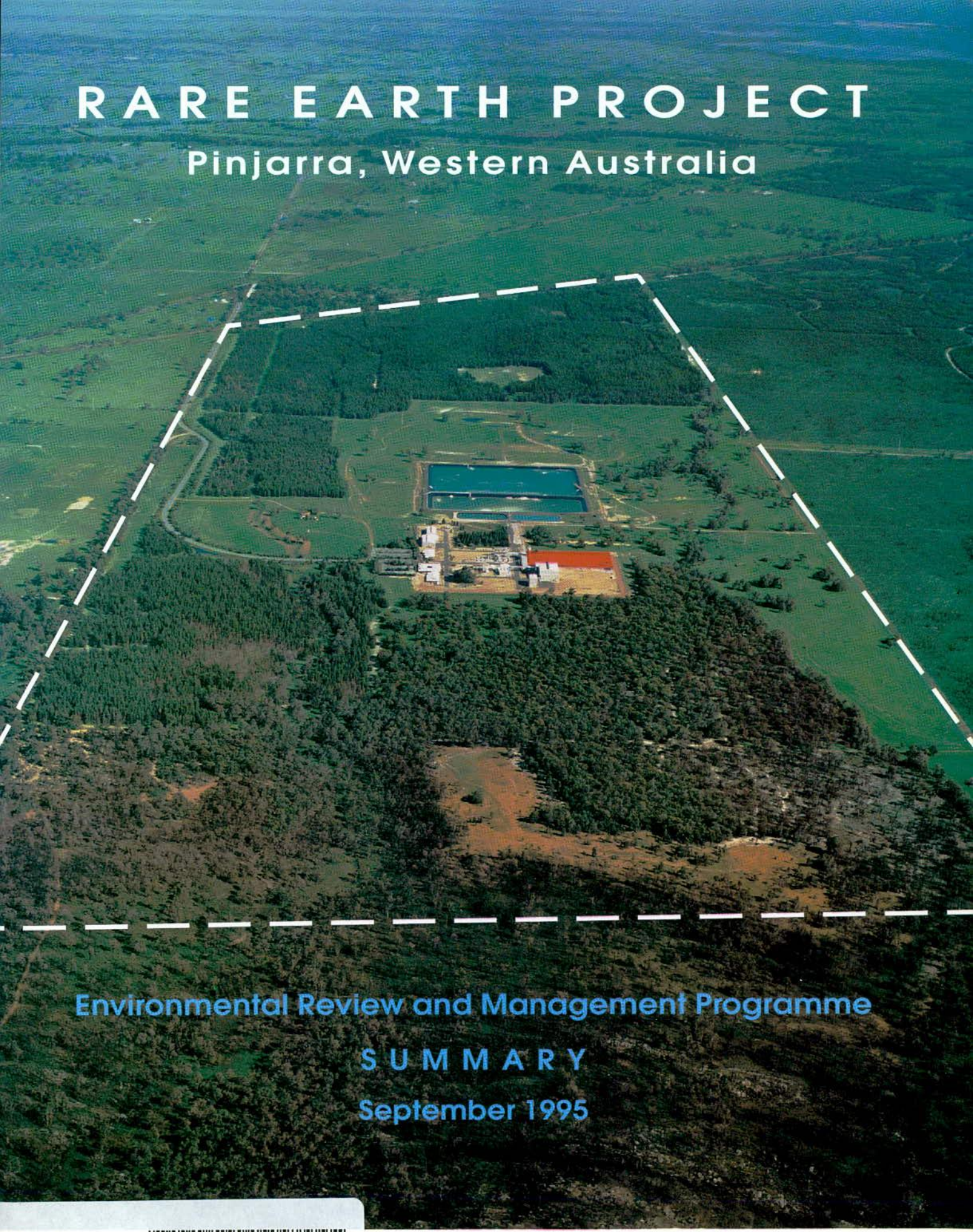
RARE EARTH PROJECT

Pinjarra, Western Australia



Environmental Review and Management Programme

SUMMARY

September 1995

RHÔNE-POULENC

TY LTD

DAMES & MOORE

ENGINEERING EXCELLENCE · ENVIRONMENTAL RESPONSIBILITY

COVER:
Aerial view of Rhône Poulenc's Pinjarra property.
The dash line denotes the property boundary and the
proposed location of the Rare Earth Plant is shown in red.

ENVIRONMENTAL REVIEW AND MANAGEMENT PROGRAMME
RARE EARTH PLANT

SUMMARY

PURPOSE OF THE SUMMARY DOCUMENT

Rhône-Poulenc Chimie Australia Pty Ltd proposes to develop a Rare Earth Plant on a site adjacent to the existing Rhône-Poulenc Gallium Plant 100km south of Perth and 9.5km southeast of Pinjarra.

The summary document is designed to give the public a basic understanding of the Project's environmental impact and management proposals, which are presented in detail in the Environmental Review and Management Programme (ERMP) for the Rare Earth Plant at Pinjarra.

Whilst you are welcome to make a submission on the ERMP using the information contained in the summary it is recommended that the complete ERMP document be read to obtain a clear understanding of the project and to make a more informed submission.

The ERMP will be available for public review between 16 October 1995 and 27 December 1995.

During this period copies can be examined at:

- Department of Environmental Protection
  Library Information Centre
  8th Floor, Westralia Square
  141 St George's Terrace
  PERTH WA 6000

- Department of Environmental Protection
  Bunbury Office
  65 Wittenoom Street
  BUNBURY WA 6230

- Department of Environmental Protection
  Kalgoorlie Office
  377 Hannan Street
  KALGOORLIE WA 6430

- The following Libraries:
  - Shire of Murray Library
  - Shire of Yilgarn Library
  - Shire of Coolgardie Library

Copies of the ERMP may be purchased for the sum of $10.00 each (including postage and packaging) from:

- Rhône-Poulenc Chimie Australia Pty Ltd
  Information Centre
  Lot 27, George Street
  PINJARRA WA 6208

  Rhône-Poulenc Chimie Australia Pty Ltd
  PO Box 355
  PINJARRA WA 6208
  (mail order copies)

  or

  Dames & Moore
  5th Floor
  South Shore Centre
  85 The Esplanade
  SOUTH PERTH WA 6151

The summary document is available free of charge from the above addresses.

Submission on this proposal are invited by 25 December 1995.

Please address your submission to:

Chairman
Environmental Protection Authority
8th Floor, Westralia Square
141 St George's Terrace
PERTH WA 6000
Attention: Ms Xuan Nguyen

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Rhône-Poulenc Chimie Australia Pty Ltd

SUMMARY

1.0 INTRODUCTION

Rhône-Poulenc Chimie Australia Pty Ltd (Rhône-Poulenc - the Proponent) proposes to develop a Rare Earth Plant on a site adjacent to the existing Rhône-Poulenc Gallium Plant. The plant site is located approximately 100km south of Perth, 30km southeast of Mandurah, the nearest regional centre and 9.5km southeast of Pinjarra, the nearest town (Figures 1 and 2).

The project will involve the processing of monazite ore to produce rare earth nitrate for export. Solid waste from the process will be disposed of at the approved Government Intractable Waste Disposal Facility (IWDF) near Mt Walton located in the Goldfields (Figure 1).

Monazite is produced in Australia as a by-product from the processing of mineral sands to produce the titanium minerals, ilmenite, rutile and zircon. It is a rare earth phosphate which also contains small quantities of other elements including thorium (approximately 6 percent ThO_2), uranium, iron, titanium and other metals. The monazite feedstock for the proposed processing plant will be obtained from existing mineral sand separation plants at Narngulu (near Geraldton), Eneabba, Capel and Bunbury in Western Australia (Figure 1).

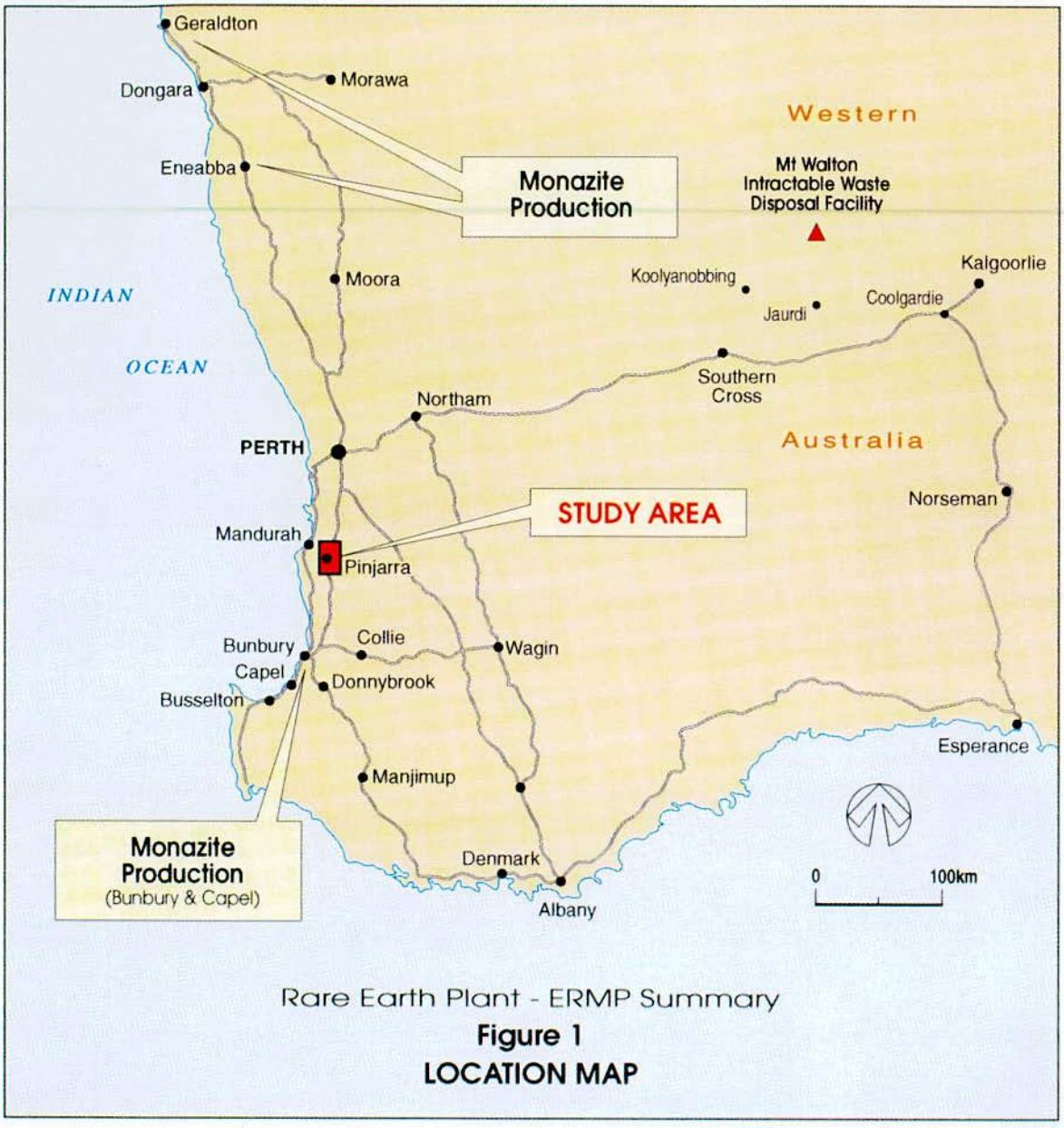
Following referral of the project to the Western Australian Environmental Protection Authority (EPA), the Proponent was notified that the project should be formally assessed as an Environmental Review and Management Programme (ERMP). The ERMP aims to provide relevant details of the project and the proposed management techniques to enable the environmental acceptability of the project to be assessed. This document is a summary of the ERMP.

1.1 HISTORY OF PREVIOUS PROJECT

Rhône-Poulenc was granted approval by the Western Australian Government to develop a gallium extraction plant at the Pinjarra site in 1987. The Gallium Plant was designed and constructed during 1987-1989 and was operational from 1989-1990 at which time it was placed on a care and maintenance programme due to a downturn in market conditions of gallium. The establishment of the Rare Earth Plant will facilitate the early restart of the Gallium Plant.

Rhône-Poulenc also sought to establish a Rare Earth Plant at the Pinjarra site in 1988. The 1988 project was subject to environmental impact assessment under Western Australian and Commonwealth Government legislation.

The Federal Environment Protection Agency approved the complete project subject to the WA EPA's assessment. The EPA found Stage I (to produce rare earth hydroxide) of the rare earths project to be environmentally acceptable (subject to various conditions) but that Stage II (to separate the rare earths from the rare earth nitrate) of the project, which would generate quantities of ammonium nitrate as a by-product, was not environmentally acceptable due to the concern of long term storage of the ammonium nitrate residue at the Pinjarra site. In response to the assessment Rhône-Poulenc developed a revised strategy for the management of the waste by-product (principally ammonium nitrate).



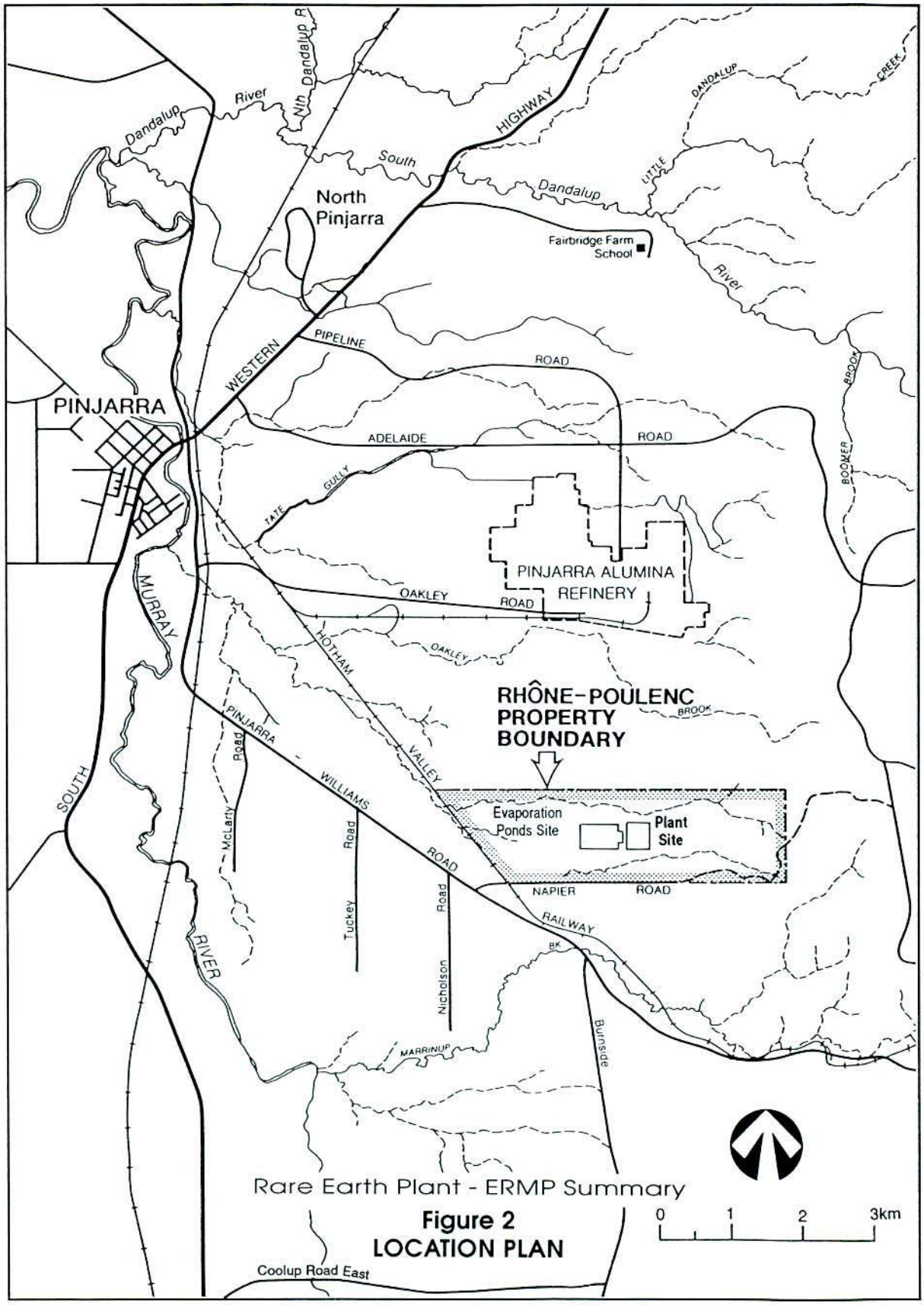
Rare Earth Plant - ERMP Summary

Figure 1
LOCATION MAP

An ERMP was prepared for the revised strategy, however, it did not receive formal assessment as Rhône-Poulenc withdrew their proposal in 1990 due to commercial reasons.

1.2 DIFFERENCE BETWEEN THIS PROJECT AND PREVIOUS RARE EARTH PROJECT

The major concern with the previous project related to the disposal of waste products associated with Stage II, in particular ammonium nitrate and the radium contaminated ammonium nitrate. Rhône-Poulenc's current project involves a different process which does not result in the generation of ammonium nitrate or a separate radium stream, thereby effectively eliminating the waste streams of concern. The revised scope of the project involves the processing of monazite ore to produce a rare earth nitrate, tricalcium phosphate as a by-product and low level radioactive material (gangue residue) as the principal waste product.



Rare Earth Plant - ERMP Summary

Figure 2
LOCATION PLAN

The radium content of the monazite previously proposed to be disposed of with the ammonium nitrate stream, will now be contained in the low level radioactive waste as an insoluble co-precipitate of barium sulphate. The addition of the radium to the waste will not significantly alter the radioactivity of the gangue residue.

Subsequent to the public release of the previous ERMP/Draft EIS, the waste disposal facility component of the 1988 project was incorporated into the State Government's proposal for an Integrated Waste Disposal Facility, since re-named the Intractable Waste Disposal Facility (IWDF), located near Mt Walton in the Eastern Goldfields (Figure 1).

A Public Environmental Review (PER) was prepared by the Health Department of Western Australia which included the proposal to dispose of 7,000 tonnes of thorium hydroxide waste, generated by the processing of monazite to produce rare earths, at the IWDF. The PER, including the disposal of thorium hydroxide waste, was assessed by the EPA and then subsequently approved by the Minister for the Environment subject to certain environmental conditions. Number 5 of the Ministerial conditions states: "Prior to commissioning, the proponent shall prepare an Environmental Management Programme (EMP) to the satisfaction of the Environmental Protection Authority". In this context, the proponent refers to the operator of the IWDF, currently the Western Australian Department of Environmental Protection's (DEP's) Waste Management Division who will be responsible for the waste. To conform with the Ministerial conditions, the DEP's Waste Management Division will prepare an EMP on waste disposal operations. The EMP will be available for public comment during the ERMP public review period.

The PER for the IWDF and the subsequent EPA Report and Recommendations and Ministerial Conditions stipulated that the proponent of the IWDF site would own and operate the facility and would assume responsibility for collection of the waste from storage and transport to the waste disposal site. However, Rhône-Poulenc has been advised that the transport of the low level radioactive waste to the IWDF will be their responsibility, therefore the transport of the waste will be assessed as part of Rhône-Poulenc's project.

Evaporation ponds already constructed on-site for effluent from the Gallium Plant will be used for the disposal of the non-radioactive liquid process wastes and for the temporary storage of tricalcium phosphate prior to sale to the fertiliser industry. There will be no ammonium nitrate disposed of in the ponds in contrast to what was proposed in the 1988 project.

1.3 THE PROPONENT

The Proponent for the project is:

Rhône-Poulenc Chimie Australia Pty Ltd
Lot 1 Napier Road
Pinjarra WA 6208
ACN 009 237 718

Postal address
Box 355
Pinjarra WA 6208

Rhône-Poulenc Chimie Australia Pty Ltd is a wholly-owned subsidiary of Rhône-Poulenc Chimie SA which is a French company. However, the ownership of Rhône-Poulenc Chimie Australia Pty Ltd will be transferred to Rhône-Poulenc Australia Holdings Pty Ltd which is the leading company for the 100% owned Rhône-Poulenc Australia operations. Rhône-Poulenc has operated in Australia since the 1930s and has invested $150 million in local manufacturing and operations. The Rhône-Poulenc Australia Group employs 500 people with approximately 75% of Australian turnover having local manufactured added value. All profits and cash flows generated in Australia have been reinvested in the business to support local growth and investment. The Group plans to invest a further $70 million in Australia of which $50 million relates to rare earth processing.

Rhône-Poulenc (and its predecessor, Societe des Terres Rares) has been processing monazite since the beginning of the 20th Century and is acknowledged to be a world leader in the field. Rhône-Poulenc, a publicly listed company, is the largest chemical and pharmaceutical group in France, and one of the largest in the world. It is a global company with over 25% of its business in North America and has approximately 81,000 employees worldwide. The group operates in four main sectors, namely:

- chemicals;
- health products;
- fibres and polymers; and
- agricultural chemicals.

Rhône-Poulenc was one of the first chemical companies in the world to set environmental targets for waste and emission reductions through to the year 2000 and reports its progress, environmental actions and plans publicly each year. A copy of the 1994 Rhône-Poulenc environmental report is available from the above address.

Rhône-Poulenc is actively pursuing forming a consortium with the Australian titanium mineral producers which may change the identity of the Proponent. Until any consortium arrangements are finalised, Rhône-Poulenc will be solely responsible for the project.

Management of the waste disposal operations at the IWDF will be the responsibility of the DEP's Waste Management Division. However, the Proponent will fund all costs of operations for the disposal of waste from the Rare Earth Plant.

1.4 TIMING, OBJECTIVE AND LEGISLATION

It is intended that the construction of the plant should commence in early 1996, with commissioning scheduled for early 1997. Once approval is obtained for the Rare Earth Plant the Gallium Plant will be recommissioned to commence production in 1996. The expected life of the project is a minimum period of 20 years, however, this could be extended depending on the longevity of the monazite source from the Titanium Mineral Producers.

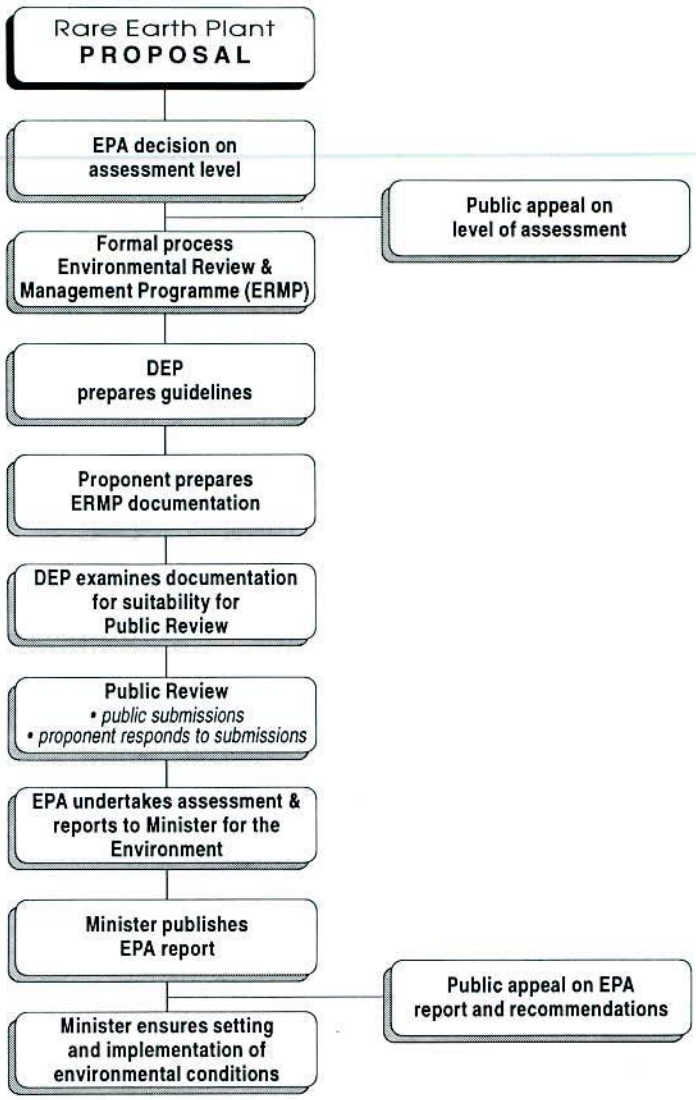
The general objective of the project is to develop a processing industry that will add value to a commodity that is currently a non-commercial by-product from mineral sands separation plants which must be returned to the mine site for disposal.

The Rare Earth Plant will be designated a mine for the purpose of the Mines Regulations Act, 1974. In addition to obtaining approval from the State Minister for the Environment, the Proponent will have to comply with legislation and regulations administered by a number of Federal and State Government bodies.

1.5 ENVIRONMENTAL IMPACT ASSESSMENT

The Environmental Impact Assessment procedure is a formalised process designed to provide information to the EPA, the DEP and the public about proposed developments with the potential to create significant environmental and social effects.

The Western Australian Environmental Protection Act 1986 was proclaimed on 20 February 1987 (and amended on 14 January 1994) and this project will be assessed under that legislation. Administrative procedures associated with the Act formalise the review process and the enforcement of the Proponent's management commitments. These procedures are illustrated diagrammatically on Figure 3.



Rare Earth Plant - ERMP Summary

Figure 3
ENVIRONMENTAL ASSESSMENT PROCESS

1.6 BENEFITS OF THE PROJECT

The project has a number of significant economic and community benefits, including improved utilisation of Western Australian mineral resources, enhanced export earnings and employment opportunities. The project will add significant value to the monazite which will be processed to produce a rare earth nitrate product which in turn will be exported for processing into rare earth finished products.

Principal applications of rare earths are in catalysts, metallurgy, glass making, lighting, magnets, electronics, ceramics, radiation safety and pigments with significant environmental benefits from some of these applications such as; catalytic converters which reduce emissions from vehicle exhaust, catalysts which reduce particulates in diesel exhausts, high efficiency lighting, X-ray

screens which reduce radiation exposure, and as a replacement for toxic metals in pigments for plastics and paints.

The benefits associated with the project are substantial, and the development of the project is consistent with both the Commonwealth and State Governments' strategy to develop downstream processing of Australia's mineral resources.

Benefits to Australia and Western Australia include:

- the production of value-added export earnings from the rare earth nitrate;
- the potential for downstream industries, utilising value-added products of the processing plant such as the rare earth component of the nitrate product;
- broadening Australia's economic and industrial bases;
- providing income to the Federal Government in the form of income tax and other miscellaneous taxes and charges;
- the generation of up to 150 jobs during the construction phase of the project and at least 50 permanent positions once the plant is operational;
- an increase in the number of indirect employment opportunities through increased demand for materials, goods and services, as a result of using local suppliers and contractors for works associated with the plant and its labour force;
- an additional $27 million per annum of export earnings to the Australian economy;
- the viability of the existing Gallium Plant, which is currently on care and maintenance, will be improved through the sharing of labour and services and will be recommissioned during the establishment of the Rare Earth Plant;
- the restart of the Gallium Plant would add approximately $20 million per annum of export earnings to the Australian economy and at least an additional 10 direct employment opportunities;
- a total industrial investment of some $100 million ($50 million for the Gallium Plant; $50 million for the Rare Earth Plant);
- income to the State Government in the form of payroll tax, stamp duties, licence fees and other miscellaneous charges; and
- tricalcium phosphate will be produced as a by-product for use in the Western Australian fertiliser industry.

2.0 EVALUATION OF ALTERNATIVES

The principal project alternatives evaluated are those relating to packaging and transport of the monazite and waste and the method of disposal of the waste at the IWDF.

The preferences for the location of the plant and liquid effluent disposal are largely governed by the existing infrastructure at the Pinjarra site.

Monazite could be supplied to the plant either by road or rail/road in the form of bulk quantities or in two tonne bulka bags. Due to the lack of a suitable railway siding at Pinjarra, it is proposed that monazite will be transported by road from the mineral sands separation plants to the Pinjarra site.

The Proponent will incorporate procedures in the plant design for both bulk and bag input of monazite as the form of packaging has yet to be finalised with the Titanium Mineral Producers supplying the monazite.

The gangue residue will be transported in packaged form. The Proponent assessed both two tonne bulka bags and 200 litre drums for the packaging of waste. Transport in bulka bags is currently preferred as it reduces packaging time, hence a reduction in potential radiation exposure to workers.

Road and a combination of road and rail have been evaluated to assess the health, environmental and economical aspects of transporting the gangue residue from the Pinjarra plant site to the IWDF. The Proponents preferred option is for road transport as it has occupational health,

management and economic advantages over a road/rail combination. There are fewer handling operations of the containers, reducing the potential risk of accidents occurring during the transfer of containers. Direct road transport also reduces the number of people involved in the transport operations, thereby minimising the number of workers with potential radiation exposure. The Proponent, together with the transport contractor will have control over the container movements for the entire route.

The selection of a road route for the road transport of the waste was based on the following criteria:

- the safest route;
- minimisation of the potential impact on communities and traffic;
- Category 1 and Category 2 roads (as defined by DOME) wherever possible;
- four lane roads in preference to two lane roads, where possible;
- roads of suitable width and condition for truck usage;
- the availability of Emergency Response Teams to minimise response time; and
- preference for roads that have already been approved by Main Roads Western Australia for B-double use.

This resulted in a preferred route via:

- Napier Road;
- Pinjarra-Williams Road;
- South Western Highway;
- Albany Highway;
- Tonkin Highway;
- Roe Highway;
- Great Eastern Highway; and
- IWDF Access Road.

3.0 PROJECT DESCRIPTION

3.1 PROJECT OVERVIEW

The Rare Earth Plant will be designed to receive, store and process up to 12,000tpa of monazite to produce a solid rare earth nitrate concentrate totalling 15,000tpa. It is a possibility that some of the rare earth nitrate product will be produced in liquid form. The product will be transported by road to Fremantle for export to France and the USA. The product will not be radioactive.

The Rare Earth Plant will produce a neutralised slurry effluent, comprising mainly tricalcium phosphate (TCP) (23,000tpa) which is largely insoluble, and a low level radioactive solid residue (gangue residue) (6,000tpa) containing thorium, uranium and their radioactive decay products.

The tricalcium phosphate slurry will be held in an evaporation pond from where the solid will be removed as a filter cake and recycled as a source of phosphate for the fertiliser industry.

The remaining effluent water will be evaporated in the ponds.

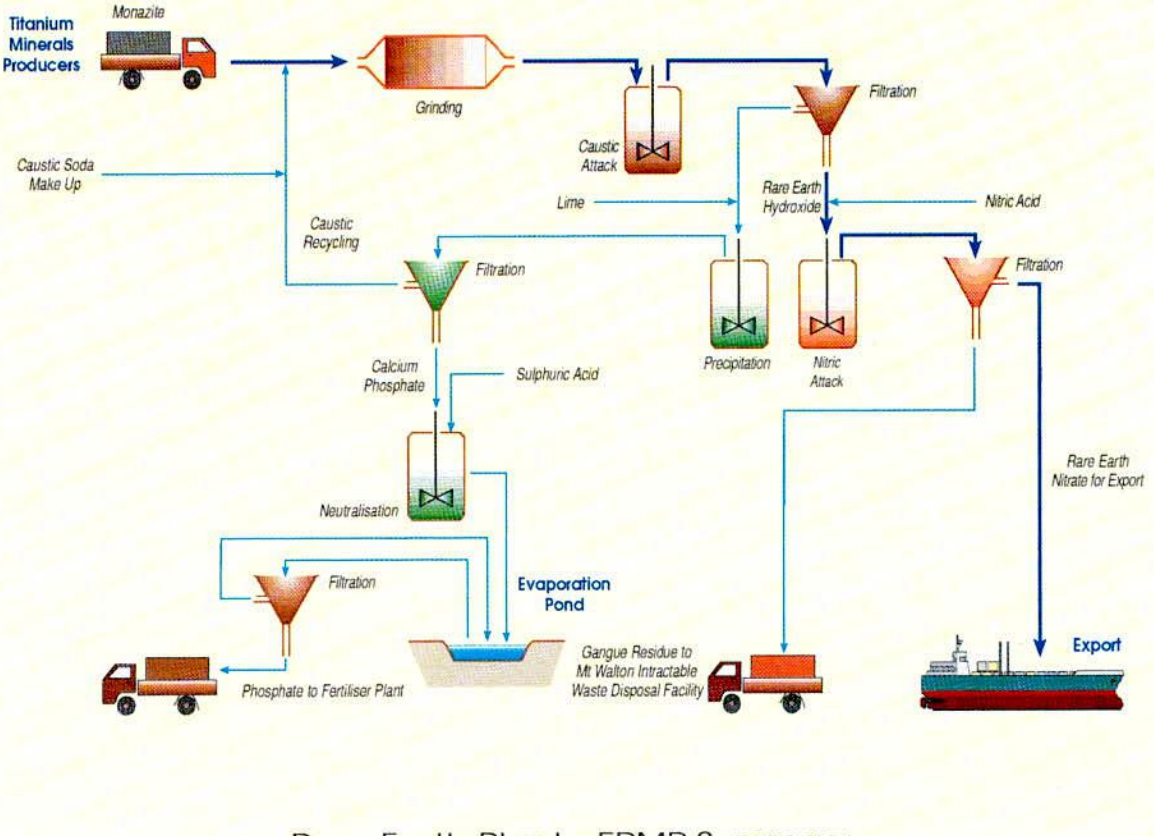
The gangue residue will be transported to and disposed of at the IWDF. The site of this facility was selected so that it could accept low level radioactive waste such as that to be produced by the Rare Earth Plant due to its geological structure in particular the deep clay structure (which will act as a barrier between the waste and the surrounding environment), the absence of potable aquifers and the remoteness of the site.

Figure 4 presents a diagrammatic overview of the project.

3.2 PROCESS DESCRIPTION

Processing extracts the rare earth elements from the monazite ore. This involves the following stages:

- **Ore attack:** the cracking of the ground monazite ore by caustic soda resulting in a slurry mixture of trisodium phosphate in solution and solid rare earth hydroxide. This solid contains all constituents of the monazite except the phosphate.



Rare Earth Plant - ERMP Summary

Figure 4
SCHEMATIC DIAGRAM OF THE PROJECT OVERVIEW

- **Hydroxide separation and caustic recycling:** the rare earth hydroxide will then be separated from the trisodium phosphate solution, backwashed and filtered to form hydroxide cake. The phosphate stream will be treated with lime to recover caustic soda and to produce tricalcium phosphate as a by-product. The caustic soda will be separated from the tricalcium phosphate by filtration and reconcentrated for recycling to the ore attack unit.

The tricalcium phosphate will be neutralised with sulphuric acid and/or with acidic effluent from the Gallium Plant before being stored in the evaporation pond. This pond will act as a temporary storage from which tricalcium phosphate cake will be recovered and recycled as a phosphate for on-selling to the fertiliser industry.

- **Acid attack of hydroxide:** the hydroxide cake will be dissolved in nitric acid and chemically treated with barium, sulphuric acid and caustic soda to precipitate out its entire radioactive content (thorium, uranium and the decay products). The precipitated solid will be filtered out to leave a non-radioactive solution of rare earth nitrate. The solid will then be transported to the IWDF site. The rare earth nitrate stream will be concentrated by evaporation, cooled and packaged for export as the final product of the plant.

3.3 RAW MATERIALS, PRODUCTS AND WASTE

Raw materials including monazite and process chemicals will be sourced in Western Australia and transported to the site by road in accordance with the appropriate transportation regulations and codes.

Monazite feedstock will be stored adjacent to the gangue material in a dedicated storage area. Special design and operating procedures will be implemented to ensure fully controlled management of the monazite and gangue material resulting in safe operating conditions for workers.

Process chemicals will be stored in a dedicated liquid storage area of the plant (Figures 5 and 6). Storage tanks will be provided for sulphuric acid (H_2SO_4) ($100m^3$) hydrochloric acid (HCl) ($50m^3$) and nitric acid (HNO_3) ($150m^3$). Each tank will be contained in a separate bunded area to avoid any possible mixing of chemicals in the event of an accidental spill. Storage tanks for the sulphuric and hydrochloric acids and the bunded area for the nitric acid storage tank have already been constructed for the Gallium Plant, therefore only the construction of the nitric acid storage tank is required. The design layout and storage of the acids will be in accordance with the Dangerous Good Regulations (1992). The existing storage tanks for the Bayer Liquor Streams (Input - $30m^3$; Output - $100m^3$) are located in a separate bunded area (Figure 6) together with the two existing caustic soda tanks ($50m^3$ each). Separate storage areas will be constructed for the reducing agents.

Separate drainage systems have been designed for each bunded area to collect and direct any spill to a special pit from which it is then directed to the process effluent collecting pit and then returned, with other effluents, to the plant effluent neutralisation facility.

Caustic soda will be delivered directly from the nearby Alcoa Pinjarra Refinery via the existing pipeline constructed for the Gallium Plant.

The rare earth nitrate product will be packaged and transported from the Pinjarra site to Fremantle by road. Tricalcium phosphate by-product will be stored temporarily in the evaporation pond and then recovered and filtered prior to being transported by road from the Pinjarra site to Kwinana.

The main wastes generated by the process and their proposed disposal methods will be:

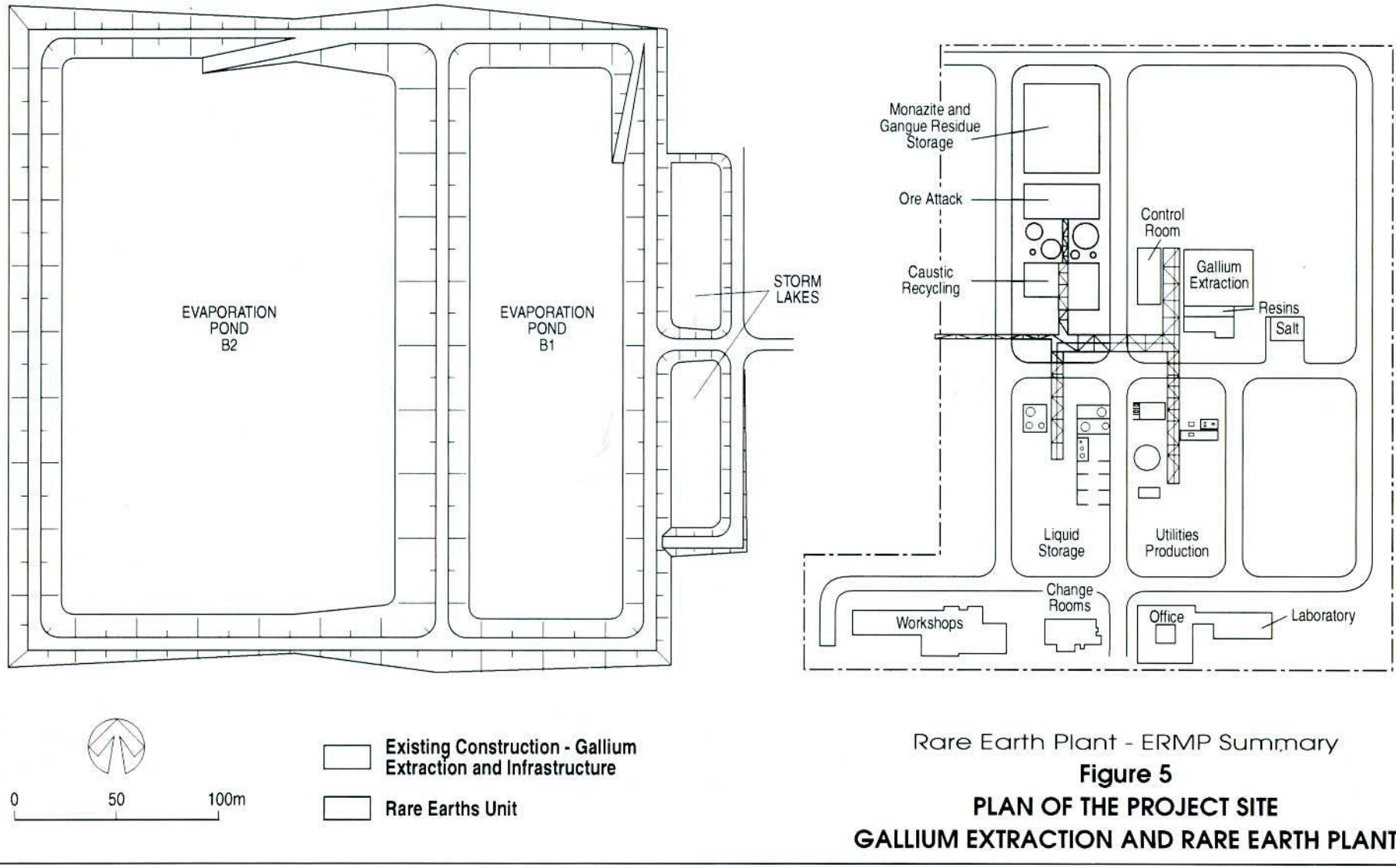
- slurry effluent, principally comprising tricalcium phosphate, which will be directed to the evaporation ponds for temporary storage prior to transporting to selected fertiliser companies;
- non-radioactive liquid process wastes to be disposed of in the on-site evaporation ponds; and
- low level radioactive gangue residue; containing thorium, uranium and their radioactive decay products, to be disposed of at the IWDF.

A variety of materials will be either disposed of or stored temporarily in the evaporation ponds, the most significant are:

- tricalcium phosphate;
- calcium sulphate;
- sodium sulphate;
- sodium chloride; and
- water.

The existing evaporation pond system constructed for the Gallium Plant at the Pinjarra plant site comprises two stormwater ponds and two larger evaporation ponds (Figure 5). The evaporation pond system was designed and constructed following extensive consultation with appropriate Government authorities and experienced engineering consultants and has been operational for Gallium Plant effluents.

The ponds are underlain by an extensive underdrain system. The system comprises 500mm of sand over a minimum thickness of 500mm *in situ* clay compacted to 98% Standard Maximum Dry Density with a design permeability of 5×10^{-9}m/s (measured permeabilities were less than the design value). The underdrains have been isolated from the pond contents by a 1m thick compacted clay liner which also has a permeability of less than 5×10^{-9}m/s. A high density polyethylene (HDPE) liner was placed over the sides of the ponds to help prevent erosion of the clay.



Rare Earth Plant - ERMP Summary

Figure 5

PLAN OF THE PROJECT SITE

GALLIUM EXTRACTION AND RARE EARTH PLANT

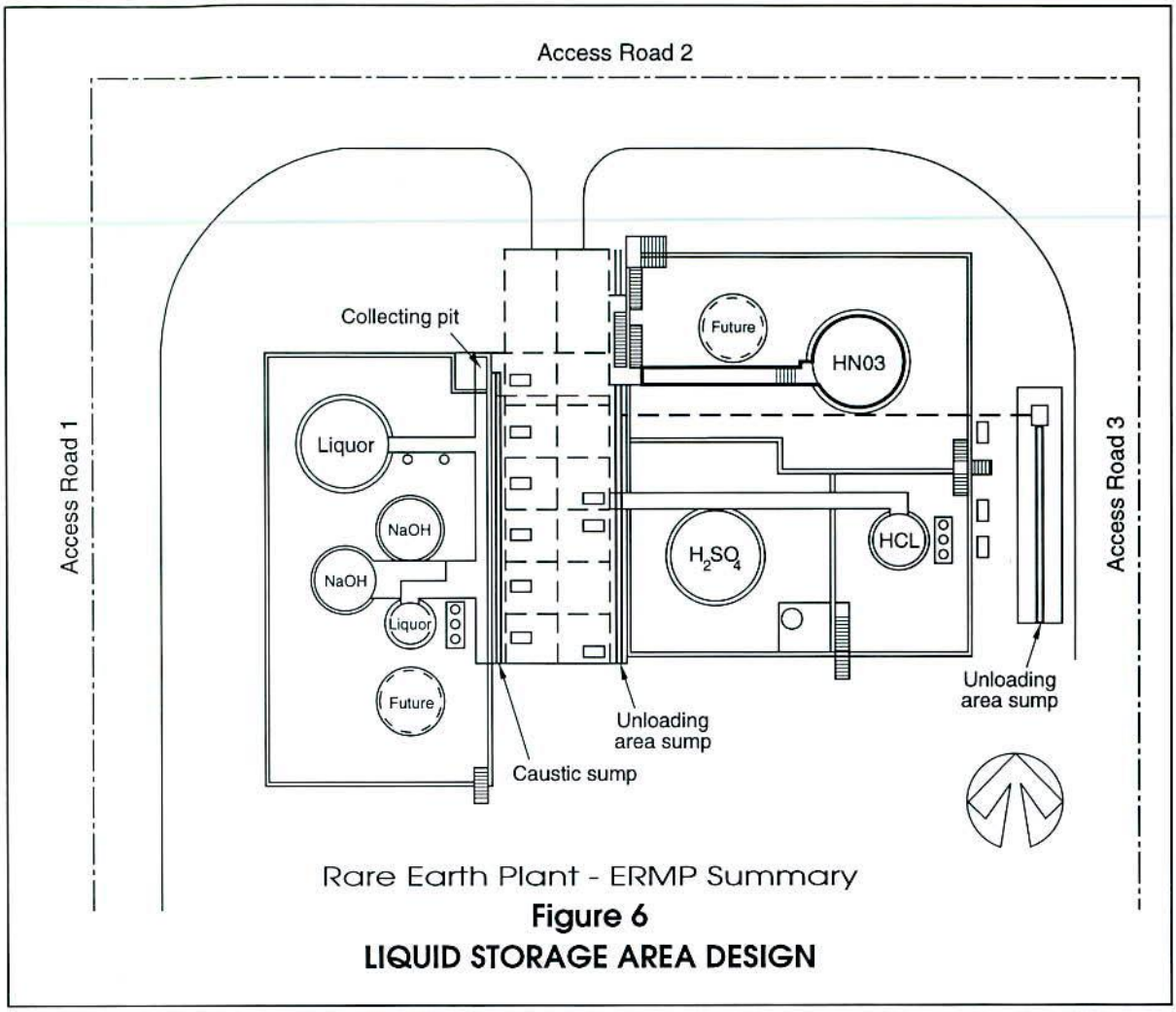


Figure 6
LIQUID STORAGE AREA DESIGN

Gangue residue, containing all the radionuclide streams, will be packaged in bulka bags and loaded into steel containers for transport to the IWDF by road. Process liquid wastes (containing mainly sodium salts) and plant washdowns will be recycled where possible and then directed to the evaporation ponds for disposal.

The gangue residue will contain:

- the non-rare earth fraction of the ore;
- some non-attacked monazite;
- thorium, uranium, iron and titanium as insoluble hydroxides;
- insoluble barium sulphate;
- radium and lead in the form of insoluble barium sulphate co-precipitates; and
- zircon and silica.

The residue will be insoluble and will be sufficiently moist (around 40%) to ensure that it will not dust and to allow it to be readily recoverable should an accidental spill occur. It will contain the radioactive components of the monazite at approximately double the original concentration. The specifications of the waste will conform with the National Health and Medical Research Council Code of Practice for Near-Surface Disposal of Radioactive Waste in Australia and by the operators of the IWDF.

The gangue residue will be automatically placed into heavy duty two tonne bulka bags. The bags containing the residue will be initially stored in a dedicated building and then loaded into either standard ISO steel shipping or purpose built steel containers for transportation. Each truck would carry two steel containers with up to twelve two tonne

bags. Three truck movements a week will be required to transport the waste from Pinjarra to the IWDF via the major roads and highways mentioned previously.

Management of the disposal operations at the IWDF will be the responsibility of the operator of the IWDF and therefore details of these operations are not contained in the ERMP. Disposal of the waste will be subject to separate assessment by way of an Environmental Management Programme (EMP) prepared by the operator of the IWDF. The EMP will be released during the ERMP public review period to allow public assessment of the Rhône-Poulenc project and the subsequent disposal operations.

3.4 INFRASTRUCTURE

The majority of the plant infrastructure and services for the Rare Earth Plant already exists as part of the Gallium Plant. Existing off-site facilities and transport networks will be used where necessary.

4.0 COMMUNITY CONSULTATION PROGRAMME

The Proponent has given a high priority to community consultation during the planning and assessment phases of the project. The community consultation programme commenced at the initial planning stage of the project to enable the following:

- early advice to community and interest groups;
- a genuine two-way consultative process;
- community access to the Proponent's decision-makers; and
- a flexible approach to project planning to accommodate community concerns.

An extensive programme was implemented during the preparation of the ERMP and will continue during the public review period, with follow-on programmes conducted during the construction and operations of the plant.

The programme comprises the following:

- meetings with Federal, State and Local Government bodies;
- issue of media statements;
- distribution of letters to various parties announcing and providing details of the project;
- open day site visits;
- briefings with Murray, Coolgardie and Yilgarn Shire Councils;
- briefings to community and interest groups;
- meetings with shire and city representatives along the transport route;
- meeting with city representatives of Kalgoorlie/Boulder;
- speaking engagements to clubs and other groups;
- distribution of background information leaflets;
- establishment of a free call line as a source of information;
- preparation of a static display for use in the local areas;
- workshops held at Pinjarra, Coolgardie and Southern Cross;
- establishment of an information centre in Pinjarra;
- direct mail information to local residents;
- a workshop held with Conservation Council representatives; and
- briefings to the Mt Walton Community Liaison Committee.

Key issues raised by community groups fall into five principal categories:

- transport;
- plant site safety;
- environmental management at both the Pinjarra site and the IWDF site;
- social issues; and
- philosophical concerns (general concerns not directly related to the Proponent).

Specific questions were raised at the workshops, these were recorded and answered by the Proponent and its technical advisers at the workshop when time allowed. All of these questions are documented in the ERMP with the Proponent's response.

5.0 EXISTING ENVIRONMENT

The existing environment of the Pinjarra area has been well described as a result of the various developments proposed for the area. The climate is temperate mediterranean with a substantial excess of evaporation over precipitation. The plant lies in the foothills of the Darling Scarp and extensive site studies have been undertaken to assess and describe the climate, geology, hydrogeology, biology, radiology, heritage, ethnography and archaeology of the site.

The site is located above thick sedimentary sequences of the Perth Basin. Regional groundwater flow is to the west and northwest and surface drainage flows in two westward-flowing streams, one towards the Murray River and the other flowing into surface sands.

There is no native vegetation left on the actual plant site. There are a few remaining Jarrah (Eucalyptus marginata) and Marri (*E. calophylla*) scattered through the property. Approximately 190ha of trees have been established on the property comprising of native trees and shrubs planted around the southern border and a hardwood plantation of Blue Gums (*E. globuli*) developed by CALM.

The primary land use of the region is farming, forestry and mining. Shires of Murray, Mandurah and Waroona have been selected for the purpose of the study. Population projections for the study region indicate higher levels than Western Australian growth rates. Unemployment in the study region is higher than the State average, however, this figure is largely attributable to Mandurah, which comprises 70% of the workforce, with a high unemployment rate.

Ethnographical and archaeological studies have identified a disused Aboriginal camp site on the Proponent's property. There is now no physical sign to mark the site of the camp and its mapped location is based totally on memory of the Aboriginal people consulted. No further disturbance is planned near the location of the temporary campsite.

A survey of baseline radiation levels at the plant site was carried out in 1988. The results suggest that the site already has natural levels of radiation which are above world average levels but are within the range of natural background radiation levels found in Western Australia. A further survey of the plant site and surrounding areas for radiation levels concerning radon and radon daughters will be undertaken prior to commissioning of the plant.

6.0 ISSUES AND MANAGEMENT

The principal environmental issues relate to the fact that monazite, the ore that will be processed to produce rare earth nitrate, contains radioactive elements. The radioactive component will not be recovered in the process and will be contained in the waste material generated by processing monazite. The waste will be transported to the IWDF. In addition to the monazite feedstock, other raw materials such as acids and lime will be required for the process.

A summary of the issues and management relating to the project is presented as Table 1.

The main environmental issues fall into three categories:

- transport;
- waste disposal; and
- radiological issues.

6.1 TRANSPORT

The existing road network will be used for the transport of all materials for the project and for workforce and service vehicle movements. The increase in existing heavy vehicle movements on roads in the Pinjarra area is in the order of 4-18%. Vehicle movements due to the operations workforce would increase the existing traffic volumes by about 5%.

Monazite and some of the process chemicals are classified as Dangerous Goods and transport handling methods will conform to

the requirements of the Dangerous Goods Regulations, 1992. In addition, the transport of monazite will comply with the Code of Practice for the Safe Transport of Radioactive Substances, 1990 (referred to as the Code for Transport) (Commonwealth of Australia, 1990). There is a good safety record for these materials being transported on metropolitan and country roads in large quantities. The relative increase in the number of truck movements of these materials due to the project will be small.

Three truck loads of gangue residue will be transported from the plant site to the IWDF each week. The transport will be in compliance with the Code for Transport (Commonwealth of Australia, 1990).

The gangue residue will be in the form of a moist clay and will be insoluble, non-toxic and will not be a chemical hazard. It is classified as Low Specific Activity Type I material for the purpose of transport which is the lowest category of hazard for the transport of radioactive materials. The hazard of this material is very low when compared with other radioactive materials regularly transported throughout the State such as industrial radiography sources, radio-pharmaceuticals and some other industrial sources. It also represents a low hazard when compared with the transport of other common hazardous materials such as LPG, petrol, sodium cyanide, chlorine and chlorine compounds and many other chemicals regularly transported by road.

A driver safety training programme and an emergency response plan will be prepared by the Proponent to minimise the risk of spillage of waste and, in the unlikely event of an accident, stipulate procedures to minimise any human health risks and clean-up any spilt material.

6.2 WASTE DISPOSAL

The effluent disposed of in the evaporation ponds will comprise non-radioactive liquid process wastes containing sodium salts, water from plant washdown areas and, if necessary, water from the stormwater pond. Rare Earth Plant process wastewaters will be neutralised by Gallium Plant effluent and will be non-toxic and pose little potential impact to the environment even in the unlikely event of seepage.

The design features of the evaporation ponds will ensure that, in addition to the substantial clay liner which minimises leachate from the ponds, any material seeping through the clay liner will be intercepted by the underdrainage system and returned to storage.

Management of potential leachates will be facilitated by the groundwater monitoring system that is already in place at the plant site. This system allows abstraction from the bores as well as groundwater level and quality determination and will thus indicate any development of leachate plumes in the subsurface and allow for plume recovery.

Results of groundwater monitoring have indicated that there have been no significant changes in the chemistry of the groundwater under the site due to the presence or operation of the evaporation ponds. The monitoring bores will continue to be monitored on a regular basis with the monitoring programme extended upon commissioning of the Rare Earth Plant.

Disposal of low level radioactive waste, resulting from mineral processing such as monazite, at the IWDF was previously proposed by the Health Department of Western Australia and was subsequently given conditional approval by the Western Australia Minister for the Environment. One of the approval conditions is that the operator of the IWDF shall prepare an EMP to the satisfaction of the EPA and this made available to the public. Therefore, the current operator of the IWDF (DEP's Waste Management Division) is preparing an EMP which will be available for public comment during the ERMP public review period.

The Government operator of the IWDF will take responsibility for the management of the waste and disposal operations at the IWDF site with the Proponent funding:

- planning of site operations with respect to Rhône-Poulenc's waste disposal costs;
- backfilling and rehabilitation of the trench area;
- monitoring of the disposal operations for Rhône-Poulenc's waste;
- a contribution to long-term monitoring of the site;
- a contribution, together with other users of the road such as mining companies, to the maintenance of the IWDF access road;
- a provision for maintenance and any costs of remedial work necessary in the first five years after a disposal operations; and
- the proportion of salaries and overheads for agreed Government management staff and site management contractors in relation to disposal of Rhône-Poulenc's gangue residue, including a proportion of out-of-pocket expenses related to the involvement of Government staff on the technical committee.

Gangue residue is a low level radioactive waste, therefore it must be disposed of correctly. Disposal operations and management of such operations will be in accordance with the following requirements:

- existing Ministerial conditions for operation of the IWDF site;
- applicable legislation;
- the National Health and Medical Research Council Code for Near-Surface Disposal of Radioactive Waste;
- the EMP for the disposal operations; and
- the IWDF site Radiation Management Plan (RMP).

The total area, of the IWDF site is approximately 2,500ha, an area of 6ha (0.25% of the total site area) will be required for 20 years disposal of waste from the Rare Earth Plant.

6.3 RADIOLOGICAL ISSUES

The principal issues relating to the radiological components of the project are:

- radiation from the plant;
- transport of the monazite and gangue residue; and
- disposal at the IWDF site.

6.3.1 Plant

Radiation protection procedures are required to ensure that workers and the general public do not receive unacceptable levels of exposure. These procedures apply to all aspects of the project where radioactive materials are handled or processed, including:

- transport of monazite feedstock to the Pinjarra plant;
- transfer of monazite to the mill;
- grinding of monazite;
- removal of phosphate from the monazite matrix by dissolution with sodium hydroxide to produce a filter cake of rare earth hydroxide;
- dissolution of the rare earths from the rare earth hydroxide with nitric acid;
- precipitating of radium with barium sulphate; and
- packaging, transport and disposal of gangue residue containing the radioactive components of the monazite.

The Rare Earth Plant has been specifically designed in its layout to minimise radiation exposure to workers. The overall layout is designed to separate the parts of the plant where radioactive materials are handled from the rest of the process units (Figure 5), resulting in well defined restricted areas and better control of access by personnel.

The radiation objectives for design and management of the plant will be approximately half (10-12mSv per year) the regulatory dose limits for radiation exposure of 20mSv per year. A principal objective will be to minimise doses to workers and the general population ensuring that, with occupancy factors and other administrative precautions, the doses will be as low as reasonably achievable (ALARA).

An operational dose constraint for plant personnel of 10mSv/year will be established by the Proponent. If any worker appears to exceed this level or does exceed the pro-rata dose in any monitoring period, the Proponent will investigate the circumstances of the exposure and implement measures to ensure that the worker or any other worker will not receive exposure in similar circumstances. The Proponent will thus use the concept of operational dose constraints to assist in minimising the exposure of workers and to keep doses to the ALARA principle.

Exposure to gamma radiation can be controlled by adherence to the principles of radiation protection, namely; time, distance and shielding. In order to minimise radiation exposure, controlled areas will be designated in which administrative controls over access and working times will be exercised. Workers will only need to remain in the controlled areas of the plant for a short time as the use of automation and modern process control can reduce the manual time required. Areas occupied by the workers will be located as far as practicable from the controlled areas and appropriate shielding will be provided to reduce general gamma radiation levels.

Control of airborne activity will be achieved through containment of the activity and by wet processing to reduce dust production. Any airborne activity in vented vessels will be filtered to remove particulates, and gaseous radon and thoron will be vented outside the plant building to ensure suitable dilution is achieved.

The operation of the Rare Earth Plant will have no significant impact on the radiation exposure of the general public.

A comprehensive Radiation Management Plan (RMP) for the Rare Earth Plant and its environment will be prepared and implemented to ensure that the safety and health of the Proponent's employees and the general public will not be impaired. The RMP will include a radiation monitoring programme for all operations of the plant.

The monitoring programme will aim at detecting and determining any releases of radioactive materials and will also measure radiation doses to workers and estimated doses to the general public. It will cover the following three stages:

- pre-operational monitoring;
- operational monitoring; and
- post-operational monitoring.

In addition, occupational health monitoring will be undertaken for plant site workers.

Pre-operational monitoring is aimed at providing a baseline of environmental radiation data which will be used to determine whether there have been significant changes attributable to the operation of the plant. Operational monitoring will aim at identifying any changes to the baseline levels measured in the pre-operational monitoring. Pre-operational monitoring data will also provide a reference level for rehabilitation of the site upon decommissioning.

Monitoring will be detailed in the RMP and will include:

- Gamma radiation monitoring;
- Radon flux;
- Radionuclides in soil and sediment;
- Radionuclides in air;
- Radon, thoron and descendants; and
- Radionuclides in water.

Occupational monitoring of workers at the plant site will be detailed in the RMP for the plant. The aim of the monitoring is to detect any increases in radiation levels in the plant and at fixed locations (environmental monitoring) and to measure the actual exposure of workers (personnel monitoring).

The results of the monitoring programmes will be used to estimate the total dose to workers. The Proponent will establish an operational dose constraint of half the maximum dose limit to assist in keeping doses as low as reasonably achievable (ALARA principle).

6.3.2 Transport

The Code for Transport is designed to ensure that doses to the public during transport of radioactive substances are very small. Compliance with this Code and the nature of the material will ensure that public exposure during transport is negligible. The radiation dose rate relative to distance from the waste follows the inverse square law that by doubling the distance the dose factor is reduced by four. For comparison purposes, the dose level will be approximately 5μSv/hr at a distance of 4-5 metres from a container of the waste which is comparable to the level of natural radiation passengers experience in air travel at a normal cruising altitude of 10,000 metres.

Estimations of dose levels based on measured radiation levels from bags and containers of monazite (Figure 7) indicate that it would require a person to be in contact with the waste for at least five hours to reach the public dose limit of 1mSv per year or 1,000 hours at a distance of 10m from a container carrying bags of waste. It is unlikely that members of the public would remain close to the waste for such periods even in emergency situations. Members of the emergency teams would be able to complete clean up operations in a period of time so as not to exceed public dose limits.

The total time for transport of waste to the IWDF site over one year is around 1200 hours. In order to minimise individual driver exposure at least two truck drivers each driving 600 hours will be used. The dose rate to the driver will depend on the configuration of the trucks used for transport and the distance and shielding between the driver and the container of waste.

The Proponent will establish dose constraint for drivers involved in transporting the waste to reduce driver dose limits to an operational 2mSv/yr, less than half of the regulatory limits of 5mSv/yr. Should a driver exceed the 2mSv dose constraint on a pro rata basis, the circumstances relating to that exposure will be investigated and measures taken to ensure that the dose to an individual drive of 2mSv in any one year will not be exceeded.

6.3.3 Disposal at the IWDF

Radiological issues relevant to the IWDF site will be:

- minimising the health risk to humans from radiation exposure; and
- protecting the environment in both the short and long term from unacceptable radiation exposure.

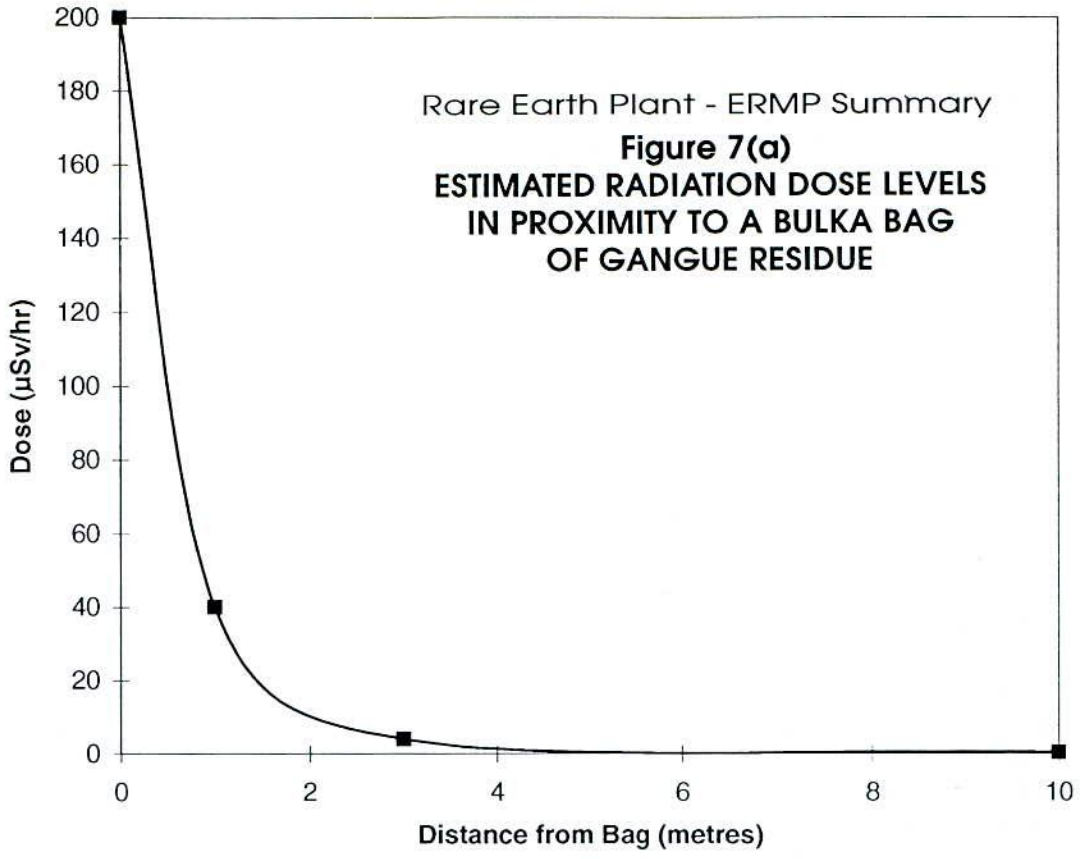
Radiation exposure and the protection of the environment will be managed in the short term through the development and use of the EMP and RMP for the disposal operations. In the long term, exposure and protection of the environment will be controlled through the integrity of the disposal structure.

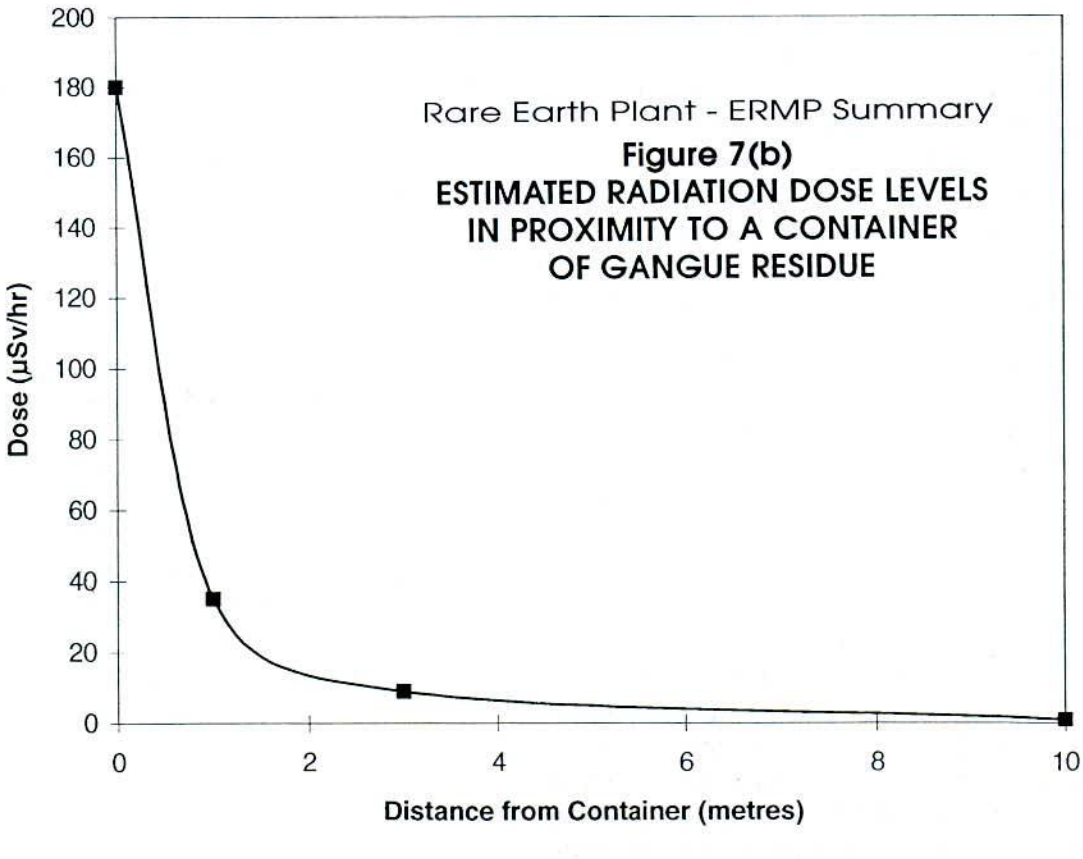
6.4 OTHER ENVIRONMENTAL ISSUES

Other potential environmental issues relating to the project are:

- Pipeline to Transfer Caustic Soda from the Nearby Refinery - the pipeline is a carbon steel construction with an inbuilt alarm system to warn the operators if any factors deviate beyond the set parameters. The pipeline will be inspected daily and monitored.

- Storage and Handling of Process Chemicals - liquid process chemicals will be stored in a dedicated liquid storage area at the plant (Figures 5 and 6) in a manner suitable for each chemical. In the case of accidental spillage, the spill would be contained within the separate concrete bunded area. After repairs, the liquid chemical would be recovered by a pump and returned to the storage tank.


Rare Earth Plant - ERMP Summary
Figure 7(a)
ESTIMATED RADIATION DOSE LEVELS
IN PROXIMITY TO A BULKA BAG
OF GANGUE RESIDUE
Dose (µSv/hr)
200
180
160
140
120
100
80
60
40
20
0
0
2
4
6
8
10
Distance from Bag (metres)


Rare Earth Plant - ERMP Summary
Figure 7(b)
ESTIMATED RADIATION DOSE LEVELS
IN PROXIMITY TO A CONTAINER
OF GANGUE RESIDUE
Dose (µSv/hr)
200
180
160
140
120
100
80
60
40
20
0
0
2
4
6
8
10
Distance from Container (metres)

- Plant Maintenance, Inspection and Contingency Planning - to achieve high standards of safety and reliability for the plant a comprehensive preventative maintenance and equipment inspection programme will be established. Annual shutdowns will be planned to enable inspection, cleaning and repair of equipment. In addition, due to the high level of instrumentation at the plant and connection to a process computer system, valuable data on the performance and conditions of equipment will provide early indication of any deterioration.

- Vegetation and Flora - no vegetation will need to be cleared for the Rare Earth Plant as the proposed site (1ha) is within the existing site boundary of the Gallium Plant. There is virtually no remnant vegetation on the proposed site of the additional evaporation pond should it be required. Therefore, impacts on native vegetation surrounding the plant site will be minimal.

- Fauna - there is unlikely to be any rare, endangered or restricted fauna on the site. The ponds may attract water fowl and wading birds, however, the contents of the ponds will be non-toxic and will pose no threat to them.

- Reserves - there will be no impact on Reserves in the area.

- Noise - construction - noise from construction activity will occur during daylight hours and will be relatively short-lived.

- Noise - operations - the main noise source will be from electrical motors, however the motors will be small and most will be enclosed within buildings. The Proponent will undertake a noise monitoring programme to determine background noise levels and noise levels during the simultaneous operation of the Rare Earth and Gallium Plants. If noise levels exceed those in the Noise Regulations, the Proponent will instigate appropriate action to rectify any noise problems.

- Buffer Area - the plant site incorporates a substantial buffer area with the total development of both the Gallium and Rare Earth plants including evaporation ponds. The proposed Rare Earth Plant location is approximately 500m from the closest boundary and a further 300m from the boundary to the nearest residence (Figure 8). This buffer distance should be adequate for noise attenuation and to reduce potential air emissions from the plant to negligible levels at the boundary.

- Visual - the plant will be screened from occupied residences by existing trees, although the higher structures may be visible from some locations.

- Economic - the Rare Earth project will have regional benefits by providing employment opportunities and the economic advantages of a new industry.

- Historical, Ethnographical and Archaeological Sites - the project will have no impacts on historical or archaeological sites as there are none recorded in the area. There is an Aboriginal temporary campsite located on the Proponent's property. There is no planned disturbance to the temporary campsite.

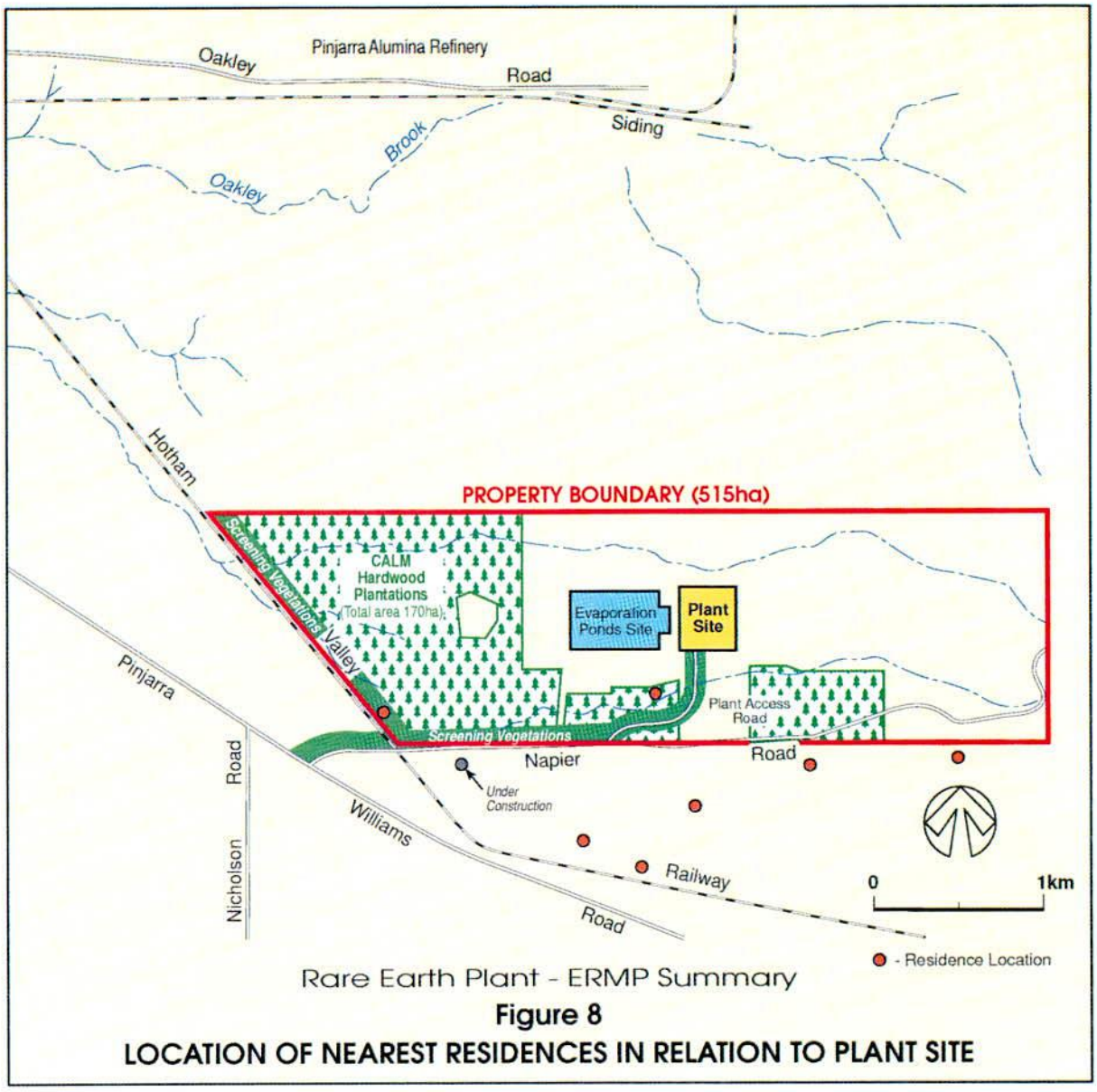


Figure 8
LOCATION OF NEAREST RESIDENCES IN RELATION TO PLANT SITE

7.0 DECOMMISSIONING AND REHABILITATION

A decommissioning and rehabilitation programme will be undertaken for the Pinjarra site at the end of the plant's life. The objectives of the programme will be to:

- eliminate unacceptable health hazards;
- restore the site to a condition such that it may be returned to its former land use (for agricultural purposes), or such other use as may be appropriate at the time of decommissioning; and
- ensure that the State does not incur any ongoing liability with regard to the plant.

Management of the closure and rehabilitation of the evaporation ponds will require that the remaining free water be evaporated and cover materials placed over the ponds and contoured to promote runoff.

Post-operational monitoring will be designed to identify if radioactive materials have accumulated in any areas within the plant and to ensure that all radioactive materials associated with the plant's operations are removed from the site.

8.0 GENERAL MANAGEMENT

In accordance with the Proponent's overall commitment to the development of an environmentally sound project the following 35 commitments have been made by the Proponent.

The Proponent has proposed the following management commitments to ensure the development of an environmentally sound project. These are:

1. During all phases of the project, the Proponent will comply with all applicable standards and regulations pertaining to and appropriate for a chemical and mineral processing plant and for waste disposal.

2. The Proponent will transport the low level radioactive gangue residue in compliance with the Code of Practice for the Safe Transport of Radioactive Substances (1990) and will develop an Emergency Response Plan to deal with an accident.

3. The Proponent will ensure that drivers attend approved Driver Training Courses including specific training for the transport of radioactive materials prior to any transport of waste materials. Refresher courses will be conducted at least yearly. This will be a condition of contract with the transport operators. The companies transporting radioactive material shall, under the Radiation Safety Act, hold an appropriate licence.

4. During the ERMP public review period, the Proponent will prepare an emergency response plan for the transport of the low level radioactive gangue residue, outlining the emergency and clean-up procedures in the event of an accident, for review by the DEP, DOME and the Radiological Council.

5. Emergency Management Teams and Field Response Teams will be trained in emergency response and clean-up procedures, prior to the transportation of waste and with refresher courses conducted yearly. Training will be funded and co-ordinated by the Proponent.

6. A shipment manifest will be prepared prior to disposal operations in accordance with the Code for Practice for the Safe Transport of Radioactive Substances (1990) by the Proponent detailing the following information:

   - waste specification;
   - transport identification;
   - waste description;
   - approval certificate; and
   - declaration.

   The manifest will accompany each truck load of gangue residue.

7. If the waste delivered to the IWDF is found to not meet the required specifications it will be returned to the plant for reprocessing. The Proponent will investigate and identify the reason for non-compliance and modify procedures to minimise the risk of repeating such non-compliance to the satisfaction of the Minister for the Environment.

8. The Proponent will dispose of all process and non-process wastes in an environmentally acceptable manner and in accordance with licensing and other requirements from the DEP, DOME, Water Authority and the Radiological Council throughout the life of the project.

9. Any additional ponds required for the project will be constructed by the Proponent according to the design standard approved by the DEP and Water Authority.

10. The existing evaporation pond and groundwater monitoring systems have

been approved by the DEP and Water Authority. The monitoring bores have been and will continue to be monitored by the Proponent for both groundwater level and groundwater quality on a routine basis. The evaporation ponds and underdrainage sumps will also be monitored for level and quality. The results of the monitoring will be made available to the DEP at a frequency to be determined. If results indicate that leakage from the ponds is entering the groundwater under the site the DEP will be notified immediately.

11. The Proponent will implement contingency plans should there be any leakage from the ponds throughout the life of the project and remediation procedures will be undertaken to the satisfaction of the Minister for the Environment.

12. The Proponent will fund, through its contract with the State Government, the following aspects of waste disposal operations:

    - planning of site operations with respect to Rhône-Poulenc's waste;
    - disposal costs;
    - backfilling and rehabilitation of the trench area;
    - monitoring of the disposal operations of Rhône-Poulenc's waste;
    - contribute to long term monitoring at the IWDF site;
    - contribute, together with other users of the road, to the maintenance of the IWDF access road;
    - a provision for maintenance and any costs of remedial work necessary in the first five years after a disposal operation; and
    - the proportion of salaries and overheads for agreed Government management staff and site management contractors in relation to disposal of Rhône-Poulenc's gangue residue, including a proportion of out-of-pocket expenses related to the involvement of Government staff on the technical committee.

13. Rhône-Poulenc's delivery of waste to the IWDF will be subject to a technical auditing as part of the technical audit in accordance with the Code of Practice for the Near-Surface Disposal of Radioactive Waste, 1992.

14. The Proponent will comply with the requirements of the applicable legislation and codes of practice relating to radiation protection.

15. Details on final plant design will be made available to DOME on completion of design.

16. The Proponent is committed to the ALARA principle (that radiation dose be kept as low as reasonably achievable, economic and social factors being taken into account) in accordance with DOME and the Radiological Council regulations.

17. A comprehensive Radiation Management Plan (RMP) will be prepared by the Proponent for the Rare Earth Plant and its environment and submitted for approval from DOME and the Radiological Council prior to commencement of operations.

18. The Proponent will implement the following strategies for the radiation protection of plant personnel:

    - Controlled areas will be established to include the monazite handling and storage facilities, filtering stages, purification area and residue handling/transport/disposal facilities and areas.
    - Handling of potential dust generators (monazite and residue) will be minimised to reduce air contamination; in particular, wet milling of monazite and disposal of residue in moist form will be undertaken.

- Adequate ventilation will ensure that radon and thoron daughter levels are maintained within acceptable levels.
- Supervised areas and appropriate procedures will be established to limit access by members of the public to the plant site.
- Where necessary, equipment containing bulk quantities of radioactive material will be shielded to reduce exposure rates.
- Equipment in controlled areas will be selected and designed for reliable operation and ease of maintenance.
- Floor surfaces in controlled areas will be non-absorbent and designed for reliable operation and ease of maintenance.
- Facilities will be provided for easy washing of floors and equipment. All washings will be returned to the process via floor sumps or the purpose designed wastewater treatment plant.
- Designated staff will be trained in radiation protection practices.
- Protective equipment and clothing will be issued to workers, where required. Such workers will be fully trained in the use of this equipment.
- Special clothing worn by plant operators will be laundered on-site with changerooms specially designed to allow work clothing to remain on-site.

19. Prior to commissioning of the plant, a comprehensive survey of the existing radiation environment at the Pinjarra site will be conducted by the Proponent as required by DOME and the Radiological Council.

20. The Proponent will implement a comprehensive monitoring and health surveillance programme for Rare Earth Plant personnel according to the requirements of DOME and the Radiological Council.

21. The Proponent will establish an operational dose constraint for plant personnel of 10mSv/yr to be agreed upon with DOME and the Radiological Council. Should any other worker exceed this dose constraint, on a pro rata basis, the circumstances relating to that exposure will be investigated and measures taken to ensure that the dose to an individual of 10mSv in any one year will not be exceeded.

22. Monitoring of radiation levels by the Proponent will continue over the life of the project. Reporting of radiation monitoring data and record keeping will be undertaken by the Proponent in accordance with the applicable legislation of DOME and the Radiological Council.

23. Radiation protection assessments given in the ERMP will be verified by the Proponent during plant commissioning, to the satisfaction of the DEP and DOME.

24. An operational dose constraint of 2mSv/yr will be established by the Proponent, in agreement with the Radiological Council for drivers transporting the gangue residue. Should a driver exceed this dose constraint on a pro rata basis, the circumstances relating to that exposure will be investigated and measures taken to ensure that the dose to an individual driver of 2mSv in any one year will not be exceeded.

25. Plant and employee safety will be maximised by the Proponent ensuring that the storage and handling of hazardous materials such as process chemicals is in accordance with the relevant statutory standards and codes.

26. Construction activities at the plant site will be undertaken in accordance with the statutory requirements and appropriate management techniques will be implemented to ensure that noise levels are within acceptable limits.

27. A noise monitoring survey will be conducted by the Proponent prior to and during plant operations. Appropriate actions will be taken by the Proponent to rectify any noise problems should levels exceed those in noise regulations and to reduce noise levels to meet those specified in the DEP regulations.

28. The Proponent is committed to achieving certification of ISO 9002 for both the Rare Earth and Gallium Plants and will operate a quality assured system.

29. The Proponent endorses the concept of a Community Liaison Committee which will encourage the active involvement of local residents and Shire of Murray officials in the monitoring process at the Pinjarra plant site.

30. The Proponent will liaise with the Mt Walton Community Liaison Committee, local Shires and interest groups on the transport, disposal, safety and environmental issues relating to the low level radioactive gangue residue.

31. The Proponent will ensure that the best practicable technology is applied throughout the life of the project where best practicable technology is defined in Clause 1(3) of the Radioactive Waste Management (Mining and Milling) Code (1982) as:

"that technology, from time to time relevant to a specific project, which enables radioactive wastes to be managed so as to minimise radiological risks and detriment to people and the environment, having regard to:

(a) the achievable levels of effluent control and the extent to which pollution and degradation of the environment is minimised or prevented in comparable mining and milling operations elsewhere;
(b) the cost of the application or adoption of that technology relative to the degree of radiological and environmental protection expected to be achieved by its application or adoption;
(c) evidence of detriment or lack of detriment to the environment after the commencement of mining or milling operations;
(d) the location of the mine or mill;
(e) the age of the equipment and facilities in use for mining and milling purposes and their relative effectiveness in achieving radiological and environmental protection; and
(f) the potential hazards from the wastes over the long term".

32. In addition to complying with the requirements of the Radiation Protection (Mining and Milling) Code (1987), the Radioactive Waste Management (Mining and Milling) Code (1982) and the Code of Practice for the Near-Surface Disposal of Radioactive Waste (1992), the Proponent will meet any future changes in these (and other relevant) standards throughout the life of the project.

33. The Proponent will prepare reports for the DEP on the environmental management of the project at a frequency to be determined by the DEP.

34. Decommissioning by the Proponent will be undertaken in accordance with statutory requirements in force at the time and in a manner acceptable to the Minister for the Environment.

35. Upon decommissioning, the Proponent will ensure all free water is evaporated from the ponds prior to placing materials over the ponds. The cover material will be developed and designed to the satisfaction of the Minister for the Environment.

TABLE 1

SUMMARY OF THE ISSUES AND MANAGEMENT OF THE RHÔNE-POULENC RARE EARTH PLANT AT PINJARRA

Category	Topic	Aspects of Concern	Present Status	Proposed Action and Objective	Proposed Management	Predicted Outcome
Biophysical Environment	Vegetation and Flora	Loss or degradation to vegetation and flora	• Plant site already cleared. • Small percentage of native vegetation remaining on the proposed additional pond site (if required).	• Clear area required for pond (if necessary). • Aim is to minimise disturbance to vegetation.	• Area to be cleared for the pond is less than 1% of the total property. • Revegetation is well established on the property (20ha of screening vegetation and 170ha of hardwood plantation).	• No significant impact on vegetation and flora on the site.
	Fauna	Impact on rare, restricted and endangered fauna due to vegetation clearing and plant operations	• Unlikely to be any rare, restricted or endangered fauna on the site. • No likely habitats on site to be cleared.	• Clearing is unlikely to result in the disturbance to fauna.	• None required.	• No impact on rare, restricted or endangered fauna.
	Reserves	Impact on Reserves in the area	• Nearest reserves and State Forest blocks are greater than 1km from plant site.	• Not applicable.	• None required.	• No impact on Reserves.
	Radiological Environment	Increase in ambient radiation levels around the Proponent's property	• Site already has natural levels of radiation above those of world average, but are within the range of natural background radiation levels found in WA.	• Radioactive components in the process are due to those contained in the monazite feedstock. There is no additional radioactivity generated by the process. • Some minor releases of radon during the processing of monazite. • All radioactive material will be contained in the waste to be disposed of at the Government's Intractable Waste Disposal Facility (IWDF) in the eastern Goldfields of WA.	• Plant designed in both layout and process technology to minimise radiation emanation. • A Radiation Management Plant (RMP) will be prepared detailing operational procedures and environmental monitoring for radiation levels including radon.	• No significant increase in ambient radiation levels at the plant boundary.
	Hydrology	Impact on surface drainage	• Gallium Plant and infrastructure exist alongside proposed plant site. • Rare Earth Plant site already cleared. • Evaporation ponds have been constructed and operational.	• Construct Rare Earth Plant building. • Additional evaporation pond may be required. • Plant and pond sites are located with respect to surface drainage of the site.	• Plant runoff initially directed to the stormwater ponds. • Additional pond designed not to impact on surface drainage.	• Minimal impact on surface drainage.
Pollution Potential	Effluent Disposal	Impact of the disposal of process effluents on the environment	• Gallium Plant effluents directed to the existing evaporation ponds when the plant was operational. • Ponds currently contain residue of Gallium Plant effluents and rainwater.	• Process effluent from the Rare Earth Plant will be neutralised with Gallium Plant effluent and directed to the evaporation ponds. • The effluent will principally comprise sodium salts. • Effluents will be concentrated by solar evaporation, thereby reducing the volume to be disposed.	• Regular monitoring of the evaporation ponds to determine, input and output volumes, quality of the effluent. • Sumps in the underdrainage systems will be monitored for water levels and water quality to determine if there is any seepage from the ponds. • Water collected in the underdrainage system will be collected and returned to storage.	• Minimal potential impact on the environment.
	Evaporation Ponds	Impacts on groundwater resources under the site due to leakage from the evaporation ponds	• Moderate amount of reasonable quality groundwater under the site. • Evaporation ponds are constructed and have been operational for Gallium Plant effluents.	• To dispose of non-radioactive process effluents into the existing evaporation ponds. • Ponds have been designed with a substantial clay liner to minimise leachate and an under drainage system to collect any seepage and return it to storage. • The objective of the ponds is to achieve zero discharge to the groundwater environment.	• Pond design to minimise leachate. • Groundwater monitoring system comprising 33 bores at 11 locations around the site. • Bores are monitored on a regular basis for groundwater levels, and quality determination and will thus indicate any development of leachate plumes in the subsurface. • Bores will allow for plume recovery by abstraction, if necessary.	• No impact on groundwater quality is expected. • Seven years of monitoring has indicated that there have been no significant changes in the chemistry of the groundwater due to the presence or operation of the evaporation ponds.
		Impact of a breach of the evaporation ponds on the surface hydrology of the area	• Evaporation ponds are located in the Murray River catchment area. • Murray River flows into the nutrient enriched Peel-Harvey Estuary.	• Non-radioactive process effluent will be disposed of in the evaporation ponds. • Tricalcium phosphate will be stored temporarily in the ponds prior to being recovered for sale to the fertiliser industry. • Evaporation ponds have been designed to ensure containment of material.	• Design of the evaporation ponds has accounted for factors such as overtopping and erosion. • The contents are unlikely to escape from the evaporation ponds, however, worst case situations due to a total breach of a wall or overtopping have been assessed.	• Minimum potential impact on the Murray River system due to the normal storage and disposal of process effluent in the ponds. • Minimal potential impact on the Murray River system in the unlikely event of a total breach of the ponds.

TABLE 1

SUMMARY OF THE ISSUES AND MANAGEMENT OF THE RHÔNE-POULENC RARE EARTH PLANT AT PINJARRA
(continued)

Category	Topic	Aspects of Concern	Present Status	Proposed Action and Objective	Proposed Management	Predicted Outcome
Pollution Potential (continued)	Solid Waste Disposal	Impact of the disposal of the low level radioactive gangue residue	• The State Government has established an Intractable Waste Disposal Facility (IWDF) near Mt Walton in the Eastern Goldfields of Western Australia. • The IWDF has been approved as a suitable site for the disposal of this type of waste.	• Gangue residue will be disposed of by burial at the IWDF. • The disposal of the waste will be the responsibility of the State Government but will be funded by the Proponent. • Waste disposal and operations will be detailed in an Environmental Management Programme (EMP) to be prepared by the operator of the IWDF in conjunction with this project.	• The IWDF has been selected from a detailed site selection study as an appropriate site for a disposal facility due to factors such as remoteness, geological stability, arid climate and lack of potable aquifers. • Waste disposal operations will be the responsibility of the Government and will be conducted in an environmentally acceptable manner and in accordance with legislative requirements including the detailed EMP and RMPs prepared specifically for the disposal of waste from the Rare Earth project. • Environmental and personnel monitoring will be conducted to ensure the management objectives are being achieved.	• Disposal of the gangue residue at the IWDF will have minimal impact on the environment.
	Transport of Materials	Impact of a spill of raw materials and process chemicals whilst being transported	• There is an existing regime of truck movements of raw material (monazite and lime) and process chemicals (acids) on metropolitan and country roads in Western Australia in much larger quantities than required for this project. • Most of the materials are classified as Dangerous Goods.	• Raw materials and process chemicals will be transported to the Pinjarra plant site by road in appropriate trucking containers by the suppliers of the materials in a safe manner. • There will be approximately 22 trucks per week transporting the raw materials and process chemicals to the plant.	• All materials will be transported according to the appropriate codes and regulations. • Acids and monazite will be transported according to the requirements of the Dangerous Goods Regulations, 1992. • Monazite, a low level radioactive material, will be transported also according to the requirements of the Code of Practice for the Safe Transport of Radioactive Substances, 1990. • Emergency Response plans are established for these materials. • Drivers contracted to the companies supplying the material are specifically trained for emergency situations.	• The potential for a spill from trucks transporting materials for this project is low due to the small increase in number of trucks required. • In the unlikely event of a spill, adequate emergency response plans will be in place to minimise any pollution potential from a spill.
		Impact of a spill of tricalcium phosphate or rare earth nitrate products	• Similar products containing phosphate and nitrate are currently transported by road in Western Australia. These products are not classified as Dangerous Goods.	• Tricalcium phosphate will be transported from the Pinjarra plant site to Kwinana in the form of a moist slurry most likely in a tanker truck. • Rare earth nitrate will be packaged and transported by road from Pinjarra to Fremantle for export. • Transport of these materials will be the responsibility of the Proponent and transport procedures will ensure that there is minimal potential of a spill should an accident occur. • A total of 28 trucks per week is likely to be transporting the products from the Rare Earth Plant.	• Transport of these materials will be according to the appropriate Codes and Regulations as will the packaging requirements of the product. • The Proponent will contract only reputable transport operators and will ensure that the codes and regulations are adhered to. • Emergency response plans and clean-up procedures will be prepared to ensure that in the unlikely event of a spill there is little or no impact on the environment.	• There is unlikely to be any impact on the environment due to the transport of the products from the Rare Earth Plant.
		Impact of a spill of low level radioactive gangue residue	• Low level radioactive materials, such as from mineral sand processing, are currently transported on country and metropolitan roads in Western Australia. • Other radioactive materials of much higher radioactivity (such as Industrial Radiography sources, radio-pharmaceutical and some industrial sources) are regularly transported throughout the State.	• The gangue residue will be packaged in bulka bags and transported in containers on trucks, from Pinjarra to the IWDF. • The transport operations and procedures will minimise the risk of a spill.	• The material will be packaged into heavy duty bulka bags and packed into containers to minimise the potential of spillage. • The material will be a moist clay like form which will not flow or dust. It will be insoluble and immobile thus minimising dispersion into the environment from a spill and allowing for ease of recovery. • Transport will be according to the requirements of the Code of Practice for the Safe Transport of Radioactive Substance, 1990. • Transport operations will be approved by the appropriate authorities. • Detailed emergency response plans and clean-up procedures will be prepared to deal with a spill if it occurs. • All of spilt material will be retrieved and repackaged for disposal.	• There will be minimum potential hazard to the public or impact on the environment from a spill of the gangue residue.

TABLE 1

SUMMARY OF THE ISSUES AND MANAGEMENT OF THE RHÔNE-POULENC RARE EARTH PLANT AT PINJARRA
(continued)

Category	Topic	Aspects of Concern	Present Status	Proposed Action and Objective	Proposed Management	Predicted Outcome
Pollution Potential (continued)	Noise	Noise impact from construction activities	• No current construction activities.	• Construction of the Rare Earth Plant involves heavy machinery and transport of construction materials. • The objective is to minimise any potential noise impact due to construction activity.	• Restriction of construction activities to daylight hours. • Acceptable and appropriate site management through the construction stage. • Appropriate noise regulations will be adhered to. • Large buffer area between plant site and nearest neighbour.	• No significant impact expected from construction activities. • Any potential impact due to noise from construction activities will be short-lived.
		Noise impacts during the operations due to the plant	• Plant site is located within a large buffer area. • Some existing noise levels from the nearby Alcoa Refinery. • Noise levels from other rare earth plants indicate that the plant operations will be relatively quiet.	• The main noise source will be from electrical motors. These motors will be relatively small and will be enclosed in buildings. • Noise from plant operations will be minimal.	• The plant will be designed for noise containment, such as housing motors inside building. • A noise monitoring survey will be conducted prior to and during plant operations. • Noise levels from the Gallium Plant and Rare Earth Plant operating simultaneously will meet the requirements of the noise regulations and appropriate actions will be taken to rectify any noise problems should levels exceed those in the noise regulations.	• No noise impact is expected due to plant operations.
		Noise relating to transport of materials due to plant operations	• High frequency of existing heavy vehicle movements associated with industry throughout the region.	• 22 heavy vehicle movements per day or an increase of between 4-18% in heavy vehicle movements in the Pinjarra region. • The objective is to minimise the noise impact of heavy vehicles associated with the project.	• Truck movements will be restricted to Monday to Friday business hours, wherever possible.	• No significant impact due to the increase in heavy vehicle movements.
	Caustic Soda Pipeline	Rupture of the pipeline supplying caustic soda	• A carbon steel pipeline has been constructed to supply caustic soda to the Gallium Plant. • Alcoa has many kilometres of similar pipes throughout its site.	• Caustic soda will be pumped directly from Alcoa's Refinery to the Proponent's operations.	• Monitoring will be conducted at each end measuring the rate, pressure and temperature. • Inbuilt alarm systems. • Pipeline inspected daily. • Pipeline can be shutdown immediately. • Clean-up procedure will be implemented in the unlikely event of a spill.	• Minimum potential impact on the environment.
Social Surroundings	Ethnographical Sites	Impact on Aboriginal sites near the plant	• One Aboriginal site identified as a relatively short term camping site (external to plant site).	• No disturbance planned.	• Avoid site.	• No impact.
	Archaeological Sites	Impact on archaeological sites	• No archaeological sites have been identified at the plant site.	• Not applicable.	• None required.	• No impact.
	Historical Sites	Impact on historical sites	• No sites in or near the process plant site are listed on the National Estate.	• Not applicable.	• None required.	• No impact.
	Traffic	Impact of increase in traffic numbers due to the project in terms of safety and noise	• Relatively high volumes of traffic through the region including heavy vehicles. • Annual average daily traffic volumes range between 1,000 to 11,000 on the main roads in the Pinjarra region with an estimated 6% to 12% heavy vehicle component through Pinjarra.	• 22 truck movements per day in the Pinjarra region increasing the heavy vehicle components through Pinjarra between 4-18%. • Other vehicle movements per day increasing existing levels by around 5%. • The objective is to manage the impact of additional vehicle movements due to the project.	• Truck movements will be scheduled, wherever possible, for business hours Monday to Friday. • The most appropriate and safest roads will be used as the transport route.	• A relative impact on Pinjarra residents due to the 4-18% increase in heavy vehicles and 5% increase in other vehicle movements.
	Visual	Impact of the Plant on Visual Amenity	• Gallium Plant and Infrastructure exists on the site. • Alcoa's Alumina refinery in the region. • Extensive vegetation screening already on the Proponent's property. • Large buffer area around plant site.	• Construction of an additional building for the Rare Earth Plant.	• Use of vegetation to screen the buildings. • Construction of the new building will be designed to blend in with the existing buildings.	• No impact on visual amenity.
	Economic	Regional benefits of the project	• Gallium Plant is currently on a care and maintenance programme and will be restarted with the Rare Earth Plant. • High unemployment in the region. • Monazite is currently being disposed of as a waste. • No income to the State or Australia from the monazite resource.	• Establish the Rare Earth Plant and restart the Gallium Plant. • Employ up to 60 people (from local area). • Process the monazite to produce a valuable product for export.	• Preference to employ local people. • Use of local services, suppliers and contractors for plant operations.	• Provide employment opportunities and flow on effects to the local community. • Help to reduce the high levels of unemployment in the region. • Increase the export income to Australia of around $50 million for Rare Earth and Gallium. • Produce a product suitable for future downstream processing in Australia.