Wagoo Hills Vanadium Project and Mingenew Coal Project

Precious Metals Australia Limited

Report and recommendations
of the Environmental Protection Authority

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THE PURPOSE OF THIS REPORT

This report contains the Environmental Protection Authority's environmental assessment and recommendations to the Minister for the Environment on the environmental acceptability of the proposal to develop a vanadium mine and processing project at Windimurra Station and an independent but related coal mine near Mingenew.

Immediately following the release of this report there is a 14-day period when anyone may appeal to the Minister against the Environmental Protection Authority's recommendations.

After the appeal period, and determination of any appeals, the Minister consults with the other relevant ministers and agencies and then issues his decision about whether the proposal may or may not proceed. The Minister also announces the legally binding environmental conditions which might apply to any approval.

APPEALS

If you disagree with any of the assessment report recommendations you may appeal in writing to the Minister for the Environment outlining the environmental reasons for your concern and enclosing the appeal fee of $10.

It is important that you clearly indicate the part of the report you disagree with and the reasons for your concern so that the grounds of your appeal can be properly considered by the Minister for the Environment.

ADDRESS

Hon Minister for the Environment
18th Floor, Allendale Square
77 St George's Terrace
PERTH WA 6000

CLOSING DATE

Your appeal (with the $10 fee) must reach the Minister's office no later than 5.00 p.m. on the 17 July, 1992.

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Summary and recommendations

Precious Metals Australia Limited has proposed to establish a vanadium oxide mine and processing plant on Windimurra Station, near Mount Magnet (the Wagoo Hills Vanadium Project). Related to that proposal is the development by the company of a small coal mining operation near Mingenew (the Mingenew Coal Project).

These proposals were subject to environmental assessment as a Public Environmental Review (PER). An eight week public review period closed on 20 March 1992.

The main environmental issues relating to these proposals are:

Vanadium mine

- control of vanadium dust;
- effect of the proposal on natural drainage;
- control of noise generated within the mine and plant area;
- impact of the process water supply borefield, and
- transportation of process materials.

Coal mine

- rehabilitation of the open-cut pit;
- effect of mining on the groundwater;
- effects of blasting on neighbouring properties, and
- control of dust and noise from the crushing plant.

These issues have been addressed by the Authority in the following ways.

Dust management

Vanadium oxides are potentially hazardous to humans. Exposure to vanadium oxide dust may cause discolouring of mucous or respiratory disorders. As a consequence, there are existing control standards that apply where vanadium oxides are present in a minesite or processing plant. The applicable standard in Western Australia under the Mines Regulation Act is a total dust concentration of no more than 0.5 milligrams of vanadium pentoxide as dust, or 0.05 milligrams of vanadium pentoxide as fume, per cubic metre of air.

The Authority has concluded that:

- vanadium dust management is a key issue associated with this proposal;
- the Department of Mines has powers that define limits and enable control of vanadium dust, and
- by effectively controlling vanadium dust levels at the minesite and process plant, there should be minimisation of vanadium dust concerns beyond the mine and plant sites.

While some limited coal dust suppression measures are proposed at the Mingenew mine, more comprehensive measures are intended at Windimurra. Dust control measures proposed for coal handling at the vanadium processing plant would include the use of water sprays as well as the enclosure of conveyors at transfer points and installation of other dust suppression devices. It would be appropriate for comparable dust control measures to be applied at Mingenew.

Affect on natural drainage

Surface drainage maintenance is important to the operation of the Windimurra Station as well as to protecting the environment. The proponent has made commitments and undertakings to prepare a drainage management plan, and to ensure that surface drainage water quality is not adversely affected by the Wagoo Hills Vanadium Project.

Control of noise

It is likely that the development and operation of a proposal such as the Wagoo Hills Vanadium Project would cause a major change in the existing noise conditions. There is a distance of approximately 4km between the vanadium mine and plant area and the nearest residence, Windimurra homestead. This would be sufficient to reduce noise impacts at the homestead, but noise levels would be apparent. Noise emissions which did not exceed the following defined limits would be environmentally acceptable, but their attainment may require specific design and management by the proponent:

- 40 dB(A) between 10.00pm and 7.00am;
- 45 dB(A) between 7.00pm and 10.00pm, and between 7.00am and 7.00pm on Saturday, Sunday and any gazetted public holiday, and
- 50 dB(A) between 7.00am and 7.00pm Monday to Friday inclusive, but excluding gazetted public holidays;

as measured at the nearest residence.

At the Mingenew Coal Project, neighbouring residences are several kilometres away. In view of the relatively small scale of the operation, the Authority would expect that, with appropriate design and management, noise emissions from the coal mine, particularly from the crusher area, can be controlled to comply with the above levels.

Process water supply borefield

It is acknowledged by the proponent that the proposed borefield for the Wagoo Hills Vanadium Project would have an affect on existing stock and domestic water supplies on Windimurra Station. Drawdown resulting from the operation of the borefield may be one to two metres within a portion of the pastoral lease that contains several stock and domestic wells. As a result, several commitments have been given by the proponent to minimise any impact on stock or domestic water supplies, by deepening wells or providing alternate supplies.

Transportation

Based on the types of vehicles and routes proposed in the PER to carry materials to the process plant at Windimurra, the Authority has been advised that the Wagoo Hills project site would be currently inaccessible. There would need to be negotiations between the proponent, local authorities and the Main Roads Department to resolve transport routes.

Coal mining and groundwater

Mining at Mingenew is not proposed to occur below the watertable. Some draw would be made on local groundwater, but this should be relatively small. A groundwater quality monitoring programme is proposed to ensure that impacts on water quality arising from the coal mining are identified and managed.

Blasting

There would be the requirement to blast at the proposed coal mine, and perhaps at the vanadium mine. The Mines Regulation Act provides controls on blasting, and defines means for remedying problems resulting from it. The proponent has undertaken to liaise with neighbours at Mingenew to prevent damage, and does not expect problems to arise at Windimurra because of the limited likelihood of blasting, as well as the distance from the minesite to the Windimurra homestead and other structures associated with the Station.

In relation to blasting, the Authority would apply a condition to a Licence issued under the Environmental Protection Act which required that:

- the air-blast over-pressure level generated by any blast did not exceed 125 dB (peak linear) as measured at any residence;
- no more than one in any ten consecutive blasts result in air-blast over-pressure level greater than 120 dB (peak linear) as measured at any residence, and
- blasting only occurred during the hours of 9.00am and 5.00pm Monday to Saturday inclusive.

As a consequence of this assessment of these projects the Authority considers that all of the environmental issues associated with the mining and processing of the vanadium oxides at Windimurra, and the mining of coal at Mingenew, can be adequately managed. The Authority therefore considers that the Wagoo Hills Vanadium Project and Mingenew Coal Project are environmentally acceptable.

Recommendation 1

The Environmental Protection Authority has concluded that the proposal to develop a vanadium oxide mine and processing plant on Windimurra Station, and a coal mining operation near Mingenew, as modified during the process of interaction between the proponent, the Environmental Protection Authority, the public and government agencies that were consulted, is environmentally acceptable.

In reaching this conclusion, the Authority identified the main environmental factors requiring detailed consideration as:

- **control of vanadium oxide dust;**
- **management of water resources and drainage at Windimurra;**
- **transport of process materials, and**
- **management of the coal mine near Mingenew.**

The Environmental Protection Authority notes that these environmental factors have been addressed adequately by environmental management commitments given by the proponent, or by the Environmental Protection Authority's recommendations given in this report.

Accordingly, the Environmental Protection Authority recommends that the proposal could proceed subject to the Environmental Protection Authority's recommendations in this report, and subject to the proponent's commitments to environmental management as detailed in Appendix 1 of this report.

Recommendation 2

The Environmental Protection Authority recommends that, to ensure that surface and groundwater resources are not adversely affected by the Wagoo Hills Vanadium Project, the drainage management plans to be prepared by the proponent should:

- **be prepared prior to construction;**
- **address surface water flows affected by the Project;**
- **monitor groundwater quality to determine whether there has been any contamination arising from the operation of the minesite or process plant and associated tailings dam;**
- **make provision for suitable water supplies for stock and domestic purposes on Windimurra Station if existing supplies are adversely affected by the Project, and**
- **be prepared to the satisfaction of the Environmental Protection Authority, in consultation with the Department of Agriculture and the Department of Mines.**

Recommendation 3

The Environmental Protection Authority recommends that the proponent should not cause short term levels of non-vanadium bearing dust at residential premises near the Wagoo Hills Vanadium Project or the Mingenew Coal Project to exceed 1000 microgrammes per cubic metre ($\mu g/m^3$), measured continuously over 15 minutes.

Recommendation 4

The Environmental Protection Authority recommends that noise emissions from the Wagoo Hills Vanadium Project or Mingenew Coal Project should not cause or contribute to noise levels in excess of:

- 40 dB(A) between 10.00pm and 7.00am;
- 45 dB(A) between 7.00pm and 10.00pm, and between 7.00am and 7.00pm on Saturday, Sunday and any gazetted public holiday, and
- 50 dB(A) between 7.00am and 7.00pm Monday to Friday inclusive, but excluding gazetted public holidays;

as measured at the nearest residence.

Recommendation 5

The Environmental Protection Authority recommends that blasting operations at the Wagoo Hills Vanadium Project or Mingenew Coal Project be undertaken such that:

- the air-blast over-pressure level generated by any blast did not exceed 125 dB (peak linear) as measured at any residence;
- no more than one in any ten consecutive blasts result in air-blast over-pressure level greater than 120 dB (peak linear) as measured at any residence, and
- blasting only occurred during the hours of 9.00am and 5.00pm Monday to Saturday inclusive.

1. Introduction

A proposal to develop a vanadium oxide mine and processing plant on Windimurra Station (Wagoo Hills Vanadium Project) near Mount Magnet, has been developed by Precious Metals Australia Limited. A major portion of the energy requirements of the processing plant would be generated from coal supplied from a proposed new coal mine to be located near Mingenew (Mingenew Coal Project).

The Authority considered that this integrated set of proposals, the vanadium mine and process plant and the coal mine, should be subject to formal environmental review at the level of Public Environmental Review (PER). Precious Metals Australia Limited prepared the PER, which was released for public comment for eight weeks until 20 March 1992. A total of 20 submissions were received by the Authority on the PER.

Precious Metals Australia Limited has recently advised the Authority that the coal mining project may commence operation prior to and initially independent of the vanadium mine and oxide processing plant (Appendix 3). However, the scale of the coal mining project presented in the PER would not change, only the locations to which coal is supplied. The Authority has taken account of this advice as part of this assessment and considers that this change does not significantly affect the environmental issues that arise as a consequence of these proposals.

2. The proposal

This proposal comprises two interdependent projects by Precious Metals Australia Limited. The main part of the proposal involves the establishment of a vanadium mine and processing plant on Windimurra Station, located some 80 kilometres south east of Mount Magnet, to produce a range of oxides of vanadium. This mine and plant would be powered by coal transported to the site and supplied from a new coal mine to be developed by the proponent located about 20 kilometres north east of Mingenew. More detailed descriptions of each of the main components of the proposals can be found in Section 4 of the Public Environmental Review.

Figure 1 indicates the main locations related to the project.

The Wagoo Hills Vanadium Project and the Mingenew Coal Project both involve the milling and grinding of material. Each project would be subject to approvals under Part V of the Environmental Protection Act for Works Approval in relation to the plant design and a Licence to operate.

2.1 Wagoo Hills Vanadium mine and plant

The mine would be located near the Windimurra Hills, on Windimurra Station. This pastoral lease is currently used for sheep and cattle grazing.

Precious Metals Australia Limited holds Mining Lease M58/178, which contains a resource of approximately 44 million tonnes of vanadiferous ilmenomagnetite (averaging 0.57% vanadium pentoxide, V_2O_5). Based on information in Precious Metals Australia Limited (1988), the resource has a strike length of 1100 metres, a width of 90 metres to 120 metres and is at least 90 metres deep.

Planned open-cut mining of the defined ore body would involve the excavation of up to 1,570,000 tonnes of material each year, of which 1,450,000 tonnes would be ore. This ore would be treated at the adjacent process plant. At this mining rate, the project would be expected to have an operational life of 30 years.

Initial production of 3700 tonnes per annum of vanadium oxides (vanadium trioxide or vanadium pentoxide) is proposed in the PER. Processing would involve crushing of the ore, separation of major impurities, then roasting and leaching to remove the vanadium from the ore, followed by precipitation of the oxides and heating them in furnaces. The product from the furnaces would be either in the form of granular vanadium trioxide (V_2O_3) or fused flake

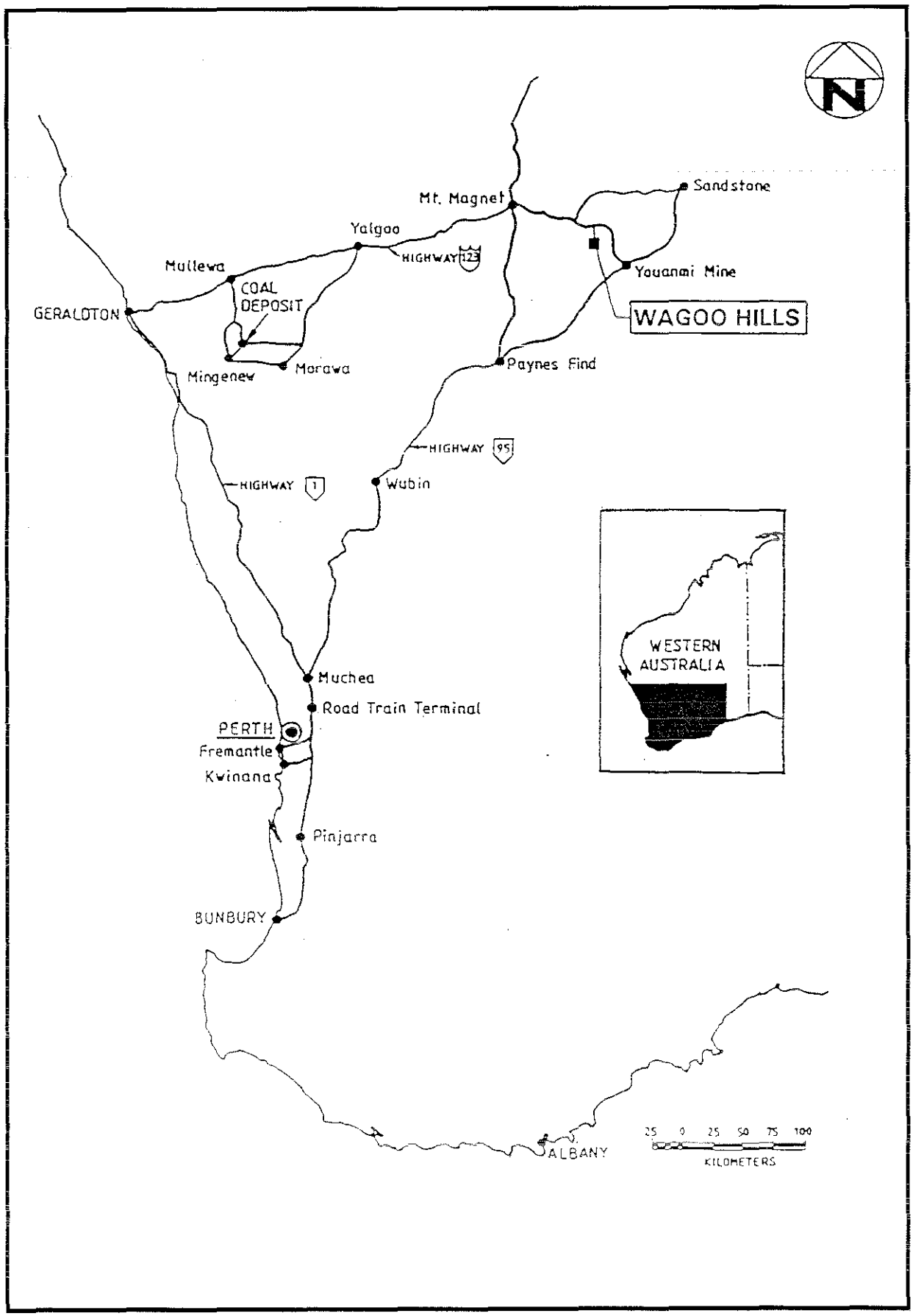

Figure 1. Locations of the Wagoo Hills Vanadium Project and Mingenew Coal Project

vanadium pentoxide (V_2O_5). These products would be bagged or drummed at the plant prior to transport and export through Fremantle.

Apart from the vanadium ore, all process materials would be brought to the plant site from outside of the Mount Magnet region. Processing of the vanadium ore would require the annual consumption of the following major materials:

Table 1. Wagoo Hills Vanadium Project major process materials

Raw Material	Source	Annual Requirement
Coal	Mingenew	30,000 - 70,000 tonnes
Sodium Salt	South West WA	15,000 - 25,000 tonnes
Diesel Fuel	Geraldton	6 - 10 million litres
Sulphuric Acid	Kwinana	4,400 - 6,500 tonnes
Ammonium Sulphate	Kwinana	3,000 - 5,000 tonnes
Water	Windimurra	est. 1,050,000 cubic metres

(Source: Wagoo Hills PER)

Output from the processing plant at Windimurra would principally comprise the following materials:

Table 2. Wagoo Hills Vanadium Project products

Material	Destination	Annual Output
Vanadium trioxide and/ or Vanadium pentoxide	Fremantle	3,700 tonnes
Sodium Sulphate	?	6,000 - 20,000 tonnes
Process Tailings	Windimurra	>1,446,300 tonnes

(Source: Wagoo Hills PER)

The operational workforce at Windimurra would comprise approximately 100 people, who would work at the mine and plant site on a fly in - fly out basis, with accommodation in a village about two kilometres to the east of the processing plant.

The PER indicates that transport access to the plant site for raw materials is expected to be through Mount Magnet, then along the Sandstone Road and the Youanmi Road, which passes approximately four kilometres to the east of the plant.

2.2 Mingenew coal mine

The main energy requirements of the vanadium mine and plant at Windimurra would be derived from coal mined at Mingenew.

Mining would occur on Victoria Location 9793, within Exploration Licence E70/1105. The current use of the land is cereal cropping. Approximately 60ha would be required for the coal mine, which would be undertaken by open-cut. Overburden would be backfilled into the exhausted portion of the pit. It is expected that the removal of 30,000 - 70,000 tonnes of coal per annum would require the excavation of 300,000 - 650,000 tonnes of overburden.

The coal is part of the Irwin River Permian Coal Measures. Two coal seams within the measures are considered to be economically extractable by Precious Metals Australia Limited. The open-cut operation would involve conventional excavation and haulage equipment, blasting of some of the overburden and all of the coal, then crushing and stockpiling or loading of the coal.

The PER presents in Table 4.4 a list of the characteristics of the main coal seams at Mingenew. To provide some indication of relative quality, the following table compares some of those characteristics with average values for other coal deposits in Western Australia.

Table 3. Characteristics of Western Australian coal deposits

Deposit	Specific Energy (MJ/kg)	Ash Content (%)	Moisture Content (%)	Sulphur Content (%)
Mingenew	18.5	16.1	20.2	0.6
Collie	19.5	10.0	25.0	0.7
Eneabba	15.0	19.0	30.0	1.4
Margaret River	28.0	8.0	8.0	0.6
Hill River	19.0	14.0	26.0	1.3

(Sources: Wagoo Hills PER and Collie Power Station ERMP)

The proponent has indicated in the PER that the coal mining at Mingenew would be undertaken under contract, using locally available labour and equipment.

3. Public review

The PER on the proposal was subject to eight weeks of public review, which closed on 20 March 1992. A total of 20 submissions were received: eight from members of the public and 12 from government departments and local authorities.

There is experience in Western Australia related to both coal mining and also vanadium mining and processing. A number of concerns expressed in public submissions reflected this knowledge, particularly in relation to the implications of vanadium oxide processing. Most government agency submissions referred to the lack of specific detail of various elements of the projects, pointing to further information requirements or the need for future negotiations to resolve issues.

The main issues raised during the submission period were:

- transport of process materials to the mine site;
- effect of the vanadium mine and plant on existing pastoral activities, especially relating to water supplies, stock management, and drainage;
- control of vanadium bearing dust and noise within the minesite and plant area, and
- management of the coal mining operation at Mingenew to minimise dust and blast effects on neighbouring properties.

The Authority prepared a summary of issues raised and comments made in submissions on the PER, and sought a written response from the proponent. This summary and response is presented in Appendix 2 of this report.

As part of its response to submissions, Precious Metals Australia Limited has made additional environmental commitments, mainly with regard to the Wagoo Hills Vanadium Project. The list of commitments presented in the PER has been revised to incorporate these additional commitments, as well as to restructure them to take account of the company's request to separate the Wagoo Hills Vanadium and Mingenew Coal Projects.

4. Environmental impact and management - Wagoo Hills Vanadium Project

The PER indicates that the area of the combined mine, plant and infrastructure (mainly borefield) would occupy approximately 120ha of the Windimurra pastoral lease, located a short distance to the north of the Windimurra homestead.

The main environmental issues relating to the Wagoo Hills Vanadium Project are:

- containment of process wastes;
- effect of the proposal on natural drainage;
- control of vanadium dust, especially within the process plant;
- potential hazards associated with several process materials;
- control of noise generated within the mine and plant area;
- impact of the process water supply borefield;
- transportation of process materials, and
- construction and operational workforce.

Each of these are discussed in the sections below.

Section 7 of the PER outlines in summary the key environmental management practices, procedures and undertakings that are intended by Precious Metals Australia Limited. These are supported by commitments given in Appendix 1 of this report. The main areas of environmental management at the Wagoo Hills Project outlined in the PER include:

- a surface drainage management plan for the vanadium mine and process plant;
- monitoring of vanadium dust levels in the processing plant;
- control of the spread of Saffron Thistle at Windimurra;
- a transport management and accident contingency plan;
- design and operation of the waste dumps and tailings dam in accordance with appropriate standards;
- monitoring of the effects of the borefield at Windimurra, and
- appointment of an environmental officer by the proponent.

4.1 Vanadium dust control

Operations which deal with vanadium oxides raise concern associated with exposure to vanadium oxide dust.

There is considerable discussion about environmental and human exposure to vanadium oxides and salts in World Health Organisation (1988). Inhalation of vanadium pentoxide (V_2O_5) at relatively low levels can produce local irritation (>0.1 mg/m^3), while high exposures to vanadium dust (5 - 150mg/m^3) have lead to atrophic rhinitis (affecting the nose) and chronic bronchitis (WHO, p. 16-17). Discolouration of mucous (called green tongue) is considered to be an indication of exposure to vanadium rather than a toxic effect (WHO, p. 17).

Experience in Western Australia with the now defunct vanadium oxide plant at Wundowie points to the need to design and operate the plant with a high standard of dust control. Specific experience at the Wundowie plant has been reported by Musk and Tees (1982). The Department of Mines has advised that the Wundowie plant operated for little more than one year and recorded problems related to dust control at the crushing plant, industrial hygiene standards in the vanadium concentration circuits, handling of sodium oxalate, and also unstable fusion furnace operation. However the Department has indicated that the experience at Wundowie should not be extrapolated to the Wagoo Hills project for two reasons. Firstly, the process design at Windimurra is different. Secondly, commitments made by the proponent to industrial hygiene measures, such as:

- control of dust emissions to the atmosphere in the crushing plant;
- a two stage gas cleaning and scrubbing system for exhaust gases from the furnaces, and
- operating the kiln at negative pressure;

should ensure that the work environment is of acceptable quality.

In view of the importance of this issue, the Authority sought additional information from the Department of Mines and Department of Occupational Health, Safety and Welfare. The discussion below incorporates that further advice.

The PER indicates (p. 57) that the applicable standard for vanadium bearing dust at the Wagoo Hills Project would be no more than 0.05 milligrams of vanadium per cubic metre of air (0.05 mg V/m^3), in accordance with the Mines Regulation Act. The Act is, however, more specific than that, stating in Section 8.10 (7)(e) that :

> "where rock containing vanadium is mined, the total dust concentration of the atmosphere breathed shall not contain more than 0.5 milligrams of V_2O_5 as dust, or 0.05 milligrams of V_2O_5 as fume per cubic metre of air ....."

In advice to the Authority, the Department of Occupational Health, Safety and Welfare has suggested that it would be difficult to satisfactorily control dust levels at the Wagoo Hills project, and that the provision of personal respiratory protection equipment would be unsatisfactory. Further, there is limited information in the PER to accurately determine the level of vanadium contaminated dust in the mining operation and the proximity of the processing facilities to the ore body suggests general, widespread contamination. The Department of Occupational Health, Safety and Welfare has recommended to the Authority that:

- beneficiation plant production and packaging processes for vanadium oxides should be fully enclosed and automated;
- kiln stack emissions should not include vanadium oxides, and
- the mining operation should minimise dust generation.

The Wagoo Hills vanadium mining operation and processing plant would be subject to control by the Department of Mines, under the Mining Act and the Mines Regulation Act. The Department of Mines has been advised of the comments and recommendations of the Department of Occupational Health, Safety and Welfare in relation to this proposal.

The Licence that would be issued under the Environmental Protection Act would state vanadium emission limits for the stack associated with the vanadium furnace in the process plant.

The Authority concludes that:

- vanadium dust management is a key issue associated with this proposal;
- the Department of Mines has powers that define limits and enable control of vanadium dust, and
- by effectively controlling vanadium dust levels at the minesite and process plant, there should be minimisation of vanadium dust concerns beyond the mine and plant sites.

4.2 Handling and use of process materials

Several of the materials that would be used in the vanadium process plant represent a level of hazard which would need to be taken into account in plant design and operation.

4.2.1 Ammonia risk

One of the process materials to be used would be ammonium sulphate. The PER indicates in Appendix 10.5 that this material is non-flammable and non-toxic. However, the final part of the process involves the heating of ammonium vanadate to remove the ammonia as a gas. The waste gas stream from this part of the plant would be subject to scrubbing to minimise ammonia gas emissions to the atmosphere (PER, p. 59).

Two specific issues have been raised by Department of Occupational Health, Safety and Welfare in relation to this part of the process. These are:

- any work involved in loading and unloading the furnaces, or performing maintenance on the furnaces, could be hazardous to personnel due to both the ammonia and vanadium, and
- the PER does not discuss the explosion potential of ammonia when ammonium vanadate is being heated in the furnace.

The Authority recognises that there may be some limited risk associated with heating ammonia and believes that this would be fully taken into account during detailed design of the relevant portion of the process plant

These issues would be addressed by the proponent during the design of the plant, and by the Department of Mines and Environmental Protection Authority when necessary approvals are sought.

4.2.2 Sodium salt organic reagent

The sodium salt organic reagent proposed to be used in the process plant is, as described in the PER (10.5) soluble in water and has a high acute toxicity - approximately 10 per cent the toxicity of sodium cyanide. In its liquid form the reagent is very corrosive and, if ingested, can be readily absorbed from the gastro-intestinal tract and cause severe damage to the kidneys. This reagent is considered dangerous when heated. During decomposition it can emit toxic and irritant fumes.

The reagent, in combination with caustic soda (sodium hydroxide) and water, would be transported as a moist filter cake in purpose built trailers.

4.3 Drainage control

The recent heavy and prolonged rains in the Mount Magnet region has highlighted the need to ensure that mining, transport and processing operations take account of potential intense rainfall events. During April, much of the Windimurra lease was covered with approximately half a metre of water. The low valley separating the proposed minesite and processing plant from the accommodation village contained deeper, flowing water. Flows of water in this area tended to radiate out from the Windimurra Hills and the minesite ridge. The general movement of water appears to have been towards the east and north. These flows could have had major implications to the design and operation of the Wagoo Hills Project. For instance, road access between the mine and process area and the accommodation area could have been cut, and the borefield would have been flooded for some time. The proponent has received advice from the Department of Mines that there was no overflow from tailing dams or mines reported in the area in spite of the very heavy rains (Appendix 2, 2.7).

Development of the vanadium mine and processing plant would also require establishment or upgrading of roads, a new runway, and pipeline corridors. These could also affect surface water flows.

The need for drainage management in and around the Wagoo Hills Vanadium Project has been recognised by the proponent. A commitment has been made to prepare a drainage management plan prior to the commencement of mining (Appendix 1, Commitment 6.1). In response to submissions, the proponent has advised that a one in 100 year event would be used as a design criteria, for tailings dams and drainage around surface structures (Appendix 2, 2.7).

The Authority has made a recommendation on water management from the Wagoo Hills Project (Recommendation 2).

4.4 Transport

The Wagoo Hills Vanadium Project requires the movement of a relatively large volume of materials to the process plant. As outlined in Table 1, the main material movements to Windimurra would be coal from Mingenew, sodium salt organic reagent from the south west and diesel fuel from Geraldton. In addition, sodium sulphate may be transported from the plant to markets within the State.

Submissions from local government authorities and the Main Roads Department have pointed to significant difficulties in moving bulk materials to the Wagoo Hills Vanadium Project. The PER and the response to submissions (Appendix 2, 3.7) indicates that the proponent's preferred transport access from Great Northern Highway would be along the Mount Magnet - Sandstone Road and then the Youanmi Road. The Authority has been advised that the Mount Magnet - Youanmi Road is not suitable for the large transport combinations that would be used for the proposal and the Mount Magnet - Sandstone Road is considered inadequate for the current traffic needs, let alone for additional heavy transport requirements arising from this proposal. These roads would need to be significantly upgraded before approvals were given for the movement of coal, sodium salt reagent, and other process materials. In addition, the section of Precious Metals Australia's proposed coal haul route between Mingenew and Yalgoo is not designated for road trains, and would require local authority and Main Roads department approval before it could be used.

At this stage, there would need to be decisions made by relevant authorities on a number of routes proposed to be taken, particularly between the coal deposit and the Geraldton - Mount Magnet Road and between Mount Magnet and the mine site. Heavy vehicle access to and from the Wagoo Hills Project would need to be resolved before the project can proceed. This would need to be achieved through negotiation between the Main Roads Department, relevant local government authorities and Precious Metals Australia Limited.

The Department of Mines would be responsible for applying safe transporting codes for the materials to be used at the processing plant, or transported from the plant. It is understood that, in the case of the sodium salt reagent, handling and transport precautions which apply to caustic soda would be used.

4.5 Coal storage and emissions

Stockpiling of the coal at the processing plant would require management of similar concerns to those detailed in Section 5.2 below. In particular, measures to ensure the minimisation of the likelihood of spontaneous combustion within the stockpile and to contain leachates generated from the stockpile would be required. The PER (p. 63) indicates that drainage control from the stockpile would be incorporated into the planned process plant drainage management plan.

As indicated in the PER, the burning of coal in the processing plant would cause the emission of sulphur dioxide (SO_2). Given the relatively small volume of coal to be burnt, less than 70,000 tonnes each year, comparatively low sulphur level (see Table 3) and the isolated location of the processing plant, the Authority does not expect that the SO_2 discharge would lead to environmental problems.

The discharge of sulphur dioxide would be subject to conditions within the Works Approval and Licence issued by the Environmental Protection Authority.

4.6 Effect on Windimurra pastoral lease

The Authority received a very comprehensive submission from the Windimurra lessee. The submission raised issues related to two principal concerns:

- what effect the mine and processing plant would have on the use of the Windimurra Homestead, and
- how the proposed mine and processing plant would affect current pastoral operations on the pastoral lease.

On the basis of details presented in Figure 1.3 of the PER, the homestead lies approximately four kilometres south-east of the southern limit of the pit after the initial five year mine plan. However, this figure also indicates that the mineralised zone within Mining Lease M58/178 extends to within about two kilometres of the homestead.

It is clear that any major change in land use such as a minesite and/or processing plant within close proximity to a station homestead would potentially have a significant affect on the existing character of the homestead area. It is likely that there would be more people, more vehicles, more noise, more dust, more light, etc than currently occur. This would almost certainly be noticeable to the residents.

The PER recognises that the Wagoo Hills Vanadium Project would have some affects on the current operation of the Windimurra pastoral lease. As a consequence, the proponent "will move positively to ensure that joint use of the land can be achieved" (PER, p. 67). The Authority is encouraged by this statement. It is important that there are continuing and productive consultations between Precious Metals Australia Limited and the Windimurra lessee about the monitoring of impacts and means of addressing them.

A number of specific potential impacts affecting the lease have been raised.

4.6.1 Dust

In view of the presence of vanadium oxide in the ore, it is essential that dust generation within the mine site and plant area is very strictly controlled and minimised. Effective control of dust in these areas should ensure, along with the 4 kilometre separation between the mine and processing plant and the Windimurra homestead, that dust does not present a problem at the homestead.

As mentioned in Section 4.1, control standards exist for dust containing vanadium oxide. For non-vanadium containing dust, the Authority would expect short-term levels of dust caused by the Wagoo Hills Vanadium Project and measured at residential premises not to exceed 1000 micrograms per cubic metre ($\mu g/m^3$), measured continuously over 15 minutes. The proponent should design and operate the Wagoo Hills Project with dust minimisation as an objective, and take specific measures should non-vanadium dust levels become an issue.

The Authority has made a recommendation on dust emissions from the Wagoo Hills Project (Recommendation 3).

4.6.2 Noise

As mentioned earlier, it is inevitable that noise levels near the homestead would rise as a consequence of this proposal. The Authority expects that the noise generated by the projects should be kept within environmentally acceptable levels. In doing so, the following noise levels should not be exceeded by industrial operations, irrespective of location. These would apply to the Wagoo Hills project.

Noise emissions from the process plant should not cause or contribute to noise levels in excess of:

- 40 dB(A) between 10.00pm and 7.00am;
- 45 dB(A) between 7.00pm and 10.00pm, and between 7.00am and 7.00pm on Saturday, Sunday and any gazetted public holiday, and

- 50 dB(A) between 7.00am and 7.00pm Monday to Friday inclusive, but excluding gazetted public holidays;

as measured at the nearest residence.

The Authority has made a recommendation on noise emissions from the Wagoo Hills Project (Recommendation 4).

4.6.3 Blasting and vibration

The PER indicates (p. 31) that the vanadium bearing ore should require minimal blasting as part of the mining operation. Where blasting does take place, the Mines Regulation Act provides guidelines for the blasting operation.

Concern has been expressed that the extent of blasting could be significantly more than outlined in the PER, and that there is the potential for damage to structures associated with the pastoral lease resulting from blasting.

In its response to these concerns, the proponent has indicated (Appendix 2, 2.37) that the Windimurra homestead and shearing shed do not lay over a geological fault and hence there is no geological reason to support the possibility of damage being caused by blasting. In addition, the proponent has reiterated its expectation that little or no blasting would be required during mining operations at Windimurra.

The Authority would expect that the proponent undertake any necessary blasting operations in accordance with the Mines Regulation Act, to ensure minimum risk of damage to structures on the pastoral lease. Further, the Authority would expect that any blasting operations would be undertaken such that:

- the air-blast over-pressure level generated by any blast did not exceed 125 dB (peak linear) as measured at any residence;
- no more than one in any ten consecutive blasts result in air-blast over-pressure level greater than 120 dB (peak linear) as measured at any residence, and
- blasting only occurred during the hours of 9.00am and 5.00pm Monday to Saturday inclusive.

The Authority has made a recommendation on blasting effects from the Wagoo Hills Project (Recommendation 5).

4.6.4 Surface drainage

This project raises two points in terms of drainage, one being management of the volume of surface flow, and the other being potential changes in quality. The former has already been addressed in Section 4.3 above. In relation to contamination, the PER indicates that there should be no interference to stock water dams resulting from the proposal and that "measures incorporated for the management of run-off .... will ensure that run-off downstream from the site is unaltered in quality." (PER, p. 71). From the point of view of the pastoral lessee, it is important that surface water quality is not adversely affected by the operation of the mine or process plant.

The Authority has made a recommendation on drainage management from the Wagoo Hills Project (Recommendation 2).

4.6.5 Bore field

The process plant and mine are expected to require approximately 3000 cubic metres of water each day. This would be obtained from a new borefield of five wells to be constructed to the north east of the Windimurra Hills. An additional two or three wells would be constructed as part of the borefield to meet initial startup water demand. The accommodation village could be supplied from the borefield, although some treatment may be necessary. The suggestion by the

proponent (PER,p. 22-23) that the quality of the aquifer in the vicinity of the proposed borefield is relatively poor has been challenged by the pastoral lessee. The lessee has advised the Authority that the aquifer is relatively fresh and current domestic supplies are drawn from a well near the proposed borefield.

The PER suggests that the proposed borefield may lower the water level in existing pastoral stock wells by one to two metres after the first year of operation of the wells. The proponent has acknowledged the importance of protecting stock water supplies, especially those in Log and Stag paddocks. As a consequence, a set of commitments have been made by the proponent to protect and/or augment stock or domestic water supplies if the proposal adversely affects them (Appendix 1, Commitments 5.1 - 5.5).

The Authority has made a recommendation on water supplies affected by the Wagoo Hills Project which would include a requirement on the proponent to monitor groundwater quality to determine whether there has been any contamination arising from the operation of the minesite or process plant and associated tailings dam (Recommendation 2).

4.7 Mining rehabilitation

The scale of mining would be relatively small, in comparison to many other mining operations in the region. The mine pit is not proposed in the PER to extend below the watertable. In addition, the ridge within which the mineralised ore is located is low and there is not expected to be large volumes of waste material from the mine. Most of the mined material would be processed and almost all of it would be disposed of in the tailing dam (Table 2).

At the completion of mining and processing, structures associated with the proposal would be removed and the ground ripped and seeded (PER, p. 68). It is important that rehabilitation of the mine pit and waste dumps is progressively undertaken, tying together mine planning and rehabilitation as part of a single, integrated strategy. The whole of the site should be rehabilitated to a stable condition.

4.8 Construction and operational workforce

The PER includes a proposal to construct an accommodation village within the Windimurra Hills, approximately two kilometres east of the process plant. This site would initially be used for the construction workforce and then by the operational workforce for the mine and processing plant.

Issues related to the sourcing of the workforce were raised in submissions. Precious Metals Australia Limited has indicated in its response that no decision has been made on whether the mine workforce would operate on a fly in-fly out basis or from Mount Magnet. Regional centres, such as Geraldton, may be used as the base for fly in - fly out operations. Sourcing the workforce from Geraldton has already been adopted by several mining companies and would be consistent with the State Government's preference towards regional development.

Another issue often raised in relation to these types of projects is the control and management of on-site personnel and existing pastoral activities. The proponent has given commitments to prevent the introduction of pets, to control the use of vehicles and to prohibit hunting (Appendix 1, Commitment 10.1 & 10.2)

5. Environmental impact and management - Mingenew Coal Project

The coal mine would be the first major mine in this historic coal field. The Irwin River Coal Measures have been recorded since the early explorers visited this region. While some limited mining has occurred, including its use for steam trains, no extraction on the scale proposed by Precious Metals Australia has been undertaken.

The site of the proposed mine has been historically cleared and used for cereal crops. While the mining operation is proposed on private property to the southern side of Nanekine Road, the resource is understood to extend to the north.

In view of its developed condition and scale of the proposal, the environmental issues associated with the Mingenew Coal Project are relatively few. These issues relate to:

- rehabilitation of the open-cut pit;
- effect of mining on the groundwater;
- effects of blasting on neighbouring properties, and
- control of dust and noise from the crushing plant.

The PER (Section 7) also outlines some key environmental management practices, procedures and undertakings for the Mingenew Project, including:

- a surface drainage management plan, and
- rehabilitation of the mine site to Mines Department guidelines.

5.1 Rehabilitation

The open-cut mine would be relatively small. The volume of waste and coal anticipated by Precious Metals Australia Limited to be removed each year is, even at the largest scale of mining proposed in the PER, less than half of that at Windimurra. In addition, the coal mine would be backfilled with the mine waste and rehabilitated to either its current use, cropping, or perhaps native vegetation (Appendix 1, Commitment 2.1). This commitment to progressively backfill and rehabilitate the open-cut is strongly supported.

5.2 Crushing and stockpiling

A significant potential dust source at the coal mine would be the crusher and associated coal stockpile area. While dust control measures proposed for coal handling at the vanadium processing plant would include the use of water sprays as well as the enclosure of conveyors at transfer points and installation of other dust suppression devices (PER, p. 60), only spraying from a water cart is proposed at the coal mine site (PER, p. 70).

Control of dust at the minesite, particularly in the crushing and stockpile area, may need more effective control than proposed. It would be reasonable to expect that those dust suppression measures that would apply at the Wagoo Hills Vanadium Project should also be adopted at the Mingenew Coal Project. Indeed, water spraying of the stockpiles may be necessary to minimise the risk of spontaneous combustion occurring within the stockpiles. This would probably increase the level of leachate generated from the stockpile, and emphasise the need for monitoring and, perhaps, improved control and management of surface runoff and groundwater contamination.

These controls would be applied through conditions in the Works Approval and Licence which would be issued under the Environmental Protection Act.

The Authority has also made a recommendation on dust control in this report (Recommendation 3).

5.3 Effects of mining

The open-cut is not intended to mine below the water table, which is approximately 50 metres below the surface (PER, Figure 4.6). Some water would be required for dust suppression. This water would be supplied from a bore to be located near the mine. The PER indicated that the expected annual requirement would be approximately 10,000 cubic metres (PER, p. 70). However, the need to adopt better dust control practices in accordance with approvals issued

under the Environmental Protection Act (See Section 5.2 above) may lead to a significant increase in this demand.

Mining and stockpiling of the coal may cause some localised groundwater contamination. The proponent has responded to a specific query about the need to monitor the neutralisation of acid discharges from the sump at the base of the coal mine by indicating that the pH of groundwater would be monitored for abnormal contaminated mine water seeping from the sump or related pit water holding pond (Appendix 2, 6.27).

A commitment to prepare a drainage management plan has been given by the proponent (Appendix 1, Commitment 5.1) as has a commitment to monitor seepage water for groundwater contamination (Appendix 1, Commitment 4.1).

Monitoring and management programmes at the coal mine should include the adjoining coal crushing and stockpile area. Conditions applied through Works Approval and Licence issued under the Environmental Protection Act would ensure that the stockpile area was not considered separately from the coal mining operation.

Concern has been raised about possible effects of blasting on neighbouring properties. As mentioned in Section 4.6.3 of this report, the Mining Act provides for controls on blasting which should minimise this risk. The nearest house is more than 3km from the proposed mine. Blasting would be necessary to allow removal of both the overburden and coal (Appendix 2, 6.23). A commitment to liaise with neighbouring residents to ensure that blasting does not cause disturbance has been given (Appendix 1, Commitment 6.1).

The same noise and blast limits that would be applied by the Authority for the Wagoo Hills Vanadium Project would also be included as conditions of a Licence at the Mingenew Coal Project.

In the case of noise arising from the coal mining and crushing operation, the following limits would be included in a Licence condition:

- 40 dB(A) between 10.00pm and 7.00am;
- 45 dB(A) between 7.00pm and 10.00pm, and between 7.00am and 7.00pm on Saturday, Sunday and any gazetted public holiday, and
- 50 dB(A) between 7.00am and 7.00pm Monday to Friday inclusive, but excluding gazetted public holidays;

as measured at the nearest residence.

The PER has clearly indicated that there would be the need to blast both the overburden and coal prior to removal. As a consequence, the Authority would apply a condition to a Licence requiring that:

- the air-blast over-pressure level generated by any blast did not exceed 125 dB (peak linear) as measured at any residence;
- no more than one in any ten consecutive blasts result in air-blast over-pressure level greater than 120 dB (peak linear) as measured at any residence, and
- blasting only occurred during the hours of 9.00am and 5.00pm Monday to Saturday inclusive.

The Authority has made recommendations on noise and blast impacts in this report (Recommendations 4 and 5).

6. Conclusion

The environmental impacts associated with the vanadium mine and process plant construction and operation at the Wagoo Hills Vanadium Project can be adequately managed to ensure that minimal adverse impacts arise.

Control of vanadium dust is an important occupational health issue. Exposure to this dust can lead to "green tongue disease", which is colouring of the mucus by vanadium oxides (mainly vanadium pentoxide). Vanadium pentoxide affects respiratory organs following inhalation, possibly leading to pneumonia and sometimes death. The proposed plant at Windimurra, including all dust control procedures, would be subject to control under the Mines Regulation Act. The plant would also be subject to Works Approval and Licensing under Part V of the Environmental Protection Act.

The pastoralist at Windimurra Station has expressed strong concern about the possible effects of the proposed vanadium oxide mine and processing plant on the existing pastoral lease and improvements. The Windimurra homestead is about 4km from the minesite and plant area and the lessee considers that some established infrastructure, including stock and domestic watering points and buildings as well as the occupiers of the homestead, may be adversely affected by the Wagoo Hills Vanadium Project.

Precious Metals Australia Limited has recognised in the PER that there could be impacts affecting some of the operations of the pastoral lease, as a consequence of drawdown on stock and domestic water supplies from establishment of a borefield for the mine and processing plant. Commitments to protect and, if necessary, replace water supplies have been given by the proponent. With respect to other concerns of the lessee, the proponent does not believe that there would be noise, dust or other impacts, mainly because the homestead is some distance from the minesite. From its review of the Wagoo Hills Project, the Authority recognises that there would be increased noise levels arising from the proposal, that there is a need to protect not only the current water supply requirements but also its quality, and that effective dust control at the minesite and processing plant is essential.

The coal mine would be the first in this coal field. The site, which would be owned freehold by Precious Metals Australia Limited, has been farmed since the beginning of this century. The pit would be backfilled with overburden. As with the vanadium project, environmental impacts can be managed to acceptable levels.

Transport of process materials for the Wagoo Hills Vanadium Project, especially the coal (30,000 - 70,000 tonnes per annum) from Mingenew to Windimurra, is a major issue that would need to be resolved between the Main Roads Department, local authorities and Precious Metals Australia Limited. A significant part of the transport route proposed in the PER, the portion between Mount Magnet and the minesite at Windimurra, is presently unacceptable to controlling authorities, without major upgrading. The Mullewa to Yalgoo route for the coal haulage would also require approval.

While there are a number of specific issues that would need to be dealt with as specific approvals are sought prior to development, the Authority concludes that the environmental issues associated with the mining and processing of the vanadium oxides at Windimurra, and the mining of coal at Mingenew, can be adequately managed to minimise potential environmental impacts.

Recommendation 1

The Environmental Protection Authority has concluded that the proposal to develop a vanadium oxide mine and processing plant on Windimurra Station, and a coal mining operation near Mingenew, as modified during the process of interaction between the proponent, the Environmental Protection Authority, the public and government agencies that were consulted, is environmentally acceptable.

In reaching this conclusion, the Authority identified the main environmental factors requiring detailed consideration as:

- **control of vanadium oxide dust;**
- **management of water resources and drainage at Windimurra;**

- **transport of process materials, and**
- **management of the coal mine near Mingenew.**

The Environmental Protection Authority notes that these environmental factors have been addressed adequately by environmental management commitments given by the proponent, or by the Environmental Protection Authority's recommendations given in this report.

Accordingly, the Environmental Protection Authority recommends that the proposal could proceed subject to the Environmental Protection Authority's recommendations in this report, and subject to the proponent's commitments to environmental management as detailed in Appendix 1 of this report.

The Authority's experience is that it is common for details of a proposal to alter through the detailed design and construction phase. In many cases alterations are not environmentally significant or have positive effects on the environmental performance of the project. The Authority considers that such insubstantial changes should be provided for within the assessment process.

The Authority also considers that any approval for the proposal based on this assessment should be limited to five years. Therefore, if the proposal has not been substantially commenced within five years of the date of this report, then such approval should lapse. After that time, further consideration of the proposal should occur only following a new referral to the Authority.

Recommendation 2

The Environmental Protection Authority recommends that, to ensure that surface and groundwater resources are not adversely affected by the Wagoo Hills Vanadium Project, the drainage management plans to be prepared by the proponent should:

- **be prepared prior to construction;**
- **address surface water flows affected by the Project;**
- **monitor groundwater quality to determine whether there has been any contamination arising from the operation of the minesite or process plant and associated tailings dam;**
- **make provision for suitable water supplies for stock and domestic purposes on Windimurra Station if existing supplies are adversely affected by the Project, and**
- **be prepared to the satisfaction of the Environmental Protection Authority, in consultation with the Department of Agriculture and the Department of Mines.**

Recommendation 3

The Environmental Protection Authority recommends that the proponent should not cause short term levels of non-vanadium bearing dust at residential premises near the Wagoo Hills Vanadium Project or the Mingenew Coal Project to exceed 1000 microgrammes per cubic metre ($\mu g/m^3$), measured continuously over 15 minutes.

Recommendation 4

The Environmental Protection Authority recommends that noise emissions from the Wagoo Hills Vanadium Project or Mingenew Coal Project should not cause or contribute to noise levels in excess of:

- **40 dB(A) between 10.00pm and 7.00am;**
- **45 dB(A) between 7.00pm and 10.00pm, and between 7.00am and 7.00pm on Saturday, Sunday and any gazetted public holiday, and**
- **50 dB(A) between 7.00am and 7.00pm Monday to Friday inclusive, but excluding gazetted public holidays;**

as measured at the nearest residence.

Recommendation 5

The Environmental Protection Authority recommends that blasting operations at the Wagoo Hills Vanadium Project or Mingenew Coal Project be undertaken such that:

- **the air-blast over-pressure level generated by any blast did not exceed 125 dB (peak linear) as measured at any residence;**
- **no more than one in any ten consecutive blasts result in air-blast over-pressure level greater than 120 dB (peak linear) as measured at any residence, and**
- **blasting only occurred during the hours of 9.00am and 5.00pm Monday to Saturday inclusive.**

7. References

Alan Tingay & Associates and Precious Metals Australia Limited (1992). Wagoo Hills Vanadium Project and Mingenew Coal Project Public Environmental Review (Report No. 91/31).

Musk A W and Tees J G (1982). "Asthma caused by occupational exposure to vanadium compounds" Med J 1982; 1: 183-184.

Precious Metals Australia Limited (1988). Prospectus.

State Energy Commission of Western Australia (1990). Proposed Collie Power Station Environmental Review and Management Programme (Report No. BD 90/12).

World Health Organisation (1988). Vanadium. Environmental Health Criteria 81.

Appendix 1

Precious Metals Australia Limited commitments on the proposals

Public Environmental Review
Wagoo Hills Vanadium Project
and
Mingenew Coal Project
January 1992

PROPONENT'S COMMITMENTS
(Consolidated from the PER and Responses)

APRIL 1992

The Proponent undertakes to fulfil the following commitments in accordance with the applicable State laws and regulations and with the standards and procedures agreed with the State.

1. Vegetation Clearing

1.1 Minimise clearing of land consistent with safe and efficient operations.

2. Weeds

2.1 Develop a management strategy to minimise the spread of Saffron Thistle. This strategy will be developed in consultation with the Department of Agriculture.

3. Fire

3.1 Maintain strict fire control procedures.

4. Rehabilitation

4.1 Design and rehabilitate all waste dumps in consultation with the Department of Mines and in accordance with the "Guidelines for Waste Dump Design and Rehabilitation" of that Department.

4.2 Rehabilitate the surrounds of the vanadium mine site and the process plant and village areas at Windimurra following decommissioning of the project.

4.3 Prepare specific proposals for site decommissioning in the event of termination of the project and implement those proposals after review and approval of the relevant Government Agencies at the time.

5. Groundwater

5.1 Design and implement a monitoring programme of groundwater levels and water quality in the borefield and other bores in the vicinity of the project area at Windimurra before operational start and to the satisfaction of the Water Authority of WA.

5.2 Undertake to guarantee continuity of stock water if changes in groundwater levels, caused by the Project, adversely affect pastoral activities.

5.3 Guarantee to provide the Pastoral Lessee with a potable water supply if the project adversely affects his current source of fresh water.

5.4 Design the tailings dams in consultation with the Department of Mines and in accordance with the "Guidelines for the Preparation of the New Tailings Dams" of that Department.

5.5 Implement measures in the process plant to conserve water.

6. Surface Water

6.1 Prepare drainage management plans for the vanadium mine and process plant at Windimurra in consultation with the Department of Mines.

7. Dust

7.1 Ensure that vanadium dust is controlled to below limits established in the Mines Regulations Act 1946 and Regulations, by incorporating dust extraction and collection equipment in the process plant.

7.2 Develop an effective operator training and awareness program to ensure that the process plant is well operated and any potential occupational health problems are quickly identified and are rectified immediately.

8. Emissions

8.1 Submit final design details of exhaust stacks and exhaust cleaning devices prior to construction for approval by the EPA as part of the Environmental Management Programme.

8.2 Submit a detailed composition of the coal to the EPA and Department of Mines to assist in designed management plans.

9. Transport/Packaging/Storage

9.1 Develop a transportation management and contingency plan to ensure that the transportation of hazardous materials is undertaken safely. A driver training program will be incorporated into the plan and will include regular review of driver awareness. Similarly, the integrity of transportation equipment will be monitored on a regular basis.

The transportation management and contingency plan will be developed in consultation with the Explosives and Dangerous Goods Division of the Department of Mines and the Western Australian Hazardous Materials Emergency Management Scheme (WAHMEMS).

9.2 Submit a final design of the storage facility for the sodium salt reagent at Windimurra to the Department of Mines and the EPA for approval as part of the Environmental Management Program prior to the construction of the process plant.

9.3 Ensure that all handling, packaging and road transport of inputs to the process plant and products from that plant comply with the requirements of the Australian Code for the Transport of Dangerous Goods by Road and Rail and the Dangerous Goods (Road Transport) Regulations 1983 and amended Regulations 1988.

10. Workforce

10.1 Prohibit domestic pets in the project area as a condition of employment.

10.2 Restrict off-road driving and prohibit hunting by employees as a condition of employment.

The Proponent undertakes to fulfil the following commitments in accordance with the applicable State laws and regulations and with the standards and procedures agreed with the State.

1. Weeds

1.1 Develop a management strategy to minimise the spread of Saffron Thistle. This strategy will be developed in consultation with the Department of Agriculture.

2. Rehabilitation

2.1 Backfill the coal quarry with overburden material, replace topsoil, and restore the site to its current use for grain production or natural vegetation.

3. Land Use

3.1 Manage surplus farm land areas in accordance with competent farm management techniques.

4. Groundwater

4.1 Design and implement a monitoring programme for abnormal contaminated coal mine water seeping from the pit and holding pond.

5. Surface Water

5.1 Prepare drainage management plans for the coal quarry at Mingenew in consultation with the Department of Mines.

6. Noise

6.1 Liaise with residents living in the vicinity of the coal quarry to ensure that blasting operations there do not cause a disturbance and modify those blasting operations if necessary.

7. Dust

7.1 Control coal dust and total dust and noise levels in the project areas in accordance with the applicable acts and regulations.

Appendix 2

Summary of issues raised during the public review period and response by the proponent

A.C.N. No : 009 131 533

PMA
PRECIOUS METALS
AUSTRALIA LIMITED

May 12 1992

The Chairman
Environmental Protection Authority
Westralia Square
38 Mounts Bay Road
PERTH WA 6000

Attention: Mr Colin Murray

Dear Sir

RE: WAGOO HILLS VANADIUM PROJECT AND MINGENEW COAL PROJECT
PUBLIC SUBMISSIONS - PROPONENT'S RESPONSES & COMMITMENTS

Please find attached our amended responses and commitments as per our recent discussion.

Once again, thank you for your assistance.

Yours faithfully

Andrew K McKee
MANAGING DIRECTOR

Enclosures

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Public Environmental Review
Wagoo Hills Vanadium Project
and
Mingenew Coal Project
January 1992

PROPONENT'S RESPONSES
to
PUBLIC SUBMISSIONS

APRIL 1992

INTRODUCTION

This document contains responses by the Proponent Precious Metals Australia Limited (PMA) to submissions on the Wagoo Hills Vanadium Project and Mingenew Coal Project Public Environmental Review (PER), by Government Departments and the general public.

The Environmental Protection Authority (EPA) has summarised the issues raised and comments made in each submission. The submissions have been categorised under the following broad headings:

1. General
2. Vanadium Mine and Process Plant
3. Transportation
4. Operational Workforce
5. Other Land Users
6. Coal Mine

Summary of issues raised or comments made are shown in italics followed by the Proponent's response.

1. GENERAL

1.1 *The Shire of Mount Magnet envisages that there should be little environmental impact on the area when compared to the impact of livestock over the past, approximately 100 years.*

1.2 *The proposals have the solid and total support of all REIWA members in the Mid-West region.*

1.3 *The area concerned for the vanadium mine is located in the Mid-West mining region, and therefore we can see no objection to this proposal, particularly given the benign nature of the project.*

1.4 *The projects will have an impact on the environments in which they operate. However, the Geraldton Mid-West Regional Development Authority is of the view that the comprehensive range of initiatives the proponent intends to undertake, as listed in Section 8.2, will ensure that the environmental integrity of both areas will be protected.*

1.6 *The operation of the project, with regard to the major issues addressed in the PER can be professionally monitored and controlled by officers of the Department of Mines through close adherence to the Mining Act, Mines Regulations Act, Coal Mines Regulation Act and the Explosives and Dangerous Goods Act.*

1.10 *The Water Authority of Western Australia (WAWA) considers that these projects pose very little pollution threat or environmental impact.*

No response required.

1.5 The PER does not contain adequate information for a detailed assessment of the possible impacts of waste dump and tailings dam at Windimurra and the overburden dump at Mingenew. A satisfactory Environmental Management Programme will be required by the Department of Mines and suitable Performance Bonds imposed prior to any approvals.

The Proponent recognises that final details of various mining activities and the possible impacts of waste dumps and tailings dams must be discussed and agreed to by the Department of Mines. The final detailed planning of mining operations will be on the basis of achieving the most efficient and cost effective means of mining, while at the same time providing for the achievement of quality environmental control and management.

1.7 Although not listed on page 8, the Wildlife Conservation Act 1950 and regulations would obviously be complied with.

The proponent notes this omission and will comply with the nominated Legislation.

1.8 If some flora or fauna or Aboriginal Heritage sites are found on the minesites, the project should be modified in order to protect them.

1.11 The company has indicated that it will be commissioning a site survey for the project area. On receiving the results of the survey, it will be possible to determine if all requirements under the Aboriginal Heritage Act 1972–1980 have been met.

A site survey has now been completed and the Proponent will fulfil their obligations under the Aboriginal Heritage Act, 1972–80. With respect to flora and fauna, the Proponent will comply with the requirements of the Wildlife Conservation Act 1950.

1.9 Regulations pertaining to the Rights in Water and Irrigation Act 1914 with regard to groundwater use at the coal mine and vanadium mine are to be adhered to.

The Proponent will develop the project's water supplies in accordance with the Rights in Water and Irrigation Act 1914.

2. VANADIUM MINE AND PROCESS PLANT

2.14 The emissions that will be generated at the project site may be more than what would generally be desirable, but at the same time the project will be situated in a fairly remote area, sparsely populated with the only residents some 4.5km from the project site. It is presumed that this will be taken into account when final assessment of the project is made.

No response required.

2.1 Local drainage lines tend to be in a northerly direction, eventually terminating in a fresh water lake, which remains potable until the lake dries up. The area is undulating with strong shallow drainage lines to the north and then east to clay pans (not salt pans). The nearest lake is approximately 30km to the south-east of the minesite.

2.3 The northerly drainage direction will present problems to the all weather access road and airstrip.

All available information regarding local groundwater conditions and soil profiles in and surrounding the site have been presented in the PER. The site has not been subject to a detailed investigation and this is reflected in the Proponent's commitments given in Sections 7.2, 7.5 (pages 79 & 80) and Section 8.2 of the PER. The Proponents project area is located on slightly elevated ground with most of the run-off draining in an easterly direction into depressions and clay pans.

2.2 The minesite will interfere with water run-off and effect vegetation on lower slopes.

2.30 The catchment of two dams will be severely effected because they are dependent on the run-off from the Hawkstone Ridge.

The Proponent's groundwater consultant has stated in the PER that the proposed project site will not disrupt the natural drainage, thus not effecting local vegetation. The proposed project land surface area to be directly affected by site works is anticipated to be less than 20ha including roads. This relatively small area will not affect the surrounding natural ground slope or alter the natural water run-off direction. Management and monitoring of surface water drainage is described in Section 5.1.2 (page 53) and Section 7.2 (page 79) of the PER.

2.4 *The recent January and March rains are considered to have been heavy enough to damage prospective tailing and other dams, washing their contents into pastoral dams and onto vegetated land used for grazing.*

2.7 *This area is prone to flash flooding after heavy rainfall. What provisions has the proponent made to ensure that the tailings dams do not overflow or bust in such a situation?*

The Department of Mines have confirmed with the Proponent that even after the recent heavy rains in the mid-west area, no overflow from tailings dams or mines within the area has been reported. Sufficient excess capacity (ie. Free board) will be allowed in the tailings dam to collect storm water falling directly into the dam and the rainwater falling into the relatively small bunded areas in and around the process plant. The plant design will allow for all spillages from process tanks to be collected in these bunded areas which will be directed back into the plant and/or to the tailings dam so that none of these spillages will contaminate surface water. The Proponent will also assess offered on-site local drainage data when defining their one in 100 years event design criteria.

2.5 *What impact will heavy rain have on the vanadium minesite?*

2.6 The surface water drainage management plan to be developed (page 53) should include the airstrip and roads.

Prior to the commencement of mining a surface water drainage management plan will be developed in consultation with the Department of Mines. The impact of heavy rainfall will be taken into account in these plans. Reference PER Section 7.2 (page 79) and Section 8.2 (page 81).

2.8 Use of saline groundwater for dust control will have to be carefully managed so as not to interfere with roadside vegetation and future rehabilitation.

These comments are noted and appropriate procedures will be incorporated in our management plans. See PER reference Section 8.2 (page 81).

*2.9 The first paragraph on page 25 mentions **Maireana rhagodia.** Is this meant to be M Pyramidata? Does M pyramidata (Halosarcia) indicate that the Blue Bush and Samphire are growing together.*

The Proponent notes this error. The paragraph (page 25) under Section 3.1.4 Vegetation and Flora, should read:

- **Drainage plains marginal to hills – open mulga with Casuarina and other Acacia species over *Eremophila forrestiana* and other Eremophila species with Blue Bush (*Maireana pyramidata*) and Sida species with annuals.**
- **Central Drainage Flats – mulga with other Acacia species including *A. tetragonophylla* and *Pittosporum phylliraeoides* and Eremophila species, *Ptilotus obovatus* and *Solanum lasiophyllum* on shallow hardpan soils, and *Maireana pyramidata* on the flood plains with the *Halosarcia* on the cracking clays.**

The error is not significant.

2.10 The proponent does not say how the minesite will be rehabilitated. We believe that total rehabilitation of the landscape to approximately its previous form should be required. All hazardous wastes should be removed or safely disposed of before the site is decommissioned.

The Proponent proposes to decommission and rehabilitate the site as addressed in Sections 5.1.3 "Overburden Dumps and Rehabilitation" and Section 5.2.7 "Decommissioning".

2.11 The waste from the mine should be backfilled into the pit during the operation of the mines, with the absolute minimum in waste dumps. This may require the pit design to be modified.

The Proponent does not intend to backfill the pit as this would be cost prohibitive and would make the project non-viable.

2.12 A programme of monitoring groundwater and air quality near the mine and processing plant should be put in place before the project starts.

2.22 The operator should maintain a regular on-site monitoring programme for hazardous wastes, especially heavy metals in water, air and dust.

Monitoring programmes will be determined in consultation with the Department of Mines, EPA and the Water Authority of Western Australia.

2.13 Emissions of sulphur dioxide from the burning of coal and their effect on humans, livestock (including respiration and reproduction), and vegetation need to be given attention.

The Proponent has stated in the PER document, Section 5.2.4, (page 65) the proposed quantity of SO^2 emitted will be of a low level due to the low sulphur content of the coal and the small quantity of coal burnt when compared to other coal users in the State. The final kiln stack height will be designed in consultation and agreement with the EPA and the Department of Mines to achieve acceptable ground level concentrations.

2.15 *The rainfall and wind conditions described for Mount Magnet are not the same as those that apply at the minesite. Annual rainfall is noticeably higher on average and the winds range from north-east to north-west in Summer, north-west and south-east in Winter and north and north-west during Spring.*

All available information regarding local climate conditions was gathered from the nearest meteorological station at the Town of Mount Magnet. Some of this historical information has been collected for over 30 years. The Bureau of Meteorology, Perth Office, consider that any great variance in wind directions, some 75km east-south-east of their weather station is highly unlikely. Some localised wind variance may happen due to the topography of a particular area, although this is not the case at Windimurra as it is generally flat. Normal rain bearing thunderstorms develop due west of this area encompassing Mount Magnet and the Windimurra area.

The Proponent considers that the weather patterns at Mount Magnet are representative of those at Windimurra and are adequate for design of water collection, surface water redirection and the planned location of infrastructure. The Proponent, however, would wish to assess offered local on-site meteorological information to assist in their final design plans.

2.16 *Throughout most of the year dust and airborne pollutants will be carried by prevailing winds over the homestead. The homestead's drinking water comes from rainwater tanks.*

Meteorological information shows that very little wind from the north and north-west will cross the project area towards the Windimurra Homestead. This pattern of wind will limit the transport of dust to the Homestead.

The proponents, in their commitment 8.2 of the PER will comply with the applicable Government Acts and Regulations in the control of noise and dust abatement.

Where dust management is warranted it may involve some of the following methods:

- **the use of water sprays on stockpiles;**
- **the watering of haul roads under dry conditions;**
- **the enclosing of conveyor transfer points; and**
- **the minimisation of exposed land areas by the early implementation of rehabilitation work.**

With these measures and normal wind patterns it is considered that dust impact on the pastoral homestead will be negligible or minimal.

2.17 *Due to the proximity of the mine to the homestead, there will be noise pollution twenty-four hours per day from plant and equipment located at the mine.*

The natural buffer distances between the mine and nearest homestead is over 4km. The Proponent believes the noise impact will not be significant.

2.18 *The storage and handling of sulphuric acid and other corrosive materials used on site (eg, sodium hydroxide) should comply with AS3780.8 - 1990.*

In accordance with Legislative requirements, both liquid and solid chemical reagents will be contained within bunded areas, with provisions to collect and contain spills, as set out in the guidelines - Australian Standard 3780.8 - 1990

2.19 How safe is sodium sulphate and what environmental and health damage can it cause?

Sodium sulphate is not a toxic, harmful or dangerous substance. It is a neutral salt that is used extensively in domestic laundry detergents (which are up to 75% sodium sulphate). Sodium Sulphate is also used in glass making, and is a component of other consumer products such as laxatives and antacids.

2.20 The proponent should be aware of the article by Musk A W and Tees J G (1982) "Asthma caused by occupational exposure to vanadium compounds" Med J Aust 1982; 1: 183-184.

The Proponent is aware of the article and have made reference to occupational safety measures on page 58 of the PER "Control of Vanadium Dust and Fume".

2.23 The pH of the tailings is slightly acidic (pH 5-7). There is a possibility that the acidic pH could mobilise any metallic components of the contents (from process tailings and rotary kiln ash) of the tailings dam. The Proponent should be asked to address this concern.

The Proponent predicts that the pH of slurry ex the plant will be between 5.0 and 7.0. As discussed in Section 4.2.4 the Proponent will design the tailings dam in accordance with established guidelines provided by the Department of Mines.

2.24 What affect will the tailings dam have on birds that might be attracted to land in it?

The Proponent believes that due to the low toxicity of the tailings water birds attracted to the dam are unlikely to be harmed or suffer any adverse affects.

2.25 *Drawdown of local aquifers from the minesite borefield will increase and have the potential to severely hamper both domestic and pastoral water supplies, and on vegetation and pasture. What contingencies has PMA to address loss of pasture and other stock feed?*

The Proponent, based on independent consultants opinion, believes the projects planned drawdown of the local aquifer will not severely impact water supply and vegetation.

The proponent has undertaken to monitor groundwater levels and water quality in the borefield and other bores in the vicinity of the project area before operational start and to the satisfaction of the WAWA. PER reference Section 8.2 (page 81).

If the groundwater monitoring programme indicated that dewatering is adversely affecting the current supply of water from the leaseholders bores, PMA will investigate options to ameliorate the drawdown by modification to the dewatering programme. If this is not feasible, PMA will arrange with the Lessee to supplement their groundwater supply to fulfil current needs, providing usage has not significantly increased. PER reference Section 7.5 (page 80) and 8.2 (page 81).

2.26 *Existing bores in the area are shallow and water quality is generally fit for human consumption. There are potential additional costs of deepening bores as the water table drops due to mine pumping, together with different equipment requirements and strong prospects of water supplies having higher and unacceptable levels of salt.*

The Proponent's groundwater consultants tested the bores and wells in the vicinity of the project area. Based on the World Health Organisation International Standards, allowance of a maximum of 1,500mg/litre (ppm) of total soluble salts for human consumption– none were fit for human consumption.

2.27 If mine dewatering is necessary at any stage, how will it affect local water sources, vegetation etc.

Drilling to date indicates that current mining plans will not be below known water table levels and as such no mine dewatering is planned. The Proponents past drilling has shown that the depth of the oxidised vanadium ore is relative to the known water table level. Where the Proponent proposes to dig to a depth of 35m, water was encountered at a depth of 38m.

2.28 It appears that PMA has drilled only two bore holes in the area, and not in the vicinity of the proposed borefield. These should not be used to make assumptions used in the PER on salinity levels. There are nine station bores in the vicinity of the borefield, all producing low salt water.

2.31 The PER suggests that PMA knows little about the aquifer and the affect of PMA's proposed draw will have on water availability over time.

2.32 There is a need for assurances with respect to affect on short term and long term fresh water supplies and remedies in the case of short term or long term failure of supplies.

The Proponent's groundwater consultant tested 13 bores or wells within and outside the project area. Nine Lessee's bores or wells tested had an average water or salinity of 4,740mg/litre TDS. All available information regarding the local aquifer has been presented in Sections 3.1.3 (page 22) and 5.4.2 (page 71) Water Supply, and the Proponent's commitment to ongoing water supplies are stated in Section 8.2 (page 81).

2.29 No consideration has been given to the effect of the anticipated 1 to 2 metre reduction in the water table on local vegetation.

The Proponent has stated in the PER that there may be a localised lowering of water levels. Any impact on vegetation would be minimal and localised in the vicinity of each well head.

Monitoring studies conducted for three to five years by the Department of Agriculture in a similar environment at Austin Downs, Cue, did not demonstrate any loss of vigour in the vegetation when the water level fell.

It is considered that a lowering of the water table by one to two metres in the immediate vicinity of the well head will have very limited affect on the vegetation which could be expected to follow the watertable down in search of water. The lowering of the watertable by up to 2m will only occur in the vicinity of the well head. The fall in the area between the wells will be much less and it is not anticipated that it will affect the vegetation.

The trees and shrubs, as well as the herbaceous component which supplies the major dietary source for the stock, do not depend upon the deep water table for production. The pastoral production depends entirely upon incident or run-on water which will be completely unaffected by the watertable, there being no relationship for this purposes between the two.

It is noted that prolonged pumping at the citrus orchard east of Wiluna did not affect the vegetation there. Adverse vegetation affects from pumping are not expected at Windimurra.

2.33 *Although the understorey of the shrublands and woodlands have been modified by stock grazing, the effect of this grazing has not disadvantage the lease.*

The Proponent's rangeland consultant has stated that over a period of time the shrublands have been modified by stock grazing and this has affected the carrying

capacity of the lease as the lease is not able to support past stock unit numbers commensurate with the pasture type. It is, however, noted that it is possible to carry stock in such a way that it will not further deteriorate the depleted shrub population.

2.34 *The area affected by the project, including the airstrip, town site, borefield, mine, roads and processing area, as well as recent pegging by PMA is in excess of 50 square kilometres.*

The Proponent's project area covers approximately 120 ha or approximately 1.2 square kilometres as stated in 3.1.7 (page 25) of the PER. The Proponent's environment and social impact study applies to this area only. The area affected by this project is not in excess of 50 square kilometres.

2.35 *The mine and process areas are key areas in the pastoral lease, and will affect breeding and shearing areas. Management of the lease will become more difficult.*

The Proponent's pastoral rangeland consultant has stated that the project area will not affect stock breeding, and shearing areas, and the project facilities are not located on key areas within the pastoral lease.

2.36 *There is a need for more information on local affects in relation to transport control for dangerous goods, dust control, operation environmental management issues, monitoring of leachates and dust.*

The Proponent has undertaken to work with the appropriate authorities in formulating and implementing safe transport and storage measures. PER reference Section 8.2 (page 82).

2.37 *The Windimurra homestead and shearing shed is on a geological fault line. Any blasting at the mine could damage these buildings.*

The Windimurra homestead and shearing shed are not on a geological fault line. Due to the weathered nature of the orebody very little, if any, blasting will be required. This has been confirmed by a study of the excavation characteristics carried out by an independent geotechnical engineering company, Barrett Fuller and Partners.

If any blasting is required, it will be carried out under the regulations laid down by the Engineering Division of the WA Department of Mines. Maximum vibration levels allowed by the Department of Mines are insufficient to cause structural damage to buildings. Noise and vibration levels are monitored by the Department of Mines.

2.38 *Assurances should be given by PMA about compliance with bush fires, feral animals and noxious weeds legislation, together with compliance with conditions of regulatory bodies involved in the pastoral industry.*

The Proponent, in Section 8.2 (page 81) List of Commitments, has given these assurances.

2.39 *A single map showing the locations of the airfield, borefield, minesite, pipelines, prospective dumps, town site, Windimurra homestead and outbuildings, roadways and access ways would allow all elements of the project to be properly considered.*

A location map providing the project's mine boundaries and construction and the Windimurra homestead is provided in the PER document in Figure 1.3 (page 6).

2.40 *From drilling results reported, it would appear that at some stage mining will go down into the sulphide zone. This will mean consistent blasting.*

The Proponent currently has no intention to mine the known sulphide zone at depth as all the proven vanadium ore is in an oxidised zone therefore no consistent blasting is planned.

2.41 *It is generally known in the mining industry that prime contractors have difficulty in controlling the behaviour of sub-contractors and their employees. What assurances will PMA give in terms of control of contractors and other visitors, and any damage that might occur.*

The Proponent believes this statement is generally incorrect. The Proponent has specifically addressed the planned work practices in Section 5.4.1, Page 70, of the PER and in Section 8.2, List of Commitments. The Proponent will enforce a code of ethics for its employees.

2.42 *How would PMA compensate the pastoral lessee in the event of chemical damage, tailings dam failure, coal stockpile leachate etc.*

2.46 *There should be an undertaking that PMA should provide prompt compensation for stock deaths caused by the project operation and employees.*

The Proponent believes in following known and proven procedures provided by the Department of Mines and the Environmental Protection Authority for the establishment and operation of mines and process plants, the Pastoral Lessee should not experience any loss of earnings due to the above stated events. However, in the unlikely event of the mining operations impacting on the pastoralist's earning capacity and only when settlement cannot be reached with the Proponent on compensation, the Lessee by successful application to the Warden's Court may be compensated for damage to improvements and loss of earnings.

2.43 *What provisions has PMA made in the event of fire associated with the mine, plant or town site.*

The Proponent does not believe that its mining activities will increase the risk of bushfires. Fire control and prevention will be part of standard operational and safety procedures.

2.44 *The mine site, plant area and other project facilities will need to be fenced off by PMA.*

The Proponent will follow the normal guidelines provided by the Department of Mines.

2.45 *It has been suggested that a nine hole golf course is planned near the village. Is this correct?*

The Proponent has not considered a nine hole golf course.

2.47 *Power transmission lines should be underground to minimise risk to commuter, mustering, RFDS aircraft using the station airstrip.*

The Proponent has noted this concern and will review the final power transmission layout to take into account these factors.

2.48 *An analysis of the composition of the ash from the kiln should be given prior to the EPA reporting.*

The Proponent will provide necessary analysis to the EPA when requested.

3. TRANSPORTATION

3.3 The Shire of Mount Magnet is of the opinion that if hazardous goods are transported in accordance with well established safe practices, the likelihood of an impact on the environment should be minimal.

No response required.

3.1 The Shire of Mount Magnet is concerned at the amount of raw materials which will be required for the project and which will have to be transported over what are currently considered inadequate roads networks:

- *Council is of the opinion that the current standard of the Mount Magnet–Sandstone Road is inadequate for the current traffic needs requirement. Additional road trains on the first 51km of the road would ensure rapid deterioration of the existing road standard and surface. The only economical alternative is to seal this section of the road.*
- *The Mount Magnet–Youanmi Road is not of a standard capable of being utilised by heavy freight transport units such as B–Doubles or road train combinations. This road would require considerable upgrading, with drainage being particularly important.*

3.2 Dust emanating from traffic using the Mount Magnet–Sandstone Road, particularly heavy freight units, is having a marked affect on roadside vegetation. This problem would only escalate.

3.4 Further discussions with the MRD and relevant local authorities should have the following objectives:

- *decisions on appropriate routes to be taken, particularly between the coal deposit and the Geraldton–Mount Magnet Road;*
- *identification of road enhancement works required to accommodate the transport routes to be used;*

- *identification of road preservation work, over and above those traditionally undertaken, required to ensure safe conditions, particularly on Local Government roads used; and*
- *agreement on cost sharing arrangements for both enhancement and preservation works over and above current funding strategies, particularly on Local Government roads.*

3.7 *The section of the coal haul route from Mingenew to Yalgoo is not designated for road trains and will require local authority and Main Roads Department approval. The Shire of Mullewa's preferred route to Wagoo Hills from the Minesite is through Mullewa via the Mingenew–Mullewa Road. This route is all weather and sealed, substantially reducing the length of unsealed road to Mount Magnet. Progressive upgrading of this road is occurring and some acceleration of the works programme could be negotiated between PMA, Council and MRD.*

The Proponent is assessing the routes for transport of all materials into and out of the Windimurra process plant based on cost, efficiency and other economic factors. Although the Proponent has certain preferred routes the Proponent is yet to finalise all transport arrangements required by the project. These matters raised will be taken into consideration in the final planning. All transport operations will be carried out in accordance with well established procedures and government regulations. The Proponent will further discuss transport routes with the appropriate Shire Councils and the MRD during the final project planning stage.

3.6 *Transport of vanadium oxides should be in a form such that they will not easily blow away if the vehicle is involved in an accident.*

Vanadium oxides may be transported in either sealed 200 litre drums or in 2 tonne capacity bulkabags. These packaging systems are commonly used to transport many

different chemicals safely throughout the world. Should the vehicle transporting the packaged oxides be involved in an accident, there is little likelihood of the product blowing away as there will be a second level of containment within the drum or bag. The Proponent has referred to the handling of products in Section 5.2.3 (page 60) and Section 8.2 (page 82).

3.5 "Explosives and Dangerous Goods Act 1983" on page 60 should be changed to "1961" unless it is intended to refer to the Dangerous Goods (Road Transport) Regulations 1983.

The Proponent notes this error and confirms the correct reading as "Explosives and Dangerous Goods Act 1961".

3.8 The project will make extensive use of heavy trucks on rural roads. The proponent should be required to pay for the upgrading and maintenance of these roads to a safe level to prevent the possibility of a spill.

Where the only user of the road is the proponent, this is a principle that the Proponent agrees with. However, as the proposed road routes are public roads, other road users will benefit from having these roads upgraded. It is therefore the Proponent's opinion that any upgrading programmes should not be paid for by the Proponent. Existing fuel taxes will be paid by the Proponent, so funds are available to the Government for the maintenance and upgrading of existing public roads.

3.9 There does not appear to be any local source of suitable road gravel near the minesite.

Materials of adequate quality for road construction will either be sourced from the nearest known deposits, or from locating new deposits in the area, or by importation of material from further afield.

4. OPERATIONAL WORKFORCE

4.2 There are obvious benefits to the region, State and Federal Governments, and hopefully additional employment opportunities for the local region.

No response required.

4.1 The Shire of Mount Magnet is against fly in-fly out operations as they are considered detrimental to the development of an individual shire.

4.4 It has been stated within Mount Magnet and can be demonstrated from the Eastmet experience that Mount Magnet town can expect little direct benefit from this mining project.

4.5 It is understood that housing is currently not available in Mount Magnet and therefore accommodating employees in that town does not appear to be a viable alternative, unless the proposed houses to be located at Windimurra are erected in that town.

The decision as to whether to operate the mine workforce on a fly in-fly out basis or from Mount Magnet has not been finalised, as addressed in Section 2.1 (page 11) and Section 5.2.6 (page 68) of the PER. The issue of road conditions, reliable access and the economics of each option will be reviewed before the final decision is made. The Proponent believes that any new mining project within a Shire region will benefit that Shire when compared to no new developments at all. The town of Mount Magnet will be the project's closest and relatively easiest accessible regional centre to service the proposed operation. In contrast to Eastmet's Youanmi Gold project, the Windimurra project proposes to utilise the Mount Magnet to Sandstone Road to transport commodities and personnel to and from site whereas the Youanmi project often uses the route via Paynes Find to their site, so not passing through Mount Magnet. In addition, the Windimurra treatment plant is more complex than the Youanmi Gold plant so will

require a much greater number of contract tradespersons to maintain the plant (particularly during planned shutdown) and the plant will require a far greater quantity of miscellaneous general spares and equipment.

4.3 The impact on the water supply availability for company employees choosing to live in Mt Magnet should be addressed directly with WAWA prior to construction.

The Proponent is aware of this issue as noted in Section 6 (page 76) of the PER.

5. OTHER LAND USERS

5.1 Council assumes the necessary assurance will be given to nearby or adjacent pastoral land holders with regard to likely affects on their pastoral operations and possibly more particularly water tables.

The Proponent has addressed the same in Section 8.2 (page 81) "List of Commitments".

5.2 PMA has not consulted with the pastoral Lessee in respect of the large majority of matters discussed in the PER.

The Proponent has consulted with the pastoral Lessee and has noted the comments made in response to the PER.

5.3 The pastoral consultant used by PMA was not aware of the total area PMA will affect, including the proposed location of the airstrip, borefield, pipelines and town site. He has advised that the condition of the lease has not deteriorated in the past 17 years, a number of which were extremely low rainfall years.

The Proponent, as part of its public consultation programme, employed the services of a well-known pastoral and rangeland rehabilitation consultant. He was fully briefed and provided with a proposed layout of the project as it appears in Figure 1.3 of the PER.

The pastoral rangeland consultant has stated, in reference to the condition of the pastoral lease, the following on Page 26 of the PER:

"The pastoral range consultant engaged to advise PMA, considers that the project will have little impact on the carrying capacity of the pastoral lease and will cause only minor disruption to pastoral activities. The project area including the borefield area

covers some 120ha which represents less than one twentieth of 1% of the total area of the pastoral lease. A study of rangeland conditions made in 1975 indicated that the Salt Bush and Blue Bush communities were in fair to good condition with some depletion of the perennial Salt Bush vegetation. Observations made by the pastoral consultant in 1992 suggest that the situation has not changed significantly in the past 17 years, though the shrub layer has been depleted. The area of the mine and process plant is mostly covered by surface scree and only a small part of this could be considered as potential grazing land."

5.4 The figure used in the PER for the area of Windimurra Station incorrectly includes the Anketell lease.

The Proponent's search of the Title suggests that the original Anketell Lease was amalgamated with the Windimurra Lease in 1980 to form one pastoral lease. This lease area is referred to in Section 1.3 of the PER as Crown Land subject to a pastoral lease (#3114/1150) and granted for grazing purposes under the provisions of the LAND ACT, 1933 and known as Windimurra Station. The Windimurra pastoral lease, incorporating the former Anketell lease, is currently leased and operated by the same person.

6. COAL MINE

6.16 The "enterprising farmers" on page 75 should be in no doubt that Mines Department will require a qualified mine manager on site, and that manager will ensure an acceptable level of experience, training and skills from his operators.

No response required.

*6.1 There are few areas left in the State to equal this Mingenew area for flora and fauna. The rare orchid **Thelymitra Mac-millanii** is found on this property, along with an abundance of echidnas, as well as roos, foxes, rabbits, emu, bungarras, etc. I understand from the PER that the flora and fauna will receive the utmost care. I do solemnly hope so.*

6.2 The bird life in the bush areas around the bores in Cauna Road has to be heard to be believed. I worry that the noise of the workings will scare them away.

6.7 The site drainage plan should be drawn up in conjunction with the Mingenew Land Conservation District Committee in addition to the Department of Agriculture and Department of Mines.

The observations and comments are noted. The Proponent will comply with the requirements of the applicable Acts and Regulations. PER reference Section 8.2 (page 81).

6.11 I would question the impact on indigenous flora and fauna, and especially if the mine site suggested in Fig 1.4 was to be located north as is possible if a better quality coal seam was found to be adjacent to the present proposal.

The rationale for the site of the mine operation as suggested in Fig 1.4 has been identified as being technically and economically feasible based on information to hand.

6.3 *Even though the dirt will be replaced in the open cut, there still has to be a big hollow compensating for the coal removed. I would hate to think that this would again form crabholes, which used to exist on this property.*

The normal practice of backfilling and rehabilitation will not leave a hollow or depression on the mined area. In fact, due to excavation methods in removing and then backfilling the waste material into pit, there will be an expansion of the backfill material which will compensate for the removal of the coal.

6.4 *While acquisition of the farm will provide and immediate buffer zone, this leaves a large portion of the farm with no mention of management for future use plan. There is the potential for lack of attention to fire control work, noxious weeds control, general water run-off control and lack of maintenance to fencing. The company should state the intended use and management of the remainder of the farm.*

The Proponent is mindful of the need to manage the surplus portion of the property and as such will place the area under management utilising competent farm management techniques. Future land backfill areas will be managed consistent with farming or natural vegetation land management procedures, depending on the decided end use.

6.5 *Local knowledge suggests that the top 150mm and then the next 500mm of top soil should be stockpiled separately for later replacement. Advice from the Department of Agriculture for fine tuning should be sought.*

6.8 *Local knowledge queries whether the backfilling to return to grain production is possible, desirable or economically feasible. It may be more acceptable to revegetate the area with natural bush.*

The Proponent, after further recent local consultation, believes the method described in Section 4.3.2 (page 47) to strip and replace the top soil will not provide immediate grain growing conditions. Upon further consultation a system of double stripping firstly the top 150mm and then separately stripping and stockpiling the next 500mm of soil will be considered if the proponent wishes to return the area to grain production. The PER in Section 8.2 (page 83) refers to the Proponent's commitment if the land was to be reinstated as grain production land.

6.9 *Figure 1.4 indicates that the coal mine is located very close to a magnificent stand of* ***Eucalyptus salmonophloia*** *which is not regenerating because of grazing because it is not fenced off and is a remnant stand in this area of the Shire and northern wheatbelt. The potential for this area to be rehabilitated is possible if the present stands of trees are left, and the mine is re-covered with soil and rehabilitated with local trees.*

The PER addresses farming Location 9793. The Proponent has no knowledge of a stand of Eucalyptus salmonophloia referred to. Notwithstanding, the Proponent will endeavour to assist in retaining and protecting all standing trees within it's influence zone.

6.10 *Perhaps co-operation with the Mingenew Land Conservation District Committee and other concerned bodies could be sought to redevelop this area with natural vegetation and not left as farmland.*

This comment is noted. The Proponent will consider this option and decide on the final use of the backfill land and the subsequent appropriate rehabilitation methods. Based on this decision the Proponent may consult the Mingenew Land Conservation District Committee.

6.6 Saffron Thistle also occurs on the Mingenew property where the mine is planned. Information and advice should be obtained from the Department of Agriculture for this location as well.

6.25 What controls will the proponent impose to ensure that weed species will not be carried from the coal mine and spread along the transport route and at the process plant site.

Comments noted. The Proponent will seek advice in accordance with Section 8.2 (page 81) "List of Commitments". There is no evidence to suggest that the project will significantly increase existing risks in this regard.

6.12 The suggested pit wall angle of 45 degrees at the coal open cut will need validation in co-operation with Mines Engineering Division at the commencement of operations.

6.13 The proposed placement of backfilled overburden above coal operations on a 7 degree footwall slope needs closer consideration by Mines engineers closer to start-up.

6.14 External slope angle of 20 degrees on page 54 seems excessive. The State Coal Agreement Act's rehabilitation committee require completed outslopes of 10-14 degrees.

Comments noted. The Proponent will seek advice in accordance with Section 8.2 "List of Commitments".

6.15 The strategic coal stockpile of 4,000 tonnes could be a source of sulphur fumes, CO_2 and smoke in the event of heating. PMA should ascertain the coal's propensity for spontaneous combustion.

6.17 Detailed chemical analysis of the overburden material will be required prior to approvals to investigate possible environmental concerns.

6.18 A detailed composition of the coal, including sulphur levels, particulates, and metals should be given.

The Proponent will provide the relevant information to the Department of Mines and the EPA to assist them in their assessment of the Proponent's future management plans.

6.19 It may be worth noting that one of the contributing causes of the Mufulira disaster (when surface tailings flooded underground workings) was that particulate size of less than 300 microns remained in suspension creating numerous perched water tables within the tailings, enabling large sections of the dam to flow like slurry years after deposition.

6.20 It is known that the area north east of Mingenew – the location of the coal project – was used as an armoured manoeuvre training area. However, no evidence has been found to date of any live firing in this area that could have resulted in unexploded ordinance. Based on the incomplete evidence available, further action in respect of UXO is not recommended at this stage.

These comments have been noted.

6.21 PMA states that the highest water table is below the proposed depth of the excavation. Blasting may change the natural direction of underground water courses. PMA should guarantee no change of natural underground water courses caused by blasting.

6.23 PMA state that they will liaise with local residents to determine whether blasting operations are creating any disturbance. There should be a guarantee from PMA of no affects on buildings resulting from blasting.

The rocks at Mingenew which may require blasting are sandstones, siltstones and claystones and the coal seams. Although a detailed mine schedule has not been formulated, any proposed blasting will be low intensity paddock blasting to loosen these sedimentary rocks prior to excavation.

During this quarrying activity any blasting carried out will be infrequent, occurring possibly twice a month, and timed for the middle of the day.

The rocks in the quarry area are relatively soft and transmit significantly lower rock vibrations than granite or basalt. Due to the rocks porosity, energy emanating from a blast would be rapidly absorbed with shockwaves being limited to the quarry area. Geological investigations indicate that these porous rock types persist for at least 10–20km to the north and south of the proposed quarry area.

The techniques of modern day blasting allow minimal noise and dust to be generated by the selection of specific explosive types and spacings of charges. As blasting can be a major cost factor in a mining operation it is also obviously in the interest of this company to use an absolute minimum quantity of explosives.

Vibration caused by blasting travels via air or in the ground. According to Mr J Wilczeski of the Engineering Division of the Department of Mines, EPA Pollution Control Licence conditions specify a maximum ground wave velocity of 5 millimetres per second and a level of 115 decibels linear for buildings outside the mine area. Vibration at these levels is well below the level which could cause structural damage. Mr Wilczeski also stated that there is no published account anywhere in the World of vibration from blasting altering a watercourse. Regular monitoring of blasting will be carried out by the Department of Mines.

Whilst blasting will not be a regular occurrence, it will be avoided when meteorological conditions may increase blast affects; eg, during atmospheric temperature inversions.

The Proponent, in Section 8.2 "List of Commitments" confirms their intentions in liaison with neighbours regarding blasting.

6.22 *It is stated that dust will be controlled by water spraying from a water cart. If insufficient water is available, dust will be lifted by strong winds. Harvesting of crops on land affected by dust would be difficult as dust adversely affects 'feeding' of the crop into the header. PMA should guarantee that no dust will settle on matured crops before harvesting.*

Dust will be suppressed by irrigation from water trucks before and after a blast. Dust from quarrying operations will be continuously suppressed by a water truck on site. It is highly unlikely that dust will escape to the neighbouring fields. It, however, can be shown (as in the Hunter Valley of New South Wales and in the Collie Region of WA), that small amounts of dust cause no detrimental affects to crops.

The affect of mining on agriculture can be observed at the Three Springs Talc Mine which is situated 54km south east of Mingenew. The Three Springs mine has operated for over 20 years and currently mines 1,000,000 tonnes of ore and waste per annum. Blasting is carried out every two weeks at a much higher intensity than would be used at Mingenew. This is because the rocks which enclose the talc deposit are hard, dense, metamorphic and igneous rocks. Wheat crops are successfully grown right up to the edge of the bund wall around the pit. This indicates that dust is adequately suppressed in this mining and blasting operation (in accordance with the directions of the Mines Department). Sheep graze in nearby areas indicating that they have become accustomed to the sound of occasional blasting.

6.24 The general and wide ranging figure for annual coal needs is given as 30,000 – 70,000 tonnes, can this figure be more specific?

The Proponent cannot be more specific until final production design parameters are decided.

6.26 This would open up a new coal mining area in Western Australia. What would happen if PMA or other tenement holders found other markets for the coal? What would prevent the company from significantly expanding the coal mining operation and what approvals would be necessary?

The Proponent is conscious of the benefits a new coal mining projects north of Perth would bring to the State of Western Australia. PMA cannot comment on other tenement holders. Any significant expansion plans by PMA would need to be referred to the Department of Mines and the Environmental Protection Authority for comment and variation to approvals, if necessary.

6.27 It is suggested that any acid leaching from the sump at the base of the coal mine will be neutralised by underlying carbonates. Is this actually to be monitored?

Any contaminated or acid water from the pit sump will be transferred to a clay lined holding pond where it will be evaporated. The pH of this holding pond will be regularly monitored. The pH of groundwater will also be monitored for abnormal contaminated mine water seeping from the pit sump and holding pond.

Appendix 3

Advice by Precious Metals Australia Limited
of variation to timing of implementation
of Wagoo Hills Vanadium Project and Mingenew Coal Project

A.C.N. No : 009 131 533

PMA
PRECIOUS METALS
AUSTRALIA LIMITED

May 13 1992

The Chairman
Environmental Protection Authority
Westralia Square
38 Mounts Bay Road
PERTH WA 6000

Attention: Mr Colin Murray

Dear Sir

RE: WAGOO HILLS VANADIUM PROJECT AND MINGENEW COAL PROJECT EPA ASSESSMENT REPORT

The Proponent has collected and presented environmental data and information for both the Wagoo Hills Vanadium Project and the Mingenew Coal Project for assessment by the EPA, the WA Public and Government Departments.

The Mingenew Coal Project, as stated in the PER forms an integral part of the Wagoo Hills Vanadium Project as a dedicated and attractive source of energy for the rotary kiln.

Although not previously identified in the PER, the Mingenew Coal Deposit has attracted interest from other parties within the Mid-West Region for the supply of coal to their operations.

The Proponent desires that the two Projects be assessed in such a way that the Mingenew Coal Project can proceed to development upon Ministerial environmental approval without the parallel development of the Wagoo Hills Vanadium Project.

This will allow the Proponent to obtain a cash flow via the sale of coal and assist in the development of the principal project, the Wagoo Hills Vanadium Project, so providing significant economic and employment benefits to Western Australia.

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The PER document prepared by PMA addresses the separate issues of the coal development and the vanadium development. PMA's commitments as a result of the PER process and submissions from the public have been separated into those related to the coal deposit and those related to the Vanadium Project.

The annual coal tonnage of 70,000 tpa described in Section 4.3.2 of the PER is sufficient to allow for the anticipated small commercial sales of coal, as well as the energy needs for the Vanadium Project. The Proponent is not requesting an increase in this amount. The only variation to the PER relates to the transport routes for the delivery of coal for sale. The transport routes for coal sales will be discussed with the appropriate authorities, however, PMA foresees that these routes will not create any greater impact than those already envisaged.

We hope this request meets with your approval and I am happy to provide further information if warranted.

Yours faithfully

Andrew K McKee
MANAGING DIRECTOR