PROPOSED SECONDARY TREATMENT PLANT PICTON, BUNBURY

Ravensthorpe Mining and Investment Company Ltd

Report and Recommendations of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
Bulletin 367 November 1988

PROPOSED SECONDARY TREATMENT PLANT

PICTON, BUNBURY

RAVENSTHORPE MINING AND INVESTMENT COMPANY LTD

Report and Recommendations
of the
Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia

Bulletin No 367 November 1988

ISSN 1030-0120
ISBN 0-7307-1903

CONTENTS

APPENDICES

FIGURES

SUMMARY AND RECOMMENDATIONS

Ravensthorpe Mining and Investment Company Ltd proposes to establish a secondary treatment plant for mineral sands at Harris Road, Picton, Bunbury. The plant would treat heavy mineral concentrate from a primary treatment plant located at the Waroona mine site.

The heavy mineral concentrate produced by the primary treatment plant would be trucked to Picton. It would then be dried, cooled and passed through a series of magnetic and electrical conductivity separators to produce a number of heavy metal minerals. The secondary treatment plant would produce approximately 100,000 tonnes of ilmenite, 2,000 tonnes of leucoxene and 5,000 tonnes of zircon per annum. The current orebody is low in monazite and so a monazite removal circuit would not be installed until the second year of operation. Discard streams containing monazite would either be held on site for reprocessing or returned to the mine as backfill. All tailings will be returned to the mine for disposal.

The proponent would export the heavy minerals produced through Bunbury. This would involve trucking the products from Picton to the Port of Bunbury once every ten weeks.

The Environmental Protection Authority determined that the proposal required formal assessment under Part IV of the Environmental Protection Act 1988, and that a Notice of Intent with a degree of public input would be required to assess the proposal.

The major environmental issues associated with this proposal are dust, noise, groundwater contamination and transport of the product. The Environmental Protection Authority considers that all these issues are manageable.

The Authority has concluded that the proposal is environmentally acceptable and has made the following recommendations:

RECOMMENDATION 1

The Environmental Protection Authority concludes that the proposed Heavy Mineral Sand Secondary Treatment Plant is environmentally acceptable and recommends that it could proceed subject to the EPA's recommendations in this report and the proponent abiding by environmental commitments in the Notice of Intent including:

- **dust control by use of bag filters;**
- **adherence to the Code of Practice for the Mining and Milling of Radioactive Ores 1987, and**
- **control of noise.**

RECOMMENDATION 2

The Environmental Protection Authority recommends that the proponent ensure that the noise from the project does not cause the noise in the surrounding residential areas to exceed 50 dB(A) from 0700 to 1900 hrs, 45 dB(A) from 1900 to 2200 hrs and 40 dB(A) from 2200 to 0700 hrs.

RECOMMENDATION 3

The Environmental Protection Authority recommends that the proponent consult with the City of Bunbury to minimise potential impact from transportation of the product from the plant site to the port to the satisfaction of the Minister for Environment upon advice from the Authority.

RECOMMENDATION 4

The Environmental Protection Authority recommends that prior to construction, the proponent prepare and implement a surface and groundwater monitoring programme to the satisfaction of the Environmental Protection Authority.

RECOMMENDATION 5

The Environmental Protection Authority recommends that the proponent refer to the EPA for assessment and expansion of the facility above its current size.

1. INTRODUCTION

Ravensthorpe Mining and Investment Company Ltd proposes to establish a secondary treatment plant for mineral sands at Harris Road, Picton, Bunbury (See Fig 1). The plant would treat the heavy mineral concentrate produced by the primary treatment plant located at the Waroona mine site.

The Environmental Protection Authority decided that a Notice of Intent, on which there would be an opportunity for public input, would be required to assess the environmental impact of the proposal.

2. PROJECT DESCRIPTION

2.1 PROCESSING

The heavy mineral concentrate produced by the primary treatment plant would be trucked to the secondary treatment plant near Bunbury. The heavy mineral concentrate would be fed via a bin and conveyor into a gas-fired drier. The dried heavy mineral concentrate would be cooled and passed through a series of cross-belt magnetic separators. The non-magnetic fraction would be pumped to the wet separation circuit where any quartz would be removed. These quartz tailings would be pumped via a cyclone to a stockpile and then backloaded to the mine site for burial. The material would be passed through an electric field with non-conducting material proceeding to the Zircon Circuit and the conductor to the Rutile/Leucoxene Circuit.

The products resulting from these processes would be zircon, rutile/ leucoxene and ilmenite. The secondary treatment plant would produce per annum approximately 100,000 tonnes of ilmenite, 3,000 tonnes of leucoxene and 5,000 tonnes of zircon.

2.2 INFRASTRUCTURE

To satisfy processing requirements, at any given time, approximately 20 cubic metres of water would be circulating within the treatment plant. Water would be recycled where possible and, on a daily basis, very little make up water would be required. Process and make up water would be obtained from a bore on site.

Power would be supplied from the adjacent substation.

Heavy mineral concentrate will be trucked 58 km from the mine site to the plant at Picton. This would involve the use of two to three, 40 tonne trucks operating ten to fourteen hours, 5.5 days per week. The mineral product for export would be trucked 8 km from the secondary treatment plant to the Port of Bunbury along highways. When shiploading is required (about every 10 weeks), 21,200 tonnes of product would require transport to the port. The trucking operation would take approximately forty-eight hours.

3. PUBLIC INPUT

The Environmental Protection Authority determined that in the light of concerns about mineral sands industry, a Notice of Intent with the opportunity for public input was required to assess the proposal. The proponent was required to hold a public meeting on 19 September 1988 so that the opinions and questions of the community could be addressed. A representative of the Environmental Protection Authority attended the meeting to receive oral representation. An opportunity for further submission was provided. The Notice of Intent was made available to all those who attended.

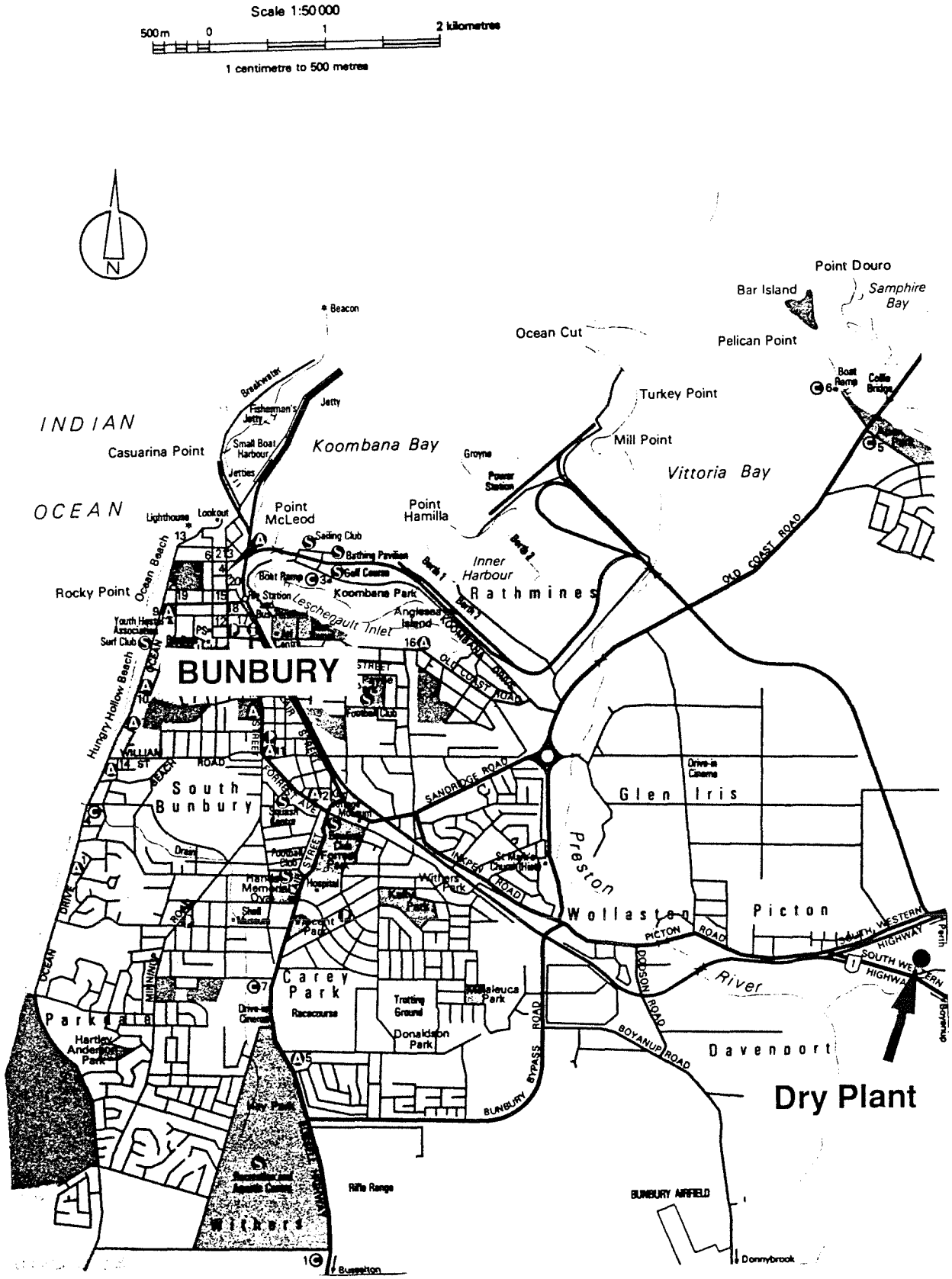


Figure 1. Location Map

The summary of submissions contained in Appendix A includes the questions raised during this meeting. Approximately 30 people attended the meeting. The major concerns expressed were:

(i) the radiation aspects of the project;
(ii) dust control, and
(iii) groundwater contamination.

4. ENVIRONMENTAL IMPACTS AND MANAGEMENT

4.1 NOISE

The noisiest component of the plant would be the electric motors. There is also a possible problem with tonal noise from large fans. The Authority has noted that the proponent has made a commitment to silencing fans should the tonal noise be found to exceed the desired levels.

RECOMMENDATION 2

The Environmental Protection Authority recommends that the proponent ensure that the noise from the project does not cause the noise in the surrounding residential areas to exceed 50 dB(A) from 0700 to 1900 hrs, 45 dB(A) from 1900 to 2200 hrs and 50 dB(A) from 2200 to 0700 hrs.

The trucking of product to the port for export has potential for producing nuisance noise in the neighbouring residential areas along the transport route. The Authority has in fact advised the proponent that the trucking proposals described in the Notice of Intent would be unacceptable. This is a matter on which the proponent needs to consult with the local government authority, so as to ensure that trucking operations are satisfactorily managed.

RECOMMENDATION 3

The Environmental Protection Authority recommends that the proponent consult with the City of Bunbury to minimise potential impact from transportation of the product from the plant site to the port to the satisfaction of the Minister for Environment upon advice from the Authority.

Large trucks transporting the concentrate to the Picton plant from the primary treatment plant at Waroona, will operate for 10-14 hours, 5.5 days per week. Accordingly, this trucking operation could also represent a potential noise nuisance source. However, the Authority believes that the risk of noise nuisance from this source is not great. This is because the trucks would use the main road into Picton and would enter the plant site well away from any residential areas. Additionally, the Authority's Recommendation 2 addresses noise levels at the plant site, and this would apply to trucks entering and leaving the site.

4.2 SETTLING PONDS

Waste water from the plant would contain sulphuric acid, iron and possibly manganese. This waste water would be neutralised with lime and pumped to the settling ponds. The settling ponds will be lined with PVC to prevent water loss. Water from the settling ponds would be re-used in the plant and solids from the settling ponds disposed of at the mine-site. Drainage from stockpiles will be directed to the settling ponds.

RECOMMENDATION 4

The Environmental Protection Authority recommends that prior to construction, the proponent prepare and implement a surface and groundwater monitoring programme to the satisfaction of the Environmental Protection Authority.

4.3 DUST

There are a number of potential dust sources:

. the dry processing plant itself;
. heavy mineral concentrate, and
. the stockpiles of discard material.

The dust levels in the dry processing plant itself would be controlled via a dust collection system with a filter. Dust would be collected in sealed bins, slurried and taken back to the mine for disposal.

The heavy mineral concentrate would be transported in covered trucks to prevent spillage. The concentrate would have very little clay content, a high density and in excess of 3% moisture content, and so stockpiles would not be expected to dust.

Discard material would be pumped as a slurry to a drainage pad where it would drain to approximately 5 to 8% moisture content. This would not be expected to dust. The discard material would then be transported to the mine site for disposal.

4.4 RADIATION

The heavy mineral concentrate would contain some radioactive constituents. The current ore-body is low in monazite and so it would be expected that the radiation levels would be low. Because the radiation levels would be low and because dust would be controlled, the radiation should have minimal impact on the environment and the workforce. The proponent will be required to adhere to the Code of Practice for the Mining and Milling of Radioactive Ores 1988 and any regulations of the day.

5. POSSIBLE EXPANSION

The Authority's assessment is based on the project as described in the proponent's Notice of Intent. Any expansion of the facility would need to be assessed by the Authority. The proponent would, therefore, need to refer any proposals for expansion of the facility above its current size, to the Authority for assessment.

RECOMMENDATION 5

The Environmental Protection Authority recommends that the proponent refer to the EPA for assessment, any expansion of the facility above its current size.

6. CONCLUSION

The Environmental Protection Authority has concluded that the proposal would be environmentally acceptable.

The Authority has considered the implication of noise and dust on the surrounding area and noted that Picton has been zoned as an industrial area.

RECOMMENDATION 1

The Environmental Protection Authority concludes that the proposed Heavy Mineral Sand Secondary Treatment Plant is environmentally acceptable and recommends that it could proceed subject to the EPA's recommendations in this report and the proponent abiding by environment commitments in the Notice of Intent including:

- **dust control;**
- **adherence to the Code of Practice for the Mining and Milling of Radioactive Ores 1987, and**
- **control of noise.**

APPENDIX A

SUMMARY OF SUBMISSIONS

SUMMARY OF SUBMISSIONS

List of Concerns Raised at Public Information Day
Eaton 7 October 1988

. How can the proponent guarantee that waste water from the dry process plant will not detrimentally affect the groundwater or the nearby water courses?

. What evidence is there that, providing occupational health requirements are met, there will be no radiation effects (ionising or non-ionising) to cause environmental concern beyond the plant site?

. Mineral sand resources both to the north and south of Bunbury are available to the proponent. How do the quantities available relate to the life of the plant? Will the opening of this plant increase the pressure to open new, more environmentally sensitive resource areas?

. Why can't the plant go at Kemerton?

. Can the proponent guarantee that the dust from the plant will cause no problem to a child who suffers from cystic fibrosis?

. Is the industrial zoning still valid in view of the review of the Bunbury Region Plan?

. How is the dust collected, handled and disposed of?

. Do radiation levels on road verges near the existing dry processing plants confirm that transport of the concentrate and products causes no hazard?

. What will happen if reversing beepers used at the plant cause excessive annoyance to me?

Further Issues of Concern to EPA

. How will the heavy mineral concentrate and the discard streams (including those containing monazite) be handled and stored? If in open stockpiles:-

- How will dust be controlled?
- How will drainage from stockpiles be controlled?
- Will stockpiles be on a sealed surface?
- If so, how will the surface be sealed?

. Will the concentrate be loaded into the conveyor bin by a front-end loader?

. What provision for dust control will there be around the bin?

. What wash down arrangements will there be for the loader?

. Will the settling ponds be lined, and if so with what?

- Will solids be recovered from the settling ponds and returned to the minesite?

- Mineral sands from the Waroona minesite are understood to be low in Monazite. Could the proponent give a representative analysis of each of the resources from which concentrate will be fed to the proposed plant, including those South of Bunbury?

- The concentrated transport of products to the port proposed in the NOI is to operate 24 hours a day, averaging 22 movements per hour. This proposal would not be environmentally acceptable. It is understood the proponent now proposes product storage by a contractor on the Inner Harbour land. Could details of this modified proposal and the full implications for product transport to and from storage be provided?

- The noise analysis in the NOI is inadequate. The proponent should employ a noise consultant to produce noise contours for the plant. This should take into account both the industrial nature of surrounding developments and the presence of some 17 residences within 1 km of the plant site. There should also be some discussion by the consultant of noise implications of product transport and handling.

Waste water management requires more details:

(i) Water balance.
(ii) Is there any discharge to Ferguson River etc?
(iii) Stormwater retention and disposal.
(iv) There should be an oil and grease trap on any storm water outlet.
(v) Details of possible pollution in waste water.
(vi) Are there settling ponds?
(vii) Settling ponds should be lined.

Radiation. The appropriate Code of Practice is "The Code of Practice for the Mining and Milling of Radioactive Ores 1987". The proponent should make a commitment to this code.

Where and how will the monazite circuit feedstock be held on site prior to the installation of the circuit?

Currently nearest house is 2.5 km away. Should the policy area 3(Glen Iris) be developed? How close would the housing be?

APPENDIX B

PROPONENT'S RESPONSE TO SUBMISSIONS

PROPONENT'S RESPONSE TO SUBMISSIONS

Question 1

How can the proponent guarantee that waste water from the dry process plant will not detrimentally affect the groundwater or the nearby water courses?

Answer

At any given time approximately 20 cubic metres of water will be circulating within the dry treatment plant. This water will be recirculated continuously to minimise any losses from the water circuit. Some sulphuric acid will be added to the water for attritioning. This will be neutralised with lime and precipitated as gypsum in the settling ponds. These ponds will be lined. At intervals the precipitate in the settling ponds will be removed using a front end loader. Water losses will be confined to evaporation. There will be no loss of this water to nearby water courses or to the ground water. The water does not contain any chemical contaminants and no water will be released from the site, and consequently there will be no contamination of nearby water courses or ground water resources.

Question 2

What evidence is there that, providing occupational health requirements are met, there will be no radiation effects (ionising or non-ionising) to cause environmental concern beyond the plant site?

Answer

The strict occupational health requirements will be met at all times. Consequently, no heavy mineral concentrate or other product will leave the plant in the form of run off or as dust. The result is thus that the operation will cause no radiation effects beyond the plant site. As indicated in the Notice of Intent, the Code of Practice for the Mining and Milling of Radioactive Ores of 1987 will be adhered to strictly.

Question 3

Mineral sand resources both to the north and south of Bunbury are available to the proponent. How do the quantities available relate to the life of the plant? Will the opening of this plant increase the pressure to open new, more environmentally sensitive resource areas?

Answer

The proposed dry process plant is designed as a long term plant to treat ore from various orebodies. The first of these orebodies is located in Waroona and it is anticipated that other orebodies will with time be brought into production. These orebodies have not yet been fully explored and consequently no details can be given on their magnitude or on their mineral compositions. As orebodies become available they will be discussed in detail in the necessary documentation to the authorities such as the Department of Mines and the Environmental Protection Authority.

Question 4

Why can't the plant go at Kemerton?

Answer

The Kemerton area has been established primarily for chemical processing type industries which are normally classified as noxious industries. A site study is now being carried out for the area by the Department of Resources Development to plan what industries should be permitted into the area and the results of this study are not expected to be finalised for six months.

The dry separation plant proposed for Picton is not a chemical processing plant, it is not a noxious industry, and it is proposed to be built on land already owned by the Company in an industrial area immediately that approval is given. Any further delays will have serious commercial implications.

Question 5

Can the proponent guarantee that the dust from the plant will cause no problem to a child who suffers from cystic fibrosis?

Answer

The plant will produce no dust and consequently will have no adverse impact on the health of any nearby residents.

Question 6

Is the industrial zoning still valid in view of the review of the Bunbury Region Plan?

Answer

Yes.

Question 7

How is the dust collected, handled and disposed of?

Answer

Dust within the plant will be collected via a dust collection system with a filter which guarantees the maximum effluent level will be 0.5 mg/m^3 of dust which is 20 times more stringent than the currently accepted industry level of 10 mg/m^3. Dust will be collected in sealed bins, slurried and taken back to the mine site and disposed of as part of the tailings disposal programme at the mine site.

Question 8

Do radiation levels on road verges near the existing dry processing plants confirm that transport of the concentrate and products causes no hazard?

Answer

Yes, the monitoring of radiation levels on road verges near existing processing plants confirms that the transportation of the concentrates and products causes no radiation hazards.

Question 9

What will happen if reversing beepers used at the plant cause excessive annoyance to me?

Answer

The law requires a warning alarm to be fitted to certain equipment to be activated when the machine is reversed. Every attempt will be made to keep these audible warnings to the minimum permitted. If, however, these warning alarms cause concern to local residents, application will be made to have the "beepers" replaced by flashing warning lights during the hours of darkness. The EPA and the Mines Department can be contacted to carry out tests to determine if the noise levels are within the required parameters.

Question 10

How will the heavy mineral concentrate and the discard streams (including those containing monazite) be handled and stored? If in open stockpiles:

- How will dust be controlled?
- How will drainage from stockpiles be controlled?
- Will stockpiles be on a sealed surface?
- If so, how will the surface be sealed?

Answer

The heavy mineral concentrate will be carted in covered trucks to the secondary treatment plant and dumped onto a drainage pad as an open stockpile. Because of the concentrate cleaning circuit at the mining plant, the heavy mineral concentrate will be clay free and with its high density and moisture content in excess of 3% no dust will be created in this area.

The drainage pad will be built on a polythene sheet base which will collect any water which drains from the stockpile and direct it to the settling ponds, from where it will be used as process water in the plant. The settling ponds will also be lined to prevent seepage losses.

The discard material will be pumped as a slurry to a section of this same drainage pad where it will drain to approximately 5-8% moisture content before being loaded into the trucks for backloading to the mine site. At the mine site, it will be mixed with the tailings from the primary treatment plant and buried.

Question 11

Will the concentrate be loaded into the conveyor bin by a front-end loader?

Answer

Yes

Question 12

What provision for dust control will there be around the bin?

Answer

The material being loaded will be damp, coarse, dust-free sand, therefore there will be no dust. Spillage which may occur will be cleaned up promptly.

Question 13

What wash down requirements will there be for the loader?

Answer

The loader will be washed down on the stockpile drainage pad. All wash down water will be caught in the drainage system and recycled through the plant.

Question 14

Will the settling ponds be lined, and if so with what?

Answer

Yes, the settling ponds will be lined with the same PVC liners that are used in vat leaching in the gold industry. To catch and drain a solution containing gold and cyanide. These liners are more than adequate to control what is basically a water dam in this situation.

Question 15

Will solids be recovered from the settling ponds and returned to the mine site?

Answer

Yes.

Question 16

Mineral sands from the Waroona mine site are understood to be low in monazite. Could the proponent give a representative analysis of each of the resources from which concentrate will be fed to the proposed plant, including those south of Bunbury.

Answer

No, at this stage the deposits which have been acquired by the Company and which will be acquired in future by the Company have not been sufficiently explored to provide such information.

Question 17

The concentrated transport of products to the port proposed in the Notice of Intent is to operate 24 hours a day, averaging 22 movements per hour. This proposal would not be environmentally acceptable. It is understood the proponent now proposes product storage by a contractor on Inner Harbour land. Could details of this modified proposal and the full implications for product transport to and from storage be provided?

Answer

When ship loading takes place, a minimum loading rate of 500 tph is required or large additional cost penalties are charged by the Bunbury Port Authority. The nominated shipping schedule for sales is in shipping tonnages of 10,000 t which at this loading rate will take approximately 20 hours to complete. The Notice of Intent quotes 21,200 tonne loads but this is the envisaged maximum shipment that could occur.

The route to be taken by these trucks is along the South West Highway and an extension of this highway into Bunbury, to the intersection with the Bunbury Bypass Road. From this point the trucks follow main roads as dictated by the Bunbury City Council for other heavy haulage to the wharf. This bypasses the city centre.

Negotiations are being held to have a transport company contract to cart and store the mineral, possible at the Inner Harbour area. Unless these negotiations are successful, and an area of land is granted by the Bunbury Port Authority, the carting method will be required.

Once the road bridge is constructed in the Point McLeod area, it is assumed that all heavy transport to the wharf will use this route to bypass more the the Bunbury built up area.

Question 18

The noise analysis in the Notice of Intent is inadequate. The proponent should employ a noise consultant to produce noise contours for the plant. This should take into account both the industrial nature of surrounding developments and the presence of some 17 residences within 1 km of the plant site. There should also be some discussion by the consultant of noise implications of product transport and handling.

Answer

A detailed noise study has not been carried out, but a prediction based on worst case assumptions has been made. This shows that the total noise levels will not be a problem. It should not exceed 40 db(A). There is the possibility that tonal noises will be a nuisance from large fans on the dust extraction system. These noises are difficult to predict, but the technology for controlling fan noise is readily available. A budget allowance has been made for silencing, and silencing will be carried out if the tonal noises are found to exceed the desired levels.

Question 19

Waste water management requires more details:

(i) Water balance.
(ii) Is there any discharge to Ferguson River etc?
(iii) Stormwater retention and disposal.
(iv) There should be an oil and grease trap on any storm water outlet.
(v) Details of possible pollution in waste water.
(vi) Are there settling ponds?
(vii) Settling ponds should be lined.

Answer

(i) See attached water balance diagram.
(ii) No.
(iii) The design meets the engineering requirements stipulated by the City of Bunbury.
(iv) Oil and grease traps are included in the design.
(v) See answer to Question 1.
(vi) Yes.
(vii) They are lined.

Question 20

Radiation. The appropriate Code of Practice is "The Code of Practice for the Mining and Milling of Radioactive Ores 1987". The proponent should make a commitment to this code.

Answer

The proponent has made a commitment to this code. See answer to question 2.

Question 21

Where and how will the monazite circuit feedstock be held on site prior to the installation of the circuit?

Answer

See answer to question 10.

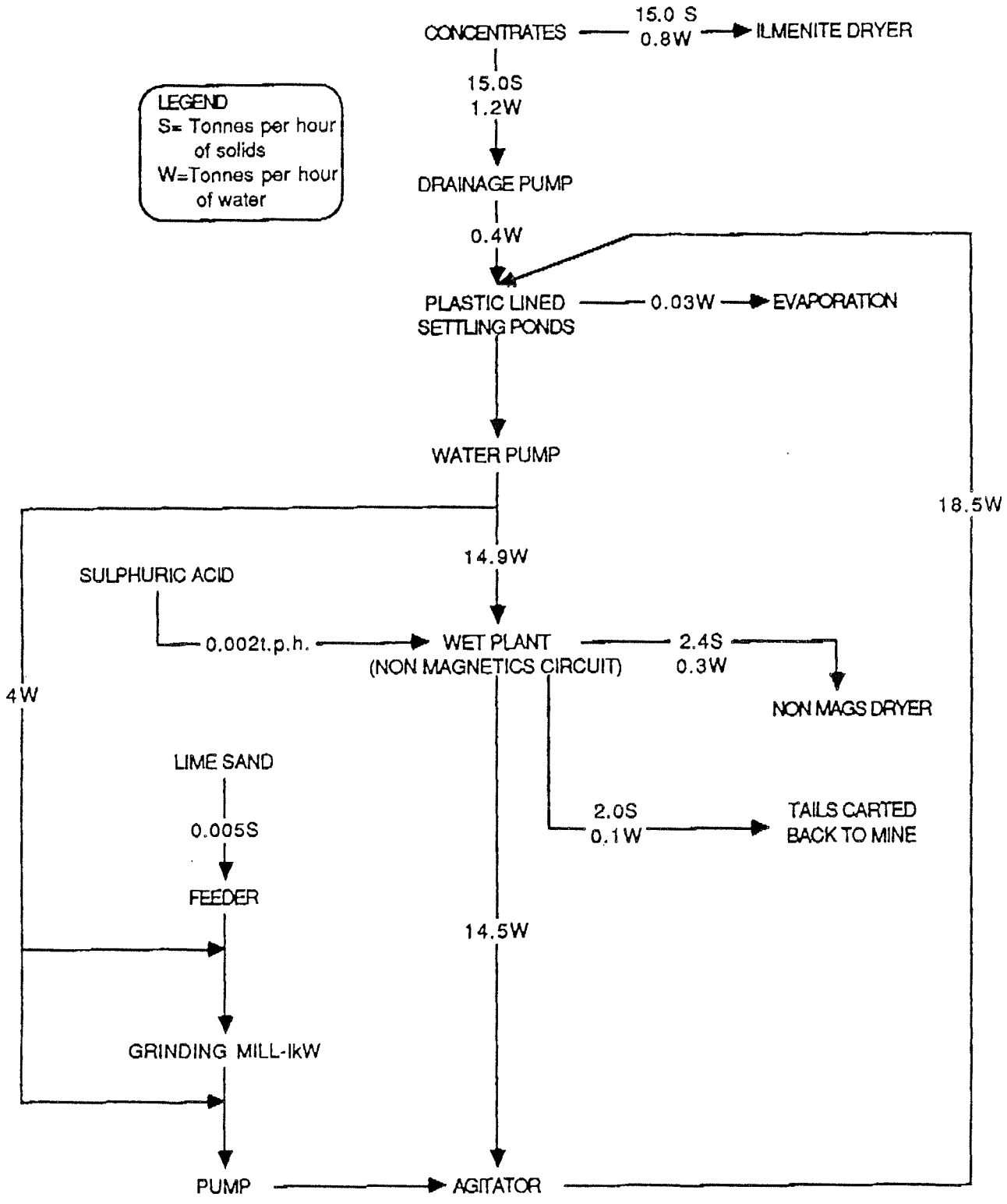
Question 22

Currently nearest house is 2.5 km away. Should the policy area 3 (Glen Iris) be developed? How close would the housing be?

Answer

Approximately 500 metres.

RAVENSTHORPE MINING AND INVESTMENT CO LTD
WATER BALANCE
DRY TREATMENT PLANT



WATER(CUBIC METRES PER HOUR)

WATER IN	
EX CONCENTRATES	1.2
BORE WATER	0.03
TOTAL	1.23

WATER OUT	
ILMENITE DRYER	0.8
EVAPORATION	0.03
NON MAGS DRYER	0.3
TAILS TO MINE	0.1
TOTAL	1.23