ASSESSMENT
OF THE ENVIRONMENTAL IMPACT STATEMENT
FOR THE PROPOSED EXPANSION OF
THE OLYMPIC DAM OPERATIONS
AT ROXBY DOWNS

ASSESSMENT REPORT
by
Environment Australia
Department of the Environment
and
Planning South Australia
Department for Transport, Urban Planning and the Arts

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ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AE CGE model</td>
<td>Access Economics computable general equilibrium model</td>
</tr>
<tr>
<td>AEA</td>
<td>Atomic Energy Act 1953</td>
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<tr>
<td>ALARA</td>
<td>As Low As Reasonably Achievable</td>
</tr>
<tr>
<td>ARL</td>
<td>Australian Radiation Laboratories</td>
</tr>
<tr>
<td>ATSIC</td>
<td>Aboriginal and Torres Strait Islander Commission</td>
</tr>
<tr>
<td>CAMBA</td>
<td>China-Australia Migratory Bird Agreement</td>
</tr>
<tr>
<td>CSIRO</td>
<td>Commonwealth Scientific and Industrial Research Organisation</td>
</tr>
<tr>
<td>CTD</td>
<td>Central Thickened Discharge</td>
</tr>
<tr>
<td>DEHAA</td>
<td>Department for Environment, Heritage and Aboriginal Affairs</td>
</tr>
<tr>
<td>DPINR</td>
<td>Department for Primary Industries and Natural Resources</td>
</tr>
<tr>
<td>DTUPA</td>
<td>Department for Transport, Urban Planning and the Arts</td>
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<tr>
<td>EIS</td>
<td>Environmental Impact Statement</td>
</tr>
<tr>
<td>EMMMP</td>
<td>Environmental Monitoring and Management Plan</td>
</tr>
<tr>
<td>EMP</td>
<td>Environmental Management Plan</td>
</tr>
<tr>
<td>ERISS</td>
<td>Environmental Research Institute of the Supervising Scientist</td>
</tr>
<tr>
<td>final EIS</td>
<td>EIS plus the Supplement</td>
</tr>
<tr>
<td>GAB</td>
<td>Great Artesian Basin</td>
</tr>
<tr>
<td>GABCC</td>
<td>Great Artesian Basin Consultative Council</td>
</tr>
<tr>
<td>GCE</td>
<td>Computable General Equilibrium</td>
</tr>
<tr>
<td>ICRP</td>
<td>International Commission on Radiological Protection</td>
</tr>
<tr>
<td>JAMBA</td>
<td>Japan-Australia Migratory Bird Agreement</td>
</tr>
<tr>
<td>MESA</td>
<td>Mines and Energy South Australia</td>
</tr>
<tr>
<td>ML/d</td>
<td>megalitres per day</td>
</tr>
<tr>
<td>NHT</td>
<td>National Heritage Trust</td>
</tr>
<tr>
<td>NPWCA Act</td>
<td>National Parks and Wildlife Conservation Act 1975</td>
</tr>
<tr>
<td>OSS</td>
<td>Office of the Supervising Scientist</td>
</tr>
<tr>
<td>PINR</td>
<td>South Australian Department of Primary Industries and Natural Resources</td>
</tr>
<tr>
<td>PMP</td>
<td>Probable Maximum Precipitation</td>
</tr>
<tr>
<td>SAHC</td>
<td>South Australian Health Commission</td>
</tr>
<tr>
<td>t/a</td>
<td>tonnes per annum</td>
</tr>
<tr>
<td>U₃O₈</td>
<td>Uranium Oxide</td>
</tr>
<tr>
<td>USEPA</td>
<td>United States Environmental Protection Agency</td>
</tr>
<tr>
<td>WMC</td>
<td>WMC (Olympic Dam Corporation) Pty Ltd</td>
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LOCATION OF OLYMPIC DAM

Environmental Assessment Report - Olympic Dam mine Expansion - November 1997
1. INTRODUCTION

1.1 GENERAL

This Environmental Assessment Report assesses the social, environmental and economic impact of the proposal by WMC (Olympic Dam Corporation) Pty Ltd (WMC) to increase their production at Olympic Dam mine from 150,000t/a of copper and associated products to 350,000t/a by a phased expansion. The first phase would take production to approximately 200,000t/a.

The report reviews the 1997 Environmental Impact Statement (EIS), public comments on the EIS, and the proponent’s responses to these comments in the Supplement to the EIS. It also relies on information, comments and advice provided by appropriate South Australian and Commonwealth government agencies (through the joint assessment process) and previous studies undertaken in the region. This Report also recognises that the Olympic Dam mine has been subject to previous environmental assessments which resulted in the environmental regime currently in place for the existing operations.

1.2 ENVIRONMENTAL IMPACT ASSESSMENT

1.2.1 OVERVIEW OF PROCESS

Environmental impact assessment (EIA) is the process of assessing the potential impacts of a proposal to determine whether or not they are significant enough to preclude the proposal being implemented and if the likely impacts are acceptable, and identifies options to avoid and/or minimise environmental damage associated with a proposal. The main purpose of EIA is to inform decision makers of the likely impacts of a proposal before a decision is made. It is appropriate for the community to have input before Governments make decisions.

The EIA process is designed to ensure that matters affecting the environment to a significant extent are fully examined and taken into account in decisions by the Commonwealth Government and the South Australian Government.

In accordance with the principles contained in the Intergovernmental Agreement on the Environment, and the Australian and New Zealand Environment and Conservation Council (ANZECC) "Basis for a National Agreement on Environmental Impact Assessment" and to satisfy the environmental requirements of both Governments, it was been agreed that a single process be undertaken in the form of a joint Commonwealth/South Australian EIS. The Environmental Impact Assessment Branch of the South Australian Department for Transport, Urban Planning and the Arts (formerly Department of Housing and Urban Development) assumed the lead role in the joint assessment process in full consultation with the Commonwealth Department of the Environment.
This Report will assess the adequacy of the final EIS in achieving the above objectives, and will evaluate the undertakings and environmental safeguards proposed by the proponent to mitigate the potential impacts. Further safeguards may be recommended as appropriate.

1.2.2 OLYMPIC DAM EXPANSION ASSESSMENT PROCESS

The South Australian Minister for Housing, Urban Development and Local Government Relations directed an EIS for the proposal on 30 October 1996.


The Commonwealth Department of the Environment and the South Australian Department of Housing and Urban Development (now the Department for Transport, Urban Planning and the Arts) jointly prepared draft Guidelines for the EIS. These draft Guidelines, which identified the issues the governments expected the proponent, WMC, to address in the EIS, were placed on public exhibition for a period of four weeks (18 November - 11 December 1996), and comments invited from the community. Public and government agency submissions were assessed and the draft Guidelines amended to take regard of comments.

WMC released an Environmental Impact Statement (EIS) in May 1997 and a response document, the Supplement in October 1997.

In accordance with State and Commonwealth environmental legislation, the draft EIS was made available for public review from 14 May 1997 until 11 July 1997. However, it was agreed between WMC and the Department of Housing and Urban Development that, where a submission requesting additional time was lodged prior to 11 July 1997, submissions would be given an extension until 25 July 1997.

During the public review period public meetings were held at Roxby Downs Township, Port Augusta and Adelaide. Approximately 30 people attended each of the Roxby and Port Augusta meetings and 60 people the Adelaide meeting. Reports on the issues raised in the public meetings were prepared and submitted to WMC for consideration in the preparation of the Supplement to the EIS.

The EIS sets out the benefits to the State and national economies. Predicted benefits for the first and second phase of the expansion are estimated respectively as follows:

- creation of between 1750 to 2500 new jobs in the State during the construction phase (phase 2-1240);
- increase in gross state product of the State of between 0.4% and 0.5% (phase 2-0.3% construction);
- new permanent jobs of 1100 in State (phase 2-1190);
• increase of just less than 0.4% of gross State product during production - GDP for Australia 0.15 (phase 2 - increase of 0.5% during production - GDP for Australia 0.1%);
• increase in receipts for State of $12m (phase 2 - $17m);
• increase in tax revenue for State and Commonwealth; and
• increase in annual revenue for sale of product of $320m (phase 2 - $400m).

It was agreed between the Commonwealth and State agencies that the scope of the 1997 EIS should encompass those issues clearly related to the proposed expansion of the Olympic Dam Development, beyond 150 000t/a of copper and associated products and the potential impacts upon the region. These issues included, among others, the construction, operation and rehabilitation of the mine site and associated infrastructure, milling operations and disposal of tailings and transport of the uranium produced within Australia for export. The scope of the EIS did 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 were beyond the control of the proponent and it would have been impractical for WMC to address these issues in the EIS. Issues relating to the use of exported uranium produced from the expansion of Olympic Dam operations have been considered in addition to the issues set out in this document.

Fifty two (52) submissions (including State and Commonwealth Government submissions) were forwarded to WMC. Full details of the submissions were incorporated as Appendices A, B and C to the EIS Supplement.

The Supplement was forwarded to the respective Commonwealth and South Australian Ministers on 27 October 1997. Subsequent to this, the Environmental Impact Assessments Branch of the South Australian Department for Transport, Urban Planning and the Arts commenced preparation of this Assessment Report in consultation with other appropriate State government agencies and by the Environment Assessment Branch of Environment Australia, in consultation with other areas of the Commonwealth Department of the Environment and other appropriate Commonwealth government agencies.

The Assessment Report and its recommendations will be provided to the South Australian Minister for Primary Industry, Natural Resources and Regional Development by the Minister for Transport, Urban Planning and the Arts to be taken into account when the Minister makes his decision under Section 7(2) of the Roxby Downs (Indenture Ratification) Act 1982.

The Assessment Report and its recommendations, has also been prepared to fulfil the requirements of Section 9.1.1 of the Administrative Procedures of the EPIP Act. After considering the Assessment Report, Section 9.3.1 of the Administrative Procedures requires the Commonwealth Minister for the Environment to:

"... make any comments, suggestions or recommendations to the action Minister and other relevant Ministers concerning the proposed action, whether or not contained in the report prepared by the Department under paragraph 9.1.1, including suggestions or recommendations concerning conditions to which the proposed action should be subject, that the Minister thinks necessary or desirable for the protection of the environment ..."
The Commonwealth Minister for Resources and Energy, as the action Minister, is required to give all such directions and do all such things as can be given or done to ensure that the EIS and the recommendations made by the Commonwealth Minister for the Environment are taken into account in matters to which they relate.

The Commonwealth Minister for Resources and Energy will make decisions relating to the granting of an export permit for uranium from Olympic Dam mine. The proposed Olympic Dam expansion relates to the production of copper, silver and gold as well as uranium. The Commonwealth Minister for Resources and Energy is not required to make decisions on any issues other than those relating to uranium production and export.

1.3 MAJOR ISSUES RAISED FROM THE PUBLIC COMMENT PERIOD

Many of the concerns raised by the public focussed on issues relating to general opposition to uranium mining and the use of nuclear material in the nuclear fuel cycle. The Guidelines for the EIS specified that these issues were outside the scope of this assessment.

Major issues associated with the construction and expansion of the Olympic Dam Development are listed below and are the focus of the contents of this Assessment Report.

- Water usage
- Tailings management
- Radiation management
- Economic and employment estimates
- EIS process, regulation and monitoring
- Flora and fauna management
- Town management

All of the above are discussed in detail within Chapters 4 and 5 of this Assessment Report.
2. BACKGROUND

2.1 HISTORY

The existing operations at Olympic Dam mine (the operations), which are located 520 km north north west of Adelaide in South Australia are currently wholly owned and operated by WMC. The plant operations have been in production since August 1988 and at present process approximately 3 million t/a of ore, for the recovery of some 84 000t/a refined copper, 1,500t/a of uranium oxide, 850 kg/a of gold and 13,000 kg/a of silver.

For the existing operations an environmental assessment process was undertaken in the early 1980s. Guidelines for the preparation of a Draft EIS were jointly agreed between the State and Commonwealth Governments in consultation with the Joint Venturers in 1981. The Draft EIS was produced in October 1982 and after public review of the draft, the Supplement was submitted to the State and Commonwealth Government in April 1983. The State and Commonwealth Government environmental and planning approvals for the proposal were granted in June and August of 1983 respectively and permitted the mining and processing at Olympic Dam of approximately 6.5 Mt/a of ore, and the recovery of 150 000t/a of copper metal, and associated products (including 3 000t/a uranium oxide, 3 400 kg/a gold and 23 000 kg/a silver).

These approvals were confirmed by the Commonwealth and State Governments in an Environmental Review of the original EIS, completed in January 1996. Water usage had been approved from Borefield A as an outcome of the 1983 EIS process. However, additional water usage and the Borefield B Development was evaluated through a Survey and Assessment Report released by WMC in August 1995. Approval of the Borefield B development followed assessment of the proposal by the Commonwealth and State Governments.

The legal framework for the terms and conditions of project development and operation was set by the 1982 Indenture between the South Australian Government (the State) and the then Joint Venturers (Western Mining Corporation, Roxby Mining Corporation, BP Australia Ltd., and BP Petroleum Development Ltd.), and was ratified by the State Parliament through the Roxby Downs (Indenture Ratification) Act 1982 and updated by the Roxby Downs (Indenture Ratification) Amendment Act 1996. The original Indenture provides for the development of a project recovering 150,000t/a of copper metal, and associated products, and defines the obligations of the State and the Joint Venturers. The amended Indenture provides for the expansion of the development, subject to approval, to 350,000t/a of copper and associated by-products whilst at the same time redefines the obligations of the State and the Joint Venturers.

The Commonwealth Department of the Environment and the South Australian Department of Transport, Urban Planning and the Arts are jointly assessing the environmental impacts of a proposed expansion of the WMC (Olympic Dam Corporation) Pty Ltd (WMC) Olympic Dam development to enable production to be increased from the currently approved level of 150,000 tonnes per annum (t/a) of copper and associated products, to up to 350,000t/a of copper and associated products ("the proposed expansion").
3. NEED FOR THE PROJECT AND KEY ALTERNATIVES

3.1 NEED FOR THE PROJECT

The Guidelines specifically required the EIS to provide a comprehensive explanation of the requirement for the expansion. The requirement is considered in Chapters 1 and 13 of the EIS with financial justification for increases in production of both copper and uranium.

Information on the need for the project in the EIS and Supplement is not particularly comprehensive but indicates that the expansion will take advantage of international copper market opportunities. The expansion of copper production will place WMC into the 'large individual producer' category but will still represent a production that is less than 3% of the current world consumption of copper. It is considered that project need has been adequately established.

The legal framework for the terms and conditions of the Olympic Dam development and operation is within the Indenture between the South Australian Government and the then Joint Venture. This Indenture was ratified by the SA Australian parliament through the Roxby Downs (Indenture Ratification) Act 1982 which provides for the development of the project and defines the obligations of the State and the Joint Venturers. In addition to the conditions set out in the Indenture, WMC are obliged to comply with relevant State and Commonwealth legislation and Codes of Practice relating to environmental issues and to comply with the conditions in relation to prospective decisions to grant approvals for uranium exports from the Olympic Dam mine under Regulation 11 of the Commonwealth Customs (Prohibitive Exports) Regulations.

3.1.1 Economic Justification

The EIS was required to evaluate the economic impacts of the proposed expansion and to present the employment projections associated with the construction and operational phases. This is addressed in Chapter 13 of the EIS. The evidence presented in the EIS indicates that there are net economic benefits to both the State and to Australia from the expansion.

Extensive comment was provided on a number of economic statements made in the EIS. This is discussed further in Section 5.11 of this Report.

3.2 PROJECT ALTERNATIVES

The EIS was required to encompass those issues directly related to the proposed expansion of the Olympic Dam development, potential impacts upon the region, and alternatives to proceeding with the proposed expansion. These issues are considered in Chapter 3 of the EIS.

The option of developing the Olympic Dam mine without the production of uranium was examined in the 1983 EIS. The conclusion then which is still considered by WMC to be valid today, is that it would not be economically viable to develop the deposit by extracting only copper and precious metals from the ore. Although the relative sales prices of minerals produced
constantly changes, the sales of uranium oxide represent about 25% of the annual value of production from Olympic Dam.
4. DESCRIPTION OF PROPOSAL

4.1 OVERVIEW

Under the current expansion to 150,000t/a of copper, the basic mining and mineral processing methods used in the existing Olympic Dam operations would remain essentially the same except that improvements in technology and pollution control will be incorporated into the design of new plant and equipment. The new plant will be designed so that any spillage of ore, concentrate or process slurries can be readily returned to the process, as in the existing plant. If an expansion to a production of 200,000t/a of copper were approved, the appropriate existing plant would be further upgraded and enlarged to meet the same technical standards.

4.2 CONSTRUCTION

Construction of the previously approved expansion from 84,000 to 150,000t/a of copper and associated products is currently being undertaken.

If a further expansion beyond 150,000t/a of copper is approved, the current expansion programme would be extended to enable production of 200,000t/a of copper by the year 2000. It is considered that the present construction is being conducted in accordance with the requirements of the Department of Mines and Energy (now DPINR) and that environmental management regimes undertaken during construction are appropriate and will avoid or minimise environmental impacts.

The WMC Board has made no formal decision on a possible future expansion from 200,000 to 350,000t/a of copper and associated products. Should such an expansion be considered at a later date, a decision by the South Australian Minister at the time holding responsibility for the Indenture Act, would be required under the Indenture Act. However, the construction of a plant with a capacity to produce up to 350,000t/a of copper and associated products should be required to meet similar environmental assessment requirements to the current expansion, and appropriate procedures set in place by the State government authorities at that time. It is considered that in relation to water usage and tailings management insufficient information is supplied in the EIS to fully assess potential impacts associated with this possible expansion. This is discussed further in Section 4.4 and 4.5.

4.3 OLYMPIC DAM OPERATION

4.3.1 Mining and Milling

Mining

Current mining extracts about 3.3 million tonnes of ore per annum to produce about 84,000t/a of copper. It is proposed to expand mining to the already approved 6.5 million t/a of ore giving 150,000t/a copper, then to about 9 million t/a of ore by the year 2000 to produce about
200,000t/a of copper and associated products (EIS Section 3). Mining methods would continue as open stoping (EIS Section 2.1) with the No 3 Shaft at present under construction to facilitate production levels of 150,000t/a copper, and to meet production levels beyond 150,000t/a.

A major change to the underground ore handling facilities is the use of an automated electric rail transportation system (EIS Section 3.3). This rail system has been designed to transport ore to No 3 shaft for the current expansion and, if the proposed expansion is approved, would be enlarged to facilitate ore handling to 200,000t/a copper. The use of electric trains would be a benefit to underground air quality and heat control.

No other major changes to the mining operations for the proposed expansion to 200,000t/a are suggested. An expansion to 350,000t/a may involve significant changes to mining procedures. Expansion beyond 200,000t/a would require the submission of a Project Notice to the South Australian Minister responsible at the time for the Indenture Act. Any new mining procedures would be required to achieve best available technology that is economically achievable as required in the Indenture Act. Any significant change could require a further environmental evaluation by both the Commonwealth and State governments.

**Milling**

The current expansion to the approved production limit of 150,000t/a of copper has required the construction of a new ore stockpile, ore handling and grinding facilities, acid plant, and extensions of the tailings leach area, oxygen plant, copper smelter, copper refinery and gold and silver refinery (EIS Section 3).

Many of these facilities would have the capability of production to a nominal 180,000t/a copper. Much of the current production facility (with a capacity to produce about 84,000t/a copper) would be refurbished and put back into use should an expansion to 200,000t/a be approved.

A further expansion to 350,000t/a of copper would require installation of additional plant and equipment of similar type. Any new plant would be required to achieve best available technology that is economically achievable as required in the Indenture Act. Approval could require a further environmental evaluation by both the Commonwealth and State governments.

**4.4 TAILINGS RETENTION SYSTEM**

The EIS (Section 8) considers alternatives to the existing paddock method for the storage of solid tailings. Since the release of the EIS, the proponent has conducted pilot trials of the Central Thickened Discharge (CTD) method (Supplement Section 3) which have indicated that the concept of CTD offers advantages with respect to site rehabilitation and a reduction in supernatant liquor volumes. However, the proposal presented is still only considered to be a concept and detailed environmental evaluation by State and commonwealth government authorities would be necessary, with particular attention being paid to both the integrity of the base of the storage area to ensure no seepage of liquor is allowed to reach the aquifer, and to detailed rehabilitation planning.
The existing paddock system at Olympic Dam mine has previously experienced a seepage problem. This has been fully evaluated in a number of studies including the 1995 Environmental Review and the 1996 Report to the Parliament of South Australia by the Environment, Resources and Development Committee, and the system has been modified to ensure that seepage has been minimised. It is considered that the paddock system provides the preferred option for the short term storage of tailings but that the CTD option should be considered to reduce the quantity of water used in future in the production process.

The Bureau of Resource Sciences (BRS) was requested by Environment Australia to provide a technical report into aspects of the existing and proposed tailings disposal methods in the EIS. Overall, BRS considers that the proposed expansion of paddock storage can be implemented and is appropriate for the expansion project. With regard to the possible use of CTD methods, BRS recommended that measures be taken to prevent supernatant fluids which drain off the tailings from coming into contact with the Andamooka Limestone and possibly entering the ground water below the tailings storage area.

BRS also indicated that as reported in the EIS, measurements of radon and radon decay products in the air near the tailings storage facility during operations, have shown that natural ventilation is sufficient to disperse and dilute radon and radon decay products to very low levels within quite short distances. Data represented shows that by 3km from the tailings storage facility the radon concentrations fall by a factor of 500.

Expansion to 350,000t/a will have significant impact on tailings management and water requirements. It may also require introduction of new technology which may have unknown environmental impacts. It will be necessary to conduct further assessment on these matters if and when WMC decides to proceed.

BRS considers that use of the CTD method is well established and may have many advantages for tailings storage in some geological environments. The current design being considered is for the supernatant liquor to be removed from the storage area via a series of drains and other structures over the whole floor area not covered by tailings. The supernatant liquor has a pH of 1.5 (significantly acidic). The area of the proposed tailings disposal consists of a thin cover of Tertiary to Quaternary sediments overlying Cambrian Andamooka limestone which is known to be karstic (subject to underground tunnelling) in places with dolines observed at the surface. It is recommended that measures continue to be taken to prevent supernatant fluids which drain off the tailings from coming into contact with the Andamooka Limestone.

BRS recommended that the final proposal for the CTD method be submitted to the South Australian and Commonwealth government environment authorities for approval.

In regard to rehabilitation options for the tailings retention structures, the broad concepts are documented in the EIS. However, detailed rehabilitation planning is presently at a preliminary stage. The first rehabilitation works at Olympic Dam are not expected to commence until 2016. Consequently this allows a long period of rehabilitation trials and consultation with government at the detailed design planning stage.
Codes of practice on the containment of tailings in Australia call for a design life of 200 years and a structural life of 1000 years. The EIS states that experience in the construction of tailings facilities to meet these criteria is available and will be applied in the design of the final form of the TSF. Slopes of the perimeter embankments for paddock storage facilities will be constructed such that allowing for the shear strength of the consolidated tailings, the embankments will be stable under seismic conditions.

The overall height of the paddock storage areas is not expected to be more than 30 metres above the general level of the surrounding land.

4.5 WATER MANAGEMENT

The water supply for the existing development is obtained from Borefields A and B both of which are situated in the Great Artesian Basin (GAB). The water supply has been considered in the original EIS (1983) for Borefield A and the Survey and Assessment Report (1995) for Borefield B. These developments were the subject of full environmental assessment. The Special Water Licence conditions stipulate maximum draw down levels at the boundaries of the designated areas of the Borefields.

As a condition attached to the South Australian Special Water Licence applying to this water supply (up to 42 ML/day, subject to a number of conditions relating to draw down levels), WMC is required to undertake monitoring of aquifer water levels and water quality. Water extraction from Borefield A has recently been greatly reduced to allow for the monitoring of aquifer recovery rates. Borefield B has not been in use for a sufficient time to confirm the modelling predictions. It is considered that the current approvals for water extraction will be sufficient to support a production level of at least 200,000t/a of copper. However, based on figures in the EIS for water usage per tonne of ore milled, production rates of up to 350,000t/a may require an increase in volume extracted under licence and result in draw down levels at the boundaries of the designated area, close to, or in excess of current licence limits.

It is therefore considered that the water extraction, at present operating under a State Special Water Licence, be re-evaluated prior to any approval for any increase in the current agreed conditions applicable to the Special Water Licence. This review should take into consideration the draw down measured over the preceding years and the ability of WMC to optimise its water usage. Such information will be reviewed by the Olympic Dam Environment Consultative Committee.

Recommendation

Should a further expansion of operations be formally proposed at the Olympic Dam mine it is recommended that environmental assessment be required under the EPIPA Act on:

(a) the impact of anticipated changes in technology or mining practice beyond that used for the expansion to 200,000t/a of copper and associated products;

(b) installation of a tailings management system including the Central Thickened Discharge (CTD) method of tailings management; and
4.6 TRANSPORT

All new materials, including chemicals used in the metallurgical process, not derived or produced on site would be transported to the site by road (EIS, Section 3.6.1). The safe packaging and transport of chemicals to Olympic Dam is considered, by WMC, to be the responsibility of suppliers and transport companies. These activities would have to be undertaken in accordance with relevant codes of practice and legislation. An increase in loads carried is not expected.

The EIS (Section, 3.7) discusses the possible importation of copper concentrate to utilise the surplus capacity in the new concentrator and smelter prior to mine output reaching full capacity.

The options for transport of imported concentrate are either shipment to Whyalla and transportation by truck to Olympic Dam, or shipment to Port Pirie or Port Adelaide followed by railing to Port Augusta or Pimba and then truck to Olympic Dam. Any Australian copper concentrate or South Australian copper would be trucked to Olympic Dam. This option is no longer part of this proposal.

Products produced at Olympic Dam (copper cathode, uranium oxide concentrate, refined gold and silver) would continue to be transported from the site by road in accordance with present arrangements (EIS, Section 3.6.2).

As the proposal to expand production does not require any significant change to the transport regime, no adverse environmental impacts are envisaged.

The International Atomic Energy Agency's (IAEA's) Regulations for the Safe Transport of Radioactive Material (the Transport Regulations) relate to the safe transport of radioactive material. They have been adopted in South Australian legislation.

The transport and handling of uranium oxide from the Olympic Dam site to international destinations is covered by the Nuclear Non-Proliferation Safeguards Act 1987 and regulated by the Australian Safeguards Office.

The existing arrangements for transport of uranium oxide from Olympic Dam to Adelaide are well established but there will be an increased movement of haulage trucks and ships from the Port. At present there is an average of three shipments per year and with a production of 200,000t/a of copper the uranium production would be increased to necessitate 6-8 shipments per annum. Procedures must continue to comply with the appropriate Commonwealth and State legislation.

The transport regime that is in place includes environmental protection measures. Further discussion of transport issues can be found in Section 5.3 of this Report.
Recommendation

WMC shall ensure that existing and proposed arrangements for transport of uranium oxide from Olympic Dam mine to Adelaide comply with all relevant Commonwealth and South Australian legislation.

4.7 ABORIGINAL HERITAGE

Section 6 of the EIS on Aboriginal Culture and Relationships provides a summary of the Aboriginal heritage surveys and consultation which has been undertaken by WMC since 1983 and prior to this time in the production of the 1983 EIS.

The Assessment Report (1983) for the EIS provided detail about the surveys and consultations which occurred at the time. There have also been a number of subsequent reports which included discussion on Aboriginal heritage issues and which need not be reiterated in this Assessment Report. These prior reports include:

- Survey and Assessment Report Supplementary Environmental Studies for the Borefield B Development, WMC Copper Uranium Division WMC (Olympic Dam Corporation) Pty Ltd, August 1995.

It is indicated in the EIS (1997) that the Olympic Dam area has significance for Aboriginal people. Since 1994, total of twenty six ethnographic sites, two dreaming tracks and 213 archaeological sites have been recorded within the Special Mining Lease, the Municipal Lease and the Stuart Shelf Exploration area. The total number of archaeological sites, including the 287 recorded in the 1983 EIS, is thus 500.

The Australian and World Heritage Group of Environment Australia commented that WMC should undertake a comprehensive study to assess the overall impact on indigenous heritage past and present in the area of the proposed development. WMC has maintained records of all the sites detected during its consultation with the Aboriginal Land Council. However, this information, at the request of the Aboriginal advisers, is treated as confidential but is made available to accredited sources only with approval by the advisers.

Aboriginal sites are protected under South Australian legislation.
5. ENVIRONMENTAL ISSUES AND SAFEGUARDS TO MINIMISE IMPACTS

The EIS and Supplement (1997), place emphasis on the major environmental issues associated with the proposed expansion. Environmental matters dealt with in previous EIS's and Reviews were not considered, except where they were relevant to the proposed expansion from 150,000 to 350,000t/a.

The existing environment has been described in the EIS based on the following documents:


- Survey and Assessment Report Supplementary Environmental Studies for the Borefield B Development, WMC Copper Uranium Division WMC (Olympic Dam Corporation) Pty Ltd, August 1995.


- Environmental Review of the Olympic Dam Operations, WMC Copper Uranium Division WMC (Olympic Dam Corporation) Pty Ltd (following designation of the Development under the Commonwealth Environmental Protection (Impact of Proposals) Act), November 1995


- Roxby Downs Water Leakage, Environment, Resources and Development Committee, 19th Report to the Parliament of South Australia, April 1996.


- Waste Management Programs 1987-1995 and associated annual reports, and

FIGURE 4.7
THE GREAT ARTESIAN BASIN

Source: Adapted from Habermehl 1980

- Groundwater flow direction
- Great Artesian Basin boundary
- Recharge area
- Great Artesian Basin spring
- Spring group supergroup
The environmental monitoring associated with the existing operations is extensive. A review system has been established and is being expanded to include independent auditing and consultation through the Olympic Dam Environment Consultative Committee (ODECC) and the Community Consultative Forum (CCF) (Supplement Section 6). Administrative arrangements between Commonwealth and State authorities and WMC are being finalised for selection of a Chairman and members of these committees.

5.1 WATER USAGE

Water usage is considered in Chapter 4 of both the EIS (Section 4.1) and the Supplement (Sections 4.3 to 4.5).

The Supplement (Appendix H) states the most recent schedule of water requirements for the Olympic Dam Operations and Roxby Downs Township is 33.4 Ml/d for a copper production rate of 200,000t/a and 42 ML/d for 350,000t/a copper.

The main issues raised in submissions concerning water use were as follows:

- water use minimisation strategies;
- cost of water.

Water Use Minimisation

Section 4.4 of the Supplement responds to submissions concerning water use minimisation.

As stated in the EIS (Section 4.4), WMC’s current water supply strategy assumes that sufficient water treatment and recycling facilities would be provided in future to enable the water use at a copper production rate of 350,000t/a to be accommodated within the infrastructure capacity and State Special Water Licence approval of 42 ML/d. The main measure proposed to achieve this efficiency is the adoption of high solids density thickeners in the copper concentrator section of the hydrometallurgical plant to allow an increased recovery of process water for recycling. Section 3.12.4 of the EIS further states that other potential measures for water savings would also be investigated and the Supplement suggests these could include use of air cooling instead of water cooling systems, process changes and the treatment and recycling of tailings liquor.

The EIS (Section 4.1.4) indicates that since production commenced, a reduction in water use of approximately 25% (from 2.1 kL/t to 1.57 kL/t of ore milled) has been achieved. The EIS (Section 4.3) also states that a further 21% reduction in water use would be achieved with the proposed expansion to production of 200,000t/a copper. A substantially greater reduction in water usage per tonne (estimated as a further 35%, EIS, Section 4.4) would however be required if the projected production rate of 350,000t/a of copper were to be achieved within the draw down requirement at the boundary of the Designated Area potentially allowed for under the current State Special Water Licence. No information is provided to substantiate the likelihood of
this being attainable, particularly as water requirements for processing per tonne may vary in future with changing ore grade.

Based on water use efficiencies achieved to date, it is considered that production levels of 200,000t/a copper can be readily achieved within the 42 ML/d potentially available through the current Special Water Licence and hence, with respect to water usage, the impacts of expansion to this level have already been considered through the previous environmental assessment processes and found to be acceptable.

However, insufficient information is presented to provide confidence that expansion beyond a production level of 200,000t/a copper could be achieved without the use of additional water. To secure an approval for greater production levels therefore, further information detailing the precise methods proposed to be adopted to minimise water use, the reduction in water use anticipated from each method and the likely impact of falling ore grade on overall water use, would need to be submitted and assessed. Demonstrated substantial reductions in water use over the next few years would serve to instil confidence that predicted reductions could continue to be achieved.

On a smaller scale, several submissions concerned water savings potentially resulting from reuse of grey-water or sewage effluent within the Roxby Downs township. Whilst the EIS (Section 3.8.3) noted that as part of the expansion additional sewage treatment facilities would be installed enabling greater quantities of treated effluent to be used for irrigation of grassed recreational facilities, no mention was made of priorities of use for this water or grey-water and its potential separate use. This latter point was addressed in the Supplement (Section 4.4). However, where it was claimed that as the existing excess demand over available supply for treated effluent is predicted to continue, there would be no available grey-water to supply a separate reticulation system. As a positive environmental initiative it is recommended that the feasibility of collecting grey-water separately from other sewage should be investigated as it may be suitable for other uses than the treated effluent. Other methods to improve the efficiency of water reuse at the township should also be investigated.

With regard to collection and use of stormwater in the township, whilst its contribution to water use minimisation may be small in comparison to other measures, it is nevertheless worthy of further consideration.

Cost of Water

As discussed in the Supplement (Section 4.3), the issue of the cost of Great Artesian Basin (GAB) water to WMC was raised in a number of submissions. Under the terms of the Indenture, WMC has no obligation to pay for the water they use, only the costs they incur in the abstraction and supply of the water to their operations. It is noted that no user of underground water in South Australia is required to pay for the resource. It is also noted that WMC provides some support for the Arid Areas Water Resources Committee. This support includes a WMC contribution to research undertaken by the Committee and facilitation of meetings. WMC uses approximately 1.6% of available inflows to the GAB. Wastage of the resource occurs from a variety of users and natural vertical leakage. Abstraction and use of the water resource in the
GAB in both a specific and strategic sense must be appropriately managed if development of mining projects and pastoral activities are not to be seriously impeded in the future.

In accordance with COAG principles on the pricing of water, the South Australian Government should ensure that by the year 2001, the licensing fees charged or obtained in kind from the proponent for abstraction of water accurately reflects the costs of water. The COAG agreement requires that the full cost of groundwater management should be identified by State Governments. The cost of direct management activities should be recovered from users via fees and charges and, within the context of the overall water cycle, appropriate apportionment of indirect costs be given consideration.
5.2 WATER SUPPLY AND GROUNDWATER MANAGEMENT

Water supply and groundwater management are discussed in Chapter 4 of both the EIS and the Supplement.

Submissions on the EIS raised a number of specific issues related to water management, as follows:

- the long term availability of water from the GAB and impacts on other users,
- compliance with Special Water Licence,
- the effects of drawdown on mound spring flows,
- the accuracy of short and long term modelling predictions,
- water quality;
- alternative water supplies;
- impacts of mine dewatering, and
- management and remediation strategies and practices.

Long Term Availability of Water from the GAB

The management of water resources is only described in the EIS in general terms. The strategy for the development of future water resources assumes management of abstractions from the existing borefields to mitigate potential adverse effects on the environment and other water users.

Maximum reduction in the demand for water by all of the users is required, which means the elimination of any wastage. In the case of pastoral bores this calls for rehabilitation and a high level of control and maintenance of the water bores, and the replacement of free flows by controlled discharges, and the replacement of open earth bore drains to distribute the artesian groundwater by closed piped distribution systems, including float valve controlled tanks and troughs. The replacement of open bore drains is a major factor in increasing the efficiency of water use, as up to 90% or more of artesian groundwater produced can be wasted in open bore drain systems.

The EIS states the GAB would be the principal source of water for future operations, with potable and process water obtained from Borefields A and B according to the requirements of the special water licences.

According to the EIS (Section 4.5.5), existing borefields would be sufficient to meet the project needs of the 20 year planning period. However, if WMC wishes to continue to extract water beyond this time or to extract water at a higher rate than 42 ML/d, it would be necessary to either review impacts other than simple drawdown at the Designated Area, or seek a further borefield site, probably nearer the deeper more productive centre of the GAB in South Australia.

Large-scale water balance calculations suggest the projected maximum daily water consumption of 42 ML/d represents approximately 9.5% of the total inflow for the South Australian portion of the Basin. However, it is considered that the water extraction for the plant should not have a
long term deleterious impact on the Great Artesian Basin’s total water availability if borefields can be located to exploit water otherwise discharged through vertical leakage and evaporation.

It is unclear to what extent water currently abstracted from Borefields A and B represents water that would otherwise have been discharged by vertical leakage. As indicated by ODEX1 modelling (Supplement, Section 4.1), the proposed increase in abstraction to 42 ML/d from these borefields located near the margin of the GAB, is predicted to cause a loss of pressure in some springs and bores suggesting the abstraction will not necessarily be accompanied by a corresponding reduction in the estimated 190 ML/d currently lost to vertical leakage, but rather by a reduction in spring and bore discharges.

The predicted impacts of abstraction from Borefield B have already been assessed in the Borefield B Survey and Assessment Report, 1995. Ongoing monitoring and reporting through the EMP should progressively reveal the actual impacts of increased abstraction and as stated in the Supplement (Section 4.1), enable refinements to be made to the ODEX1 model which will greatly enhance the level of understanding of the aquifer parameters and behaviour, such that more reliable predictions to twenty years on (and beyond) can be made. As recommended in the assessment of the SAR, monitoring procedures of MESA and WMC have been standardised so that valid comparisons of data can be undertaken on an annual basis.

Vertical leakage is higher along the shallow margins of the GAB, but has not been quantified in the deeper more productive parts of the GAB, where it is suggested any future borefields would be located. No information is provided as to how any future borefields located closer to the centre of the GAB could be sited to access such water. Further investigations and modelling would be required to substantiate the feasibility of any such development which would in any case be the subject of further public environmental review, if and when development of a third borefield is necessary.

The Supplement (Section 4.1) acknowledges that should any future borefields be required by WMC or any other user this would need to take into account the predicted aquifer pressure reductions from the existing WMC borefields, as well as existing pastoral bores. Whilst at this stage development of a further borefield to meet the water requirements of the planned expansions is not proposed, consideration should be given to the likely location of any such borefield, and preliminary investigation/monitoring bores installed to assess the accuracy of modelled conditions in the subject area.

The Olympic Dam mine and the town of Roxby Downs should endeavour to reduce the demand on the water resources to the maximum, by using highly efficient practices, and the application of recycling systems. The high costs of the water supply to the Olympic Dam mine and the town of Roxby Downs, and the need for desalination to produce potable water, are already good incentives to be efficient in the use of water. The EIS indicated that already highly efficient practices for the use of water in the mining and processing are applied, and further activities are carried out to increase efficiency. Similarly, Roxby Downs Township employs efficient water use practices.
On a broader scale, there is a need for a comprehensive management strategy and plan for the GAB, particularly given the scale and potential longevity of groundwater extraction by WMC. To ensure ecologically sustainable use of the GAB’s water resources, it is essential that a mechanism be developed whereby the cumulative environmental impacts of various users can be evaluated. WMC’s support for such a strategy as articulated in the Supplement (Section 4.5) is commended.

Recommendation

WMC must undertake the collection and use of spring flow data to refine aquifer parameters and re-estimate drawdown effects at spring groups at regular intervals. The revised predictions must be presented to the Olympic Dam Environment Consultative Committee.

Recommendation

WMC must prepare detailed contingency measures and a response plan to address significant variations in monitored and/or predicted drawdown or flow rates at mound springs and that the responsibility for any contingency response be that of WMC, in consultation with the Olympic Dam Environment Consultative Committee.

Recommendation

WMC must continue, and expand when appropriate, the mound spring monitoring program, to enable the collection of a long term data set to achieve a better understanding of the biological fluctuations in these systems. The results of the monitoring program must be presented annually to the Olympic Dam Environment Consultative Committee and the Great Artesian Basin Consultative Council.

Compliance with Special Water Licence

The Special Water Licence is administered by the South Australian Department for Environment, Heritage and Aboriginal Affairs (DEHAA), on behalf of the Minister for Environment and Heritage. Compliance with the conditions of the licence is monitored by DEHAA based on data supplied annually to DEHAA by both WMC and MESA. At this stage annual review is considered sufficient to ensure compliance with the conditions of the Licence, however, should monitoring results indicate more frequent review is necessary, this would be implemented.

Section 4.1 of the Supplement suggests that the current drawdown limits set within Special Water Licence incorporate a margin of safety with respect to protection of the environment and the supply to other users. However, it should be noted that there is no allowance for any margin over and above the agreed limits for permissible drawdown. Any variations in licence conditions would need to be negotiated between WMC and the South Australian Minister for Environment and Heritage. In assessing the effects of greater potentiometric drawdown in the GAB, such negotiations would not consider in isolation the drawdown limits specified at the boundary of the Designated Area (identified as the key management parameter in Section 4.1 of the Supplement) but also the impact on mound springs and environmental values. Whilst the Indenture indicates that a drawdown limit of 5m at the boundary of the Designated Area would apply, it also recognises that this figure could be varied by agreement between WMC and the South Australian
Minister for Water Resources (currently the South Australian Minister for Environment and Heritage).

In the event that the drawdown limits agreed under the Special Water Licence are approached, the Supplement (Section 4.1) outlines a number of options that would be available to WMC to ensure the water supply for the Olympic Dam operations. At this stage these options represent contingency measures and as such, an appropriate level of information is provided. Should monitoring reveal that it may be necessary to implement any of these options, further details would be required and an environmental review additional to this Assessment Report would be undertaken. With the exception of the consideration of other viable water sources, accurate modelling of the appropriate sector of the GAB would be critical for evaluating the acceptability of the various options presented.

**Modelling**

The concerns of people commenting on the draft EIS regarding the models used to predict impacts are considered justified, as the GABROX model, used to predict changes to discharge rates from mound springs in the Lake Eyre South region as a result of abstractions from Borefield A, substantially underestimated the reduction in flow subsequently recorded in several cases. The claim in the Supplement (Section 4.1) that “the predictions of spring flow discharge made in 1984 have proven to be remarkably good...” is considered somewhat misleading as four of the predictions proved close to what was subsequently recorded, four exceeded the predictions by between 23 - 40% and one had a flow reduction 60% lower than forecast (Table 4.4 1997 EIS).

To consider the likely impacts of abstractions from Borefield B, monitoring data was used to update the GABROX model to GAB95, as presented in the SAR. No monitoring data for Borefield B is as yet available to assess the accuracy of modelled predictions of impacts on spring and bore flows resulting from abstractions from the new borefield. The first data is anticipated to be available in the near future and will be presented to the Olympic Dam Environment Consultative Committee as it becomes available.

A new groundwater model, ODEX1 has been used by WMC to predict the impacts of the abstractions needed from the existing Borefields for the proposed increased production at Olympic Dam mine. It is agreed that ODEX1 represents a considerable advance on earlier models. An outline of the ODEX1 model and how it differs from the previously used GABROX and GAB95 models was requested by a number of submissions and was subsequently included in the Supplement as Appendix H.

Using ODEX1, draw down predictions at the corners of the Borefield B Designated Area have been made for a combined Borefield (A and B) extraction rate of 42 ML/d. In particular the draw down at corners P1 and D2 approach the 5m limit of the Special Water Licence. Whilst it is indicated that these figures include abstractions by other users, the proportion attributable to WMC is not given.
**The Effects of Drawdown on Mound Spring Flows**

The maintenance of flows at key mound spring groups is recognised as a major environmental issue. Monitoring and the detection of any project induced changes to the (mound) springs and their vegetation, aquatic fauna, flow rates and hydrochemistry are part of a comprehensive program, which has been developed, implemented, and is regularly reviewed. However, it is not clear from the EIS what the proposals are to manage the impacts appropriately, and what the stated objectives are for any such management.

By use of the ODEX1 model, WMC has attempted to predict changes in flows at mound springs and bores based on reduced aquifer pressure, resulting from water abstractions at Borefields A and B. The accuracy of these predictions for individual springs, while technically reasonable, should be viewed with caution. As flows at mound springs are also strongly influenced by local structural geology and other features such as climatic variables and biological events, unless the local conditions are factored into the prediction, an unspecified level of uncertainty remains.

The EIS (Section 4.5.3) states the predicted drawdown over the period 1996 - 2016 along the line from Marree to Hermit Hill is generally less than 0.25m, suggesting a minimal impact on springs in that area. Springs in the southern margin eastern zone would appear to be the most vulnerable, as greater declines in flows (eg 16% at Wangianna) are predicted. Ongoing monitoring of spring and bore flows will be essential to ensure that any greater than anticipated adverse impacts are quickly identified and contingency measures implemented. Section 4.2 of the Supplement confirms that WMC will continue to monitor mound springs as described in the EMMP.

Past experience indicates that further discussion between regulatory agencies and WMC must continue to occur to determine the amount and kind of deviations from anticipated impacts would trigger contingency plans and/or remedial action. For example, in Section 4.5 of the Supplement (aquifer re-injection at Bopeechee Spring) it is noted that in hindsight, a trend of declining artesian pressure and flow at Bopeechee Spring has been evident since 1988. However, this trend has been masked by short term variability. It should be noted that when this trend was being discussed between the regulating authorities and WMC in the early 1990s, it was not possible to conclude that trends could be postulated in the flow records of this spring.

In spite of the refinement in predictive modelling represented by ODEX1, the precise impact on springs resulting from the ongoing operation of Borefield A, even at reduced rates and increased abstraction from Borefield B, will not be known until actual flow data is accumulated over time, a point acknowledged by WMC (Supplement, Section 4.2). The proposed use of this data by WMC to refine aquifer parameters and re-estimate drawdown effects at spring groups should be undertaken at regular intervals and the revised predictions presented to the Olympic Dam Environment Consultative Committee as they become available.

**Management and Remediation Strategies and Practices**

The Australian Geological Survey Organisation (AGSO) was requested to provide a technical assessment of water extraction and use for the proposed expansion at the Olympic Dam mine.
AGSO has advised that management of the artesian groundwater resources is carried out by the State Government Authorities taking into account the interests of all stakeholders including pastoralists, towns, oil and gas producers, mining and environmental requirements. These authorities apply the principle of sustainable resource management. The Basin-wide management of the Great Artesian Basin is entering a new phase, with the establishment during 1997 of the Great Artesian Basin Consultative Council, which comprises representatives of local communities (State Advisory Bodies), industry (National Farmers Federation, Minerals Council of Australia, Australian Petroleum Production and Exploration Association), traditional landholders (Aboriginal and Torres Strait Islander Commission), conservation (Australian Conservation Foundation), local, State and Commonwealth Governments (Australian Local Government Association, State Water Agencies, Commonwealth Department of Primary Industries and Energy and Environment Australia), and a representative of the Great Artesian Basin Technical Working Group (State and Commonwealth Water and Geological Agencies). A Strategic Management Plan is being prepared by the Great Artesian Basin Consultative Council. Such an integrated management approach is required to ensure that sustainable production and the conservation of biodiversity in the region is achieved.

If there are significant future variations between monitored and predicted flows at mound springs, WMC indicates in Section 4.2 of the Supplement, three possible options as follows:

- modification of the relative abstraction rates for the two borefields and from individual bores;
- implementation of re-injection strategies to maintain aquifer pressure at strategic locations; and
- development of another borefield further into the GAB.

The use of re-injection strategies was discussed in the EIS (Section 4.2.7) in relation to Bopeechee Springs and in response to submissions, further information is provided in the Supplement (Section 4.5).

Contingency measures to be implemented in the event of significant variations to those predicted in mound spring flows, are of fundamental importance to sound spring management (as discussed further in Section 5.5.4 of this Report) and should be a condition of approval of the proposed expansion. Significant variations in drawdown or flow rates at mound springs which would trigger contingency measures should be defined, and the agencies of government which would regulate these aspects should be specified. It is suggested that the responsibility for any contingency response be with WMC and that it advises the Olympic Dam Environment Consultative Committee of implementation of any contingency response.

**Recommendation**

*WMC must commit to reducing the demand on water resources to the maximum amount possible, both at the mine and at Roxby Downs township, by the use of efficient water supply and usage practices, including the application of recycling systems and through the investigation and application of alternatives to the use of water wherever possible.*
Recommendation
WMC must work in close consultation with the Great Artesian Basin Consultative Council and other major users of the resource to establish and maintain environmental management plans and to address recommendations made by the Great Artesian Basin Consultative Council and similar bodies for appropriate management of the water resources of the Great Artesian Basin.

Recommendation
WMC must make available to the scientific community, the Olympic Dam Environment Consultative Committee and to the Great Artesian Basin Consultative Council, monitoring data relating to fauna and flora in and around its lease areas and for mound springs monitored by WMC.

Water Quality

The Supplement states that water quality data is presented in the EIS, only where relevant to the assessment of environmental impacts. In response to a submission for more water quality data, WMC advise in the Supplement that more comprehensive water quality data is provided in the EMMP Annual Reports which are publicly available.

Nevertheless, the Assessment Report for the SAR for Borefield B (Section 5) recognised the need for water quality monitoring, particularly due to the long term possibility of movement of more saline water into the main artesian aquifer (the Algebuckina Sandstone), and stated that the interaction between aquifers and resulting impact on groundwater chemistry would need to be evaluated by WMC and government agencies as the monitoring proceeds. Given that release of the latest EMMP Annual Report that would have contained some of this data has been delayed, it would have assisted for some discussion of results to date to have been included in the Supplement.

Recommendation
WMC must undertake monitoring of groundwater quality (hydrochemistry) into the long term possibility of movement of more saline water into the main artesian aquifer (the Algebuckina Sandstone), due to interaction between aquifers and report the findings to the Olympic Dam Environment Consultative Committee and appropriate regulating authorities.

Alternative Water Supplies

The Supplement (Section 4.5) indicates that alternative water supplies have been considered by WMC: However, to date options such as desalination of water from the Spencer Gulf or local groundwater have not been shown to be economically or environmentally viable. Nevertheless options for alternative water supplies should be reviewed periodically as circumstances may change.
Recommendation
WMC continue research into the identification and assessment of alternative water supplies and review the viability of identified options, taking into account changes in technology and economics. WMC is to report on progress to the Olympic Dam Environment Consultative Committee.

Impacts of Mine Dewatering

The regional water table contours for the mine area, depicted in Figure 4.19 of the EIS, show a cone of depression to -40m AHD, which is consistent with the cone of depression shown for the Arcoona Quartzite in Figure 4.1 of the Supplement, but differs substantially from the water table mound to 70m AHD in the Andamooka Limestone as shown on Figure 4.21 of the EIS. Comparison of Figures 4.1 and 4.21 indicates a local groundwater head difference of up to 120m between the Andamooka Limestone and Arcoona Quartzite aquifers at the mine site, suggesting a very limited degree of hydraulic connection. No data is provided to indicate the lateral extent of groundwater within the Andamooka Limestone in the mine area or the influence of current mine dewatering activities on watertable levels within the aquifer. If the regional watertable in the mine area is within the Andamooka Limestone and if there is limited hydraulic connection with the underlying Arcoona Quartzite aquifer, it is possible that seepage from the mine water disposal pond may not remain within the cone of drawdown caused by dewatering of the deeper aquifers. Relocation of the pond to the NE of the Whenan Shaft and the increase in size of the pond to accommodate the additional dewatering from the mine, could result in the formation of a considerably larger groundwater mound within the Andamooka Limestone than that currently developed by seepage from the existing disposal pond and at a location less likely to be affected by the mine dewatering. It is possible that seepage water from the pond could preferentially migrate away from the mine site through the more permeable Andamooka Limestone.

The EIS states that the asymmetry of the cone of depression within the Arcoona Quartzite aquifer appears to indicate recharge from the Andamooka Limestone aquifer in the vicinity of the southwestern corner of the tailings retention system (TRS). As acknowledged in the EMMP annual report for 1995-96, there appears to be little hydraulic connection between the Andamooka Limestone and the much larger underlying Arcoona Quartzite aquifer, hence the EIS (Section 4.6.5) postulates that drainage between the two aquifers could possibly be occurring through old exploration bores in the TRS area, but indicates evidence for this is not conclusive.

No data is presented in the EIS to show that watertable levels in the Andamooka Limestone are affected by mine dewatering, or provided to support evidence for the contention that seepage water from the TRS and the mine disposal pond will be retained within the mine area as suggested in Section 4.6.4 of the EIS.
Recommendation

WMC must continue work to define the hydrogeological regimes of the Andamooka Limestone and Arcoona Quartzite aquifers and their degree of hydraulic interconnection be better defined by WMC in order that the potential environmental impacts of leakage from the TRS and mine water disposal pond can be properly evaluated and monitored. WMC must indicate progress in this regard to the Olympic Dam Environment Consultative Committee.

5.3 TRANSPORT ISSUES

Chapter 11 of both the EIS and Supplement describe the infrastructure requirements of the expansion project and the Roxby Downs township.

Construction of new roads is not envisaged and maintenance and dust control on existing roads is clearly defined (Supplement, 11.1).

One submission indicated that the transport of uranium products through South Australia had not been discussed in the EIS. This is not addressed in the Supplement. However, it should be noted that transport of all radioactive material within South Australia is controlled under the Radiation Protection and Control Act which is administered by the South Australian Health Commission (SAHC).

Construction of a rail link between Pimba and Olympic Dam as an alternate transport link was suggested in two responses. The rail connection is not part of the present expansion project but remains a future option.

5.4 RADIATION IMPACTS

The EIS and Supplement have adequately addressed the radiation issues required by the Guidelines and those raised by the SAHC, other government bodies and members of the public in relation to the expansion. There is sufficient information to demonstrate that worker dose levels predicted for the expanded operation will be well below the limits set by the South Australian Department of Health. Similarly, radiation doses to members of the public at the Roxby Downs township are expected to remain an extremely small fraction of the relevant limit.

The EIS and Supplement have shown that the radiation management plan provides sufficient information for assessment of doses to workers and members of the public. Monitoring and reporting systems are considered satisfactory and provide sufficient flexibility for variation as the project develops.

Information provided represented a summary of monitoring results, exposure pathway analysis and dose estimates covering many years of operating experience. The data presented is a refinement of the predictions made in the original EIS for this project and demonstrates doses to workers both in the mine and the processing plant to be well within the annual dose limit for radiation workers. While it is expected that the effect of the expansion on worker doses will be
There is reason to believe that dose reductions may occur in some areas of the project through improvements in design and technology.

The discussion in the EIS and Supplement of environmental radiation data collected to date has also satisfactorily demonstrated that the small radiological impact of the existing operations can only be clearly identified within a 5 km radius of the site. Monitoring data and analysis of exposure pathways show doses to members of the public at the town of Roxby Downs and at the Olympic Dam Village arising from the expanded operation, will continue to be of the order of 1% of the annual dose limit.

Information relating to radiation health has been supplied by the Supervising Scientist Group (SSG) of Environment Australia. SSG states “The increase in throughput through the mill is not expected to significantly increase radiation doses to workers or members of the public, or the radiological burden of the surrounding environment. WMC has presented convincing evidence that these parameters are not linked to production rate. One minor exception is the increase in radon emanation from the increased surface area of tailings. Whereas there is expected to be a localised increase in radon progeny concentrations, it is not predicted to result in significant increase in radiation doses to members of the public or workers”.

5.5 BIOLOGICAL

5.5.1 Native Vegetation

Native vegetation in the region is discussed in Chapter 7.2 of both the EIS and Supplement documents. Native vegetation was previously considered in the Draft EIS (1982), Supplement (1982), the Borefield B SAR and the ER.

Clearance or Disturbance of Native Vegetation

As discussed in Section 4.4 of this Assessment Report, the proposal for a CTD tailings retention system is being further investigated by WMC for consideration to accommodate tailings arising from an expansion to 350,000t/a. Tailings disposal of up to 200,000t/a can be accommodated by an expansion of the current paddock system for which approval has already been requested. Likewise vegetation clearance associated with other aspects of the expansion proposal to 150,000t/a has been previously approved. Consequently, there will be no further impact on native vegetation other than that which has already been envisaged and approved as part of the original proposal.

A project expansion of up to 350,000t/a or the approval of a CTD system would require a much larger land area for tailings retention with consequent impacts on native vegetation. This aspect is addressed later in this Section under Future Expansion of Olympic Dam Operations.
**Impact of Air Emissions and Dust**

Generally, the following types of air emissions that may effect vegetation health are generated by mining and construction activities:

- aerosol or particulate salt entrained in mine ventilation exhaust streams;
- gases (mainly sulphur dioxide) from the metallurgical plant stack;
- acid liquor spray from the TRS; and
- dust from construction activities and vehicle movements.

The EIS (Section 7.2.5) stated that mining operations have reduced vegetation indirectly through the impacts of increased sand mobility and erosion, salt deposition, gaseous emissions and dust particle deposition. The most noticeable decrease appears to be in cover of the dominant perennial narrow-leaved hopbush (*Dodonaea viscosa*) in the vicinity of raise bores (mine ventilation structures) due to salt deposition. At one monitoring site (near raise bore 4), approximately 90% of original perennial cover had been lost within 100-200 metres of the site. Whilst mitigation measures were implemented in 1989, perennial cover has only slowly recovered to less than 20%, compared to the original cover of over 90%, despite above-average rainfall in 1989 and 1992. The 1995-96 Annual Report acknowledges that full recovery to the former cover is unlikely without new establishment of tall shrubs on the dune. While salt deposition is now minimal, past deposition, rabbit grazing and the absence of major rainfall events have meant no seedlings have yet established.

While the impact of raise bores was not predicted in the initial EIS (1983), monitoring has detected changes to native vegetation and mitigation measures have been progressively implemented and refined. The commitment that all new raise bores will be fitted with salt interception devices when they become operational is noted. Existing bores are currently undergoing a program of installation of emission inverters which should reduce salt emissions to the surrounding area to insignificant levels.

The EIS (Section 7.2.5) states that during 1989, gaseous emissions (probably sulphur dioxide) caused significant defoliation and other injury to tall shrub and tree species close to the metallurgical plant. Increased sand dune movements (deflation) has also inhibited annual growth. High rabbit numbers around the mine lease area and high risk landforms (ie. landforms that traditionally have low cover and high sand movement) have exacerbated impacts from emissions. While gaseous emission impacts are stated as being reduced by 1990, and further reduced in 1991 due to the installation of taller stacks for the anode furnace, any increase in plant cover presented in Figure 7.8 of the EIS is difficult to attribute to mitigation measures given the above-average rainfall levels of 1989 and 1992. In any case, the long-term monitoring of impacts at this site, especially chronic physiological changes or shifts in community composition, is no longer possible due to the closure of the site for construction works.

While damage to areas of native vegetation within a 3km radius of the metallurgical plant occurred in the first year of production, current and future vegetation damage is expected to be only localised (ie. within 200-300m of the metallurgical plant) as a result of improvements in air emission controls, and confined within the Special Mining Lease. The EIS (Section 7.2.6)
further stated that future emission levels would generally be much less than those from the existing plant. However, ground level concentrations of sulphur dioxide, sufficient to cause damage to vegetation, would occur during periods of abnormal operating conditions under unfavourable mixing/dispersion atmospheric conditions, albeit at a reduced frequency. The commitment to further mitigate emission impacts by increasing the height of stacks from the current 30-50 m height to 90 m is supported.

The 1993-94 EMP Annual Report identified a decline of tall shrubs about the TRS. Whilst the losses may be due to natural deflation and sand movement, emissions from the ponds (or blow-off from the evaporation pond) were considered to contribute, either directly to reductions and losses, or indirectly by inhibiting the growth of annuals and increased sand movement rates. In addition, the 1995-96 EMP Annual Report concluded that a temporary sprinkler system for the distribution of liquor into the TRS resulted in deposits on dunes to the immediate south, which may have contributed to cover reductions and attrition of tall shrubs. These examples highlight the need for monitoring vegetation condition around the TRS and minimising the effects of tailings emissions.

The EIS (Section 7.2.5) stated there have been occasional instances where dust deposition has been sufficient to defoliate tall perennial shrubs, with abnormal levels of track usage during a particular construction project causing the partial defoliation of a 0.4 Ha area. Whilst the commitment to water unsealed roadways more frequently, to suppress dust when heavily used, is supported, the impact of using saline water on vegetation health should be addressed and monitored.

The long-term changes to a species survival and regenerative capacity, reduced vegetative cover, or changes to plant community composition as a result of emissions, cannot be fully determined. Whilst monitoring has identified immediate changes to native vegetation communities, the impacts of mining and construction activities are not readily separated from other factors, such as grazing pressure (especially from rabbits), natural environmental variability and seasonal factors (especially rainfall). Overall, the affected communities are well represented in the region. Therefore, the loss which may occur on the lease is considered minimal in terms of biodiversity and habitat availability.

**Spread of Introduced Plant Species**

Introduced and pest plants were discussed in Section 7.2.4 of the EIS. The document concluded that monitoring has indicated that development of the mine and its associated infrastructure since 1980 has had minimal effect on the presence and spread of introduced plant species. Monitoring of introduced and proclaimed plant species should continue. Reporting of the presence, abundance and control of these species would be included in the future EMMP annual reports. Control of proclaimed plant species would continue to be conducted in accordance with the legislation and policies of the South Australian Animal and Plant Control Commission.
Rehabilitation and Monitoring

The EIS (Section 7.2) stated that vegetation clearance would be kept to the minimum necessary, and disturbed areas rehabilitated promptly. A submission on the EIS noted that the majority of the vegetation clearance will be for permanent infrastructure and hence rehabilitation of these areas is not possible. The Supplement noted that the statements in the EIS should be quantified by the words “where practicable”.

There was some concern that the long term monitoring program undertaken by WMC would be jeopardised or that monitoring and rehabilitation sites would be lost in the expansion process. This aspect is unclear. Some sites may be lost as a result of the expansion of the tailings system, although as noted above, this clearance has been approved. Other sites may be impacted by emissions. There is a need to review the monitoring and rehabilitation program to ensure that adequate sites are in place and if necessary, new sites established to replace any which may be lost.

The important issue of tailings rehabilitation trials should be adequately monitored, and any general environmental photo-monitoring sites should be monitored in a comparable manner to the DEHAA (Pastoral Management Section) monitoring program on adjacent leases.

The Native Vegetation Council of South Australia (the Council) has a general policy that where clearance of native vegetation is unavoidable or essential, there should always be an offset to obtain at least some positive gain for biodiversity conservation. In a submission to the EIS, the Council had regard to this policy in suggesting that WMC consider permanent destocking of Roxby Downs, Parakylia South and Purple Downs Pastoral Leases held by WMC, possibly to be protected under the terms of Heritage Agreements under the Native Vegetation Act. The submission further suggested that when mining operations are decommissioned, consideration could be given to the Leases (plus Andamooka Pastoral Lease) being resumed/ transferred to the Crown for conservation purposes, as an extension to the Lake Torrens National Park. The Supplement (Section 7.2) noted that WMC is committed to sustainable management of its pastoral leases. WMC is working with the Pastoral Management Section of DEHAA to ensure that its stock management practices are appropriate and it is for this reason that some of its pastoral leases are currently destocked. WMC have advised (Supplement, Section 7.2) that while these leases may be restocked at an appropriate time, regional environmental management options will be kept under review.

From a pastoral management perspective, it is desirable for destocking to continue for some time in the most degraded areas, but there is no evidence that sustainable grazing on most of these lands could not be carried out in the future, provided native and feral animal populations are controlled, and stock numbers on each watering point are maintained below about 400 sheep or equivalent numbers of cattle. At the same time, it is recognised that management for the purposes of sustainable grazing will not always be compatible with management for the conservation of biodiversity and there would be merit in WMC entering into discussions with DEHAA, the Native Vegetation Council and the Pastoral Board on regional environmental management options. Such options could include Heritage Agreements over selected areas and in the longer term incorporation of some areas into the existing Lake Torrens National Park as
proposed in the submission. It is noted in the Supplement that WMC has indicated a willingness to consider such options.

The submission from the Council further suggested that WMC erect rabbit-proof fencing around the whole project area. The rabbit-proof fencing proposal is not considered practical by WMC, as it considers much of the project area is not of major conservation value, and that total control of rabbits in such a large area would not be practicable.

It is considered that the extension of rabbit-proofed areas is not appropriate at this stage as WMC has already committed itself to a large fenced exclosure, and the RCD virus may prove to be effective enough to negate the need for rabbit exclusion fencing. However, experience with myxomatosis suggests that rabbit calicivirus may simply represent a window of opportunity for redoubling existing control measures and WMC's commitment to continually review control options for feral and pest animals is crucial (Supplement 7.2).

WMC is involved in a joint research project with DEHAA and the University of Adelaide, under which a rabbit-proof fence has been erected around a 13 sq km area, rabbits are currently being eradicated from that area, and the response of plant and animal species to the removal of domestic and feral grazing stock will be monitored into the future. Longer term aims of this project include upgrading the fence to predator-proof standard, the eradication of foxes and cats within the area, and, in the longer term, reintroduction of locally extinct or endangered species from other areas of Australia. WMC has contributed $180,000 to this project (for which additional funding is being sought from the National Heritage Trust Fund), but a long term commitment of support and funding is needed for the area to provide sound data and lasting benefits.

The Supplement noted that data derived from monitoring of vegetation regeneration as well as native and introduced flora and fauna in the Roxby Downs Ecosystem Restoration and Research Project area, will be used to develop a more effective natural environment management program in the project area and the region.

The Supplement supports the continuing and proposed monitoring and research of the biological environment in and adjacent to the project area (including the mound springs near Lake Eyre South) and the public dissemination of the results.

Future Expansion of Olympic Dam Operations

Approval of a CTD system for the TRS would require a very large area with associated impacts on native vegetation. An environmental evaluation should be undertaken prior to any future approval of a CTD system (see Recommendation 2). This evaluation should include the total amount of vegetation clearance (in hectares) required to accommodate the tailings retention system and each species association affected. The area of vegetation required for the tailings dams should be identified and a detailed species list and assessment of the conservation value of the vegetation within the area provided.
5.5.2 Fauna

Section 7.3 of the EIS contained a detailed discussion of fauna in the region including mammals, birds, reptiles, amphibians, macroinvertebrates and introduced animals, and the likely impacts of the expansion proposal. Some concern was raised in response to the EIS in regard to the lack of invertebrate information provided. The Supplement (Section 7.1) noted that whilst no assessment of microinvertebrate faunal composition and abundance has been undertaken, ants have been monitored in some detail as an indicator of microinvertebrate activity and it considered that the survey, assessment and monitoring of vascular plants, terrestrial and aquatic microinvertebrates and vertebrates being undertaken, are sufficient to provide environmental data that permit informed conclusions to be made about ecology and indications of environmental change.

It is considered that it is unlikely that the expansion proposal will have any effects other than the well documented minor effects on the local vertebrate and invertebrate fauna, and will not significantly effect regional population numbers.

Avifauna

A submission requested additional information about the species composition of the 92 bird fatalities from TRS in 1995. The Supplement (Section 7.3) stated that grebes, ducks and silver gulls constituted the majority of the fatalities. With the exception of an occasional greenshank, caspian tern and sandpiper, there is no record of any bird species listed under the JAMBA and CAMBA international agreements or of regional conservation significance, being present at the TRS ponds. The Supplement also noted that the bird fatalities for the tailings retention system for the year March 1996 - February 1997 were reduced to 32. No wading bird species have been recorded on or adjacent to the tailings retention system to date. Data on bird usage of the TRS are reported publicly in the EMMP annual reports.

Information on bird deterrent systems in use at Olympic Dam is provided in the EIS (Section 7.3.4). A submission on the EIS had concerns in regard to the use of ‘bird scarers’ on the tailings retention system. The Supplement (Section 7.3) stated that the development and use of bird deterrents is part of the EMMP for the project area’s TRS ponds. The submission considered that the five bird scaring management practices listed in the EIS are probably the only realistic approaches available. Methods to deter birds from the evaporation ponds need to be clarified in the EMMP.

A submission on the EIS expressed concern that describing the increase in frequency of some bird species related to the modified environment produced by the mine operations, as being ‘beneficial’, is simplistic ecology. Most of the bird species predicted to increase in numbers have done so. Most of these increases have been real, through the establishment of breeding populations, rather than migration into the changed Olympic Dam environment from surrounding areas. The submission expressed concern that there may be negative effects such as increased competition with other bird species or increased local predation pressures. There would need to
be some assessment of the relative dependence of these species on the increased resources provided by the development, such as water and food, compared with their use of the original surrounding natural environment.

Under the expansion proposal there will be an increase in the area of evaporation ponds compared to those operating at present. There are now more birds of particularly adaptable species centred on the Olympic Dam site development. As long as the impact on other species is minor or nil, this is not seen as a problem as the mine represents a very small area in regional terms.

**Cat Control**

It is well demonstrated that feral cats have a major impact on native bird and animal populations. The Supplement (Section 7.3) provided details on cat control. It noted that under the South Australian *Animal and Plant Control (Agricultural Protection and Other Purposes) Act 1986*, the domestic cat is a proclaimed species (Class 4). Under Section 44 of this Act it is an offence to release a cat or permit a cat to be released in South Australia. The *Dog and Cat Management Act 1995* also allows for a range of cat management actions. The Supplement noted that the control of cats within the Municipality is vested with the Town Administrator and not WMC. The Supplement document set out a number of items which could be included in a Roxby Downs cat control policy and program, including discouraging cat ownership, introduction of a local by-law relating to cat control, registration and identification, desexing, night curfews and enforcement of control measures. The document notes that there is considerable local research, documentation and support for establishing domestic cat control at Roxby Downs. The establishment of a local by-law to control and manage cats has occurred elsewhere and could be considered by the Town Administrator and the proposed Roxby Downs Town Board. WMC should endorse the establishment of a township cat control policy and programme that is complementary to the WMC's Special Mining Lease Cat Control Policy and to actions undertaken under the EMMP. The establishment of a cat control policy and programme is recommended.

**Recommendation**

*That the Town Administrator and the proposed Roxby Downs Town Board adopt a township cat control policy.*

**Monitoring**

WMC's ongoing comprehensive fauna monitoring program is supported.

**Future Expansion of Olympic Dam Operations**

The establishment of any CTD tailings retention system would impact on fauna habitat and hence fauna impacts would need to be addressed in any future environmental assessment.
In particular, information on bird fatalities associated with water storage areas and the tailings retention ponds as a result of monitoring should be provided. Lists should include species affected and number recorded each year, with those that are threatened or regionally significant being highlighted. The timing of implementation of management measures should also be indicated.

5.5.3 Off Road Vehicles

Off road vehicle access was mentioned in the EIS. As noted in Section 5.3 of the Supplement, concerns were raised with respect to the environmental degradation and nuisance impacts of off road driving, predominantly within the municipal lease area.

Experience in other mining towns of significant size has also indicated that unauthorised access and activities by residents on surrounding pastoral leases is often a problem, as can be their dogs if allowed to roam at will. Access to pastoral lands in South Australia is covered by the provisions of Sections 45-48 of the Pastoral Land Management and Conservation Act 1989. There is a need for an educational campaign to be undertaken as appropriate to increase resident and visitor awareness of their rights, obligations and restrictions. In particular, people should be made aware of the requirement for visitors to seek the lessee’s approval, if intending to travel across or into pastoral lands other than on a public road or public access route.

The Supplement (Section 5.3) stated that WMC is currently considering the establishment of a land management plan for the Special Mining Lease and the surrounding pastoral leases held by WMC and that this plan could identify areas suitable for off road driving, camping and picnicking, which could reduce the incidence of off road driving and degradation in environmentally sensitive areas. If it can be demonstrated that there is any area on adjacent pastoral leases where the Roxby Downs townspeople currently have, or desire to have access but which have no public road access, then a process should be put in train in order to review the perceived need and if necessary establish a public access route to the area. The Supplement (Section 5.3) noted that an increase in off road driving and damage in the municipal lease is a matter for the Administrator to consider.

5.5.4 Mound Springs

Mound spring drawdown from operations of Borefields A and B has already been discussed in the context of the 1996 Borefield B SAR. The issues of impacts on mound springs and areas of high conservation value remain a significant public and government concern. In view of this ongoing concern, WMC addressed environmental impacts on the mound springs in the Supplement and indicated their intention to manage overall water use in an environmentally appropriate manner.

The Supplement (Section 7.4) stated that all observed adverse environmental impacts at mound springs cannot necessarily be attributed to reduction in flows as a result of abstractions by WMC. Notwithstanding this observation, no clear indication was given of the action WMC would take if
there are significant future variations between monitored and predicted flows. One submission expressed concern regarding the damage to the mound springs vegetation and fauna caused by abstractions from Borefield A. It suggested that earlier remedial action should be taken if monitoring detects such damage at Borefield B. There was some initial reluctance to acknowledge that the growing evidence of impacts on springs from Borefield A was greater than was originally forecast. A responsive approach is needed with a clear indication of the action that will be taken if there are significant future variations between monitored and predicted flows.

The statement (EIS, Section 7.4.13) that the mound spring monitoring program conducted by WMC is to continue and be expanded where appropriate to enable a better understanding of the biological fluctuations in the systems is strongly supported. The mound springs monitoring programme was discussed further in the Supplement (Section 7.4). In particular WMC proposes that the development of a formal, regular, WMC and DEHAA review process would allow for more direct DEHAA input into future projects and programs. This is supported.

The Supplement (Section 7.4) also noted that additional monitoring and research being undertaken by WMC and others should provide more definitive information on the biology and ecology of fauna, including confidence limits of data.

Until actual flow data is accumulated over time, the precise impacts on flow rates as a result of abstractions from Borefield A and B, cannot be known. Given that the relationship between flow rates and animal numbers is non-linear, there is a clear need for contingency plans to cope with any unexpected reductions in flow. This has been addressed in the Supplement (Section 4.2) with several contingency measures listed. These are discussed in Section 5.2 of this Report where it is recommended that the responsibility for any contingency response be with WMC in consultation with the Olympic Dam Environmental Consultative Committee.

WMC has stated (Supplement, Section 7.4) that it would support a proposal by the South Australian Government to develop an environmental management plan for the mound springs and would contribute technical expertise. The Supplement (Section 7.4) stated that a regional mound springs assessment and management plan should be established as a high priority for the region and that although WMC considers this is a matter for Government, WMC would participate in such a program for mound springs on its pastoral leases. With recently committed NHT funding DEHAA will now be proceeding with a regional management plan for mound springs. WMC’s commitment to cooperation and technical assistance is acknowledged.

The biological monitoring data for both vegetation and mound springs supported by WMC is not easily accessible to the general scientific community. It would appear to be appropriate for WMC biologists and consultants should submit a series of papers on this significant arid zone monitoring data set for publication in appropriate Australian scientific journals.
5.6 REHABILITATION

Rehabilitation and decommissioning was addressed in Section 14 of the EIS and Supplement documents. The EIS discussed the incorporation of progressive rehabilitation into operations and provides a conceptual plan for rehabilitation and decommissioning of the project.

The EIS stated that site-specific rehabilitation and decommissioning procedures and completion criteria for the expansion proposal would be developed concurrently with evaluation of the ongoing rehabilitation and monitoring program. Final rehabilitation procedures and completion criteria would be included in a decommissioning plan that would be submitted to the South Australian Government for approval, prior to implementation.

5.7 PROJECT INFRASTRUCTURE AND TOWNSHIP DEVELOPMENT

5.7.1 Waste Management

The Municipality of Roxby Downs is responsible for waste management within the township. Both the level of recycling and the management of the landfill sites were commented on in public submissions. Following discussions between the Town Administrator, the State government and WMC, the Administrator agreed to consider WMC proposals for improving landfill operations and recycling procedures. The response does not indicate whether the existing facilities have long term capability to service the township’s waste disposal requirements. A stronger response, supported by Town Administration, would have given more confidence to assessing this matter.

Recommendation

That the relevant State government agencies monitor any increase in need for services with the expected population increase at Roxby Downs.

5.7.2 Water Supply (Domestic)

A number of responses highlighted the fact that rainwater tanks were not a standard feature of houses at the township.

A house with a roof area of 240m² @ 160mm/a (average) of rain would collect nearly 4,000 litres of water. While not a great volume some residents might consider it worthwhile for cooking and drinking. It should be noted that rainwater tanks have been used for many years at Woomera Village.

Rainwater tanks were initially denied because of potential radioactive dust falling on the roof. However, tests carried out in June 1994 on rain water samples taken from tanks at the Roxby Downs Area School showed that radiation levels are similar to other rain waters in South Australia. It could also be argued that directing rain water off the roof could benefit planted areas around the house.
The estimated costs per house to collect 4,000L of water yearly is $2,000. By considering all conservation measures available to reduce consumption it is estimated that one person would require 70L/d (if they used rainwater for all needs except gardens) (Engineering and Water Supply Department of South Australia, Bulletin, June 1986).

Consideration should be given to utilising "grey water" for gardening. Reclaimed waste water has been used for many years at Woomera village for public open space watering and a similar program has commenced at Coober Pedy.

Although these are issues strictly not relevant to the expansion project, growth of the township is directly related to the growth in the mine and is an important issue to the residents. Any shortcomings of present operations of the township should be noted and rectified in any new development.

5.8 SOCIAL AND CULTURAL IMPACTS

A number of social issues were raised by agencies and members of the public in submissions to the EIS. Issues raised in relation to Aboriginal Heritage will be considered in that section of the Report.

Many of the issues raised by the public relate to the existing management and administration of the town of Roxby Downs. There were no submissions submitted which directly related to the expansion of the mine except for some queries about direct employment and the multipliers used to calculate its impact on indirect employment. These issues are discussed in Section 6.11 of this Report.

5.8.1 Social Environment

The social environment of the Roxby Downs township and surrounding areas of interest to the mine expansion are discussed adequately in Section 12 of the EIS(1997) and the Supplement (1997).

The town of Roxby Downs was constructed in mid 1986 with first residents moving into the town in 1987. To date some 699 residential dwellings have been built around the town centre. In addition there are 335 single persons’ quarters and 151 caravan spaces (Section 11.7.1 of the EIS 1997). Figure 11.6 of the EIS (1997) provides an aerial view of the existing town and the proposed residential expansion areas. The town has been designed to minimise environmental impacts on existing vegetation and to avoid too much impact on the pattern of longitudinal sand dunes in the area. Two sites of Aboriginal significance have been identified in the southern expansion area and development plans for the area should take these sites into account.

There were a large number of submissions which related to the detail of management of the existing town and matters which could be dealt with by either the municipality, or the proposed new Town Board. WMC has not accepted responsibility for the resolution of these management
matters nor has it sought resolution of them from the municipality or the State Government through the EIS process.

These issues of local management have been listed below and it is necessary that DPINR take responsibility for addressing them. It has not been possible for them to be satisfactorily resolved during the assessment process.

Issues raised of importance to the residents at Roxby Downs

- tree planting of exotic species on private allotments
- removal of trees by the municipality (seen as undesirable in some circumstances) and by residents on allotments and on reserves
- limited mulching of streetscape plantings
- over watering and poor maintenance of streetscapes and reserves
- no provision of extra police resources during expansion (a decision is presently with the South Australian Police Department)
- expansion of indoor and outdoor recreation facilities
- lack of opportunities for youth
- occupation and management of light industrial blocks in the town
- provision of shade cloth over pool and playgrounds
- provision of alternative housing types in the town should be investigated
- provision for an interpretive visitors centre should be considered
- parking and traffic issues causing conflicts in some areas
- construction of the new mezzanine floor for the library has not yet occurred

None of these matters has been addressed satisfactorily in the EIS process for the proposed expansion, although some of them may be outside the scope of the EIS they need to be addressed.

Community consultation is a feature of the Plan Amendment Report (PAR) process. A PAR can address the town environmental management issues as well as development and land allocation issues, especially to cater for any new expansion needs. The amendment of the 1991 Development Plan may provide some scope to address these issues.

**Recommendation**

That a Plan Amendment Report (PAR) for the Roxby Downs Township be investigated as a mechanism to resolve a number of the issues raised by the community.

5.8.2 Demographics

The population of Roxby Downs, Olympic Dam Village and the surrounding countryside stands at approximately 2,500. The population is predicted to increase to 3,100 by mid 2000 with expansion to production of 200,000t/a copper. For the future possible production rate of 350,000t/a of copper, the population is estimated to reach around 4,500.
In the Indenture documents and the 1982 EIS, it was estimated that at the time production reached 150,000t/a, the population of Roxby Downs would reach at least 9,000 people. The town planning outlined in the 1982 EIS reflected the needs of a predicted population of 9,000 when in reality less than a third of this figure has been achieved. This is a result of the lower than predicted level of employment at the mine, due to technology advances, and the lower than predicted flow on (or indirect) employment in the town.

As outlined in Section 12.2.2 of the EIS there is a relatively high average household size of 3.18 persons at Roxby Downs. This reflects the high proportion of two parent families in the town and the corresponding low level of single parent families or single people living in the township. Many of the single workers reside at the Olympic Dam Village which is approximately 9km north of Roxby Downs.

There are a higher than average (Australian Bureau of Statistics figures) number of children and young adults at Roxby Downs and a lower than average number of older and elderly (50 plus age group) people at Roxby Downs. There are also very few Aboriginal people living in Roxby Downs (0.8% of the population).

The town of Andamooka is 32km from Roxby Downs and a number of WMC contractors (approximately 50 people) live in Andamooka. There has not been a large population increase in Andamooka or extra requirements for community and other facilities.

5.8.3 Work Force Projections

Since commencement of operations in 1989, there has been steady direct employment at the mine of approximately 850 people per annum (EIS Table 12.1). Further information is provided in Section 12.3.1 of the EIS about the categories of the workforce and indirect employment.

The projected construction workforce to the year 2000 is an average of 1,300 to reach a production level of 200,000t/a of copper. In addition it is estimated in the EIS (Section 12.3.2) that a further 200 to 300 personnel be required on a short term basis from January to April 1998. Many of these personnel will be accommodated at the Olympic Dam Village rather than at Roxby Downs.

The indirect workforce at Olympic Dam is estimated at between 130 and 260 to support the 2 year construction workforce of 1,300.

Projected workforce to the year 2010 is provided in the EIS Table 12.8.

5.8.4 Accommodation

The Roxby Downs and Stuart Shelf Indenture requires that WMC be responsible for providing for the accommodation needs of WMC employees and their dependents and to assist in providing housing for those people who provide services for the town.
Section 12.6.1 of the EIS adequately describes how the township and the Olympic Dam Village have developed over the last 10 years, while Section 12.6.2 discusses the requirements for additional housing with the increase in the work force discussed earlier in this assessment. A southern expansion of the township is being planned releasing up to 253 allotments. A 150-200 berth caravan park at Olympic Dam Village has been constructed and is now available for use. A separate area for tourists has also been made available.

5.8.5 Community Services

The State Government is responsible for the provision of many of the community services at Roxby Downs required for the number of people resident in the town. The present township has a high level of community services, when compared with other remote area towns, and residents in the vicinity of Roxby Downs ie Andamooka draw on resources located there. The town also provides resources and facilities for tourists and travellers passing through the area. It is agreed with WMC (EIS Section 12.7.3) that the increase in population resulting from the mine expansion to 200,000t/a of copper will have a minimal impact on existing services and facilities. If further consideration is given to increasing production to 350,000t/a of copper, the needs of the residents at Roxby Downs and Olympic Dam Village will need to be monitored and if necessary further expansion of services provided by either WMC or the State Government under the terms of the Indenture.

The Roxby Downs child care centre provides child care service on a full-time, part-time, casual and emergency basis. It is currently operating at just under half its licensed capacity and will therefore be able to absorb any increase in demand as a result of the mine expansion.

At the preschool, the proposed expansion would create a demand for approximately 10-15 additional places for children and would bring the Kindergarten close to capacity. This is an issue which will need to be monitored by the present South Australian Department of Education, Training and Employment, who are responsible for providing education services.

The Roxby Downs area school is able to cater for up to 600 students and is not yet at capacity. If the projected town population increases to 4,500, it is estimated in the EIS that approximately 900 students will need to be catered for at the school. According to WMC there is land available for the school to be expanded in size. This will also need to be monitored by the Department of Education, Training and Employment.

**Recommendation**

That educational requirements at Roxby Downs be monitored by the Department of Education, Training and Employment.

5.8.6 Health and Medical Services

Section 12.7.3 of the EIS outlines the existing health and medical services available to the residents of Roxby Downs, Olympic Dam Village and surrounding areas. A new medical centre
is expected to open in early 1998 and will provide new facilities for accident and emergency, minor surgical procedures, day surgery and low risk obstetric care.

The health and medical services provided at Roxby Downs are considered suitable for a population of its size. The need to travel to Port Augusta or Adelaide for specialist treatment is generally acknowledged as a feature of rural living which is typical in any regional area in Australia.

5.8.7 Welfare and Support Services

As discussed in Section 12.7.4 of the EIS the Department of Human Services provides an outreach service to Roxby Downs from Port Augusta. A number of church groups also provide support to the community. The Department of Human Services should monitor any possible increase in need for services with the expected population increases.

5.8.8 Recreation and Cultural Facilities

Roxby Downs is provided with a wide range of recreational and cultural services. A number of public submissions raised questions and issues about the expansion or provision of new services in this area and these are considered in Section 5.8.10 of this Report.

5.8.9 Commercial Development

Roxby Downs provides a relatively (compared to other small country towns) wide selection of retail and other businesses. A number of public submissions raised issues in relation to the variety of business and the lack of competitiveness in the town. These issues will be considered in Section 5.8.10 of the Assessment Report but it should be noted that the resolution of these issues is outside the control of WMC and outside the parameters of the EIS.

5.8.10 Municipal Management

There is clearly some dissatisfaction conveyed in public comment in regard to municipal management. Sections 12.9.1, 12.9.2 of the EIS and Section 12 of the Supplement do not provide enough information about municipal management issues and their possible resolution.

The common theme of the comments concerning municipal management (including a petition with 412 signatures) was that there was no effective communication between the community and the municipality and no means by which the community has input into decision making.

This issue should be pursued more thoroughly by all parties in order to satisfy the needs of the residents of the town to have input on the planning and development of the town through the formation of the Roxby Downs Town Board.
At the commencement of the establishment of the town at Roxby Downs, an advisory committee was established in order for the community to communicate with the Town Administrator (who is appointed by the previous Minister for Mines and Energy (now the Minister for Primary Industries, Natural Resources and Regional Development)) and WMC. This committee has not met for several years and is no longer relevant to the decision making processes which occur in relation to the town management. It is understood that the Town Administrator plans and budgets for town improvements, plus ongoing management. The budget must be approved and funding provided by the State Government and WMC.

In the Supplement, WMC has indicated that issues to do with the town management and Manager are outside its influence and these matters will not be addressed in the EIS process.

The Supplement (Section 12.9) does indicate that WMC and the State Government have discussed the formation of a new Roxby Downs Town Board which will form a communication forum to the Town Administrator on town management issues. This is supported and should be implemented as soon as possible.

The possibility of the town becoming a corporation under the Local Government Act is not likely for some time due to the low rate base from the smaller than expected population growth at Roxby Downs. A population of around 8,000 people would be needed to support a full Council. The State Government may wish to explore this option in the longer term.

It is suggested that a new Roxby Town Board be formed, as soon as possible, as a communication forum for town management issues.

**Recommendation**

*That DPINR evaluate the formation of a new Roxby Town Board, as a communication forum on town management issues.*

**5.8.11 Aboriginal Heritage**

Six submissions relating to Aboriginal heritage and issues were provided during the consultation period. WMC’s responses are in Section 6 of the Supplement.

WMC employs a Community Consultation Liaison Officer who is responsible for assisting in the management of relations with the surrounding Aboriginal communities. WMC has also developed a number of policies in response to Aboriginal issues which have arisen with the development of the mine. This includes an Indigenous People’s Policy, to assist in fostering better community relations at Olympic Dam. WMC advised that they are fully participating in discussions concerning Native Title claims and will continue to do so during the present mine expansion. Section 6 outlines the Aboriginal groups which have been consulted in relation to the special mining lease and municipal lease, borefields and service corridors.

Section 6.1 “Aboriginal Dissatisfaction and Conflict with the Expansion Project” of the Supplement outlines some of the previous problems with Aboriginal consultation, encountered
by the communities and WMC. WMC has not outlined in detail the basis for these conflicts only that they have occurred and that their resolution is part of an ongoing consultation process. WMC are required to outline the consultation process and progress on this in the annual Environmental Management Plan (EMP) which is supplied to the State Government for review.

It is noted that no submissions were received from Aboriginal people or groups following the public release of the EIS (or subsequently) to either the Minister for Mines and Energy or the Minister for the Department of Housing and Urban Development.

Divergent views held on the processes of consultation with the Aboriginal communities confirm the need for the process to be documented prior to the consultation being undertaken and the results clearly presented during and after the process. In consultation with the State government, WMC should establish a process, reporting measures and mechanisms to avoid misunderstandings in the future. There is a need to co-operate in the development of standards for consultation and identification of Aboriginal sites, together with mechanisms for reporting against these standards.

The Australian and World Heritage Group of Environment Australia commented that WMC should undertake a comprehensive study to assess the overall impact on indigenous heritage past and present in the area of the proposed development. WMC has maintained records of all the sites detected during its consultation with the Aboriginal Land Council. However, this information, at the request of the Aboriginal advisers, is treated as confidential but is made available to accredited sources only with approval by the Aboriginal advisers.

5.9 AIR, DUST AND NOISE IMPACTS

Air quality and noise are discussed in Chapter 9 of both the EIS and the Supplement. Meteorology, which is considered to be an influencing factor on air emissions, is also discussed in the same chapters. Of the three submissions which raised issues regarding air quality, one questioned the suitability of the regulations. No response is given by WMC since it is considered to be a government legislation issue. The proponent has provided answers to the other matters raised in the submissions. The responses provide sufficient information to enable the government regulatory bodies to have confidence in the proponent’s ability to operate within prescribed standards.

With regard to Greenhouse gas emission WMC has (EIS, Section 3.8.4) and (Supplement, Section 15.4) made a commitment to participate in the Commonwealth Government’s Greenhouse Challenge program. An initial target for a 15% reduction in carbon dioxide emissions per tonne of ore processed by mid 1998, has been set. The expansion to 200,000t/a copper production is expected to comply with this figure.

Fugitive dust emissions from roads is acknowledged (Supplement, Section 11.1). The proponent is of the view that, while it regularly waters roads in the Special Mining Lease area and Olympic Dam Village, roads outside the Special Mining Lease are not its responsibility. Roads used to service Borefield A and B pump stations are maintained by the South Australian Department for Transport, Urban Planning and the Arts (Transport SA).
Comment from the Noise Abatement Branch, Department for Environment, Heritage and Aboriginal Affairs, indicates that noise issues have been adequately addressed in the EIS. No comment on meteorological data presented in the EIS was received in the public or government submissions.

It is concluded that the proponent has demonstrated that the proposed expansion can meet all existing statutory requirements regarding air and noise emissions.

5.10 VISUAL IMPACTS

The visual and aesthetic impacts on the site during the current expansion to 150,000t/a are considered to be unavoidable. However, expansion to 200,000t/a will have little additional visual impact. A further expansion beyond 200,000t/a would again present an unavoidable visual impact.

5.11 ECONOMICS

Extensive comment was provided on a number of economic statements made in the EIS, including the economic model used, assumptions and model results. The analysis of copper and uranium products, markets and prospects for the output from the mine expansion is considered to be comprehensive and credible. The EIS provides estimates of the economic benefits in terms of GDP, exports, employment etc using the computable general equilibrium (CGE) model. Because GCE models contain many simplifying assumptions and representations of the complexities of the real world economy and include arbitrary values where reliable estimates are not available, the estimates produced by such models are necessarily indicative only. The order of magnitude is more significant than its precise value. However, the modelling appears to be of a good standard, except in relation to employment estimates.

Some of the scenarios used in the EIS for employment generation resulting from the expansion, use employment multipliers of 4.2 and 5.8. These are considered very high by accepted standards elsewhere in Australia. It is accepted that estimates of total employment generated by a proposal such as Olympic Dam expansion, not only includes the effect of direct jobs but also from the effects of expenditure on other investment operating costs and the effects of revenues.

Notwithstanding the problems discussed above, the evidence presented does indicate that there are net economic benefits to both the State and to Australia.

The Supplement suggests all additional government expenditures required under the terms of the indenture agreement have been included. On this basis, the additional costs of service provision for government agencies is likely to be marginal as a result of mine expansion. For this reason we consider the response satisfactorily addresses the issue of increased government costs.

While the Supplement briefly explains why the original estimates of economic impact have not been realised (Draft EIS 1982), the Supplement suggests sensitivity analysis was not undertaken.
on differing investment and production levels in respect of the current proposal, “as the expansions modelled are the best estimates available from WMC”. It should be acknowledged that if changes in the commercial environment warrant a reduction in the project scale (or timelines), the nature and extent of the economic impacts will be lower than that currently envisaged through the modelling process.

In our view the EIS sufficiently addresses the economic issues, including those raised through the public consultation process.

5.12 ENVIRONMENT MONITORING AND MANAGEMENT PLAN

The environmental monitoring associated with the existing operations is extensive and the proponent has made a commitment to continue this monitoring. A well established review system has been established which has been expanded to include independent auditing and consultation through the Olympic Dam Environment Consultative Committee and Community Consultative Forum (Supplement Section 6).
6. CONCLUSIONS

It is considered that the EIS addressed all of the issues highlighted in the EIS Guidelines. It is also considered that the risks to the biophysical, historical, cultural and social environments from the proposed Olympic Dam expansion are acceptable provided the mine continues to operate under stringent environmental controls, including those recommended below.

The WMC Board has made no formal decision on a possible future expansion from 200,000 to 350,000t/a of copper. Should such an expansion be considered at a later date, a decision by the Minister responsible for the Indenture Act would be required under the Indenture Act. However, the environmental impact of construction of a plant of up to 350,000t/a of copper and associated products should meet similar requirements to the current expansion and appropriate procedures should be set by the State authority at that time.

No major changes are suggested to the mining and milling operations for the proposed expansion to 200,000t/a. An expansion to 350,000t/a copper may require other mining or milling changes and such changes would need to be approved by the Minister responsible for the Indenture Act. Such approval could require a further environmental evaluation to be undertaken at that time.

There is still further development required to ensure protection of the base of the storage area of a CTD system, which will need to be evaluated before such a system is approved.

Contingency measures to be implemented in the event of significant variations in mound spring flows to those predicted, and the commitment to a WMC/DEHAA Review Group meeting at least bi-annually, are of fundamental importance to sound spring management.

In spite of the refinement in predictive modelling represented by ODEX1, the precise impact on springs resulting from the ongoing operation of Borefield A, even at reduced rates and increased abstraction from Borefield B, will not be known until actual flow data is accumulated over time. However, this is not seen necessarily as an impediment to the expansion proceeding to the 200,000t/a limit.

Any proposed expansion beyond 200,000t/a of copper and associated products would require further environmental evaluation of tailings and water management, and the impact of changes in mining and milling technologies or practice.

With regard to impacts on vegetation and for atmospheric emissions for the expanded operation, there is a need to review the monitoring and rehabilitation program to ensure that adequate monitoring sites are in place and if necessary new monitoring sites established, to replace any which may be lost during the expansion program.

Tailings rehabilitation trials should be adequately monitored, and any general environmental photo-monitoring sites should be monitored in a comparable manner to the DEHAA (Pastoral Management Section) monitoring program on adjacent leases.
Insufficient information is presented to provide confidence that a production level of 350,000t/a of copper could be achieved without the use of additional water. To secure an approval for greater production levels, therefore, would require a review of water usage.

The feasibility of collecting grey-water separately from other sewage and other methods to improve the efficiency of water reuse at the township should also be investigated by WMC and the Township Administrator.
7. **RECOMMENDATIONS**

This Environmental Assessment Report has been prepared jointly between the Commonwealth and South Australian governments. Implementation of recommendations will be shared depending on the nature of the specific recommendations and the responsibilities of each jurisdiction for regulating matters associated with operation of the Olympic Dam mine.

**Commonwealth Recommendations**

A condition of the granting of an export permit for uranium oxide from the Olympic Dam mine expansion must be that WMC agrees in writing to be bound by the following recommendations:

**Recommendation 1**

It is recommended that the permit to export uranium oxide from an expansion of the Olympic Dam mine to the equivalent of 200,000t/a of copper and associated products, be subject to the following conditions:

(a) WMC shall ensure that existing and proposed arrangements for transport of uranium oxide from Olympic Dam mine to Adelaide comply with all relevant Commonwealth and South Australian legislation.

(b) WMC undertakes the collection and use of spring flow data to refine aquifer parameters and re-estimate draw down effects at spring groups at regular intervals. The revised predictions must be presented to the Olympic Dam Environment Consultative Committee.

(c) WMC prepares detailed contingency measures and a response plan to address significant variations in monitored and/or predicted draw down or flow rates at mound springs and that the responsibility for any contingency response be that of WMC, in consultation with the Olympic Dam Environment Consultative Committee.

(d) WMC continues and expands when appropriate the mound spring monitoring program, to enable the collection of a long term data set to achieve a better understanding of the biological fluctuations in these systems. The results of the monitoring program must be presented to the Olympic Dam Environment Consultative Committee and the Great Artesian Basin Consultative Council.

(e) WMC must commit to reducing the demand on water resources to the maximum amount possible, both at the mine and at Roxby Downs township, by the use of efficient water supply and usage practices, including the application of recycling systems and through the investigation and application of alternatives to the use of water wherever possible.
(f) WMC undertake monitoring of groundwater quality (hydrochemistry) into the long term possibility of movement of more saline water into the main artesian aquifer (the Algebuckina Sandstone), due to interaction between aquifers and report the findings to the Olympic Dam Environment Consultative Committee and appropriate regulating authorities.

(g) WMC continues research into the identification and assessment of alternative water supplies and review the viability of identified options, taking into account changes in technology and economics. WMC is to report on progress to the Olympic Dam Environment Consultative Committee.

(h) The hydrogeological regimes of the Andamooka Limestone and Arcoona Quartzite aquifers and their degree of hydraulic interconnection be better defined by WMC in order that the potential environmental impacts of leakage from the TRS and mine water disposal pond can be properly evaluated and monitored. WMC must report progress in this regard to the Olympic Dam Environment Consultative Committee.

(i) WMC makes available to the scientific community, the Olympic Dam Environment Consultative Committee and to the Great Artesian Basin Consultative Council, monitoring data relating to fauna and flora in and around its lease areas and for mound springs monitored by WMC.

Recommendation 2

Should a further expansion of operations be formally proposed at the Olympic Dam mine it is recommended that environmental assessment be required under the EPIP Act on:

(a) the impact of anticipated changes in technology or mining practice beyond that used for the expansion to 200,000 t/a of copper and associated products;

(b) installation of a tailings management system including the Central Thickened Discharge (CTD) method of tailings management; and

(c) ground water use and management that exceeds the existing conditional approval.

Recommendation 3

Noting that future development of Olympic Dam and mining in general, sustainability of the pastoral industry and protection of natural assets such as the mound springs in the Great Artesian Basin, will all be adversely affected by inadequate management of the Basin as a water resource, it is recommend that:

(a) the Commonwealth Minister for Primary Industries and Energy use his best endeavours to ensure that all relevant jurisdictions and user groups agree on a strategic plan for use of Great Artesian Basin waters; and
(b) that Commonwealth and State Ministers responsible for Great Artesian Basin management in relevant jurisdictions expand programs to cap unused wells to reduce significant water wastage, currently estimated by AGSO at 15 - 20% of flowing artesian bores.

Recommendation 4

It is recommend that WMC works in close consultation with the Great Artesian Basin Consultative Council and other major users of the resource to establish and maintain environmental management plans and to accommodate recommendations made by the Great Artesian Basin Consultative Council and similar bodies for appropriate management of the water resources of the Great Artesian Basin.

Recommendation 5

That the action Minister notes the proposed South Australian recommendations that relate to South Australian government legislation.
South Australian Recommendations

It is recommended by the South Australian Minister for Transport, Urban Planning and the Arts that the following conditions be taken into account when the Minister for Primary Industry, Natural Resources and Rural Development makes a decision under Section 7(2) of the Roxby Downs (Indenture Ratification) Act 1982.

Recommendation 1

Should a further expansion of operations, including methods of tailings management, be proposed at the Olympic Dam mine, WMC should advise the State government who will confer with the Commonwealth government regarding the following issues:

(a) the use of plant and equipment of major variation to existing approved plant and equipment;
(b) before installation of a new tailings management system; and
(c) water usage and extraction, which is at variance with the present approval under a conditional Special Water Licence.

Recommendation 2

That WMC ensure that existing and proposed arrangements for the transport of uranium oxide from Olympic Dam mine to Adelaide shall continue to comply with appropriate Commonwealth and South Australian legislation.

Recommendation 3

That WMC contribute appropriate technical expertise and support, in association with the Great Artesian Basin Consultative Committee (GABCC), towards the development of a strategic management plan for the water resources of the GAB, along with other users and stakeholders in the region.

Recommendation 4

That the collection and use of both spring flow and wellfield observation data by WMC, to refine aquifer parameters and re-estimate draw down effects at spring groups, be undertaken at regular intervals and the revised predictions presented to the Olympic Dam Environment Consultative Committee as they become available.
Recommendation 5:

That contingency measures and a response plan be defined by WMC to address significant variations in monitored and/or predicted draw down or flow rates at mound springs and that the responsibility for any contingency response be that of WMC, and that WMC advise the Olympic Dam Environment Consultative Committee of any contingency response.

Recommendation 6:

That the WMC mound spring and wellfield monitoring program continues (and be expanded where appropriate), to enable the collection of a long term data set to achieve a better understanding of the biological fluctuations in these systems. The results of the monitoring program are to be presented annually to the Olympic Dam Environment Consultative Committee and the GABCC.

Recommendation 7

That WMC commit to reduce the demand on water resources to the maximum amount possible, both at the mine and at Roxby Downs township, by the efficient use of water supply and usage practices.

Recommendation 8

That WMC work in close consultation with the GABCC and other major users of the GAB resource, to establish and maintain environment management plans and to address recommendations made by the GABCC and similar bodies for appropriate management of the water resources of the GAB.

Recommendation 9

That WMC make available to the scientific community, the Olympic Dam Environment Consultative Committee and to the GABCC, monitoring data relating to fauna and flora in and around its lease areas and for mound springs monitored by WMC.

Recommendation 10

That WMC undertake monitoring of groundwater quality (hydrochemistry) into the long term possibility of movement of more saline water into the main artesian aquifer (the Algebuckina Sandstone), due to interaction between aquifers and report the findings to the Olympic Dam Environment Consultative Committee and appropriate regulating authorities.
Recommendation 11

That WMC must continue research into the identification and assessment of alternative water supplies and review the viability of identified options, taking into account changes in technology and economics. WMC is to report on progress to the Olympic Dam Environment Consultative Committee.

Recommendation 12

That the hydrogeological regimes of the Andamooka Limestone and Arcoona Quartzite aquifers and their degree of hydraulic interconnection be better defined by WMC in order that the environmental impacts of potential seepage from the TRS and mine water disposal pond can be properly evaluated and monitored. WMC must indicate progress in this regard to the Olympic Dam Environment Consultative Committee.

Recommendation 13

That the Town Administrator and the proposed Roxby Downs Town Board adopt a township cat control policy.

Recommendation 14

That the relevant State government agencies monitor any increase in need for services with the expected population increase at Roxby Downs Township.

Recommendation 15

That a Plan Amendment Report (PAR) for the Roxby Downs Township be investigated as a mechanism to resolve a number of the issues raised by the community.

Recommendation 16

That educational requirements at Roxby Downs be monitored by the Department of Education, Training and Employment.

Recommendation 17

That DPINR evaluate the formation of a new Roxby Town Board, as a communication forum on town management issues.
8. REFERENCES


Olympic Dam Project Assessment of the Environmental Impact, South Australian Department of Environment and Planning, November 1983.


Survey and Assessment Report Supplementary Environmental Studies for the Borefield B Development, WMC Copper Uranium Division WMC (Olympic Dam Corporation) Pty Ltd, August 1995.


Environmental Review of the Olympic Dam Operations, WMC Copper Uranium Division WMC (Olympic Dam Corporation) Pty Ltd (following designation of the Development under the Commonwealth Environmental Protection (Impact of Proposals) Act), November 1995


Roxby Downs Water Leakage, Environment, Resources and Development Committee, 19th Report to the Parliament of South Australia, April 1996.


Waste Management Programmes 1987-1995 and associated annual reports, and