to check the units for uranium-238 activity given for rainwater in Table 30 (ERMP Part 1 p. 4-22) as they seemed to the submitter to be high.

Submission: 32

Response:

In December 2010, a sample was collected from the lake bed near Centipede deposit immediately following a rainfall event and sent for analysis of the long-lived radionuclides. The results are reported in Table 30 (ERMP Part 1 pp 4-22). The location of the sample was in proximity to an area where there had been an approved discharge of groundwater. The units for uranium-238 are correct.

Issue:

Toro’s approach to establishing baseline radiation ecology was questioned. Submissions suggested major risks were said to be associated with the intermittent surface and subterranean aquatic systems but Toro’s baseline information was based on terrestrial flora and a sample of station roadkill. It was suggested the ecosystem should have been examined for its current background exposure to radioactive elements and radiation movement from cryptogamic/microbial mat producers, aquatic macro-invertebrates and stygofauna to aquatic birds. It was also suggested that heavy rainfall during February/March 2011 had provided an opportunity for in-situ investigation of aquatic biota and sampling of radionuclides in surface water (ERMP Part 1. p. 4-22) but this opportunity was not taken even though this was essential to be able to ‘assess and manage’ uranium mining.

Submission: 1,2,3,4,5,6,8,9,10,11,13,14,15,19,21,23,31,32,34,40

Response:

The assessment of potential radiological risks to the environment was based on the internationally accepted ERICA tool. It is a misunderstanding to imply that the assessment was based on the radionuclide concentrations in particular species in the existing natural environment. The assessment was based on predicted increases due to
Project operation. It is not expected that the Project would lead to significant increases in radionuclide concentrations in the aqueous environment.

The ERMP has a comprehensive discussion of surface hydrology, chemistry and hydrology (ERMP Part 1. Section 4-7). Appendices F and G provide further detailed information. As these references indicate, Toro has carried out comprehensive water quality and lake sediment testing and when land access was available following significant rainfall events, was able to take limited samples for radiological analysis. However, the particularly heavy rain in early 2011 made sampling near Lake Way impossible because the unsealed access tracks in the vicinity of the lake were impassable.

It is not correct to state that an understanding of ecological indicators is essential to be able to assess and manage uranium mining. When assessing the potential impact to biota from exposure to radiation, the International Commission on Radiological Protection (ICRP) recommends performing an assessment in line with the recommendations in ICRP 108. As stated above, an assessment of potential radiological risk to the environment was conducted for the Wiluna Project using the ERICA tool recommended by the ICRP.

Issue:

*The extent of soil sampling for uranium and radionuclide concentrations was questioned (ERMP Part 1. pp. 4-22 to 4-24).*

**Submission: 32**

**Response:**

As outlined in ERMP Part 1 pp 4-22 to 4-24, Toro undertook a comprehensive soil sampling programme in 2010 and assessed the results against the world median for soils (UNSCEAR 2000) to determine and assess potential impacts. The impacts are outlined in the ERMP Part 1, Section 6.2. Toro is satisfied that the soil sampling regime provides sufficient information for this assessment.

Issue:

*Clarification was sought whether the uranium concentration in Table 31 (ERMP Part 1. p. 4-22) is only uranium-238 or natural uranium (ie uranium-238 + uranium-235)*

**Submission: 32**

**Response:**

The concentration is of total uranium (includes uranium-238 and uranium-235)

Issue:

*Inclusion of sites of 12 samples collected in 2010 in Figure 28 (ERMP Part 1. p. 4-23) was requested.*

**Submission: 48**

**Response:**

This information has been provided in Figure 13 of Appendix D to the ERMP.
**Issue:**

In relation to the anomalous result for the radionuclide level in an acacia sample noted in the ERMP Part 1, p.4-25, it was asked whether this could be due to preferred uptake by certain species, or to increased uptake during growth of new vegetation after rainfall events?

**Submission: 7**

**Response:**

There is insufficient information to form a definite conclusion about this particular sample. The result may be due to a sampling or analysis error. It also should be noted that this sample was collected from a location very close to the existing highway and mainly showed elevated levels of Pb-210.

To gain clarification around this anomaly, Toro would be conducting further sampling. Toro would also include flora sampling and analysis as part of the Environmental Management System for the Project.

The other flora results provided data to determine a broad average to characterise the existing environment and, excluding the sample referred to by the submitter, do not affect the conclusions in the ERMP.

**Issue:**

It was claimed that the number of biota samples tested for uranium and radionuclide concentrations (ERMP Part 1, pp. 4-25 to 4-27) is insufficient to infer statistical confidence in the variable values presented and a more comprehensive assessment of natural concentrations of radionuclides in the biota of the broader Wiluna region was sought.

**Submission: 32**

**Response:**

The intention of the monitoring programme was to determine the broad indicative radiological characteristics of the region rather than to conduct a detailed statistical analysis (hence species and area averages and ranges have only been provided – see Table 33 of the ERMP, Part 1) and Toro is satisfied that sufficient information has been obtained to achieve this. The impact that the operation may have on the environment is independent of the existing levels (that is, Toro is interested in the incremental impact that it may have) and this was determined using standard modelling methods and the results have been presented in the ERMP Part 1, section 6.2.8 and in Appendix D of the ERMP.

**Issue:**

It was questioned why 1981 values have been used for radon exhalation (ERMP Part 1, p. 6-17) and it was stated that if this resulted in an overestimation of the potential inhalation doses, data should be provided to underpin such a statement or the more recent, complete data set covering a whole seasonal cycle should be used and discussed.

**Submission: 48**
Response:

The results of the more recent radon emission testing arrived late in the process of producing the ERMP documentation and after the air quality modelling was undertaken. Accordingly, the higher earlier figures were used for dose assessment resulting in conservative overestimates. The original air quality modelling for radon was based on an estimated radon emanation rate of 3.6 Bq/square metre for Lake Way ore which itself was based on an Australian Atomic Energy Commission report from 1980 and is noted in Appendix D to the ERMP (Radiation Technical Report).

The more recent testwork undertaken by Toro in 2010 and included in the ERMP Part 1, Section 4.4.3.2 indicates that the original emanation rate used may be high by a factor of eight, which would effectively result in an eight-fold reduction in the estimated occupational and public doses from inhalation of radon decay products. Toro is undertaking further testwork to confirm this.

Issue:

An explanation was sought on the assumption (ERMP Part 1. p. 6-17 to 6-18) that the covered mine pit at Centipede would show an above background radon flux density of zero once mined out and covered with top soil in year 8. Data around the effectiveness of the cover and an assessment of the predicted increases in the annual average RDP concentrations also were requested.

Submission: 48

Response:

Toro would return radiological levels to as close as practicable to the pre-mining levels.

As part of the rehabilitation process, Toro would cover each of the tailings cells with inert rock to a planned depth of at least 2 metres.

The ‘half value thickness layer’ (or that depth of material which would reduce the amount of radon being released by 50per cent) for soil is 0.5 metres, compacted soil is 0.3 metres and clay is 0.12 metres. Therefore, assuming that the cover is ‘compacted moist soils’ (since it would need to be load bearing in order for trucks and loaders to be able to place cover) then a 2 metre cover would reduce the radon flux by a factor of about one sixty-fourth (or to 1.5per cent of the pre cover flux levels). For uncompacted soil, the 2 metre cover would reduce levels by about one-sixteenth (or to 6.3per cent of the pre cover levels).

Toro would also comply with all relevant legislation including meeting relevant dose limits. This would ensure that the radiation levels in the area of operations would be returned to levels within the range of those consistent with pre-mining levels.

Issue:

It was suggested that the estimated radon exhalation fluxes and emissions shown in Table 72 (ERMP Part 1. p. 6-18) were a result of the operation and did not include the natural component.

Submission: 48
Response:

This is noted by Toro. Table 72 specifically refers to estimates of emissions of radon from the Project for the purpose of estimating impacts.

Issue:

*Information was requested on any further test work undertaken regarding the change from proposed heap-leach to agitated leach processing in the context of demonstrating that the radionuclides have low solubility and do not migrate with seepage.*

*Submission: 30*

Response:

Testing of total metals was completed in November 2011. Results so far show that the total metals concentrations in tailings from the agitated leach circuit are typically less than half of the concentrations present in the heap leach tailings. This reflects the higher extraction efficiency of the agitated leach process. In the case of uranium, the average concentration of total uranium in the agitated leach tailings is about 65 mg/kg compared to 126 mg/kg in the heap leach tailings.

Issue:

*It was claimed that the ERMP and associated management plans did not acknowledge the requirement to record workers’ radiation doses to ensure that dose limits are not exceeded in the National Radiation Dose Register maintained by the Australian Radiation Protection and Nuclear Safety Agency, with the monitoring equipment required needing to be identified in the ERMP. Toro’s commitment to make available worker radiation dose records to the National Radiation Dose Register was questioned because it was claimed the Register was incomplete as it excludes miners in the Northern Territory and all workers involved in exploration.*

*Submission: 25, 34*

Response:

Toro would supply all required dose information to the National Radiation Dose Register. This requirement would be detailed in all approved Radiation Management Plans. The extent of the Register is a matter for government.

Issue:

*It was stated that because there was a latency period of about 20 years between radon exposure and health effects becoming apparent, records of uranium mine workers would need to be maintained for this period of time as a minimum and Toro must acknowledge and agree to its accountability should health effects be realised attributed to occupational exposure at the Wiluna Project. It was further suggested that monitoring of these records must be conducted by the Australian Radiation Protection and Nuclear Safety Agency with inspection and audit by an independent authority such as the Auditor General or Ombudsman to ensure compliance and accuracy of data.*

*Submission: 25*
Response:

Toro would retain records of radiation exposure for a period of at least 30 years, as required by the Code of Practice for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing. Dose records also would be submitted to the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) for holding in the National Radiation Dose Register. How the records are then managed is a matter for ARPANSA.

Issue:

It was suggested that Toro must acknowledge responsibility for payment of compensation claims that may be filed by workers or members of the public who develop cell tissue damage and illnesses attributed to occupational or environmental exposure in future, as occurred with the precedent set by the James Hardie asbestos exposure.

Submission: 25

Response:

Toro would comply with all applicable laws in relation to worker or public exposure.

Issue:

It was suggested that the weight of medical evidence indicated there was no safe dose of radiation, with new research showing nuclear radiation caused biological effects in humans at much lower levels than previously thought possible, raising the question of whether this new information had been considered in the planning of the Wiluna Uranium Project. One submitter pointed out that over the years the permitted levels of radiation exposure for workers and the public had dropped dramatically as research, particularly by radiation biologists, had indicated harmful effects still exist at much lower levels.

Concern was also expressed that Toro had not factored in recent advice from the International Commission on Radiological Protection (ICRP) that dose conversion factors for radon would likely increase by a factor of two. It was claimed that this was extremely significant, since it suggested that exposures for mine workers would approach 10 mSv per year which were large average doses compared to other mines and peak exposures during climate inversions could easily approach the statutory limit of 20 mSv/year. Information was sought to demonstrate an understanding of the impact of any new radon dose conversion factors to be determined by the ICRP on the commitments, dose estimations and monitoring programmes presented in the ERMP (ERMP Part 1. pp. 6-3 to 6-4)

Submission: 1,2,3,4,5,6,8,9,10,13,14,15,19,21,23,25,26,28,29,31,32,34,40,48

Response:

Toro adheres to the recommendations of the ICRP and complies with the appropriate legislation on radiation protection for the Wiluna Project and would implement systems to limit Project dose with a focus on ensuring that doses are as low as reasonably achievable (the ALARA principle).

Internationally recommended radiation exposure limits have been stable. There has been only one reduction in the limits in the past fifty years – from 50 millisieverts per year (mSv/y) to 20 mSv/y in 1990 for the annual occupational dose. The most recent publication of the ICRP in 2008 did not further reduce the limits.

As discussed in the ERMP Part 1. Section 6.2, Toro’s radiation protection philosophy and approach are based on the internationally accepted recommendations of the ICRP and the International Atomic Energy Agency (IAEA)
which have been adopted in Australia through state and territory legislation or through ARPANSA. Toro would continue to comply with such recommendations and legislation.

Radiation dose limits are expressed in terms of the ‘effective dose’ measured in Sieverts (Sv). Occupational doses in mining are in the range of millisieverts (mSv= one-thousandth of a Sievert) and the primary radiation protection limits currently accepted internationally are:

- Annual limit to a worker of 20 mSv; and
- Annual limit to a member of the public of 1 mSv.

Occupational doses may be averaged over a five year period when assessing compliance with the limits and exclude radiation from natural background sources. There is an absolute annual limit of 50 mSv for workers.

The total radiation dose to which a worker is exposed is the sum of exposure to gamma radiation, radiation associated with airborne dust and exposure to radon decay products. Toro’s prediction is that average doses to miners working in the Wiluna Project would be 2.6 mSv/y, less than a quarter below the internationally accepted limit. (See Appendix D of the Response to Submission for further information about occupational classes).

The ICRP has recently published ‘Lung Cancer Risk from Radon and Progeny’ (ICRP 115). This foreshadows an increase in the dose conversion factors recommended to be used to convert intakes of radon or radon decay products to dose and notes that ‘these dose coefficients would be larger (than those currently recommended) by about a factor of two or more.’ This change comes about mainly from a change in the way of calculating doses, to bring the method for radon and its decay products into line with that used for other isotopes, not from any new evidence indicating that radon and its decay products are significantly more harmful than was previously understood.

Assuming that the new dose conversion factor has been increased by a factor of two, then the doses calculated in the ERMP from the inhalation of radon and radon decay products (but not doses from other sources) would also increase by a factor of two.

The table below indicates the new doses that would be expected under a doubling of the radon and radon dose conversion factors. Note that the doses to workers (miners and plant workers) are based on the revised doses supplied in Appendix D.
### Current Recommendations

<table>
<thead>
<tr>
<th>Group</th>
<th>RDP dose (mSv/y)</th>
<th>Total Dose mSv/y</th>
<th>Expected Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miners</td>
<td>1.3</td>
<td>2.6</td>
<td>2.6</td>
</tr>
<tr>
<td>Plant workers</td>
<td>0.04</td>
<td>1.7-2.7</td>
<td>0.08</td>
</tr>
<tr>
<td>Wiluna Township</td>
<td>0.02</td>
<td>0.022</td>
<td>0.04</td>
</tr>
<tr>
<td>Bondini Reserve</td>
<td>0.014</td>
<td>0.015</td>
<td>0.028</td>
</tr>
<tr>
<td>Nganganawili Community</td>
<td>0.031</td>
<td>0.034</td>
<td>0.062</td>
</tr>
<tr>
<td>Millillillie Station</td>
<td>0.02</td>
<td>0.021</td>
<td>0.04</td>
</tr>
<tr>
<td>Lake Way Station</td>
<td>0.005</td>
<td>0.005</td>
<td>0.01</td>
</tr>
<tr>
<td>Apex Village</td>
<td>0.042</td>
<td>0.047</td>
<td>0.084</td>
</tr>
<tr>
<td>Toro Energy Construction Camp</td>
<td>0.031</td>
<td>0.033</td>
<td>0.062</td>
</tr>
<tr>
<td>Toro Energy Operations Camp</td>
<td>0.015</td>
<td>0.016</td>
<td>0.03</td>
</tr>
</tbody>
</table>

#### Table 7: CALCULATED DOSES TO WORKERS & THE PUBLIC BASED ON DOUBLING OF THE RDP DOSE CONVERSION FACTOR

**Issue:**

*It was suggested that the scientific and medical community (including those within the ICRP) opposed the practice of condensing annual limits of 20 mSv over five years to 50 mSv per year for two years. Reference was made to an announcement in June 2005 by the International Agency for Research on Cancer claiming a study of 407,000 nuclear industry workers showed cumulative exposure was leading to a 10 per cent raised risk of death from all types of cancer and a 19 per cent increase from leukaemia.*

**Submission: 42**

**Response:**

The average dose from natural background radiation around the world is approximately 2.4 mSv/year and the range can vary in each country from 1 to 10 mSv/year. Workers in Australian uranium mines routinely receive doses that are comparable with natural background levels.

The potential for ‘even low doses of radiation (to) cause cancer’ is recognised and is the basis for the ICRP’s recommendations and is taken into account when setting exposure standards.
**Issue:**

It was suggested that the annual risk of death from cancer for a uranium mine employee is 16 times the risk of fatal injury in Australian industry generally.

**Submission:** 42

**Response:**

The basis of this calculation is not known to Toro and the submitter provides no reference for it.

**Issue:**

It was suggested that the most serious health hazard associated with uranium mining was lung cancer due to inhalation of uranium decay products in the form of dust or radon gas emanating from tailings structures and that if the tailings structures in the Kalgoorlie region had been from uranium mining, thousands of people would have developed Alpha respiratory induced cancer as a result of the inhalation of the constant airborne dust particles under 0.25 parts per million.

**Submission:** 42

**Response:**

The potential radiological risks that may arise from the inhalation of radioactive dusts or radon decay products are understood and discussed in the ERMP and Appendix D. The predicted radiation doses on account of the Wiluna Project would be low and comply with the internationally accepted recommendations of the ICRP. Tailings from the Project would be managed to minimise release of dusts and radon.

**Issue:**

It was suggested that exposure to radon progeny was likely to create damage to cell tissues and risk of lung cancer, bone and connective tissue cancers and diseases of the blood and that in the United States, radon exposure was the second leading cause of lung cancer. Another submitter claimed that international cancer incidence and mortality data demonstrated statistically significant links between radiation and all solid tumours as a group as well as for cancers of the stomach, colon, lung, breast, ovary, bladder, thyroid and non melanoma skin cancers and most types of leukaemia.

**Submission:** 25, 29, 39

**Response:**

The properties of radiation and in particular radon are well known and are specifically taken into account by the ICRP and other bodies when developing exposure limits. Exposure to radon decay products and radium (in dust) is discussed in the ERMP Part 1. Sections 4.4, 6.1 and 6.2.

**Issue:**

It was suggested that any mining of uranium at Wiluna would expose all of life around to radiation risks causing illnesses and death because the wind would pick up the radioactive tailings and scatter them broadly.

**Submission:** 39
Response:

Uranium ore is safely mined at depths significantly greater than 15 metres at many places around the world. Dispersal modelling of dust (including any tailings dust) indicates that resulting exposures to both the environment and the nearest residents would be low and within acceptable limits. (<0.05mSv/year or 1/20th of the allowable limit for members of the public (Apex Village)). Monitoring at existing uranium mines verifies this.

Issue:

*It was suggested that the extent of genetic damage from radiation exposure was far reaching, passing from parents through to their children.*

Submission: 25, 39

Response:

The potential genetic risks from radiation exposure are well known and understood and are considered by the ICRP in setting dose limits.

Developmental problems in the foetus have only been found at very high doses in the range 100 to 500 mSv during the most sensitive period of pregnancy. Annual doses in Wiluna due to the Project are estimated at 0.022 mSv/year, which is approximately 5,000 times lower that the lower levels at which effects have been observed.

The potential radiosensitivity of children is taken into account in the setting of radiation limits to members of the public.

Issue:

*It was asked whether the background radon concentration quoted in the ERMP Part 1. p.6-18 as approximately 27Bq/cubic metre was a consistent background level over the Project Area and if not, could the typical background levels be presented in a similar style to Figure 71 to enable the relative changes in radon levels to be observed.*

Submission: 7

Response:

In accordance with UNSCEAR 2000, which lists an order of magnitude range in average radon concentrations, the background concentration quoted in ERMP Part 1. p.6-18 is a best estimate of the average concentration across the region. The aim of Figure 71 is to show the impact of the operational contribution to the overall radon concentration.

Issue:

*It was suggested that the statement that there was an absolute limit of 50 mSv per year for workers implied that a worker could receive 50 mSv per year, every year (ERMP Part 1. pp. 6-23 to 6-24).*

Submission: 48
Response:

Toro Energy recognises that the annual radiation limit is 20 mSv/y. The statement in ERMP Part 1. p. 6-23 can be clarified by stating that the ‘annual limit to a worker’ is 20 mSv (averaged over five years).

Issue:

*Justification was sought for the selection of a dose constraint of ‘50 per cent of the internationally accepted limit’ and clarification of whether this commitment would remain if the internationally accepted limits changed in the future or if the conversion factors for calculating dose changed. (ERMP Part 1. p. 6-24)*

Submission: 48

Response:

Toro is committed to meeting internationally accepted dose limits. In some areas, Toro aims to go beyond legislative requirements and in this instance has elected to set an internal management goal of maintaining all worker and public doses less than 50 per cent of the internationally accepted limit.

The responsibility for establishing dose constraints sits with the regulator, and Toro would be guided by dose constraints as they apply.

Toro is committed to maintaining worker and public doses at less than 50 per cent of the internationally accepted limit.

Issue:

*It was suggested that doses below 50 mSv increase the risk of cancer (ERMP Part 1. p. 6-24).*

Submission: 48

Response:

Toro is guided by the position of the International Commission on Radiological Protection (ICRP), which is the recognised preeminent international body on radiological protection. The Linear No Threshold theory is used by the ICRP to assess health effects resulting from exposure to radiation. This conservative theory is based on the assumption that there is a linear relationship between dose and effect at all levels of exposure.

Toro notes that the statement in the ERMP should be clarified to read ‘while there is no evidence to suggest that low levels of chronic exposure (<50 mSv) actually cause cancer, Toro is guided by the ICRP and has assessed the exposures to people and the environment in accordance with ICRP recommendations.’

Issue:

*Supporting data was requested for the statement that shielding provided by mining equipment would reduce doses to miners by a factor of 0.25. (ERMP Part 1. p. 6-25 to 6-28)*

Submission: 48
Response:

ERMP Part 1. p. 6-25 to 6-28 estimates that miners would on average receive 1 mSv/y from gamma radiation based on gamma radiation levels observed in other open-cut uranium mines. Toro has not assessed positive impacts of shielding equipment. The aim of the theoretical assessment was to indicate a maximum possible level, which is well below the international recognised limit.

Issue:

Clarification was sought of the statement that the equilibrium factor is the ratio of RDP concentrations to the radon concentration. (ERMP Part 1. p. 6-25 to 6-28)

Submission: 48

Response:

The equilibrium has been clarified in the verification section which is Appendix D of the Response to Submissions.

Issue:

Toro was requested to provide the complete equation used to calculate worker exposure from RDP from an assumed radon concentration of 60 Bq/cubic metre and 2 000 working hours per year. (ERMP Part 1. p. 6-25 to 6-28)

Submission: 48

Response:

The full workings for miner doses are provided in section 4.3 of Appendix D of the ERMP. They were not provided in the main document to make it easier to read. The doses have been re-assessed and are presented in Appendix D of this Response to Submissions.

Issue:

It was suggested that Toro had not provided data for the RDP equilibrium factor from operating open cut mines, especially Langer Heinrich as a virtually identical project, including diurnal variation and during climate inversions. (ERMP Part 1. p. 6.27) It was also suggested that Toro may have significantly underestimated radon exposures.

Submission: 32

Response:

The equilibrium factor outlined in ERMP Part 1 p. 6.27 used for mine exposures (0.5) is considered to be conservative. Toro is not aware of any equilibrium factor data from the Langer Heinrich operation.

Additional information on equilibrium factors is provided in Appendix D of this Response to Submissions.

Issue:

A reason was sought for the Radon Decay Product (RDP) dose level at Centipede being 38 times greater than at the Ranger mine, (ERMP Part 1. p. 6-28) given that Ranger is a relatively deep open cut mine with potential for inversions, and has a higher ore grade.
Submission: 7

Response:

The figure quoted (ERMP Part 1. p. 6-28) is a conservative estimate and the values sit well below the internationally accepted dose limits.

Toro would continue to model predicted doses using conservative factors. The benefit is that actual doses are expected to be lower during operation.

The comparison with Ranger doses is intended to highlight this effect. Even with this inherent conservatism built into dose estimation, the resulting values are still well below the internationally accepted dose limits.

Issue:

Information was sought on the factors which influenced the selection of the 0.2 equilibrium factor between radon concentrations and radon daughter product concentrations indicated in the ERMP Part 1. p. 6-28 and Toro was requested to provide the complete equation used to calculate worker exposure from RDP from an assumed radon concentration of 5 Bq/cubic metre and 2 000 working hours per year.

Submission: 7, 48

Response:

This information is in the verification document which is Appendix D of this Response to Submissions.

Issue:

Information was requested about the various design, engineering and procedural controls that would be considered to minimise potential radiation and other hazards in the plant.

Submission: 7

Response:

Toro is committed to minimise potential health and safety risks on workers.

Design, engineering and procedural controls include but would not be limited to:

- Preparing detailed process and engineering design criteria documents;
- Engaging of an experienced and competent engineering consultant to undertake the process and detailed design of the plant and associated infrastructure;
- Peer review of completed designs;
- Implementing HAZOP and HAZAN studies; and
- Detailed risk assessments covering all safety, environmental, radiation and operational aspects of the Project.

Issue:

Results of air quality modelling of RDP for office areas was requested. (ERMP Part 1. pp. 6-29 to 6.30)
Submission: 48

Response:

It is anticipated that the office accommodation would be located just outside the processing facility area and would be close to the 1 Bq/cubic metre contour shown in Figure 71 of the ERMP Part 1 p 6-19 (for year 8 of operations).

It is estimated that the annual dose from inhalation of radionuclides in dust would be 1.5 µSv/y and that the RDP dose would be 20 µSv/y.

Appendix D gives further information to support these estimates.

Issue:

Justification was sought for the statement that ‘consumption of locally grown food is a potential pathway which has been considered and has been found to be negligible.’ (ERMP Part 1. p 6-31)

Submission: 48

Response:

This statement is based on the theoretical dose assessment for consumption of vegetation growing immediately adjacent to the mine boundary combined with the most restrictive uptake factors as presented in the ERMP Part 1. pp. 6-30 to 6-31. Locally grown foods such as vegetables and fruits would only reasonably occur some distance away from the minesite and would therefore only be minimally impacted by airborne emissions from the mine and processing facilities. The potential impact at such distances would be negligible.

Issue:

Verification was sought of radiation information in the ERMP and in particular – radon decay product doses to the public (ERMP Part 1. p 6-31); relative radionuclide content (Table 67); radon emanation from groundwater (asserted to be low); evidence to support the assertion that radionuclide increase in groundwater would be a low risk on subterranean fauna; evidence that post-closure, radiation levels would be low and close to pre-disturbance (natural levels).

Submission: 33

Response:

This information is provided in Appendix D of this Response to Submissions.

Issue:

Data was requested (such as effectiveness of tailings cover, solubility of radionuclides in the tailings, radionuclide uptake in plants growing on rehabilitated land form) to support statements that radiation doses post rehabilitation would be consistent with pre-mining levels and that radionuclides would be largely insoluble and remain bound in tailings solids. (ERMP Part 1. pp. 6-32 to 6-33)

Submission: 48
Response:

The most recent test work conducted by the Australian Nuclear Science and Technology Organisation (ANSTO) verifies the low solubility of radionuclides in the ore apart from the U which has a higher solubility. For the tailings, the test work clearly shows that the long lived radionuclides (Th-230, Ra-226, Po-210 and Pb-210) remain predominantly in the solids phase of the tailings with very low quantities (about 0.3 per cent) reporting to the liquor phase. Approximately 5 per cent of the remaining U reports to tailings liquor.

In relation to the tailings cover, for an inert rock cover of 2 metres, the ‘half value thickness layer’ (or that depth of material which would reduce the amount of radon being released by 50 per cent) for soil is 0.5 metres, compacted soil is 0.3 metres and clay is 0.12 metres. Therefore, assuming that the cover is ‘compacted moist soils’ (since it would need to be load bearing in order for trucks and loaders to be able to place cover) then a 2 metre cover would reduce the radon flux by a factor of about one sixty-fourth (or to 1.5 per cent of the pre cover flux levels). For uncompacted soil, the 2 metre cover would reduce levels by about one-sixteenth (or to 6.3 per cent of the pre cover levels). Toro would provide an appropriate cover thickness to reduce radon release to levels acceptable to regulatory authorities.

As part of the design of the cover, consideration would be given to the depth of root penetration of bush tucker species and the depth would be established to minimise the risk of root penetration into tailings.

Further, the tailings would be disposed of below the saline water table where most vegetation do not access so root penetration is unlikely. Orebodies in the region are generally very shallow so even without mining there is already the likelihood that roots of bush tucker food species intrude into ore zones, including those with radioactive minerals present. It also should be noted that even without mining, radon is being produced in and released from shallow orebodies in the region. Mining and then properly disposing of the tailings would not increase the total amount of radon being released.

Issue:

An estimate was requested of the diet of ‘local gatherers’ (ERMP Part 1. p 6-32) and it was pointed out that the public dose limit of 1 mSv per year applied to all pathways and not just food.

Submission: 48

Response:

The estimate outlined in (ERMP Part 1. p. 6-32) was based on initial consultation with Traditional Owners. Toro is committed to gain greater understanding on the impacts and is committed to undertake additional bush tucker survey work in 2012.

In the absence of more detailed information, a conservative dose assessment was undertaken which showed that consumption doses would be low. It is noted and understood that 1 mSv is for all exposure pathways, and the assessment was indicative of the large amount of material required to be consumed in order to reach the relevant limit.

Issue:

It was stated that the ERMP (ERMP Part 1. pp. 6-32 and 6-33, and Appendix D, Section 5.5) should acknowledge that the lifetime of radionuclides in the tailings would be of the order of ten thousand to a few hundreds of thousands of years, depending on whether radium-226 or thorium-230 was at the head of the tailings chain.
**Submission: 48**

**Response:**

The radioactive properties of tailings are well understood by Toro.

**Issue:**

*The results were requested of test work which indicates that radionuclides would remain bound in the tailings solids. (ERMP Part 1. pp. 6-32 and 6-33 and Appendix D, Section 5.5)*

**Submission: 48**

**Response:**

Recent preliminary testwork conducted by ANSTO verifies the low solubility of radionuclides in the Wiluna Project ore, apart from uranium which is more soluble in alkaline conditions. For the tailings, the testwork shows that the long lived radionuclides (Th230, Ra226, Pb210) remain predominantly in the solids phase of the tailings with very low quantities (about 0.05 per cent for Th230, <0.3 per cent for Ra226 and 0.005 per cent for Pb210) reporting to the liquor phase. Approximately 5 per cent of the remaining uranium reports to tailings liquor.

Preliminary results are summarised in the following table, with the full report available in Appendix C.

<table>
<thead>
<tr>
<th>Stream</th>
<th>Percentage Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tailings – solids</td>
<td>U238/U235</td>
</tr>
<tr>
<td></td>
<td>6.2</td>
</tr>
<tr>
<td>Tailings – liquor</td>
<td>0.8</td>
</tr>
<tr>
<td>Product (SDU)</td>
<td>93.0*</td>
</tr>
</tbody>
</table>

*estimated 99.2% SDU precipitation yield; ** not measured.

**Table 8: Modeled Percentage Department Across Pilot Plant**

**Issue:**

*Toro was requested to demonstrate that seepage of radionuclides to groundwater (ERMP Part 1. pp. 6-32 and 6-33 and Appendix D, Section 5.5) was not significant noting that test work alone would not be sufficient to demonstrate this point and that modelling of the situation should be done to at least 10 000 years to provide some level of assurance that there was no significant seepage of radionuclides from the tailings to groundwater and that there was no unacceptable radiation risk to people or the environment in this timeframe.*

**Submission: 48**

**Response:**

Recent testwork by Toro has confirmed the original assessment that radionuclides predominantly remain fixed in the solids fraction of the tailings (see response to previous issue above) and are therefore not present in any significant quantities in tailings liquor (see Appendix C). If it is assumed that the tailings liquor (or water fraction) permeated through the tailings and becomes seepage, it follows that radionuclides are not likely to migrate from the tailings. Therefore, it is not expected that there would be any impacts on the environment and on people.
The confirming testwork indicates that the permeability of the tailings is low at between $2 \times 10^{-8}$ m/s and $8 \times 10^{-8}$ m/s, meaning that downward movement of liquor in the tailings itself is low, with the dominant effect being evaporation.

It should be noted that radionuclides and metals naturally exist in the groundwater in the region and that the groundwater already is unsuitable for human and stock consumption due to its high salinity.

**Issue:**

*It was suggested there was a contradiction between the conclusion in the ERMP (ERMP Part 1. p 6-41, Table 86) that there is no radiation impact on non-human biota and information in Appendix D of the ERMP indicating that the impact is negligible. Further justification was sought if the predicted outcome is ‘no impact.’*

**Submission: 48**

**Response:**

Toro will revise Table 86 to read ‘negligible impact.’

**Issue:**

*It was suggested that statements such as ‘radiation exposures would be low’ (ERMP Part 1. pp. 8-12 and 8-13) are not appropriate for predicted dose assessment and that a more appropriate phrasing would be that “based on studies conducted so far, it is anticipated that......”*

**Submission: 48**

**Response:**

ERMP Part 1. Sections 4.4, 6.1, 6.2 and Appendix D, provide extensive data and information on the expected radiological impacts of the Project. The statement “radiation exposures would be low” is a summary of the work that indicated that occupational and public doses are expected to be low and well below statutory limits.

**Issue:**

*Clarification was sought of the statement (ERMP Part 1. pp. 8-12 and 8-13) that worker radiation doses would be less than a quarter of the limit.*

**Submission: 48**

**Response:**

Appendix D of the Response to Submissions provides further clarification of this statement. The total average dose predicted for miners is 2.6mSv/y. The annual limit is 20mSv/y.

**Issue:**

*It was claimed that the Radioactive Waste Management Plan (ERMP Part 2. Section 9) was inadequate and that Toro should be required to prepare a complete plan for all phases of the Project to be available for further public consultation.*

**Submission: 39**
Response:

In compliance with WA legislation and the Code of Practice for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (ARPANSA 2005) (the Code), a comprehensive Radiation Management Plan (RMP) and Radioactive Waste Management Plan (RWMP) would be developed for each stage of the Project and submitted to the relevant regulatory authorities for approval. The RMP and RWMP in the ERMP Part 2 provide an interim overview of the key radiation management strategies and systems to be put in place. Toro is committed to developing more comprehensive plans to meet the legislative requirements and in compliance with the Code and would submit plans for approval prior to operations commencing, and for each stage of the Project.

Issue:

It was suggested that in the ERMP Part 2. Section 9, there were many statements about modelling without any reference to the models or assumptions used. Information or cross references were sought on the models used, assumptions made and relevant references over the life of the radioactive waste to support the conclusions presented in the Radioactive Waste Management Plan.

Submission: 48

Response:

Toro addresses these matters in the verification document which is Appendix D to this Response to Submissions. Appendix D of the ERMP as the Radiation Technical Report provides additional information.

Toro is committed to complying with WA legislation and the Code of Practice for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (ARPANSA 2005) (the Code). This Code requires a comprehensive Radiation Management Plan (RMP) and Radioactive Waste Management Plan (RWMP) to be developed for each stage of the Project and submitted to the relevant regulatory authorities for approval.

The RMP and RWMP in the ERMP Part 2 were intended to provide an indication of the detail of the key radiation management strategies and systems to be put in place, based on the discussion provided in the ERMP.

In line with legislative requirements, Toro would further develop the RMP and RWMP to ensure compliance with the requirements of WA legislation and the Code, and would submit both plans for assessment to the appropriate authority, prior to operations commencing, and for each stage of the Project as required by the Code.

Issue:

It was claimed that the Radioactive Waste Management Plan (ERMP Part 2. Section 9) ignored mine shut down and what happened to the long lived radioactive mine tailings that would be left and this was doubly concerning because Toro planned to bury tailings at the mine site while mining was ongoing. It was also claimed that Toro must undertake a long term risk assessment of mine closure prior to the Project being assessed.

Submission: 40
Response:

Toro would comply with all applicable legislation and regulations in relation to mine closure and would ensure that radiation levels in the areas of the operation are returned to those consistent with pre-mining levels.

Toro would place tailings into the mined out voids and cover progressively with inert rock and cover material. The traffic compaction of the tailings and the subsequent cover would provide an effective barrier and encapsulation of the tailings. The final design would be based on risk assessment for mine closure and would be subject to final approval by the appropriate regulator.

Toro has undertaken a risk assessment for mine closure and this is presented in the ERMP Part 2 pp. 16-27 to 16-29.

Issue:

It was claimed that the Radioactive Waste Management Plan, while noting that water in Lake Way was saline and unsuitable for human or stock consumption, did not address the other bio-activity of the Lake, such as its use by birds as a breeding ground after cyclones and evidence of other forms of life in the lake.

Submission: 40

Response:

Toro is committed to using best practice assessment tools. To assess the potential impact to biota from exposure to radiation, Toro utilised the ERICA tool, which is based on the recommendations of the International Commission on Radiological Protection (ICRP). The results were that potential impact would be negligible beyond the mine lease boundary. The assessment was based on dust deposition from the Project and the year of maximum production from each of the Centipede and Lake Way deposits.

Issue:

It was stated that the Radioactive Waste Management Plan (ERMP Part 2. Section 9) noted that groundwater was too saline for human or stock consumption but did not address the other bioactivity of the Lake, and that the fact humans and stock would not be drinking the water is an insufficient basis to claim that when radiation reaches the lake, the impact would be negligible.

Submission: 40

Response:

The assessment process undertaken by Toro to evaluate potential seepage also considered the potential impacts of radionuclides.

The assessment determined that the tailings have low permeability \((2 \times 10^{-8} \text{m/s})\), indicating very low seepage rates. Recent metallurgical test work has also shown that radionuclides predominantly remain within the solids fraction of the tailings, with about 0.3 per cent reporting to the liquor fraction. If there were to be seepage from the tailings, then it would likely be tailings liquor containing low levels of radionuclides.
In accordance with WA legislation and the Code of Practice for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (ARPANS 2005), Toro would develop a comprehensive Radiation Management Plan and Radioactive Waste Management Plan for each stage of the Project and submit them to the relevant regulatory authorities for approval.

**Issue:**

*More information was requested on assessed figures for occupational exposure to gamma radiation. (ERMP Part 2. p. 9-7)*

**Submission: 39**

**Response:**

The information presented on gamma dose rates is in the ERMP Part 1. pp. 6-25 to 6-30 and in Sections 4.3, 4.4 and 5.2 of Appendix D to the ERMP.

**Issue:**

*It was suggested that the mining activities would increase radionuclides in the soil by 3 per cent over 15 years, ‘a massive amount’ but the assessment had not considered the environmental impact of a spill of radionuclides into soil. (ERMP Part 2. p 9-8)*

**Submission: 39**

**Response:**

The ERMP Part 2 pp. 5-22 to 5-23 and 5-28 discusses spill management.

An increase in soil radionuclides (U series only) by 3 per cent would be expected to increase radiation dose rates in that area by less than 1 per cent above natural background levels. Such a change would not have any significant impact on human health or the environment.

**Issue:**

*It was claimed that the mining activities would be in breach of the legal requirement to contain all radioactive contaminants for a minimum of 1,000 years. (ERMP Part 2. P 9-8)*

**Submission: 39**

**Response:**

Toro is committed to complying with all applicable legislative and regulatory requirements. Toro is not aware of any legal requirement to contain all radioactive contaminants for a minimum of 1,000 years and is unable to find reference to this by the submission.

**Issue:**

*It was suggested that the title of the Radiation Management Plan be revised so it clearly notes that this is a conceptual plan. An indication was also requested about what would be addressed in a comprehensive Radiation Management Plan. (ERMP Part 2. Section 13) One submitter wanted to know when the Plan would be developed and suggested it needed to be provided for further public consultation.*
Submission 39; 48

Response:

Toro is committed to complying with WA legislation and the Code of Practice for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (ARPANSA 2005) (the Code). This Code requires a comprehensive Radiation Management Plan (RMP) and Radioactive Waste Management Plan (RWMP) to be developed for each stage of the Project and submitted to the relevant regulatory authorities for approval.

The RMP and RWMP in the ERMP Part 2 were intended to provide an indication of the detail of the key radiation management strategies and systems to be put in place, based on the discussion provided in the ERMP.

In line with legislative requirements, Toro would further develop the RMP and RWMP to ensure compliance with the requirements of WA legislation and the Code, and would submit both plans for assessment to the appropriate authority, prior to operations commencing, and for each stage of the Project as required by the Code.

Issue:

It was stated that as the Radiation Management Plan is further developed, it would need to be submitted to both the Radiological Council of Western Australia and the State Mining Engineer for approval, with the final Plan be reviewed at a frequency compliant with Part 16.7 of the Mine Safety and Inspection Regulations (WA).

Submission: 30

Response:

Toro is committed to meeting all legislative requirements as a minimum, and has undertaken consultation with the Radiological Council of Western Australia for the preliminary Radiation Management Plan.

Toro would continue to consult with the Radiological Council of Western Australia and the State Mining Engineer about the development of its Radiation Management Plan. The approved Radiation Management Plan (and the approved Radioactive Waste Management Plan) would be reviewed at a frequency determined by the appropriate regulatory authorities in accordance with the Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management (ARPANSA 2005) and any stipulations in WA legislation.

Issue:

It was stated that the lack of cross referencing (ERMP Part 2. Section 13) made the reader’s task difficult to assess how radiation doses had been determined and it was requested that where appropriate, cross referencing to Appendix D and other sections of the ERMP documentation be provided.

Submission: 48

Response:

Toro recognises this as an issue for the reader and has aimed to address this in the Response to Submissions.

Issue:

It was pointed out that while an average diluted ore grade of 300 parts per million had been used to estimate doses in the Radiation Management Plan (ERMP Part 2. Section 13) the average ore grade had been estimated at 600 parts per million raising the question of whether there was potential for workers in the pit zones to be
continuously exposed to an average ore grade of 600 parts per million for extended periods. Information was requested to demonstrate the implications of worker exposures to an average ore grade higher than 300 parts per million. It was also pointed out that the approach used in assessing the RDP assumed an ore grade of 600 parts per million, raising the need for consistency across the Plan.

Submission: 48

Response:

Toro’s approach is to use conservative figures when undertaking modelling predictions. Worker exposure would remain well below limits at both 600 parts per million and 300 parts per million.

Issue:

An indication was requested of what modelling (or otherwise) had been used to base the figures of an annual dust dose of 0.32 mSv/year for mine workers and 0.64 mSv/year for process plant workers. (ERMP Part 2. pp 13-6)

Submission: 48

Response:

This information is in the verification document which is Appendix D of the Response to Submissions.

Issue:

It was suggested that reducing the gamma dose by a factor of four required further justification, evaluation and referencing. (ERMP Part 2. p 13-7)

Submission: 48

Response:

This is a misinterpretation of the statement in the ERMP Part 1. p 6-26 that ‘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. Toro makes no assessment on the effect of shielding in heavy equipment, which would need to be measured in-situ when mining was occurring. The aim of the theoretical assessment is to indicate a maximum possible level, which is well below the statutory limit.

Issue:

Further information was requested to better understand the impact on driver radiation dose from the behaviour of drivers over the distance travelled and the variability of transport trucks used (e.g. distance from front of loader to driver). (ERMP Part 2. p 13-7)

Submission: 48

Response:

The predicted dose for uranium product drivers is below the Member of Public limit (1 mSv/y) and would be monitored at least initially to confirm the prediction. All radiation monitoring would be set out in the Radiation Management Plan and discussed with regulatory authorities prior to the commencement of operations.
The predicted radiation levels from containers of final product are based on actual measurements from similar final product containers from Olympic Dam.

The monitoring results show that on average, the gamma dose rate in the cab of a truck hauling final product is about 1 μSv/h. Other measurements show that the gamma dose rates are 5 μSv/h at one metre from the side of the container.

The dose received by a second driver sleeping in the cabin would be similar to that from the driver (being 1 μSv/h). This is because the distance between the container and the cabin is dictated by mechanical requirements and so the distance of the sleeper cabin would be the same as the driver location in non sleeper cabins.

Further details of dose assessments during the transport of final product are provided below. The three dose scenarios (presented in the ERMP Part 1. p 7-8) are based on three trucks transporting final uranium oxide product leaving site each month:

a) Member of the public at road edge (1 metre from truck as it passes)
   - situation simulates a truck with final product stopped at traffic lights and the same member of the public as a pedestrian at the traffic lights;
   - assume that the truck takes four minutes each time to pass the person standing at the edge of the road each time;
   - there would be three trucks per month by 12 months, giving 36 truck passing each year, giving a total exposure time of 144 minutes; and
   - the measured dose rate at 1 metre is 5 μSv/h, giving a total dose of 12 μSv/y

b) Member of the public travelling in a vehicle behind a uranium oxide consignment
   - situation simulates a car travelling behind a truck with a container of final uranium oxide product at a distance of 1 metre;
   - assume this occurs a number of times in a year (once per month for a year) and each time the same car is behind the vehicle for one hour; and
   - the measured dose rate at 1 metre is 5 μSv/h giving a total dose of 60 μSv/y.

c) Final product truck drivers
   - final product is trucked between the site and Port Adelaide;
   - the trip is approximately 36 hours and the expected dose rate in the truck cabin is 1 μSv/h (BHP Billiton 2009); and
   - If a driver was to undertake 12 trips in a year (one trip each month) then the calculated maximum dose is 1 μSv/h x 36h/trip x 12 trips/year, giving 0.43 mSv/y.

**Issue:**

*Toro was asked to state whether the source of the 0.022mSv/year excess exposure for Wiluna residents (ERMP Part 2 – p 13-8) was gamma, alpha or RDP.*

**Submission:** 7

**Response:**

The dose comprises 0.02mSv/yr from RDPs and 0.002mSv/yr from inhalation of dust.
**Issue:**

*It was stated that no dose constraint had been defined in the Objectives, Targets and Indicators for the Radiation Management Plan. (ERMP Part 2. p 13-9) Toro was asked to establish appropriate dose constraints and include a demonstration of their application in the process of Project optimisation.*

**Submission: 48**

**Response:**

Toro is committed to meeting internationally accepted dose limits. In some areas, Toro aims to go beyond legislative requirements and in this instance has elected to set an internal management goal of maintaining all worker and public doses less than 50 per cent of the internationally accepted limit.

The responsibility for establishing dose constraints sits with the regulator, and Toro would be guided by dose constraints as they apply.

**Issue:**

*Reference was made to Toro’s commitment to base design criteria on the As Low as Reasonably Achievable principle in relation to radiation protection and it was questioned why Toro had not provided any detailed design information in the ERMP to allow the public to fully consider what was proposed. (ERMP Part 2. p 13-10)*

**Submission: 39**

**Response:**

A detailed design of proposed pit and processing facilities has not been developed, as outlined in ERMP Part 1. p 6-33. However, Toro would establish radiation design criteria and conduct a specific radiation optimisation study during detailed design. The outcomes of this would be included in the Radiation Management Plan and the Radioactive Waste Management Plan.

**Issue:**

*It was claimed that because the Nganganawili Community (ERMP Part 2. p 13-16) was only 5.2 km from the closest mining activities, no uranium mining should be allowed so close to a community and Toro was ignoring the existence of infants, children and pregnant mothers so close to its operations.*

**Submission: 39**

**Response:**

Toro would be conducting safe mining practices and has considered the health risks to the public.

As discussed in the ERMP Part 1, p 6-31, radiation exposure levels to the community would be negligible. The predicted total dose level at the Nganganawili community is 0.034 mSv/yr, or 1/29th of the accepted public dose limit of 1 mSv/yr.

**Issue:**

*Further justification was requested on the Action Levels specified in Table 5 (ERMP Part 2. p 13-18) including a dose estimation based on the assumption that routine monitoring results were constantly at action levels.*
Submission: 48

Response:

Action levels would be detailed in the approved Radiation Management Plan and are set for internal management purposes only.

Issue:

It was suggested that equations and factors used in calculations were lacking throughout Appendix D. An example given was P. 58 in relation to information to demonstrate an understanding of the conversion from 1 mg/cubic metre to an activity concentration of 3.7 mBq/cubic metre and then to 18.6 alpha dps/cubic metre. It was requested that where appropriate, equations and factors should be supplied.

Submission: 48

Response:

The verification document, which is Appendix D of the Response to Submissions provides clarification for equations and factors supplied.

Issue:

Clarification and further information about the Radiation Technical Report (Appendix D) was sought:

- Table 2.7.2 (p.29 – radionuclides in groundwater) reports an average U-238 level (7.81 Bq/L) for the 1981 data which is outside the reported range (0.35 – 1.36 Bq/L);
- Is there any more recent data available than that reported in Figure 7 and Table 13;
- How does the average hourly radon concentration for November reported in Figure 8 compare with other months and how do the results compare seasonally;
- What was the proximity to the Project Area of the samples obtained during the opportunistic fauna sampling reported on p. 37;
- Could the variations between 1981 and 2010 in the sampling results reported in Table 18 be due to the variation in proximity to site; and
- Table 21 indicates that the annual average Total Suspended Particulars reduces between Year 4 and Year 8 but that of the construction camp increases – is this correct?

Submission: 30, 36

Response:

- This is a typographical error. The correct value for the Average U-238 is 0.78 Bq/L.
- More recent information is in Appendix D of the ERMP.
- The intent of this figure is to demonstrate diurnal variation. Other months would show a similar diurnal variation.
- Opportunistic sampling refers to the collection of sample(s) for analysis as a consequence of another unrelated activity or by taking advantage of a particular situation. The native monitor which was killed by a vehicle near the Centipede deposit, in close proximity to the trial mining area, provided an excellent opportunity to increase the understanding of the pre-existing radiological parameters in the region and it was sent for radionuclide analysis. Other fauna radionuclide results provided in this section of the ERMP.
came from sampling conducted for the 1981 Lake Way EIS and were reported to have been animals taken from the mineralised area of the Lake Way site.

- The fauna sampled in 2010 and 1981 were different species. This information has been provided as an indication of radionuclide levels in fauna. Even within species, there would be a significant variation in the level of radionuclides measured.
- The predicted particulate concentrations show that the annual average TSP levels increase at some key receptor sites by year 8 and decrease at others. During earlier years the Centipede deposit would be mined and in later years the Lake Way deposit would be mined with the ore trucked to Centipede. The modelled concentrations vary depending on proximity to the dust sources.

**Issue:**

*Information was requested on the flying height of the aerial radiometric survey (Appendix D Section 2.3.2) including line spacing, tie line spacing, detector volume, flying height, plane speed and whether the gamma dose rates quoted include the cosmic gamma rays component.*

**Submission: 48**

**Response:**

Details of the survey are in the table below:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>40 metres</td>
</tr>
<tr>
<td>Line spacing</td>
<td>100 metres</td>
</tr>
<tr>
<td>Tie line spacing</td>
<td>1000 metres</td>
</tr>
<tr>
<td>Detector volume</td>
<td>32 litres</td>
</tr>
<tr>
<td>Aircraft speed</td>
<td>142 kilometres</td>
</tr>
</tbody>
</table>

*Table 9: AERIAL RADIOMETRIC SURVEY RESULTS*

The raw data from the aerial survey does not include gamma from cosmic radiation.

**Issue:**

*A discussion was requested to demonstrate an understanding and application of the ‘representative person’ and how it compares to the critical group approach in the assessment. (Appendix D Section 2.4)*

**Submission: 48**

**Response:**

‘Representative person’ has been defined by the International Commission on Radiological Protection (ICRP) and is outlined in ICRP 103.

It is defined as: ‘an individual receiving a dose that is representative of the more highly exposed individuals in the population (see Publication 101, ICRP 2006 a). The term is the equivalent of, and replaces, ‘average member of the critical group’ described in previous ICRP recommendations.’

Accordingly, there is no practical difference between the two terms.
Issue:

The location was requested of the TEOM-PM10 measurements conducted in 2007/8. (Appendix D Section 2.4.3)

Submission: 48

Response:

The TEOM monitoring was undertaken by Nova Energy in 2007 and 2008 as follows:

- Easting GDA 94 (m) – 223,800; and
- Northing GDA 94 (m) – 7,046,110.

Issue:

It was suggested that Figure 10 (Appendix D Section 2.6.1) should be used to calculate an equilibrium factor for the region and results shown in the main document to underpin that using 0.2 as an equilibrium factor is conservative. It was also suggested that variations of the equilibrium factor should be estimated with the time of day.

Submission: 48

Response:

The additional studies on equilibrium factor variation suggested by the submitter fall outside the scope of the ERMP. However, additional information on the equilibrium factor is provided in Appendix D of the Response to Submissions.

Figure 10 is included in Appendix D of the ERMP, and at the time it was considered unnecessary to include it in the main document.

Issue:

It was suggested that it was important to give the results of the individual samples (Appendix D Section 2.8.3) in addition to ranges and averages as individual sample data would be a lot more useful when comparing post rehabilitation measurements with the pre-mining data.

Submission: 48

Response:

Many individual results are included in the appendices to the ERMP. For example, the individual soil results are contained in Appendix E of the ERMP (Section 3.3.7). Further information is also now included in Appendix D of the Response to Submissions, including:

- Radioactivity concentrations in soil;
- Radioactivity concentrations in vegetation; and
- Elemental concentrations.

Issue:

Further information was requested on the analytical techniques used to determine the given radionuclide activity concentrations in flora and fauna. (Appendix D Section 2.9)
Submission: 48

Response:

Toro used the following techniques to determine radionuclide activity concentrations in flora and fauna:

<table>
<thead>
<tr>
<th>Soil</th>
<th>Each sample was dried and milled to a uniform particle size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetation/Fauna</td>
<td>Each sample was washed to remove any dust and dried at 100° C. The dried sample was then processed by cutting in an industrial cutter and blending to produce fine powder. A portion of each powdered sample was contained in a standard counting geometry for measurement</td>
</tr>
<tr>
<td>Measurement of radionuclides</td>
<td>Gamma ray emitting radionuclides were analysed by high resolution ray spectrometry; alpha spectrometry was used for Po-210 and Th-230; ICPMS for arsenic, cadmium, chromium, molybdenum, selenium, tin, thorium, uranium and vanadium</td>
</tr>
</tbody>
</table>

Table 10: RADIONUCLIDE ACTIVITY CONCENTRATIONS IN FLORA AND FAUNA

Issue:

An explanation was sought of why an equilibrium factor of 0.5 was applied for miners’ dose assessment (Appendix D Section 3.2.3) but 0.2 was applied for assessment of RDP at the receptor locations, as radon at the receptor locations should be ‘older’ this the equilibrium factor larger than at the mine.

Submission: 48

Response:

An equilibrium factor of 0.5 was used for workers and the public. A typographical error resulted in 0.2 being in the ERM text instead of 0.5. The calculated doses are based on the correct equilibrium factor of 0.5 which is a conservative assumption.

Issue:

The complete equation was requested to calculate worker exposure from RDP from an assumed radon concentration of 60 Bq/cubic metres and 2 000 working hours per year.

Submission: 48

Response:

This information is provided in Appendix D of the Response to Submissions.

Issue:

Further assessment was sought on potential dose pathways resulting from the use or consumption of contaminated lichens and bryophytes. (Appendix I of Appendix D, Section 5.1.1)

Submission: 48
Response:

Lichens and bryophytes are in fact extremely resistant to radiation. The pathway for Cs-137 via lichens and reindeer is well understood but is specific to particular northern hemisphere lichens. No lichens are known to be consumed as bush tucker in the Wiluna region.

Issue:

Justification was sought for the assumption that kangaroos would only spend a fraction of their time in the affected areas. (Appendix I of Appendix D, Section 5.1.4)

Submission: 48

Response:

Toro has assessed this using the ERICA assessment method.

The assessment concluded that at the 10 g/square metre/month contour (immediately adjacent to the operational mining area) ‘large herbivores’ (for example kangaroos) would have dose rates approximately one fifth of the screening level. This indicates that should kangaroos spend virtually all of their time at the operational boundary they would still be assessed as ‘negligible risk.’

Issue

Evidence was requested to support the claim that doses to members of the public above the pre-mining natural background levels are expected to be negligible following closure and rehabilitation. (Appendix D Section 5.5)

Submission: 48

Response:

Toro is committed to returning the mining and processing area to pre-mine land use conditions following closure.

When the mine closes, mining would cease and the area rehabilitated with plant and equipment being properly disposed of. There would be no exposed ore and tailings would be covered to a planned depth of 2 metres with non-mineralised material. Consequently, potential exposures following closure would be limited and described as follows:

<table>
<thead>
<tr>
<th>Source of Radiation</th>
<th>Potential For Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gamma</td>
<td>no source of exposure as tailings would be covered and no ore would be exposed</td>
</tr>
<tr>
<td>Radionuclides in dust</td>
<td>no source of ore or tailings dust as tailings would be covered and no ore exposed</td>
</tr>
<tr>
<td>Radon decay products</td>
<td>see discussion below</td>
</tr>
<tr>
<td>Ingestion of radionuclides in flora and fauna from the region</td>
<td>no source of uptake by flora and fauna</td>
</tr>
<tr>
<td>Ingestion of groundwater which may contain radionuclides</td>
<td>groundwater is not potable, therefore there is no exposure pathway</td>
</tr>
<tr>
<td>Ingestion of surfaced water containing dust from mine area</td>
<td>the assessment in the ERMP shows that this is a minimal exposure pathway</td>
</tr>
</tbody>
</table>

Table 11: POTENTIAL EXPOSURES FOLLOWING CLOSURE
Data in Table 11 of Appendix D of the ERMP shows that the radon emissions vary from 0.3 Bq/square metre atop or close to the mineralised areas to 0.14 Bq/square metre in the region around the mineralised area to 0.04 Bq/square metre in the wider region.

In relation to the tailings cover of inert rock of 2 metres, the ‘half value thickness layer’ (or that depth of material which would reduce the amount of radon being released by 50 per cent) for soil is 0.5 metres, compacted soil is 0.3 metres and clay is 0.12 metres. Therefore, assuming that the cover is ‘compacted moist soils’ (since it would need to be load bearing in order for trucks and loaders to be able to place cover) then a 2 metre cover would reduce the radon flux by a factor of about one sixty-fourth (or to 1.5 per cent of the pre cover flux levels). For uncompacted soil, the 2 metre cover would reduce levels by about one-sixteenth (or to 6.3 per cent of the pre cover levels).

The air quality modelling was based on the assumption that tailings would emit radon at a rate of 3.6 Bq/square metre. When the reduction factors are applied for the cover, the calculated emission rates are 0.06 Bq/square metre (for a compacted moist soil cover) or 0.23 Bq/square metre (for a soil cover).

In both cases, these levels are consistent with the pre-mining fluxes presented in Table 11 of Appendix D of the ERMP.

**Issue:**

A reference was requested for ‘WA Uranium Mining Guidelines’. (Appendix D Section 7.5)

**Submission: 48**

**Response:**


**Issue:**

Toro was asked to specify which version of the ERICA tool was used to undertake the assessment of radiation exposures to non-human biota in Appendix D.

**Submission: 48**

**Response:**

The September 10 2009 update was used.

**Issue:**

Further information and justification were requested on how the RDP concentration/radon equilibrium factor was determined (Appendix D).

**Submission: 48**

**Response:**

The equilibrium factor relationship is:
1 Bq/m³ of Radon = $5.56 \times 10^{-6}$ mJ/cubic metre of RDP when the equilibrium factor is 1 (UNSCEAR 2000, Appendix B, para 122).
5.5 Air Quality

Issue:

A justification was sought for the assumption in Table 67 (ERMP Part 1. p. 6-5) that there would be a 0 per cent radon retention in dust, tailings and product.

Submission: 48

Response:

Table 67 provides an indication of the relative ratio of long lived alpha emitting radionuclides in the various dusts. The shorter-lived radionuclides have been omitted from this table as their contribution to effective dose, via inhalation, is low compared to the longer-lived radionuclides.

From a radiological dose assessment perspective, the inclusion of radon makes little impact on the assessed dose. However, for assessing the broader radiological impacts of radon and its decay products via air dispersion, it is conservative to assume that all radon that enters the process is emitted. In practice, this would not be the case, as some of the radon would be retained within the dust particles. However, by assuming that all radon is emitted, a maximum theoretical radon emission rate can be determined and used as a source term in the air quality modelling.

Issue:

It was pointed out that all emissions from the Project should be controlled so as to ensure that members of the public are not exposed to more than 0.5mSv per year from all potential pathways (as stated in Toro’s commitments) and confirmation was sought that dose constraints recommended by the ICRP would be set. (ERMP Part 1. p.6-3)

Submission: 48

Response:

Toro would comply with all international and national regulatory requirements including guidelines set by the ICRP.

Toro has also committed to an internal management goal that goes beyond legislative requirements to maintain public exposure doses at less than 50per cent of the internationally accepted limit (0.5 mSv/yr).

Issue:

It was suggested that radon gas was not a key pollutant of concern as radon decay products were the pollutants which could deliver a dose upon inhalation. (ERMP Part 1. p. 6-3)

Submission: 48

Response:

The comment is noted by Toro. This is stated correctly in the ERMP Part 1. p. 6-17.

Issue:

It was suggested that in addition to water and the Dust Management Plan, additional measures such as surface binding agents and tarpaulins would be required to control dust.
Response: Toro’s Dust Management Plan (ERMP Part 2) commits to reduce the impacts from dust to the workers and community by implementing defined measures. However, these would be the minimum management practice, and Toro would continue to explore opportunities to minimise risks, including surface binding agents.

Issue: It was claimed that Toro had ignored the issue of very fine particulates less than 2.5 microns in diameter, or PM 2.5 and that this was a category of particulates closely related to health risks and should be explicitly addressed. (ERMP Part 1 p. 4-2)

Response: Dust estimates are presented in terms of ‘total suspended particulates’ (ERMP Part 1. Sections 4.3 and 6.1) which includes the PM 2.5 fraction.

Issue: It was claimed that the dust sampling was inaccurate and that Toro must be required to control dust and protect the community and environment from radiological impact based on up to date, accurate and verified baseline data.

Response: Dust sampling was undertaken to characterise the background airborne dust concentrations and to provide information for the air quality modelling.

During 2010, sampling was undertaken using active air sampling (high volume and medium volume air samplers) and passive dust deposition sampling. In addition, earlier natural dust concentration information from 2007, using a tapered element oscillating microbalance (TEOM), was provided in the ERMP (Part 1. Section 4.3). As noted in the ERMP (Part 1 section 4.3), the main factors that influence air quality in the Project Area are bush fires and dust storms. This produces a highly variable natural background.

As well as measuring dust concentrations in air, samples from both the passive and active samplers are analysed for radionuclides and heavy metals, in order to assist in characterising the origins of dust in air.

Data continues to be collected from the monitoring stations, adding to the existing data set.

To determine the potential impact of the operations, air quality modelling was undertaken and this has shown that the impact of the operation on airborne dust concentrations would be low. See ERMP Part 1 section 6.1.2 and Appendix B of the ERMP.

Toro’s network of dust deposition gauges and active air samplers would be used to identify any potential impacts from the operations.
**Issue:**

Toro was asked to supply data from high volume air sampling (HVAS) undertaken during 2010.

**Submission: 32**

**Response:**

A full HVAS database for 2010 was not available due to technical difficulties resulting in intermittent and unreliable monitoring. However, low volume air sampling and passive dust deposition monitoring continues, and HVAS recommenced in early 2011. Samples continue to be provided for gravimetric and radiometric analysis.

Toro would continue to undertake dust monitoring to demonstrate current conditions and potential operational impacts.

**Issue**

Concern was expressed that radioactive materials would be released as a result of wind erosion and it was stated that mere management of such contaminants is insufficient. (ERMP Part 2 p. 2.5)

**Submission: 39**

**Response:**

Radiation exposures to members of the public would not exceed one-twentieth of the internationally acceptable limit of 1 mSv/year (ERMP Part 1 pp. 6-30 to 6-32). This dose is derived irrespective of the exposure pathway, and includes the potential pathway via wind erosion.

**Issue:**

It was claimed that the ERMP (ERMP Part 2 p. 2-7) falsely asserts that the Project is remote from people and residential, tourism and commercial activity and ‘sensitive areas’ and that this is an insult to the Nganganawili community.

**Submission: 39**

**Response:**

The Nganganawili community is recognised as a ‘sensitive receiver’ for the purposes of dust monitoring. (ERMP Part 2 p. 2-7) The term ‘sensitive receiver’ is taken from the Draft State Environmental (Ambient Air) Policy 2009 (WA EPA) which sets the requirements under which the Dust Management Strategy in the ERMP was developed.

**Issue:**

It is suggested that the reference in Table 2 (ERMP Part 2 p. 2-7) to ‘dust generating activities at year 8’ is insufficient and that measures of dust generating activities throughout the life of the Project should be provided.

**Submission 39**
Response:

Dust generating activities for the life of the Project are the same as in Year 8. The data for Year 8 was modelled because this represents the worst case. No adverse impacts to sensitive receivers are identified as a result of the Project development.

Issue:

It was questioned why there was no requirement for the accommodation village to meet dust performance criteria. (ERMP Part 2. p. 2-7).

Submission: 39

Response:

There are no specific criteria set for the accommodation village because the location of the accommodation village is still to be determined through detailed engineering design and cultural heritage surveys by the Traditional Owners.

Toro is committed to implementing the Dust Management Strategy (ERMP Part 2. pp. 2-1 to 2-14) and developing a Health and Safety Management Plan for the operations which includes managing occupational exposure to dust for workers in mining accommodation.

Issue:

The use of ‘sensitive receivers’ was questioned. It was stated this would not prevent animals or plants still being badly affected. (ERMP Part 2. p. 2-7)

Submission: 39

Response:

The term ‘sensitive receiver’ is taken from the Draft State Environmental (Ambient Air) Policy 2009 (WA EPA) which sets the requirements under which information provided in the ERMP was developed.

Issue:

It was suggested that the dust monitoring plan should be reviewed quarterly, rather than annually to ensure continuous improvement. (ERMP Part 2. p. 2-13)

Submission: 39

Response:

Strong seasonal variations in dust monitoring results are expected based on baseline data, such that annual review of dust monitoring results provides the most relevant information for dust management on site. Toro is committed to annual review of its dust monitoring plan to ensure continuous improvement.

Issue:

It was suggested that there was a lack of information about how the dust monitoring plan would be audited. (ERMP Part 2. p 2-13)

Submission: 39
Response:

Environmental audits would be conducted by internal and external auditors (ERMP Part 1. p. 8-10) in accordance with the requirements of ISO 14001. Auditing of the dust monitoring plan would be undertaken as part of this process.

Toro would also implement an internal (or self) audit process annually at a minimum. All internal environmental compliance audits would be undertaken by competent auditors, who would be registered members of RABQSA International or a similarly accepted professional certification body.
5.6 Fauna

5.6.1 Subterranean Fauna

Issue:

Further information was sought on baseline survey work to assess impacts on terrestrial invertebrates and subterranean fauna:

- Detailed habitat mapping to show that habitats supporting subterranean or potential SRE species are widespread outside the direct and indirect impact areas; and
- Quantification of the removal of habitat in the direct impact area.

Submission: 33

Response:

Recent taxonomic work has identified that three of the five putative SRE species identified within the original SRE invertebrate survey work (Outback Ecology 2011) are no longer classified as potential SRE species.

Further, of the other two SRE species identified, neither is restricted to the Project impact footprints. These SRE species are:

- the mygalomorph spider Aname ‘MYG176’, which has only been collected outside of impact footprints; and
- the scorpion Urodacus ‘yeelirrie’, known to occur at Yeelirrie, 70 km south west of Lake Way.

Habitat maps for terrestrial fauna are provided in Appendix C of the ERMP. No habitats known to support SRE fauna are limited only to the Project Area.

The extent of subterranean fauna habitat is best described using the results of Toro’s drilling programme. Baseline subterranean fauna studies confirm that both stygofauna and troglofauna occur (as expected) in calcrete strata (or calcareous, non-cohesive sediments), but generally not in clayey sediments. The calcrete layers within which subterranean fauna occur near the Lake Way playa are present as an extensive, but discontinuous, band running along the western and northern edges of the playa and extending for a limited distance beneath the playa, as shown in the three sections in Figures 7 and 8. This distribution reflects the genesis of the calcretes as a depositional product formed in a deltaic setting.

The direct removal of habitat was quantified in technical reports provided in Appendix C, Appendix E and Appendix F of the ERMP. The volume of calcrete removed as a result of Project implementation would be a very minor proportion of the calcrete habitat available in the Lake Way playa area.
Figure 7: LOCATION OF SUBTERRANEAN FAUNA HABITAT CROSS SECTIONS AT CENTIPede
Figure 8: SUBTERRANEAN FAUNA HABITAT SECTIONS 2
Issue:

Further information was requested in relation to the sampling of stygofauna and compliance with the WA EPA Guidance. It was suggested that vast areas of several of the calcretes (particularly Uramurdah and Lake Violet) were under-sampled. It was also suggested that sampling had mostly taken advantage of pre-existing bores rather than undertaking a strategic drilling and sampling campaign which would have provided hydrological/geological information and opportunity for investigations throughout the extent of potential habitat in the calcretes (ERMP Appendix F, p31-34). Another submitter suggested that more research needed to be done to understand the impacts of uranium mining on stygofauna habitats, their adaptability and survival and that the information in the ERMP was deficient and an unacceptable basis for any Project approval.

Submission: 34, 47

Response:

WA EPA Guidance Note 54 would not require any of the calcrete Priority Ecological Communities (PEC) in the Project Area to be comprehensively sampled, as much of the area within the PECs lies well outside the Project’s footprint. The guidance statement makes the following recommendations in relation to sampling:

Proponents should ‘provide an explicit statement, based on the best information available, about the distribution of stygofauna found in the zone of influence of the proposal, their occurrence outside that zone and the likely effect of the development on species population….the principal objective of sampling is to demonstrate to the satisfaction of the WA EPA and other regulatory authorities that no species is restricted to the impact zone.’

As described in Appendix F of the ERMP, Toro has implemented, and would continue to implement its environmental impact assessment and management programmes in accordance with WA EPA guidelines and the requirements of the Environmental Scoping Document. The results of this work provide a robust basis for evaluating and managing environmental risks associated with Toro’s proposed activities.

Issue:

Quantified data was requested to support the statement that impacts on stygofauna would be ‘moderate’ as a consequence of groundwater abstraction. (ERMP Part 2, p. 5-26)

Toro was also requested, in consultation with the Office of the WA EPA and the WA DEC to assess the potential impacts of the Project on the following Priority 1 ecological communities and then identify strategies to avoid or minimise impacts on them:

- Lake Violet South and Lake Violet calcrite groundwater assemblage types on Carey palaeodrainage of Millbillillie Station;
- Uramurdah Lake calcrite groundwater assemblage type on Carey palaeodrainage on Millbillillie Station;
- Hinkler Well calcrite groundwater assemblage type on Carey palaeodrainage on Lake Way Station; and
- Millbillillie Bubble Well groundwater calcrite assemblage type on Carey palaeodrainage on Millbillillie Station.

Submission: 44
Response:

Toro’s baseline studies to date have shown that the impact of Project implementation on subterranean fauna would be very modest (Appendix F). The potential impact on PECs is shown in Table 12 and Figures 9, 10, 11 and 12. The impact is calculated using data from Appendix G of the ERMP and information sourced from the WA DEC.

Between two and eight per cent of PECs would be disturbed, assuming that water barriers were in place at both Centipede and Lake Way, but that they were ineffective. This is the most conservative (that is, maximum) impact scenario. Under a more realistic scenario (with groundwater barriers installed and effective) less than five per cent of any PEC would lie within the Project’s potential impact footprint.

Project implementation would not affect either the Millbillillie Bubble Well PEC or the Hinkler Well PEC. The Depot Springs PEC also lies entirely outside the Project’s potential area of influence.

<table>
<thead>
<tr>
<th>Potential PEC area affected (per cent)</th>
<th>Lake Violet PEC</th>
<th>Wiluna PEC</th>
<th>Uramurdah PEC</th>
<th>Hinkler Well PEC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min</td>
<td>Max</td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>Centipede direct disturbance</td>
<td>0.001</td>
<td>0.001</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Centipede within 0.5 m drawdown*</td>
<td>0</td>
<td>0.37</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Lake Way direct disturbance</td>
<td>0.64</td>
<td>0.65</td>
<td>0.64</td>
<td>1.36</td>
</tr>
<tr>
<td>Lake Way within 0.5 m drawdown*</td>
<td>0</td>
<td>2.00</td>
<td>0</td>
<td>4.76</td>
</tr>
<tr>
<td>West Creek direct disturbance</td>
<td>0.02</td>
<td>0.02</td>
<td>0.001</td>
<td>0.002</td>
</tr>
<tr>
<td>West Creek within 1 m drawdown</td>
<td>3.32</td>
<td>3.32</td>
<td>0.70</td>
<td>1.49</td>
</tr>
<tr>
<td>Not impacted</td>
<td>96.01</td>
<td>93.64</td>
<td>98.67</td>
<td>92.39</td>
</tr>
</tbody>
</table>

*Drawdown areas are presented separately only where they do not coincide with direct disturbance

Table 12: ESTIMATED PROPORTION OF SUBTERRANEAN PECs POTENTIALLY IMPACTED BY PROJECT IMPLEMENTATION

(including direct and indirect impacts)
Figure 9: LAKE VIOLET PEC HABITATS

- Lake Violet PEC: possible loss of habitat (worst case)

- Centipede direct disturbance
- Centipede within 0.5 m drawdown
- Lake Way direct disturbance
- Lake Way within 0.5 m drawdown
- West Creek direct disturbance
- West Creek within 1 m drawdown
- Not impacted

Figure 10: WILUNA PEC HABITATS

- Wiluna PEC: possible loss of habitat (worst case)

- Centipede direct disturbance
- Centipede within 0.5 m drawdown
- Lake Way direct disturbance
- Lake Way within 0.5 m drawdown
- West Creek direct disturbance
- West Creek within 1 m drawdown
- Not impacted
Figure 11: URAMURDAH PEC HABITATS

Uramurdah PEC: possible loss of habitat (worst case)

- Centipede direct disturbance
- Centipede within 0.5 m drawdown
- Lake Way direct disturbance
- Lake Way within 0.5 m drawdown
- West Creek direct disturbance
- West Creek within 1 m drawdown
- Not impacted

Figure 12: HINKLER WELL PEC HABITATS

Hinkler Well PEC: possible loss of habitat (worst case)

- Centipede direct disturbance
- Centipede within 0.5 m drawdown
- Lake Way direct disturbance
- Lake Way within 0.5 m drawdown
- West Creek direct disturbance
- West Creek within 1 m drawdown
- Not impacted
Issue:

Toro was requested to reassess impacts of the Project on stygofauna once there is clarity with respect to groundwater drawdown and the potential for change in the haloclines/chemoclines affecting stygofauna within the groundwater. This reassessment to include:

- further stygofauna sampling within West Creek borefield area and potentially also the Lake Way area if the revised groundwater modelling shows that drawdown is likely to extend into the majority of bores currently considered to be the ‘reference bores’;
- undertaking a risk assessment based on habitat extent where stygofauna species have only been recorded from within the proposed drawdown extent, taking into consideration the role haloclines/chemoclines might have with respect to the provision of suitable fauna habitat (i.e., depth of saturated calcrete remaining is not adequate for the purpose of habitat assessment in this case, given that hypersaline groundwater is unlikely to provide suitable habitat for the diversity of stygofauna within the calcrete assemblage); and
- developing and implementing a stygofauna monitoring and management program in consultation with and to the requirements of the Office of the WA EPA, the WA DEC and the WA Museum to ensure that it meets its objective of not affecting the abundance and diversity of subterranean fauna at the regional scale. The program needs to include acceptable limits of change and triggers for specified management actions.

Submission: 44

Response:

Toro has conducted further subterranean fauna survey work and risk assessments in relation to the Project impacts on the stygofauna species and the results are included in Appendix E. The further studies undertaken over summer 2011/12 confirm the original species diversity and broad habitat occupation, and included both project specific, regional studies and a further review of all published data for the region.

Toro’s stygofauna monitoring and management plan for the Project would include the formulation and establishment of a monitoring and management programme to ensure that Project impacts remain within acceptable limits.

Water quality depth profiling to date across each of the Hinkler, Lake Violet and Uramurdah calcretes suggests that during Project implementation:

- sufficient habitat would remain saturated within the fresh groundwater zone within the West Creek borefield area to support subterranean fauna; and
- close to and within the proposed Centipede mining area, little to no fresh groundwater was recorded. No species found to be confined to that area only were collected from fresh groundwater.

Toro’s proposed water abstraction strategy in the West Creek area has been specifically devised to limit risk of impacts on water dependent biota. That is, Toro proposes to limit its draw on the borefield to no more than the abstraction rate that previously applied during historic use of the borefield. This is analogous to limiting the Project’s impact footprint to a previously disturbed area in a conventional terrestrial habitat.

Issue:

Prior to approval of the Project, it was requested that an assessment be conducted in relation to the potential impact on the surrounding environment from backfilling into the pit with tailings, with particular reference to both direct and indirect impacts on stygofauna habitat.
 Submission: 44  

Response:  

The potential impacts of in-pit disposal of tailings are described in ERMP Part 1, Section 6.7.4.1 and Appendix G. Toro has conducted further contaminant leachability studies and fate of contaminant modelling which demonstrates that radionuclides migration from the tailing facility will be very low, and groundwater quality adjacent to the mine voids will remain constant.  

Issue:  

Further information was requested to demonstrate that stygofauna so far not recorded outside the Project area would be found elsewhere. It was stated in particular that while the ERMP shows that there are at least two new species of Brine Shrimp (Parartemia) and a unique genus of Ostracod endemic to the Lake Way system, the ERMP does not demonstrate that they would be protected outside the sphere of impact.  

Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13, 14, 15, 19, 21, 23, 31, 34, 48  

Response:  

Further survey during summer 2011/2012 has demonstrated that stygofauna detected to date only within the impact areas also occur outside those areas, or significant similar habitats exist around the margin of Lake Way that may also host stygofauna.  

The Parartemia and Ostracods found during Toro’s baseline studies are endemic to Western Australia, not to Lake Way (Appendix F of the ERMP). These taxa can be found along other lakes in the Carey Palaeodrainage.  

Toro cannot demonstrate the protection of species outside the Project sphere of impact where it has no authority or responsibility to do so. This is the role of government.  

Issue:  

Further assessment was requested of potential impacts to hyporheic or subterranean fauna associated with changes in groundwater quality adjacent to infilled mine voids (especially tailings deposition). (ERMP Part 1. pp. 6-77 to 6-82)  

Submission: 48  

Response:  

Appendix G of the ERMP outlines the predicted movement of soluble constituents of tailings into the groundwater environment. Modelling predicted that dissolved uranium released into the shallow groundwater system at Centipede would be unlikely to persist at 0.001 mg/L (typical detectable concentration) for distances of more than 25m from the edge of the pit void, even 1,000 years after mine closure. Any contamination by uranium would remain within the disturbance footprint of the mine, and no discernible changes to groundwater quality adjacent to the defined Project footprint are predicted.  

Toro is continuing to develop its understanding of the potential environmental impacts of tailings constituents. A second stage of ecotoxicity investigations involving whole of effluent testing is being undertaken and would be reported to the WA EPA on completion.  

Issue:  

TORO ENERGY LIMITED
Clarification was requested in relation to sampling methods, interpretation and conclusions from Toro’s investigations of stygofauna. It was stated that while Toro claimed to have sampled up to 96 per cent of the species at the Centipede deposit and up to 87 per cent at the Lake Way deposit, these numbers could be read in the alternative as: sampling as little as 83 per cent of subterranean fauna at Centipede and 43 per cent at Lake Way. It was further suggested that a similar lack of certainty applied to sampling at the West Creek borefield where it was possible that as little as 45 per cent of the species had been sampled.

It was also stated that Toro should be required to demonstrate its opinion that habitat for stygofauna only recorded so far in the Centipede and Lake Way deposits probably existed elsewhere.

**Submission: 40**

**Response:**

Prior to the studies initiated by Toro, the number of stygofauna species recorded from longer term collection by the WA Museum was as follows:

- Lake Way associated calcretes - 27 spp
- Hinkler Well calcrete - 10 spp
- Lake Violet calcrete - 9 spp
- Uramurdah calcrete – 17 spp (Humphreys et al. (2009)).

The species diversity estimates given in Appendix F of the ERMP are reasonable and realistic estimations based on sound statistical analysis.

The species estimators that returned exceptionally high species diversities were disregarded as reliable statistical hypotheses because they were inconsistent with published records of subterranean fauna occurrence in the Yilgarn. To Toro’s knowledge, there are no published records demonstrating such high species diversities for calcretes in the Yilgarn.

Subterranean fauna studies conducted both as part of Toro’s baseline studies and further more recent studies have substantially increased the state of knowledge of species diversity in the Project Area.

The *Parartemia* and ostracods found during these studies are endemic to Western Australia, not just to Lake Way. These taxa can be found along other lakes in the Carey Palaeodrainage. Further, Toro’s drilling records in areas outside the Project Area show that the strata in which the three species of subterranean fauna were found within the proposed Centipede pit shell also occur outside the proposed mine footprint.

Toro would conduct further survey work to verify the existence of similar stygofauna habitat close to but outside the mining impact zone.

**Issue:**

In referring to a review by the WA EPA’s policy position on stygofauna, it was suggested this was one reason to reject Toro’s current application and to require Toro to conduct full and complete studies of the ecosystem to inform any future and more comprehensive Project application.

**Submission: 34, 42**

**Response:**

Toro has designed and implemented baseline subterranean fauna studies and impact assessments to align with current WA EPA guidance statements.
The baseline study reports outlined in Appendix F of the ERMP were independently reviewed in March 2011. The reviewer noted that additional surveys would be required, and these additional surveys, have been completed.

The results of these surveys and the peer review report are provided in Appendix E.

**Issue:**

Toro was requested to confirm whether species currently only known from the Project footprint are troglobitic or not.

The ecological status assigned to some of the troglofauna species was also questioned as being highly reliant on a string of assumptions that may not be valid. It was also stated that species that have not yet been collected from outside of the impact area should be considered of potential conservation concern until their occurrence can be verified by sampling. (ERMP Appendix F p. 81)

**Submission: 44, 47**

**Response:**

Classification of subterranean fauna as ‘troglobites’ (fauna living permanently and exclusively underground, but not below the water table) generally relies on a range of indirect evidence, as it is virtually impossible to observe directly the habits of specimens collected during surveys. Evidence used in classifying specimens as troglobites may include: pale, blind or reduced eyes and the presence of subsurface strata containing suitable voids. Few of the species collected in Western Australia which are currently considered troglobitic display the extreme morphological modifications, such as distinct elongation of appendages and development of extra non-visual sensory modifications, associated with true troglobites. All species of the order Diplura to which the Projapygidae species belong are pale and blind, but most are nonetheless recognised as soil fauna (ie, edaphic).

Whether or not the subterranean species collected in the vadose zone during Toro’s baseline surveys should be described as ‘troglobitic’ or ‘edaphic’ is difficult to determine. The key issue is whether it is likely that the subsurface invertebrates so far collected only occur within the impact zone.

Studies to date have shown that some specimens of putative troglobites have only been recovered in the Project Area footprint. However Toro’s considerable database of drilling records shows that the strata in which the putative troglobites occur are widespread.

Toro would conduct further work to verify the existence of similar subterranean fauna habitat and species close to but outside the mining impact zone.

**Issue:**

It was claimed that the troglofauna sampling effort had been repeated in fewer seasons than the stygofauna sampling, that only a pilot survey had been undertaken at West Creek and that at Lake Way, the sampling effort had not been developed to provide thorough geographical coverage nor representative coverage of the range of potential habitats. (ERMP Appendix F p 38)

**Submission: 47**

**Response:**

Representative geological habitats present in the Project Area were sampled.

There were relatively extensive areas, outside of the Project’s area of influence that were not sampled. In particular, the Lake Violet calccrete (outside the proposed borefield draw down contours) was not sampled because bores were
not present and new drilling was constrained by cultural considerations, as acknowledged in Appendix F of the ERMP. Sampling these areas would only have provided further reference sites and the possibility of demonstrating extended distributions of taxa. More than 60 per cent of the taxa recorded from the borefield draw down zone were also found to occur outside. A number of additional bores from the Lake Violet calcrete have been located recently and sampled outside of the proposed draw down contours. The results are included in Appendix E.

**Issue**

Quantified data was requested to support the statement that impacts on stygofauna would be ‘moderate’ as a consequence of groundwater abstraction. (ERMP Part 2. p 5-26)

**Submission: 48**

Response:

This assessment is based on the predicted drawdown cones shown in Appendix G of the ERMP (Table 5.1, p. 99). Maximum draw down is predicted to occur over a limited area (10 per cent of the total drawdown zone) with draw down rapidly reducing to 0.5 metres.

**Issue:**

It was claimed that applying the precautionary principle, Toro should not be permitted to proceed with the Project unless it can prove the mining activities would not affect the five species of troglomorphic species that have been found to exist only within the Project Area. (ERMP Part 2. p 12-4)

**Submission: 39**

Response:

Three (not five) putative troglofauna species have so far been recovered only from within the potential Centipede impact area. The shallow, unsaturated alluvial sediments from which the specimens were recovered occur extensively along the playa edge and it is highly unlikely that these presumptive troglofauna are confined to the Project’s impact footprint. Additional samples were recovered in November 2011 and additional sampling is planned for January 2012, for the purpose of demonstrating the wider occurrence of the putative troglofauna.

**Issue:**

An explanation was sought for excluding Oligochaeta taxa from the assessment (ERMP Part 2. p. 12-8).

**Submission: 39**

Response:

Oligochaeta taxa were not excluded from Toro’s assessment of potential impacts on subterranean fauna. However the oligochaete specimens were considered separately in conducting a statistical analysis of subterranean fauna data. Pending more detailed classification of the oligochaete specimens, specimens from different locations (Lake Way or Centipede) were provisionally treated as a separate species. Further determination of Oligochaeta material from recent surveys is reported in Appendix E.
In the context of impacts on stygofauna, it was claimed that Toro should not be allowed to proceed with a Project that would cause groundwater levels to drop by 4 metres (ERMP Part 2. p. 12-11)

Submission: 39

Response:

The predicted draw down cones referred to in Appendix G of the ERMP (Table 5.1) show that the maximum draw down of 4.0 metres would occur over about 10 per cent of the total draw down zone, with draw down rapidly reducing to 0.5 metres. The thickness of the fresh to brackish water layer in the borefield is approximately 20 metres.

Issue:

It was claimed that the species accumulation curves indicate lack of sampling effort. (ERMP Appendix F pp. 76 and 87)

Submission: 47

Response:

Sampling in parts of the Project Area was constrained by Toro’s inability to drill new boreholes from which to sample in areas not then confirmed as being free of cultural significance by the Traditional Owners. A number of additional suitable boreholes have since been identified following the submission of the ERMP and further sampling was undertaken over summer 2011/2012. The results are reported in Appendix E.

Issue:

It was claimed that the potential for habitat connectivity between most of the calcrete bodies had not been explored by drilling and sampling. (ERMP Appendix F p. 57)

Submission: 47

Response:

Morphological identifications showed that many of the stygofauna species found during Toro’s baseline investigations were found in several calcrete systems. Molecular (DNA) studies of larger subterranean fauna species confirmed the broad distribution of these taxa across multiple calcrites or drainage systems, suggesting connectivity between several of the calcrete systems which are currently recognised by DEC as separate subterranean communities.

Issue:

It was claimed that the possibility of multiple habitat niches for stygofauna within the calcrites had not been fully investigated and that the habitat information was also inadequate in the following respects:

- the physical differences between geological/hydrogeological habitats in the various calcrite areas were not properly represented;
- potential variability in the geological and hydrogeological habitat structure within the calcrites or between the calcrites has not been covered fully; and
• potential alternative habitats for stygofauna and troglofauna (e.g., transitional calcrete, scree and coarse alluvium) known to support stygofauna and troglofauna elsewhere, have not been fully investigated (ERMP Appendix F p. 47).

Submission: 47

Response:

Toro has recognised the possibility of multiple groundwater habitats in proximity to the Lake Way playa. Further sampling for subterranean fauna and interrogation of Toro’s drilling records are underway to further characterise the geological and hydrogeological strata that may host potential alternative habitats outside the Project impact area and determine their extent.

Although baseline groundwater monitoring data shows wide salinity variation in time and space there is no evidence that the subterranean assemblages vary in a similar manner. Many stygofauna species collected displayed a considerable tolerance to variations in salinity levels and appear not to form ‘unique’ communities within the hydrogeological system.

Issue:

It was suggested that information about the thickness and depth of calcrete habitats between Uramurdah, Hinkler Well, Lake Violet etc was incomplete and made it difficult to compare the extent of saturated and unsaturated calcrete habitats between the different areas. A model/diagram of each of the calcrete systems was requested. (ERMP Appendix F p 23-24)

Submission: 47

Response:

Schematic cross-sections for Lake Way and Centipede showing the extent of calcrete in relation to the groundwater table are given in Section 3.3. At the Lake Way deposit (which includes parts of the Lake Violet and Uramurdah calcretes) approximately 40 per cent of the calcrete is unsaturated and 60 per cent saturated, with the groundwater table sitting at approximately 2m below surface. More than 90 per cent of the uranium ore is located below the groundwater table, of which the majority is hosted by calcrete (60 per cent) and minor sand/silt (30 per cent) and clay (10 per cent).

At the Centipede deposit (which intersects the Hinkler Well calcrete), more than 90 per cent of the calcrete is saturated. Uranium ore is located within the saturated strata, which comprise calcrete (50 per cent), minor sand/silt (40 per cent), and clay (10 per cent).

Issue:

It was suggested that some sampling holes attributed to the Uramurdah were located in the Lake Violet calcrete and that some holes attributed to Lake Violet were in the West Creek calcrete and that the sampling sites should have been divided up between the distinct calcrete units and their surrounding habitat as the information presented makes for misleading interpretation of the possibility of shared species between sampling areas. (ERMP Appendix F p. 35)

Submission: 47

Response:
Appendix F of the ERMP clearly demonstrated that approximately 60 per cent or more of stygofauna taxa recorded from a particular calcrete were also found to occur in other neighbouring calcretes. Given that the majority of species from a particular calcrete have been demonstrated to also occur in neighbouring calcretes, the potential impacts of the Project have been analysed with reference to the overall effect of groundwater abstraction, rather than an artificial consideration of impacts on a calcrete-by-calcrete basis.

**Issue:**

*It was claimed that the use of groundwater drawdown zones to describe stygofauna habitats and sampling layout was confusing and that spatial zones are more relevant.* (ERMP Appendix F p.3.8)

**Submission: 47**

**Response:**

Just as subterranean PECs recognised by the WA DEC encompass a range of subsurface conditions, the areas within the Wiluna Project’s zone of influence may include different lithologies and stratigraphy. The delineation of very fine subterranean habitats is not justifiable as the baseline studies have shown that many of the taxa present are broadly distributed.

### 5.6.2 Terrestrial Fauna

**Issue:**

*Further information was requested on means to deter fauna from accessing the evaporation pond:*

- The type of deterrent to be used and what would trigger its use;
- The impacts of birds spending extended periods swimming or standing on or in the liquid in the pond;
- The impact to endangered birdlife landing in this facility such as the potential for poisoning through contact with the liquid or entrapment in the pond or its exclusion barriers; and
- Whether material from the pond could enter the food chain.

**Submission: 33, 48**

**Response:**

The pond used to contain and concentrate pregnant liquor solution (PLS), also known as the “evaporation pond”, would be located within a controlled-access area.

Toro would adopt the following methods to ensure the PLS solution is extremely unlikely to enter the environment:

- Fencing the pond;
- Constructing the pond with an engineered liner on its base and sides; and
- Ensure the plant area within which the pond would be located would be surrounded with flood control bunds designed to exclude the 1 in 100 year flood event.

The fauna group most likely to be able to access the pond in the absence of additional controls would be birds. Toro would install suitable deterrent devices, egress points, and if necessary, additional fencing and/or netting to prevent fauna interaction with the PLS evaporation pond.
As discussed in the ERMP Part 1. p. 6-73, no threatened fauna species listed under the EPBC Act (Cth) or the Wildlife Conservation Act 1950 (WA), or Priority Fauna Species listed under the WA DEC Priority Species List have been recorded in the Project Area during Tor’s baselines studies or during other studies of the Project Area.

Published studies of uranium toxicity show that uranium in solution is far less toxic in chemically ‘hard’ water (such as the groundwater in the Wiluna area) than in less saline water (such as the natural waters in parts of the Northern Territory where uranium is mined). Comparative studies cited in Hydrobiology (2011) have shown that in hard water, uranium may be several orders of magnitude less toxic than other common constituents of metalliferous process waters (for example, copper, arsenic, cadmium, nickel, lead or zinc).

Additionally, the high salinity of the liquid held in the evaporation pond would tend to make it unattractive to birds as a routine source of drinking water. The literature review by Toro did not find any published sources of information about the ecotoxicity of uranium in hypersaline solutions. Accordingly, Toro has commissioned laboratory studies of invertebrate test organisms to provide Project specific information on the potential toxicity of PLS. No direct testing of birds is currently proposed due to ethical considerations.

In parallel with its ecotoxicity studies, Toro is continuing to assess other fauna deterrents should they be needed.

**Issue:**

Further information was requested to demonstrate how fauna surveys have met the requirements of:

- EPA (2009) Guidance Statement No 20; Sampling of Short Range Endemic Invertebrate Fauna for Environmental Impact Assessment in Western Australia;
- EPA (2003) Guidance Statement No 54; Consideration of Subterranean Fauna in Groundwater and Caves during Environmental Impact Assessment in Western Australia; and
- EPA (2007) Draft Guidance Statement No 54a; Sampling Methods and Survey Considerations for Subterranean Fauna in Western Australia.

In any case where a survey did not meet WA EPA requirements, further information was sought on the scope of the further work proposed to cover any inadequacies such as supplementary subterranean fauna sampling for the West Creek borefield.

**Submission: 33**

**Response:**

The fauna surveys used as the basis for Toro’s assessment of potential Project impacts on terrestrial fauna including short range endemics (SREs) met WA EPA requirements as described in WA EPA Guidance Statements Nos 56 and 20 and complied with WA EPA’s Technical Guide for Terrestrial Vertebrate Fauna Surveys (2010). Results of further surveys for Vertebrate and invertebrate terrestrial fauna conducted in Autumn 2011 have recently been received by Toro. The studies confirm that no short range endemic (SRE) fauna are restricted to areas which may be impacted by the Project. Appendix C of the ERMP outlines how the baseline terrestrial fauna surveys satisfied WA EPA requirements and contains clear method statements and describes any limitations that may affect the survey findings.
The surveys used as the basis for Toro’s assessment of potential Project impacts on subterranean fauna were conducted in accordance with WA EPA Guidance Statements 54 and 54a as provided in Appendix F of the ERMP. The technical report contains clear method statements and describes any limitations that may affect the survey findings.

Additional surveys for subterranean fauna were carried out in November 2011 and further surveys are scheduled for January 2012. The scope of the further assessments includes:

- finalising surveys of troglofauna and stygofauna in and surrounding the West Creek borefield, in order to provide a more robust basis for evaluating potential impacts of water abstraction during Project implementation;
- further targeted stygofauna and troglofauna sampling outside the Centipede mining impact area, in order to demonstrate the wider distribution range of subterranean fauna species that have only been detected from within the impact zone to date.

As part of its approach to continuous improvement Toro would continue to look into opportunities to minimise impacts to subterranean fauna.

**Issue:**

The purpose of the fauna collection and analysis program (ERMP Part 1. p. 4-27) was questioned, and whether the local community or the WA DMP were consulted on the relevance of the analysis.

**Submission: 48**

**Response:**

A bush tucker survey in the region is scheduled to be conducted in conjunction with Traditional Owners in 2012.

As indicated in the ERMP, the analysis of a single native monitor lizard was opportunistic (due to a road kill) and not for dose assessment purposes. The ingestion dose assessment method involved estimating the amount of either vegetation or meat from the area immediately adjacent to the Project boundary that would need to be consumed to reach a dose of 1mSv/year above natural background levels.

**Issue:**

The reliance on a report on terrestrial fauna was questioned. It was stated that because the report was indicated to be ‘draft interim’, a complete final version of a full study of all fauna impacted by the Project needed to be incorporated in the ERMP. (ERMP Part 2. p 6-10)

**Submission: 39**

**Response:**

A complete final version of the terrestrial fauna report was presented in Appendix C of the ERMP.

**Issue:**

Information was requested about how birds would be affected by the Project when they are attracted in large numbers after flooding occurs in the area.

**Submission: 28, 34**

**Response:**

TORO ENERGY LIMITED
The possible presence of migratory birds at Lake Way during infrequent lake filling would be similar to other water bodies in the area (such as Lake Violet, Uramurdah Creek). This does not constitute a reason for concluding that Toro’s activities would result in a significant impact on water birds.

Baseline studies conducted for the Project (Appendix C of the ERMP) acknowledged the potential for occasional visits by migratory birds to Lake Way, including following a rare rainfall event. The baseline studies noted, for example, that nesting sites established by water birds following the passage of Cyclone Iona in 1988 ‘were primarily located on the islands and natural causeways between the islands and the mainland within Lake Way.’ The islands which may provide habitat to water birds during or following the lake fill events would not be affected by Toro’s activities.

**Issue:**

More information was sought about the way the species accumulation data was handled (ie which species/morphospecies data was included and excluded and why certain species estimation models were chosen over others). (ERMP Appendix F p. 46)

**Submission:** 47

**Response:**

Species that could not be identified conclusively because the available specimens were damaged or juvenile (as indicated in the results table) were not included. There were only three instances where species diversity estimations were disregarded. In each case, the reasons why the estimations were disregarded are clearly described in Appendix F of the ERMP.

**Issue:**

It was claimed that the reason behind exclusion of higher species richness estimates was not adequately explained or justified and that WA Museum (WAM) records showed significantly higher species richness than recorded in the Toro study. (ERMP Appendix F p 76-80)

**Submission:** 47

**Response:**

The most recent published species diversity list from the WAM that is relevant to Toro’s Project Area (Humphreys et al. 2009) does not exceed the species richness detected from Toro’s baseline studies. Although WAM has been collecting from the Yilgarn area for a considerably longer period than the time that Toro has been conducting baseline studies, its published estimates of species richness in the Project Area (including data from the Hinkler Well calcrite, Lake Violet calcrite and the Uramurdah calcrite) include only 27 species.

It is possible that the unpublished WAM records may contain a somewhat higher species diversity (if all taxa were identified or morphotyped) but it is unlikely that the species diversity for a particular calcrite would be as high as 45 to 55 species, (effectively double the species found by WAM or Toro). Accordingly, estimation routines which generated such high theoretical species diversities were considered to be inconsistent with survey experience and therefore unrealistic.

**Issue:**
The generation of accumulation curves using a combination of species level taxonomic groups as well as family or higher level morphospecies identifications, and an uneven use of DNA in taxonomic resolution were questioned. (ERMP Appendix F pp. 44, 76, 87)

Submission: 47

Response:

DNA cannot realistically be used for all groups over and above taxonomic effort and DNA analysis is not considered to be a proven method of uncovering many cryptic species.

There are many instances where genetic data reveals one species to exist when previously, intraspecific variation was considered to be interspecific, or where large distances between specimens were involved and so considered likely to represent multiple spp.

Toro acknowledged that the DNA analysis of Copepoda and Pseudoscorpion material was valuable and as such DNA analysis has been carried out since the ERMP was completed. DNA analysis confirmed the morphological designations of the pseudoscorpions. However, no polymerase chain reaction (PCR) product was obtained from the Copepoda material which is a notoriously difficult group to sequence because of its small size.

Toro is confident the taxonomic effort and DNA analysis of specific material provides reliable data for the purpose of the Project.

Issue:

The presentation of data on numbers of taxa collected was questioned. It was stated that a conservative approach should be applied to all data prior to any statistical analysis to remove any potential double-up in counting the occurrence or abundance of species (ERMP Appendix F pp. 58-73 and 80-85). It was also claimed that the assessment of inequalities in taxonomic resolution between the various taxa had not noted the possibility that each of the indeterminate taxa could compromise multiple species. (ERMP Appendix F p 54-57)

Submission: 47

Response:

A taxonomically transparent approach was taken in relation to the species data tables. The records of indeterminate taxa were listed and an explanation was given as to why further determination to a lower taxonomic level was not possible for juvenile and/or damaged specimens. The subterranean fauna report presented in Appendix F of the ERMP clearly stated that taxa determined to species or morphospecies were considered, but indeterminate specimens were not.

Distribution patterns in the Pilbara of groundwater enchytreaids and other better known groups, such as phreodrilids, show widespread distributions for many species that can occur across major river catchments, with only a few species known from limited ranges (Biota 2010, Pinder 2008, Pinder et al. 2010). There are no described species of enchyteaids considered to represent stygofauna. On the basis that members of these families are usually widespread, the species in this group were not considered to be at risk and were not further defined taxonomically.

In relation to the supposition that indeterminate taxa could comprise multiple species, it has been identified that only the Oligochaeta families and a single Bathynellidae specimen were not morphotyped.
There was only one Bathynellidae specimen collected from the entire survey. Accordingly, it can only represent one species. Bathynellacea specialists from South Australian Museum and the University of Adelaide have advised that this family has not been well defined taxonomically.

**Issue**

*It was claimed that the interpretation of Multidimensional scaling (MDS) analyses would benefit from a clear statement of the hypotheses being tested and discussion of how results contributed to the understanding of the stygofauna communities within the various habitat units. (ERMP Appendix F pp. 74-75)*

**Submission: 47**

**Response:**

Toro concedes that the technical report did not clearly explain how data for Oligocheata taxa were used in MDS and estimate S analysis (ERMP Appendix F). Specimens from each family and from each operational area were treated as separate taxa. Further testing of Oligochaeta material is being carried out as part of Toro’s further investigations.

**Issue:**

*It was claimed the interpretation that the smaller stygofauna (e.g. copepods) can be assumed to occur more widely than detected by Toro’s sampling, because ‘other physically larger animals were found to be more widely distributed’, was conjectural and unsupported by ecological information or sampling data, and that the interpretation of species distribution would benefit from deeper investigation into species ecology and regional context. (ERMP Appendix F p. 89)*

**Submission: 47**

**Response:**

The wider distribution of physically larger species indicates that interstitial dispersal pathways exist. DNA studies summarised in the subterranean fauna report Appendix F of the ERMP provides corroborating evidence of the existence of interstitial dispersal pathways. What little is known of the species’ ecologies was included in the results tables along with regional context.

**Issue:**

*It was suggested that the PEC reference cited an old version of the WA DEC’s list of PECs and that there was an updated one with some changes to numbers of PECs recognised and one community, Depot Springs, now listed as TEC. (ERMP Appendix F p. 14)*

**Submission: 47**

**Response:**

The Depot Springs calcrete lies within an entirely different palaeodrainage channel (Raeside) to the system intersected by the Wiluna Project and is located more than 150km to the south of Lake Way. It is well beyond the Project’s area of influence.
5.7 Flora and Vegetation

**Issue:**
Further information was requested to demonstrate how flora and vegetation surveys have met the requirements of a Level 2 Flora and Vegetation Survey according to EPA (2004) Guidance Statement No 51; Flora and Vegetation Surveys for Environmental Impact in Western Australia.

In any case where a survey did not meet EPA requirements, further information was sought on the scope of the further work proposed to cover any inadequacies such as supplementary subterranean fauna sampling for the West Creek borefield.

**Submission: 33**

**Response:**
Explanations of how the baseline surveys satisfied WA EPA requirements for flora and vegetation surveys are presented in the flora and vegetation report provided in Appendix E of the ERMP. The technical report contains clear method statements and describes any limitations that may affect the survey findings.

Further sampling of flora and fauna will continue as part of the ongoing monitoring and studies for the Project.

**Issue:**
It was stated that Toro should be required to undertake sufficient botanical surveys to clarify the regional importance of the plants it was planning to clear.

**Submission: 40**

**Response:**
Toro has commissioned both local scale and regional baseline botanical surveys which commenced in 2007. Flora and vegetation surveys have been completed to a standard consistent with WA EPA requirements for Level 2 botanical surveys. The studies completed are sufficient to allow an assessment of the environmental significance of Toro’s proposed activities.

**Issue:**
Toro was requested to develop management plans for sensitive biological receptors to the satisfaction of the Office of the WA EPA prior to implementation of the Project.

**Submission: 44**

**Response:**
The only “sensitive biological receptors” in the Project Area are those vegetation groupings which are restricted in extent and considered to be water dependent. Toro provided an Environmental Management Strategy for Groundwater Dependent Vegetation in Volume 2 of the ERMP. This management strategy would be further developed into an environmental management plan in consultation with the Office of the WA EPA and the WA DEC prior to the commencement of water abstraction or ground disturbing works.
Issue:

A floristic analysis was requested of the data from Toro’s Project and regional surveys with the results presented to support statements in the ERMP that vegetation units (that appear to be of conservation significance) are widespread.

Submission: 44

Response:

The following refers to conclusions presented in the ERMP regarding conservation significant vegetation units and provides further information:

- The only vegetation unit lying within the direct disturbance footprint of the Project which has uncertain conservation significance is the *Tecticornia* unit found on the Lake Way playa. Whether or not this unit is truly of conservation significance is dependent upon the taxonomic analysis conducted by the WA Herbarium, which indicate that 76.5% of the *Tecticornia* species collected from the Project Area are able to be identified and none are of conservation significance. The remainder of the specimens have been unable to be positively identified, due to the lack of seeds and flowers on the specimens, and the uncertainty in the taxonomy of *Tecticornia* in Western Australia. Additional sampling may be required to resolve the taxonomy of specimens for which no seeds were available at the time of previous surveys.

- The *Eucalyptus camaldulensis* dominated vegetation unit that occurs along the West Creek drainage line has been classified as having conservation significance because it represents a unit that is not widely observed in the surrounding landscape. Effectively no direct clearing of this vegetation unit is proposed. However, there is potential for the unit to be affected by alterations to groundwater levels. The floristic make-up of the creekline and drainage line vegetation units is adequately defined.

Further information on Tecticornia surveys and analysis is presented in Appendix F.

Issue:

Toro was requested to undertake further vegetation surveys outside the Project Area to demonstrate that sustainable areas of vegetation units would be conserved where those units currently are only known from surveys in the Project Area and appear to be of conservation significance.

Submission: 44

Response:

Regional surveys have been completed. All vegetation units identified within the proposed Project clearing footprint have also been identified in other areas. Additional targeted regional surveys for *Eucalyptus camaldulensis* dominated vegetation units found in drainage lines of the West Creek borefield would be conducted as part of the further evaluation of the ecological water requirements of this relatively uncommon vegetation unit.

Issue:

Where there are Tecticornia specimens with unresolved taxonomy, it was requested that the taxonomy be resolved as a priority and that Toro then reassess the Project impacts on those taxa.
Submission: 44

Response:

Of the 191 specimens collected during Toro’s baseline studies and lodged with the WA Herbarium for identification, there were 81 specimens from within the Project Area. The remaining specimens were collected from regional surveys. Of the 81 specimens from within the Project Area, 62 have been identified to species level or identified as having an affinity to a known species. This represents 76.5 per cent of specimens identified to acceptable levels. The balance were either sterile or flowering, with no seeds. It is unclear from the data available that any of these collections are potentially novel species, due to the taxonomic uncertainty of Tecticornia species.

Issue:

It was requested that prior to Project commencement, Toro further considers impacts on vegetation and fauna habitats from bunding and diversion of creeks.

Submission: 44

Response:

The likely extent of disturbance that would result from construction of bunds and other drainage works to accommodate the 1 in 100 year flood event has been incorporated already in the predicted Project disturbance footprint. The design disturbance footprint was taken into account in conducting both flora and fauna habitat assessments.

Issue:

It was stated that because the expected drawdown cone of the West Creek borefield would impact on a regionally significant vegetation complex, Toro must be required to cause no harm to this unique environment.

Submission: 40

Response:

The vegetation and habitats within the proposed West Creek borefield are not unique. The *Eucalyptus camaldulensis* vegetation unit associated with drainage lines at West Creek has been assessed as having some regional significance on the grounds that it represents a relatively large and more or less continuous occurrence of a vegetation unit which is not common in the Murchison bioregion or LGA of Wiluna. The unit is not classified as a threatened vegetation unit under either State or Commonwealth legislation. Nonetheless, in recognition of the local cultural significance and potential habitat function of the creekline vegetation, Toro proposes to constrain its water abstraction at West Creek to no more than 0.7GL pa. This is the rate at which water was historically taken from the borefield. The vegetation in the area has previously experienced (and tolerated) this level of water abstraction.

Issue:

It was claimed that the potential impacts on vegetation and soils from clearing and earthworks for the development of the Project (ERMP Part 2. pp 3-13 and 3-16) had not included radiation.

Submission: 39
Response:

The purpose of the sections of the ERMP referred to was to discuss the impacts of clearing of vegetation and earthworks. Radiation impacts and their management are dealt with extensively elsewhere in the ERMP, particularly in the ERMP Part 1, Section 4.4 and Section 6.2 and in Appendix D (Radiation Technical Report).

Issue:

It was suggested that the potential impacts of loss of seedbank (ERMP Part 2, p 3-14) had not discussed the potential two new species identified (ERMP Part 2, – p 3-9)

Submission: 39

Response:

No new flora species have been identified within the Project Area. There are some specimens for which taxonomy has not been fully resolved, but this is due to sterility of specimens (see Appendix F). Glasshouse trials of top soil samples collected from the Project Area have indicated highly successful germination and growth of local species, confirming that propagation is likely to be possible. In addition to this, there is no evidence that there would be a loss of seedbank, providing that topsoil is stored correctly. Rehabilitation field trials and seed collection are also confirming as part of the ongoing monitoring program.

Issue:

Clarification was sought of the locations of A. vesicaria shown on the map (ERMP Part 2, p 4-18)

Submission: 48

Response:

A. vesicaria, commonly known as ruby dock, is a weed widespread in disturbed areas in the Wiluna region, both inside and outside Toro’s Project Area. The weed has been reported to occur on tenements to the south (BHP Billiton Nickel West), north (Apex Gold) and west (BHP Billiton Yeelirrie) of the Wiluna Project Area. Toro has already undertaken a campaign to eradicate located outbreaks within the Project Area.
5.8 Transport

Issue:

It was suggested that Toro should continue a dialogue with Main Roads Western Australia during the feasibility phase of the Project to discuss the impact that transport operations would have on the road network. Main Roads also should be consulted on traffic management planning and emergency management planning that may be associated with preparing risk management plans for product transport.

Submission: 22

Response:

Toro has already and would and continue to consult with Main Roads and other relevant government and emergency service authorities in preparing its Transport Management Risk Management and Emergency Response plans.

Issue:

Toro’s Transport Management Plan as presented in the ERMP was criticised as inadequate.

Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13, 14, 15, 19, 21, 23, 24, 25, 29, 31, 34

Response:

The ERMP Part 1. pp. 7-8 to 7-13 provides detailed information about the proposed route for transport of product, potential impacts and the extensive regulatory regime with which Toro would comply.

Issues of public interest are explained in the ERMP, including arrangements to ensure the safety of the community, the environment and infrastructure and property along transport corridors. Toro is committed to developing emergency procedures in consultation with relevant authorities, including providing local emergency crews with appropriate training and equipment as required.

Toro is committed to further developing the Transport Management Plan to align with the transport service provider when appointed.

The Transport Management Plan would also be subject to further assessment by relevant government regulators for the transport of uranium oxide concentrate from the Wiluna Uranium Project (ERMP Part 2. pp. 15-5).

Issue:

It was stated that Toro must be required to develop and submit to the WA EPA an Emergency Response Plan for transport of product, and the Plan must be made available for stakeholder comment prior to approval.

Submission: 45

Response:

Toro would prepare a comprehensive Emergency Response Plan for the unlikely event that a transport incident would occur. This would consider transport of product, and would be developed in consultation with the relevant authorities (ERMP Part 1 pp. 6-36 to 37 and Part 2. pp. 15-27 to 30). Toro is also committed to undertaking
further consultation with the City of Kalgoorlie-Boulder (at its request) and other key stakeholders in the preparation of the Plan.

**Issue:**

*It was proposed that Toro be required to define the product transport route and the locations of any secure stopping areas, with the transport route not involving the transport of uranium product through residential areas or past sensitive receptors such as hospitals and schools within the municipality of Kalgoorlie-Boulder.*

*It was also stated that as the proposed export route and methodology of the Project is not specified and does not confirm safe transport through Western Australia, South Australia and potentially the Northern Territory environments, the ERMP should not be approved until Toro has done so.*

**Submission: 25, 45**

**Response:**

Toro proposes to transport product by road from Wiluna to Adelaide for shipment from Port Adelaide or transfer to rail for movement to the Port of Darwin (ERMP Part 1 p 2-34 and Part 2 pp. 15-21 to 22).

Toro has discussed its proposed product transport arrangements with all those jurisdictions through which product may be transported. Product would be transported from the Wiluna site on the Goldfields Highway to Norseman, using the eastern by-pass at Kalgoorlie then on the Eyre Highway to Adelaide. The transport route is shown in Figure 7-1 and is described in detail in Section 7-5-3 of Part I and Table 7-4 of Appendix I of the ERMP.

The Transport Management Plan (ERMP Part 2, Section 15) sets out arrangements to ensure the safety of the community, the environment and infrastructure and property along transport corridors. Emergency management procedures are being developed in consultation with government and local authorities, including the provision of training and equipment for local emergency service crews. Toro would continue to consult with communities and key stakeholders with an interest in the transport route, including in relation to the establishment of any secure stopping areas.

**Issue:**

*It was suggested that the transport of uranium presented the same risk of contamination and other impacts to the community as the transport of lead which had led recently to the suspension of mining operations near Wiluna.*

**Submission: 25**

**Response:**

Transport of uranium oxide concentrate as proposed from the Project is not comparable with the form of lead transport from previous operations near Wiluna.

Uranium oxide concentrate would be protected from dust generation by transport in sealed steel drums and sealed shipping containers (Transport Management Plan, ERMP Part 2. pp. 15-18 to 15-20). The packaging sequence would be as follows:

- Packed in Industrial Packaging standard IP-1 205 litre steel drums;
- Secured and packed using an acceptable design with Corex strapping approved by the Australian Maritime Safety Authority; and
- Loaded and locked in a 20ft container lined with plastic sheeting and labelled showing carriage of radioactive material.

No uranium product losses are predicted during transportation.

**Issue:**

*It was suggested that Toro be required to consult with other uranium mining companies and the Australian Uranium Association in the development of the Emergency Response Plan and adopt a uniform approach to emergency response in Western Australia.*

**Submission: 45**

**Response:**

Toro has consulted with other uranium mining project proponents in Western Australia and the Australian Uranium Association to gain understanding of best practice across industry on a range of product transport issues, including emergency response, and would continue to do so.

This collaboration has included consultation with communities and key stakeholders, including emergency services, with a view to ensuring a uniform approach to emergency response in Western Australia.

**Issue:**

*It was suggested that the ERMP was silent on measures to be taken in the event of a security breach involving the loss of control of uranium product, including a reference to a scenario involving the theft of radioactive materials and their use in a dirty radiation bomb.*

**Submission: 34**

**Response:**

The ERMP Part 2 pp. 15-29 to 15-34 discussed security of product transport.

During product transport, security measures would include:

- Approved transport management plans with a minimum of two trucks travelling together at all times along approved and designated transport routes with stops only for necessary operational requirements;
- Drivers following established communication protocols throughout the journey, including regular reporting of whereabouts/status; and
- Continuous monitoring of the location of each vehicle transporting product.

In conjunction with the Australian Safeguards and Non-Proliferation Office (ASNO) and relevant government authorities in Western Australia, South Australia and the Northern Territory, security assessments would be undertaken covering all credible risks and threats as part of the approval process for transport of product.

**Issue:**

*It was suggested that Toro should ensure effective communication and utilisation of regionally based commercial and government health and safety providers as part of developing a best practice transport management system.*

**Submission: 16**
Response:

Toro has participated in industry initiatives to involve regionally-based commercial and government agencies in discussions about transport management and the provision of associated health and safety services. Should the Project be approved, Toro would establish and coordinate training programmes across all relevant agencies likely to be involved in the transport of uranium oxide concentrate (UOC) to include:

- Radiation training and awareness for transport workers involved in transporting, handling, storing or loading UOC;
- Radiation training and awareness for emergency services (State Emergency Service, fire brigade, ambulance service and volunteer emergency services) or other agency personnel involved in the initial response to any incident; and
- Emergency response and clean up of any spilt UOC for emergency services personnel.

The training would focus on providing participants with awareness regarding:

- Requirements relating to the safe handling, storage and transportation of Class 7 radioactive materials;
- The characteristics of UOC; and
- Radiation safety protection requirements, first aid and personal safety.

Issue:

*It was proposed that Toro be required to complete a detailed risk analysis prior to transporting uranium.*

**Submission: 45**

Response:

Toro would complete a detailed risk analysis prior to the transport of any product from the Project.

Issue:

*It was proposed that Toro be required to make the results of reporting and monitoring programmes associated with the transport of uranium publicly available. Another submitter stated that Toro’s environmental and statutory compliance reports should be made available in full on Toro’s website.*

**Submission: 34, 45**

Response:

Toro would implement a Community and Stakeholder Consultation Programme to include an annual report on the operational, environmental and social performance of the Project (ERMP Part 1. pp. 3-17 to 3-18, pp. 8-9 and 8-11), which would be made available on our website. This report would include information about product transport and monitoring. Toro also commits to offering an annual site visit for non-government organisation representatives as indicated in the ERMP Part 1 p 3-18.

Issue:

*It was proposed that Toro be required to make publicly available information about all incidents involving the transport of uranium and all speed compliance violations of trucks transporting uranium.*

**Submission: 45**
Response

Toro would publicly disclose major safety or environmental incidents as outlined in the Community and Stakeholder Consultation Programme (ERMP Part 1. pp. 3-17 to 3-18).

In relation to the speed of trucks transporting uranium, truck drivers would be under instruction to comply with all applicable traffic laws in the jurisdictions travelled through.

Issue:

*It was pointed out that the draft Transport Management Plan refers to a proposed transfer station at Parkeston near Kalgoorlie which at this stage has no proponent, no funding and no approval.*

**Submission:** 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13, 14, 15, 19, 21, 23, 28

Response:

The proposed facility at Parkeston is not within the scope of this assessment (ERMP Part 1 p 2-37). It is not proposed as part of Toro’s transport route. Toro’s preferred method to transport product using currently available infrastructure is by road to Adelaide for shipment from Port Adelaide or subsequent rail to Darwin for export from the Port of Darwin.

Issue:

*It was suggested that if storage of uranium for transfer to rail is necessary in Kalgoorlie-Boulder, it should be in conjunction with other possibly hazardous products and in keeping with statutory regulations.*

**Submission:** 16

Response:

Toro has no plan to store uranium for transfer to rail at Kalgoorlie-Boulder.

Issue:

*It was suggested that Toro has ignored requests to provide data on the frequency of truck accidents and that Toro’s proposed product transport arrangements would more than double accident rates on the roads used, including roads in the Northern Territory. Toro was asked to explain:*

- What systems and processes are in place to prevent an accident;
- In the event of an accident in which product has been dispersed, how the immediate site and the surrounding area would be cleaned up;
- Whether spillage during a severe rain event would disperse the product via water flowing downhill from the Goldfields Highway across Kalgoorlie via the road and drainage system;
- Monitoring to ensure the area was sufficiently clean to be cleared of all contaminant; and
- Who would be responsible for clean up and insurance to cover such an event so that the clean up was at no cost to the public and insurance was adequate to avoid any loss to residents or businesses.

*It was also suggested that a rate of 0.234 accidents per 10,000 km travelled should have been used in the assessment, resulting in a likelihood of 2.35 truck accidents per year involving product trucked from the Wiluna Project. Questions were also raised about the response in the event of an accident which resulted in a spill of uranium.*
Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13, 14, 15, 16, 18, 19, 21, 23, 25, 28, 33, 34, 40

Response:

In the current phase of Australian uranium mining which began in the early 1980s there have been no transport-related incidents involving the spillage of product on the open road.

The suggested rate of 0.234 accidents per 10,000 km travelled would have resulted in up to 1.5 accidents per annum since 2003 if applied to existing uranium oxide concentrate transport arrangements in South Australia and the Northern Territory. However, there have been no accidents in those jurisdictions involving the transport of uranium oxide concentrate, demonstrating the effectiveness of current transport management systems and controls in the Australian uranium industry.

While Toro values input and is committed to benchmark against industry standards, Toro questions the accuracy of the accident rate suggested by the submitter. Toro suggests the accident rate should be 0.076 fatalities for 10,000 km travelled on the following basis:

The accident rate of 0.234 accidents per 10,000 km travelled includes vehicle accidents other than articulated trucks as would be used by the Project. Current accident rates for articulated vehicles show that the likelihood of an accident involving the transport of uranium oxide concentrate would be extremely low. Using the latest comparable figures in Western Australia for the twelve months ending March 2009 for the worst possible scenario of a fatal accident, Western Australia recorded 209 road fatalities, of which 119 occurred in rural areas. Nine of the total fatalities involved articulated vehicles (ERMP, Part 2, Appendix I, Table 8.4). Therefore, if we assume all nine fatalities occurred regionally, this would equate to 0.076 fatalities per 10,000 km travelled or 1 fatality every 13 years for transport of uranium oxide concentrate.

Truck accident data are provided in the ERMP Part 1 (Section 7.6.1), and transport safety and incident management is discussed in the ERMP Part 1. Section 6.2.7.6 and 7.5, and Part 2. pp. 15-27 to 15-30.

Toro has engaged in discussion with Federal, WA, South Australian and Northern Territory government agencies, including emergency services, regarding emergency response planning and procedures in the event of an incident off-site.

The response to any incident would be supported by:

- A Toro Emergency Response Plan communicated to the relevant regulatory authorities and emergency services;
- Appropriate training for the drivers of trucks carrying uranium oxide concentrate;
- Appropriate training for emergency services personnel;
- The availability of clean up equipment;
- Qualified specialists on call at all times; and
- Agreements with local service providers to participate in the response, containment and recovery phases.
When responding to transport incidents involving radioactive material, Toro would activate the Emergency Response Plan to be developed in conjunction with the relevant State authorities and emergency services to include the following procedures:

- Rescue any 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 to reduce the possibility of inhaling radioactive material;
- Minimise the time spent nearby and maximise the distance to any spilt product;
- Control fires and other common consequences of transport incidents;
- Identify any 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 (e.g. PPE, clothing) for correct disposal;
- Decontaminate equipment in preparation for rail and/or road transport; and
- Decontaminate and restore the surrounding environment to an acceptable standard.

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 goods defined as dangerous. Toro’s plans would conform and integrate as closely as possible with procedures for dealing with other transport incidents involving other classes of dangerous goods.

Toro would carry appropriate liability insurances to cover claims should Toro become legally obliged to pay for losses arising from claims for bodily injury, property damage or clean-up costs caused by pollution conditions from transported product.

**Issue:**

*Toro’s Qualitative Risk Assessment for transport was questioned. It was suggested that instead of low risk, the residual risk of loss of control through a loss of containment would be moderate, and that the distance of 2,700 km between Wiluna and Adelaide to be driven in two days introduced fatigue as a risk factor.*

**Submission: 22**

**Response:**

Toro’s Qualitative Risk Assessment included an assessment of a range of risk factors, including fatigue (ERMP Part 2, Appendix I). Overall, the assessment determined the risk rating to be low. It also determined that road transport with dual driver-road transport combination from Wiluna to Adelaide was the preferred solution on the basis of:

- Shortest road distance to travel compared to Darwin;
- Minimising interaction times with public and communities along the proposed transport route and connecting with established road (and rail) routes in South Australia; and
- No impacts of tropical cyclones which can close the road route to northern Australian destinations.
Issue:

Three submissions referred to specific incidents and accident rates on rail and in the trucking industry, some involving vehicles carrying uranium and other radioactive material as follows:

- Two incidents in the Northern Territory – a truck carrying product from the Ranger mine to Darwin port became bogged on the side of the Arnhem Highway while carrying ship containers filled with drums of uranium; a truck carrying 17,000 litres of sulphuric acid at Ranger rolled and spilled the acid affecting local wilderness areas;
- An acknowledgement by the Australian Nuclear Science and Technology Organisation that there are 1-2 accidents or ‘incidents’ every year involving the transportation of radioactive materials to and from the Lucas Heights reactor site in Sydney;
- In 2011 an accident occurred at the intersection of the Brand and Great Northern Highways in Western Australia involving two trucks, one of them carrying a radioactive isotope used in industrial operations;
- During the 12 months to the end of December 2010, 244 people died from 210 crashes in Australia involving heavy trucks or buses. These included 147 deaths from 127 crashes involving articulated trucks and 85 deaths from 70 crashes involving heavy rigid trucks;
- Truck accidents killed 50 per cent more people on Victorian roads in 2010 compared to 2009;
- WA experiences on average more than 2000 truck accidents per year involving both articulated and rigid trucks involving an average 120 accidents a year requiring people to be hospitalised and 25 a year involving deaths;
- WA Main Roads compliance officers stopped over 5,300 heavy vehicles between July 2004 and February 2005 with approximately 15 per cent of operators receiving financial penalties or work orders;
- There were 28 serious transport and handling accidents reported in Western Australia during 2009/10 including an LNG tanker roll over, a spill of 35,000 litres of cyanide, a number of acid and acid-waste spills and other serious accidents involving ammonium nitrate, flammable gas and other toxic and hazardous materials;
- Dust contamination in the town of Esperance as a result of the transport of lead; and
- WA experiences on average more than 35 train incidents a year on running lines, most of them derailments involving collisions with infrastructure or crashes with road vehicles at level crossing.

It was also suggested that serious accidents were a persistent reality in the WA freight industry but the proposal submitted by Toro did not provide the level of detail for the transport plan to enable it to be assessed given the very real risks involved.

Submission: 28, 34, 42
Response:

Product has been safely transported in the Australian uranium mining without any major transport related incidents since the early 1980s. Table 13 (ASNO) shows that almost 59,000 tonnes of uranium oxide concentrate were exported from Australia between 2004/5 and 2009/10.

<table>
<thead>
<tr>
<th>Year</th>
<th>Tonnage of U₃O₈ shipped</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004/5</td>
<td>11,215</td>
</tr>
<tr>
<td>2005/6</td>
<td>10,233</td>
</tr>
<tr>
<td>2006/7</td>
<td>9,518</td>
</tr>
<tr>
<td>2007/8</td>
<td>10,140</td>
</tr>
<tr>
<td>2008/9</td>
<td>10,114</td>
</tr>
<tr>
<td>2009/10</td>
<td>7,555</td>
</tr>
<tr>
<td>Total</td>
<td>58,775</td>
</tr>
</tbody>
</table>

Table 13: SUMMARY OF UOC EXPORTED FROM AUSTRALIA FROM 2004 TO 2010

The transport of product from the Wiluna Project would be undertaken in compliance with a Transport Management Plan approved and regulated by the Federal and WA governments. Transport of product in South Australia or the Northern Territory would comply with the Plan.

The Transport Management Plan establishes the framework for operational control systems and procedures (i.e. day to day aspects) for the safe, efficient and incident-free transport of product between the mine site and the port of export. The Plan would be progressively revised and refined during further detailed Project planning, leading to its submission to the respective governments prior to the movement of any product from the Wiluna Project site.

The Transport Management Plan would also be supported by Toro’s Incident Management Plan and Emergency Response Plan. The planning would involve all relevant regulatory agencies and emergency response organisations to establish appropriate responses to any incidents that may arise during transport of product.

Issue:

*It was suggested that there was a disparity between figures in the ERMP Part 1 (p7-8) and ERMP Part 2 (p13-7) in estimated total maximum doses for truck drivers transporting uranium oxide concentrate. It was also suggested that there should be a requirement for Toro to have radiation monitoring for truck drivers as they would be exposed to higher than background levels of radiation.*

Submission: 7, 34

Response:

The relevant precise figure is 0.432 mSv above background which is well within the occupational exposure limit of 1 mSv/year. The figures quoted differ due to rounding differences.

All drivers would be monitored for occupational exposure to radiation. All radiation monitoring would be outlined in the Radiation Management Plan and discussed with regulatory authorities prior to the commencement of operations.
**Issue:**

Consideration was requested of monitoring of radiation levels along the route for product transport with the suggestion that monitoring points could be where trucks enter and leave site and stopping places along the route including roadside rest areas, towns and stop over points.

**Submission: 22, 34**

**Response:**

Radiation monitoring along the product transport route was determined to be unviable as the variability in natural radiation levels means that an increase in radiation due to product transport would be undetectable. Further, the radiation levels on the transport route would only increase if there was a spillage of uranium oxide concentrate. As the product is solid and packed in sealed drums then lined containers, the risk of contamination during normal transport is negligible. In the event of any spillage of uranium oxide concentrate, monitoring would be undertaken of the incident area to ensure that appropriate clean-up and removal had been implemented.

**Issue:**

In view of the possibility of Toro using the Adelaide to Darwin railway for transport of product, it was suggested that there already had been at least two derailments on this railway in its short history and that it had been plagued by a series of other incidents.

**Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15**

**Response:**

There have been no incidents on the Adelaide to Darwin railway involving the transport of uranium oxide concentrate since the line has been used for this purpose. Toro’s Transport Management Plan (ERMP Part 2, Section 15) outlines the management approach to ensure that the risk of accidents involving the transportation of Toro’s uranium product is minimised.

**Issue:**

It was pointed out that the Dangerous Goods Regulations do not apply to the transport of uranium oxide concentrate. (ERMP Part 2. p 15-9)

**Submission: 7**

**Response:**

Uranium oxide concentrate is a Dangerous Goods Class 7 Material under the Australian Dangerous Goods Code and the transport of radioactive material is managed under the Code of Practice for the Safe Transport of Radioactive Material (ARPANSA 2005). Class 7 material is exempt under the WA Dangerous Goods Regulations.

**Issue:**

Further information was sought about radiation doses on the product transport route including equations, factors and references to justify the doses derived, including the justification for using cumulative doses (Appendix I Section 8).

**Submission: 48**
Response:

The predicted dose for uranium product drivers is below the Member of Public limit (of 1 mSv/year) and would be monitored to confirm predicted doses. All radiation monitoring would be set out in the Radiation Management Plan and discussed with regulatory authorities prior to the commencement of operations.

The predicted radiation levels from containers of final product uranium are based on actual measurements from similar final product containers from Olympic Dam.

The monitoring results show that on average, the gamma dose rate in the cab of a truck hauling final product is about 1 μSv/hour. Other measurements show that the gamma dose rates are 5 μSv/hour at 1 metre from the side of a container.

The dose received by a second driver sleeping in the cabin would be similar to that from the driver (being 1 μSv/hour).

Further details of dose assessments during the transport of final product uranium are provided in the ERMP (Part 1 p 7-8). The three scenarios for transporting final uranium oxide product demonstrate that:

1. for a member of the public at the road edge (1 metre from truck as it passes), the measured dose rate at 1 metre is 5 μSv /hour, giving a total dose of 0.012 mSv/year above background;
2. for a member of the public travelling in a vehicle behind a uranium oxide consignment for one hour four times per year, the measured dose rate at 1 metre is 5 μSv /hour (for the total trip) giving a total dose of 0.060 mSv/year; and
3. For final product truck drivers undertaking 12 trips in a year (one trip each month), the calculated dose is 1 μSv/hour per 436 hours (due to distance from the product and shielding from the cab), giving a total dose of 0.43 mSv/year.

Issue:

*It was suggested that because the WA Government would not permit the use of any port in the State for the export of uranium, residents of the Northern Territory would not appreciate the suggestion that a lower level of protection should apply to them if Toro were allowed to ship uranium out of Darwin, particularly as recent incidents with the mismanagement of copper concentrate at Darwin East Arm Port had exposed deficiencies in the monitoring, regulation and enforcement of pollution control at East Arm.*

Submission: 12

Response:

Access to ports is a matter for state and territory jurisdictions and the policy of the WA government is that uranium is not to be exported from ports where transport of product through residential areas is required.

It is incorrect to assume that the restriction is related to a level of protection, because uranium has been safely and securely shipped from the ports of Darwin and Adelaide for many years.

The transport and export of uranium is heavily regulated with oversight from state and federal authorities.

Comparing the transport of uranium with the transport of copper concentrate is erroneous as uranium is exclusively transported and shipped within sealed steel drums that are wrapped and secured within locked shipping containers. Therefore there is no possibility for emissions during routine transport.
The Port of Darwin and Port Adelaide are certified ports to handle uranium ore concentrate and are able to receive and load Class 7 vessels.
5.9 Aboriginal and Cultural Heritage

Issue:

It was stated that the scope of Toro’s indigenous research and consultation was too narrow and confined to previously registered WA DIA sites and Native Title claimants. It was suggested that Toro should also consult with other indigenous people in the area who may have knowledge about heritage places that may be impacted by the proposal.

Submission: 48

Response:

Toro has consulted with indigenous people of the region based on advice from Traditional owners, Native Title Claimants and their representative body. This is consistent with requirements of the WA DIA and respectful of the connection of Traditional Owners to the country. Toro’s consultation has not been confined to previously registered sites and Native Title claimants.

Issue:

It was suggested that because Wiluna was a ‘beautiful, stable, safe place of significant heritage for both Traditional Stewards and Non-Indigenous Australians’, establishing a uranium mine in the region would be akin to the damming of the Gordon and Franklin Rivers in Tasmania. It was further suggested that the proposed location of the Project at the beginning of the Canning Stock Route would be adverse to tourism opportunities.

Submission: 25, 39

Response:

Toro recognises the heritage values of Wiluna and is working to protect them. For example Toro is actively working with Traditional Owners on a Cultural Heritage Management Plan and on plans to restore a heritage listed original mine manager’s house to preserve non-Aboriginal heritage.

Toro would operate in a manner that minimises environmental and social impacts and provides a range of benefits to local communities if the Project receives approval.

Issue:

It is recommended that the ERMP provide clarification as to whether a Section 18 (Aboriginal Heritage Act 1972 (WA)) (AHA) application would be submitted to the WA DIA in the event of an Aboriginal heritage sites being impacted by the Project. The application ensures that appropriate permissions are obtained for disturbance of Aboriginal heritage sites and ensures that a breach of Section 17 of the Act does not take place.

Submission: 37
Response:

Toro has made itself aware of all cultural heritage issues associated with the construction, execution, closure and rehabilitation phases of the Project prior to working in the Project Area. Toro is working with Traditional Owners and Central Desert Native Title Services on cultural mapping of the Project Area. The information provided by this work would be incorporated into any applications to the WA DIA that may be necessary pursuant to Section 18 of the AHA.

Toro would endeavour to avoid any impact on Aboriginal cultural heritage. Where that is not possible, Toro would seek to minimise any impact through management of the Project’s configuration and operation. A key feature of this mitigation strategy is to locate Project infrastructure away from cultural heritage sites to avoid any direct or indirect activity. If an application under Section 18 of the AHA becomes 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; and
- 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.

Issue:

*It was pointed out that there were registered Aboriginal cultural heritage sites in the Project Area and that their protection should take precedence over mining. Disappointment was also expressed that Toro had not already completed archaeological and ethnographic studies and did not already have a comprehensive Aboriginal Heritage Management Plan.*

Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13, 14, 15, 19, 21, 23, 24, 25, 28, 39, 31, 34

Response:

Registered Aboriginal cultural heritage sites in the Project Area have been identified both from the WA DIA registers and through consultation with the Traditional Owners under the Memorandum of Understanding regarding cultural mapping issues.

A comprehensive Aboriginal Heritage Management Plan is being developed in consultation with the Traditional Owners and their representative body, Central Desert Native Title Services (Central Desert), according to the timeframe that the Traditional Owners have set. The basis of the Plan is cultural mapping of the entire Project Area. As part of this work, a large group of Traditional Owners spent ten days in the Project Area in October 2010 undertaking ethnographic survey work.

The Traditional Owners have sought information to allow them to make their own informed decision about the Project and Toro has facilitated this process in a manner which has fully respected their rights, as evidenced by the agreements and cultural heritage activities undertaken so far.

Protection of identified sites is afforded through the application of the *Aboriginal Heritage Act (1972)*. Toro would continue to comply with all applicable legislation in dealing with Aboriginal cultural heritage.
Issue:

It was pointed out that the Project would prevent access to Aboriginal ceremonial, mythological or historical areas to maintain traditional law or custom activities.

Submission: 25

Response:

Toro is committed to the negotiation of a mining agreement with Traditional Owners, which would include arrangements for the Traditional Owners to maintain access to heritage areas in the Project Area during and after Project execution, closure and rehabilitation (Aboriginal Cultural Heritage Management Plan, ERMP Part 2. p. 14-16).

Issue:

It was stated that Toro did not have a finalised Aboriginal Cultural Heritage Management Plan and that it should provide a final plan for further public consultation (ERMP Part 2. Section 14). It was also suggested that as only four of fifteen registered heritage sites had been formally evaluated and assessed so far, all 15 sites should be assessed before the Project advanced (ERMP Part 2. p. 14-18).

Submission: 39

Response:

Toro has committed in the ERMP to preparing an Aboriginal Cultural Heritage Management Plan. The timing of this plan is defined by a schedule provided by the Traditional Owners through their representative body, Central Desert Native Title Services.

If Project implementation requires the disturbance of any cultural heritage site, Toro has committed to completing formal evaluation and assessment with the Traditional Owners and would make an application to the Aboriginal Cultural Material Committee pursuant to section 18 of the Aboriginal Heritage Act 1972 (WA) where required. Any such application would require further evaluation and assessment of any site included in the application.

Issue:

Information was requested on each cultural heritage site of significance with comments about site importance sourced to traditional owners (ERMP Part 2. p14-30).

It was also requested that Toro provide all completed cultural heritage studies (including ethnographic and bush tucker surveys) within the area to be affected by the proposal as well as completed archaeological surveys so potential impacts of the proposal can be assessed.

A copy was also requested of the Memorandum of Understanding for monitoring and inspection of indigenous objects or areas of cultural significance (ERMP Part 2. p 14-40) and the Program of Works (ERMP Part 2. p 14-42)

Submission: 48
Response:

The cultural heritage sites of significance have been identified by the Traditional Owners through cultural mapping of the Project Area, which received significant funding from Toro (ERMP Part 1. Section 3.5.3). All information and data collected during this work would remain the property of the Tarlpa and Wiluna Native Title Claimants under the conditions of the Memorandum of Understanding.

The limits of mining and infrastructure development to protect cultural heritage values have been agreed with the Traditional Owners. Toro has included any information about the significance of cultural heritage sites within or potentially within the Project Area that it was able to provide in the ERMP Part 2. (Aboriginal Cultural Heritage Management Plan) Sections 6.1 and 6.2.

The provision (i.e. publication) of the information requested has been raised with the Traditional Owners but because of its cultural sensitivity and confidentiality to Traditional Owners as they have requested it remains confidential to them. Information would be provided to the submitter only with the agreement of the Traditional Owners.

Issue:

Toro was asked to provide details of specific concerns raised by native title claimants and how these concerns have been addressed, such as areas that have been identified for exclusion from disturbance (ERMP Part 2. p. 14-32).

Submission: 48

Response:

Traditional Owners have identified Project configuration and cultural heritage, radiation management and bush tucker as their specific concerns.

During the course of cultural mapping of the Project Area by the Traditional Owners Toro’s proposed Project configuration was discussed, as documented in ERMP Part 1. Section 3.5.3., The Traditional Owners raised issues associated with the impacts of mining the Centipede and Lake Way deposits on the lake shoreline. They also raised issues associated with the potential impact of mining within the Lake Way deposit on Uramurdah Creek.

Consultation between Toro and the Traditional Owners since the submission of the ERMP has resulted in agreement on a revised Project configuration that accommodates issues raised by the Traditional Owners about impacts on the lake shoreline and the creek. The limit of mining on the lake shoreline has been agreed and an exclusion zone within which mining would not occur has been identified on each side of Uramurdah Creek, as shown in Figure 13. Cultural heritage issues have been addressed through the continuing development of the Cultural Heritage Management Plan and ongoing cultural mapping and heritage surveys as outlined above.

Toro has provided funding for an independent radiation specialist (selected by the Traditional Owners) to advise the Traditional Owners on aspects of radiation management under Toro’s current agreement to enable them to make an informed decision regarding the Project. The Traditional Owners have provided comments to Toro on radiation issues through their representative body Central Desert Native Title Services.

Toro is committed to undertaking further bush tucker surveys, radiation and environmental monitoring with the involvement of the Traditional Owners as part of our ongoing environmental monitoring programmes.
The submitter requested further mapping information to identify all registered cultural heritage sites on their respective tenements, exclusion areas and the complete disturbance boundary (ERMP Part 2. pp. 14-47 and 14-48).

**Submission: 48**

**Response:**

Figure 14 shows the areas of disturbance and registered cultural heritage sites that may be impacted by execution of the Project. The infrastructure alignment and project configuration (including the exclusion zone) have been agreed with the Traditional Owners as part of the mining agreement negotiations.

Table 14 lists heritage reports held by the WA DIA for the registered sites that may be impacted by execution of the Project.

<table>
<thead>
<tr>
<th>Site ID</th>
<th>Site Name</th>
<th>Site Type</th>
<th>Project Area Tenement</th>
<th>Heritage Report (Refer to legend below)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>Wiluna South 1</td>
<td>Artefacts/Scatter</td>
<td>L53/150</td>
<td>1, 2, 3, 4</td>
</tr>
<tr>
<td>2010</td>
<td>Wiluna South 2</td>
<td>Artefacts/Scatter</td>
<td>L53/150</td>
<td>1, 2, 3, 4</td>
</tr>
<tr>
<td>2149</td>
<td>Tjilla</td>
<td>Mythological</td>
<td>L53/150</td>
<td>5, 6, 7, 8</td>
</tr>
<tr>
<td>19361</td>
<td>Butchers Well</td>
<td>Ceremonial, Mythological</td>
<td>L53/150</td>
<td>No reports available on this site</td>
</tr>
<tr>
<td>2611</td>
<td>Uramurdah Claypan</td>
<td>Mythological, Artefacts/Scatter</td>
<td>E53/1132</td>
<td>2, 3, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18</td>
</tr>
<tr>
<td>2614</td>
<td>Area D</td>
<td>Artefacts/Scatter</td>
<td>E53/1132</td>
<td>3, 11, 14, 17, 18</td>
</tr>
<tr>
<td>2616</td>
<td>Contemporary Artefacts</td>
<td>Artefacts/Scatter</td>
<td>E53/1132</td>
<td>2, 3, 9, 11, 14, 16, 17</td>
</tr>
<tr>
<td>2701</td>
<td>Yuruwari</td>
<td>Ceremonial/Mythological</td>
<td>E53/1132</td>
<td>9, 10, 11, 13, 15, 16, 17, 18, 19</td>
</tr>
<tr>
<td>2440</td>
<td>Lake Way 5</td>
<td>Artefacts/Scatter</td>
<td>M53/113; P53/1355</td>
<td>3, 4, 8, 11, 17, 19, 20, 21, 22</td>
</tr>
<tr>
<td>2441</td>
<td>Lake Way 6</td>
<td>Artefacts/Scatter</td>
<td>M53/113; P53/1396</td>
<td>3, 8, 11, 19, 20, 21, 22</td>
</tr>
<tr>
<td>2617</td>
<td>Yapukarumpi</td>
<td>Mythological</td>
<td>E53/1287; P53/1355; P53/1372; P53/1373; M53/113; M53/147; M53/796</td>
<td>3, 4, 8, 11, 16, 19, 20, 22, 23, 24</td>
</tr>
<tr>
<td>2434</td>
<td>Lake Way Find 1</td>
<td>Artefacts/Scatter</td>
<td>M53/113</td>
<td>4, 8, 11, 19, 22</td>
</tr>
<tr>
<td>2345</td>
<td>Lake Way Find 2</td>
<td>Artefacts/Scatter</td>
<td>M53/224</td>
<td>3, 4, 8, 11, 17, 18, 19, 22</td>
</tr>
</tbody>
</table>

Table 14: HERITAGE SURVEY REPORTS HELD BY WA DEPARTMENT OF INDIGENOUS AFFAIRS
Legend for Heritage Survey reports listed in Table 14.

<table>
<thead>
<tr>
<th></th>
<th>Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Report of an Archaeological Survey of Wiluna Mine Site and Lake Way Pipeline, South of Wiluna, Western Australia. – Veth, P.</td>
</tr>
<tr>
<td>4.</td>
<td>Report of the Survey for Aboriginal Sites at the Asarco (Aust.) Pty Ltd Gold Exploration Lease, Wiluna. – O’Connor, R</td>
</tr>
<tr>
<td>5.</td>
<td>Desktop Aboriginal Heritage Survey for proposed Telstra optic fibre route from Meekatharra to Wiluna, to Leinster, Western Australia. – Goode, B.</td>
</tr>
<tr>
<td>6.</td>
<td>Proposed Goldfields Gas Transmission Pty Ltd Pipeline Route and Topographical Features. – Goldfields Gas Transmission Pty Ltd.</td>
</tr>
<tr>
<td>7.</td>
<td>A site avoidance field survey report of the proposed Leinster to Wiluna optic fibre route, Gascoyne District, Western Australia. – Goode, B.</td>
</tr>
<tr>
<td>8.</td>
<td>Report on a survey for Aboriginal sites at Honeymoon Well Prospect near Wiluna. – O’Connor, R.</td>
</tr>
<tr>
<td>11.</td>
<td>A survey for Aboriginal sites near Lake Way, Wiluna, Western Australia. – Bindon, P.</td>
</tr>
<tr>
<td>12.</td>
<td>Report on the survey for Aboriginal sites at the Chevron Exploration Corporation Project, Wiluna, WA. – O’Connor, R.</td>
</tr>
<tr>
<td>17.</td>
<td>Report on a preliminary investigation for Aboriginal Sites, Uramurdah and Lake Way Project areas near Wiluna. - Quartermaine, G.</td>
</tr>
<tr>
<td>19.</td>
<td>Survey for Aboriginal sites: Lake Way, South Wiluna, Western Australia. – Kirkby, I.</td>
</tr>
<tr>
<td>20.</td>
<td>Report of an ethnographic and archaeological survey at the Red Lady Project, Lake Way near Wiluna, Western Australia. – Moore, P.</td>
</tr>
<tr>
<td>21.</td>
<td>A report on a Field Trip to Area North of Meekatharra, August 1975 – Layton, R.</td>
</tr>
<tr>
<td>22.</td>
<td>Report on an archaeological survey for Aboriginal sites, Honeymoon Well Project, Wiluna. – Quartermaine, G.</td>
</tr>
<tr>
<td>24.</td>
<td>Report on further archaeological investigations for Aboriginal sites, Wedgetail Project infrastructure, Honeymoon Wel Project Area, Wiluna. – Quartermain, G.</td>
</tr>
</tbody>
</table>
Figure 13: AREA OF EXCLUSION AT LAKE WAY FOR CULTURAL HERITAGE REASONS
Figure 14: DIA SITES THAT MAY BE IMPACTED BY EXECUTION OF THE PROJECT
5.10 Other Issues

5.10.1 Climate

Issue:

*It was questioned whether the reference to ‘actual areal evapotranspiration’ (ERMP Part 1 p 4-1) should be to ‘areal potential evapotranspiration.’*

Submission: 32

Response:

The reference should have been to the areal potential evapotranspiration (APET). The actual areal evapotranspiration (AAET) (200-300 mm/yr) cannot by definition exceed the mean annual rainfall of ~255 mm/yr. APET for the Wiluna area is approximately 1,400mm/yr.

5.10.2 Energy and Greenhouse

Issue:

*It was claimed that the Project was very energy intensive, with a requirement of 3 terajoules a day or 15 330 terajoules over a 14 year life.*

Submission: 34, 43

Response:

Compared to other energy sources, uranium production has low energy intensity per tonne of material produced. At annual UO$_4$ production of 800 tonnes, each tonne would require approximately 1 TJ of energy, or 280,000 kW/hr. The energy yield from 1 kg of uranium dioxide would be 360,000 kW/hour (or 1.3TJ), or approximately 110 times as much energy as was required for the fuel’s production.

The 3 TJ per day of energy estimated to be needed for the Wiluna Project is an upper level estimate, with final usage expected to be closer to 2 TJ per day (for both power and heating). Accordingly, total annual energy demand would be in the order of 700 to 800 TJ.

Issue:

*Toro was asked to provide estimates of annual greenhouse gas emissions from the proposal.*

Submission: 32, 34, 44

Response:

Annual greenhouse gas emission estimates for the life of the mine are 80,000 tonne CO$_2$e averaged over the life of the Project and using natural gas as the primary fuel.

Issue:

*Criticism was expressed of the analysis of potential greenhouse gas emissions based on omission, referencing, analysis and interpretation of information.*
**Submission: 32**

Response:

The annual average tonnes of CO$_2$-e to be emitted by the Project annually is estimated at 80,000 tonnes. Based on annual production of 800 tonnes of U$_3$O$_8$, the unit emission would be approximately 78 tonnes CO$_2$-e/per tonne of U$_3$O$_8$.

**Issue:**

* Toro was asked to demonstrate that due consideration had been given to offsets to minimise greenhouse gas emissions.

**Submission: 44**

Response:

The Project would trigger the *National Greenhouse and Energy Reporting Act (2007)*, and be subject to the carbon tax legislation (*Clean Energy Future Act*) recently passed by the Federal Parliament. Toro would consider the most effective way to meet this obligation when it applies, including direct tax payment or offsets should they be an accepted mechanism under the Federal system.

**Issue:**

* Toro was asked to benchmark the emission intensity of the proposal against other uranium mining operations

**Submission: 44**

Response:

Recent greenhouse intensity data are available only from the Ranger mine. It shows that the Ranger mine has an emissions rate of ~ 23 tonnes CO$_2$-e per tonne of product, compared with an estimated ~78 tonnes CO$_2$-e per tonne of product for the Wiluna Project.

The Wiluna Project is significantly influenced by the amount of energy required for leach heating, which is not undertaken at the Ranger operation. The Ranger data is only for the year 2010 when mining was significantly reduced, while the Wiluna Project’s is averaged over 11 years of full operation.

**Issue:**

* Toro was asked to make a distinction between how the Project would contribute to global greenhouse gas mitigation efforts and to domestic mitigation goals.

**Submission: 44**

Response:

As a consumer of energy, Toro would contribute to domestic mitigation goals through payment of the carbon tax recently approved by the Federal Parliament.
Issue:

It was pointed out that when setting conditions for the proposal that relate to greenhouse gas emissions, the Project may not be liable to report under the National Greenhouse and Energy Reporting Act 2007 (NGER Act) and may be below the Commonwealth’s threshold for liable entities under the proposed national carbon pricing scheme.

Submission: 44

Response:

The Project is expected to trigger the NGER Act reporting thresholds based on both emissions and energy used. Consequently, Toro would be liable to both report and for the payment of a carbon tax under the proposed national carbon pricing scheme. The particular application of the scheme to the Project would depend on regulations and administrative rules determined by the Australian Government.

5.10.3 Noise and Vibration

Issue:

It was suggested that the noise levels of 133 and 127 dB(A) for the surface miners and CAT 777 haul-packs (ERMP Part 1, pp. 6-44 and 6-46) were high and if so, could pose issues from an occupational health perspective for the operators.

Submission: 7

Response:

The levels indicated for the surface miner and CAT 777 haul packs in the Environmental Noise Assessment Report are indicative numbers from a data set of similar equipment. The values used in the report demonstrate that potential environmental impacts from noise would be low.

Occupational health considerations would be addressed in detailed risk assessments, including those conducted during the detailed design stage. Occupational exposure levels would meet the requirements of the DMP.

Issue:

It was claimed that Toro proposed to engage in above ground extremely noisy scraping and cutting activity within 5.2 kilometres of the closest residents.

Submission: 39

Response:

The results of noise modelling (ERMP Part 1 p. 6-46) show that noise emissions would not result in exceedance of the Environmental Protection (Noise) Regulations 1997 at any sensitive premises. Toro would use the quietest practicable vehicles, plant and machinery equipment and if necessary, use noise reduction techniques.
5.10.4 Cumulative Impacts

Issue:

Questions were raised about cumulative impacts of Toro’s proposed operations. It was stated that Toro’s ERMP failed to provide information on cumulative impacts and that a study should consider existing mines in the region and any future plans by Toro and other project proponents including by Mega Uranium at Lake Maitland and BHP Billiton at Yeelirrie. Information was sought on the cumulative impacts of dewatering; creek diversions; dust depositions; potential groundwater contamination and on flora, vegetation, fauna and fauna habitat and subterranean fauna.

Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13, 14, 15, 19, 21, 23, 28, 29, 31, 34, 40

Response:

There are no expected regional scale impacts from the Wiluna Project and the combined footprints of the limited number of other mining projects in the region are small and localised in the context of the surrounding landscape. As such, cumulative impacts are minimal.

Toro is not able to comment on the regional cumulative impacts of uranium and other mining activities in the wider region, as the information required to prepare an objective discussion of this topic is not available. In particular, the Lake Maitland and Yeelirrie uranium deposits are not currently under development and no environmental impact assessments for the projects have been published.

For the Wiluna Project, no measured cumulative impacts were detected for surface water, groundwater abstraction and decontamination, subterranean fauna and dust deposition, as the possible impacts are all localised and not regional scale effects.

In relation to flora, vegetation, fauna and fauna habitat, the area of clearing for the Project is 1530 hectares. All of the land and ecosystems in the proposed clearing footprint are also represented in the surrounding area. There are no conservation significant species or ecosystems in the footprint and the proposed clearing would not increase the level to any vegetation or habitat units in the Project Area. Accordingly, the cumulative impact is determined to be minimal.

The proposed clearing would not increase the level of threat to any vegetation or habitat units in the Project Area.

5.10.5 Land Systems

Issue:

A ‘to scale’ plan was requested of the proposed landform changes associated with the mining areas including a before and after topographical map.

Submission: 39

Response:

Details of landform changes post mining would not be known until the mine planning has been completed. This would be included in the detailed engineering studies provided in the Mining Proposal to be submitted the DMP.
Issue:

It was claimed that the ERMP has not addressed the following studies:


Submission: 42

Response:

This study was considered in the ERMP and is referenced in Appendix E (p. 89 of soil survey report prepared by Outback Ecology).

5.10.6 Risk Assessment

Issue:

It was claimed that ‘the risks as identified in the ERMP are seriously understated.’

Submission: 11, 24, 31, 34

Response:

Toro does not agree with this statement. It has already undertaken a Risk Assessment programme that has identified and addressed all risks associated with the Project. Toro would continue this programme which is held in a Project risk register. Appropriate actions to mitigate each of the identified risks to As Low as Reasonably Achievable are identified in this programme, consistent with Best Practice.

5.10.7 Health

Issue:

It was pointed out that all wastewater treatment systems (e.g. septic tanks) in the Project Area require approval from the Executive Director, Public Health (WA) under the Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste Regulations 1974). Toro was advised that consideration needed to be given to the types of systems chosen and fulfilling maintenance requirements in remote areas. Wastewater treatment systems must be designed to adequately treat and dispose of wastewater from peak construction phase numbers. The disposal of sludge from wastewater treatment plants must be undertaken by a licensed contractor to an approved landfill or seepage disposal site. If reuse of wastewater is considered, including the use of recycled water to the processing circuit, an application for approval of a recycled water scheme is required. All applications require a Recycled Water Quality Management Plan as per the Guidelines for the Non-Potable Uses of Recycled Water in Western Australia (Department of Health 2011). All recycled water schemes must be approved by the Executive Director of Public Health prior to implementation.

Submission: 46
Response:

All waste water treatment and management systems would be designed and constructed to comply fully with WA Department of Health Guidelines and Regulations. Prior to construction and commissioning and commencement of operations, Toro is committed to seeking all the necessary approvals from Local and WA Government authorities for wastewater treatment and recycled water schemes in the Project Area.

Issue:

*It was stated that the ERMP did not address health requirements for the supply of potable drinking water for the proposed accommodation village and mine site. Toro would be required to ensure that the Project has a safe drinking water supply and that the Project operations did not adversely affect groundwater sources for adjacent water supplies such as for the Wiluna township.* Toro would be required to comply with the following:

- Australian Drinking Water Guidelines 2004;
- Establish a Drinking Water Quality Management Plan;
- Establish drinking water quality monitoring as per Small Community Sampling Grid;
- Establish system compliance and reporting protocols as per the Systems Compliance and Routine Reporting Requirements for Minesites and Exploration Camps Manual; and
- Ensure that non-potable water activities such as dust suppression did not affect drinking water supplies.

Submission: 46

Response:

Toro would ensure that the drinking water supply for the proposed accommodation village complied with the standards required by Commonwealth, State and Local Government regulations and standards (for example, Australian Drinking Water Guidelines 2004). Toro would comply with all legislative and regulatory requirements and guidelines relating to the supply and use of drinking water in the Project Area, and develop a Drinking Water Quality Management Plan to include requirements for water quality monitoring and compliance reporting.

Issue:

*It was stated that the ERMP did not address mosquito management issues and that Toro should ensure:*

- Changes to topography resulting from earthworks (e.g. the installation of pipelines and infrastructure) do not allow run-off to create surface ponding;
- Constructed water bodies (reservoirs, drainage ponds and swales, settling ponds, sewage ponds etc) are located, designed and maintained in a manner such that they do not create favourable mosquito breeding habitat, possibly requiring the regular monitoring and harvesting of invasive vegetation to prevent harbourage of mosquito larvae;
- Water tanks and other water-holding containers are sealed to prevent mosquito access and breeding and if this cannot be achieved, regular monitoring for mosquito larvae and treatment with larvicide as necessary;
- Location of the accommodation village as far away as possible from natural breeding sites of mosquitoes and biting midge with mosquito-proof design incorporated to minimise worker exposure to mosquito bites during high risk periods;
- Use of the Chironomid midge and mosquito risk assessment guide for constructed water bodies during the early stages of planning to ensure that the potential for on-site mosquito breeding in constructed water bodies such as evaporation ponds and water holding dams is minimised; and
• Liaison with the Shire of Wiluna (prior to finalising location of accommodation facilities and other areas where workers would spend considerable periods of time) to identify natural breeding sites in the vicinity of the proposed development with this infrastructure located as far away as possible from natural breeding sites of mosquitoes and biting midge

It was also recommended that any proposed accommodation village structures have mosquito-proof design incorporated into built-form plans (such as mosquito mesh on all doors and windows and the inclusion of an enclosed outdoor recreation area) to minimise worker exposure to mosquito bites during high risk periods.

Submission: 46

Response:

Toro would establish and maintain a Pest and Weed Management Plan that addressed the issue of potential disease carrying insects, including mosquitoes and other pests, both terrestrial and airborne.

Issue:

It was pointed out that any treatment and application of pesticides in the Project Area must be applied in accordance with the Health (Pesticides) Regulations 2011. It was further suggested that a Pest Management Plan be adopted to ensure that the use of pesticides is minimised in the control of pests including insects, weeds, vermin, and where appropriate, feral animals.

Submission: 46

Response:

Any pesticides or herbicides required for either pest or weed management would be stored, mixed and applied in accordance with the relevant WA Department of Health and Dangerous Goods regulations. A Pest and Weed Management Plan would be developed that set out the requirements and conditions governing the use of pesticides and herbicides. All persons involved in mixing and/or applying pesticides and herbicides would hold the necessary competencies.
6 COMMUNITY ISSUES AND CONSULTATION

6.1 Indigenous People

Issue

It was suggested that the community consultation had been undertaken in an ‘extremely cynical, calculated and culturally insensitive manner’. The submission stated on one occasion a planned consultation clashed with a funeral and related ‘sorry business’ and Toro used the lack of attendance due to the ‘sorry business’ against the local people when it came to debate about public interest in uranium mining.

Submission: 39

Response:

This submission is referring to a Public Information Day held at Wiluna on 18 August 2011 during the public review stage of the ERMP, which clashed unavoidably with a local community funeral. Toro acknowledges that holding the consultation at this time did not take account of other local community events. However, these were not known at the time when Public Information Days were advertised. Once arranged Toro was committed to hold this Public Information Day, consistent with our commitment to the public consultation process.

Toro provided a separate further consultation with Traditional Owners at Wiluna on 3 and 4 October 2011 to inform those people who may have been unable to attend the Information Day about the Project. This was undertaken within the public review period for the ERMP.

Toro would continue to discuss the Project with the Traditional Owners and Indigenous people in the Wiluna community.

Issue:

It was stated that the nuclear industry imposed an unfair burden on Indigenous communities and that Aboriginal people would bear the brunt in health costs of any failure to adequately maintain radioactive tailings structures created by the Wiluna Project, requiring the impact of the Project and similar projects in the region on widely dispersed aboriginal communities to be taken into account with specific regard to the long term security and maintenance of tailings dams.

Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 13, 14, 15, 21, 24, 28, 42

Response:

Since securing the Centipede and Lake Way deposits in 2007, Toro has consulted with Aboriginal people about a range of issues including establishing an agreement to deal with any impacts on cultural heritage during the early stages of the Project, and a Memorandum of Understanding to facilitate consultation on radiation management and cultural management issues and Project impacts.

The Traditional Owners have sought independent information to allow them to make their own informed decision about the Project. Toro has facilitated this process in a respectful manner.
The environmental impact assessment and modelling of radiation exposure risk to the local community estimates that the highest public dose from current background sources is at the Apex mine camp at 0.047 mSv/year and the average public dose across the Wiluna community is 0.022 mSv/year. The closest Aboriginal community of Nganganawili is estimated at 0.034 mSv/year (ERMP Part 1, Table 80 p 6-31). All these doses are well within the safe public dose limit of 1 mSv/year and the risk is equivalent for both non-Indigenous and Indigenous communities in the region.

Toro would continue to discuss a mining agreement with Traditional Owners to deal with construction, operational, closure and rehabilitation phases of the Project.

**Issue:**

Toro’s commitment to provide benefits to Traditional Owners was questioned in light of the alleged failure of mining projects elsewhere in the Northern Goldfields or of the Ranger uranium mine to deliver such benefits. It was further suggested that the uranium industry has a track record of ignoring the concerns of Traditional Owners by adopting divide and rule tactics, ‘humbugging’ traditional owners and providing Traditional Owners with inadequate or misleading information.

**Submission: 12, 29**

**Response:**

Through the negotiation of a mining agreement with Traditional Owners, Toro proposes to establish a trust or similar arrangement by which it can provide benefits to Traditional Owners over the life of the Project.

To date, Toro has recruited five young Aboriginal men for work in the Project Area. During construction and operation of the Project, Toro would provide further training, employment and business development opportunities for Aboriginal people. It would also include arrangements for continuing consultation with Traditional Owners through all phases of the Project in its mining agreement. This is in keeping with previous arrangements made by Toro to provide funding to Traditional Owners so that they could secure their own independent advice about impacts of the Project.

Toro makes no judgment on the performance of other companies other than to note that 15 per cent of the workforce employed at the Ranger mine are Aboriginal people.

**Issue:**

It was recommended that Toro should work with Native Title claimants to apply their Indigenous Ecological Knowledge in:

- Track based monitoring in reporting mechanisms where any fauna monitoring is to be undertaken within and adjacent to the Project Area;
- All flora mapping surveys including repeat monitoring of areas deemed to be culturally important flora sites;
- Seed collection;
- The planning of any burning and fire management activities within and adjacent to the Project Area;
- Water mapping, management and monitoring;
• Determining environmental changes not measurable under current legislative and regulatory compliance practices; and
• Providing Toro with strong anecdotal knowledge of contemporary measures for determining stasis in the local Wiluna environment.

**Submission: 33**

**Response:**

Toro would continue to discuss the application of Indigenous Ecological Knowledge with the Native Title claimants. This includes involvement of Traditional Owners in environmental and radiation monitoring as part of the negotiation of a mining agreement.

**Issue:**

Concerns were raised that Toro had not properly consulted with Traditional Owners about vegetation species used by them for food, medicinal and cultural purposes (ERMP Part 2. p. 3-10).

In particular, reference was made to the potential significant cultural impact on the species Hrigiakea francisiana, identified by Traditional Owners for its use in the manufacture of shields, woomeras, boomerangs or carrying trays, with the submitter suggesting that the only way to avoid the impact was for the Project not to proceed (ERMP Part 2. p. 3-15).

**Submission: 39**

**Response:**

In addition to the surveys Toro has conducted with Traditional Owners to identify plants of importance to them for these purposes, Toro would continue to consult with Traditional Owners to ensure their continuing access to vegetation species for cultural purposes should the Project proceed. Wherever possible during the Project implementation stage, Toro would seek to avoid mature trees of cultural significance to them.

**Issue:**

Clarification was sought about whether local Aboriginal people had been consulted about ingestion of fauna and the extent of collection and analysis of fauna.

**Submission: 48**

**Response:**

There has been regular consultation with Traditional Owners in the Wiluna area about the potential impacts of the Project on ‘bush tucker’ including the ingestion of fauna. As well as conducting its own consultation process, Toro provided funds to the Traditional Owners through their representative body to enable them to get their own advice on radiation issues, including impacts on ‘bush tucker’.
6.2 Wiluna Community

Issue:

Despite existing mining activity in the Wiluna area, it was suggested that the town would still suffer from social impacts from a uranium mine. Toro was also asked to establish a communication process that would lead to a lasting legacy to the Wiluna community in particular.

Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13, 14, 15, 16, 19, 21, 23, 25, 29, 31, 34, 40

Response:

The following potential benefits as a result of a growing local population based on increased mining activity were identified in the ERMP Part 1 (Section 7.4):

- Employment and business opportunities with an increased market for local goods and services;
- Increased opportunities for training and skills development;
- Integration of community and industry infrastructure needs;
- Greater viability for recreational and leisure facilities; and
- Opportunity to recruit workers who would add to the diversity of the community, particularly those possessing skills that can be used in community building capacity – eg. volunteers for sporting and community groups and professional partners of mine employees.

Toro would take the following actions to minimise any adverse impacts from the Project and maximise the benefits to the local community:

- Close consultation and collaboration with other mining companies, government and the Wiluna Shire in infrastructure and service delivery planning and development;
- Consider establishing some housing in Wiluna for operations’ management;
- Support the Shire of Wiluna Strategic Plan – and as an adjunct to the Plan, establish a Community and Economic Development Plan to guide and manage community and workforce integration in consultation with the Shire and through the Wiluna Regional Partnership Agreement;
- Provide opportunities for local businesses to tender for supply and service contracts;
- Encourage fly-in, fly-out employees and contractors to make use of local recreational services and negotiate with the Shire a shared services agreement;
- Negotiate a shared services agreement with Nganganawili Aboriginal Health Service, including for the provision of workforce health monitoring;
- Within the Wiluna Regional Partnership Agreement, continuing support for capacity building to the Martu Coordinator and Martu representatives;
- Recruitment of operational workforce to focus on local and regional residents, young couples and older couples with children no longer living at home who would be prepared to live in Wiluna;
- Implement recruitment and human resource practices to enable flexibility to accommodate Aboriginal culture;
- Provide cross cultural awareness training for all employees;
- Provide support for sustainable community development through negotiation of a mining agreement with Native Title claimants; and
- Establish a community office in Wiluna to ensure that Project information is readily available and to permit on-going engagement between the company and the community.
**Issue:**

*It was suggested that the Project could ‘irreversibly radioactively contaminate’ the Wiluna town water supply.*

**Submission:** 28

**Response:**

The Wiluna town water supply is up gradient of Toro’s mining and processing areas and not connected hydraulically. There is no plausible scenario under which groundwater from the vicinity of Toro’s operations could flow towards the town water supply.

### 6.3 Local and Regional Economic Benefits

**Issue:**

*Toro was asked to arrange briefings for business and the wider community as a means of identifying mutual opportunities and to establish a process where regional businesses can register expressions of interest, tender or quote on supplies and service needs of the operation.*

**Submission:** 16

**Response:**

Toro has undertaken briefings for local and regional communities and businesses to provide information on the progress of the Project and the benefits and opportunities that may arise from its implementation. This has included Project briefings in Wiluna, Leonora, Menzies and Kalgoorlie. Toro would continue with similar briefings to ensure the community is aware for future opportunities.

To date Toro has made extensive use of local contractors for site works during the site investigation and exploration phases of the Project. The local contractors engaged include Desert Enterprises, Goodwork Holdings, Apex Gold, Wiluna Wild and Colin Gordon Constructions. Toro is committed to sourcing local and regional labour and contractors to the extent that they are available and it is economic to do so (ERMP Part 1 p 7-17). There would be a range of local and regional contracting opportunities during the construction, operational, closure and rehabilitation phases of the Project including site works, civil construction, supply of materials, transport and logistics, catering, road maintenance, laundry and cleaning services.

Toro would implement a Community and Stakeholder Consultation Programme, which would provide regular information and updates on the Project. Some information about the Programme is provided in the ERMP Part 1 p3-17. Toro would also establish a supply function within the company which would make local and regional businesses aware on a regular basis of contract opportunities associated with the construction and operation of the Project and enable them to register Expressions of Interest subject to meeting certain acceptance criteria, and they would be invited to bid for Project work either as primary contractors or sub-contractors.

**Issue:**

*It was indicated that there are contradictory statements in the ERMP about the jobs impact of the Project because of a statement in ERMP Appendix D that the Project would involve ‘a relatively small workforce’ with two 12 hour shifts daily, each with 20 workers.*
Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 13, 14, 15, 19, 21, 23, 31, 34

Response:

The reference in the ERMP Appendix D is to the number of equipment operators in the mine on a single shift. It does not include other service workers involved in the mining operations including supervisors, geologists and environmental and safety officers. Nor does it include personnel working in other areas of the operation including the processing plant and infrastructure.

As stated in the ERMP Part 1. (p 2-34), approximately 165 employees and contractors would be required during the operational phase of the Project. The construction phase would require a workforce peaking at 350.

Issue:

It was suggested that most workers would be on fly-in, fly-out employment arrangements, so that local employment would not be supported.

Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 13, 14, 25

Response:

As stated in the ERMP Part 1. p 7-16 Toro would be sourcing labour and contractors locally and regionally to the extent they are available and it is economic to do so. It would also continue its current support for job readiness and other initiatives to maximise such opportunities.

Toro would have an operational recruitment focus on young people and older couples with children no longer living at home who may be prepared to live in Wiluna. The establishment of some new housing for operations’ management in Wiluna would also be considered.

Toro has completed a pilot indigenous training and employment programme involving recruitment from Wiluna. In seeking a mining agreement with Traditional Owners, Toro has indicated it would be prepared to include specific provisions relating to training, employment and business development.

Issue:

It was stated that the Australian uranium mining industry only employed about 1,200 people, 0.02 per cent of national employment, raising questions about whether the environmental impact of the industry was justified by such low employment generation. It was also stated that mining overall was capital intensive and was only nineteenth out of the top 20 industries by employment in Australia.

Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 13, 14, 15, 19, 21, 23, 29, 31, 34

Response:

The current operational uranium mines in Australia directly employ about 4,200 people, mostly in remote areas where there are few other employment opportunities (Australia’s Uranium Industry – Australian Government Department of Resources, Energy and Tourism, February 2011). Uranium mining also generates significant revenues through royalty payments to the South Australian and Northern Territory governments, as well as company taxes paid to the Federal Government.

It has been estimated that uranium mining in Western Australia could earn $460 million in State revenue by 2030 and boost the State’s economic growth by $3.2 billion over the same period. (Uranium Mining in Western
Australia, Australian Uranium Association – March 2011). The Wiluna Uranium Project would contribute to this forecast economic growth and continuing expansion of the Australian resources sector, generating export income, increased royalty payments and other government revenues and jobs.

**Issue:**

*It was suggested that the benefits to the community and to the economy are ‘grossly overstated’ in the ERMP.*

**Submission: 11**

**Response:**

Toro has taken a conservative view in its assessment of employment and other benefits of the Wiluna Uranium Project. One of the main benefits to the local community would be delivered through a mining agreement with Traditional Owners, which is currently being negotiated. Toro has committed to providing benefits through a trust or similar structure.

**Issue:**

*The ERMP was criticised for not clearly identifying the Nganganawili community, which is located 5.2 kilometres from the Lake Way mining area and the Bondini community, in a map showing the Project location (ERMP Part 2, p. 1-4)*

**Submission: 39**

**Response:**

The purpose of the map referred to above was to show the proximity of the Project to the Wiluna township.

The Nganganawili and Bondini communities have been recognised in work to measure potential impacts of the Project, for example air quality (ERMP Part 1. pp. 6-2, 6-15, 6-16, 6-19); Radiation (ERMP Part 1 p. 6-31); and Noise (ERMP Part 1 pp. 6-45, 6-47, including map).

### 6.4 Consultation

**Issue:**

*Toro was criticised for funding ‘speaking tours to Australia by fringe scientists who argue that low level radiation is beneficial to human health’ while the company has done nothing to promote the ‘overwhelming weight of scientific opinion that there is no threshold below which radiation is harmless or beneficial’. In support of this contention, the submitters referred to a statement by nuclear radiologist, Dr Peter Karamoskos, that ‘to promote such marginal views without any counter-balance is self-serving and irresponsible.’*

**Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 13, 14, 15, 21, 23, 32, 34**

**Response:**

Toro respects that there are a range of views about uranium mining and the impacts of radiation and has sought to encourage the communication of information and open debate about issues of interest to the community. Toro continues to promote open, objective and factual debate on issues relevant to uranium mining in Western Australia based on sound scientific evidence, to enable the public to be informed on all aspects of the uranium mining process. This includes supporting conferences, academics and research organisations that specialise in...
radiation health. Where Toro considers it necessary, it would respond publicly to allegations about uranium mining which may misinform the community.

**Issue**

*It was suggested that Toro had not offered to undertake any voluntary external reporting of Project impacts (ERMP Part 2. p 2.12).*

**Submission: 39**

**Response:**

Toro would conduct a Community and Stakeholder Consultation Programme, which would communicate information about Project performance and impacts via extensive on-going consultation with the local community (ERMP Part 1. pp. 3-17 and 3-18). Toro would also provide an annual report on its web site on operational, environmental and social performance.
7 ISSUES OUTSIDE THE SCOPE OF THE ERMP

Out of Scope Issues

The following issues have not been addressed in the Response to Submissions because they are out-of-scope of the ESD and the ERMP:

- nuclear power industry;
- high level radioactive waste management produced by nuclear reactors;
- nuclear weapons proliferation; and
- international policies, treaties and conventions.

Where Toro has a viewpoint on any out-of-scope issues, these have been identified and are discussed on Toro’s website (Toro 2011b).

Issue:

It was suggested that uranium exported from Wiluna would ‘at worst’ end up as fissile material used in nuclear weapons. The effectiveness of safeguards against diversion to military applications was also questioned.

Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13, 14, 15, 19, 21, 23, 25, 28, 29, 31, 34, 35, 38, 40

Issue:

It was claimed that Toro should have considered depleted uranium (DU) in its ERMP because it has become ‘a component of munitions that can penetrate just about anything.’

Submission: 28

Issue:

It was claimed that uranium exported from Wiluna would ‘at best’ end up as high-level nuclear waste because no country had a repository for such waste ‘let alone a better solution’ than to dump it. Toro’s statement (Toro letter to shareholders, 6 June 2011) that the company plays an active role in work by Australian companies through the Australian Uranium Association to develop a global stewardship network for uranium was questioned, with the suggestion that an outcome of this work could be a renewed push to establish an international high-level nuclear waste repository in Western Australia.

Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13, 14, 15, 19, 21, 23, 25, 28, 29

Issue:

It was suggested that uranium exported from Wiluna could end up in a nuclear disaster such as that unfolding in Fukushima.

Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13, 14, 15, 19, 21, 23, 25, 28, 29, 31, 35, 38, 40

Issue:

It was claimed that radiation from the Chernobyl disaster in 1986 significantly exceeded that of a 20 kilotonne nuclear explosion and more correctly equates to the radiation imposed by a nuclear war and the resultant suffering is on-going.
Submission: 39

Issue:

Information was requested on Toro’s potential customers including whether they were located in nuclear weapons states, in states blocking the Comprehensive Test Ban Treaty and the Fissile Material Cut-Off Treaty, were in undemocratic or repressive states or states that had not signed the Nuclear Non-Proliferation Treaty.

Submission: 34

Issue:

Toro was asked to state whether or not it has initiated discussions with potential customers in Japan despite the Japanese nuclear power industry’s well documented record of routine safety breaches and data falsification.

Submission: 29

Government Issues

There are also a number of issues identified that refer directly to the policies and processes of the WA Government. These issues are listed below and Toro refers these to the relevant Government department.

Issue:

It was suggested that the WA Government was pursuing uranium mining in Western Australia without public support and the Government was called on to reject Toro’s application to mine uranium at Wiluna. Some submitters referred to an opinion poll in four WA State seats in April 2011 which found 46 per cent of voters against uranium mining, and 34 per cent in favour with 20 per cent undecided.

Submission: 1, 2, 3, 4, 5, 6, 8, 9, 11, 13, 14, 15, 19, 21, 23, 29, 31, 34, 38

Issue:

The WA EPA was called upon to require more information from Toro before processing the company’s application and to initiate a full and independent inquiry into uranium mining. Reasons advanced for such an inquiry included the complexity of the Wiluna Uranium Project and the intense public interest in proposals for uranium mining in Western Australia.

Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13, 14, 15, 24, 28, 29, 31, 34, 38, 42

Issue:

It was suggested that because the WA Government was currently benchmarking uranium regulations with ‘world’s best practice’, it should require assessment of the global implications of Australian uranium mining as part of any uranium approval process.
Submission: 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13, 14, 15, 19, 21, 23, 24, 28, 31

Issue:

Because uranium mining would be a new industry for Western Australia, concerns were expressed that current government monitoring, regulations and compliance mechanisms to monitor and manage risks may not be adequate and it was argued that the Wiluna application ought to be rejected on these grounds. In this respect, reference was made to the statement in the recent report of the WA Auditor-General, Ensuring Compliance with Conditions in Mining, that conditions are being met.’ Reference was also made to other organisational and regulatory reviews including changes within the WA EPA and the WA DMP; a review by the WA EPA of mechanisms for protection of stygofauna; new mine closure plans.

Submission: 11, 28, 34, 40, 42

Issue:

Reference was made to a 2009 report Uranium Exploration: Safety, Environmental, Social and Regulatory Considerations’ by Nick Tsurikov of Calytrix Consulting with a request that the WA EPA determines which of the concerns expressed in the report about radiation management and standards in Western Australia have been satisfactorily addressed and which ones have not.

Submission: 34, 42

Issue:

It was suggested it may be more appropriate for the Wiluna Uranium Project to be bound by the Mining Act (WA), the Mines Safety and Inspection Regulations (WA) and associated guidelines administered by the WA DMP, and the WA Radiation Safety and Radiation Safety (Transport of Radioactive Substances) regulations administered by the Radiological Council rather than codes of practice administered by the Australian Radiation Protection and Nuclear Safety Agency.

Submission: 34

Issue:

Concern was expressed about the composition of an independent panel on uranium mining regulations established by the WA Government in 2010 and that its processes had been secretive with no public release of any of its findings.

Submission: 28, 34, 42

Issue:

It was claimed there is a lack of confidence in the ability of the WA Government to assess the dangers of radioactive waste relating to the Wiluna Uranium Project. This was based on alleged shortcomings in regulating waste in the vicinity of the Project.

Submission: 28
Issue:

It was suggested that a decision by the WA Government on the Wiluna Uranium Project should occur only after the Government has completed the current review of the mine securities/bond requirements and that as a serious nuclear incident could drain the pool of funds available from mining industry bonds, uranium should be treated as a special case with the WA EPA designing and imposing a specific bond reflective of full clean up costs and providing protection from liability for the duration of the radioactivity.

Submission: 42

Issue:

It was stated that if the Project was approved, Toro could export uranium to India.

Submission: 28
8 COMMITMENTS

This section lists the major commitments that Toro can make at this stage in the development of the Project. These commitments are recorded in the ERMP and the Response to Submissions and would be confirmed in the Environmental Management Strategies forming part of the Project’s overall environmental management framework.

Implicit in its assessment of the impacts and benefits of the Project is that Toro would comply with all legal obligations and its own policies.

The management measures Toro has proposed to meet its commitments would be further refined or amended as a result of improved practices or technological advances as contemplated by its environmental management framework.

All aspects of the Wiluna Project would be in line with best practice and comply with the WA DMP/EPA Guidelines for Preparing Mine Closure Plans, (June 2011).

Toro would carry appropriate liability insurances to cover claims should Toro become legally obliged to pay for losses arising from claims for bodily injury, property damage or clean-up costs caused by pollution conditions from transported product.

ABORIGINAL AND CULTURAL

- Toro would negotiate a mining agreement with Traditional Owners which would include commitments to cultural heritage protection; funding of community development projects; training, employment and business development; on-going consultation with Aboriginal people through the life of the Project; cross cultural awareness training for all employees and contractors.
- If Toro has to make application to the WA Government under Section 18 of the Aboriginal Heritage Act for disturbance of any registered cultural heritage site, Toro would ensure this was done in consultation with Traditional Owners and, where requested to do so, implement site salvaging work and any other reasonable mitigation measures.
- Toro would continue to discuss with Traditional Owners, the application of Indigenous Ecological Knowledge in environmental monitoring and management.
- Toro would undertake further bush tucker surveys, radiation and environmental monitoring with the involvement of the Traditional Owners as part of our ongoing environmental programmes.

WATER BALANCE AND GROUNDWATER

- Toro would continue periodic manual monitoring and sampling of groundwater in accordance with WA DoW hydrogeological reporting guidelines.
- Toro would prepare a Groundwater Management Plan to ensure protection of groundwater dependent vegetation prior to commissioning the West Creek borefield and commencing dewatering at Centipede and Lake Way mining areas.
- Toro would continue to enhance its understanding of local hydrogeological systems through a combination of monitoring and modelling during the operational life of the Project.
- Development of any additional source of water would be referred to the WA EPA if the proposed development had the potential to give rise to significant and environmental impacts as set out in the Environmental Impact Assessment Administrative Procedures (2010).
• Toro would commence dewatering at Lake Way deposit ahead of mining (in Year 3) and identify an additional water resource prior to commencement of operations.

• Toro would establish a comprehensive groundwater monitoring network at Centipede and Lake Way to include water quality monitoring holes located directly downstream of the mining areas.

• As indicated in the ERMP, additional sources of water would be identified for assessment prior to the commencement of the Project.

SURFACE WATER

• Toro is committed to constructing bunding and temporary diversions as required to enable mining to be undertaken at the same time as protecting the surface water drainage requirements.

MINE DEWATERING

• To minimise the amount of groundwater to be pumped to allow safe mining, water barriers would be constructed in advance of mining. Toro would use a compacted clay barrier to control water inflow during mining in all pits, depending on the suitability to the local geology. While trials have indicated that the compacted clay barrier is most effective in reducing water inflow, in some lithologies, such as shallow calcrete or where clay compaction is difficult to achieve, HDPE liners may be preferred. This will be determined prior to mining.

• Surplus water from pit dewatering would be directed to pit voids or temporary storage ponds within the mining footprint for use in ore processing or for other operational requirements, including dust suppression. Bunding for surface water management would seek to maximise water use for operational requirements. It would be only under the circumstances of extreme flooding that water would need to be discharged from site. In such circumstances, there would be a high dilution within a short distance. Discharge would only occur if the water complied with criteria to ensure there was no adverse environmental impact.

• Bunding, with appropriate freeboard, would be designed and constructed to accommodate at least the maximum 1 in 100 year rainfall event.

MINE CLOSURE, TAILINGS AND REHABILITATION

• Toro’s approach is to minimise environmental impacts during its management of materials, including process residues.

• Concentrations of uranium and other trace elements in groundwater beyond the perimeter of the proposed disturbance footprint would not exceed the range of concentrations in the pre-mining environment.

• Toro would seek to minimise land disturbance and undertake progressive rehabilitation of disturbed areas to limit exposures to dust.

• Toro would cover each tailings cell with inert rock to a planned depth of two metres. Mineralised wastes from the Centipede and Lake Way deposits would be placed below natural ground level.

• The Tailings Storage Facility would not be used for water disposal.

• Disturbed areas would be re-contoured to blend in with the surrounding landscape. The form, soil and vegetation types used in rehabilitation design would, as closely as practicable, mimic the pre-mining landscape.

• No large or high waste landforms or open pits would remain after mining with all disturbed areas being returned, as close as practicable, to the original topography.
• Toro would submit a revised and more detailed version of its closure plan with its Mining Proposal to the WA DMP.
• After closure, Toro would ensure that radiation levels in the areas of its operations were consistent with pre-mining levels.
• Toro would review its closure liability annually and undertake a review of the Mine Closure and Rehabilitation Plan, with the outcomes submitted to the DMP every three years.
• In the event of unplanned closure Toro would implement relevant components of its mine closure plan. Short-term actions following any business interruption expected to last longer than six months would include a review of site security procedures to prevent unauthorised access to site; a review and reconciliation of rehabilitation provisioning; updating the site materials inventory; audits of site drainage, containment systems and rehabilitation works. Following consultation with relevant government agencies and other stakeholders, Toro would either move to a care and maintenance programme or commence implementation of its closure plan.
• Toro would minimise the amount of contaminated material deposited within pits on site after closure.

RADIATION

• Toro would comply with internationally accepted radiation limits for workers and the public and would set a goal of maintaining doses at less than 50 per cent of the current internationally accepted limit for workers.
• Toro would continue to undertake dust monitoring to demonstrate current conditions and potential operational impacts.
• Toro would ensure that it supplies all required occupational dose information to the State Government and the National Radiation Dose Register.
• A Radiation Management Plan and a Radioactive Waste Management Plan would be developed for each stage of the Project and submitted to the relevant regulatory authorities for approval.

SUBTERRANEAN FAUNA

• Toro would establish a monitoring programme to include acceptable limits of change and triggers for specified management actions.
• Toro would use multispectral imagery to help identify and monitor water dependent ecosystems.
• Toro is committed to conducting further subterranean fauna survey work and risk assessments in relation to the Project impacts on the stygofauna and troglofauna species. Toro’s subterranean fauna monitoring and management plan for the Project would include the formulation and establishment of a monitoring programme and the results reported to the WA EPA.
• Toro would conduct further survey work to target similar habitats close to but outside the mining impact zone to further verify the existence of regional subterranean fauna habitats.

FLORA AND VEGETATION

• Toro would undertake progressive clearance of vegetation to allow fauna time to disperse to other areas. Habitat corridors and/or linkages would be retained where required so that fauna could move between remaining habitat patches. Progressive rehabilitation of disturbed areas would include direct return of top soil that had been pre-stripped and stockpiled.
• Toro would undertake further field surveys of Tecticornia to help resolve the taxonomy issues in the Lake Way region.
TRANSPORT

- Toro would transport all product by road to Adelaide for shipment from Port Adelaide or rail to Darwin for shipment from the Port of Darwin. Should alternative arrangements become available during the life of the mine, Toro would assess their applicability to the Project.
- Toro would consult with Main Roads Western Australia and other relevant government and emergency service authorities in further developing its Transport Management, Risk Management and Emergency Response Plans.
- Toro would consult with the Council of the City of Kalgoorlie - Boulder and other key stakeholders in the preparation of the Transport Management and Emergency Response Plans.
- Toro would continue to work with other uranium project proponents on a range of product transport issues, including emergency response.
- Toro would establish and coordinate training programmes with agencies likely to be involved in the transport of product to include radiation and emergency response training.
- Toro would complete a detailed risk analysis prior to the transport of any product from the Wiluna Project.

SOCIAL IMPACT

- Toro would source labour and contractors locally and regionally to the extent they are available and it is reasonably economic to do so.
- Toro would establish a supply function to make local and regional businesses aware of contract opportunities associated with the construction and operation of the Project and enable them to register Expressions of Interest subject to meeting certain acceptance criteria, and they would be invited to bid for Project work either as primary contractors or sub-contractors.
- In recruitment, Toro would indicate a preference for employees who may wish to live in Wiluna. While engaging a core group of managers and operators with experience in uranium mining and processing, it would also have a priority to train people interested in careers in the resources sector.
- Prior to the commencement of construction, Toro would appoint a Community Relations Manager to have responsibility for local and regional community consultation and engagement during the life of the Project. Toro would provide the opportunity for annual site visits by representatives of the Wiluna community, including Traditional Owners, and representatives of Non-Government Organisations.
- Toro would publish an annual report on its operational, environmental and social performance and have such a report externally audited every three years.
- Toro would maintain collaboration with other mining operations in the region through continuing active participation in the Wiluna Regional Partnership Agreement.
- Toro would continue to promote open, objective and scientific debate on issues relevant to uranium mining in Western Australia, to enable the public to be informed on all aspects of the process.
OTHER ACTIONS

- If necessary, Toro would install suitable deterrent devices, egress points and if necessary, fencing and or/netting to prevent fauna interaction with the PLS evaporation pond.
- Toro would seek to keep greenhouse gas emissions for the Project as low as practicable and would use natural gas instead of diesel as the primary source of fuel for site power generation (with diesel available for back-up). This would provide a saving of 208,000 tonnes of greenhouse gas, or 20 per cent, over the life of the Project.
- As a minimum, engineering studies including peer reviews, Australian Standard, HAZOP and HAZAN and design reviews would be undertaken during process plant design.
- Toro would develop a Drinking Water Quality Management Plan to include requirements for water quality monitoring and compliance reporting.
- Prior to construction, commissioning and commencement of operations, Toro would seek all necessary approvals from Local and WA Government authorities for wastewater treatment and recycled water schemes in the Project Area.
- Toro would establish and maintain a Pest and Weed Management Plan that addressed the issue of potential disease carrying insects, including mosquitoes and other pests, both terrestrial and airborne.
- Toro would design and construct the PLS pond in multiple independent cells each with its own leak detection and underdrainage systems. The cells would be sized so that the contents of one cell can be pumped into the remaining cells (in the event of a leak) whilst still maintaining adequate freeboard.
- Toro would construct a protective bund around the perimeter of the mine site, suitable to contain runoff from a 1 in 100 year rainfall event whilst maintaining adequate freeboard. Where necessary, wave protection measures would be constructed.
- Toro commits to implementing the Dust Management Strategy and developing a Health and Safety Management Plan for the operations which includes managing occupational exposure to dust for workers in mining accommodation.
- Toro commits to developing Emergency Response procedures in consultation with relevant authorities. Where necessary, local emergency crews would be provided with appropriate training and equipment.
### 9 ACRONYMS AND ABBREVIATIONS

#### 9.1 Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>AHA</td>
<td>Aboriginal Heritage Act 1972 (WA)</td>
</tr>
<tr>
<td>AHD</td>
<td>Australian Height Datum</td>
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<tr>
<td>ALARA</td>
<td>As Low as Reasonably Achievable</td>
</tr>
<tr>
<td>ANSTO</td>
<td>Australian Nuclear Science and Technology Organisation</td>
</tr>
<tr>
<td>ANZECC</td>
<td>Australian and New Zealand Environment Conservation Council</td>
</tr>
<tr>
<td>ARI</td>
<td>Average Recurrence Interval</td>
</tr>
<tr>
<td>ARMCANZ</td>
<td>Agriculture and Resource Management Council of Australia and New Zealand</td>
</tr>
<tr>
<td>ARPansa</td>
<td>Australian Radiation Protection and Nuclear Safety Agency</td>
</tr>
<tr>
<td>ASNO</td>
<td>Australian Safeguards and Non-Proliferation Office</td>
</tr>
<tr>
<td>CSIRO</td>
<td>Commonwealth Scientific and Industrial Research Organisation</td>
</tr>
<tr>
<td>DEC</td>
<td>Department of Environment and Conservation</td>
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<tr>
<td>DFS</td>
<td>Definitive Feasibility Study</td>
</tr>
<tr>
<td>DSEWPC</td>
<td>Department of Sustainability, Environment, Water, Population and Communities (Commonwealth)</td>
</tr>
<tr>
<td>DIA</td>
<td>Department of Indigenous Affairs</td>
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<tr>
<td>DMP</td>
<td>Department of Mines and Petroleum</td>
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<tr>
<td>DoW</td>
<td>Department of Water</td>
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<tr>
<td>EIS</td>
<td>Environmental Impact Statement</td>
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<td>EPA</td>
<td>Environmental Protection Authority</td>
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<tr>
<td>EP Act</td>
<td>Environmental Protection Act 1986</td>
</tr>
<tr>
<td>EPBC Act</td>
<td>Environment Protection and Biodiversity Conservation Act 1999</td>
</tr>
<tr>
<td>ERMP</td>
<td>Environmental Review and Management Programme</td>
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<tr>
<td>ESD</td>
<td>Environmental Scoping Document</td>
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<tr>
<td>HDPE</td>
<td>High Density Polyethylene</td>
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<tr>
<td>IAEA</td>
<td>International Atomic Energy Agency</td>
</tr>
<tr>
<td>ICRP</td>
<td>International Commission on Radiological Protection</td>
</tr>
<tr>
<td>IFD</td>
<td>Intensity-frequency-duration (rainfall data)</td>
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<tr>
<td>ISO</td>
<td>International Organisation for Standardisation</td>
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<tr>
<td>LGA</td>
<td>Local Government Area</td>
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<tr>
<td>LNG</td>
<td>Liquefied Natural Gas</td>
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<td>NORM</td>
<td>Naturally occurring radioactive material</td>
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<tr>
<td>OEPA</td>
<td>Office of the Environmental Protection Agency</td>
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<tr>
<td>PEC</td>
<td>Priority Ecological Community</td>
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<tr>
<td>pH</td>
<td>Degree of alkalinity/acidity</td>
</tr>
<tr>
<td>PLS</td>
<td>Pregnant liquor solution</td>
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<tr>
<td>RMP</td>
<td>Radiation Management Plan</td>
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<tr>
<td>RDP</td>
<td>Radon decay product</td>
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<tr>
<td>RWMP</td>
<td>Radioactive Waste Management Plan</td>
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<tr>
<td>SDU</td>
<td>Sodium diuranate</td>
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<tr>
<td>SRE</td>
<td>Short Range Endemic</td>
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<tr>
<td>TDS</td>
<td>Total Dissolved Solids</td>
</tr>
<tr>
<td>TEOM</td>
<td>Tapered Element Oscillating Microbalance</td>
</tr>
<tr>
<td>TSF</td>
<td>Tailings Storage Facility</td>
</tr>
<tr>
<td>TSP</td>
<td>Total Suspended Particulates</td>
</tr>
<tr>
<td>UNSCEAR</td>
<td>United Nations Scientific Committee on the Effects of Atomic Radiation</td>
</tr>
<tr>
<td>UOC</td>
<td>Uranium oxide concentrate</td>
</tr>
<tr>
<td>WA</td>
<td>Western Australia</td>
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<tr>
<td>WAM</td>
<td>WA Museum</td>
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### 9.2 Abbreviations

<table>
<thead>
<tr>
<th>Abbreviations</th>
<th>Description</th>
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<tbody>
<tr>
<td>Bq</td>
<td>Becquerel, a unit of radioactivity</td>
</tr>
<tr>
<td>Bq/m$^3$</td>
<td>Becquerels per cubic metre. A volumetric measure of radioactivity.</td>
</tr>
<tr>
<td>CO$_2$e</td>
<td>Carbon dioxide equivalent</td>
</tr>
<tr>
<td>db(A)</td>
<td>Decibel (Audio)</td>
</tr>
<tr>
<td>DNA</td>
<td>Deoxyribonucleic acid. The hereditary material in humans and almost all organisms</td>
</tr>
<tr>
<td>GDA</td>
<td>Geocentric Datum of Australia</td>
</tr>
<tr>
<td>GLpa</td>
<td>Gigalitres per year. One gigalitre is equal to 1,000,000,000 litres, or one million cubic metres.</td>
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<tr>
<td>Ha</td>
<td>Hectare</td>
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<tr>
<td>Kg</td>
<td>Kilogram</td>
</tr>
<tr>
<td>KL</td>
<td>Kilolitre</td>
</tr>
<tr>
<td>Km</td>
<td>Kilometre</td>
</tr>
<tr>
<td>kW/h</td>
<td>A unit of energy equal to 1,000 watt hours</td>
</tr>
<tr>
<td>M</td>
<td>Metre</td>
</tr>
<tr>
<td>MBCM</td>
<td>Million cubic metres</td>
</tr>
<tr>
<td>Mg</td>
<td>Milligram. One thousandth of a gram.</td>
</tr>
<tr>
<td>mg/L</td>
<td>Milligram per litre, approximately equivalent to one part per million</td>
</tr>
<tr>
<td>mm</td>
<td>Millimetres</td>
</tr>
<tr>
<td>mSv</td>
<td>Millisievert, a measure of radiation dose to tissue</td>
</tr>
<tr>
<td>Mtpa</td>
<td>Million tonnes per annum. Same as “million tonnes per year”.</td>
</tr>
<tr>
<td>MW</td>
<td>Megawatt (1,000,000 watts)</td>
</tr>
<tr>
<td>PM$_{10}$</td>
<td>Particulate matter having an equivalent aerodynamic diameter equal to or less than 10 micrometres (a micrometre is one millionth of a metre)</td>
</tr>
<tr>
<td>Ppm</td>
<td>Parts per million</td>
</tr>
<tr>
<td>RDP</td>
<td>Radon Daughter Products</td>
</tr>
<tr>
<td>TDS</td>
<td>Total dissolved solids: a measure of salinity</td>
</tr>
<tr>
<td>Tj</td>
<td>Terajoule</td>
</tr>
<tr>
<td>Tpa</td>
<td>Tonnes per annum</td>
</tr>
<tr>
<td>TSF</td>
<td>Tailings Storage Facility</td>
</tr>
<tr>
<td>μSv</td>
<td>Microsieverts – a measure of radiation dose to tissue</td>
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</tbody>
</table>
10 REFERENCES


11 APPENDICES

11.1 Appendix A: Groundwater and Water Supply Management

11.2 Appendix B: Details of Water Barriers and Dewatering Volumes

11.3 Appendix C: Mine Closure and Tailings

11.4 Appendix D: Radiation

11.5 Appendix E: Subterranean Fauna (Stygofauna)

11.6 Appendix F: Tecticornia