APPENDIX A

EIS GUIDELINES

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APPENDIX A1

Australian and South Australian Government Guidelines

GUIDELINES

For an ENVIRONMENTAL IMPACT STATEMENT on the proposed expansion of the Olympic Dam operations at Roxby Downs





GUIDELINES

For an ENVIRONMENTAL IMPACT STATEMENT on the proposed expansion of the Olympic Dam operations at Roxby Downs

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ISBN 0759000875 FIS 22489

January 2006

GUIDELINES FOR AN ENVIRONMENTAL IMPACT STATEMENT ON THE PROPOSED EXPANSION OF THE OLYMPIC DAM OPERATIONS AT ROXBY DOWNS

JANUARY 2006

FOREWORD

The Australian Minister for the Environment and Heritage and the South Australian Minister for Mineral Resources Development will be collaboratively assessing the environmental impacts of a proposed expansion of the existing WMC (Olympic Dam Corporation) Pty Ltd (the proponent and a member of the BHP Billiton Group) Olympic Dam mining operation. Olympic Dam is located approximately 570km north north-west of Adelaide in South Australia.

The proposed expansion would enable mining and processing at Olympic Dam within an extended Special Mining Lease boundary for a life of mine of approximately 70 years and a possible production rate over time of up to 1 million tonnes per annum (t/a) of copper and associated products.

Operations at Olympic Dam are regulated by the *Roxby Downs (Indenture Ratification) Act 1982*, which was ratified by the South Australian Parliament in 1982 and amended in 1996. The existing operation has Commonwealth and South Australian Government environmental approvals (with conditions) to produce up to 350,000 tpa of copper and associated products.

The assessment process commenced following a determination on 2 September 2005 by the Australian Minister for the Environment and Heritage that the proposed expansion was a controlled action under the provisions of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). In the referral document the proponent committed to the preparation of an Environmental Impact Statement (EIS) and on 8 November 2005 the Australian Minister for the Environment and Heritage determined that an EIS would be required for the proposal. An EIS is a document which describes to the Australian Government, the South Australian Government and the community what the proponent wants to do, what the environmental impacts will be and how the proponent plans to manage these impacts.

Under the provisions of the *Roxby Downs (Indenture Ratification) Act 1982* on 15 September 2005 the South Australian Minister for Mineral Resources Development made a declaration in the State Government Gazette that the proposed expansion of Olympic Dam would be a Major Development.

The purpose of environmental assessment is to identify potential impacts, examine proposed mitigating strategies and ensure, should the proposal proceed, that it does so in a well managed way. To meet these objectives, it is appropriate for the community to have input before governments make decisions.

The Australian and State Governments jointly prepared a Draft Guidelines/Issues Paper for the EIS and this was placed on public exhibition from 21 November to 16 December 2005. Issues in the submissions were considered in the development of these Guidelines. These Guidelines establish the matters that should be addressed in the proponent's EIS.

The EIS shall encompass those issues clearly related to the expansion of the existing Olympic Dam development and the potential impacts on the region. These issues include, among others, the construction operation and rehabilitation of the mine site and associated infrastructure, including power, water, gas, rail, airport and port, ore processing operations, the management of tailings and waste rock and transport of uranium within Australia for export. The scope of the assessment will not include broader issues relating to the use of exported uranium in the nuclear fuel cycle. Issues relating to the use of exported uranium in the nuclear fuel cycle are beyond the control of the proponent and it would be impractical for the proponent to address these issues in the EIS.

A further opportunity for public comment will occur when the completed EIS is released for comment. At that time, an advertisement will be placed in the Advertiser, Australian and relevant local newspapers to indicate where the EIS is available and the length of the public exhibition period, during which time written submissions can be made.

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1 INTRODUCTION

1.1 Background

The Olympic Dam mine deposit, located approximately 570 km NNW of Adelaide in South Australia, was discovered in 1975 by the exploration division of WMC Resources. A joint venture to facilitate development of the project was formed in 1979 between WMC (Olympic Dam Corporation) Pty Ltd and the BP Group. WMC (Olympic Dam Corporation) Pty Ltd purchased the partner's share in April 1993. WMC (Olympic Dam Corporation) Pty Ltd (the proponent) has recently become a member of the BHP Billiton Group.

Following environmental, social and cultural heritage studies documented within an Environmental Impact Statement (EIS) in 1982, mining at Olympic Dam commenced in 1988 at a production rate of 45,000 tonnes per annum (tpa) of copper plus associated products. Between 1989 and 1995 the production rates at Olympic Dam increased as a result of two optimisation programs. The first optimisation of the operation in 1992 saw the production rate increase to 66,000 tpa of copper plus associated products, the second in 1995 saw the production rate increase to 85,000 tpa of copper plus associated products.

A major expansion was investigated and approved through a second EIS in 1997 and this enabled production rates to be increased to the current levels of 220,000 tpa of copper plus associated products (being 4,000 tpa of uranium oxide, 80,000 ounces of gold and 800,000 ounces of silver).

An intensive drilling program has confirmed a very large ore body on the existing Olympic Dam Special Mining Lease (SML). The extent of this mineral resource has led the proponent to request a further expansion to the existing mining and processing approvals (see Section 3.2 for anticipated production rates).

The operation currently provides employment for approximately 1,130 staff and 550 contractors on site. The township of Roxby Downs, 16km south of the mine, was first occupied in 1987 and houses over 4,000 people.

Existing infrastructure associated with the current mining and processing operation include a series of groundwater bores in the Great Artesian Basin, water supply pipelines from these borefields to Olympic Dam, transmission lines from Port Augusta to Olympic Dam, an airport and construction camp at Olympic Dam Village, an on-site desalination plant and mine processing plant and associated infrastructure (including tailings retention systems, evaporation ponds, a quarry and waste handling facilities).

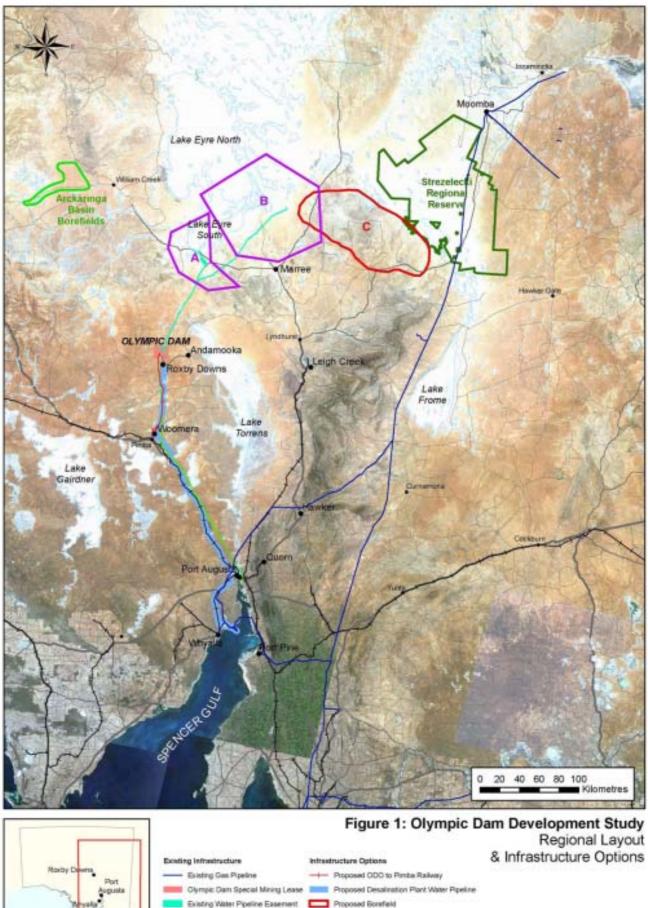
1.2 Proposed expansion

The proponent proposes to expand the existing Olympic Dam copper, uranium, gold and silver mine and processing plant, including all associated infrastructure. The project is in the planning phase, with several options for major infrastructure being investigated.

The principal components of the proposed expansion currently under investigation include (see Figures 1 and 2 for locations):

- the mining and processing of copper, uranium, gold and silver within an expanded boundary of the existing SML (this would allow for a possible increased annual production rate from the currently approved 350,000 tpa copper up to 1M tpa copper if required)
- sourcing and supplying additional water (via a water pipeline from one or more of various options including borefields within the Great Artesian Basin (GAB), a seawater desalination plant, local or regional saline aquifers)
- sourcing and supplying additional energy (via a transmission line from the existing State electricity grid or from an on-site gas fired power station supplied by a natural gas pipeline)
- construction, relocation or upgrades to transport infrastructure (including rail, road, airport and port)
- additional infrastructure and services associated with expanded accommodation needs at the Olympic Dam Village (i.e. the construction camp), Roxby Downs and potentially other local townships. This expansion is likely to require an expansion to the current Roxby Downs Municipal Lease.

Further details of the proposed expansion are provided in Section 3.



Existing Water Pipeline Easement Proposed Borefield Existing Powerline Easement Existing Borefields Data Source: DEH, WAIC Geoscience Australia ODA94 Production Date: August 2005

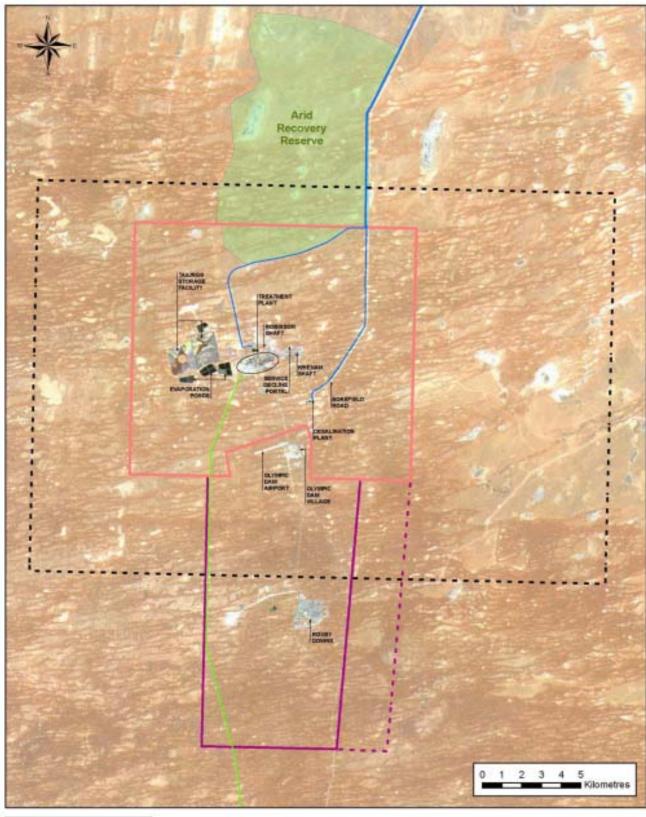




Figure 2: Olympic Dam Development Study Existing Operation

Olympic Dam Special Mining Lease

Rosity Downs Municipal Lease

"" Indicative Boundary of Expanded SML

" Indicative Boundary of Expanded Municipal Lease

Existing Borefield Water Pipeline

Data Source: Geoscience Australia Projection: 9DA94 Production Date: August 2005

2 ENVIRONMENTAL ASSESSMENT AND APPROVAL PROCESS

2.1 Background

The Roxby Downs (Indenture Ratification) Act 1982 (Indenture) which was ratified by the South Australian Parliament in 1982 and amended in 1996 sets the legal framework for the terms and conditions of operations at Olympic Dam. The existing operation has Australian and South Australian Government environmental approvals (with conditions) to produce up to 350,000 tpa of copper and associated products.

The proposed expansion requires assessment under both Australian and State processes. On 2 September 2005 the Australian Minister for the Environment and Heritage determined that the proposal was a controlled action under the provisions of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The controlling provisions under the EPBC Act are listed threatened species, migratory species, Ramsar wetlands, Commonwealth land and nuclear action. On 8 November 2005 the Australian Minister for the Environment and Heritage determined that an Environmental Impact Statement (EIS) would be required for the proposal.

Under the provisions of the Indenture the South Australian Minister for Mineral Resources Development is able to adopt the provisions of the South Australian *Development Act 1993* contained in Division 2 of Part 4 (the Major Developments or Projects process). The Minister for Mineral Resources Development adopts the role of the Major Developments Panel in developing the Issues Paper and Guidelines and is responsible for making a decision under the State process. The Australian Minister for the Environment and Heritage has determined that an EIS is required for the proposal. Under the Indenture, the Minister for Mineral Resources Development has also adopted this determination.

On 15 September 2005 the Minister for Mineral Resources Development made a declaration in the State Government Gazette that the proposed expansion of Olympic Dam would be a Major Development.

2.2 Collaborative environmental impact assessment process

As the proposed expansion triggers both Australian and State legislation, the environmental assessment of the expanded project will be conducted under a collaborative assessment process between the Australian and State Governments. The proponent shall produce a single EIS to meet the requirements of both the Australian and State Governments. It is therefore a requirement of the EIS that it identifies all Australian and State legislative Acts and Regulations relevant to the project, and obtains all relevant permits and licenses under these Acts and Regulations.

The key stages of the collaborative assessment process are as follows:

- referral under the EPBC Act submitted to Australian Department of the Environment and Heritage (Australian DEH)
- decision that the proposal is a controlled action under the EPBC Act
- decision on the assessment approach (level of assessment)
- project proposal submitted to South Australian Minister for Mineral Resources Development
- Draft Guidelines / Issues Paper placed on public exhibition (4 weeks), written submissions invited and compiled by State Government
- Australian and State Government prepare final Guidelines giving consideration to written submissions
- Guidelines finalised, provided to the proponent and made available to the public by way of advertisement
- the proponent prepares the Draft EIS document
- public exhibition of Draft EIS (8 weeks), written submissions invited, compiled by State Government and then provided to the proponent
- public meetings may be held at Roxby Downs, the Upper Spencer Gulf and Adelaide during the exhibition period to assist people in the preparation of their submissions
- the proponent prepares and lodges Supplementary EIS / Response Document to respond to public and Government submissions
- Government assessment of Supplementary EIS / Response Document and preparation of assessment reports for Australian and State Ministers
- Government decision on the proposal.

This document has been prepared to service both legislative requirements and to provide consistency for the assessment process. The Draft EIS required under the EPBC Act is the same document as the EIS required under the Development Act 1993. In this document reference to Draft EIS should be taken to also mean an EIS under the State process. Similarly, reference to a Supplementary EIS as required under the EPBC Act should be taken to also mean a Response Document under the State process as both documents serve the same purpose. It should be noted that the Final EIS under the EPBC Act comprises the Draft EIS and Supplementary EIS documents.

2.3 Purpose of Guidelines

The purpose of the Guidelines is to establish the matters that should be addressed in the proponent's EIS.

This document is not intended to address policy issues about the appropriateness of uranium mining or the broader issues relating to the use of exported uranium in the nuclear fuel cycle. Rather, it is intended to set the scope of environmental, social, cultural heritage and economic studies required in the EIS to allow for an assessment and decision on the appropriateness of an expansion to the existing Olympic Dam mining and processing operation.

2.4 Opportunities for public input

There are numerous opportunities for public input throughout the environmental impact assessment process.

The following are statutory requirements for public input:

- when the Project EPBC Act Referral was lodged on 15 August to the Australian Department of the Environment and Heritage (Australian DEH) and placed on the Australian DEH web site
- during the four week public exhibition period of the Draft Guidelines/Issues Paper
- during the eight week period for public comment when the Draft EIS has been completed and submitted to the Commonwealth and State Governments.

It is proposed to hold public meeting(s) during the EIS consultation period to enable the proponent to present details of the proposed Olympic Dam Expansion Project and the Australian and State Governments to provide information on the environmental impact assessment process. In addition to the above statutory requirements, the proponent may seek to engage the community in consultation throughout the development of the EIS. The nature and level of this engagement is at the discretion of the proponent. Preliminary consultations have commenced, including discussions with Olympic Dam staff, the Roxby Downs community and Aboriginal communities.

2.5 General Content, Format and Style of the EIS

The document should place emphasis on the major environmental issues associated with the proposed expansion. Matters dealt with in previous EIS' and Reviews should be considered and dealt with to the extent that they are relevant to the current proposed expansion. Matters of lesser concern should be dealt with only to the extent required to demonstrate that they have been considered.

It is envisaged that the EIS will be based on the results of available research, studies and data as appropriate, with further studies being conducted where necessary and practicable. The extent to which the limitations, if any, of available information may influence the decisions of the environmental assessment should be discussed.

In these Guidelines, the terms 'description' and 'discussion' should be taken to include both quantitative and qualitative materials as practicable.

The main text of the EIS should be written in a clear, concise style that is easily understood by the general reader. Technical jargon should be avoided wherever possible. Detailed technical information necessary to support the main text should be included as appendices issued with the EIS so that the EIS is complete and self-contained. Where appendices include results of studies conducted in preparing the proposal, the public availability of studies should be indicated.

The documentation should include references and a list of individuals and organisations consulted. Relevant maps and illustrations should be included. The cost of the EIS to the public should be minimised.

While every attempt has been made to ensure these Guidelines address all of the major issues associated with this proposal, they are not necessarily exhaustive and should not be interpreted as excluding from consideration matters deemed to be significant but not incorporated in them, or matters that emerge as important or significant from environmental studies or otherwise during the course of the preparation of the EIS.

3 DESCRIPTION OF THE PROJECT

The expanded project is in its planning phase. Several options for major infrastructure components are being investigated. As a result, the description of the expanded project is broad. In the description that follows details of the infrastructure requirement (water supply, energy, transport, area of the proposed development components, etc) are provided on the basis of an expansion to 500,000 tonnes per annum (of copper and associated products). However, it is possible that the production rate of the expanded mine could be up to 1 million tonnes per annum.

Engineering studies are being undertaken by BHP Billiton to define the water, energy, transport and other requirements for an expansion up to 1 million tonnes per annum if required and the revised infrastructure needs would be incorporated in the EIS document.

3.1 The current and proposed project area

The current operations include the existing SML, the Olympic Dam Village, township of Roxby Downs and several linear infrastructure corridors as shown on Figure 1. The SML is located approximately 570 km NNW of Adelaide in South Australia. Olympic Dam Village is 6km south of the mine and the township of Roxby Downs is 16 km south of the mine.

The SML covers an area of approximately 17,800 ha. Figure 2 shows the current extent of the SML and the proposed extended boundary of the SML. The location and extent of the footprint for the expanded project is under investigation, and this investigation will continue throughout the early stages of the project's EIS. The entire area of the expanded SML boundary will be investigated as a potential footprint for the mine development and associated on-site infrastructure. The total area of the expanded SML is approximately 41,000 ha.

The project's infrastructure options are being investigated, and therefore preferred options for the various infrastructure components are yet to be finalised. Approximate distances and areas (though these are preliminary in nature and may well be expanded) for the main infrastructure options being investigated include (assuming a worse case scenario of 30m wide for the corridor easements; refer Figure 1 for corridor locations):

- 350km water supply pipeline from a Borefield C in the GAB 1,500 ha, or 330km water supply pipeline from a seawater desalination plant in the Upper Spencer Gulf 990 ha
- 270km energy supply transmission line from Port Augusta 810 ha and/or a natural gas pipeline(s) to an on-site gas fired power station;
- 90km rail line from Pimba 270 ha
- accommodation footprint at Roxby Downs 2,100 ha
- accommodation footprint at the construction camp (Olympic Dam Village) 250 ha
- footprint associated with a relocation of the existing airport 600 ha.

It is possible that the planning studies may identify further options for infrastructure (including water supply from local sources or from the Arckaringa Basin), additional area requirements and additional processing of non mine site products and materials.

3.2 Description of proposed activities

Mine expansion and associated infrastructure

Mining and production rates

The proponent is seeking approval for mining and processing activities within the extended SML boundary as shown on Figure 2. The existing mining method is underground mining (sub-level open stoping) of approximately 10 million tonnes per annum (Mtpa) of ore. The location and extent of the mineral resource to be mined as part of the expanded project warrants open pit mining, and an anticipated increase of mined ore to at least 40Mtpa for 500,000 tpa copper equivalent (this is likely to increase in the future as mining technology advances).

In the description that follows details of the infrastructure requirement (water supply, energy, transport, area of the proposed development components, etc) are provided on the basis of an expansion to 500,000 tonnes per annum (of copper and associated products). However, it is possible that the production rate of the expanded mine could be up to 1 million tonnes per annum.

Engineering studies are being undertaken by BHP Billiton to define the water, energy, transport and other requirements for an expansion up to 1 million tonnes per annum if required and the revised infrastructure needs would be incorporated in the EIS document.

The mineral composition of the ore body being mined currently and that to be mined for the expanded project is different. The differences in mineral composition result in changes to the quantity and production rate, of copper, uranium, gold and silver between the current and expanded project. Table 1 provides an example of the differences in production rates from the existing and future mineral resource for data relating to 10Mtpa and 40Mtpa respectively.

Table 1: Example of mined tonnages as a result of mineral composition

Mineral	Current production rate (based on 10Mtpa)	Anticipated production rate (based on 40Mtpa)		
Copper	220,000 tpa	500,000 tpa		
Uranium 4,000 tpa		15,000 tpa		
Gold	80,000 ounces	500,000 ounces		
Silver	800,000 ounces	2,900,000 ounces		

Current predictions suggest that the final open pit would be approximately 3.0 km long, 2.8 km wide and 1.0 km deep. Initial design of the waste rock stockpile indicates that it may cover an area ranging from approximately 1,600 ha (based on a 160 m high waste rock stockpile) up to 4,400 ha (based on a 60m high waste rock stockpile). The open pit and waste rock stockpile would be located entirely within the boundaries of the expanded SML.

An option of co-disposing the waste rock and the tailings in the same area is being investigated and this would see the footprint area of the waste rock stockpile increase to approximately 5,500 ha (based on a 60m high stockpile). However, this material handling method would avoid the need for additional tailings retention systems. The details of the material handling methods and footprint areas will be further investigated during the EIS.

The current mining method of sub-level open stoping will continue for approximately 25 years, but at a reduced rate of 5Mtpa. Once this area of the ore body has been exhausted, the infrastructure supporting the underground mine will be used for the expanded operation where possible, or decommissioned. Some areas of the ore body may be better suited to a different mining method, such as block caving, and therefore a combination of mining methods are likely to be implemented throughout the life of the mine.

Processing

The most likely ore processing option is two-stage smelting, which would be required to address an anticipated reduction in the copper to sulphur (Cu:S) ratio in the southern region mineral resource (i.e. the area proposed to be mined for the expanded project). As noted in the *Roxby Downs (Indenture Ratification) Act 1982*, non mine site products and materials may also be processed at Olympic Dam and the expanded project will continue to consider these products in the design of the relevant infrastructure. The footprint to support the plant for the expanded operation would be approximately double that of the current metallurgical treatment plant (refer Figure 2). All plant required for processing of the ore would be located entirely within the boundaries of the existing SML.

Tailings Retention System

The existing operation utilises a paddock tailings retention system for tailings and water liquor and this occupies an area of approximately 550 ha, with a further 200 ha to be constructed shortly as part of the current approved operation. Using the same tailings retention system, a further 1,100 ha would be required for tailings storage (assuming the current height restriction of 30m remains in place). Co-disposal of the tailings and the mine waste rock as a thickened paste is being investigated and this option would significantly reduce the area required for the storage of tailings. The restriction on the height of the tailings retention system is being investigated as this also presents an opportunity to significantly reduce the footprint area for tailings storage. Irrespective of the tailings retention system adopted, all tailings would be located entirely within the extended boundaries of the SML.

Water supply and associated infrastructure

The current water licence provides for 42 Ml/d from the GAB, of which approximately 32 Ml/d is currently used. Water is supplied from Borefield A (approximately 6 Ml/d) and Borefield B (approximately 26 Ml/d) (refer Figure 1 for locations). For the expanded mine operation, it is estimated that up to 120 Ml/d of additional water would be required. A number of options are being considered to source and supply this water, including additional GAB borefields (including Borefield C or the existing borefields around Moomba: see Figure 1), a local or regional aquifer borefield (including within the SML itself or the Arckaringa Basin: see Figure 1), seawater desalination in the Upper Spencer Gulf and further on-site recycling of water.

Pipelines to transport the water from the additional water supply sources would be required and would form a component of the expanded project approval.

The existing operation has an on-site desalination plant with a capacity of 14.7 Ml/d (refer Figure 2 for location). If the additional water is sourced from anywhere other than a coastal seawater desalination plant, an expansion to the existing on-site desalination plant would be required. It is also likely that the existing on-site desalination plant would need to be relocated to accommodate the proposed open pit and waste rock stockpile.

Energy supply and associated infrastructure

The current operation is connected to the State grid via a 275 kV power line from Port Augusta and a 132 kV transmission line from Pimba. At present, the average load is 105-115 MW and the maximum demand is approximately 125 MW. For the proposed mine expansion, the average demand is expected to increase to 400 MW with a peak demand of 420 MW (these figures are preliminary and will be investigated further during the EIS). Options currently being considered to provide the additional energy supply include additional transmission line (s) from the State grid and / or the installation of a natural gas pipeline(s) and on-site power generation.

Transport infrastructure

Currently, transport of materials to and from Olympic Dam is via road. The construction of a rail line between Pimba and Olympic Dam, which would connect to the existing State network from Pimba to Port Adelaide, is being investigated and forms a component of the expanded project. During operation of the expanded mine, approximately 2.2 Mtpa of materials would be transported from the mine to a port (with several ports being investigated including, but not limited to, Port Adelaide and Darwin). The number, size and haulage capacity of trains between Port Adelaide (and/or Darwin) and Olympic Dam is being investigated and will be discussed within the project's EIS.

The increased quantity of material transported to the port is likely to necessitate an upgrade of existing port facilities. The details and environmental assessment of any such upgrades would be included within the project's EIS.

The existing airport at Olympic Dam would be relocated as the mine expansion progresses. Studies are currently being undertaken to determine the most appropriate location for the new airport and the timing of the relocation. It is likely that the new airport would be located closer to Roxby Downs than the existing airport.

Accommodation and associated infrastructure

The township of Roxby Downs, 16 km south of the mine, houses approximately 4,000 people. The construction camp at Olympic Dam 6 km south of the mine houses approximately 800 people (but has an approved footprint that housed 1500 people during the last Olympic Dam expansion). During the construction and operation of the proposed expansion, the workforce will increase significantly and it is estimated that in the order of 10,000 people would be housed at Roxby Downs and in the order of 3,000 people at a construction camp. An expansion to the existing footprint at both the township of Roxby Downs and the construction camp (Olympic Dam Village) would be

required. It is also possible that the planning studies identify additional areas more suited to accommodate the increased workforce.

It is likely that an expansion to the existing Roxby Downs Municipal Lease would be required. Figure 2 shows an indicative boundary for this proposed expansion. It is noted however that this is an indicative boundary only and further studies of land tenures would be undertaken during the EIS prior to finalising this boundary. It is also likely that additional pre-fabrication yards would be required and these may be located within the expanded Roxby Downs Municipal Lease, Port Augusta, Port Adelaide or elsewhere.

Additional service and community infrastructure would also form a component of the project. Planning studies that establish the location and extent of the increased footprints and associated infrastructure will be undertaken during the EIS.

3.3 Timeframe

Project timing is under investigation and projected timeframes will change. The proponent has indicated the following schedule, which would be subject to the proposal obtaining environmental approval:

- construction of the necessary infrastructure would commence immediately upon environmental approval of the expanded project
- pre-feasibility and preliminary engineering studies would occur concurrent with the environmental assessment
- construction of the various infrastructure components would be staged, commencing after environmental approval is obtained
- mining would commence as soon as practicable after and subject to all relevant approvals been obtained
- the actual ore body is expected to be reached in the order of 4 years after commencement of mining
- mining of the resource would continue until the resource within the extended SML boundary was exhausted. The proponent has anticipated that this equates to a life of mine of approximately 70+ years.

4 CONTENT OF THE EIS

The objective of both the environmental impact assessment provisions of the Australian and South Australian Governments is to ensure that those matters that could potentially have a significant environmental, social or economic impact are fully examined and taken into account in decisions by both Governments. The terms 'environment' and 'environmental' as used herein refer to all aspects of the surroundings of human beings, whether affecting human beings as individuals or in social groupings, and including the natural environment, the built environment (present and historic), and economic and social aspects of our surroundings. This definition covers such factors as air, water, soils, vegetation, fauna, buildings, roads, employment, housing and recreational facilities.

The EIS is required to:

- Provide information of the existing operations, the proposed expanded operations and the alternatives considered in establishing the expanded project. The expanded project being defined as all works associated with the proposed expanded operations including works on the SML, municipality of Roxby Downs and all associated infrastructure such as water and energy supply and transport and traffic infrastructure. From this information interested individuals and groups may gain an understanding of the proposed expansion, the need for the expansion, the alternatives, the environment which it could affect, the impacts that may occur and the measures to be taken to minimise the impacts.
- Identify the existing biological, physical, social and cultural environment, impacts which may occur on this environment (both beneficial and adverse) and the measures proposed to mitigate adverse impacts. Discussion of impacts is to include an analysis of the significance of the relevant impacts and a statement as to whether any relevant impacts are likely to be unknown, unpredictable or irreversible.
- Provide a forum for public consultation and informed comment on the proposal;
- Provide a framework in which decision-makers may consider the environmental, economic and social aspects of the proposal;
- Specifically address all relevant matters under the requirements of the Environment Protection and Biodiversity Conservation Act 1999.
- Be generally consistent with the principles of assessment, reporting and consultation processes for a major development under the South Australian Development Act 1993.
- Recognise the provisions of the Roxby Downs (Indenture Ratification) Act 1982.

The EIS is also to include:

- the title of proposed development
- the name and address of proponent
- an executive summary
- a glossary of terms
- a table of contents and list of tables, figures and appendices
- a description of the existing operations
- project justification

- a description of the proposed expanded project
- a description of the alternatives investigated, including the no-expansion option
- a description of the community consultation process undertaken
- an assessment of the existing environment, potential impacts on that environment and mitigation measures proposed to ameliorate impacts
- a Draft Environmental Management Plan (Draft EMP)
- a means of cross-referencing the relevant sections of the EIS with the corresponding sections of the final Guidelines
- appendices that include:
 - o the final Guidelines
 - the key personnel of the study team
 - o a list of the stakeholders consulted
 - technical reports that supplement the EIS (including the source, currency, reliability and any uncertainties in relation to the information).

The specific requirements to be addressed in the EIS are provided in Section 5. It is on these requirements that public comment is sought, with the earlier sections of this document providing the context.

As noted above, the EIS is not to address policy issues about the appropriateness of uranium mining. The scope of the assessment will also not include broader issues relating to the use of exported uranium in the nuclear fuel cycle. Issues related to the use of exported uranium in the nuclear fuel cycle are beyond the control of the proponent and it would be impractical for the proponent to address these issues in the EIS.

5 SPECIFIC REQUIREMENTS – CONTENTS OF THE EIS

The EIS is to address the following requirements and may use the same or similar format as shown below.

5.1 Executive Summary

The executive summary is to be written as a stand-alone document, able to be reproduced on request for interested parties who may not wish to read or purchase the full EIS. The structure of the executive summary is to follow that of the EIS, although focussed strongly on the key issues allowing the reader to obtain a clear understanding of the existing Olympic Dam operations, the proposed expanded project and the environmental, social, cultural and economic impacts, both beneficial and adverse, of the expanded project. The executive summary is also to provide a brief discussion of the alternatives, reasons for selecting the preferred option and a concise account of the management measures proposed to avoid or minimise potential adverse impacts.

5.2 Glossary of terms

A glossary of technical terms and commonly used acronyms is to be provided.

5.3 Introduction

The introduction is to explain clearly the purpose of the EIS, why it has been prepared and what it sets out to achieve. It is to define the audience to whom the EIS is directed and contain an overview of the structure of the document. It is to identify clearly the scope of the project as being an expansion to an existing mining and processing operation.

The introduction is to provide:

- A background to the project this section is to include a statement of the
 objectives which have led to the proposal for an expanded project and a brief
 outline of the events leading up to the project's formulation, including
 alternatives, envisaged time scale for implementation, project life, anticipated
 establishment costs and actions already undertaken within the project area.
- Company profile provide an overview of the project proponent, including the
 nature and extent of relevant business activities and environmental record
 (including details of any proceedings taken against the proponent under a
 Commonwealth, State or Territory law for the protection of the environment or
 the conservation and sustainable use of natural resources) including the
 proponent's environmental policy and planning framework.
- The environmental impact assessment process provide an outline of the impact assessment process steps, likely timing and decisions to be made for relevant stages of the project. The introduction should briefly describe the studies/surveys/consultations that have been conducted in developing the expansion and preparing the EIS. Results of studies and detailed comments resulting from consultation should be included as appendices. Also outline the relevant legislation and policies controlling the environmental impact assessment process.

- Public consultation process provide an outline of the public consultation process that has taken place during the preparation of the EIS, and outline further opportunities for public input throughout the assessment process.
- Introduction to the existing operations at Olympic Dam provide a general overview of the existing operations.
- Introduction to the proposed expanded project provide a general overview of the expanded project.
- The format of the EIS provide an outline of how the EIS has been prepared and demonstrate consistency with the requirements of the Guidelines.

5.4 Existing Operations

A description of the key elements of the existing operations at Olympic Dam is to be provided and illustrated to give context to the expanded project. The location of the existing operations and associated infrastructure is to be described and indicated on relevant plans. The description is to include issues such as the geology of the deposit, the resource and ore reserves, the mining process, the metallurgical process, tailings management, major infrastructure (such as the township of Roxby Downs, water supply, energy, telecommunications, transportation and waste management) and an overview of existing environmental management practices for the mine operation including the Arid Recovery Reserve north of the mine.

5.5 Project Justification

The need for the project is to be described, with particular reference made to the economic, environmental, social and cultural impacts (beneficial and adverse), including employment and spin-off business development, which the expanded project may provide.

The need for the project is to be discussed in an international, national, state and regional context. The consequences of not proceeding with the project, an indication of the project timeframe and a clear outline of the objectives of the project are also to be included.

5.6 Description of the Expanded Project

This section is to provide a detailed description of the expanded project through its lifetime of planning, construction, operation and decommissioning (including rehabilitation).

This section is to identify the relationship of the EIS to the project evaluation work including descriptions of the alternatives investigated, and the 'do nothing' option, in the context of conceptual, technological and locality alternatives. Alternatives are to be discussed in sufficient detail to enable an understanding of the reasons for preferring certain options and rejecting others, and to enable an assessment of the alternatives as they significantly relate to the matters of national environmental significance (NES) protected under Part 3 of the EPBC Act.

The interdependencies of the project's components are to be explained, particularly in regard to how each element relates to the viability of the project. Issues such as mining method, tailings management, water supply, hydrometallurgical process, smelting, refining, waste management, road, rail and airport infrastructure, landform and land

rehabilitation, energy supply, accommodation and finished product transport are to be discussed.

The description of the expanded project is to include, but not be limited to, the areas outlined below.

RESOURCE

The results of studies and surveys undertaken to identify and delineate the mineral resource are to be summarised. The location, tonnage and quality of each mineral resource proposed to be mined are to be described. The geological resources are to be defined using formal terminology as recommended by the Australian Stock Exchange, the Australasian Institute of Mining and Metallurgy and/or the Australian Mining Industry Council.

Plans are to be provided showing the general location of the project area, and in particular:

- the location of the resource to be explored, developed or mined
- the location and boundaries of the existing SML and any proposed expansion to that lease
- the location of any proposed buffers surrounding the resource.

MINE OPERATIONS

The preferred mining option and mine alternatives are to be discussed and the location and extent of the expanded mine excavations and associated ore crushing, transfer facilities and waste rock stockpiles are to be illustrated. Discussion is to be provided on probable mining pit boundaries, mine access, dewatering, mine development timeframes and any final void to be left at cessation of mining. The rationale for the preferred operational program is to be explained.

Plans are to be provided showing the general location of the project area, and in particular:

- the location of existing mine excavations
- the location and extent of excavations, tailings retention systems, overburden stockpiles and waste rock and ore stockpiles associated with the expanded project
- key environmental and aboriginal heritage sites recorded within the SML unless culturally inappropriate
- the area disturbed at each major stage of the project.

PROCESSING PLANT

The capacity of the plant and equipment is to be described, together with the chemicals to be used and stored. The existing and proposed processing plant site is to be illustrated on appropriately scaled plans. Any proposed processing of non-mine site materials should be discussed. The criteria for selecting the plant site for the expanded operation is to be described and the rationale for the preferred option explained. Integration of the existing and newly proposed plants is to be discussed, indicating major components associated with the expansion, together with timeframes

of proposed decommissioning. Significant changes from currently used processes are to be clearly identified and described.

LAND USE

The existing land uses, tenures and the location of project components, including infrastructure corridors that could be affected by the expanded project are to be described and indicated on appropriate plans. The plans are also to identify areas of conservation value, the location of existing dwellings and the zoning of affected lands according to existing town or strategic plans.

INFRASTRUCTURE

The location of proposed infrastructure is to be illustrated on plans and described. The rationale for the preferred infrastructure elements is to be explained. This section is to include, but not be limited to, the elements outlined below.

Accommodation

A description is to be provided of the proposed expansion or relocation of existing accommodation at construction camps, Roxby Downs or other relevant areas.

Transport—road/rail/ship/airport

Details are to be included of any new roads, rail, shipping requirements or airport relocation as a result of the project, as well as any upgrade of existing transport infrastructure. The transport of plant equipment, products and personnel during both the construction and operational phases of the project are to be included. The proposal will result in a significant increase in mine production. Details of how it is proposed to transport this increased production to various markets are to be included.

Energy

This section is to describe all energy/power supply requirements, including electricity, natural gas, and/or solid and liquid fuel requirements for the construction, operation and decommissioning phases of the expanded project. The feasibility of using alternative renewable fuel sources and energy efficiency initiatives to enhance sustainability objectives are to be discussed in this section. The locations of any easements or corridors are to be shown on infrastructure plans.

Water supply and storage

This section is to provide information on any required infrastructure for additional water supply or storage. In particular, the proposed source of water supply is to be described (e.g. coastal desalination plant, extraction from the GAB or saline aquifers) and the means of transporting this water to Olympic Dam (e.g. size and location of water pipelines). Estimated rates of supply from each source (average and maximum rates) are to be given.

In addition this section should describe the proposed desalination plant (in the event of the desalination plant being the preferred option for water supply), intake structure for saline water and disposal options for waste brine (including assessment of the pros and cons of marine disposal versus land based options).

This section is also to provide discussion of the investigation of water conservation measures, such as recycling and re-use initiatives.

Telecommunications

This section is to describe any impacts on existing telecommunications infrastructure (such as optical cables, microwave towers, etc.) and identify the owners of that infrastructure. Any newly proposed telecommunications (procedures or processes or technologies) are to be described and impacts (both beneficial and adverse) on existing networks discussed.

Sewerage

This section is to describe any newly proposed sewerage infrastructure and any potential impacts (both beneficial and adverse) on existing sewerage networks and treatment plants.

Solid waste disposal / handling

The proposed location, site suitability, dimensions and volume of stockpiles (overburden, waste rock and tailings), including their design, method of construction, operation and any changes in technologies proposed to be utilized, is to be discussed and illustrated on appropriately scaled plans. This is to include staging or sequencing of these stockpiles throughout the proposed life of the mine. This section is also to discuss the investigation of reduction and recycling/re-use of solid wastes from domestic and commercial/industrial activities.

Liquid waste disposal / handling

The proposed location, site suitability, dimensions and volume of liquid disposal/storage ponds, including their design, method of construction and operation, changes in technologies proposed to be use, management of runoff from overburden and waste rock stockpiles, mine water disposal, and management of liquid wastes from tailings retention systems, associated seepages and evaporation ponds, is to be discussed and illustrated on appropriately scaled plans.

CONSTRUCTION

The extent and nature of the project's construction phase is to be described. The description is to include the type and methods of construction to be employed, the construction equipment to be used and the items of plant to be transported by each proposed means to the construction site.

The estimated numbers of persons to be employed for the construction phase are to be given.

MATERIALS HANDLING

This section is to describe the proposed methods and facilities to be used for materials storage (e.g. imported diesel, sulfur, acid etc) and for transferring materials to, from and within the mine site. Discussion is to include any environmental design features of

these facilities including bunding of storage facilities. Appropriately scaled plans that identify the location of relevant infrastructure and storage areas are to be included.

REHABILITATION AND DECOMMISSIONING

Proposals for decommissioning of both the existing underground operation and the proposed expanded project are to be described. The description is to include proposed timing, rehabilitation methods, the anticipated final landform (including the final open pit void) and any special consideration for the long-term containment of radioactive or other hazardous materials. The description should also include estimates of long-term effects (including radiological) on groundwater in contact with the decommissioned mine, and on the surface environment resulting from the presence of rehabilitated tailings retention systems, waste rock stockpiles and the final open pit void. Altered stormwater drainage patterns are also to be discussed.

5.7 The Approvals Process / Legislative Obligations

The purpose of this section is to make clear the methodology and objectives of the EIS under the relevant legislation. This section is to include a description of the impact assessment process steps, timing and decisions to be made for relevant stages of the expanded project. In particular, this section is to outline mechanisms in the process for public input, identify the timing of the public release of the Draft EIS and specify that responses to public submissions will be considered and addressed in a separate Supplementary EIS/Response Document.

The information in this section is required to ensure:

- · that relevant legislation is addressed
- that there is awareness of the process to be followed
- that stakeholders are aware of opportunities for input and participation.

The approval processes and legislative requirements for both the whole of project approval and the permits / licenses for activity approvals are to be described. The legislation (Acts and Regulations), policies, licenses and permits controlling the approvals process are to be outlined. Reference is to be made to the Australian Environment Protection and Biodiversity Conservation Act 1999, the Roxby Downs (Indenture Ratification) Act 1982, the Development Act 1993 and other relevant Australian and South Australian legislation.

This section is also to discuss the project's consistency with existing policy frameworks for the area (e.g. as reflected in regional and local plans), and with relevant standards or recognised codes of practice.

5.8 Public Consultation

An appropriate public consultation program to secure approval for a controlled action requiring an EIS under the Australian *Environment Protection and Biodiversity Conservation Act 1999*, and a Major Development requiring an EIS under the State's *Development Act 1993* must be provided.

The public consultation program is to provide opportunities for community involvement and education throughout the EIS assessment and approvals process. It may include

public meeting(s), interest group meetings, production of regular summary information sheets and updates, and other consultation mechanisms to encourage and facilitate appropriate public consultation and participation.

The reader is to be informed as to how public submissions on the Draft EIS are to be addressed.

The results of the public consultation program are to be presented in this section, with a detailed report of responses and persons consulted provided as an appendix to the Draft EIS and Supplementary EIS, as appropriate.

5.9 Hazard and Risk

This section is to address those hazards and risks associated with human health i.e. public and environmental health, as well as occupational health and safety management practices and procedures associated with the current mining and processing operation and discuss, where relevant, proposed changes to these procedures to account for the expanded project.

This section is to include a risk assessment that addresses, but is not limited to, the following:

- occupational health and safety for the workforce and potentially affected communities associated with the proposed expansion
- the implications for, and the impacts on, surrounding land uses and land users as a result of the expanded project
- exposure sources and potential exposure to pollutants (including any potential increased levels of ionizing radiation) at all stages of the operation (including mining, processing, waste management systems, product transportation to the port and storage prior to and during transportation to the port) and post mine closure for employees, nearby communities and the environment
- estimates of radiation doses to employees, nearby communities arising from the proposed expansion
- unplanned process materials, tailings or other storage discharges
- road and rail transport accidents
- fire (including bushfires), explosion and blasting hazards
- physical security (including uranium production) issues.

The review and reporting against the existing management procedures is to include, but not be limited to:

- relevant hazards (minor and major) and current competencies in emergency response management of human casualties
- the likely frequency and severity of potential hazards, accidents and spillages occurring during all stages of the project (recognising that some hazardous liquids are standard in the mine's metallurgical process streams)
- an indication of cumulative risk levels to surrounding residents and land users
- · the duration of any identified hazards
- hazardous substances to be used, stored, processed or produced and the rate of usage.

This section is also to describe how hazards and risks will be managed to an acceptable level, and how the achievement of the objectives will be monitored, audited and reported.

This section of the EIS is also to provide:

- safeguards proposed for the transport, storage, use and handling of hazardous materials
- the capacity and standard of bunds to be provided around the storage tanks for classified dangerous goods and other goods likely to impact adversely upon the environment in the event of an accident or spill
- the procedures to reduce spillages and the emergency plans to manage hazardous situations
- description of quality control and equipment maintenance systems in place to minimize failures leading to spillage
- contingency plans for spills or accidental releases of process materials, tailings or other waste or hazardous materials
- any existing exemptions relevant to hazardous materials as a result of the nature of operations and process streams at Olympic Dam.

5.10 Land Use and Planning

The EIS is to provide a description of existing land uses relevant to the project (including associated infrastructure), the potential impacts on these uses as a result of the expanded project and the compliance of the proposed expansion with current planning schemes or similar planning instruments.

LAND USE

This section is to provide a description of current land tenures and land uses, including details of the status of any native title claims, in the project area. The locations of the native title claims in relation to the project area are to be shown. The potential for the construction and operation of the expanded project to impact existing land uses is to be provided.

Post operations land use options are to be discussed, including suitability of the area to be used for agriculture, pastoralism, industry, tourism or nature conservation. The factors favouring or limiting the establishment of the above options are to be given in the context of land use capability or suitability and the potential liabilities for long-term management.

Consideration of the proposed expansion of the Cultana Defence facility should also be included where relevant.

Appropriately scaled plans are to be provided to support the descriptions in this section of the EIS.

PLANNING

This section is to discuss the compliance of the newly proposed land uses and infrastructure requirements with current planning instruments, for the construction,

operation and decommissioning phases of the project. Particular attention is to be afforded to accommodation (both short-term at construction camps and long-term at Roxby Downs and other relevant townships), the workforce and newly proposed infrastructure.

Accommodation

A description is to be provided of proposed expansion or relocation of existing accommodation at construction camps, Roxby Downs or other areas. Concept master plans for the proposed expansion of accommodation and service infrastructure at Roxby Downs are to be provided. Consistency of these expansions with planning schemes is to be discussed.

Workforce

The size, make-up (e.g. permanent and contractors) and location of the workforce is to be described. The potential environmental, social, cultural and economic impacts associated with this increased workforce are to be discussed.

Infrastructure

This section is to identify the various infrastructure components proposed for the expanded project and assess these for compliance against the appropriate planning instruments. Issues to be addressed include:

- Roads predictions are to be made for any new roads, road realignments or proposed road closures required as a result of the expanded project. This section is also to include an analysis of the probable impact of identified construction and operational traffic generated by the project, with particular attention paid to impacts on road infrastructure, road users and road safety. Mitigation measures necessary to address any adverse road impacts are to be provided; this will require a comparison between the existing and predicted traffic and road conditions.
- Rail any impact (adverse and beneficial) to the rail network, including any increased delays at traffic crossing points, is to be discussed. The consistency of any newly proposed rail infrastructure with state, regional and local plans are also to be addressed.
- Airport any changes to the existing operation of the Roxby Downs airport as a
 result of the expanded project, including additional capacity requirements,
 relocation of the airstrip and compliance with relevant airport planning and
 operation policies / procedures is to be provided. Compliance with relevant
 national and state policies and standards is also to be discussed.
- Port transport of finished product is currently through the Port of Adelaide.
 Any changes to the existing operation or capacity requirements of this port, or the use of other ports, as a result of the expanded project, are to be discussed.
- Energy energy / power supply requirements, including electricity, natural gas, solid and liquid fuel for the construction and operation phases of the project are to be identified and compliance with relevant standards and policies discussed. Energy conservation is to be described in the context of relevant government policies.

- Water supply and storage water supply requirements, including footprint areas for plant and associated infrastructure, for the construction and operation phases of the project are to be identified and compliance with relevant standards and policies discussed. In addition, an estimate of industrial and domestic water demand is to be made for the project, including the temporary demands during the construction period. Details are to be provided of any changes to existing town water supply to meet such requirements. Water storage and treatment proposed on site for use by the site workforce is to be described in relation to compliance with relevant planning instruments.
- Sewerage volume estimates of industrial and domestic effluent are to be provided and the proposed method of disposal / recycling is to be described. This is to include the physical and chemical characteristics of such effluent. If discharging into an existing sewerage system, an assessment of the capacity of the existing system to accept the effluent is to be provided.

5.11 Meteorological Environment and Climate

The EIS is to describe the temperature, humidity, wind speed and direction, and any other factors (e.g. temperature inversions) likely to affect the meteorological environment within the region of the project. Rainfall patterns including magnitude and seasonal variability of rainfall are to be included. Extremes of climate (e.g. floods, droughts, cyclones) and natural hazards (e.g. lightning strikes, bushfires and earthquakes) are to be discussed with particular reference to the relative frequency, magnitude and risk of these events resulting in significant environmental impact throughout the life of the project.

This section is also to discuss the potential for climate change and, where relevant (e.g. for a seawater desalination plant), sea level rise over the life of the project. Information about trends in changing climate patterns at a national, state and regional level is also to be provided for the life of the project.

Information provided in this section is to be adequately cross-referenced to other relevant sections of the EIS. For example, the implications of rainfall intensity is to be included in the discussion of erosion potential; wind speed and direction is to be included in the discussion of air quality.

5.12 Air Quality

This section is to describe the existing air environment, which may be affected by the project. A description of the existing air quality conditions of the project area is to be provided having regard for particulates, gaseous and odorous compounds. The background levels and sources of suspended particulates, PM10, SOx, NOx, radon progeny, radioactive dust and any other major constituent of the air environment which may be affected by the project are to be discussed.

Sufficient data on local meteorology and ambient levels of pollutants are to be gathered to provide a baseline for later studies or for the modeling of air quality environmental impacts, if any, within the project's air shed. Parameters are to include air temperature, wind speed and direction, atmospheric stability, mixing height/depth and other parameters necessary for input to predictive models. This section is to be cross-referenced to the Meteorological Environment and Climate section of the EIS.

This section is to define and describe the objectives and practical measures for protecting environmental values for air, to describe how nominated quantitative standards and indicators may be achieved, and how the achievement of the objectives will be monitored, audited and managed. The origins, quantities and composition of airborne emissions from the project during construction, operation and decommissioning is to be addressed.

The objectives for airborne emissions are to be stated in accordance with relevant standards, emission guidelines and legislation. The potential for interaction between the emissions from the processing plant and mine (including emissions from blasting operations) and existing particulates in the air shed, are to be considered and the likely health and environmental impacts, if any, from any such interaction. The assessment should consider the impacts of deposition of dust on adjacent areas.

The proposed levels of emissions are to be compared with the current Draft National Environmental Protection Measures (1998) for ambient air quality, the National Health Medical Research Council (NHMRC) National Guidelines for control of emissions from stationary sources, radiation dose limits and other relevant state guidelines. Emission levels are also to be discussed in relation to those that trigger reporting thresholds under the National Pollutant Inventory (NPI) for those industries relevant to the expanded project.

Where appropriate, the maximum ground level concentrations for major air borne pollutants are to be predicted using appropriate computer modeling. These predictions are to be made for expected maximum emission conditions. The techniques used to obtain the predictions are to be referenced and key assumptions and data sets explained. The pollutants to be modeled must include any significant mass emissions including volatile organic compounds associated with the processing plant.

An assessment of greenhouse gas emissions for the project is to be provided, including:

- predicted annual emissions for each greenhouse gas and total emissions expressed in terms of 'CO₂ equivalents'
- the intended measures to reduce greenhouse emissions
- discussion of alternative technologies, processes and equipment to reduce greenhouse gases and how these have been considered in selecting the preferred project options
- methodologies by which estimates were made.

This assessment is to include sufficient detail to enable comparison of the greenhouse gas implications of the expanded project with other energy sources.

The above assessment is to be undertaken with due consideration of relevant protocols, agreements and strategies including: 'The National Greenhouse Strategy', 'National Greenhouse Gas Inventory', 'The Kyoto Protocol' and 'The Framework Convention on Climate Change' and voluntary programs developed by the Australian Greenhouse Office.

5.13 Topography, Geology and Soils

This section is to describe the existing environment of the land that may be affected by the expanded project. Issues to be addressed include those outlined below.

TOPOGRAPHY/GEOMORPHOLOGY

Plans are to be provided that identify the location of the major infrastructure components of the expanded project. These plans are to include the topography of the project area, shown at appropriate contour increments and with respect to Australian Height Datum (AHD), and significant features of the landscape.

GEOLOGY

The EIS is to provide a description and a series of cross-sections of the ore reserve. The physical and chemical properties of surface and sub-surface materials and geological structures within the proposed areas of disturbance are to be included. Geological properties that may influence ground stability (including seismic activity and risks, if relevant), safety, environmental monitoring and rehabilitation programs, or the quality of wastewater leaving any area disturbed by the project are to be described.

In locations where the age of the rock and the nature of the geology is such that fossil specimens may be uncovered during the construction or operation of the mine, the EIS is to address the potential for finds, provide a procedure to establish the significance of the find, and identify the management procedure to record and notify of any significant find.

SOILS

A soil survey of the sites affected by the expanded project is to be conducted at a suitable scale, with particular reference to the physical and chemical properties of the materials which will influence erosion potential, stormwater run-off quality and site stability. Background chemical and radiological composition of soils should be established for the areas likely to be affected by the expanded operations.

An acid sulfate soil investigation, carried out according to applicable national and state guidelines, is to be undertaken in areas where any excavations or disturbance works are proposed in coastal areas <5m AHD (e.g. for a seawater desalination plant and associated water pipeline).

Soil types are to be mapped at a suitable scale, and soil profiles from representative samples of each soil type are to be described according to the Australian Soil and Land Survey Field Handbook (McDonald et al, 1990) and Australian Soil Classification (Isbell, 1996). For each soil type identified, erosion potential (wind and water) and erosion management techniques are to be outlined.

The EIS is to include an assessment of likely erosion effects, especially those resulting from the removal of vegetation, for disturbed areas such as:

- the mine site, including the expanded tailings retention systems, ,waste rock stockpile and any material stockpiles
- access roads, rail, energy and water supply corridors.

Methods proposed to minimise or control erosion are to be specified and are to be developed with regard to preventing soil loss in order to maintain land capability / suitability and minimise degradation of downstream waterways or water impoundments.

An overview of the current monitoring, auditing and management practices for the control of erosion, sedimentation and contamination for the existing Olympic Dam operations are to be provided, with any required amendments to these practices to account for the expanded project identified and discussed.

5.14 Flora

The EIS is to discuss matters relevant to the existing vegetation communities and the potential impacts on these communities as a result of the expanded project. The EIS is to identify issues relevant to locations with sensitive flora assemblages, or areas that may have low resilience to environmental change. Areas of sensitivity include the marine environment and wetlands, any significant habitat for State and / or Australian Government listed threatened species and endangered ecological communities, with particular attention being required on GAB springs. The capacity of the environment to assimilate disturbance is to be assessed.

Surveys of flora are to be conducted at those times that are appropriate to maximize the detection of significant species and communities. Key flora indicators for future monitoring are to be identified.

TERRESTRIAL FLORA

This section is to describe the existing terrestrial vegetation communities of those areas potentially impacted by the expanded project, including associated infrastructure, the direct and indirect impacts on this environment, any impacts of regional importance and measures proposed to mitigate impacts. The potential environmental impact, if any, to the ecological values of the area arising from the construction, operation of the mineral processing plant and mine and decommissioning of the project including clearing, salvaging or removal of vegetation is to be described. Mitigation measures and / or offsets are to be proposed for adverse impacts including beneficial re-use options of cleared vegetation.

Vegetation mapping is to be included for relevant project areas including new infrastructure corridors. Mapping of vegetation types is to be at a suitable scale as to be clearly understood and accompanied by descriptions of each representative vegetation type. Sensitive or important vegetation types are to be highlighted, including any preferred habitat for State and / or Australian Government listed threatened flora or endangered ecological communities and / or locally significant communities (e.g. duricrust).

The existence of important regional and local weed species is also to be discussed. Weed control strategies aimed at containing existing weeds and reducing the risk of new invasive weeds being introduced to the project area are required. Reference is to be made to national, state and local government pest management plans when determining appropriate control strategies.

AQUATIC FLORA

This section is to describe the existing aquatic vegetation communities of aquatic areas potentially impacted by the expanded project, the direct and indirect impacts on this environment and measures proposed to mitigate adverse impacts (including sea water intake and discharge structures for the desalination plant). Appropriate modeling of the discharge of wastewater from the desalination plant to the marine environment is to be undertaken if this option is considered.

Aquatic flora occurring in areas potentially affected by the project are to be described, noting the patterns and distribution in the waterways and/or associated lacustrine and marine environments. Particular attention is to be provided for State and / or Australian Government listed threatened species and endangered ecological communities.

5.15 Fauna

The EIS is to discuss matters relevant to the existing faunal communities and the potential impacts on these communities as a result of the expanded project. The EIS is to identify issues relevant to sensitive fauna habitats, or areas which may have a low resilience to environmental change. Areas of sensitivity include the GAB springs, the marine environment and wetlands, wildlife breeding or roosting areas, any significant habitat or relevant bird flight paths for migratory species, bat roosting and maternity caves and habitat of listed threatened animals.

The occurrence of pest animals in the project area is to be included. Key fauna indicators are to be identified for future monitoring. Surveys of fauna are to be conducted at those times that are appropriate to maximize the detection of significant species, including migratory species).

TERRESTRIAL FAUNA

This section is to describe the existing terrestrial faunal communities of areas potentially impacted by the expanded project, the direct (e.g. clearing) and indirect (e.g. increased recreational use of natural areas by more people) impacts on this environment and measures proposed to mitigate adverse impacts. This should include an assessment of the potential impact of an increase in pets and the impacts this may have on the environment.

The terrestrial fauna occurring in the areas affected by the project are to be discussed. The description of the fauna present or likely to be present in the area is to include:

- species richness (i.e. a species list) and conservation status of animals, including amphibians, birds, reptiles, mammals (including microchiropteran bats)
- habitat requirements and sensitivity to change, including the effect of pollutant emissions, movement corridors and barriers to movement
- the existence of feral or exotic animals
- existence of any listed threatened species in the project area (vertebrate and invertebrate), including discussion of the species conservation status, range, habitat, breeding, recruitment, feeding and movement requirements

- use of the area by, and potential impacts on, migratory, nomadic and vagrant birds and include a discussion on potential exposure of fauna to tailings retention systems
- where relevant, discussion of arachnids, gastropods and the unique fauna associated with the GAB springs.

Feral animal control strategies aimed at containing existing feral species and reducing the risk of new feral species being introduced to the area is to be included. Reference is to be made to national, state and local government pest management plans when determining appropriate control strategies.

AQUATIC FAUNA

This section is to describe the existing aquatic faunal communities of those aquatic areas potentially impacted by the expanded project, the direct and indirect impacts on this environment and measures proposed to mitigate impacts (including sea water intake and discharge structures for the desalination plant). Appropriate modeling of the discharge of wastewater from the desalination plant to the marine environment is to be undertaken if this option is considered.

Aquatic fauna occurring in areas potentially affected by the project are to be described, noting the patterns and distribution in the waterways and/or associated lacustrine and marine environments. Specific attention is to be provided to listed threatened species, particularly GAB spring fauna (if the GAB water source is considered) and the cuttlefish in Spencer Gulf (if a seawater desalination plant is considered).

5.16 Groundwater

The EIS is to identify and describe the location, quantity and quality of groundwater that could be considered as an additional source for the life of the expanded project and the impacts of sourcing this water on applicable sources such as the GAB, regional saline aquifers and the local groundwater associated with the mine site. A description of the GAB springs and their connection to groundwater is required.

The information to be gathered for analysis is to include:

- location of the groundwater source
- pumping parameters
- draw down and recharge at proposed extraction rates
- seasonal variations (if records exist) of groundwater levels.

Observation points / bores that would satisfactorily monitor groundwater resources prior to construction, during operation and post-operation are to be developed if this option for water supply is assessed as sustainable for the life of the expanded project.

When discussing groundwater conditions and the proposed groundwater monitoring regime, reference is to be made to:

- the nature of the aguifer(s) including:
 - o geology/stratigraphy such as alluvium, volcanic, metamorphic
 - o aquifer type such as confined, unconfined, artesian

- o depth to and thickness of the aquifers
- sustainability of the aguifer
- hydrology of the aquifer(s) including:
 - o depth to water level and seasonal changes in levels
 - o groundwater flow directions (defined from water level contours)
 - interaction with surface water
 - o interaction with seawater (in the desalination plant option)
 - o possible sources of recharge
 - o vulnerability to pollution.

The data obtained from the groundwater survey are to be sufficient to enable the major ionic species present in the groundwater to be specified, and pH, electrical conductivity and total dissolved solids to be measured.

The EIS is to include an assessment of the potential environmental impacts, if any, caused by the expanded project to national, state, regional and local groundwater resources. The impact assessment is to define the extent of the area within which groundwater resources are likely to be affected by the expanded operations and the significance of the project to groundwater depletion, aquifer recharge or inflow and discharge. The potential impact on existing and potential future groundwater users within the project area is to be considered and strategies to mitigate these impacts are to be considered.

This section is to be cross-referenced to the Flora and Fauna sections of the EIS, particularly in relation to potential impacts on GAB springs. Management options and strategies available to monitor, mitigate and implement corrective action of these effects are to be included.

The EIS is to discuss post-mining groundwater recovery, rehabilitation and decommissioning of the borefield areas and regional and / or local groundwater resources and its impact on underground, open pit or subsidence depression of the mine area.

The potential impact of the expanded project on the local groundwater regime caused by the altered porosity and permeability of any land disturbance is to be considered, together with the potential re-use of the water from mine de-watering.

The potential to contaminate groundwater resources from sources such as seepage from mine and plant areas, tailings retention systems and the waste rock stockpiles is to be included. Measures to control, mitigate and remediate such contamination are also to be discussed.

A discussion of chemical, radiological and physical properties of any wastewater (including concentrations of constituents) at the point of entering groundwater is required.

An overview of the current monitoring, auditing and management practices for the control of groundwater quality associated with the existing Olympic Dam operations are

to be provided, with any required amendments to these practices to account for the expanded project identified and discussed in the Draft EMP.

5.17 Surface Water

This section is to discuss the surface waterways and water impoundments in the area affected by the expanded project with reference made to the significance of these waters to the catchment system in which they occur. Information provided is to include a description of existing surface drainage patterns, water quality, catchment size and flows in major waterways and wetlands. The likelihood of flooding, history of flooding including extent, levels and frequency, and a description of current water uses and users downstream of the areas potentially affected by the project is to be included. The discussion on flooding may be cross-referenced to Section 5.11 (Meteorological Environment and Climate). Potential impacts of post mine drainage patterns and flooding is to be addressed. Given the potential 70+ years mine life, and assessment should be undertaken of the potential impact of climate change on rainfall patterns and impacts on surface water runoff from the waste rock and tailings stockpiles.

Water quality is to be described, including an appropriate range of physical, radiological, chemical and biological parameters to gauge the environmental impact, if any, on potentially affected creek or waterway systems. The discussion is to include:

- sustainability, including both quality and quantity
- physical integrity, fluvial processes and morphology of watercourses, including riparian vegetation
- any water resource plans, land and water management plans relevant to the affected catchments.

Water quality parameters to be investigated are those appropriate to the catchment type as per the applicable parameters and levels provided in relevant policies and guidelines (e.g. South Australian Environment Protection (Water Quality) Policy 2003 and Australian and New Zealand Environment and Conservation Council (ANZECC) Guidelines for Fresh and Marine Water Quality 2000)). Chemical, radiological and physical properties of any waste water (including concentrations of constituents) at the point of entering natural surface waters is to be discussed along with toxicity of effluent constituents to flora and fauna.

Options for mitigation and the effectiveness of mitigation measures are to be discussed with particular reference to sediment, acidic liquor, hazardous or toxic materials, salinity and brine discharge (if the seawater desalination plant is considered).

An overview of the current monitoring, auditing and management practices for the control of surface water quality associated with the existing Olympic Dam operations are to be provided, with any required amendments to these practices to account for the expanded project identified and discussed.

5.18 Noise and Vibration

This section of the EIS is to discuss the background noise and vibration levels, changes to these levels as a result of the expanded project and the mitigation measures and management strategies proposed to minimise any adverse impacts.

Sufficient data are to be gathered to provide baseline information for monitoring, where relevant, during the construction and operational phases.

The location of noise and vibration sensitive receptors is to be identified on an appropriately scaled plan. The daily variation of background noise levels at sensitive receptors is to be investigated and reported in accordance with relevant State policies and guidelines. Information, including noise contours from a suitable acoustic model is to be provided for significant noise generating activities (e.g. blasting, desalination plant operation). Noise and vibration levels are to be compared, where possible, to recognized national and state standards.

Discussion specific to the township of Roxby Downs is to be included, as is discussion on any other township or community in close proximity to the proposed expansion works, including infrastructure corridors. This will include consideration of the impacts on townships of road, rail and aircraft routes as a result of the expansion. The potential environmental impact, if any, on terrestrial and marine animals and avifauna, particularly migratory species, is also to be considered.

Information is to be supplied on blasting which might cause ground vibration or fly rock on, or adjacent to, the SML. The magnitude, duration and frequency of any vibration generating activity are to be discussed. Mitigation measures for identified noise and vibration impacts are to be provided, together with consideration of how these measures will be monitored, audited and managed. Timing schedules for the construction, operation and decommissioning phases are to be provided together with a discussion on how these timeframes may influence noise and vibration impacts.

This section is also to describe any project-related noise and vibration sources, potential impacts as a result of these sources and mitigation measures to ameliorate impacts. Examples to be included in this discussion, where relevant, are road and rail infrastructure, power plant, seawater desalination plant and gas pipeline and associated compressor stations.

5.19 Cultural Heritage

INDIGENOUS CULTURAL HERITAGE

This section of the EIS is to describe the existing indigenous cultural heritage sites and values that may be affected by the expanded project.

A list of all existing cultural heritage reports held by WMC (Olympic Dam Corporation) Ptv Ltd should be included. This section should also include:

- information about liaison with relevant indigenous community/communities concerning:
 - o the identification of places of significance to that community/communities (including archaeological sites, natural sites, historical sites and anthropological sites etc)
 - any requirements of indigenous peoples relating to confidentiality of site data is to be identified
- a summary of the results of all previous cultural heritage assessments conducted within the project area including (subject to any indigenous confidentiality restrictions) the location and recording of all significant indigenous cultural heritage sites that may be affected by the project

- assessment of the significance of all cultural heritage sites located
- commentary on the impact of the proposed development on cultural heritage sites and values.

A process for the management of cultural heritage sites throughout the project area is to be explained, which addresses the following:

- a process for ensuring the ongoing involvement of indigenous communities associated with the areas of the expanded project, in the protection and management of indigenous cultural heritage sites
- a process for mitigation of any impacts, through the salvage or management and protection of identified cultural heritage sites and places in the project areas, including associated infrastructure corridors, during land disturbance activities
- a process for the management of sites, in accordance with the relevant legislation, where destruction, damage or disturbance of sites is not avoidable
- provisions for the management of the unanticipated discovery of cultural material
- cultural heritage awareness training within induction programs for all employees.

NON-INDIGENOUS/EUROPEAN HERITAGE

This section of the EIS is to describe the existing cultural heritage sites and values that may be affected by the expanded project.

A list of all existing cultural heritage reports held by WMC (Olympic Dam Corporation) Pty Ltd should be provided. This section should also include the following:

- information about liaison with relevant communities concerning:
 - the identification of places of significance to that community/communities (including archaeological sites, natural sites and historical sites
- the results of all previous cultural heritage assessments conducted within the project area including the location and recording of any significant cultural heritage sites that may be affected by the project
- assessment of the significance of any cultural heritage sites located
- the impact of the proposed development on cultural heritage sites and values

A process for the management of cultural heritage sites throughout the project area is to be explained, which addresses the following:

- a process for mitigation of any impacts, through the management and protection of identified cultural heritage sites and places in the project areas, including associated infrastructure corridors, during land disturbance activities
- a process for the management of sites, in accordance with the relevant legislation, where destruction, damage or disturbance of sites is not avoidable
- opportunities for employment of indigenous peoples within the construction and operational phases of the expansion project

5.20 Social impact assessment

Social, economic and cultural values are not easily separated and therefore it may be necessary for some material in this section to be cross referenced to other relevant sections of the EIS. The social impact assessment is to consider the information gathered in the community consultation program and the socio-economic assessment.

This section is to describe the existing social environment, with consideration given to:

- community infrastructure and services, access and mobility
- family structure and demographics of the potentially affected communities
- health services and educational facilities
- workforce characteristics, including types of skills or occupations and availability during both construction and operational phases
- accommodation type, quantity and availability (as it relates to the need for accommodation for the expanded project construction and operational workforce).

The assessment of impacts is to identify possible beneficial and adverse impacts. These impacts are to be considered at the state, regional and local level. Consideration is to be given to the following:

- the impact of the expanded project on existing pastoral land uses (mainly associated with infrastructure corridors and potential impacts on fences, water supply and stock watering points, movement of agricultural machinery), cross referenced to section 5.16
- potential impacts and timing on access to the general public and Arid Recovery Reserve associated with relocating public roads, such as the bore field road
- the impact on any affected land holders
- the potential and mechanisms for local and statewide communities and businesses to tender contracts for services and supplies for any relevant components of the construction, operation and decommissioning phases of the project
- the impact of accommodation requirements during the construction and operational phases, including secondary construction workforce (e.g. workers involved in town expansion and other accommodation development), contractors employed on an as need basis for periodic shut downs and refurbishments and staff that would work in the shops and other service providers
- the impact of the construction workforce on local human services (e.g. housing, education and health services) and local community social and recreational environments
- any potential impacts on the health of the surrounding community (this may be cross-referenced to Section 5.9) and the need for health services specifically relating to families (obstetric and paediatric services), provision of family friendly open space and public spaces, provision of youth centres and community meeting places
- the potential positive and negative social impacts that could result from an increased population at the town

 impact on town expansion and services of other development projects in the region that have publicly available information of relevance to this proposal

5.21 Visual Amenity

This section is to describe the existing landscape character of the project area and the surrounding area. Discussion, plans, photographs and the like are to be used to address the following:

- identification of elements within the project and surrounding area that contribute to the image of the area as discussed in any local government strategic plan or similar government planning instrument
- major views, existing viewing outlooks, ridgelines and other features contributing to the visual amenity of the area
- focal points, landmarks (built form or topography), gateways associated with the project area and immediate surrounding areas, waterways and other features contributing to the visual quality of the area
- character of the local and surrounding areas including character of built form (scale, form, materials and colours) and vegetation (natural and cultural vegetation)
- where relevant, the value of existing vegetation as a visual screen.

The visual impact in terms of the extent and significance of the changed skyline as viewed from places of residence, work and recreation, from road, cycle and walkways, from the air and other known vantage points, day and night, during all stages of the project as it relates to the surrounding landscape is to be considered. Sketches, diagrams or computer imaging and photographs are to be used, where possible, to portray the near and far views of the completed structures (including expanded ore processing plant, waste rock dumps, desalination plant, power station and other major infrastructure components) and their surroundings from visually sensitive locations.

Management measures proposed to minimise any adverse affects on visual amenity are to be discussed. The opportunity to establish viewpoints for the general public as a tourist feature should be considered as part of establishment of the waste rock stockpiles.

5.22 Waste Materials Management

The EIS is to identify and describe those sources of radioactive and non-radioactive waste associated with construction, operation and decommissioning of the expanded project. This section is to include, but not be limited to, the following:

- the amount and physical, radiological and chemical characteristics of solid and liquid waste produced as a result of the expanded project (both on and off the SML) and the processes generating the wastes including those produces by the processing on non-mine site materials
- a summary of key issues in relation to radioactive waste management plans and associated monitoring and reporting programs
- any proposed waste treatment process for disposal of construction, operational and decommissioning waste

- consideration of waste minimisation and cleaner technology options during the construction and operational phases (including solid and gaseous wastes such as nitrogen oxides, sulphur oxides, particulates and carbon dioxide)
- the methods proposed to avoid stormwater contamination by raw materials, wastes or products and the means of containing, recycling, reusing and where appropriate treating of stormwater
- contingency measures in the event of incidents or equipment or operational failures
- the expected total volumes of each waste produced, including an inventory of the following per unit volume of product produced:
 - · the tonnage of products processed
 - the amount of resulting process wastes
 - the volume and tonnage of any by-products
- natural resource use efficiency (e.g. energy and water), integrated processing design, and by-product reuse as shown in a material/energy flow analysis.

The potential impact of waste materials to be generated is to be discussed with details of each material discussed in terms of:

- operational handling, storage and disposal of wastes
- on-site treatment methods proposed for waste materials
- methods of disposal and storage (including the need to transport waste off-site for disposal) proposed to be used for any trade wastes, liquid wastes and solid wastes
- the potential level of impact on environmental values as a result of waste storage and disposal
- proposed discharge/disposal criteria for solid, liquid and gaseous wastes
- methods to control seepage and contamination of groundwater from tailings' retention systems, waste rock stockpiles or any other relevant source
- where appropriate, market demand for recyclable materials.

Further to the above, the potential impacts of additional wastes resulting from the expansion project and the disposal and handling of these wastes is to be considered, including opportunities for coordinating waste management practices for the mine and township of Roxby Downs.

Solid waste disposal / handling

The proposed location, site suitability, dimensions and volume of stockpiles or disposal facilities (overburden, waste rock and tailings), including their method of construction, is to be discussed and illustrated on appropriately scaled plans. The discussion should include details of any tailings and solid waste management options, including codisposal of tailings with waste rock, generation and use of thickened tailings and possible changes in design and operation of the paddock tailings retention system.

This is to include staging or sequencing of these stockpiles or disposal facilities throughout the proposed life of mine. Methods to minimise the risk of acid formation, seepage and contamination are to be provided. Measures to ensure containment of

wastes and stability of the stockpiles or disposal facilities and impoundments, if required, are to be described. The information provided is to be supported by appropriate testing and analysis, seepage analysis and slope stability assessment.

Liquid Wastes

A description of the origin, quality and volume estimates of liquid wastes originating from the project is to be provided, including, but not limited to management of runoff from overburden and waste rock stockpiles, mine water disposal and management of liquid wastes from tailings retention systems and evaporation storages and associated seepages. The design, construction and operation of liquid waste retention systems and evaporation storages are to be discussed. Particular attention is to be given to the capacity of wastes to generate radioactive, acid, saline or sodic wastewater. A water balance for the project and processing plant is required to account for the estimated usage of water. The extent to which existing waste disposal systems and treatment plants are to be used or modified for the expanded project is also to be discussed.

5.23 Economic Assessment

The existing economic environment that may be affected by the project is to be discussed in the national, state, regional and local context. The character and basis of the regional and local economies is to be described, including:

- existing housing market, particularly rental accommodation which may be available for the project workforce
- economic viability (including economic base and economic activity, current regional and local economic trends).

The EIS is also to define and describe the objectives and practical measures for protecting or enhancing economic values and to describe how relevant quantitative standards and indicators may be achieved for economic management.

The effect on state, regional and local labour markets is to be discussed with regard to the source of the workforce. This information is to be presented according to occupational groupings of the workforce.

Direct and indirect impact of the expanded project on the national, state, regional and local economies in terms of effects on employment, income and production is to be discussed. The economic analysis is to include:

- the significance of this project in the national, state, regional and local economic context
- the long and short-term beneficial (e.g. job creation) and adverse (e.g. competition with local small business) impacts that may result from the expanded project
- the cost to all levels of government of any additional infrastructure provision
- the potential economic impact of any major hazards identified.

5.24 Rehabilitation and Decommissioning

This section of the EIS may be presented as, or include, a summary mine closure plan. The strategies and methods for progressive and final rehabilitation of the SML and associated infrastructure corridors for the life of mine are to be discussed. The final

topography of the underground and above ground mine excavations, any additional excavations outside the SML, waste areas, tailings retention systems, infrastructure corridors and evaporation ponds are to be described and illustrated.

This section is to include, but not be limited to, the following:

- the means and proposed timing of decommissioning the project, in terms of the removal of plant equipment, structures and buildings
- the methods proposed for the stabilisation of affected areas
- final rehabilitation of the SML is to be discussed in terms of rehabilitation standards, engineering controls to minimize radiation and other emissions from the site, ongoing land use suitability, management of any residual contaminated land and any other land management issues such as water management and land access
- rehabilitation methods to be used for the project including backfilling, covering, re-contouring, topsoil and cleared vegetation handling and progressive and final revegetation is to be described
- method for decommissioning and rehabilitation of tailings retention systems and associated liquid waste evaporation ponds and other waste storages
- effect of choice of the tailings retention system on final land form and long term stability of rehabilitated tailings retention systems for the duration of risk to the surrounding environment
- consideration is to be given to settling or subsidence of rehabilitated areas and how this may affect the use of the land in its post mine form
- the final drainage and seepage control systems and long-term monitoring plans for these is to be described
- management of any voids remaining post operations are to be described, including proposed land use, void water quality, suitability for use by stock, safety of access and stability of void walls
- post mining impacts on local / regional groundwater resources
- decommissioning of the existing underground operation is to be addressed as well as the proposed expanded project

5.25 Draft Environmental Management Plan

A Draft Environmental Management Plan (Draft EMP) is to be developed from the mitigation measures detailed in the EIS for the construction, operation and decommissioning phases. The Draft EMP is to take account of the existing Olympic Dam Environmental Management Program 2005-2007 and focus on those components of the expanded project not currently addressed, or requiring update, in the existing management program.

The Draft EMP is an integral part of the EIS, but is to be capable of being read as a stand-alone document without reference to other parts of the EIS. The general content of the Draft EMP are to comprise:

 a consolidated list of the proponent's commitments to acceptable levels of environmental performance, including environmental objectives (i.e. levels of expected environmental impact, performance standards and associated measurable indicators, performance monitoring and reporting against the predicted effectiveness of mitigation measures and corrective action in the case of non-compliance)

- control strategies and estimated costs to implement the commitments
- the name of the agency responsible for endorsing or approving each mitigation measure or monitoring program.

5.26 References and Appendices

All references are to be consistent and presented in a recognised format. Items in the appendices are to include:

- the final Guidelines
- the key personnel of the study team
- · a list of the stakeholders consulted
- site plans
- technical reports that supplement the EIS (including the source, currency, reliability and any uncertainties in relation to the information).

ATTACHMENT A

MATTERS THAT MUST BE ADDRESSED IN AN EIS (SCHEDULE 4 OF THE EPBC ACT REGULATIONS 2000)

1. General information

- 1.01 The background of the action including:
 - (a) the title of the action;
 - (b) the full name and postal address of the designated Proponent;
 - (c) a clear outline of the objective of the action;
 - (d) the location of the action;
 - (e) the background to the development of the action;
 - (f) how the action relates to any other actions (of which the Proponent should reasonably be aware) that have been, or are being, taken or that have been approved in the region affected by the action;
 - (g) the current status of the action; and
 - (h) the consequences of not proceeding with the action.

2 Description

- 2.01 A description of the action, including:
 - (a) all the components of the action;
 - (b) the precise location of any works to be undertaken, structures to be built or elements of the action that may have relevant impacts;
 - (c) how the works are to be undertaken and design parameters for those aspects of the structures or elements of the action that may have relevant impacts;
 - (d) relevant impacts of the action;
 - (e) proposed safeguards and mitigation measures to deal with relevant impacts of the action;
 - (f) any other requirements for approval or conditions that apply, or that the Proponent reasonably believes are likely to apply, to the proposed action;
 - (g) to the extent reasonably practicable, any feasible alternatives to the action, including:
 - (i) if relevant, the alternative of taking no action;
 - (ii) a comparative description of the impacts of each alternative on the matters protected by the controlling provisions for the action; and
 - (iii) sufficient detail to make clear why any alternative is preferred to another;

- (h) any consultation about the action, including:
 - (i) any consultation that has already taken place;
 - (ii) proposed consultation about relevant impacts of the action; and
 - (iii) if there has been consultation about the proposed action any documented response to, or result of, the consultation; and
- (i). identification of affected parties, including a statement mentioning any communities that may be affected and describing their views.

3 Relevant impacts

- 3.01 Information given under paragraph 2.01(d) must include
 - (a) a description of the relevant impacts of the action;
 - (b) a detailed assessment of the nature and extent of the likely short term and long term relevant impacts;
 - (c) a statement whether any relevant impacts are likely to be unknown, unpredictable or irreversible;
 - (d) analysis of the significance of the relevant impacts; and
 - (e) any technical data and other information used or needed to make a detailed assessment of the relevant impacts.

4 Proposed safeguards and mitigation measures

- 4.01 Information given under paragraph 2.01(e) must include:
 - (a) a description, and an assessment of the expected or predicted effectiveness of, the mitigation measures;
 - (b) any statutory or policy basis for the mitigation measures;
 - (c) the cost of the mitigation measures;
 - (d) an outline of an environmental management plan that sets out the framework for continuing management, mitigation and monitoring programs for the relevant impacts of the action, including any provisions for independent environmental auditing:
 - (e) the name of the agency responsible for endorsing or approving each mitigation measure or monitoring program; and
 - (f) a consolidated list of mitigation measures proposed to be undertaken to prevent, minimise or compensate for the relevant impacts of the action, including mitigation measures proposed to be taken by State governments, local governments or the Proponent.

5 Other Approvals and Conditions

- 5.01 Information given under paragraph 2.01(f) must include:
 - (a) details of any local or State government planning scheme, or plan or policy under any local or State government planning system that deals with the proposed action, including:

- (i) what environmental assessment of the proposed action has been, or is being carried out under the scheme, plan or policy; and
- (ii) how the scheme provides for the prevention, minimisation and management of any relevant impacts;
- (b) a description of any approval that has been obtained from a State, Territory or Commonwealth agency or authority (other than an approval under the Act), including any conditions that apply to the action;
- (c) a statement identifying any additional approval that is required; and
- (d) a description of the monitoring, enforcement and review procedures that apply, or are proposed to apply, to the action.

6 Environmental record of person proposing to take the action

- 6.01 Details of any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against:
 - (a) the person proposing to take the action; and
 - (b) for an action for which an EIS has applied for a permit, the person making the application.
- 6.02 If the person proposing to take the action is a corporation details of the corporation's environmental policy and planning framework.

7 Information sources

- 7.01 For information given the EIS must state:
 - (a) the source of the information; and
 - (b) how recent the information is; and
 - (c) how the reliability of the information was tested; and
 - (d) what uncertainties (if any) are in the information.



South Australian Government Guidelines

Guidelines

for the preparation of an ENVIRONMENTAL IMPACT STATEMENT

Expansion of the Olympic Dam operations at Roxby Downs Proposal

Second Declaration by BHP Billiton Olympic Dam Corporation Pty Ltd



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Development Assessment Commission South Australia

www.planning.sa.gov.au/dac

ISBN 978 1 876702974 FIS 22908

November 2008

GUIDELINES FOR AN ENVIRONMENTAL IMPACT STATEMENT ON THE PROPOSED EXPANSION OF THE OLYMPIC DAM OPERATIONS AT ROXBY DOWNS

NOVEMBER 2008

(First released February 2006)

FOREWORD

Background

The Australian Minister for the Environment, Heritage and the Arts and the South Australian Ministers for Mineral Resources Development and Urban Development and Planning will be collaboratively assessing the environmental impacts of a proposed expansion of the existing BHP Billiton Olympic Dam Corporation Pty Ltd (the proponent) Olympic Dam mining operation. Olympic Dam is located approximately 570km north north-west of Adelaide in South Australia.

Operations at Olympic Dam are regulated by the Roxby Downs (Indenture Ratification) Act 1982, which was enacted by the South Australian Parliament in 1982 and amended in 1996 and 1997, and the Indenture the subject of that Act. The existing operation has Commonwealth and South Australian Government environmental approvals (with conditions) to produce up to 350,000 tpa of copper and associated products.

The proposed expansion would enable mining and processing at Olympic Dam within an extended Special Mining Lease boundary for a life of mine of approximately 70 years and a possible production rate over time of up to 1 million tonnes per annum (t/a) of *refined* copper and associated products.

First Declaration and Guidelines

The assessment process for the expansion commenced following a determination on 2 September 2005 by the Australian Minister for the Environment and Heritage that the proposed expansion was a controlled action under the provisions of the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). The controlling provisions under the EPBC Act are listed threatened species, migratory species, Ramsar wetlands, Commonwealth land and nuclear actions. In the referral document the proponent committed to the preparation of an Environmental Impact Statement (EIS) and on 8 November 2005 the Australian Minister for the Environment and Heritage determined that an EIS would be required for the proposal. An EIS is a document which describes to the Australian Government, the South Australian Government¹ and the community what the proponent wants to do, what the environmental impacts will be and how the proponent plans to manage these impacts.

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¹ The Northern Territory Government will also rely on the EIS for assessment of proposed activities at the Port of Darwin associated with the Olympic Dam Expansion project.

The Indenture the subject of the Roxby Downs (Indenture Ratification) Act 1982 modifies in certain respects the provisions contained in Division 2 of Part 4 of the South Australian Development Act 1993 (the Major Developments process) as they apply to the land the subject of the Special Mining Lease (SML), and land reasonably required for the transport or provision of water, power and petroleum (including gas). On 15 September 2005 the South Australian Minister for Mineral Resources Development, acting in pursuance of these provisions, made a declaration in the State Government Gazette that the proposed expansion of Olympic Dam would be a Major Development. Because of the interaction between the Indenture and the Development Act, however, the first declaration is limited to development on the Special Mining Lease (SML) and land reasonably required for the provision or transport of water, power, gas and petroleum.

Following the making of that declaration and the subsequent lodgement by the proponent of a development application, and in pursuance of the Indenture, the South Australian Minister for Mineral Resources Development assumed the role of the Development Assessment Commission in developing the joint Guidelines/Issues Paper. The joint Guidelines/Issues Paper was prepared in collaboration with the Australian Government and released in February 2006 (first Guidelines document).

Second Declaration and Guidelines

Under the provisions of the Development Act 1993, the South Australian Minister for Urban Development and Planning made a second Major Development declaration on 21 August 2008. The second declaration was necessary to capture activities not covered by the first declaration, for activities proposed to occur outside the SML and the infrastructure corridors for water, power and petroleum. Activities captured under the second declaration include a landing facility, a rail line from Pimba to Olympic Dam, a new airport and workers accommodation.

The proponent subsequently lodged a second 'updated' development application for activities captured by both declarations. Accordingly the formulation of a second Guidelines document has been necessary.

Under the Development Act 1993 the Development Assessment Commission (Commission), an independent statutory authority, has the responsibility for setting the level of assessment for the proposal under the Development Act 1993 and for formulating the relevant Guidelines.

Following a thorough review of the proposal as described in the latest development application, and of the existing Guidelines issued in February 2006, the Commission has endorsed an EIS as the appropriate level of assessment. Furthermore, the Commission also endorsed the framework of the existing Guidelines, including the format, and the specific requirements for the EIS prescribed in sections 4 and 5, as the Commission considered the existing Guidelines comprehensively covered all issues associated with the project components.

However the Commission has made some modifications to the introductory sections of the Guidelines, including the Forward and sections 1-3, to better reflect the current project description and assessment process. To assist in reading and applying the two sets of Guidelines together, changes have been made in italics to

assist the proponent and the public in easily identifying the differences and any additional requirements to be addressed in the EIS.

All development covered by the two Major Development Declarations are components of a single project for the expansion of the Olympic Dam operations. Therefore, although the interaction between the Indenture and the Development Act mandates that two sets of Guidelines will apply to the expansion project, it is intended that a single EIS will address the requirements of both sets of Guidelines, for assessment and decision by the State² and Commonwealth Governments.

The EIS shall encompass those issues clearly related to the expansion of the existing Olympic Dam development and the potential impacts on the region. These issues include, among others, the construction, operation and rehabilitation of the mine site and associated infrastructure, including power, water, gas, rail, airport and port, ore processing operations, the management of tailings and waste rock and transport of uranium *oxide* within Australia for export. The scope of the assessment will not include broader issues relating to the use of exported uranium in the nuclear fuel cycle. Issues relating to the use of exported uranium in the nuclear fuel cycle are beyond the control of the proponent and it would be impractical for the proponent to address these issues in the EIS.

An opportunity for public comment will occur when the completed EIS is released for comment. When the EIS is ready for public release, an advertisement will be placed in The Advertiser, The Australian and relevant local newspapers to indicate where the EIS is available and the length of the public exhibition period, details of the public meetings and details about how written submissions can be made.

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² Including assessment by the Northern Territory Government against Guidelines issued under the NT Environmental Assessment Act 1994.

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1. INTRODUCTION

1.1 Background

The Olympic Dam mine deposit, located approximately 570 km NNW of Adelaide in South Australia, was discovered in 1975 by the exploration division of WMC Resources. A joint venture to facilitate development of the project was formed in 1979 between WMC Olympic Dam Corporation Pty Ltd and the BP Group. WMC Olympic Dam Corporation Pty Ltd purchased the partner's share in April 1993. WMC Olympic Dam Corporation Pty Ltd has since become a member of the BHP Billiton Group, and is now called BHP Billiton Olympic Dam Corporation Pty Ltd.

Following environmental, social and cultural heritage studies documented within an Environmental Impact Statement (EIS) in 1982, mining at Olympic Dam commenced in 1988 at a production rate of 45,000 tonnes per annum (tpa) of copper plus associated products. Between 1989 and 1995 the production rates at Olympic Dam increased as a result of two optimisation programs. The first optimisation of the operation in 1992 saw the production rate increase to 66,000 tpa of copper plus associated products, the second in 1995 saw the production rate increase to 85,000 tpa of copper plus associated products.

A major expansion was investigated and approved through a second EIS in 1997 and this enabled production rates to be increased to the current levels of approximately 200,000 tpa of copper plus associated products (being 4,000 tpa of uranium oxide, 80,000 ounces of gold and 800,000 ounces of silver). It is anticipated that optimisation of the underground operations will occur over approximately the next 20 years to increase production within the scope of the existing approval. This project is not subject of the current EIS.

An intensive drilling program has confirmed a very large ore body on the existing Olympic Dam Special Mining Lease (SML). The extent of this mineral resource has led the proponent to request a further expansion to the existing mining and processing approvals (see Section 3.2 for anticipated production rates).

The operation currently provides employment for approximately 1700 permanent staff and 2450 contractors on site. The township of Roxby Downs, 16km south of the mine, was first occupied in 1987 and houses over 4,000 people.

Existing infrastructure associated with the current mining and processing operation include a series of groundwater bores in the Great Artesian Basin, water supply pipelines from these wellfields to Olympic Dam, transmission lines from Port Augusta to Olympic Dam, an airport and construction camp at Olympic Dam Village, an on-site desalination plant and mine processing plant and associated infrastructure (including tailings retention systems, evaporation ponds, a quarry and waste handling facilities).

1.2 Proposed expansion

The proponent proposes to expand the existing Olympic Dam copper, uranium, gold and silver mine and processing plant, including all associated infrastructure. The project is in the planning phase, with several options for major infrastructure being investigated.

The principal components of the proposed expansion currently under investigation include (see Figures 2 and 3 for locations):

- the mining and processing of copper, uranium, gold and silver within an expanded *SML* boundary (this would allow for a possible increased annual production rate from the currently approved 350,000 tpa copper up to 1M tpa copper if required)
- sourcing and supplying additional water (via a water pipeline from one or more of various options including water extraction from the Great Artesian Basin (GAB) within licence limits, a coastal seawater desalination plant, local or regional saline aquifers)
- sourcing and supplying additional energy (via a transmission line from the existing State electricity grid and/or from an on-site gas fired power station supplied by a natural gas pipeline and supplemented by a co-generation facility to recover waste heat from processing)
- construction, relocation or upgrades to transport infrastructure (including rail, road, airport, *landing facility* and port)
- additional infrastructure and services associated with expanded accommodation needs at Roxby Downs and potentially other local townships to house the permanent and temporary workforce.

Further details of the proposed expansion are provided in section 3.

2. ENVIRONMENTAL ASSESSMENT AND APPROVAL PROCESS

2.1 Background

The proposed Olympic Dam expansion EIS will be assessed under two legislative regimes, namely³:

- The Major Development assessment process under the South Australian Development Act 1993 (as affected by the Indenture the subject of the Roxby Downs (Indenture Ratification) Act 1982).
- The Commonwealth Environment Protection and Biodiversity Conservation Act 1999 for assessment of Matters of National Environmental Significance.

2.2 Collaborative environmental impact assessment process

As the proposed expansion triggers both Australian and State legislation, the environmental assessment of the expanded project will be conducted under a collaborative assessment process between the Australian and State Governments. The proponent shall produce a single EIS to meet the requirements of both the Australian and State Governments. It is therefore a requirement of the EIS that it identifies all Australian and State legislative Acts and Regulations relevant to the project, and obtains all relevant permits and licenses under these Acts and Regulations.

The key stages of the collaborative assessment process are as follows:

- referral under the EPBC Act submitted to Australian Department of the Environment and Heritage (Australian DEH)
- decision that the proposal is a controlled action under the EPBC Act
- decision on the assessment approach (level of assessment)
- project proposal submitted to South Australian Minister for Mineral Resources Development
- Draft Guidelines / Issues Paper placed on public exhibition (4 weeks), written submissions invited and compiled by State Government
- Australian and State Government prepare final Guidelines giving consideration to written submissions
- Joint Guidelines finalised, provided to the proponent and made available to the public by way of advertisement
- Second Major Development Declaration made by the South Australian Minister for Urban Development and Planning, for activities on land outside the SML and not for the transport or provision of water, power, or petroleum.
- The Development Assessment Commission reviews the existing Guidelines and prepares a second Guidelines document (necessary because of the second Major Development Declaration).

³ The NT Government will assess the EIS (only for the activities proposed at the Port of Darwin) under the NT Environmental Assessment Act.

- The Minister for Urban Development and Planning issues the second Guidelines document to the proponent and makes it available to the public by way of advertisement.
- the proponent prepares the Draft EIS document
- public exhibition of Draft EIS (8 weeks), written submissions invited, compiled by State Government and then provided to the proponent⁴
- public meetings may be held at Roxby Downs, the Upper Spencer Gulf and Adelaide during the exhibition period to assist people in the preparation of their submissions
- the proponent prepares and lodges Supplementary EIS / Response Document to respond to public and Government submissions
- Government assessment of Supplementary EIS / Response Document and preparation of assessment reports for Australian and State Ministers
- Government decisions required on the proposal, from the State (SA and NT) and Commonwealth Governments.

This document has been prepared to service both legislative requirements and to provide consistency for the assessment process⁵. The Draft EIS required under the EPBC Act is the same document as the EIS required under the Development Act 1993⁶. In this document reference to Draft EIS should be taken to also mean an EIS under the State process. Similarly, reference to a Supplementary EIS as required under the EPBC Act should be taken to also mean a Response Document under the State process as both documents serve the same purpose. It should be noted that the Final EIS under the EPBC Act comprises the Draft EIS and Supplementary EIS documents.

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⁴ Note all submissions to be made to Planning SA

⁵ The NT Government will issue a separate Guidelines document, which only deals with activities proposed for the Port of Darwin.

⁶ And the Northern Territory Government's EIS

2.3 Purpose of Guidelines

The purpose of the Guidelines is to establish the matters that should be addressed in the proponent's EIS.

This document is not intended to address policy issues about the appropriateness of uranium mining or the broader issues relating to the use of exported uranium in the nuclear fuel cycle. Rather, it is intended to set the scope of environmental, social, cultural heritage and economic studies required in the EIS to allow for an assessment and decision on the appropriateness of an expansion to the existing Olympic Dam mining and processing operation.

2.4 Opportunities for public input

There are numerous opportunities for public input throughout the environmental impact assessment process.

The following are statutory requirements for public input:

- when the Project EPBC Act Referral was lodged on 15 August to the Australian Department of the Environment and Heritage (Australian DEH) and placed on the Australian DEH web site
- during the four week public exhibition period for the first Draft Guidelines/Issues Paper that ran from 21 November to 16 December 2005.⁷
- during the eight week period for public comment when the Draft EIS has been completed and submitted to the Commonwealth and State Governments.

It is proposed to hold public meeting(s) during the EIS consultation period to enable the proponent to present details of the proposed Olympic Dam Expansion Project and the Australian and State Governments to provide information on the environmental impact assessment process. In addition to the above statutory requirements, the proponent may seek to engage the community in consultation throughout the development of the EIS. The nature and level of this engagement is at the discretion of the proponent. Preliminary consultations have commenced, including discussions with Olympic Dam staff, the Roxby Downs community and Aboriginal communities.

2.5 General Content, Format and Style of the EIS

The document should place emphasis on the major environmental issues associated with the proposed expansion. Matters dealt with in previous EIS' and Reviews should be considered and dealt with to the extent that they are relevant to the current proposed expansion. Matters of lesser concern should be dealt with only to the extent required to demonstrate that they have been considered.

It is envisaged that the EIS will be based on the results of available research, studies and data as appropriate, with further studies being conducted where necessary and practicable. The extent to which the limitations, if any, of available information may influence the decisions of the environmental assessment should be discussed.

⁷ Note: It was not a legislative requirement to publicly exhibit the second Guidelines document.

In these Guidelines, the terms 'description' and 'discussion' should be taken to include both quantitative and qualitative materials as practicable.

The main text of the EIS should be written in a clear, concise style that is easily understood by the general reader. Technical jargon should be avoided wherever possible. Detailed technical information necessary to support the main text should be included as appendices issued with the EIS so that the EIS is complete and self-contained. Where appendices include results of studies conducted in preparing the proposal, the public availability of studies should be indicated.

The documentation should include references and a list of individuals and organisations consulted. Relevant maps and illustrations should be included. The cost of the EIS to the public should be minimised.

While every attempt has been made to ensure these Guidelines address all of the major issues associated with this proposal, they are not necessarily exhaustive and should not be interpreted as excluding from consideration matters deemed to be significant but not incorporated in them, or matters that emerge as important or significant from environmental studies or otherwise during the course of the preparation of the EIS.

DESCRIPTION OF THE PROJECT

The expanded project is in its planning phase. Several options for major infrastructure components are being investigated. As a result, the description of the expanded project is broad. In the description that follows details of the infrastructure requirements (water supply, energy, transport, area of the proposed development components) are provided on the basis of an expansion to 750,000 tonnes per annum (of refined copper equivalent plus associated products). However, it is possible that the production rate of the expanded mine could be up to 1 million tonnes per annum.

Engineering studies are being undertaken by BHP Billiton to define the water, energy, transport and other requirements for an expansion of up to 750 000 tonnes per annum of refined copper plus associated products and the revised infrastructure needs would be incorporated in the EIS document.

3.1 The current and proposed project area

The current operations include the existing SML, the Olympic Dam Village, township of Roxby Downs and several linear infrastructure corridors as shown on Figure 1. The SML is located approximately 570 km NNW of Adelaide in South Australia. Olympic Dam Village is 6km south of the mine and the township of Roxby Downs is 16 km south of the mine.

The SML covers an area of approximately 17,800 ha. Figure 2 shows the current extent of the SML and the proposed extended boundary of the SML. The location and extent of the footprint for the expanded project is under investigation, and this investigation will continue throughout the early stages of the project's EIS. The entire area of the expanded SML boundary will be investigated as a potential footprint for the mine development and associated on-site infrastructure. The total area of the expanded SML is approximately 49,700 ha.

The project's infrastructure options are being investigated, and therefore preferred options for the various infrastructure components are yet to be finalised. The main infrastructure options being investigated include:

- Seawater desalination plant at Point Lowly
- 320km water supply pipeline from a seawater desalination plant in the Upper Spencer Gulf
- 270km energy supply transmission line from Port Augusta to Olympic Dam
- On-site gas fired power station and gas pipeline from Moomba (between 400 560 km of pipeline)
- 105km rail line from Pimba to Olympic Dam and new rail/road intermodal freight terminal at Pimba:
- accommodation footprint at Roxby Downs for up to 10, 000 people
- accommodation footprint at the relocated and expanded construction camp for up to 10 000 people (Hiltaba Village)
- Relocation of the existing airport
- Landing facility south of Port Augusta to off-load pre-assembled infrastructure and connector road to the Port Augusta pre-assembly yard

• Upgrading of facilities at the Port of Darwin to allow for the secure export of Copper Concentrate via rail from Olympic Dam⁸.

It is possible that the planning studies may identify further options for infrastructure, additional area requirements and additional processing of non mine site products and materials.

3.2 Description of proposed activities

Mine expansion and associated infrastructure

Mining and production rates

The proponent is seeking approval for mining and processing activities within the extended SML boundary as shown on Figure 2. The existing mining method is underground mining (sub-level open stoping) of approximately 10 million tonnes per annum (Mtpa) of ore. The location and extent of the mineral resource to be mined as part of the expanded project warrants open pit mining, and an anticipated increase of mined ore to at least 72Mtpa. This quantity of ore would yield 2.4Mtpa of copper concentrate, which when refined would produce 750,000 tpa copper equivalent (this is likely to increase in the future as mining technology advances).

In the description that follows details of the infrastructure requirement (water supply, energy, transport, area of the proposed development components) are provided on the basis of an expansion *up to 2.4Mtpa of copper concentrate*.

Engineering studies are being undertaken by BHP Billiton to define the water, energy, transport and other requirements for an expansion up to 1 million tonnes per annum if required and the revised infrastructure needs would be incorporated in the EIS document.

The mineral composition of the ore body being mined currently and that to be mined for the expanded project is different. The differences in mineral composition result in changes to the quantity and production rate, of copper, uranium, gold and silver between the current and expanded project. Table 1 provides an example of the differences in production rates from the existing and future mineral resource for data relating to 10Mtpa and 72Mtpa of ore respectively.

Table 1: Example of mined tonnages as a result of mineral composition

Mineral	Indicative Current production rate (based on 10Mtpa)	Indicative proposed expansion production rate (based on 72Mtpa)
Copper	220,000 tpa	<i>750</i> ,000 tpa
Uranium	4,000 tpa	<i>19</i> ,000 tpa
Gold	80,000 ounces	800,000 ounces
Silver	800,000 ounces	2,900,000 ounces

Current predictions suggest that the open pit would be approximately 3.5 km long, 4.1 km wide and 1.1km deep at year 40 (approximately 1010 hectares). Initial design of the waste rock stockpile indicates that it may cover an area of up to 7350 ha (based on

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⁸ The SA Government will not be assessing the part of the EIS dealing with the proposed facilities at the Port of Darwin. This is a matter for the Northern Territory Government.

a *150m* high waste rock stockpile). The open pit and waste rock stockpile would be located entirely within the boundaries of the expanded SML.

An option of co-disposing the waste rock and the tailings in the same area is being investigated. This material handling method would avoid the need for additional tailings retention systems. The details of the material handling methods and footprint areas will be further investigated during the EIS.

The current mining method of sub-level open stoping will be optimised to increase production to a rate of approximately 235 000 tonnes per annum, then will begin to reduce as construction of the open pit commences and continue for approximately 20 years, but at a reduced rate. Once this area of the ore body has been exhausted, the infrastructure supporting the underground mine will be used for the expanded operation where possible, or decommissioned. Some areas of the ore body may be better suited to a different mining method, such as block caving, and therefore a combination of mining methods are likely to be implemented throughout the life of the mine.

Processing

New processing facilities will be required to process the additional ore. Ore from the proposed open pit is expected to have a lower copper to sulphur (Cu:S) ratio than ore currently mined from the existing underground mine. All ore recovered will be processed to concentrate in processing facilities at the mine. The lower grade ore will likely require a two stage smelting option. Smelting capacity for the concentrate produced from ore recovered by the open pit may be produced at the mine or at another location (potentially outside of South Australia).

In general, the processing of ore would be similar to that currently used, with each component suitably scaled to meet the increased ore throughput, but otherwise not differing significantly in technology or function. Further, as noted in the Roxby Downs (Indenture Ratification) Act 1982, non mine site products and materials may also be processed at Olympic Dam and the expanded project will continue to consider these products in the design of the relevant infrastructure.

Tailings Retention System

The existing operation utilises a paddock tailings retention system for tailings and water liquor and this occupies an area of approximately 550 ha. This tailings system may be expanded, or alternatively a new tailing storage system may be established to support the expanded operations. A number of tailings options are being investigated and will be addressed in the EIS, including co-disposal of the tailings and the mine waste rock as a thickened paste, which would significantly reduce the area required for the storage of tailings. The restriction on the height of the tailings retention system is being investigated as this also presents an opportunity to significantly reduce the footprint area for tailings storage. Irrespective of the tailings retention system adopted, all tailings would be located entirely within the extended boundaries of the SML.

Water supply and associated infrastructure

The current water licence provides for 42 Ml/d from the GAB, of which approximately 32 - 36 Ml/d is currently used. Water is supplied from Wellfield A (approximately 6 Ml/d) and Wellfield B (approximately 28 Ml/d) (refer Figure 1 for locations). For the expanded mine operation, it is estimated that between 235 - 260 ML of additional water may be required. A number of options will be investigated in the EIS including:

- · seawater desalination in the Upper Spencer Gulf,
- desalination facilities on the SML,
- new local and regional saline aguifer wellfields, and
- further on-site recycling of water (including de-watering of the pit).

Pipelines to transport the water from the seawater desalination plant and saline wellfields would be required and form a component of the expanded project.

The existing operation has an on-site desalination plant with a capacity of 14.7 Ml/d (refer Figure 2 for location). An expansion to the existing on-site desalination plant may be required. It is also likely that the plant would need to be relocated to accommodate the proposed open pit and waste rock stockpile.

Energy supply and associated infrastructure

The current operation is connected to the State grid via a 275 kV power line from Port Augusta and a 132 kV transmission line from Pimba. At present, the average load is approximately 125 MW. For the proposed mine expansion, the demand is expected to increase to a maximum demand of about 800 MW (to be investigated further during the EIS). Options being considered to provide the additional energy supply include:

- additional transmission line (s) from the State grid
- Gas pipeline
- on and off site power generation (including on-site cogeneration).

Transport infrastructure

Currently, transport of materials to and from Olympic Dam is via road. The construction of a rail line between Pimba and Olympic Dam, which would connect to the existing State network from Pimba to Port Adelaide, is being investigated and forms a component of the expanded project. During operation of the expanded mine, materials would be transported by rail and road, from the mine to a port (with several ports being investigated including, but not limited to, Port Adelaide and Darwin). The number, size and haulage capacity of trains between Port Adelaide (and/or Darwin) and Olympic Dam is being investigated and will be discussed within the project's EIS.

The increased quantity of material transported to and from ports is likely to also necessitate an upgrade of existing, or the construction of new transport and storage infrastructure. Examples may include new or upgraded port infrastructure, landing facilities, access corridors, intermodal facilities, storage facilities and laydown areas. The details and environmental assessment of any such upgrades and/or new infrastructure would be included within the project's EIS.

The existing airport at Olympic Dam would be relocated as the mine expansion progresses. Studies are currently being undertaken to determine the most appropriate location for the new airport and the timing of the relocation.

Accommodation and associated infrastructure

The township of Roxby Downs, 16 km south of the mine, houses approximately 4,500 people. The construction camp at Olympic Dam 6 km south of the mine houses approximately 1650 people. During the construction and operation of the proposed expansion, the workforce will increase significantly and it is estimated that in the order of 10,000 people would be housed at Roxby Downs and *up to 10,000* people at construction camp/s.

An expansion to the existing Roxby Downs Municipal Lease would not be required. Additional service and community infrastructure would also form a component of the project. Planning studies that establish the location and extent of the increased footprints and associated infrastructure will be undertaken during the EIS.

It is also likely that additional pre-fabrication yards would be required and these may be located within the expanded Roxby Downs Municipal Lease, Port Augusta, Port Adelaide or elsewhere.

3.3 Timeframe

Project timing is under investigation and projected timeframes will change. The proponent has indicated the following schedule, which would be subject to the proposal obtaining environmental approval:

- construction of the necessary infrastructure would commence immediately upon environmental approval of the expanded project
- pre-feasibility and preliminary engineering studies would occur concurrent with the environmental assessment
- construction of the various infrastructure components would be staged, commencing after environmental approval is obtained
- mining would commence as soon as practicable after and subject to all relevant approvals been obtained
- the actual ore body is expected to be reached in the order of 5 years after commencement of mining
- mining of the resource would continue until the resource within the extended SML boundary was exhausted. The proponent has anticipated that this equates to a life of mine of approximately 70+ years.

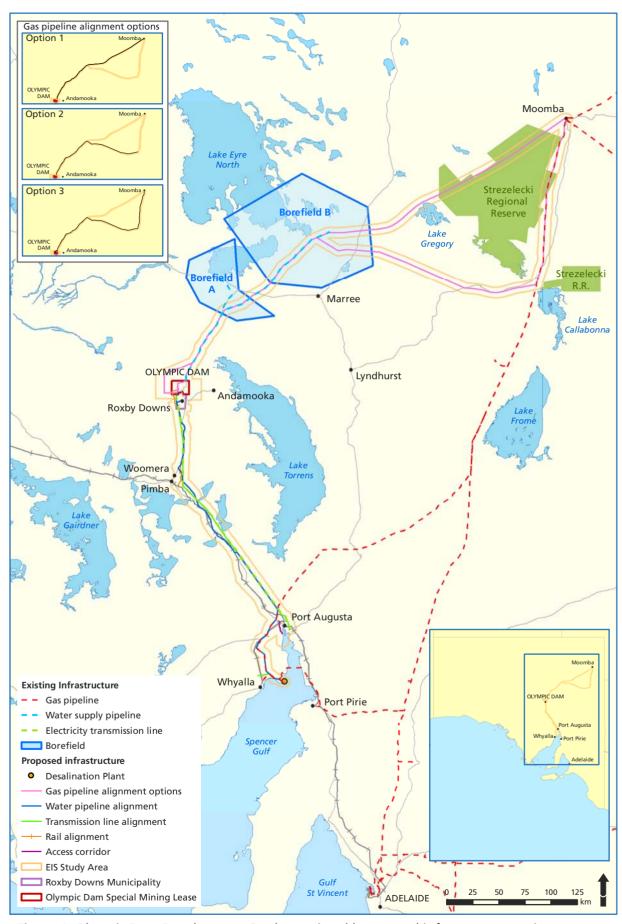


Figure 1: Olympic Dam Development Study - regional layout and infrastructure options



Figure 2 Olympic Dam Development Study - existing operation

4. CONTENT OF THE EIS

The objective of both the environmental impact assessment provisions of the Australian and South Australian Governments is to ensure that those matters that could potentially have a significant environmental, social or economic impact are fully examined and taken into account in decisions by both Governments. The terms 'environment' and 'environmental' as used herein refer to all aspects of the surroundings of human beings, whether affecting human beings as individuals or in social groupings, and including the natural environment, the built environment (present and historic), and economic and social aspects of our surroundings. This definition covers such factors as air, water, soils, vegetation, fauna, buildings, roads, employment, housing and recreational facilities.

The EIS is required to:

- Provide information of the existing operations, the proposed expanded operations and the alternatives considered in establishing the expanded project. The expanded project being defined as all works associated with the proposed expanded operations including works on the SML, municipality of Roxby Downs and all associated infrastructure such as water and energy supply and transport and traffic infrastructure. From this information interested individuals and groups may gain an understanding of the proposed expansion, the need for the expansion, the alternatives, the environment which it could affect, the impacts that may occur and the measures to be taken to minimise the impacts;
- Identify the existing biological, physical, social and cultural environment, impacts which may occur on this environment (both beneficial and adverse) and the measures proposed to mitigate adverse impacts. Discussion of impacts is to include an analysis of the significance of the relevant impacts and a statement as to whether any relevant impacts are likely to be unknown, unpredictable or irreversible;
- Provide a forum for public consultation and informed comment on the proposal;
- Provide a framework in which decision-makers may consider the environmental, economic and social aspects of the proposal;
- Specifically address all relevant matters under the requirements of the Environment Protection and Biodiversity Conservation Act 1999;
- Be generally consistent with the principles of assessment, reporting and consultation processes for a major development under the South Australian Development Act 1993;
- Recognise the provisions of the Roxby Downs (Indenture Ratification) Act 1982.

The EIS is also to include:

- the title of proposed development
- the name and address of proponent
- an executive summary
- a glossary of terms
- a table of contents and list of tables, figures and appendices
- a description of the existing operations
- project justification
- a description of the proposed expanded project

- a description of the alternatives investigated, including the no-expansion option
- a description of the community consultation process undertaken
- an assessment of the existing environment, potential impacts on that environment and mitigation measures proposed to ameliorate impacts
- a Draft Environmental Management Plan (Draft EMP)
- a means of cross-referencing the relevant sections of the EIS with the corresponding sections of the final Guidelines
- appendices that include:
 - o the final Guidelines
 - o the key personnel of the study team
 - o a list of the stakeholders consulted
 - technical reports that supplement the EIS (including the source, currency, reliability and any uncertainties in relation to the information).

The specific requirements to be addressed in the EIS are provided in Section 5. It is on these requirements that public comment is sought, with the earlier sections of this document providing the context.

As noted above, the EIS is not to address policy issues about the appropriateness of uranium mining. The scope of the assessment will also not include broader issues relating to the use of exported uranium in the nuclear fuel cycle. Issues related to the use of exported uranium in the nuclear fuel cycle are beyond the control of the proponent and it would be impractical for the proponent to address these issues in the EIS.

SPECIFIC REQUIREMENTS – CONTENTS OF THE EIS

The EIS is to address the following requirements and may use the same or similar format as shown below.

5.1 Executive Summary

The executive summary is to be written as a stand-alone document, able to be reproduced on request for interested parties who may not wish to read or purchase the full EIS. The structure of the executive summary is to follow that of the EIS, although focussed strongly on the key issues allowing the reader to obtain a clear understanding of the existing Olympic Dam operations, the proposed expanded project and the environmental, social, cultural and economic impacts, both beneficial and adverse, of the expanded project. The executive summary is also to provide a brief discussion of the alternatives, reasons for selecting the preferred option and a concise account of the management measures proposed to avoid or minimise potential adverse impacts.

5.2 Glossary of terms

A glossary of technical terms and commonly used acronyms is to be provided.

5.3 Introduction

The introduction is to explain clearly the purpose of the EIS, why it has been prepared and what it sets out to achieve. It is to define the audience to whom the EIS is directed and contain an overview of the structure of the document. It is to identify clearly the scope of the project as being an expansion to an existing mining and processing operation.

The introduction is to provide:

- A background to the project this section is to include a statement of the
 objectives which have led to the proposal for an expanded project and a brief
 outline of the events leading up to the project's formulation, including
 alternatives, envisaged time scale for implementation, project life, anticipated
 establishment costs and actions already undertaken within the project area.
- Company profile provide an overview of the project proponent, including the
 nature and extent of relevant business activities and environmental record
 (including details of any proceedings taken against the proponent under a
 Commonwealth, State or Territory law for the protection of the environment or
 the conservation and sustainable use of natural resources) including the
 proponent's environmental policy and planning framework.
- The environmental impact assessment process provide an outline of the impact assessment process steps, likely timing and decisions to be made for relevant stages of the project. The introduction should briefly describe the studies/surveys/consultations that have been conducted in developing the expansion and preparing the EIS. Results of studies and detailed comments resulting from consultation should be included as appendices. Also outline the relevant legislation and policies controlling the environmental impact assessment process.
- Public consultation process provide an outline of the public consultation process that has taken place during the preparation of the EIS, and outline further opportunities for public input throughout the assessment process.

- Introduction to the existing operations at Olympic Dam provide a general overview of the existing operations.
- Introduction to the proposed expanded project provide a general overview of the expanded project.
- The format of the EIS provide an outline of how the EIS has been prepared and demonstrate consistency with the requirements of the Guidelines.

5.4 Existing Operations

A description of the key elements of the existing operations at Olympic Dam is to be provided and illustrated to give context to the expanded project. The location of the existing operations and associated infrastructure is to be described and indicated on relevant plans. The description is to include issues such as the geology of the deposit, the resource and ore reserves, the mining process, the metallurgical process, tailings management, major infrastructure (such as the township of Roxby Downs, water supply, energy, telecommunications, transportation and waste management) and an overview of existing environmental management practices for the mine operation including the Arid Recovery Reserve north of the mine.

5.5 Project Justification

The need for the project is to be described, with particular reference made to the economic, environmental, social and cultural impacts (beneficial and adverse), including employment and spin-off business development, which the expanded project may provide.

The need for the project is to be discussed in an international, national, state and regional context. The consequences of not proceeding with the project, an indication of the project timeframe and a clear outline of the objectives of the project are also to be included.

5.6 Description of the Expanded Project

This section is to provide a detailed description of the expanded project through its lifetime of planning, construction, operation and decommissioning (including rehabilitation).

This section is to identify the relationship of the EIS to the project evaluation work including descriptions of the alternatives investigated, and the 'do nothing' option, in the context of conceptual, technological and locality alternatives. Alternatives are to be discussed in sufficient detail to enable an understanding of the reasons for preferring certain options and rejecting others, and to enable an assessment of the alternatives as they significantly relate to the matters of national environmental significance (NES) protected under Part 3 of the EPBC Act.

The interdependencies of the project's components are to be explained, particularly in regard to how each element relates to the viability of the project. Issues such as mining method, tailings management, water supply, hydrometallurgical process, smelting, refining, waste management, road, rail and airport infrastructure, landform and land rehabilitation, energy supply, accommodation and finished product transport are to be discussed.

The description of the expanded project is to include, but not be limited to, the areas outlined below.

RESOURCE

The results of studies and surveys undertaken to identify and delineate the mineral resource are to be summarised. The location, tonnage and quality of each mineral resource proposed to be mined are to be described. The geological resources are to be defined using formal terminology as recommended by the Australian Stock Exchange, the Australasian Institute of Mining and Metallurgy and/or the Australian Mining Industry Council.

Plans are to be provided showing the general location of the project area, and in particular:

- the location of the resource to be explored, developed or mined
- the location and boundaries of the existing SML and any proposed expansion to that lease
- the location of any proposed buffers surrounding the resource.

MINE OPERATIONS

The preferred mining option and mine alternatives are to be discussed and the location and extent of the expanded mine excavations and associated ore crushing, transfer facilities and waste rock stockpiles are to be illustrated. Discussion is to be provided on probable mining pit boundaries, mine access, dewatering, mine development timeframes and any final void to be left at cessation of mining. The rationale for the preferred operational program is to be explained.

Plans are to be provided showing the general location of the project area, and in particular:

- the location of existing mine excavations
- the location and extent of excavations, tailings retention systems, overburden stockpiles and waste rock and ore stockpiles associated with the expanded project
- key environmental and aboriginal heritage sites recorded within the SML unless culturally inappropriate
- the area disturbed at each major stage of the project.

PROCESSING PLANT

The capacity of the plant and equipment is to be described, together with the chemicals to be used and stored. The existing and proposed processing plant site is to be illustrated on appropriately scaled plans. Any proposed processing of non-mine site materials should be discussed. The criteria for selecting the plant site for the expanded operation is to be described and the rationale for the preferred option explained. Integration of the existing and newly proposed plants is to be discussed, indicating major components associated with the expansion, together with timeframes of proposed decommissioning. Significant changes from currently used processes are to be clearly identified and described.

LAND USE

The existing land uses, tenures and the location of project components, including infrastructure corridors that could be affected by the expanded project are to be described and indicated on appropriate plans. The plans are also to identify areas of conservation value, the location of existing dwellings and the zoning of affected lands according to existing town or strategic plans.

INFRASTRUCTURE

The location of proposed infrastructure is to be illustrated on plans and described. The rationale for the preferred infrastructure elements is to be explained. This section is to include, but not be limited to, the elements outlined below.

Accommodation

A description is to be provided of the proposed expansion or relocation of existing accommodation at construction camps, Roxby Downs or other relevant areas.

Assess the potential impact of the South Australian Government Policy on Affordable Housing on expansion of the Roxby Downs Township.

Transport—road/rail/ship/airport

Details are to be included of any new roads, rail, shipping requirements or airport relocation as a result of the project, as well as any upgrade of existing transport infrastructure. The transport of plant equipment, products and personnel during both the construction and operational phases of the project are to be included. The proposal will result in a significant increase in mine production. Details of how it is proposed to transport this increased production to various markets are to be included.

Energy

This section is to describe all energy/power supply requirements, including electricity, natural gas, and/or solid and liquid fuel requirements for the construction, operation and decommissioning phases of the expanded project. The feasibility of using alternative renewable fuel sources and energy efficiency initiatives to enhance sustainability objectives are to be discussed in this section. The locations of any easements or corridors are to be shown on infrastructure plans.

Water supply and storage

This section is to provide information on any required infrastructure for additional water supply or storage. In particular, the proposed source of water supply is to be described (e.g. coastal desalination plant, extraction from the GAB or saline aquifers) and the means of transporting this water to Olympic Dam (e.g. size and location of water pipelines). Estimated rates of supply from each source (average and maximum rates) are to be given.

In addition this section should describe the proposed desalination plant (in the event of the desalination plant being the preferred option for water supply), intake structure for saline water and disposal options for waste brine (including assessment of the pros and cons of marine disposal and the environmental implications for the receiving marine environment versus land based options).

This section is also to provide discussion of the investigation of water conservation measures, such as recycling and re-use initiatives.

Telecommunications

This section is to describe any impacts on existing telecommunications infrastructure (such as optical cables, microwave towers, etc.) and identify the owners of that infrastructure. Any newly proposed telecommunications (procedures or processes or technologies) are to be described and impacts (both beneficial and adverse) on existing networks discussed.

Sewerage

This section is to describe any newly proposed sewerage infrastructure and any potential impacts (both beneficial and adverse) on existing sewerage networks and treatment plants.

Solid waste disposal / handling

The proposed location, site suitability, dimensions and volume of stockpiles (overburden, waste rock and tailings), including their design, method of construction, operation and any changes in technologies proposed to be utilized, is to be discussed and illustrated on appropriately scaled plans. This is to include staging or sequencing of these stockpiles throughout the proposed life of the mine. This section is also to discuss the investigation of reduction and recycling/re-use of solid wastes from domestic and commercial/industrial activities.

Liquid waste disposal / handling

The proposed location, site suitability, dimensions and volume of liquid disposal/storage ponds, including their design, method of construction and operation, changes in technologies proposed to be used, management of runoff from overburden and waste rock stockpiles, mine water disposal, and management of liquid wastes from tailings retention systems, associated seepages and evaporation ponds, is to be discussed and illustrated on appropriately scaled plans.

CONSTRUCTION

The extent and nature of the project's construction phase is to be described. The description is to include the type and methods of construction to be employed, the construction equipment to be used and the items of plant to be transported by each proposed means to the construction site.

The estimated numbers of persons to be employed for the construction phase are to be given.

MATERIALS HANDLING

This section is to describe the proposed methods and facilities to be used for materials storage (e.g. imported diesel, sulfur, acid etc) and for transferring materials to, from

and within the mine site. Discussion is to include any environmental design features of these facilities including bunding of storage facilities. Appropriately scaled plans that identify the location of relevant infrastructure and storage areas are to be included.

REHABILITATION AND DECOMMISSIONING

Proposals for decommissioning of both the existing underground operation and the proposed expanded project are to be described. The description is to include proposed timing, rehabilitation methods, the anticipated final landform (including the final open pit void) and any special consideration for the long-term containment of radioactive or other hazardous materials. The description should also include estimates of long-term effects (including radiological) on groundwater in contact with the decommissioned mine, and on the surface environment resulting from the presence of rehabilitated tailings retention systems, waste rock stockpiles and the final open pit void. Altered stormwater drainage patterns are also to be discussed.

5.7 The Approvals Process / Legislative Obligations

The purpose of this section is to make clear the methodology and objectives of the EIS under the relevant legislation. This section is to include a description of the impact assessment process steps, timing and decisions to be made for relevant stages of the expanded project. In particular, this section is to outline mechanisms in the process for public input, identify the timing of the public release of the Draft EIS and specify that responses to public submissions will be considered and addressed in a separate Supplementary EIS/Response Document.

The information in this section is required to ensure:

- · that relevant legislation is addressed
- that there is awareness of the process to be followed
- that stakeholders are aware of opportunities for input and participation.

The approval processes and legislative requirements for both the whole of project approval and the permits / licenses for activity approvals are to be described. The legislation (Acts and Regulations), policies, licenses and permits controlling the approvals process are to be outlined. Reference is to be made to the Australian Environment Protection and Biodiversity Conservation Act 1999, the Roxby Downs (Indenture Ratification) Act 1982, the Development Act 1993 and other relevant Australian and South Australian legislation.

This section is also to discuss the project's consistency with existing policy frameworks for the area (e.g. as reflected in regional and local plans), and with relevant standards or recognised codes of practice.

5.8 Public Consultation

An appropriate public consultation program to secure approval for a controlled action requiring an EIS under the Australian *Environment Protection and Biodiversity Conservation Act 1999*, and a Major Development requiring an EIS under the State's *Development Act 1993* must be provided.

The public consultation program is to provide opportunities for community involvement and education throughout the EIS assessment and approvals process. It may include

public meeting(s), interest group meetings, production of regular summary information sheets and updates, and other consultation mechanisms to encourage and facilitate appropriate public consultation and participation.

The reader is to be informed as to how public submissions on the Draft EIS are to be addressed.

The results of the public consultation program are to be presented in this section, with a detailed report of responses and persons consulted provided as an appendix to the Draft EIS and Supplementary EIS, as appropriate.

5.9 Hazard and Risk

This section is to address those hazards and risks associated with human health i.e. public and environmental health, as well as occupational health and safety management practices and procedures associated with the current mining and processing operation and discuss, where relevant, proposed changes to these procedures to account for the expanded project.

This section is to include a risk assessment that addresses, but is not limited to, the following:

- occupational health and safety for the workforce and potentially affected communities associated with the proposed expansion
- the implications for, and the impacts on, surrounding land uses and land users as a result of the expanded project
- exposure sources and potential exposure to pollutants (including any potential increased levels of ionizing radiation) at all stages of the operation (including mining, processing, waste management systems, product transportation to the port and storage prior to and during transportation to the port) and post mine closure for employees, nearby communities and the environment
- estimates of radiation doses to employees, nearby communities arising from the proposed expansion
- unplanned process materials, tailings or other storage discharges
- road, rail and marine transport accidents
- fire (including bushfires), explosion and blasting hazards
- physical security (including uranium production and export) issues.

The review and reporting against the existing management procedures is to include, but not be limited to:

- relevant hazards (minor and major) and current competencies in emergency response management of human casualties
- the likely frequency and severity of potential hazards, accidents and spillages occurring during all stages of the project (recognising that some hazardous liquids are standard in the mine's metallurgical process streams)
- an indication of cumulative risk levels to surrounding residents and land users
- the duration of any identified hazards
- hazardous substances to be used, stored, processed or produced and the rate of usage.

This section is also to describe how hazards and risks will be managed to an acceptable level, and how the achievement of the objectives will be monitored, audited and reported.

This section of the EIS is also to provide:

- safeguards proposed for the transport, storage, use and handling of hazardous materials
- the capacity and standard of bunds to be provided around the storage tanks for classified dangerous goods and other goods likely to impact adversely upon the environment in the event of an accident or spill
- the procedures to reduce spillages and the emergency plans to manage hazardous situations
- description of quality control and equipment maintenance systems in place to minimize failures leading to spillage
- contingency plans for spills or accidental releases of process materials, tailings or other waste or hazardous materials
- any existing exemptions relevant to hazardous materials as a result of the nature of operations and process streams at Olympic Dam.

5.10 Land Use and Planning

The EIS is to provide a description of existing land uses relevant to the project (including associated infrastructure), the potential impacts on these uses as a result of the expanded project and the compliance of the proposed expansion with current planning schemes or similar planning instruments.

LAND USE

This section is to provide a description of current land tenures and land uses, including details of the status of any native title claims, in the project area. The locations of the native title claims in relation to the project area are to be shown. The potential for the construction and operation of the expanded project to impact existing land uses is to be provided.

Post operations land use options are to be discussed, including suitability of the area to be used for agriculture, pastoralism, industry, tourism or nature conservation. The factors favouring or limiting the establishment of the above options are to be given in the context of land use capability or suitability and the potential liabilities for long-term management.

Consideration of the proposed expansion of the Cultana Defence facility should also be included where relevant.

Appropriately scaled plans are to be provided to support the descriptions in this section of the EIS.

PLANNING

This section is to discuss the compliance of the newly proposed land uses and infrastructure requirements with current planning instruments, for the construction, operation and decommissioning phases of the project. Particular attention is to be afforded to accommodation (both short-term at construction camps and long-term at

Roxby Downs and other relevant townships), the workforce and newly proposed infrastructure.

Accommodation

A description is to be provided of proposed expansion or relocation of existing accommodation at construction camps, Roxby Downs or other areas. Concept master plans for the proposed expansion of accommodation and service infrastructure at Roxby Downs are to be provided. Consistency of these expansions with Development Plans is to be discussed.

Workforce

The size, make-up (e.g. permanent and contractors) and location of the workforce is to be described. The potential environmental, social, cultural and economic impacts associated with this increased workforce are to be discussed.

Infrastructure

This section is to identify the various infrastructure components proposed for the expanded project and assess these for compliance against the appropriate planning instruments. Issues to be addressed include:

Roads – predictions are to be made for any new roads, road realignments, *upgrades* or proposed road closures required as a result of the expanded project. This section is also to include an analysis of the probable impact of identified construction and operational traffic generated by the project, with particular attention paid to impacts on road infrastructure, road users and road safety. Mitigation measures necessary to address any adverse road impacts are to be provided; this will require a comparison between the existing and predicted traffic and road conditions.

- Rail any impact (adverse and beneficial) to the rail network, including any increased delays at traffic crossing points, is to be discussed. The consistency of any newly proposed rail infrastructure with state, regional and local plans are also to be addressed.
- Airport any changes to the existing operation of the Roxby Downs airport as a
 result of the expanded project, including additional capacity requirements,
 relocation of the airstrip and compliance with relevant airport planning and
 operation policies / procedures is to be provided. Compliance with relevant
 national and state policies and standards is also to be discussed.
- Port transport of finished product is currently through the Port of Adelaide. Any changes to the existing operation or capacity requirements of this port, or the use of other ports, as a result of the expanded project, are to be discussed.
- Energy energy / power supply requirements, including electricity, natural gas, solid and liquid fuel for the construction and operation phases of the project are to be identified and compliance with relevant standards and policies discussed. Energy conservation is to be described in the context of relevant government policies.
- Water supply and storage water supply requirements, including footprint areas for plant and associated infrastructure, for the construction and operation phases of the project are to be identified and compliance with relevant standards and policies discussed. In addition, an estimate of industrial and

domestic water demand is to be made for the project, including the temporary demands during the construction period. Details are to be provided of any changes to existing town water supply to meet such requirements. Water storage and treatment proposed on site for use by the site workforce is to be described in relation to compliance with relevant planning instruments.

 Sewerage – volume estimates of industrial and domestic effluent are to be provided and the proposed method of disposal / recycling is to be described. This is to include the physical and chemical characteristics of such effluent. If discharging into an existing sewerage system, an assessment of the capacity of the existing system to accept the effluent is to be provided.

5.11 Meteorological Environment and Climate

The EIS is to describe the temperature, humidity, wind speed and direction, and any other factors (e.g. temperature inversions) likely to affect the meteorological environment within the region of the project. Rainfall patterns including magnitude and seasonal variability of rainfall are to be included. Extremes of climate (e.g. floods, droughts, cyclones) and natural hazards (e.g. lightning strikes, bushfires and earthquakes) are to be discussed with particular reference to the relative frequency, magnitude and risk of these events resulting in significant environmental impact throughout the life of the project.

This section is also to discuss the potential for climate change and, where relevant (e.g. for a seawater desalination plant), sea level rise over the life of the project. Information about trends in changing climate patterns at a national, state and regional level is also to be provided for the life of the project.

Information provided in this section is to be adequately cross-referenced to other relevant sections of the EIS. For example, the implications of rainfall intensity is to be included in the discussion of erosion potential; wind speed and direction is to be included in the discussion of air quality.

5.12 Air Quality

This section is to describe the existing air environment, which may be affected by the project. A description of the existing air quality conditions of the project area is to be provided having regard for particulates, gaseous and odorous compounds. The background levels and sources of suspended particulates, PM10, SOx, NOx, radon progeny, radioactive dust and any other major constituent of the air environment which may be affected by the project are to be discussed.

Sufficient data on local meteorology and ambient levels of pollutants are to be gathered to provide a baseline for later studies or for the modeling of air quality environmental impacts, if any, within the project's air shed. Parameters are to include air temperature, wind speed and direction, atmospheric stability, mixing height/depth and other parameters necessary for input to predictive models. This section is to be cross-referenced to the Meteorological Environment and Climate section of the EIS.

This section is to define and describe the objectives and practical measures for protecting environmental values for air, to describe how nominated quantitative standards and indicators may be achieved, and how the achievement of the objectives will be monitored, audited and managed. The origins, quantities and composition of

airborne emissions from the project during construction, operation and decommissioning is to be addressed.

The objectives for airborne emissions are to be stated in accordance with relevant standards, emission guidelines and legislation. The potential for interaction between the emissions from the processing plant and mine (including emissions from blasting operations) and existing particulates in the air shed, are to be considered and the likely health and environmental impacts, if any, from any such interaction. The assessment should consider the impacts of deposition of dust on adjacent areas.

The proposed levels of emissions are to be compared with the current Draft National Environmental Protection Measures (1998) for ambient air quality, the National Health Medical Research Council (NHMRC) National Guidelines for control of emissions from stationary sources, radiation dose limits and other relevant state guidelines. Emission levels are also to be discussed in relation to those that trigger reporting thresholds under the National Pollutant Inventory (NPI) for those industries relevant to the expanded project.

Where appropriate, the maximum ground level concentrations for major air borne pollutants are to be predicted using appropriate computer modeling. These predictions are to be made for expected maximum emission conditions. The techniques used to obtain the predictions are to be referenced and key assumptions and data sets explained. The pollutants to be modeled must include any significant mass emissions including volatile organic compounds associated with the processing plant.

Sustainability and Greenhouse Gas Emissions

An assessment of greenhouse gas emissions for the project is to be provided, including:

- predicted annual emissions for each greenhouse gas and total emissions expressed in terms of 'CO₂ equivalents'
- the intended measures to reduce greenhouse emissions
- discussion of alternative technologies, processes and equipment to reduce greenhouse gases and how these have been considered in selecting the preferred project options
- · methodologies by which estimates were made.

This assessment is to include sufficient detail to enable comparison of the greenhouse gas implications of the expanded project with other energy sources.

The above assessment is to be undertaken with due consideration of relevant protocols, agreements and strategies including: 'The National Greenhouse Strategy', 'National Greenhouse Gas Inventory', 'The Kyoto Protocol' and 'The Framework Convention on Climate Change', 'Tackling Climate Change, SA's Greenhouse Strategy 2007 - 2020 and voluntary programs developed by the Australian Greenhouse Office.

5.13 Topography, Geology and Soils

This section is to describe the existing environment of the land that may be affected by the expanded project. Issues to be addressed include those outlined below.

TOPOGRAPHY/GEOMORPHOLOGY

Plans are to be provided that identify the location of the major infrastructure components of the expanded project. These plans are to include the topography of the project area, shown at appropriate contour increments and with respect to Australian Height Datum (AHD), and significant features of the landscape.

GEOLOGY

The EIS is to provide a description and a series of cross-sections of the ore reserve. The physical and chemical properties of surface and sub-surface materials and geological structures within the proposed areas of disturbance are to be included. Geological properties that may influence ground stability (including seismic activity and risks, if relevant), safety, environmental monitoring and rehabilitation programs, or the quality of wastewater leaving any area disturbed by the project are to be described.

In locations where the age of the rock and the nature of the geology is such that fossil specimens may be uncovered during the construction or operation of the mine, the EIS is to address the potential for finds, provide a procedure to establish the significance of the find, and identify the management procedure to record and notify of any significant find.

SOILS

A soil survey of the sites affected by the expanded project is to be conducted at a suitable scale, with particular reference to the physical and chemical properties of the materials which will influence erosion potential, stormwater run-off quality and site stability. Background chemical and radiological composition of soils should be established for the areas likely to be affected by the expanded operations.

An acid sulfate soil investigation, carried out according to applicable national and state guidelines, is to be undertaken in areas where any excavations or disturbance works are proposed in coastal areas <5m AHD (e.g. for a seawater desalination plant and associated water pipeline).

Soil types are to be mapped at a suitable scale, and soil profiles from representative samples of each soil type are to be described according to the Australian Soil and Land Survey Field Handbook (McDonald et al, 1990) and Australian Soil Classification (Isbell, 1996). For each soil type identified, erosion potential (wind and water) and erosion management techniques are to be outlined.

The EIS is to include an assessment of likely erosion effects, especially those resulting from the removal of vegetation, for disturbed areas such as:

- the mine site, including the expanded tailings retention systems, ,waste rock stockpile and any material stockpiles
- access roads, rail, energy and water supply corridors.

Methods proposed to minimise or control erosion are to be specified and are to be developed with regard to preventing soil loss in order to maintain land capability / suitability and minimise degradation of downstream waterways or water impoundments.

An overview of the current monitoring, auditing and management practices for the control of erosion, sedimentation and contamination for the existing Olympic Dam operations are to be provided, with any required amendments to these practices to account for the expanded project identified and discussed.

5.14 Flora

The EIS is to discuss matters relevant to the existing vegetation communities and the potential impacts on these communities as a result of the expanded project. The EIS is to identify issues relevant to locations with sensitive flora assemblages, or areas that may have low resilience to environmental change. Areas of sensitivity include the marine environment and wetlands, any significant habitat for State and / or Australian Government listed threatened species and endangered ecological communities, with particular attention being required on GAB springs. The capacity of the environment to assimilate disturbance is to be assessed.

Surveys of flora are to be conducted at those times that are appropriate to maximize the detection of significant species and communities. Key flora indicators for future monitoring are to be identified.

TERRESTRIAL FLORA

This section is to describe the existing terrestrial vegetation communities of those areas potentially impacted by the expanded project, including associated infrastructure, the direct and indirect impacts on this environment, any impacts of regional importance and measures proposed to mitigate impacts. The potential environmental impact, if any, to the ecological values of the area arising from the construction, operation of the mineral processing plant and mine and decommissioning of the project including clearing, salvaging or removal of vegetation is to be described. Mitigation measures and / or offsets are to be proposed for adverse impacts including beneficial re-use options of cleared vegetation.

Vegetation mapping is to be included for relevant project areas including new infrastructure corridors. Mapping of vegetation types is to be at a suitable scale as to be clearly understood and accompanied by descriptions of each representative vegetation type. Sensitive or important vegetation types are to be highlighted, including any preferred habitat for State and / or Australian Government listed threatened flora or endangered ecological communities and / or locally significant communities (e.g. duricrust).

The existence of important regional and local weed species is also to be discussed. Weed control strategies aimed at containing existing weeds and reducing the risk of new invasive weeds being introduced to the project area are required. Reference is to be made to national, state and local government pest management plans when determining appropriate control strategies.

AQUATIC FLORA

This section is to describe the existing aquatic vegetation communities of aquatic areas potentially impacted by the expanded project, the direct and indirect impacts on this environment and measures proposed to mitigate adverse impacts (including sea water intake and discharge structures for the desalination plant). Appropriate modeling of the

discharge of wastewater from the desalination plant to the marine environment is to be undertaken if this option is considered.

Aquatic flora occurring in areas potentially affected by the project are to be described, noting the patterns and distribution in the waterways and/or associated lacustrine and marine environments. Particular attention is to be provided for State and / or Australian Government listed threatened species and endangered ecological communities.

5.15 Fauna

The EIS is to discuss matters relevant to the existing faunal communities and the potential impacts on these communities as a result of the expanded project. The EIS is to identify issues relevant to sensitive fauna habitats, or areas which may have a low resilience to environmental change. Areas of sensitivity include the GAB springs, the marine environment and wetlands, wildlife breeding or roosting areas, any significant habitat or relevant bird flight paths for migratory species, bat roosting and maternity caves and habitat of listed threatened animals.

The occurrence of pest animals in the project area is to be included. Key fauna indicators are to be identified for future monitoring. Surveys of fauna are to be conducted at those times that are appropriate to maximize the detection of significant species, including migratory species).

TERRESTRIAL FAUNA

This section is to describe the existing terrestrial faunal communities of areas potentially impacted by the expanded project, the direct (e.g. clearing) and indirect (e.g. increased recreational use of natural areas by more people) impacts on this environment and measures proposed to mitigate adverse impacts. This should include an assessment of the potential impact of an increase in pets and the impacts this may have on the environment.

The terrestrial fauna occurring in the areas affected by the project are to be discussed. The description of the fauna present or likely to be present in the area is to include:

- species richness (i.e. a species list) and conservation status of animals, including amphibians, birds, reptiles, mammals (including microchiropteran bats)
- habitat requirements and sensitivity to change, including the effect of pollutant emissions, movement corridors and barriers to movement
- · the existence of feral or exotic animals
- existence of any listed threatened species in the project area (vertebrate and invertebrate), including discussion of the species conservation status, range, habitat, breeding, recruitment, feeding and movement requirements
- use of the area by, and potential impacts on, migratory, nomadic and vagrant birds and include a discussion on potential exposure of fauna to tailings retention systems
- where relevant, discussion of arachnids, gastropods and the unique fauna associated with the GAB springs.

Feral animal control strategies aimed at containing existing feral species and reducing the risk of new feral species being introduced to the area is to be included. Reference is to be made to national, state and local government pest management plans when determining appropriate control strategies.

AQUATIC FAUNA

This section is to describe the existing aquatic faunal communities of those aquatic areas potentially impacted by the expanded project, the direct and indirect impacts on this environment and measures proposed to mitigate impacts (including sea water intake and discharge structures for the desalination plant). Appropriate modeling of the discharge of wastewater from the desalination plant to the marine environment is to be undertaken if this option is considered.

Aquatic fauna occurring in areas potentially affected by the project are to be described, noting the patterns and distribution in the waterways and/or associated lacustrine and marine environments. Specific attention is to be provided to listed threatened species, particularly GAB spring fauna (if the GAB water source is considered) and the cuttlefish in Spencer Gulf (if a seawater desalination plant is considered).

5.16 Groundwater

The EIS is to identify and describe the location, quantity and quality of groundwater that could be considered as an additional source for the life of the expanded project and the impacts of sourcing this water on applicable sources such as the GAB, regional saline aquifers and the local groundwater associated with the mine site. A description of the GAB springs and their connection to groundwater is required.

The information to be gathered for analysis is to include:

- location of the groundwater source
- pumping parameters
- draw down and recharge at proposed extraction rates
- seasonal variations (if records exist) of groundwater levels.

Observation points / bores that would satisfactorily monitor groundwater resources prior to construction, during operation and post-operation are to be developed if this option for water supply is assessed as sustainable for the life of the expanded project.

When discussing groundwater conditions and the proposed groundwater monitoring regime, reference is to be made to:

- the nature of the aquifer(s) including:
 - o geology/stratigraphy such as alluvium, volcanic, metamorphic
 - o aquifer type such as confined, unconfined, artesian
 - o depth to and thickness of the aguifers
 - sustainability of the aquifer
- hydrology of the aquifer(s) including:
 - o depth to water level and seasonal changes in levels
 - groundwater flow directions (defined from water level contours)
 - o interaction with surface water
 - o interaction with seawater (in the desalination plant option)

- possible sources of recharge
- vulnerability to pollution.

The data obtained from the groundwater survey are to be sufficient to enable the major ionic species present in the groundwater to be specified, and pH, electrical conductivity and total dissolved solids to be measured.

The EIS is to include an assessment of the potential environmental impacts, if any, caused by the expanded project to national, state, regional and local groundwater resources. The impact assessment is to define the extent of the area within which groundwater resources are likely to be affected by the expanded operations and the significance of the project to groundwater depletion, aquifer recharge or inflow and discharge. The potential impact on existing and potential future groundwater users within the project area is to be considered and strategies to mitigate these impacts are to be considered.

This section is to be cross-referenced to the Flora and Fauna sections of the EIS, particularly in relation to potential impacts on GAB springs. Management options and strategies available to monitor, mitigate and implement corrective action of these effects are to be included.

The EIS is to discuss post-mining groundwater recovery, rehabilitation and decommissioning of the borefield areas and regional and / or local groundwater resources and its impact on underground, open pit or subsidence depression of the mine area.

The potential impact of the expanded project on the local groundwater regime caused by the altered porosity and permeability of any land disturbance is to be considered, together with the potential re-use of the water from mine de-watering.

The potential to contaminate groundwater resources from sources such as seepage from mine and plant areas, tailings retention systems and the waste rock stockpiles is to be included. Measures to control, mitigate and remediate such contamination are also to be discussed.

A discussion of chemical, radiological and physical properties of any wastewater (including concentrations of constituents) at the point of entering groundwater is required.

An overview of the current monitoring, auditing and management practices for the control of groundwater quality associated with the existing Olympic Dam operations are to be provided, with any required amendments to these practices to account for the expanded project identified and discussed in the Draft EMP.

5.17 Surface Water

This section is to discuss the surface waterways and water impoundments in the area affected by the expanded project with reference made to the significance of these waters to the catchment system in which they occur. Information provided is to include a description of existing surface drainage patterns, water quality, catchment size and flows in major waterways and wetlands. The likelihood of flooding, history of flooding including extent, levels and frequency, and a description of current water uses and users downstream of the areas potentially affected by the project is to be included.

The discussion on flooding may be cross-referenced to Section 5.11 (Meteorological Environment and Climate). Potential impacts of post mine drainage patterns and flooding is to be addressed. Given the potential 70+ years mine life, and assessment should be undertaken of the potential impact of climate change on rainfall patterns and impacts on surface water runoff from the waste rock and tailings stockpiles.

Water quality is to be described, including an appropriate range of physical, radiological, chemical and biological parameters to gauge the environmental impact, if any, on potentially affected creek or waterway systems. The discussion is to include:

- sustainability, including both quality and quantity
- physical integrity, fluvial processes and morphology of watercourses, including riparian vegetation
- any water resource plans, land and water management plans relevant to the affected catchments.

Water quality parameters to be investigated are those appropriate to the catchment type as per the applicable parameters and levels provided in relevant policies and guidelines (e.g. South Australian Environment Protection (Water Quality) Policy 2003 and Australian and New Zealand Environment and Conservation Council (ANZECC) Guidelines for Fresh and Marine Water Quality 2000)). Chemical, radiological and physical properties of any waste water (including concentrations of constituents) at the point of entering natural surface waters is to be discussed along with toxicity of effluent constituents to flora and fauna.

Options for mitigation and the effectiveness of mitigation measures are to be discussed with particular reference to sediment, acidic liquor, hazardous or toxic materials, salinity and brine discharge (if the seawater desalination plant is considered).

An overview of the current monitoring, auditing and management practices for the control of surface water quality associated with the existing Olympic Dam operations are to be provided, with any required amendments to these practices to account for the expanded project identified and discussed.

5.18 Noise and Vibration

This section of the EIS is to discuss the background noise and vibration levels, changes to these levels as a result of the expanded project and the mitigation measures and management strategies proposed to minimise any adverse impacts. Sufficient data are to be gathered to provide baseline information for monitoring, where relevant, during the construction and operational phases.

The location of noise and vibration sensitive receptors is to be identified on an appropriately scaled plan. The daily variation of background noise levels at sensitive receptors is to be investigated and reported in accordance with relevant State policies and guidelines. Information, including noise contours from a suitable acoustic model is to be provided for significant noise generating activities (e.g. blasting, desalination plant operation). Noise and vibration levels are to be compared, where possible, to recognized national and state standards.

Discussion specific to the township of Roxby Downs is to be included, as is discussion on any other township or community in close proximity to the proposed expansion works, including infrastructure corridors. This will include consideration of the impacts

on townships of road, rail and aircraft routes as a result of the expansion. The potential environmental impact, if any, on terrestrial and marine animals and avifauna, particularly migratory species, is also to be considered.

Information is to be supplied on blasting which might cause ground vibration or fly rock on, or adjacent to, the SML. The magnitude, duration and frequency of any vibration generating activity are to be discussed. Mitigation measures for identified noise and vibration impacts are to be provided, together with consideration of how these measures will be monitored, audited and managed. Timing schedules for the construction, operation and decommissioning phases are to be provided together with a discussion on how these timeframes may influence noise and vibration impacts.

This section is also to describe any project-related noise and vibration sources, potential impacts as a result of these sources and mitigation measures to ameliorate impacts. Examples to be included in this discussion, where relevant, are road and rail infrastructure, power plant, seawater desalination plant and gas pipeline and associated compressor stations.

5.19 Cultural Heritage

INDIGENOUS CULTURAL HERITAGE

This section of the EIS is to describe the existing indigenous cultural heritage sites and values that may be affected by the expanded project.

A list of all existing cultural heritage reports held by WMC Olympic Dam Corporation Pty Ltd should be included. This section should also include:

- information about liaison with relevant indigenous community/communities concerning:
 - the identification of places of significance to that community/communities (including archaeological sites, natural sites, historical sites and anthropological sites etc)
 - any requirements of indigenous peoples relating to confidentiality of site data is to be identified
- a summary of the results of all previous cultural heritage assessments conducted within the project area including (subject to any indigenous confidentiality restrictions) the location and recording of all significant indigenous cultural heritage sites that may be affected by the project
- assessment of the significance of all cultural heritage sites located
- commentary on the impact of the proposed development on cultural heritage sites and values.

A process for the management of cultural heritage sites throughout the project area is to be explained, which addresses the following:

- a process for ensuring the ongoing involvement of indigenous communities associated with the areas of the expanded project, in the protection and management of indigenous cultural heritage sites
- a process for mitigation of any impacts, through the salvage or management and protection of identified cultural heritage sites and places in the project areas, including associated infrastructure corridors, during land disturbance activities

- a process for the management of sites, in accordance with the relevant legislation, where destruction, damage or disturbance of sites is not avoidable
- provisions for the management of the unanticipated discovery of cultural material
- cultural heritage awareness training within induction programs for all employees.

NON-INDIGENOUS/EUROPEAN HERITAGE

This section of the EIS is to describe the existing cultural heritage sites and values that may be affected by the expanded project.

A list of all existing cultural heritage reports held by the proponent should be provided. This section should also include the following:

- information about liaison with relevant communities concerning:
 - the identification of places of significance to that community/communities (including archaeological sites, natural sites and historical sites
- the results of all previous cultural heritage assessments conducted within the project area including the location and recording of any significant cultural heritage sites that may be affected by the project
- assessment of the significance of any cultural heritage sites located
- the impact of the proposed development on cultural heritage sites and values

A process for the management of cultural heritage sites throughout the project area is to be explained, which addresses the following:

- a process for mitigation of any impacts, through the management and protection of identified cultural heritage sites and places in the project areas, including associated infrastructure corridors, during land disturbance activities
- a process for the management of sites, in accordance with the relevant legislation, where destruction, damage or disturbance of sites is not avoidable
- opportunities for employment of indigenous peoples within the construction and operational phases of the expansion project

5.20 Social impact assessment

Social, economic and cultural values are not easily separated and therefore it may be necessary for some material in this section to be cross referenced to other relevant sections of the EIS. The social impact assessment is to consider the information gathered in the community consultation program and the socio-economic assessment.

This section is to describe the existing social environment, with consideration given to:

- community infrastructure and services, access and mobility
- family structure and demographics of the potentially affected communities
- health services and educational facilities
- workforce characteristics, including types of skills or occupations and availability during both construction and operational phases

 accommodation type, quantity and availability (as it relates to the need for accommodation for the expanded project construction and operational workforce).

The assessment of impacts is to identify possible beneficial and adverse impacts. These impacts are to be considered at the state, regional and local level. Consideration is to be given to the following:

- the impact of the expanded project on existing pastoral land uses (mainly associated with infrastructure corridors and potential impacts on fences, water supply and stock watering points, movement of agricultural machinery), cross referenced to section 5.16
- potential impacts and timing on access to the general public and Arid Recovery Reserve associated with relocating public roads, such as the bore field road
- the impact on any affected land holders
- the potential and mechanisms for local and statewide communities and businesses to tender contracts for services and supplies for any relevant components of the construction, operation and decommissioning phases of the project
- the impact of accommodation requirements during the construction and operational phases, including secondary construction workforce (e.g. workers involved in town expansion and other accommodation development), contractors employed on an as need basis for periodic shut downs and refurbishments and staff that would work in the shops and other service providers
- the impact of the construction workforce on local human services (e.g. housing, education and health services) and local community social and recreational environments
- any potential impacts on the health of the surrounding community (this may be cross-referenced to Section 5.9) and the need for health services specifically relating to families (obstetric and paediatric services), provision of family friendly open space and public spaces, provision of youth centres and community meeting places
- the potential positive and negative social impacts that could result from an increased population at the town
- impact on town expansion and services of other development projects in the region that have publicly available information of relevance to this proposal.
- Impact of housing/construction camp expansion on the Aboriginal community and any training needs that have been identified by the company.

5.21 Visual Amenity

This section is to describe the existing landscape character of the project area and the surrounding area. Discussion, plans, photographs and the like are to be used to address the following:

- identification of elements within the project and surrounding area that contribute to the image of the area as discussed in any local government strategic plan or similar government planning instrument
- major views, existing viewing outlooks, ridgelines and other features contributing to the visual amenity of the area

- focal points, landmarks (built form or topography), gateways associated with the project area and immediate surrounding areas, waterways and other features contributing to the visual quality of the area
- character of the local and surrounding areas including character of built form (scale, form, materials and colours) and vegetation (natural and cultural vegetation)
- where relevant, the value of existing vegetation as a visual screen.

The visual impact in terms of the extent and significance of the changed skyline as viewed from places of residence, work and recreation, from road, cycle and walkways, from the air and other known vantage points, day and night, during all stages of the project as it relates to the surrounding landscape is to be considered. Sketches, diagrams or computer imaging and photographs are to be used, where possible, to portray the near and far views of the completed structures (including expanded ore processing plant, waste rock dumps, desalination plant, power station and other major infrastructure components) and their surroundings from visually sensitive locations.

Management measures proposed to minimise any adverse affects on visual amenity are to be discussed. The opportunity to establish viewpoints for the general public as a tourist feature should be considered as part of establishment of the waste rock stockpiles.

5.22 Waste Materials Management

The EIS is to identify and describe those sources of radioactive and non-radioactive waste associated with construction, operation and decommissioning of the expanded project. This section is to include, but not be limited to, the following:

- the amount and physical, radiological and chemical characteristics of solid and liquid waste produced as a result of the expanded project (both on and off the SML) and the processes generating the wastes including those produces by the processing on non-mine site materials
- a summary of key issues in relation to radioactive waste management plans and associated monitoring and reporting programs
- any proposed waste treatment process for disposal of construction, operational and decommissioning waste
- consideration of waste minimisation and cleaner technology options during the construction and operational phases (including solid and gaseous wastes such as nitrogen oxides, sulphur oxides, particulates and carbon dioxide)
- the methods proposed to avoid stormwater contamination by raw materials, wastes or products and the means of containing, recycling, reusing and where appropriate treating of stormwater
- contingency measures in the event of incidents or equipment or operational failures
- the expected total volumes of each waste produced, including an inventory of the following per unit volume of product produced:
 - the tonnage of products processed
 - the amount of resulting process wastes
 - the volume and tonnage of any by-products

 natural resource use efficiency (e.g. energy and water), integrated processing design, and by-product reuse as shown in a material/energy flow analysis.

The potential impact of waste materials to be generated is to be discussed with details of each material discussed in terms of:

- operational handling, storage and disposal of wastes
- · on-site treatment methods proposed for waste materials
- methods of disposal and storage (including the need to transport waste off-site for disposal) proposed to be used for any trade wastes, liquid wastes and solid wastes
- the potential level of impact on environmental values as a result of waste storage and disposal
- proposed discharge/disposal criteria for solid, liquid and gaseous wastes
- methods to control seepage and contamination of groundwater from tailings' retention systems, waste rock stockpiles or any other relevant source
- where appropriate, market demand for recyclable materials.

Further to the above, the potential impacts of additional wastes resulting from the expansion project and the disposal and handling of these wastes is to be considered, including opportunities for coordinating waste management practices for the mine and township of Roxby Downs.

Solid waste disposal / handling

The proposed location, site suitability, dimensions and volume of stockpiles or disposal facilities (overburden, waste rock and tailings), including their method of construction, is to be discussed and illustrated on appropriately scaled plans. The discussion should include details of any tailings and solid waste management options, including codisposal of tailings with waste rock, generation and use of thickened tailings and possible changes in design and operation of the paddock tailings retention system.

This is to include staging or sequencing of these stockpiles or disposal facilities throughout the proposed life of mine. Methods to minimise the risk of acid formation, seepage and contamination are to be provided. Measures to ensure containment of wastes and stability of the stockpiles or disposal facilities and impoundments, if required, are to be described. The information provided is to be supported by appropriate testing and analysis, seepage analysis and slope stability assessment.

Liquid Wastes

A description of the origin, quality and volume estimates of liquid wastes originating from the project is to be provided, including, but not limited to management of runoff from overburden and waste rock stockpiles, mine water disposal and management of liquid wastes from tailings retention systems and evaporation storages and associated seepages. The design, construction and operation of liquid waste retention systems and evaporation storages are to be discussed. Particular attention is to be given to the capacity of wastes to generate radioactive, acid, saline or sodic wastewater. A water balance for the project and processing plant is required to account for the estimated usage of water. The extent to which existing waste disposal systems and treatment plants are to be used or modified for the expanded project is also to be discussed.

5.23 Economic Assessment

The existing economic environment that may be affected by the project is to be discussed in the national, state, regional and local context. The character and basis of the regional and local economies is to be described, including:

- existing housing market, particularly rental accommodation which may be available for the project workforce
- economic viability (including economic base and economic activity, current regional and local economic trends).

The EIS is also to define and describe the objectives and practical measures for protecting or enhancing economic values and to describe how relevant quantitative standards and indicators may be achieved for economic management.

The effect on state, regional and local labour markets is to be discussed with regard to the source of the workforce. This information is to be presented according to occupational groupings of the workforce.

Direct and indirect impact of the expanded project on the national, state, regional and local economies in terms of effects on employment, income and production is to be discussed. The economic analysis is to include:

- the significance of this project in the national, state, regional and local economic context
- the long and short-term beneficial (e.g. job creation) and adverse (e.g. competition with local small business) impacts that may result from the expanded project
- the cost to all levels of government of any additional infrastructure provision
- the potential economic impact of any major hazards identified.

5.24 Rehabilitation and Decommissioning

This section of the EIS may be presented as, or include, a summary mine closure plan. The strategies and methods for progressive and final rehabilitation of the SML and associated infrastructure corridors for the life of mine are to be discussed. The final topography of the underground and above ground mine excavations, any additional excavations outside the SML, waste areas, tailings retention systems, infrastructure corridors and evaporation ponds are to be described and illustrated.

This section is to include, but not be limited to, the following:

- the means and proposed timing of decommissioning the project, in terms of the removal of plant equipment, structures and buildings
- the methods proposed for the stabilisation of affected areas
- final rehabilitation of the SML is to be discussed in terms of rehabilitation standards, engineering controls to minimize radiation and other emissions from the site, ongoing land use suitability, management of any residual contaminated land any other land management issues such as water management and land access
- rehabilitation methods to be used for the project including backfilling, covering, re-contouring, topsoil and cleared vegetation handling and progressive and final revegetation is to be described

- method for decommissioning and rehabilitation of tailings retention systems and associated liquid waste evaporation ponds and other waste storages
- effect of choice of the tailings retention system on final land form and long term stability of rehabilitated tailings retention systems for the duration of risk to the surrounding environment
- consideration is to be given to settling or subsidence of rehabilitated areas and how this may affect the use of the land in its post mine form
- the final drainage and seepage control systems and long-term monitoring plans for these is to be described
- management of any voids remaining post operations are to be described, including proposed land use, void water quality, suitability for use by stock, safety of access and stability of void walls
- post mining impacts on local / regional groundwater resources
- decommissioning of the existing underground operation is to be addressed as well as the proposed expanded project

5.25 Draft Environmental Management Plan

A Draft Environmental Management Plan (Draft EMP) is to be developed from the mitigation measures detailed in the EIS for the construction, operation and decommissioning phases. The Draft EMP is to take account of the existing Olympic Dam Environmental Management Program 2005-2007 and focus on those components of the expanded project not currently addressed, or requiring update, in the existing management program.

The Draft EMP is an integral part of the EIS, but is to be capable of being read as a stand-alone document without reference to other parts of the EIS. The general content of the Draft EMP are to comprise:

- a consolidated list of the proponent's commitments to acceptable levels of environmental performance, including environmental objectives (i.e. levels of expected environmental impact, performance standards and associated measurable indicators, performance monitoring and reporting against the predicted effectiveness of mitigation measures and corrective action in the case of non-compliance)
- control strategies and estimated costs to implement the commitments
- the name of the agency responsible for endorsing or approving each mitigation measure or monitoring program.

5.26 References and Appendices

All references are to be consistent and presented in a recognised format. Items in the appendices are to include:

- the final Guidelines
- the key personnel of the study team
- a list of the stakeholders consulted
- site plans
- technical reports that supplement the EIS (including the source, currency, reliability and any uncertainties in relation to the information).

ATTACHMENT A

MATTERS THAT MUST BE ADDRESSED IN AN EIS (SCHEDULE 4 OF THE EPBC ACT REGULATIONS 2000)

1. General information

- 1.01 The background of the action including:
 - (a) the title of the action;
 - (b) the full name and postal address of the designated Proponent;
 - (c) a clear outline of the objective of the action;
 - (d) the location of the action;
 - (e) the background to the development of the action;
 - (f) how the action relates to any other actions (of which the Proponent should reasonably be aware) that have been, or are being, taken or that have been approved in the region affected by the action;
 - (g) the current status of the action; and
 - (h) the consequences of not proceeding with the action.

2 Description

- 2.01 A description of the action, including:
 - (a) all the components of the action;
 - (b) the precise location of any works to be undertaken, structures to be built or elements of the action that may have relevant impacts;
 - (c) how the works are to be undertaken and design parameters for those aspects of the structures or elements of the action that may have relevant impacts;
 - (d) relevant impacts of the action;
 - (e) proposed safeguards and mitigation measures to deal with relevant impacts of the action;
 - (f) any other requirements for approval or conditions that apply, or that the Proponent reasonably believes are likely to apply, to the proposed action;
 - (g) to the extent reasonably practicable, any feasible alternatives to the action, including:
 - (i) if relevant, the alternative of taking no action;
 - (ii) a comparative description of the impacts of each alternative on the matters protected by the controlling provisions for the action;
 - (iii) sufficient detail to make clear why any alternative is preferred to another;

- (h) any consultation about the action, including:
 - (i) any consultation that has already taken place;
 - (ii) proposed consultation about relevant impacts of the action; and
 - (iii) if there has been consultation about the proposed action any documented response to, or result of, the consultation; and
- (i). identification of affected parties, including a statement mentioning any communities that may be affected and describing their views.

3 Relevant impacts

- 3.01 Information given under paragraph 2.01(d) must include
 - (a) a description of the relevant impacts of the action;
 - (b) a detailed assessment of the nature and extent of the likely short term and long term relevant impacts;
 - (c) a statement whether any relevant impacts are likely to be unknown, unpredictable or irreversible;
 - (d) analysis of the significance of the relevant impacts; and
 - (e) any technical data and other information used or needed to make a detailed assessment of the relevant impacts.

4 Proposed safeguards and mitigation measures

- 4.01 Information given under paragraph 2.01(e) must include:
 - (a) a description, and an assessment of the expected or predicted effectiveness of, the mitigation measures;
 - (b) any statutory or policy basis for the mitigation measures;
 - (c) the cost of the mitigation measures;
 - (d) an outline of an environmental management plan that sets out the framework for continuing management, mitigation and monitoring programs for the relevant impacts of the action, including any provisions for independent environmental auditing;
 - (e) the name of the agency responsible for endorsing or approving each mitigation measure or monitoring program; and
 - (f) a consolidated list of mitigation measures proposed to be undertaken to prevent, minimise or compensate for the relevant impacts of the action, including mitigation measures proposed to be taken by State governments, local governments or the Proponent.

5 Other Approvals and Conditions

- 5.01 Information given under paragraph 2.01(f) must include:
 - (a) details of any local or State government planning scheme, or plan or policy under any local or State government planning system that deals with the proposed action, including:

- (i) what environmental assessment of the proposed action has been, or is being carried out under the scheme, plan or policy; and
- (ii) how the scheme provides for the prevention, minimisation and management of any relevant impacts;
- (b) a description of any approval that has been obtained from a State,

 Territory or Commonwealth agency or authority (other than an approval under the Act), including any conditions that apply to the action;
- (c) a statement identifying any additional approval that is required; and
- (d) a description of the monitoring, enforcement and review procedures that apply, or are proposed to apply, to the action.

6 Environmental record of person proposing to take the action

- 6.01 Details of any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against:
 - (a) the person proposing to take the action; and
 - (b) for an action for which an EIS has applied for a permit, the person making the application.
- 6.02 If the person proposing to take the action is a corporation details of the corporation's environmental policy and planning framework.

7 Information sources

- 7.01 For information given the EIS must state:
 - (a) the source of the information; and
 - (b) how recent the information is; and
 - (c) how the reliability of the information was tested; and
 - (d) what uncertainties (if any) are in the information.



APPENDIX A3

Northern Territory Government Guidelines

Guidelines for Preparation of an Environmental Impact Statement

OLYMPIC DAM EXPANSION (NT TRANSPORT OPTION) PROJECT

- BHP Billiton -

November 2008

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1 INTRODUCTION

BHP Billiton Olympic Dam Corporation Pty Ltd (BHP Billiton) is proposing to expand its existing mining and minerals processing operation at Olympic Dam in South Australia to increase the production of copper and associated products including uranium oxide, gold and silver.

The Olympic Dam Expansion Project is currently being jointly assessed by the Australian Government and the South Australian Government at the level of an Environmental Impact Statement (EIS). A draft EIS is being prepared by BHP Billiton in accordance with EIS guidelines that were published in January 2006, and then recently updated, to satisfy the requirements of both jurisdictions.

BHP Billiton is assessing a number of options for transport and shipment of product. One option that was developed after the joint government guidelines were published is to export copper concentrate, as well as uranium oxide, via the Port of Darwin. These guidelines deal with only the **NT Transport Option** of the Olympic Dam Expansion Project.

The Northern Territory Minister for Natural Resources, Environment and Heritage (the NT Minister) has determined that the Olympic Dam Expansion NT Transport Option of the Olympic Dam Expansion Project (NT Transport Option) requires formal assessment under the NT *Environmental Assessment (EA) Act* at the level of an EIS. Issues of concern contributing to this decision include:

- A high level of public interest in the mining of radioactive materials in general;
- A high level of public scrutiny in the transport of radioactive materials close to residential areas;
- A high level of public interest in the environment, health and social implications of a loading and storage facility operating for radioactive products close to habitable areas;
- Wastewater management at Port of Darwin (particularly rail wagon wash down water); and
- Air emissions (particularly radioactive dust particles).

The NT Government has agreed to work collaboratively with the Australian and SA Governments to enable the NT Transport Option to be considered within the current joint assessment process framework. These guidelines therefore supplement the *Guidelines for an Environmental Impact Statement on the proposed expansion of the Olympic Dam operations at Roxby Downs*, published jointly by the Australian Government and SA Government and henceforth termed the **Joint Assessment Guidelines**. The original document and a recently updated version can be accessed on the SA Government's website at http://www.planning.sa.gov.au/go/olympic-dam.

Information about the proposal and its relevant impacts, as outlined in this document, is to be provided in the EIS. This information must be sufficient to allow the NT Minister to make informed recommendations to the responsible (consent) Minister in accordance with the EA Act.

Responsibilities within the assessment process are divided among the jurisdictions as follows:

- The Australian Government is responsible for assessing all aspects of the proposal including aspects relevant to matters of National Environmental Significance (NES);
- The South Australian Government is responsible for all aspects of the proposal within its jurisdiction in South Australia; and
- The Northern Territory Government is responsible for assessing all aspects of the proposal within its jurisdiction in the Northern Territory (The NT Transport Option).

The guidelines only apply to the NT Transport Option. Where the word "action" or "proposal" is used in these guidelines, its interpretation is limited to the NT Transport Option.

2 GENERAL ADVICE ON EIS

2.1 GENERAL CONTENT, FORMAT & STYLE

A full description of the content required in the EIS is contained within Sections 2, 3 and 4 of the Joint Assessment Guidelines.

Information requirements specific to the Northern Territory as set out in these NT Transport Option guidelines must be included as a separate Appendix to the EIS to allow stakeholders and other interested parties to easily locate NT-specific matters in the EIS documentation. These matters should also be summarised within the relevant sections of the main body of the EIS.

2.2 ADMINISTRATION

Three 'preliminary' copies of the draft EIS should be lodged with the Environment, Heritage and the Arts (EHA) Division of the Department of Natural Resources, Environment, the Arts and Sport (NRETAS) for internal review prior to the public review.

Once the internal review is complete and the proponent implements any necessary changes, 10 bound copies of the draft EIS should be lodged with the NT Minister care of the EHA Division for distribution to NT Government advisory bodies.

The EIS should be provided on CD/DVD in ADOBE *.pdf format for placement on the NRETAS internet site (Executive Summary, Chapters and Appendices separate). The NRETAS site will also provide a link to an electronic, interactive version maintained by the proponent. This should be done at least 4 days before notice is provided by newspaper. Additionally, two Microsoft Word copies of the Draft EIS should be provided to facilitate production of the Assessment Report and Recommendations.

The draft EIS is to be advertised for review and comment in the *NT News, The Advocate (Alice Springs)*, and *Katherine Times*.

The EIS should be made available for public review at:

- Environment, Heritage and the Arts Division (Dept. Natural Resources, Environment, the Arts and Sport), 2nd Floor, Darwin Plaza, 41 Smith Street Mall, Darwin;
- Development Assessment Services (Dept. Planning and Infrastructure), Information Desk, Ground Floor, Cavenagh House, Cnr Cavenagh and Knuckey Streets, Darwin;

- Minerals and Energy Information Centre, Department of Regional Development, Primary Industry, Fisheries and Resources, 3rd Floor, Paspalis Centrepoint,
 - 48 Smith Street Mall, Darwin;
- Northern Territory Library (NTL), Parliament House, Darwin;
- Casuarina Public Library (e-mail <u>citylibrary@darwin.nt.gov.au</u> , Ph: 89300230);
- Palmerston City Library, Goyder Square, Palmerston (Contact tree.malyan@palmerston.nt.gov.au or phone 8935 9993);
- Darwin City Council Libraries (Casuarina, Darwin City, Karama, Nightcliff);
- The Environment Centre NT, Unit 3, 98 Woods St, Darwin (two copies requested with supporting documentation);
- Northern Land Council, 45 Mitchell St. Darwin;
- Litchfield Shire Council office 7 Bees Creek Road, Fred's Pass, NT (email council@lsc.nt.gov.au; Ph: 8983 1912);
- Environment Hub, Rapid Creek (Shop 9 Rapid Creek Business Village, Pearce Place, Millner);
- Katherine Town Council Public Library (telephone: 8972 5500);
- Alice Springs Town Council Public Library (telephone: 8950 0500);
- Tennant Creek Public Library (telephone: 8962 0050).

3 GENERAL INFORMATION

This should provide the background and context of the action including:

- The title of the action;
- The full name and postal address of the designated proponent;
- A clear outline of the objective of the action;
- Legislative background for the proposal, including the relevant NT legislation that applies to the project;
- The background to the development of the action;
- How the action relates to any other proposals or actions (of which the
 proponent should reasonably be aware) that have been or are being taken,
 or that have been approved in the region affected by the action;
- The current status of the action; and
- The consequences of not proceeding with the action.

4 DESCRIPTION OF THE PROPOSAL

This section must describe the **NT Transport Option** proposal to allow an understanding of proposed infrastructure design and engineering. All construction (including site preparation), operation and management elements of the proposed action must be described. Where applicable, this information should be described separately under the appropriate headings.

Details should include the proposed location/s of the NT Transport Option components, works to be undertaken, date or time period over which construction, operation and management is expected to take place, any structures to be built, and elements of the action that may have impacts on identified environmental factors.

Aspects to be covered include:

An explanation of the objectives, benefits and justification for the action;

- A description of the proposal's location indicating distance from Alice Springs, Katherine and Darwin, and the proposal in relation to the Stuart Highway and the Adelaide to Darwin Railway. The proximity of nearby residential areas and communities, pastoral leases and any major watercourses that may be impacted must also be indicated;
- An overall layout of the proposed action;
- Schedule for the proposal;
- Location and design criteria for each component of the proposal including design limitations imposed by site characteristics;
- Land requirements, land tenure, acquisition requirements (permits, rezoning and Native Title), and the tenures under which the proposal would be held including details of relevant legislative processes required to grant proposed tenure;
- Infrastructure requirements and specifications (permanent and temporary), and ancillary activities;
- Employment and business opportunities (direct and indirect), including sources of workforce, skill levels required and opportunities for local people and businesses;
- Methods for storage, handling, containment and emergency management of chemicals and other hazardous substances (including fuel and explosives);
 and
- Decommissioning planning with objectives for the site.

5 ALTERNATIVES

Alternative proposals for the NT Transport Option must be discussed in sufficient detail to enable an understanding of the reasons for preferring certain options and rejecting others.

Alternatives to be discussed must include:

- Not proceeding with the proposal;
- Transport options:
- Storage and handling facility locations;
- Environmental management technologies, particularly for dust and waste water management.

6 RISK ASSESSMENT

6.1 RISK ASSESSMENT APPROACH

This EIS should be undertaken with specific emphasis on identification, analysis and treatment of risks through a whole-of-project risk assessment. Through this process, the EIS will:

- Acknowledge and discuss the full range of risks presented by the proposed NT Transport Option including those of special concern to the public;
- Quantify (where possible) and rank risks so that the reasons for proposed management responses are clear;
- Acknowledge levels of uncertainty about estimates of risk and the effectiveness of risk controls;
- Extend risk assessment to problems in realising benefits; and

 Discuss the residual risks and their consequences expected to be borne by the community, providing better understanding of equity issues.

Levels of uncertainty with the impact assessment should be identified and addressed by the risk assessment. Steps taken to reduce uncertainty or precautions taken to compensate for uncertainty should also be identified and their effect/s demonstrated.

Information provided should permit the reader to understand the likelihood of the risk, its potential severity, and any uncertainty about the effectiveness of controls. If levels of uncertainty do not permit robust quantification of risk, then this should be clearly acknowledged.

The risk assessment should be based on international best practice. Processes for risk management are formalised in Standards Australia / Standards New Zealand (eg. AS/NZS 4360:2004; HB 436:2004; HB 158:2006).

BHP Billiton is expected to work with close regard to community expectations and concerns and to respect that the community may perceive the level of risk for this proposal differently to the proponent. In the interest of achieving a balanced risk assessment, it is expected that the proponent will place a high priority on communicating with the local community throughout the EIS process.

6.2 HAZARDS AND RISKS TO HUMANS AND FACILITIES

The EIS should include an assessment of the risks to people and nearby facilities associated with the construction, operation and maintenance of the various components of the NT Transport Option, and the storage and transport of materials within the NT. The aim of this assessment is to demonstrate that:

- The proponent is fully aware of the risks to human health and safety associated with all aspects of the development;
- The prevention and mitigation of risks to human health and safety are properly addressed in the design specifications for the facility; and
- The risks can and will be managed effectively during the construction, commissioning, operation, and decommissioning of the development.

Sufficient analysis should be provided to indicate whether risks are likely to be acceptable compared with similar ventures in Australia and Internationally. Assumptions used in the analyses should be explained. Relevant standards, codes and best practice methodologies that minimise risks should be discussed.

The proponent must discuss how the relevant authorities will be engaged to ensure emergency response capacity is adequate and emergency management is coordinated.

Section 5.9 (Hazard and Risk) of the Joint Assessment Guidelines provides more specific requirements, some of which are relevant to the NT Transport Option.

7 KEY RISKS OF THE NT TRANSPORT OPTION

7.1 DESIGN, CONSTRUCTION AND OPERATION OF THE STORAGE AND LOADING FACILITY

The proponent is to demonstrate how the storage and loading facilities would be designed and operated to achieve no detectable contamination of the

surrounding environment. It is also to discuss the potential likelihood and consequence of product spillage from unplanned risk events.

7.1.1 Context

The nature of the material being handled at East Arm Port requires special measures to be put in place to prevent airborne emissions of particulates from the facility and contaminated stormwater from entering the receiving environment.

7.1.2 Information requirements

Detailed information requirements for this key risk can be found in the *Air Quality, Surface Water* and *Waste Materials Management* sections of the Joint Assessment Guidelines. A summary of these and other requirements specific to the NT Transport Option are included below:

- Describe the existing air environment that may be affected by the proposal having regard for particulates, gaseous and odorous compounds, particularly radioactive dust and any other radiation hazards.
- Describe the surface water drainage systems that may be affected by the storage and handling of copper concentrate and the likely fate of stormwater from the site.
- Sufficient data on local meteorology and ambient levels of pollutants are to be gathered to provide a baseline for later studies.
- Describe the pollutant exposure sources, likely exposure receptors and potential levels of exposure, including potential levels of ionising radiation.
- Define and describe the objectives and practical measures for protecting environmental values for air and water, and how these objectives will be achieved and monitored.
- Include an outline of the stormwater and wash-down water management system designs associated with the likely storage facility location scenarios.
- Discuss the air filtration and ventilation system in the storage facility and how any particulate emissions will meet the National Environment Protection Measure for ambient air quality at the site boundary.
- Discuss wastewater treatment at the site.
- Detail the measures to prevent product losses to the environment during ship loading.
- Outline plans for decommissioning and rehabilitation of the storage and port facilities.

7.2 TRANSPORT OF PRODUCT

The proponent must demonstrate that fugitive product losses to the environment will be prevented as far as reasonably practicable and that any incidental product losses to the receiving environment can be managed with no significant environmental harm (including to human health).

7.2.1 Context

- There are risks associated with the transport of product that cannot be managed through engineering alone.
- The railway and many of the roads that are proposed for use are shared with the community, or pass through private land or close to dense residential

- areas, and traverse waterways. Ships will pass through Darwin Harbour and shipping activity will increase.
- Potential impacts of concern associated with the transport of product include radiological contamination of air, soil and water. Sources of impact could include dust generation, accidents such as product spills or vehicle collisions/derailment, unsecured loads, etc.

7.2.2 Information Requirements

From a risk perspective, examine aspects of product transport including, but not limited to:

- Details of any new or upgraded roads and rail infrastructure and facilities;
- An outline of the regulations, guidelines and procedures specific to operating the NT Transport Option;
- Details of how high risk elements of the transport route will be managed (such as road intersections, river crossings, driver fatigue, port activities);
- Details of product containment, and how risks of spillage, fugitive product losses and other risks associated with the product in transit will be managed;
- Emergency procedures in the event of an accident such as a train derailment; and
- A discussion of rolling stock and vehicle wash-down practices and how the waste water will be managed.

7.3 PUBLIC INTEREST IN ENVIRONMENTAL AND SOCIAL IMPACT

Environmental, social and health impact assessment is necessary to help citizens, communities and community leaders understand and quantify social and health implications of a project. This allows the community to collectively plan for and deal with the consequences of a proposed development.

The proponent needs to demonstrate that the communities potentially affected by this proposal will not bear significant costs in terms of social, economic and health impacts and can maximise the benefits that may be associated with the proposal. Community perceptions need to be managed sensitively.

7.3.1 Context

- There is strong public concern about the health impacts related to the exposure of humans to radioactive material.
- There is strong public interest in the mining of uranium, and the fate of the product.
- There is public concern that radioactive wastes (in this case, the fate of wastes recovered in wash down water and dust residues) could create "legacy" issues after the mining company has finished with the site.

7.3.2 Information Requirements

The Joint Assessment Guidelines require a thorough social impact assessment to be conducted as well as an economic assessment. In addition to these considerations, the proponent must assess the potential social and health impacts (including wellbeing) associated with the **NT Transport Option**. Relevant requirements include:

A discussion of the costs and benefits of the proposal to the community;

- Any potential impacts on the health of the surrounding port users and community, and management measures to prevent impacts;
- A summary of the perceptions expressed by individuals and groups within the community;
- A considered response to these perceptions; and
- A community consultation program to engage the community and keep them informed about the proposal, as well as providing a conduit for complaints and expression of concerns.

8 OTHER ENVIRONMENTAL RISKS

The Joint Assessment Guidelines contain detailed information requirements on the following risk areas and environmental factors:

- Roads, Rail and Infrastructure (Section 5.10 Land Use and Planning)
- Greenhouse emissions and Climate Change (Sections 5.11 Meteorological Environment and Climate, and 5.12 Air Quality);
- Erosion and sediment control (Section 5.13 Topography, Geology and Soils);
- Flora and fauna (Sections 5.14 Flora and 5.15 Fauna);
- Water management (Sections 5.16 Groundwater and 5.17 Surface Water)
- Noise (Section 5.18 Noise and Vibration);
- Cultural heritage (Section 5.19);
- Social Impact Assessment (Section 5.20)
- Visual Amenity (Section 5.21);
- Waste management (Section 5.22 Waste Materials Management);
- Economic Assessment (Section 5.23); and
- Rehabilitation and Decommissioning (Section 5.24)

In addition to the relevant requirements outlined in the above sections of the Joint Assessment Guidelines, the proponent must consider the following advice with respect to the NT Transport Option:

- NT Environmental Assessment Guide Greenhouse Gas Emissions (Attachment 1) or (http://www.nt.gov.au/nreta/publications/environment/index.html);
- Any receptacles or depressions with the potential to store water for more than 3 days should be avoided, and stormwater drains must be kept clear of vegetation and free-draining to avoid formation of mosquito breeding habitat. See 'Construction Practice Near Tidal Areas of the Northern Territory – Guidelines to Prevent Mosquito Breeding' (Attachment 2);
- NT Erosion and Sediment Control guidelines (http://www.nt.gov.au/nreta/natres/soil/management/index.html);
- Any discharge of wastewater from the premises in to Darwin Harbour will require a Waste Discharge Licence under the *Water Act 1992*. Guidance and application forms can be found at the following site: (http://www.nt.gov.au/nreta/environment/licences/guides.html#water);
- A licence to possess will be required for copper concentrate under the Radiation Protection Act and the Radiation (Safety Control) Act. The 'Code of Practice for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing' will be a condition of licence;
- A licence under the *Radioactive Ores and Concentrates (Packaging and Transport) Act* and approval for a store will be required.

9 ENVIRONMENTAL MANAGEMENT

Specific safeguards and controls, which are proposed to be employed to minimise or remedy environmental impacts identified in Section 7, are to be included in a draft Environmental Management Plan (EMP).

The draft EMP should be strategic, describing a framework for environmental management for construction and operational phases of the proposal; however, as much detail as is practicable should be provided to enable adequate assessment during the public exhibition phase. Where possible, specific management policies, practices and procedures should be included in the draft EMP.

Where practicable, the draft EMP should include:

- The proposed management structure of the construction, operational and decommissioning phases and its relationship to the environmental management of the site;
- Management targets and objectives for relevant environmental factors;
- The proposed measures to minimise adverse impacts and maximise opportunities;
- Performance indicators by which all anticipated and potential impacts can be measured;
- Proposed monitoring programs to allow early detection of adverse impacts;
- A summary table listing the undertakings and commitments made in the EIS, including clear timelines for key commitments and performance indicators, with cross-references to the text of the Statement; and
- Provision for the periodic review of the management plan itself.

Reference should be made to relevant legislation, guidelines and standards, and proposed arrangements for necessary approvals and permits should be noted. The agencies responsible for implementing and overseeing the management plan should be identified. Proposed reporting procedures on the implementation of the management plan, independent auditing or self-auditing and reporting of accidents and incidents should also be included.

The EMP would continue to be developed and refined following the conclusion of the assessment process, taking into consideration the proposed timing of the NT Transport Option, comments on the EIS and incorporating the Assessment Report recommendations and conclusions.

10 PUBLIC INVOLVEMENT AND CONSULTATION

The EIS has an important role in informing the public about this proposal. It is essential that the proponent demonstrate how public concerns were identified, and will influence the design and delivery of the proposal. Public involvement and the role of government organisations should be clearly identified. The outcomes of any surveys, public meetings and liaison with interested groups should be discussed including any changes made to the proposal as a result of consultation. Details of any ongoing liaison should also be discussed.

An outline of negotiations and discussions with local government and the Northern Territory Government should be provided.

A stakeholder communication plan must be included in the EIS to facilitate consultation, information sharing and involvement with Government and the local

community during the planning, construction, operation and decommissioning of the proposal.

Attachment 1



DEPARTMENT OF NATURAL RESOURCES, ENVIRONMENT, THE ARTS AND SPORT

NT ENVIRONMENTAL IMPACT ASSESSMENT GUIDE:

GREENHOUSE GAS EMISSIONS AND CLIMATE CHANGE

PURPOSE

The Northern Territory Government's objective for managing greenhouse gas emissions from new and expanding operations is to minimise emissions to a level that is as low as practicable. This will help fulfil the objective of minimising greenhouse gas emissions from the NT into the future.

The Northern Territory Government's objective for considering future climate change in the assessment process is to ensure projects and developments are planned taking climate change science and projections into account, to minimise future environmental, social and economic costs and take advantage of any opportunities.

This Guide aims to assist proponents in providing the information needed by the Department of Natural Resources, Environment, the Arts and Sport (NRETAS) to assess the impact of greenhouse gas emissions from proposed projects and assess other potential impacts from proposed projects under projected future climatic conditions under the *Northern Territory Environmental Assessment Act 1994*.

GUIDANCE

Emissions estimates

Note that the Australian Government is establishing a national greenhouse gas emissions trading system, which may have implications for some proponents. More information on a national emissions trading scheme is available at

http://www.climatechange.gov.au/emissionstrading/index.html

Proponents should detail the following in their environmental impact assessment documentation:

- 1. An estimate of the greenhouse gas emissions for the construction and operation phases:
- (a) in absolute and carbon dioxide equivalent figures (refer to the Glossary in this Guide) for each year of the project;
- (b) identified on a gas by gas basis; and

(c) by source (including on site and upstream sources such as emissions arising from land clearing and the production and supply of energy to the site).

Emissions estimates are to be calculated using the methodology developed and periodically updated by the National Greenhouse Gas Inventory Committee or another national or internationally agreed methodology. See http://www.climatechange.gov.au/workbook/index.html for access to the National Greenhouse Accounts Factors which may assist.

For emissions from clearing of vegetation, emissions estimates are to be calculated using the National Carbon Accounting System, or another nationally recognised methodology. For more information see http://www.climatechange.gov.au/ncas/index.html

2. Details of the project lifecycle greenhouse gas emissions and the greenhouse gas efficiency of the proposed project (per unit and/or other agreed performance indicators).

Lifecycle emissions and greenhouse gas efficiency should be compared with similar technologies producing similar products.

To provide an understanding of the broader impact of the proposal, proponents are encouraged to place the estimated greenhouse gas emissions from the proposal into a national and global context. Information on Australia's national emissions profile can be obtained from the Department of Climate Change at http://www.climatechange.gov.au/inventory/2005/index.html. International emissions can be seen at the United Nations Framework Convention on Climate Change (UNFCCC) website at http://unfccc.int/ghg emissions data/items/3800.php

Measures to minimise greenhouse gas emissions

Proponents must demonstrate consideration of a wide range of options and indicate the intended measures and efficient technologies to be adopted to minimise total greenhouse gas emissions from the proposed project, including:

- (a) identifying energy conservation measures, opportunities for improving energy efficiency and ways to reduce fugitive emissions where applicable;
- (b) indicating where potential savings in greenhouse gas emissions can be made through the use of renewable energy sources, taking into account fossil fuels used for supplementary power generation; and
- (c) whilst recognising the likely commencement of an emissions trading scheme in 2010, their commitment to offsetting greenhouse gas emissions.

The design measures to maximise efficiency and minimise emissions should represent best practice at the time of seeking project approval.

Proponents are to advise whether they will join the Commonwealth Government's Greenhouse Challenge program. For more information on the program see http://www.climatechange.gov.au/challenge/index.html

Offsets

Emission offsets include activities that remove carbon from the atmosphere or reduce the greenhouse gas intensity (output per unit product) from current or future activities. No Australian standards for offsets currently exist, although the Australian Government has committed to the development of an Australian standard for offsets by the end of 2008. The Australian Government

does currently approve Greenhouse Friendly carbon credits under the Greenhouse Friendly initiative, more information about which can be found at http://www.greenhouse.gov.au/greenhousefriendly

Measures that offset emissions within the NT are encouraged, and NRETAS staff can discuss possible options with proponents. Proposed emissions offsets projects should include an estimate of greenhouse gas emissions savings that will be achieved through implementation.

Emissions monitoring and reporting

Consistent with the principles of continuous improvement, a program is to be outlined in the proponent's Environmental Management Plan which includes ongoing monitoring, investigation, review and reporting of greenhouse gas emissions and abatement measures.

The Australian Government is developing a nationally consistent framework for greenhouse and energy reporting by industry. Projects with significant emissions may be required to report their emissions under the National Greenhouse and Energy Reporting Act 2007. Data reported through the system will underpin the National Emissions Trading Scheme. For more information see http://www.climatechange.gov.au/reporting/index.html

Impacts of climate change

Climate change is projected to result in changes to sea level, land and sea temperatures, cyclone intensity, frequency of fire weather, and frequency of extreme weather events including storms, drought and flood.

Proponents should discuss how projected climate change has been taken into account in planning the proposal, and how climate change is expected to affect the proposal over its stated lifetime. Proponents should discuss how climate change-related risks (for example, risk of failure of project infrastructure during potential extreme weather events) will be managed.

Potential impacts of climate change on the surrounding environment including water, land, biodiversity and ecosystems, coastal zones, and the social environment should also be taken into account in proposal planning.

In assessing climate change risk, proponents should be guided by recent projections published by organisations such as the CSIRO, the Bureau of Meteorology (BoM), and the Intergovernmental Panel on Climate Change. For the latest CSIRO and BoM projections for Australia, see: http://www.climatechangeinaustralia.gov.au

GLOSSARY OF GREENHOUSE TERMS

Abatement: Limiting, abating, avoiding or sequestering greenhouse gas emissions through source reduction, fuel displacement or switching, carbon stabilising techniques or sink enhancement.

Absolute emissions: Refers to the total emissions of greenhouse gases expressed in terms of the actual mass of each individual gas emitted over a specified time period.

Best Practice: A best practice is a process, technique, or use of technology, equipment or resource that has a proven record of success in minimising energy use and greenhouse gas emissions. A commitment to use best practice is a commitment to use all available knowledge and technology to ensure that greenhouse gas emissions are minimised.

Carbon Dioxide Equivalent: A unit of greenhouse gas emissions calculated by multiplying the actual mass of emissions by the appropriate Global Warming Potential. This enables emissions of different gases to be added together and compared with carbon dioxide (see Table 1 below).

Commonwealth Government's Greenhouse Challenge program: A cooperative effort by industry and the Commonwealth Government to reduce greenhouse gas emissions through voluntary industry action. See: http://www.climatechange.gov.au/challenge/index.html

Greenhouse Gases: Table 1 lists the greenhouse gases proponents are required to report on.

Global Warming Potential (GWP): The warming potential of a gas, compared to that for carbon dioxide. GWPs are revised from time to time as knowledge increases about the influences of different gases and processes on climate change. Refer Table 1.

Project Lifecycle Greenhouse Gas Emissions: Those greenhouse gas emissions measured cumulatively over a defined period. Typically this period is from the point of extraction of the raw materials to either the beginning of the consumer phase of a product or the final disposal or recycling stage of a product, depending on its nature. Proponents should justify their choice of the defined period.

National Greenhouse Gas Inventory Committee: A committee comprising representatives of the Commonwealth, State and Territory Governments that oversees the development of greenhouse gas inventory methods and compilation of inventories for Australia.

Sequestration: Removal of greenhouse gases from the atmosphere by vegetation or technological measures. Sequestration is not yet precisely defined for the purposes of recognised trading or offset schemes. Accordingly, NRETAS will take a common sense approach on a case by case basis in the interim. To assist proponents, NRETAS regards sequestration as a process that results in the isolation of carbon dioxide from the atmosphere for a period which is significant in terms of influencing the global warming effect.

Source: Any process or activity that releases a greenhouse gas into the atmosphere.

Table 1: Greenhouse gases and respective Global Warming Potential (GWP) factors

Greenhouse Gas	Global Warming Potential
Carbon dioxide (CO ₂)	1
Methane (CH ₄)	21
Nitrous oxide (N ₂ O)	310
Perfluorocarbons (CF _x)	6,500 – 9,200
Hydrofluorocarbons (HFCs)	140 - 11,700
Sulphur hexafluoride (SF ₆)	23,900

Greenhouse gas emissions expressed in carbon dioxide equivalent (CO₂-e) are calculated by multiplying the actual mass of emissions for each greenhouse gas by its respective GWP factor. GWP factors listed are those published by the International Panel on Climate Change in its 4th Assessment Report, 2007, see http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1 Print Ch02.pdf

Attachment 2



CONSTRUCTION PRACTICE NEAR TIDAL AREAS IN THE NORTHERN TERRITORY

GUIDELINES TO PREVENT MOSQUITO BREEDING

NORTHERN TERRITORY COASTAL MANAGEMENT COMMITTEE JUNE 1988

Minor update 13/08/02 Minor update 25/8/05

For more information contact:

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CONSTRUCTION PRACTICE NEAR TIDAL AREAS IN THE NORTHERN TERRITORY

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P. I. Whelan Medical Entomology Branch Department of Health & Community Services

for the Coastal Management Technical Advisory Group

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Construction Practice Near Tidal Areas in the Northern Territory

Guidelines to Prevent Mosquito Breeding

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- 6.3 Embankments and access roads
- 6.4 Water retention in tidal areas.
- 6.5 Land fill into tidal areas.
- 6.6 Sewage pond construction.
- 6. 7 Urban subdivision.
- 7.0 Consultation Authorities

Appendix I

Previous mosquito problems in the Top End of the Northern Territory created by construction practice.

1.0 **Introduction**

There have been many instances of construction in or near tidal areas in the Top End of the Northern Territory that have resulted in ecological disturbance and subsequent mosquito breeding. Many of the deleterious disturbances have been the result of little or no recognition of the ecological consequences of construction practices, either during the construction period or on completion of the project. Much of the deleterious ecological disturbance can be avoided or minimized by consultation between engineers or construction authorities and people with ecological expertise.

One of the most significant impacts of construction in or adjacent to tidal areas is the creation of new sources of pest and potential disease causing mosquitoes. The creation of new mosquito breeding sites can have an enormous bearing of the quality of life, land values, costly rehabilitation measures, mosquito control programs and most importantly, the health and legal implications involved in an outbreak of mosquito-borne disease.

2.0 Aim of Guidelines

These guidelines are intended as a checklist for planners, engineers or any supervisory officers, responsible for the planning or implementation of any construction activity near tidal areas, in order to prevent the creation of mosquito breeding sites.

They are also intended to be used as a checklist in the preparation and evaluation of any Preliminary Environment Report or Environmental Impact Statement. In this way it is hoped that the 'potential for additional. mosquito breeding areas will be recognized and avoided in the planning or implementation phases of any construction project, so that later costly or environmentally disruptive rectification works will not be necessary.

It is proposed to circulate these guidelines to the relevant construction or advisory authorities. Any doubts on the potential for creating mosquito breeding sites on any project can be referred to the Senior Medical Entomologist of the Department of Health and Community Services or any COMTAG member.

3.0 Mosquitoes of Public Health Importance

Background information on mosquito biology, breeding sites, potential diseases and specific control measures can be found in "Mosquitoes of Public Health Importance in the Northern Territory and their Control" (1984), available from the Department of Health and Community Services. Of the 100 species of mosquitoes in the Northern Territory, fifteen (15) species can breed in the intertidal zone, at least at certain sites and some times of the year. These include the principal vectors of malaria, epidemic polyarthritis, and a number of other virus diseases, as well as those species regarded as the most important pest species.

Salt Water Mosquitoes	Common Name	<u>Importance</u>
Anopheles hilli	Saltwater Anopheles	Potential disease vector
Culex sitiens	Saltwater Culex	Localized pest species
Aedes alternans	Scotch Grey	Negligible pest
Aedes vigilax	Saltmarsh mosquito	Major pest and disease vector

Brackish Water Mosquitoes

Anopheles farauti s.l.	Australian malaria mosquito	Major malaria vector
Verrallina funerea	Brackish water mosquito	Important local pest

Brackish to fresh water mosquitoes

Culex annulirostris	Common banded mosquito	Major pest and disease vector	
Anopheles bancroftii	Black malaria mosquito	Potential malaria vector and pest	
Anopheles annulipes s.l.	Australian Anopheles	Potential malaria vector	
Anopheles meraukensis	Water reed Anopheles	Pest species	
Coquillettidia xanthogaster	The orange mosquito	Important pest species	
Mansonia uniformis	Water hyacinth mosquito	important pest species	

3.1 **Malaria**

Malaria was only eradicated in the Northern Territory in 1962 and many communities in the Northern Territory remain vulnerable to malaria reintroduction, particularly those communities which are near large sources of *Anopheles* mosquitoes. Each year up to thirty malaria cases are imported into the Top End from overseas, and the Department of Health and Community Services investigates and follows up each case. With increasing numbers of people living in remote areas with large mosquito populations, or adjacent to mosquito sources in expanding urban areas, the potential for malaria reintroduction is increasing. In particular circumstances, adult mosquito control measures near urban areas may be necessary, but problems due to lack of access, thick vegetation, or the proximity to urban areas, may prevent or reduce the effectiveness of these measures. We need to reduce these potential problems by reducing the mosquito breeding areas adjacent to urban areas.

3.2 **Arbovirus Diseases**

Each year there are up to 20 cases of epidemic polyarthritis reported in the Top End. These are laboratory confirmed cases only, and it is thought the number of clinical cases is very much higher. All of these cases have been investigated and the likely sites of transmission were frequently in towns adjacent to particularly productive mosquito breeding areas. With a tropical lifestyle and an expanding population, it is becoming increasingly necessary to provide mosquito free urban areas.

4.0 Mosquito Breeding Sites in Coastal Areas

The breeding sites of the various mosquito species are illustrated in Fig. 1. The area of greatest potential for mosquito breeding lies within the upper high tide zone (from 7. 3m to 7. 9m A. C. D. in the Darwin area). In addition, the region up to 1.0m above maximum high tide can be a significant mosquito breeding area, as this region is usually the recipient of seepage, rain water and silt inputs being transported to the tidal areas. These regions have the capacity for both natural and human disturbances that can lead to significant increase in mosquito breeding.

The intertidal areas of wide expanse, thick vegetation, very flat topography, and fresh water inflows are the largest sources of mosquitoes. These large tidally influenced marshes (e. g. Leanyer Swamp) have variable salinity water which is shallow and thickly vegetated and is the ideal breeding habitat for most of the important mosquito species. Natural tidal marshes such as these can be extended and made much more productive sources of mosquitoes with increased silt, nutrient and water inputs from urban and industrial developments.

Any construction practice that increases the flow of water, silt or nutrients, or interrupts or prolongs the drainage through these areas, has the capacity to increase the amount of mosquito breeding. This is particularly so in the upper high tide area, where the often naturally self draining margin of the mangroves can be easily disturbed and result in the pooling of tidal water. Such sites can be quite small, but extremely productive in the numbers of salt water mosquitoes such as *Ochlerotatus vigilax*.

At present the Northern Territory Government and the Darwin City Council have a continuing mosquito engineering control program around urban Darwin, to rectify past poor

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construction practices. The annual expenditure for the three years 1985-1987 has been in the region of \$180 000.

This annual expenditure included funds for the construction of drains and a proportion to permanently upgrade those drains that repeatedly breed mosquitoes. The program will need to be relatively long term to rectify all the past poor construction practices and achieve a relatively mosquito free city, particularly when poor construction practices are still proceeding. In contrast, planners of the new satellite city of Palmerston considered the potential for mosquito breeding at an early stage. The siting of the urban areas, the rectification of existing mosquito breeding areas, the design and endpoints of the storm drains, and reclamation works in Palmerston have resulted in a relatively mosquito free urban environment. This consideration in the planning stage has been a very cost effective solution.

5.0 Construction practices that can result in mosquito breeding

Mosquito problems created by previous construction practices are detailed in Appendix I.

5.1 **Sand Extraction**

Deposits are usually found in low lying areas along swamps and creeks or close to the tidal areas. Any sand extraction activity has the capacity to produce wet season flooded depressions or waterfilled borrow pits that quickly become colonized with aquatic or semi aquatic vegetation and result in new mosquito breeding areas. These areas can be extremely productive, particularly if the borrow pits have some tidal influence, as this can eliminate may of the freshwater aquatic predators of mosquito larvae. Those sand extraction areas that are deep enough to penetrate the water table can become perennial mosquito sources.

5.2 **Storm Water Drainage**

Storm water drain construction can produce mosquito breeding sites by poor placement of berm material and the disruption of normal drainage patterns. If the disruption of drainage is in tidal areas it can create extreme mosquito problems.

Open unlined storm drains with relatively permanent dry season flows can be mosquito sources, particularly if the drain receives organic nutrients from urban run off or industrial processes.

If storm drains with considerable dry season flows are directed into low lying areas, particularly in the upper high tide zone, considerable ecological disturbance can result in dramatic increases in mosquito breeding.

5.3 Road embankments and Access Roads

Road embankments and access roads can result in impoundments or impedance of normal drainage patterns and frequently cause at least wet season pooling. Detailed topographic and vegetation surveys are usually necessary to avoid such disturbances.

5.4 Water Retention in Tidal Areas

The construction of water retention features can result in altered vegetation patterns that can give rise to mosquito breeding. Water retention in standing mangrove areas which

results in the death of mangroves can create extremely productive sources of the salt marsh mosquito, the salt water *Anopheles* or the salt water *Culex* mosquito. Inundation of disturbed tidal areas by high tides, rain or waste water can result in emergence of large numbers of mosquitoes. Meticulous planning or water retention features is necessary to avoid creating mosquito breeding sites. Aspects that need particular attention include the final water level, the quality and salinity range of the impounded water, the maintenance drainage capability, the potential vegetation growth in or at the edges, and the inflow of silt.

5.5 Land Fill Operations

Land fill in tidal areas can disrupt previously self draining areas and result in pooling of water. This is particularly so if the land fill has silt laden run off and is sited in a complex drainage pattern. Pollution and vegetation growth at the edge of land fill operation in water can eliminate or restrict the normal activity of aquatic predators and give rise to mosquito problems.

5.6 **Sewage Pond Construction**

The siting of sewage ponds is one of the most important factors in reducing potential mosquito problems. Recent siting of ponds in Darwin has been excellent, as disruption of mangrove drainage patterns has been avoided, and access and service embankments have not resulted in the inadvertent impoundment of water.

Maintenance needs, such as emptying certain ponds, can cause extreme mosquito problems unless the pond contents can be channelled or discharged directly to a daily flushed tidal area. These maintenance practices need to be considered in the planning stages and should be important factors in the choice of a site.

The type of ponds, particularly the depth, size and bank material can have a large bearing on whether the ponds are mosquito sources.

5.7 **Urban Subdivisions**

When urban subdivisions are poorly sited near pre-existing mosquito sources, or sites that have the potential to become sources, it is very likely that there will be public pressure at a later date to rectify the mosquito breeding. Sometimes the rectification works can be extremely expensive, or severely disrupt natural features such as swamplands. It is logical to avoid such costly rectification works or possible destruction of animal and fish habitats, by the correct siting of urban subdivisions.

The Health Department has recommended avoiding large and uncontrolled tidally influenced mosquito breeding areas by having a 1.6km buffer between the breeding areas and the proposed urban development.

This buffer is very relevant for those large salt marsh swamps with fresh water input such as Leanyer Swamp and Howard Swamp, but it is of little relevance for very small areas that are not very productive, or that can be easily controlled or rectified.

If urban areas are built near these large and at present uncontrollable mosquito breeding areas, then attempts will be necessary to control the breeding. Examples of types of physical control methods recommended include:

1. Swamp drainage by a system of channels

- 2. Tidal bunds, tide gates and an internal drainage system
- 3. Steep sided relatively deep (greater than 2. Om) excavated fresh water lake
- Salt water lake.

Insecticide control for extended periods should not be contemplated as a control measure around urban areas, as there can be no certainty that such methods will be effective in the longer term.

6.0 **Guidelines for Construction Practice**

6.1 **Borrow Pits and Excavations**

- 6.1.1 No borrow pits, extractive industry or excavation should be conducted within the tidal zone, unless provision is made to prevent ecological changes.
- 6.1.2 Borrow pits or extractive operations should not excavate to a base level below maximum high tide level.
- 6.1.3 Cover material and vegetation should not be pushed into the tidal zone. There should be no impedance of overland flow into the tidal zone.
- 6.1.4 All borrowing or extractive areas should be rehabilitated immediately upon completion of the operation such that all operational areas are completely self draining.
- 6.1.5 Vehicle disturbed areas such as wheel ruts and compacted soil areas should be rectified as soon as practical to prevent water ponding.

6.2 **Storm Water Drainage**

- 6.2.1 Drains should be constructed to discharge direct into regularly flushed tidal areas, such as tidal creeks or a formalized channel dug back from a tidal creek. In Darwin 100 year flood drains should be constructed to the 3.7 AHD level and low flow drains to the 3.0 AHD (or below this level if silt accumulation is a potential problem).
- 6.2.2 Drains through tidal areas need to be of dimensions that will not result in silt accumulation in or near the drain. Low flow drains should be installed wherever there is the possibility of longer term dry season flows. Such drains can be either impervious above ground inverts or sub soil pipes.
- 6.2.3 Low flow drains should be installed wherever there is the possibility of longer term dry season flows. Such drains can be either impervious above ground inverts or sub soil pipes.
- 6.2.4 Access along all drains is necessary for regular maintenance.

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- 6.2.5 Drains through tidal areas should follow the course of existing creeks or flow lines wherever possible.
- 6.2.6 Drains for mosquito control purposes should be only of dimensions that are necessary to drain over a period of 2 to 3 days for tidal areas, and 4 to 5 days for fresh water, unless there are other considerations requiring larger drains.
- 6.2.7 Silt traps should be installed in drains that are likely to carry considerale silt loads. This is particularly necessary in large urban drains during subdivision construction.

6.3 **Embankments and Access Roads**

- 6.3.1 No embankments should be constructed across tidal areas unless provision is made for sufficient tidal exchange to prevent any considerable ecological change. If upstream impoundments of tidal water are completely flushed at least once in 7 days, there is usually no significant mosquito breeding in the impounded tidal water.
- 6.3.2 Embankments should have provision for complete drainage of upland areas at least over a period of less than five days after flooding. This particularly applies to areas near the tidal limit, which would only be reached by tides once in 10 to 14 days.
- 6.3.3 Embankments for land reclamation purposes should have an internal drainage system with tide valves at the embankment. If upland flows are diverted around the reclamation area, the diverted flow should be discharged direct to the major tidal drainage line immediately seaward of the embankment.
- 6.3.4 Vehicle access along the upper high tide zone should be restricted as much as possible, to prevent the creation of vechile disturbed areas that could pond tide and rainwater.

6.4 Water Retention in Tidal Areas

6.4.1 An ecological and hydrological study should be undertaken before any water retention feature is constructed in a tidal area.

Those aspects that are considered critical to the success of an aquatic feature include:

the levels and seasonal fluctuations in salinity; the possible aquatic and semi aquatic vegetation changes likely to occur; the effect on aquatic animal life; the number of days under tidal influence; the depth of the retained water; inputs of organic and other pollutants into the system; the' source., amounts. and quality of possible top up water; the provisions for periodic maintenance; possible ecological effects seaward of the retention.

- 6.4.2 If the tidal regime in the water feature is significantly reduced or eliminated, all existing mangroves in the retention area should be removed.
- 6.4.3 Silt traps should be constructed at all significant silt entry points.
- 6.4.4 Regular vegetation maintenance or control programs will be necessary. The provision of 1:1 side slope or impervious margins should be considered to reduce maintenance needs.

6.4.5 There should not be any small cut off areas at any height level of the water.

6.5 Land Fill in Tidal Areas

- 6.5.1 Land fill operations should not impede any established drainage patterns, either by the land fill operations, or possible erosion from the fill area.
- 6.5.2 There should be drainage provisions all around the base of sanitary land fill operations, and these drains should discharge direct to a daily flushed tidal system.

6.6 **Sewage Pond Construction.**

- 6.6.1 Sewage ponds should be sited preferably on bare mud flat areas in preference to existing mangrove areas to minimize ecological disturbances.
- 6.6.2 The siting of ponds should not result in any impedance to pre-existing drainage lines, either landward or within the tidal area.
- 6.6.3 Pond drainage during maintenance should be direct to daily flushed tidal areas.

6.7 Urban Subdivision

- 6.7.1 A mosquito buffer zone for the exclusion of urban residential development is recommended within 1.6km of large and uncontrolled tidally influenced mosquito breeding areas.
- 6.7.2 No urban residential developments are recommended within 1km of mangroves, unless biting midges are not likely to be a significant problem.
- 6. 7. 3 Any subdivisions bordering tidal areas should incorporate a buffer distance between the high tide level and property boundaries, so that access is possible for management purposes, and to prevent the creation of new mosquito breeding sites.

7.0 **Consultation**

The Medical Entomology Branch of the Northern Territory Department of Health and Community Services is available for advice on what may constitute a potentially significant mosquito breeding site. In some instances where detailed entomological investigations are necessary, 12 months entomological monitoring may be required before the detailed planning stage. For significant entomological investigations, it may be necessary for the developer to engage an entomological consultant.

Consultation for any project within a tidally affected area may be required with the Northern Territory Department of Lands, the Environment Unit of the Conservation Commission, or the Coastal Management Technical Advisory Group (C. O. M. T. A. G).

Appendix I

<u>Previous mosquito problems in the Top End of the</u> Northern Territory created by Construction Practice

1.0 Sand Extraction

Bynoe Harbour

Sand extraction on a beach area in Bynoe Harbour resulted in an area of mangroves being bulldozed and pushed further into a tidal area to form a retarding barrier. Fresh water inflow into the retarding basin resulted in an area of impounded water varying from brackish to salt, depending on tidal movement. The large quantities of dead and dying mangroves contributed to high levels of organic matter and flotsam. The area proceeded to breed very large numbers of salt marsh mosquitoes and a range of other pest and potential disease carrying mosquitoes.

Casuarina Beach

Sand mining at Casuarina Beach was carried out behind the frontal dunes, to a depth below high tide level. Although initially the pits only collected freshwater, the weakened frontal dunes soon collapsed, allowing tidal entry into the pits.

The result was a range of fresh, brackish and tidal water pools, with mangroves and dense salt water couch grass, providing ideal habitats for a large range and huge numbers of mosquitoes. These mosquitoes seriously disrupted the recreational use of the nearby park, and affected nearby residential areas and the hospital area.

2.0 Storm Water Channelization Ludmilla Creek

During the installation of storm water drainage in the Ludmilla area, a large channel was constructed through the upper reaches of the Ludmilla mangroves to convey the increased storm water further downstream. The spoil from the channelization was thrown up on the sides of the channel to form a continuous embankment. This embankment disrupted the free drainage of the nearby mangrove and mud flat areas, resulting in cut off tidal depressions throughout the upper reaches of mangroves. These depressions created the breeding sites for hordes of salt marsh mosquitoes that plagued the general area for many years until rectified by the re-establishment of a drainage system under the combined mosquito engineering control group.

3.0 Storm Water Discharge, Sandy Creek, Tiwi

The construction of storm water drainage in the Tiwi area resulted in the discharge of storm water into the upper reaches of Sandy Creek along Rocklands Drive. With residential development, this extensive drainage system had considerable dry season flows from overwatering and wash down activities, which transformed the seasonal drainage line into a permanently flowing creek. Ecological changes occurred in the creek and for a considerable distance downstream into the

mangrove areas of Sandy Creek. Fresh water and brackish water reeds began growing beneath mangroves and on former bare mud flat areas. Silt accumulation caused drainage pattern changes and pooling of both fresh and tidal waters over considerable areas. Some areas of mangroves died while others colonized new areas. These ecological changes led to the creation of a range of mosquito breeding habitats and serious mosquito pest problem.

4.0 Road Embankments and Access Tracks

Tiger Brennan Drive

During the construction of the Tiger Brennan Drive extension, a large area of mangroves was cut off from regular tidal influence by an earth embankment. Some areas of the mangroves were flattened and left in situ, while other areas were bulldozed clear, leaving deep machinery tracks. Inadequate temporary drainage pipes were installed which were too small to allow sufficient drainage of impounded water, sited too *high to* allow complete drainage, and yet sufficient to allow tidal ingress and water level fluctuations. This situation led to a stagnant brackish water impoundment, with periodic tidal flooding of sheltered shallow water and artificial depressions. The resultant emergence of salt marsh and other species of mosquitoes required regular surveys and mosquito control operations in areas of inaccessible swamp. Notwithstanding that the affected area will soon be landfilled for future commercial development, even short-term impoundment of brackish water provides an unacceptable environment that promotes mosquito breeding.

Access Tracks

Access tracks, particularly those constructed by Electricity or Sewerage authorities, are frequently just above tidal reach, due to the positioning of many of their facilities. These tracks sometimes have inadequate drainage provisions which can interupt overland water flow into tidal areas or disrupt tidal drainage patterns. This can result in the retention of water in drainage lines and creeks, creating swampy areas, or cause pooling on the uphill sides of the track. In some instances, when drainage is constructed under the road, scouring on the downhill side of the drain can result in depressions that can fill after rain or high tides.

5.0 Water Retention Features in Tidal Areas

Examples of the range of problems created by water retention in tidal areas can be illustrated by the construction of the Frances Bay Mooring Basin, the old Fannie Bay Golf Club dam, the Gove alumina final retention pond and Palmerston Lake on the Darwin City Council Golf Course. All of these projects had water retained either permanently or temporarily during construction, and were periodically under water level fluctuations by tidal or storm water influence. Each impoundment exhibited a range of salinities and resulted in vegetation changes which included either death of mangroves, growth of fresh or brackish water reeds, death of fish or other aquatic mosquito predators or prolific algal growth.

Any of these factors can result in prolific breeding of mosquitoes. The ecological modifications caused by the construction has usually been considerable and the mosquito breeding can only be alleviated by expensive or critically timed water management procedures.

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In the mooring basin, the mangrove death and coincident mosquito breeding was caused by the embankment of an area of mangroves upstream of the mooring basin, with inadequate provision for stormwater drainage from the impounded area.

The Old Fannie Bay Dam mosquito problems arose from the creation of a non draining tidal depression which was periodically flooded by high tides.

Extensive algal growth and colonization by dense reeds in the Palmerston Lake resulted from infrequent tidal entry, inadequate pumping capacity for top up sea water, inflow of organic rich storm water and the insufficient side slope and depth of the impoundment.

The Gove waste water retention pond was created by impounding a large area of mangroves behind an embankment. The low salinity and high PH of the impounded water caused the death of a large area of dense mangroves and destroyed all aquatic life except for periodic pulses of enormous numbers of mosquito larvae. The periodic plagues of salt marsh mosquitoes from this area precipitated industrial problems and ushered in a mosquito control program which was frequently inefficient. The large area of mosquito breeding and the inaccessibility of the breeding areas by a tangle of dead mangroves hindered larval control, and adult mosquito control by fogging was restricted by the lack of all around access to cope with varying wind directions.

6.0 **Sanitary Land Fill, Leanyer Dump**

Urban refuse fill into the edge of a salt marsh resulted in areas of polluted marsh becoming significant mosquito breeding sites as the normal aquatic predators such as fish beetles and bugs were eliminated. Other areas became breeding sites by poor placement of the fill creating cut off pools or silt runoff interrupting surface drainage patterns. Additional problems were created by depressions left by the operation of machinery on the salt marsh floor. In one instance, the stockpiling of a large number of tyres without a covering of soil led to appreciable numbers of artificial container breeding mosquitoes affecting nearby suburbs.

7.0 **Sewer Line Construction**

The installation of sewer lines, by the nature of gravity flow requirements, are invariably installed near the tidal zone. The creation of mosquito breeding has been caused by the construction of embankments to carry pipes across tidal areas, the subsidence of excavations, or the pushing of earth and debris into the mangroves. An embankment across a former tidal creek in Coconut Grove resulted in changing a free draining section of tidal creek into a dense swampy fresh water reed swamp. The ecological changes were not confined to upstream of the embankment. Continued seepage through the embankment caused mangrove species change in the tidal area below the embankment and the resultant root growth and silt accumulation created a series of brackish and saline cut off pools. A section of the control zone sewerage scheme bordering tidal areas of Fannie Bay created depressions by machinery disturbance and subsidence of earth cover. More recent installations for the Trade Development Zone created additional mosquito breeding sites by pushing earth and mangroves into the tidal zone.

8.0 Construction of Leanyer Sewage Ponds

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The siting of the Leanyer Ponds and associated embankments led to severe disruption of mangrove drainage patterns. One embankment had provision for drainage but the culvert was not installed with any consideration for possible ecological consequences. This area retained fresh water in the wet season, but was still subject to very high tides. Mangroves within the embankment died and the previous mud flat was transformed into a dense brackish water reed swamp. In addition, the maintenance of certain ponds could only be achieved by effluent release into the impounded area. In the tidal area, the drainage pattern disruptions led to very large areas of mangrove channels and flow lines without the capacity to drain freely at low tides. Subsequent mangrove vegetation growth further aggravated the disruption and resulted in large areas of tidal pooling. The consequences of these practices led to enormous populations of a range of mosquito species, severely affecting nearby residential areas.

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