Environment Effects Act, 1978

ENVIRONMENT EFFECTS STATEMENT
DONALD MINERAL SANDS

REPORT OF INQUIRY

SEPTEMBER 2008

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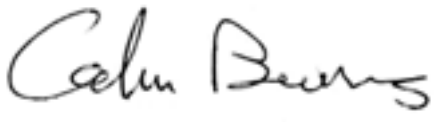
Mark Marsden, Chair

Geoff Angus, Member



Colin Burns, Member

SEPTEMBER 2008

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1. EXECUTIVE SUMMARY

Donald Mineral Sands Pty Ltd (DMS) proposes to develop a mineral sand mine approximately 17 km southeast of Minyip in western Victoria.

The area is mainly freehold agricultural land with remnant patches of native vegetation. Cropping is the dominant activity with some sheep and cattle grazing. Total area of the mine site is approximately 2,800 ha.

The project will involve mining the ore from an open pit, processing it to produce heavy mineral concentrate (HMC) and transporting the HMC to port for export. The expected life of the mine is 25 years.

The Minister for Planning required DMS to prepare an Environmental Effects Statement (EES) under the *Environment Effects Act*, 1978 (EE Act) due to the potential significant effects on the environment.

Additionally, the project requires approval from the Commonwealth Government because the proposal has the potential to adversely affect two threatened bird species (Swift Parrot, Plains Wanderer) and a plant community (Buloke Woodlands) under the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act).

The Commonwealth Government has accredited the EES process as the assessment process under the EPBC Act.

The EES was exhibited for six weeks from 4 February, 2008 to 14 March, 2008 and 34 submissions were received.

The Minister for Planning appointed an Inquiry on 16 June, 2008 under section 9(1) of the EE Act. Members of the Inquiry are Mark Marsden (Chair), Geoff Angus and Colin Burns. The Minister provided the Inquiry with terms of reference to inquire into and make findings regarding the potential environmental effects of the proposal; to recommend any modifications to the project; to recommend any mitigation and management measures to achieve acceptable environmental outcomes; and to recommend whether the project should proceed in light of its expected effects.

The Inquiry conducted a public hearing for 5 days between 7 and 11 July, 2008 in Minyip. Submissions were made by the proponent, government departments and agencies, a local council, local group representatives and local farmers, landowners and members of the public.

While a number of local submitters expressed concerns with either aspects of the EES documentation or the potential environmental impacts of the mine, the Inquiry considers that the proposal is largely supported by the local community. The support for the proposal appears to stem from an appreciation of the significant local and regional economic benefits of the project and the potential social benefits in terms of employment, population increase, boost for local community groups etc.

Each of the main government departments and agencies – Department of Primary Industries (DPI), Environment Protection Authority (EPA) and Department of Sustainability and Environment (DSE) - support the project provided impacts particularly relating to water quality, noise, air quality, native vegetation and rehabilitation are addressed through appropriate approval mechanisms.

The Inquiry considers that the DMS sand mine project should be approved by the Minister for Planning. It has significant local, regional, State and national economic benefits, and potential local social benefits.

Further, the Inquiry considers that the environmental impacts can be properly managed through appropriate approval mechanisms, particularly the Work Authority and Work Plan to be administered by DPI.

While the EES did not provide a specific recommendation as to which of the two options to secure water supply would be pursued (Avon Deep Lead aquifer or potable water from Mallee Wimmera Pipeline), the Inquiry is satisfied that there are no fundamental statutory barriers that would prevent consideration of either option. Securing water supply from either option requires formal approval from Grampians Wimmera Mallee Water (GWM Water) who must make an assessment against a wide range of criteria, including environmental impacts.

Finally, the Inquiry concludes that the proposed mine will not have a significant impact on threatened species or communities under the EPBC Act.

The Inquiry's detailed conclusions and recommendations are set out in chapter 18.

PART A: BACKGROUND

2. INTRODUCTION

2.1 The Inquiry

The Minister for Planning required DMS to prepare an Environmental Effects Statement (EES) under the *Environment Effects Act* 1978 due to the potential significant effects on the environment.

An Inquiry was appointed by the Minister for Planning on 16 June, 2008 under section 9(1) of the *Environment Effects Act*, 1978 (EE Act) to consider the proposed Donald Mineral Sands mining project located approximately 17 km southeast of Minyip in western Victoria and submissions made in response.

The Inquiry comprises:

- Chairperson: Mark Marsden;
- Member: Geoff Angus; and
- Member: Colin Burns.

The proponent for this project is Donald Mineral Sands Pty Ltd (DMS).

The Terms of Reference note that the project needs approval under the Commonwealth's *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act). The controlling provisions under this Act are:

- Sections 18 and 18A (Listed threatened species and communities).

The Commonwealth Government has accredited the EES process as the assessment process under the EPBC Act to assess the matters relevant to the Commonwealth's Government's decision whether to approve the project.

2.2 Terms of Reference

The Minister for Planning issued Terms of Reference (TOR) for the Inquiry on 15 April, 2008 (see **Appendix A**). The TOR provides background information on the proposal and outlines the Inquiry's tasks in point 2 and notes the Inquiry is required:

i To inquire into and make findings regarding the potential environmental effects (impacts) of the proposed project, including impacts on relevant matters under the EPBC Act;

ii To recommend any modifications to the project as well as environmental mitigation and management measures that are needed

to achieve acceptable environmental outcomes, within the context of applicable legislation and policy.

iii *To recommend whether the project should proceed in light of its expected effects, assuming the measures recommended in ii were implemented.*

The Inquiry is required to provide advice in the form of a written report to the Minister for Planning within eight weeks of its last hearing day.

2.3 Public exhibition

The EES was on public exhibition for six weeks from 4 February, 2008 to 14 March, 2008.

2.4 Submissions and hearings

A total of 34 submissions were received in response to the public exhibition of the EES.

Seven submissions were received from government departments/agencies, three from local government, two from interest groups and 22 from individuals.

Details of submitters are included in a table in **Appendix B**.

A Directions Hearing was held at the Mt Wycheproof Motor Inn on 14 May, 2008. Following the Directions Hearing, the Inquiry issued provisional directions on 22 May, 2008.

The Hearing was conducted for 5 days between 7 and 11 July, 2008 in the RSL room at the Minyip Memorial Hall.

2.5 Submissions made at Hearing

The Inquiry heard the parties listed in Table 1 below.

Table 1 Submitters who appeared at the Inquiry

Submitter	Represented By
Donald Mineral Sands Pty Limited	Mr. Mark Bartley of the firm DLA Phillips Fox, assisted by Emma Vogel, Simon Peters and Arno Kruger of Donald Mineral Sands Pty Ltd, and Guy Hamilton of Coffey Natural Systems, who called the following witnesses: ▪ Mr Gerard King, Chairman, Astron Limited, who provided background to the company ▪ Mr Aaron Organ, flora and fauna, Ecology Partners Pty Ltd ▪ Mr Gustaf Reutersward, noise and air quality, Heggies Pty Ltd ▪ Mr Jeff Morgan, groundwater, GHD ▪ Mr John Smart, water supply, Goldfields Revegetation ▪ Mr John Griffiths and Mr John Smart rehabilitation, Goldfields Revegetation and Dryland Agricultural Services
Department of Planning and Community Development	Mr Geoff Ralphs
Department of Primary Industries	Ms Kathryn Friday and Mr Noel Dunn
Department of Sustainability and Environment	Mr Rod Davison and Mr Nathan McDonald
Environment Protection Authority	Mr Jeff Cummins, Mr James Nancarrow, Dr Lyn Denison, Mr Danny Childs
GWM Water	Mr Nigel Binney
Northern Grampians Shire Council	Mr Jim Nolan
	Mr Frank Drum
	Mr Peter Drum
Department of Human Services (Radiation Safety Services)	Mr Morrie Facci
	Mr Ian Morgan
	Mr Lyndon Fraser
	Mr Stuart White
	Mr Gil Hopkins
	Mr Harold Flett

Submitter	Represented By
	Mr Oliver Guthrie
	Mr John Martin[1]

2.6 Inspections

The Inquiry made an accompanied inspection of the site and surrounding areas on Tuesday 8 July, 2008.

Appendix C shows the inspection tour map. Due to wet weather not all specific locations on the map were able to be inspected. However, the Inquiry is satisfied that it gained a sufficient understanding of the site and surrounds to assist in the preparation of this Report.

2.7 Approach to Report

The Inquiry has divided the report into four parts:

Part A: Background – This part provides information about the Inquiry and its processes, a description of the proposal, the relevant State and Commonwealth legislation and policies (Chapters 2 to 4).

Part B: Analysis of effects and impacts – This part considers the key issues addressed in the EES and discusses them in summary form. In each of these chapters, the Inquiry provides a description of the subject matter, the relevant issues, the Inquiry response and findings and recommendations (where applicable, not all chapters have recommendations) (Chapters 5 to 15).

This part of the report adopts the EES section headings, however Section 6.1 Surface Water and Water Supply and Section 6.2 Groundwater are consolidated into one chapter on Water (Chapter 7).

Section 6.11 Land Use and Infrastructure Planning is not covered as a separate chapter in the report because most of the issues are addressed in other aspects of the report and the issues in Section 6.13 Soils and Mine Materials are covered in the chapter on rehabilitation (Chapter 15).

Part C: Evaluation and assessment – This part provides the response of the Inquiry in terms of its obligations under the EPBC Act. The Inquiry provides additional recommendations where warranted in this part of the report (Chapters 16 to 17).

[1] Despite lodging a request to be heard form, Mr Martin failed to appear

Part D: Conclusions and recommendations – this part provides the overall conclusions of the Inquiry and its specific recommendations (Chapter 18).

2.8 Regulatory Framework

The EES is a starting point in the assessment process for the proposed mine. **Appendix 4** sets out the regulatory framework for the mine that was provided in DPI's submission to the Inquiry. It should be noted many of the detailed requirements for the construction and operation of the mine will be included in the Work Plan. One of the key requirements of the Work Plan will be an Environment Management Plan (EMP), which will require a Construction Environment Management Plan, Vegetation Management Plan, Radiation Management Plan etc. It should be noted that the Inquiry makes a number of recommendations for specific matters to be addressed in the Work Plan and Environment Management Plan.

2.9 Other matters

2.9.1 Role of Technical Reference Group (TRG)

Mr Bartley for DMS raised some concern with the effectiveness of the TRG. In particular, he raised concern with the lack of attendance to meetings by some State Government departments and that some departments were represented by relatively junior staff that could not provide as much assistance during discussions as more experienced staff.

In addition, he advised that some of the issues raised by State Government departments in response to the EES were surprising given that there had not been responses to some of the specialist reports that had been prepared for the TRG meetings and which were used to develop the EES.

Mr Ralphs of the Department of Planning and Community Development (DPCD) advised the Inquiry that he would provide copies of the six TRG minutes so the Inquiry could at least ascertain attendance at the TRG meetings.

The Inquiry also asked Department of Sustainability and Environment (DSE) and the Environment Protection Authority (EPA) during the Hearing whether they would like to respond to the concerns raised by Mr Bartley.

Mr Davison of the DSE acknowledged that there had been a change over of staff in the south-west regional office that made attendance at all meetings difficult.

Mr Cummins of the EPA conceded that due to lack of staff it was not always possible to attend TRG meetings. He advised that the practice of the Authority was to view upcoming meeting agendas and determine whether it was necessary for an EPA representative to attend a meeting.

From the copies of the six TRG minutes provided by Mr Ralphs, the Inquiry notes that the DSE (Biodiversity) was an apology for two meetings and EPA was an apology for five meetings (they only attended the first meeting).

The fact that the EPA was only able to attend one TRG meeting is of concern, and appears to have contributed to their concerns with some elements of the EES report which came as a surprise to DMS. The EPA's requirements in this project are a critical component of the assessment process, and for the TRG to be a useful process it is important that the EPA attend meetings and respond to draft reports.

The DSE's (Biodiversity) absence at least two meetings is also a concern given the critical issues on biodiversity and habitat in this matter. Similarly, some of the DSE's concerns appear to have resulted because they were unable to attend all the meetings or respond to draft reports.

The Inquiry is aware that some government departments/agencies lack resources and are unable to provide a level of service that is required to meet client needs. Given the significant investment in time and money in preparing an EES, it is important that government departments/agencies are able to be responsive to matters arising from an EES process. It would be appropriate for the DPCD to provide feedback to the Minister for Planning on these concerns so that the Minister can raise the concerns with other relevant Ministers.

3. THE PROPOSAL

3.1 What is proposed?

DMS proposes to develop a mineral sand mine approximately 17 km southeast of Minyip in western Victoria.

The area is mainly freehold agricultural land with remnant patches of native vegetation. Cropping is the dominant activity with some sheep and cattle grazing. Total area of the mine site is approximately 2,800 ha.

The project will involve mining the ore from an open pit, the extraction of heavy mineral concentrate (HMC) and transporting the HMC to port for export.

The EES describes the project as follows:

> *The project will produce 398,000 t of HMC annually, which equates to a mining rate of 7.5 Mt of ore per year. Originally, DMS planned to mine everything within the Donald Project Area (known as the superseded project area) but, subsequently reduced the project area to just the northern half. This reduced area is the subject of a mining licence application. The planned mine life for the project area is 25 years.*
>
> *The deposit will be mined using conventional earthmoving machinery such as excavators, trucks, bulldozers and scrapers. In the first 6 to 12 months, topsoil, subsoil and overburden will be stripped and stockpiled, while tailings will be placed in a dedicated tailing storage facility (TSF). After this period, further production of all these materials will be returned to the pit and the mine progressively backfilled.*
>
> *In order to protect topsoil fertility, all topsoil movements will be done in an annual campaign. The TSF will then be decommissioned and rehabilitated.*
>
> *The HMC, rich in ilmenite (iron-titanium oxide), rutile (titanium dioxide), leucoxene (another iron-titanium oxide) and zircon (zirconium silicate), will be separated from non-valuable clays and sand by wet gravity separation, followed by wet magnetic separation. Two concentrate products will be produced; magnetics (mainly ilmenite) and non-magnetics (mainly rutile, zircon and leucoxene).*

The final rehabilitation of the mined area will produce a landform similar to that existing before the mining operation, including the restoration of native vegetation and agricultural land.

Concentrates will be separately stockpiled on site then progressively transported to port either by road or a combination of road and rail. If rail is selected, a rail siding near Minyip will be used.

3.2 Background to the proposal

The EES also includes a brief project history, which is reproduced as follows:

The Donald deposit was once part of the Wimmera Industrial Minerals (WIM) deposits extensively explored by CRA Exploration (now Rio Tinto) in the 1980s. Significantly, the WIM deposits are finer grained than the strandline deposits currently being mined, for example, by Iluka Resources at its Douglas mine, southwest of Horsham. The Donald deposit forms part of one of the largest undeveloped mineral sands deposits in the world. However, in 1998, Rio Tinto judged the fine-grained deposit to be uneconomic and relinquished the licences.

GDM Pty Ltd acquired the exploration tenements in December 1999. In the period since 2000, there have been two major drilling programs and a bulk sample program within the project area and surrounds, as well as extensive metallurgical testing. In November 2003, Astron acquired the exploration rights for the Donald (WIM 250) deposit and created Donald Mineral Sands Pty Ltd to become the corporate vehicle for the project.

Feasibility studies by DMS have concluded that the combination of improved zircon prices and advances in mineral processing methods has made these deposits economic to develop.

4. LEGISLATIVE AND POLICY FRAMEWORK

The following is an overview of the various State and Commonwealth legislation and policy affecting the project, as well as the approval processes, that were contained in Section 2 of the EES Main Report.

Mr Bartley for Donald Mineral Sands Pty Ltd also tabled a document that identified relevant State and Commonwealth legislation and policies. He also referred to the two local planning schemes and policies.

4.1 State legislation

Table 2 Summary of approvals

Legislation	Regulatory outcome	Regulatory Authority	Reason
Mineral Resources (Sustainable Development) Act 1990	Mining licence. Approved work plan. Work authority to commence mining	Department of Primary Industries (DPI)	Required for mining. Gives effect to the Native Vegetation Management: A Framework for Action
Environment Effects Act 1978	Environmental assessment of project by Minister	DPCD	Directed to prepare an EES by the Minister for Planning
Aboriginal Heritage Act 2006	Approval of Cultural Heritage Management Plan (CHMP)	Registered Aboriginal Party (RAP) (or Aboriginal Affairs Victoria (AAV) in their absence)	Required for mining impact on Aboriginal cultural heritage values
Heritage Act 1995	Approval to disturb known historic sites	Heritage Victoria	Historic sites are to be disturbed
Water Act 1989	Groundwater extraction licence	Grampians Wimmera Mallee (GWM) Water	To extract groundwater
Planning and Environment Act 1987	Planning permit	Yarriambiack Shire Council, (Buloke Shire Council, Northern Grampians Shire Council)	High voltage power line and potentially, a water supply pipeline
Radiation Act 2005	Approved radiation management plan and radioactive waste management plan	Department of Human Services (DHS)	The code specifically applies to mineral sand mines

4.2 State Government policy and guidelines

Relevant State Government policies identified in the EES include:

- Growing Victoria Together (2001);
- Earth Resources Policy – Promoting Victoria's Prospects (2006);
- Securing Our Water Future Together (2004);
- Regional Development Policy (Moving Forward) (2005);
- Native Vegetation Management Framework – A Framework for Action (2002);
- Victorian Greenhouse Strategy (2002);
- Victorian Biodiversity Strategy (1997);
- Environment Guidelines for Major Construction Sites;
- Construction Techniques for Sediment Pollution Control (1991) (S275);
- Industrial Waste Management Policy – Waste Minimisation (1990);
- Industrial Waste Management Policy – Prescribed Industrial Waste (2000);
- Protocol for Environmental Management: Greenhouse Gas Emissions and Energy Efficiency in Industry (2002) (S824);
- Heritage Victoria Draft Guidelines for the Assessment of Heritage Planning Applications (2000);
- Victoria's Environmental Sustainability Framework (2005); and
- Our Environment Our Future – Sustainability Action Statement (2006).

In addition, the Inquiry identified three other EPA guidelines and one regulation relevant to the Inquiry's task:

- Protocol for Environmental Management: State Environment Protection Policy (Air Quality Management) Mining and Extractive Industries: EPA Publication 1191 December 2007;
- Interim Guidelines for Control of Noise from Industry in Country Victoria, N3/89;
- Noise Control Guidelines TG 302/92; and
- Environment Protection (Environment and Resource Efficiency Plans) Regulations 2007.

4.3 Commonwealth legislation

4.3.1 Table 3: Summary of Approvals

Legislation	Regulatory outcome	Regulatory Authority	Reason
Environment Protection and Biodiversity Act 1999	Environmental approval under Commonwealth guidelines or an accredited Victorian process	Department of Environment, Water, Heritage and the Arts (DEWHA)	The project has been determined to be a 'controlled action' by DEWHA
Native Title Act 1993	Consider any application for native title	National Native Title Tribunal	Any native title claim would need to be resolved before the grant of a mining licence

4.4 Other Policy and Guidelines

Code of Practice on Radiation and Radioactive Waste for Mining and Mineral Processing (ARPANSA, 2005).

4.5 Local planning scheme and policies

The proposed sand mining project is exempt from a planning permit under Clause 52.08-2 of the planning scheme if an Environmental Effects Statement (EES) has been prepared under the *Environment Effects Act* 1978 and mining is exempt from the requirement to obtain a permit under Section 42 or Section 42A of the *Mineral Resources (Sustainable Development) Act* 1990. However, Mr Bartley provided an overview of the relevant planning scheme controls and policies. He submitted that notwithstanding the exemption both the Yarriambiack and Northern Grampians planning schemes contain objectives that support mining (including sand mining in the case of Yarriambiack) provided social, economic and environmental issues are properly addressed.

PART B ANALYSIS OF EFFECTS AND IMPACTS

5. ECONOMIC AND SOCIAL IMPACTS

5.1 Description

Economic benefits identified by DMS include the following:

- capital investment of $93 million;
- annual operating expenditure of $30 to $40 million per annum;
- annual salaries of $6.5 million;
- construction workforce of approximately 100 to 120 people (8 to 12 months); and
- operations workforce of approximately 75 people.

In terms of employment, DMS advised that there was a potential 3:1 job multiplier and that an employment policy will be developed that will have the following objectives:

- Employing local people (where possible);
- Live in – fly in fly out is not proposed;
- Family friendly roster is proposed; and
- Flexible working arrangements such as job share will be considered.

Socio-economic analysis was undertaken as part of the EES and included as Supporting Study No 9 (SS9 – Social and Economic Assessment). The key findings and conclusions are identified in Section 6.12, pages 6-131 to 6-142 of the EES.

Surveys conducted on behalf of the proponent indicated a range of opportunities and concerns (see page 6-138 of EES). Benefits included local investment, increased population and increased employment opportunities. Concerns included reduced participation in community events and volunteer organisations, local labour shortages, disruption of existing infrastructure, increased pressure on regional water resources, concerns regarding uncertainties related to the project and reduced community cohesion.

Mr Bartley for DMS summarised the social impacts as follows:

> *The area is characterised as a relatively stable farming community of largely European background. The main economic base for the area is dry land agriculture and light industry associated with the production and processing of farm products.*

Six families operate farms or own or live on land within the project area and there are 13 additional neighbouring and nearby landowners located within 2 km of the project area. Farm properties are generally in the order of 800-1000 hectares.

The impact of the project will be on the one hand to displace some families from the mine area, and on the other hand to increase employment opportunities in the area and surrounding townships.

It is likely that a number of existing farming families whose land comprises the mine area or within 1 or 2 kilometres of the site will be bought out by the mine. This would allow them to relocate, with some apparently indicating that they will take the opportunity to retire or relocate out of farming.

5.2 Issues

Issues concerning economic and social impacts identified by the proponent, submitters and the Inquiry include the following:

- Economic benefits of the proposal;
- Whether there will be a net social benefit to the local community; and
- The establishment of an Environment Review Committee (ERC).

5.2.1 Economic benefits of the proposal

As identified in the EES (page 6-141), the mining project would produce a gross margin of approximately $750 million compared to $4 million for agricultural production of the affected properties over the 25 year period of the mine's operations.

No other submission was received that questioned this projection.

5.2.2 Will there be a net social benefit?

The EES states that given the mine is likely to employ between 75 and 100 employees, there will be some additional demand for accommodation and community services and facilities within the area.

Social impacts were addressed in submissions by Buloke Shire Council, Northern Grampians Shire Council and the Department of Primary Industries (DPI).

In addition, a number of local groups and individual submitters commented on the social impacts. Some submitters expressed strong support for the project because of the perceived benefits the project would bring, while

others submitters expressed strong concern with the potential social upheaval by the relocation of long-term farming families and a sudden influx of workers to the area.

5.2.3 Environment Review Committee

DMS stated it would be appropriate to establish an ERC to advise on the environmental management and monitoring of the mine and provide a forum for local community input into the environmental management of the mine.

It was suggested that membership of the ERC could include local councils (with a nominee as chair), 3 to 5 local residents and representatives of relevant agencies.

DPI provided the Inquiry with a copy of a document 'Review of Environmental Review Committees' (March 2008) which has been prepared for mining and extractive industry projects.

5.3 Inquiry response

5.3.1 Economic benefits of the proposal

In terms of purely economic considerations, the Inquiry considers there is little doubt that the project will deliver substantial economic benefits in terms of direct investment, royalties and taxes and employment opportunities and that the economic benefits apply at the local, regional, State and National levels.

5.3.2 Will there be a net social benefit?

Social impacts are more subjective. As noted above, some submitters are very concerned about the impact on social cohesion, while others considered the project as a not-to-be missed opportunity to deliver increased prosperity and a boost to local groups and businesses.

It is noteworthy both local shires considered that, on balance, the project will have positive social benefits to the local community.

The Inquiry considers that it is important that the social impacts of the project are properly managed by DMS, relevant government agencies, the two councils and other community groups.

In terms of DMS' responsibilities, it will be important that negotiations with affected land owners and occupiers achieve fair financial and social

outcomes. It appears to the Inquiry that DMS has had successful negotiations thus far as there were no submissions that criticised the company in this regard.

The Inquiry considers that DMS commitments to support a local workforce (as distinct from 'fly in fly out'), to employ local workers (where possible) and provide a flexible workplace (that may allow workers to job share and therefore continue working farms) to be important initiatives to achieve social cohesiveness.

A sudden influx of workers may provide some disruption to the local community and could result in labour and accommodation shortages. However, the Inquiry notes that the Minyip area is within the broader Horsham catchment which should help provide a labour supply and meet accommodation needs.

5.3.3 Environment Review Committee

The Inquiry considers that the successful management of the environmental impacts are important to the outcomes of the social impacts. A mining project (or any major development project for that matter) that is having an adverse impact on the health, safety and amenity of local people will cause community concern and potential social upheaval, and result in a negative social outcome.

A key mechanism to monitor environmental impacts is the establishment of Environmental Review Committees (ERC). As noted above, DPI has recently produced a discussion paper on ERCs which provides a series of recommendations on the function, structure and operation for mining and extractive industry projects.[2]

The Inquiry strongly supports the establishment of an ERC for the Donald Mineral Sands project. While the proponent invited the Inquiry to provide specific recommendations on the function, structure and operation of an ERC for this project, the Inquiry considers that it would be more appropriate for the matter to be resolved by the parties (principally DPI, DMS and the two councils) at the relevant time having regard to the nature of the outcomes of DPI's discussion paper.

[2] The discussion paper is available on the DPI web site www.dpi.vic.gov.au/minerals

5.4 Findings and recommendations

The Inquiry finds that:

- **There are significant potential economic benefits of the DMS mineral sands mining project;**
- **Social impacts of the project need to be carefully managed; and**
- **An Environmental Review Committee (ERC) should be established to monitor the environmental impacts, and should be set up, function and operate having regard to the recommendations of the DPI discussion paper on ERC's.**

The Inquiry recommends that:

- **DPI establish an Environmental Review Committee (ERC) to monitor the environmental impacts of the proposal; and**
- **The ERC should be set up, function and operate having regard to the recommendations of the DPI discussion paper on ERCs.**

6. WATER

6.1 Description

The proposed establishment and operation of the mine and associated infrastructure has the potential create impacts on both surface waters and groundwater.

Surface waters are protected under the *State Environment Protection Policy (Waters of Victoria)* (SEPP WoV) while the *Water Act* 1989 deals with, among other issues, drainage of land, flood protection and water supply.

The potential for impacts on surface waters at or near the proposed mine site results from the possibility of:

- discharge of contaminated water from the site with such contamination including sediment and chemicals, including salt;
- changes to the flow regime resulting in damage to adjacent farmland, roads and constructed drainage channels; and
- reduction or interruption of supply to other water users.

The EES and Supporting Study 10 (SS10 – Groundwater and Surface Water Management), by GHD, provide a description of the regional and local surface water environments, identification of potential impacts and descriptions of proposed measures to be taken to mitigate impacts. Proposed mitigating measures include:

- collection, containment and on-site use of all water entering or falling on disturbed areas;
- diversion of "clean" water around disturbed areas, which will also act to prevent flooding of the mine;
- diversion channels designed to approximate the natural flow regime; and
- installation of sediment traps to prevent downstream impacts.

If accepted, the information provided in the EES and SS10 allow the following conclusions to be drawn:

- the proposed mine development and operation would have no impact on existing water bodies in the region due largely to their location relative to that of the site and the predicted lack of run-off from the site;

- flooding of the proposed mine site from rivers and creeks in the region is highly unlikely; and
- impact mitigation needs to be concentrated on:
  - prevention of contaminated run-off from the site; and
  - the maintenance or emulation, and ultimate reinstatement of original surface drainage.

The EES identifies the fact that the there would be a requirement for water to be imported to the site with the estimate of that requirement being of the order of 87 L/s (2.75 GL/year) over the life of the mine with a maximum annual requirement of 4 GL/year. Supporting Study 11 (SS11 – Water Supply Options), by Goldfields Revegetation, identifies two possible sources for this water:

- the existing GWM Water head works with water being delivered through existing GWM Water infrastructure (channels and pipes); and
- the Avon Deep Lead, a saline aquifer some 25 km east of the proposed mine site, with water being delivered via a pipeline to be constructed as part of the project.

Both the EES and SS11 acknowledge that the implementation of either alternative would be subject to approval by GWM Water in accordance with the *Water Act* 1989 and planning permits for the development and use of infrastructure for the extraction and delivery of water.

Both options have the potential to impact on surface waters. The first could affect the availability of non-saline water for other uses, such as, consumption by others and the maintenance of river and lake environments. Potential impacts on surface waters of the second alternative relate to the possibility of reducing groundwater discharge to existing water bodies, reducing the availability and accessibility of groundwater to others and the potential impacts of importing a large amount of salt on to the mine site.

Under either water source option, there would be a need for infrastructure, (pumps, pipeline and power supply etc) the construction and operation of which have the potential for significant impacts. While SS11 provides a basic description of the two alternatives neither alternative has been the subject of detailed design to an extent that allows definitive assessment of the impacts. Supporting Study 12 (SS12 – Preliminary Assessment of Impacts of Water Supply Options on Flora and Fauna) provides general descriptions of potential impacts on flora and fauna, measures that might be taken to minimise such impacts and appropriate methods for the rehabilitation of land disturbed.

The *State Environment Protection Policy (Groundwaters of Victoria)* (the Groundwater SEPP) provides the framework for protection of groundwater resources in the state and has the aims of maintaining and, where possible, improving groundwater quality and the protection of beneficial uses.

Regional groundwater salinity is between 14,000 and 35,000 mg/L, total dissolved solids, and the Groundwater SEPP specifies that for groundwater of such salinity the beneficial uses to be protected are the maintenance of ecosystems, industrial water use and buildings and structures.

In SS11 it is noted that:

> *"Only a sustained pumping test can establish the sustainable yield of the aquifer (the Avon Deep Lead) and provide an indication of the likely long term effects on water levels, both locally and regionally."*

Despite this, SS11 makes the following general points in regard to the Avon Deep Lead:

- the water in the lead is generally quite saline (11,000 to 15,000 μS/cm EC);
- there is extremely limited existing use of water from the lead, due largely to its salinity;
- from time to time there is some discharge of water from the lead to several lakes, including Lake Buloke, but the general flow is to the Murray River; and
- the proposed extraction of water from the lead will reduce the discharge to the lakes and the Murray River, which would be a positive impact.

Potential impacts of importing saline water on to the mine site are related to the potential for impacts on the groundwater and soil at the mine site. These matters were the subject of an investigation by GHD with the results of that investigation being contained in SS10.

The EES provides a description of the proposed mining and rehabilitation method that includes the following:

- extraction of ore below the existing watertable by dry mining methods thus requiring dewatering, that is, extraction of groundwater;
- refilling of pits with layers, in order of deposition, of:
  - relatively coarse free draining material (oversize and sand) at 75 to 85% solids by weight;
  - fine material (slimes) at 35 to 45% solids by weight on deposition increasing to 45 to 50%, as a result of evaporation, decantation and

drainage, and then to 50 to 55% solids during compression from the placement and compaction of the layers above;

- saline overburden;
- non-saline overburden; and
- subsoil and topsoil.

The EES recognises the potential impacts on groundwater as being:

- lowering of the watertable in the vicinity of mine dewatering and ore extraction;
- soil salinisation by each of the following mechanisms:
  - placement of slimes or saline overburden close (within 3 metres) of the ground surface;
  - seepage from the slimes layer, during consolidation, to the watertable resulting in an increase in the watertable level; and
  - development of a perched watertable into the root zone due to restricted vertical groundwater movement at the slimes layer;
- altered groundwater quality; and
- modification of baseflow to surface water features.

A number of measures to avoid and mitigate these potential impacts are proposed; including the following:

- monitoring of groundwater levels both within and outside the mine site pre, during and post mining;
- conduct of trials during the pre-production phase to confirm predicted fate of saline water incorporated in slimes;
- coverage of replaced saline overburden with non-saline overburden to a thickness at least equal to that prior to mining;
- maintenance of the top of the slimes layer in the backfilled pit at a minimum depth of 7 metres below ground surface;
- compaction of overburden replaced in the pit to reinstate the low vertical-permeability nature of the material prior to mining;
- installation of observation bores in the replaced overburden, screened above the slimes layer to enable detection of the accumulation of perched groundwater;
- construction of the initial tailings storage facility in accordance with the DPI Guidelines to ensure the containment of both salt and tailing solids; and
- monitoring of groundwater quality.

In relation to impacts resulting from the lowering of the watertable, the EES states that:

- based on the hydrogeological modelling performed by GHD the maximum extent of the area over which the groundwater level will be lowered will be 2.5 km or less from the edge of the mined area;
- no waterways or existing water supply bores lie within the area predicted to be affected; and
- in light of the above, no impacts on yields of existing bores or the discharge of groundwater to surface waters are expected.

SS10 provides a water balance for the operation that predicts that, throughout the life of the mine, seepage from the slimes layer in the refilled pit to the groundwater will occur at a rate of 0.6 ML/day. A prediction, made by numerical modelling, of the impact of such a flow to groundwater indicated that no mounding of the watertable would result.

It was also noted in the groundwater assessment (SS10) that:

- since the distance between the top of the slimes layer and the ground surface would always be greater than 7 metres there is no possibility of soil salinisation due to the proximity of the saline slimes layer to the ground surface; and
- the likelihood of the development of a perched watertable above the slimes layer was extremely low due to the low permeability of the compacted overburden layer above the slimes layer that would restrict inflow to around 6 mm/year.

It is acknowledged in SS10 and the EES that the results of modelling are based on a number of assumptions in regard to both the hydrogeological characteristics in the area and the expected behaviour of the slimes layer in terms of time required for drying and water squeezed out during compression. While it is stated that all assumptions are based on best available data SS10 also states that:

"Tests will be conducted to determine whether this strategy allows for adequate drying and strength development of the tailing and, if not, the following feasible alternatives will be considered:

- *Co-disposal of the fines tailing with the sand tailing to aid drainage and strength development.*
- *Placing sand over fines.*
- *Placing fines over sand.*
- *Longer drying periods."*

SS10 identified variations in groundwater quality as a potential impact of the proposal and provided a discussion on the matter in terms salt load. A case

in which the external water supply source was the Avon Deep Lead, which is the worst case in terms of salt load, was considered and it was found that:

- the net importation of salt to the mine site would be 4,101 tonnes per year (102,525 tonnes over the life of the mine);
- the vast majority of the introduced salt load is expected to be bound permanently in the 3 metre thick slimes layer above the watertable with the remaining water (and salt) seeping to the groundwater; and
- the salinity of the water seeping from and bound in the slimes layer will be marginally lower than that of the local groundwater.

It was concluded, by GHD, that the impact on groundwater quality would not affect its beneficial uses.

SS10 provides a description of the existing groundwater monitoring regime that includes:

- 10 bores within and around the proposed mining area;
- 14 bores drilled in the vicinity of the ore body; and
- 12 GWM Water and State Observation Bores.

All of these bores have been monitored on a monthly basis since April 2006. Monitoring has been of standing water level, pH and electrical conductivity.

The EES provides some information of the proposed environmental monitoring program, which it is indicated will include monitoring of groundwater level, pH and electrical conductivity. It is indicated in the EES that monitoring of the regional watertable will occur monthly while bores adjacent and within the mine pits will be monitored on a quarterly or annual basis.

SS10 contains the following information in regard to proposed groundwater monitoring:

- a groundwater monitoring network around the perimeter of the mining area is required and monitoring of the existing bores on a monthly basis would be sufficient;
- the already installed bores along the Richardson River should be monitored on a regular basis during the life of the mine;
- monitoring of groundwater levels within mining cells is proposed;
- groundwater sampling is proposed from the network of existing bores with sampling of salinity being determined quarterly for the two closest bores and annually for the remainder; and

- it is essential to measure and record the salinity of process water and water imported to the site (either from GWM Water or the Avon Deep Lead) on a daily basis.

6.2 Issues

Water related issues identified by the proponent, the proponent's consultants, submitters and the Inquiry include the following:

- the adequacy of proposed surface water management at the mine site;
- water supply, including:
  - the selection of the most appropriate source; and
  - the accuracy and acceptability of predicted impacts of both alternative water supply options;
- the accuracy and acceptability of predicted impacts on groundwater levels and soil salinity at and near the proposed mine site;
- the accuracy and acceptability of predicted impacts on groundwater quality; and
- the adequacy of the proposed groundwater monitoring.

Each of these issues is discussed in the following.

6.2.1 Surface Water Management

The submission made to the Inquiry by the EPA generally accepts the adequacy of the surface water management aspects of the proposal but suggests that all sediment control works should be undertaken in accordance with EPA Publication 480 *Environmental Guidelines for Major Construction Sites*.

In response the proponent indicated acceptance of such a requirement.

The EPA expressed concern that sewage disposal from the site was not discussed in the EES and indicated that details of sewage management would be required.

In response the proponent referred to section 4.7.2 of the EES, which states:

> *"Sewage will be collected in a tank for removal and disposal offsite by an approved contractor. The contractor will be required to comply with local government statutory requirements."*

The Wimmera Catchment Management Authority (WCMA) expressed the view that it is imperative that:

- *"There is no change in the natural drainage pathways and surface water hydrology both within and outside the project area; and*
- *The by-products of mining operation (including disturbed sediment) are retained on-site and are not carried into natural drainage systems or onto neighbouring properties".*

The WCMA went on to indicate that, given the information in the EES, the authority had no major concerns in regard to impacts on surface waters.

A number of submitters including the Buloke Shire Council, Mr Gil Hopkins and Mr Harold Flett expressed the view that the pumping of saline water through extensive pipeline systems creates significant risk of damage to the environment through spillage or leakage.

In response the proponent indicated agreement but maintained that the risk could be readily managed through appropriate design that would be detailed in the Work Plan and planning permit applications.

6.2.2 Water Supply – Source Selection

A considerable number of submitters including the Victorian National Parks Association, Mr Frank Drum, Mr Hopkins and Mr Lyndon Fraser, for the Real River People, expressed the view that the option to obtain water from the GWM Water system was inappropriate and should not be allowed. The main reason behind this view was that the water was required, or at least could be better used, for other purposes.

A great deal of information was presented to the Inquiry as to why water of such quality was required for other purposes, in particular for the maintenance of the ecological health of the Wimmera River. In addition to the question of appropriate use, Mr Don McAllister indicated that he had significant doubts about the availability of water from GWM Water.

Mr Fraser provided a great deal of historical information on the deterioration of the ecology of the Wimmera River attributing the majority of the degradation of the river, and a number of terminal lakes, to past diversions of water for consumptive uses resulting in a lack of water in the river and lakes. Mr Fraser submitted that the events of the past were due in large part to GWM Water and its predecessors and that they should not be trusted with decisions in regard to water allocation in the future.

Mr Fraser together with the Victorian National Parks Association suggested that restricting the flow in the Wimmera River by diverting water for use in mining was a contravention of the provisions of the *Heritage Rivers Act* 1992.

This Act lists the area of land adjacent to most of the Wimmera River as a Heritage River Area and limits land and water uses as follows:

> *"…..transfers between existing water users take place, where appropriate but no additional diversion of surface water shall be made in the Wimmera Basin;*
>
> *Increased allocations may only be made where they can be achieved from water savings through schemes that improve water distribution efficiency, such as the piping of parts of the Wimmera-Mallee Stock and Domestic Supply System;*
>
> *An adequate proportion of such water savings is to be allocated to environmental water requirements for the Wimmera River upstream of Lake Hindmarsh; and*
>
> *On completion of studies of the means of providing environmental water requirements along the Wimmera River and Outlet Creek to the terminal lakes, an adequate proportion of water savings is to be allocated to these requirements."*

Evidence provided by Mr John Smart of Goldfields Revegetation for the proponent included the following:

> *"The two potential water sources are equally feasible, but the deep lead is superior in environmental respects as it would use a resource which currently has no significant beneficial use and would have a positive effect on salinity in the area. Water from the GWM Water system is fresh and suitable for any likely use, such as domestic, irrigation or stock".*

In the proponent's submission at the hearing, reference was made to information on the Wimmera Mallee Pipeline Project, obtained from the National Water Commission website. This information included the following:

- a projected water saving of 103 GL/year; and
- a decision to utilise these savings as follows:
  - 80 GL/year for improving the environment of stressed rivers and wetlands;
  - 3 GL/year for recreational lakes; and
  - 20 GL/year for new enterprises that will directly help the region's economic growth.

The proponent suggested that the requirements of the mine could be met from the 20 GL/year that has been set aside for consumptive use.

A number of submitters, including the Victorian National Parks Association and Mr Hopkins indicated that there was considerable doubt in regard to what the actual savings would be and, in reality, the required water may not be available from such savings.

The proponent submitted that, since the water had already been set aside for consumptive use, the use of such water at the mine would not change the amount of water available for other uses such as environmental flows in rivers and protection of wetland ecology.

GWM Water confirmed the view expressed by the proponent in regard to the anticipated use of water savings obtained as a result of the Wimmera Mallee Pipeline Project and indicated that it was reasonable to expect that the proponent could obtain a licence for sufficient water to meet its needs.

It was noted by GWM Water that, while a license could be obtained, water delivery is not guaranteed by such a license but depended on water availability and capacity to deliver.

GWM Water's submission included the following comment:

> *"Should DMS pursue either groundwater or surface water, a broad range of environmental and other matters are required to be considered by GWM Water in its assessment of such an application. The EES reports provide a solid basis to assist GWM Water in such assessments; however it is likely that further information would be required to inform GWM Water's assessment in accordance with Water Act requirements."*

Section 53 of the *Water Act* 1989 specifies the matters that must be taken into account in considering an application for a license to take and use water. These matters include existing and project water availability, water quality, the requirements of existing and competing users, government conservation policies and need to protect the environment.

A number of submitters expressed dissatisfaction with the fact that considerable uncertainty remains in regard to where water would be obtained from and that, as a consequence, assessment of the potential impacts, including those of the infrastructure requirements, of either alternative, was not possible at this time.

The proponent acknowledged that it had not been possible to be definitive as to the source of water for the operations and that this was primarily due to the fact that the sustainable yield of the Avon Deep Lead had not been established. The proponent further stated that, without knowledge of how much water can be obtained from the lead, it is not possible to provide a design for the required infrastructure and, without such a design, a final

impact assessment cannot be made. This is not to say that such an assessment is not required prior to implementation as the necessary information will be required to support applications for the required water licences and planning permits.

The proponent submitted that:

> *"Regarding the water supply, the position is that there are at least three options: Avon Deep Lead, piped water from GWMW and purchase of entitlements on the market (this has been the approach of Coliban Water and Central Highlands Water in relation to the Goldfields Superpipe supply to Bendigo and Ballarat). In the event that the required volume cannot be obtained from any one source a combination of sources may be used. The failure to secure water supply at this stage should not be regarded by the Inquiry as a reason to reject or qualify the findings of the EES. The EES should be accepted and if water supply cannot be secured the project may not proceed. This is no different from an EES being accepted and a project subsequently not proceeding due to a failure to achieve another approval or the market changing and the project not proceeding for financial reasons."*

GWM Water advised that, under the *Water Act* 1989, assessment of an application for a groundwater extraction licence requires consideration of a wide range of factors as specified in section 53 of the Act, described previously.

In response to a question from the Inquiry on the details of the investigation that would be undertaken in considering an application for a groundwater extraction licence, GWM Water provided a document titled *Ministerial Guidelines for Licensing Groundwater for Urban Water Supply July 2008* and indicated that, while the specific purpose of this document differed from the licensing of groundwater for industrial use in rural areas, the guidance provided was considered appropriate in this case and would be applied.

6.2.3 Water Supply – Impacts

The description of potential impacts and proposed mitigating measures in relation to pipelines and other water supply related infrastructure provided in the EES, and appended specialist studies, were not the subject of submissions except for the following:

- the matter of adequate safeguards to prevent accidental discharge of saline water from pipelines, discussed previously; and

- the DSE submitted that the statement of the matters to be addressed in regard to impacts on vegetation of the water supply infrastructure in the EES was incomplete and should have included:
  - the avoid, minimise and offset principles of Victoria's Native Vegetation Management Framework; and
  - the conservation significance of the vegetation, in accordance with Victoria's Native Vegetation Management Framework.

The proponent indicated agreement with the DSE on this matter.

The DSE also expressed concern with the possibility of a reduction of flow into Lake Buloke, pointing out that "*Lake Buloke is a very important wetland which supports large numbers of waterbirds when full and is the most popular duck hunting area in the state.*"

Mr Smart advised that the major flow into Lake Buloke is fresh water from the Avon River and that the only time the lake is filled is when it is filled from the river.

Mr Peter Drum suggested that extraction of water from the Avon Deep Lead would result in *"A reduced discharge of water down the Avon River and Sandy Creek (through a plug hole effect at the head of the lead)."*

In response, Mr Smart advised that in the upper reaches of the Avon River the deep lead is approximately 18 metres below the river bed and the water level in the lead is below its upper limit. As a result there is currently no flow to the river so a lowering of the water level in the lead could not result in change in the flow in the Avon River or Sandy Creek.

6.2.4 Groundwater levels at and near the proposed mine site

Reduction in groundwater levels.

Mr Stuart White indicated that the predicted 2.5 km zone at the southern end of the mine area was insufficient because of the complexity and high variability of groundwater movements.

Mr Frank Drum indicated that he had concerns in regard to the possible impacts on groundwater in the region and that he considered that further investigations are required. Mr Drum also expressed the view that the existing aquifer was under some pressure and that excavating into the aquifer could result in saline water rising to the ground surface.

In response, the proponent indicated reliance on the work of GHD, the results of which are contrary to the assertions made in these submissions.

Increase in groundwater level post mining

The DPI indicated that while they are comfortable with the concept and feasibility of progressive placement of overburden upon slimes, considerable uncertainty remains in regard to the details of the proposed method and that refinement will be required based on actual field trials.

The proponent agreed with the DPI's submission on this matter and pointed out that the conduct of such trials was part of the proposal.

The EPA acknowledged that the management of slimes had been discussed in the EES however it noted that there was no discussion as to whether the proposal could be considered to be best practice or if there were other methods for increasing evaporation or stabilisation of the slimes.

In response the proponent stated that:

- *"Use of a flocculation system is leading practice in tailings management around the world. The term 'best practice' is subjective and rarely backed up by benchmarking. As a result, its use is in rapid decline;*
- *Increasing evaporation is not desirable as DMS intends to maximise water recovery as part of tailings management;*
- *Flocculation and solar drying will result in the physical and chemical stabilisation of the slimes; the only question is how long it will take; and.*
- *GHD have proposed the conceptual depositional model which, based on available information, is deemed a suitable approach for the deposit."*

The EPA asked if the slimes layer could act as an impermeable barrier causing reduction in infiltration and groundwater recharge during flood years and whether there is potential for a perched watertable to form and bring salt towards the surface.

In response Mr Jeff Morgan, of GHD, provided evidence on the hydrogeological character of the area that may be subject to flooding and concluded that formation of a perched watertable was not of concern due to the following:

- the compacted overburden above the slimes layer will be of significant thickness and have a vertical hydraulic conductivity similar to that pre-mining, which is low at 0.01 to 0.02 m/day, resulting in low recharge of the order of 6 mm/year; and

- while the slimes layer is expected to have similar or lower vertical permeability to existing units in the unsaturated zone, even if it did act as a barrier, the resulting perched watertable would be less than one metre above the top of the slimes layer and, due to the intermittent nature of the recharge, would dissipate to the watertable over the following months or years. As the slimes layer will be at a depth of greater than 7 metres below ground surface, such a perched watertable would not cause any detrimental impact at the ground surface or in the root zone.

Mr White expressed concern with the potential increase in groundwater levels and provided level data from a bore on his property (located approximately 1.5 km to the south of the proposed mine). The data showed that, from time to time, the groundwater level has risen to as little as 0.21 metres from the ground surface, emphasising that any additional rise could have a significant adverse impact.

A number of submitters, including Mr Hopkins, Mr Powell, Mr Flett, Mr McAllister and Mr Burchell expressed concerns in regard to the possibility of the migration of salt from the slimes layer with several of those submitters indicating their mistrust of the predictions and suggesting that further investigations are required.

In response, Mr Morgan explained that the slimes material, which can be described as "clayey", has a high specific retention (the ratio of the volume of water soil can retain against gravity drainage to the total volume of the soil) due to the fact that there is a large volume of pores but the small size of the pores restricts the flow of water. Mr Morgan stated that experience at other mineral sands mines shows the mineral sands slimes do not dewater without external influences, i.e. even if saturated they do not drain. As a result, water loss from the slimes will primarily occur by evaporation and during external loading by the placement and compaction of overburden layer above.

Mr Morgan's evidence included the following statement:

> *"It has been assumed that water is further pushed from the slimes due to placement of the overburden and the solids content increases to 50 to 55% Solids over 5 years, however this is considered to be a conservative approach (in terms of impacts) and it is possible that this increase in solids may not occur (i.e. and no more water will be released)."*

6.2.5 Groundwater Quality

The EPA indicated general acceptance of GHD's conclusion in regard to the absence of impact on beneficial uses of the groundwater but requested further information on the following:

- the use of chemicals, including flocculants, in the processing plant and their potential impact on the aquifer; and
- differences in pH and chemistry that may lead to precipitation of minerals in the aquifer.

On the matter of chemicals to be used in processing Mr Morgan and Mr Ken Keam, of GHD, advised that:

- the only "chemical" proposed to be used is flocculant;
- the flocculant to be used will be selected primarily on its ability to maximise water recovery in the plant thickeners;
- flocculants are generally classified as non-hazardous, are used in low concentrations, and breakdown with agitation such as during pumping and pipe transport;
- the residual flocculant may marginally reduce the permeability of the slimes layer, however the slimes layer is already recognised as a lower permeability layer and any decrease in permeability would not result in an increase in impact; and
- the impact of flocculant on groundwater chemistry is expected to be negligible.

In regard to the potential for precipitation of minerals in the aquifer, Mr Morgan advised that, while the data required for a technical assessment was not available at this time, the following observations could be made:

- it is considered probable that precipitation of iron and aluminium may occur, as this is common with saline groundwater from the Murray Basin, but such precipitation is of concern in relation to operational problems, as the groundwater is exposed to air, rather than impact on the groundwater;
- any precipitation that does occur in the aquifer is considered unlikely to have a major impact on the permeability of the aquifer system since the aquifer naturally has a low permeability;
- it is unlikely that there would be any impact on through flow across the site, particularly considering the groundwater levels will still be depressed at the end of the mine life and the majority of the material to be placed below the watertable (sand and oversize) is likely to have a higher permeability than the original aquifer; and

- further work could be done to assess this matter but the timing of such work should be after the source of water to be imported to the site is known.

Mr Hopkins and Mr George Powell suggested that the potential exists for groundwater to be contaminated with radioactive materials.

This matter was addressed in the EES with the following statement:

> *"Radionuclide constituents are highly inert and bound strongly in the mineral structure. Physical methods have been proposed to separate the heavy minerals in the ore (see Section 4.6), and tailing returned to the pit will not be subject to chemical treatment. Consequentially, the tailing will not be chemically altered (apart from concentration changes in various stages of processing the mineral) and the solubility of uranium and thorium (and the other radioactive elements in the decay series) will remain unchanged. As a result, the backfill material, which has less than 5% of the original monazite and was at least partially below the groundwater table, should not affect groundwater quality due to mobilisation of radionuclides. Furthermore, over the long term, any local movement of radionuclides through the aquifer would be very slow."*

Groundwater Monitoring

Matters raised in regard to groundwater monitoring can be divided into those concerned with the adequacy of the available data on existing groundwater conditions and those concerned with future groundwater monitoring.

The DPI suggested that, in order to assess changes in the future, background data on existing groundwater chemistry, including indicators in addition to pH and electrical conductivity, would be required.

The EPA's suggestion that potential impacts on groundwater chemistry should be determined would also require data on the existing groundwater chemistry beyond pH and electrical conductivity.

Mr McAllister and Mr Flett expressed doubt about the accuracy of the groundwater quality data contained in SS10 with Mr Flett providing an example of relatively low salinity water in the area.

In response, Mr Morgan stated that, while lower salinity groundwater had been detected in the vicinity of the Richardson River, the groundwater salinity around the area of the proposed mine is known to average 16,930 mg/L and that this knowledge is based on extensive sampling and measurement.

While unable to be definite about the particular case referred to by Mr Flett, Mr Morgan advised that localised "freshening" of groundwater can occur as a result of recharge from a river or a combination of shallow groundwater and permeable soils resulting in above average aquifer recharge.

Submissions received on the matter of future groundwater monitoring included the following:

- EPA - The project will need to continue groundwater monitoring during and after the life of the project, and EPA requests that an environmental professional assess the monitoring results against the background data and modelling results.
- DPI - DPI will require full details of a groundwater monitoring program in the environmental management plan including the mine and tailing storage facility.
- GWM Water - Groundwater monitoring data collected by DMS should be reported to GWM Water to maintain oversight of the resource. GWM Water would require this as part of a water licence.
- Northern Grampians Shire Council - The effects of the lowering of the saline watertable and its affects on the Northern Grampian Shire district aquifers will be watched with interest. It is hoped that the correct amounts of monitoring bores are installed and implemented.
- Wimmera CMA - Due to the limited knowledge relating to how groundwater systems in this area will respond to the proposed mining operations, the CMA strongly supports the ongoing and regular monitoring of groundwater pre, during and post mining.
- Mr Frank Drum - Effective groundwater monitoring is essential and would best be done by a community group assuming responsibility for the provision of independent monitoring and that this group should be funded through a levy on production.

With the exception of the suggestions made by Mr Drum, the proponent indicated agreement with these submissions.

6.3 Inquiry response

6.3.1 Surface Water

The Inquiry notes that there is general agreement that the surface water management proposed is satisfactory and that implementation of the proposed management measures will limit impacts on the surface water environment to an acceptable level. The Inquiry agrees with this view.

Along with the proponent, the Inquiry accepts the view of the EPA that sediment management should be according to EPA Publication 480 *Environmental Guidelines for Major Construction Sites*.

The issue in regard to disposal of sewage raised by the EPA appears to be adequately covered in the EES.

Concerns raised in regard to the risks associated with the pumping of saline waters are valid but the Inquiry considers that such risks can be adequately addressed in the detailed design and subsequent approval stages. It is considered extremely unlikely that a Work Plan or planning permit application that did not include adequate minimisation of this risk would be approved.

6.3.2 Water Supply

While the EES is not definitive as to the source of the water required for the operation, two alternatives, both of which are presented as viable, are provided. While this approach can be seen as creating additional levels of uncertainty and complexity to the assessment of the environmental impacts, the Inquiry does not believe that having to consider more than one alternative is a barrier, in itself, to making the necessary assessments. It remains open for the Inquiry to find that either one, or both, of the alternatives would result in an unacceptable impact or that either, or both, proposals require modification in order to limit adverse impacts to an acceptable level.

While the Inquiry may be supportive of the view expressed by a number of submitters, and in fact by the expert witness on water supply, that the supply and use of saline water from the Avon Deep Lead would provide the more environmentally sustainable solution, it is noted that water supply from Avon Deep Lead is a possibility rather than a proven viable alternative. Further testing is required to establish the quantity of water that can be sustainably drawn from the lead and whether that quantity is sufficient to meet the needs of the mine. Had the Inquiry been presented with two alternatives that it considered to have proven viability, then it is highly likely that a view would have been formed as to which of those alternatives should be adopted. This however is not the case and, as a result, it is not possible to rule out either of the alternatives based on it being inferior to the other.

Instead of comparing two alternatives the Inquiry must consider each alternative separately and provide separate assessments of their impacts and the acceptability of those impacts.

The assessments the Inquiry is able to make are limited by the fact the information provided on both alternatives is conceptual and as a result impact predictions are general rather than specific. The Inquiry has therefore taken the approach that its assessments should be on the basis of:

- the identification of fundamental difficulties with the concepts proposed that the Inquiry consider are incapable of resolution; and
- reasonable expectations of the scrutiny that will be applied to the detailed proposals when they are developed and used to support applications for subsequent approvals.

The tests to be applied are whether there are any fatal flaws in the concepts as proposed and whether acceptance of the concepts at this stage might lead to an unacceptable result through lack of subsequent assessment.

Water Supply from GWM Water System

The Inquiry received a significant amount of information on the need for water to be used for protection and improvement of the health of the Wimmera River and the associated terminal lakes and of what might be considered a regrettable history of mismanagement of water resources and the environment. As a consequence, the Inquiry has no reason to doubt that additional water in the river and lakes system would be of considerable benefit; however, if the Inquiry is to recommend that use of water from the GWM Water system be prohibited, it must be convinced that the imposition of such a prohibition would result in:

a) Additional water being provided to the river and lakes; and

b) The amount of additional water that could be provided to the river and lakes would in fact make a difference to their ecological health.

On both counts the Inquiry is unconvinced.

It is noted that a decision has already been made on the use of water that is predicted to be saved as result of the Wimmera Mallee Pipeline Project and that the decision is that some of that water be made available for consumption by new enterprises that will directly help the region's economic growth. The proponent is seen as such an enterprise and could rightly expect to be a potential beneficiary of the decision that has been made.

The Inquiry does not believe that it is in a position to disregard or even comment on the decision that has already been made in regard to use of water saved or the accuracy of the estimate of the amount of water that will in fact be made available by such savings. The Inquiry has received submissions challenging both the estimated savings and the allocation of those savings but has not been provided with any contrary evidence. This

lack of evidence is not because such evidence does not exist but rather to fact that it was not requested or needed for the Inquiry to satisfy its Terms of Reference. The Inquiry has no choice but to consider the matters before it on the basis that GWM Water are in a position to advise on the availability of water from its system and to accept such advice.

Despite submissions to the contrary, the Inquiry can identify no reason to question the intention or ability or of GWM Water to act in an appropriate manner on matters relating to water licensing and allocation.

This is not to say that the Inquiry agrees, or disagrees, with either the estimated savings or the allocation of those savings but only that it does not have, or require, the information on which to form a view and in the absence of such information is content to rely on the views of the relevant authorities.

It is therefore accepted that a volume of 20 GL/year will be available for consumptive uses. Furthermore it is considered highly likely that this water will not only be available but will also be allocated to consumptive uses, irrespective of the amount that might be taken and used by the proponent.

It is therefore improbable that prohibition of the use of water from the GWM Water system at the proposed mine would result in more water being made available for the rivers and lakes.

It is also noted that of the projected savings as a result of the Wimmera Mallee Pipeline Project, 80 GL/year is to be made available for improving the environment of stressed rivers and wetlands. If the 4 GL/year that might be consumed by the mine was allocated for environmental purposes, the increase in water availability from 80 to 84 GL/year would be highly unlikely to result in a meaningful difference.

The Inquiry understands the principle that "every little bit helps" and that the cumulative effect of more mines in the future may be more significant, however these are matters that should rightly be considered in the allocation of water for consumptive use rather than for individual developments. The Inquiry has no reason to believe that due consideration has not been given to all possible uses for water savings in the past or will not be in the future.

The allocation of almost 80% of the projected savings from the Wimmera Mallee Pipeline Project for improving the environment of stressed rivers and wetlands appears to be an adequate response to the requirement of the *Heritage Rivers Act* 1992 that "*An adequate proportion of such water savings (*That is from projects such as the Wimmera Mallee Pipeline Project) *is to be allocated to environmental water requirements for the Wimmera River upstream of Lake Hindmarsh*"

While Mr Fraser suggested to the Inquiry that the provision of water from the GWM Water system would be in contravention of the *Heritage Rivers Act* 1992, the Inquiry has reviewed the relevant provision of that Act and found that the proposal is not in contravention of that Act as it does not involve a new diversion from the Wimmera River.

The Inquiry notes that the possibility exists that a system of ponds, pumps and pipelines may be required to deliver water to the mine site and that:

- the establishment and operation of such infrastructure has the potential to impact on flora and fauna, soil productivity and land access;
- in the understandable and accepted absence of details of the infrastructure design and pipeline routes it is not possible to quantify the extent of such impacts, at this time;
- the development and use of such infrastructure will require the application for and grant of a planning permit or permits; and
- the information provided in SS12 provides what the Inquiry considers to be sound and practical advice on the methodology that should be applied during the construction and rehabilitation of such works.

The Inquiry can identify no barrier to the preparation of a detailed design of this infrastructure and an impact assessment predicting an acceptable degree of impact. Such information would be required to enable consideration of planning permit application(s) and the Inquiry is of the view that the provisions of the relevant planning schemes, including policy, notice and referral requirements and decision guidelines, would enable the local planning authority to deal with an application in an appropriate manner. The Inquiry considers the risk of an inappropriate decision by the local planning authority that fails to provide adequate protection of the natural and built environments and the amenity of an area to be low.

There appears to be no doubt that application of the principles of Victoria's Native Vegetation Management Framework, including each of the avoid, minimise and offset principles, to the satisfaction of DSE, would be required.

While the Inquiry considers it highly likely that an appropriate proposal for the infrastructure required to deliver water from the GWM Water system to the mine site could be developed and that the local planning authority, together with referral authorities, have the ability to assess such a proposal, this should not be interpreted as a recommendation that such a proposal should or should not approved. The point being made by the Inquiry is that no fundamental barriers to approval of the works required can be identified and that it is reasonable to expect that any proposal will be subject to appropriate scrutiny.

Water Supply from the Avon Deep Lead

Potential impacts of the proposal to obtain water from the Avon Deep Lead arise from the following:

- the import of salt to the mine site;
- the required construction of infrastructure to deliver water to the mine site (ponds, pumps, power and pipelines); and
- the lowering of the water level in both the deep lead and other aquifers.

The Inquiry's response to matters relating to the import of salt to the mine site is provided below in the discussions of impacts on groundwater levels and quality.

The infrastructure required is similar in concept and character to that required for the delivery of water from the GWM Water system with the exception that the salinity of the water being delivered is such that the risk of spillage or leakage is significantly greater as a result of the more severe consequences. The Inquiry is of the view that well proven methodology and technology exists to reduce the risk to an acceptable level, by decreasing the likelihood of such leakage or spillage. Furthermore the Inquiry notes that, without specifying precisely what will be used, the proponent has identified and described a number of measures that could be applied, including pipeline inspections, continuous leak detection with automatic shutdown and rapid and effective cleanup.

The Inquiry's conclusions on this matter are as for the matters relating to the delivery of water from the GWM Water system that include:

- there are no fundamental barriers to the development and approval of an appropriate proposal; and
- the planning permit application and assessment process is adequate and the risk of the approval of a proposal that does not provide adequate protection of the natural and built environments, and the amenity of the affected area, is low.

The suggestion by one submitter that extraction of water from the Avon Deep Lead would result in a significant reduction in the flows in the Avon River and Sandy Creek is found to be invalid. It is considered likely that some change to the flow to Lake Buloke, and possibly other lakes, is likely to occur but the extent of such a change has not been quantified.

Impact definition and quantification requires the establishment of the sustainable yield of the lead, precise definition of the quantity of water to be extracted and a detailed understanding of the local hydrogeology. The

absence of this information prevents the Inquiry from making recommendations on the acceptability, or otherwise, of the impacts.

What is known is that any extraction of water from the Avon Deep Lead would require a groundwater extraction licence to be granted by GWM Water and that, as is required under *Water Act* 1989, the assessment of an application for such a licence will include consideration of, amongst other matters, the following:

- any adverse impacts that the allocation or use of water is likely to have on:
  - existing authorised uses of water; and
  - a waterway or aquifer.
- the need to protect the environment, including the riverine and riparian environment; and
- the needs of other potential applicants.

The Inquiry has reviewed the Ministerial Guideline that GWM Water indicated would be applied in its dealing with an application for a groundwater extraction licence and notes the following:

- the application for a groundwater extraction licence would need to be supported by a "Groundwater Assessment Report", which includes the information required to enable assessment of potential impacts on both existing and future groundwater users and the environment; and
- any licence granted will include conditions requiring adequate impact monitoring, protection of both groundwater and surface water and compensation of other authorised users if such users are materially and adversely affected.

In light of this information and the assurances given by GWM Water at the hearing, the Inquiry considers it reasonable to expect that:

- a groundwater extraction licence will not be granted without adequate assessment of potential impacts; and
- sufficient control of activities conducted under the licence will be applied to ensure actual impacts are known and limited to those predicted.

In light of this view, and a similar degree of confidence in the adequacy of assessment and control that would be applied to the associated infrastructure works under the *Planning and Environment Act* 1987, the Inquiry is able to conclude that:

- there are no fundamental barriers to the development and approval of appropriate proposals to obtain and deliver water from the Avon Deep Lead to the mine site; and
- the approvals processes to be applied provide all the relevant criteria by which a proposal to extract and use water form the Avon Deep Lead can be assessed and, given appropriate application, can be expected to result in appropriate protection of the natural and built environments and the amenity of the affected area.

6.3.3 Groundwater levels at and around the mine site.

The Inquiry notes that one submitter questioned the extent of the predicted impact on groundwater levels during the mining phase while another submitter expressed the view that further investigations were required. The bases of these views are unclear and the Inquiry finds no reason to question the methodology applied or the results of the modelling undertaken to make the prediction.

It was also suggested that, since the aquifer is under pressure, excavation could result in the rise of saline water to the surface. In light of the facts that, during the mining phase, the watertable level will be maintained at or below the level of excavation and the proposed backfilling of the mined area will involve reinstatement of the existing hydrogeological characteristics, the Inquiry is unable to accept the validity of this concern.

Overall the Inquiry finds itself able to accept the predicted impact on watertable levels during mining and the consequent lack of adverse impacts on groundwater users and the surface water environment.

The Inquiry notes the concerns expressed by numerous submitters that are based on the fact that it is proposed to import a large volume of water, and salt to the site and uncertainty as to the fate of this water and salt. In the simplest of terms, the answers provided by the proponent and its consultants to these concerns are that:

- the vast majority of the water and salt imported to the site will ultimately be bound in the slimes layer in the backfilled pit;
- the slimes layer will be located such that it will have no direct impact on the ground surface or root zone; and
- water migration from the slimes layer will be small, in a downward direction and would not result in a significant increase in the level of the groundwater.

The Inquiry notes that the proposal is that the slimes layer is to be, at least, 7 metres below ground surface and accepts the adequacy of the proposed

methods of satisfying this criteria thus ensuring that the slimes layer will remain well below the root zone.

The validity of the answers relating to the fate of the water and salt in the slimes layer and its resultant impact depends on assumptions or estimates of the following:

- the specific retention of the slimes;
- the quantity of water (and salt) that will flow from the slimes layer when pressure is applied during placement and compaction of the overburden layer above the slimes layer; and
- the hydrogeological characteristics of the receiving aquifer.

In testing these assumptions the Inquiry finds that:

- while the specific retention of the slimes has not been evaluated by physical testing the estimate used is considered reasonable;
- the estimate of outflow from the slimes layer during compression is considered to be conservative, i.e. the actual outflow is more likely to be less than predicted rather than more; and
- the assumed hydrogeological characteristics of the receiving aquifer are based on best available knowledge.

As a result the Inquiry finds the predictions of the fate of the water and salt in the slimes layer to be credible.

The other identified mechanism by which an adverse impact could be created as a result of the existence of the slimes layer is that it will act as a barrier to the downward movement of water resulting in formation of a perched watertable.

The Inquiry notes that, for this mechanism to produce an adverse impact, the perched water table would need to enter the root zone that lies in the top 3 to 4 metres. The proposal is that the top of the slimes layer will be located at least 7 metres below the ground surface therefore 3 to 4 metres below the root zone.

The prediction that a perched watertable of sufficient size to encroach on the root zone would not develop is based on a prediction that the infiltration rate through the refilled zones will be similar to that prior to mining. While there is no doubt that if existing conditions are reproduced the risk of adverse impact through perched watertable development is negligible, and information was presented as to why this could be expected to be the case, some doubt remains.

The doubts are not considered to be sufficient to conclude that the risk is too high but they are sufficient to elevate the importance of effective monitoring of actual performance and the development of contingency plans if that performance varies significantly from that predicted.

The same can be said of the predictions of minimal rise in the water table as a result of recharge from the slimes layer. While the Inquiry finds the predictions credible they remain predictions and confirmation by measurement of actual performance is required.

Overall the Inquiry is satisfied that there is a reasonable expectation that adverse impacts resulting from changes to groundwater levels will be negligible, however this expectation requires confirmation by effective monitoring.

6.3.4 Groundwater quality

The evidence provided enables the Inquiry to conclude that, since the salinity of the water that could be added to the groundwater is slightly lower than that of the groundwater itself, no impact on the beneficial uses of the groundwater is expected.

The Inquiry is also confident that the nature of the flocculant to be used is such that no adverse impact on groundwater will result from the addition of flocculant, at the predicted concentration, to the groundwater.

Due to the lack of what might be considered hard evidence, the Inquiry is less certain about adverse impacts on the aquifer, and the water it contains, which may result from chemical reactions between the constituents of the water exiting the slimes and that of the groundwater.

It is acknowledged and accepted that the lack of evidence is due to the fact that quality of the water in the slimes layer depends on the water supply source and that such evidence should be obtained when the water supply source is known. The Inquiry anticipates that all the required information will be available prior to the approval of the Work Plan.

In light of the fact that the effect of mining and processing is to make a significant reduction in the concentration of radioactive materials in the mine area without chemical alteration, the suggestion that groundwater could become contaminated with radioactive materials is not supported.

6.3.5 Groundwater monitoring

The Inquiry finds no reason to doubt the accuracy of the background groundwater level, pH and salinity data provided by the proponent but the need for additional data on the chemistry of the groundwater at the mine site and that of the potential offsite water sources is accepted.

The widespread and general agreement in regard to need for groundwater monitoring prior to, during and following mining is noted and the Inquiry also supports this view.

The precise detail of the groundwater monitoring program is a matter to be considered in the preparation and evaluation of the Work Plan and it is noted that while the DPI is the approval authority for that Plan, the evaluation will include referral to the EPA, GWM Water, the Wimmera CMA and the local municipalities.

The Inquiry expects that the Work Plan submitted for approval will include the following, in addition to the data provided in the EES:

- comprehensive data on the chemistry of the existing groundwater at the mine site and of any water to be imported to the site;
- an assessment of the potential impact on the chemistry of the groundwater in the vicinity of the mine including prediction of the impact of reactions between the constituents of water added to the groundwater and the groundwater itself, on the aquifer; and
- a groundwater level and quality monitoring program that will enable assessment of actual impacts on groundwater levels and chemistry within an area extending at least 4 km from the site boundary.

This expectation is based on:

- the submissions of the DPI and other authorities to the Inquiry;
- a confidence in the ability of the DPI and those other authorities to determine appropriate groundwater monitoring requirements; and
- the capability of the DPI, in consultation with others, to assess whether those requirements will be satisfied.

While the Inquiry recognises that members of the local community are in a position to provide valuable input into the development of an appropriate groundwater monitoring program and should be involved in the assessment of monitoring results, the establishment of an elected community group to conduct independent monitoring of groundwater is not supported.

The Inquiry is of the view that responsibility for impact monitoring should belong to those responsible for causing the impact, in this case, the operator

of the mine. The reason behind this view is that the people in the best position to actually take any action that may be required are the mine operators.

While the Inquiry has no reason to doubt the integrity of the proponent in this case, it is also recognised that other stakeholders need to be comfortable with the validity and completeness of the monitoring program and its results. It is recognised that the mine operator may not be seen as unbiased so, the Inquiry believes that, to provide the required degree of comfort, the implementation of the monitoring program and the results obtained should be subject to independent audit on a regular basis.

Responsibility for the ultimate assessment of performance belongs to the regulatory authority, in this case the DPI. In order to meet this responsibility the DPI requires input from other regulatory authorities including the EPA, the CMA, the water authority, the local municipalities and, importantly, the local community.

All of the bodies and organisations from which input is required are expected to be represented on the Environmental Review Committee (ERC). The Inquiry therefore considers the ERC to be the appropriate forum for the results of groundwater monitoring to be presented and for all members of that committee to provide input for the use by DPI to assess performance and, if appropriate, direct that action be taken.

It is the role of the community representatives on the ERC to act as a conduit between the community they represent and both the mine operators and the regulatory authorities. Providing the community representatives on the ERC are supplied with the required information in an appropriate form and the lines of communication with the broader community are open, then a separate community group with responsibility for groundwater monitoring would be superfluous.

6.4 Findings and recommendations

The Inquiry finds that:

- **Given the implementation of the surface water management measures proposed and the application of guidance provided by EPA Publication 480 *Environmental Guidelines for Major Construction Sites*, impacts on surface waters will be acceptable;**
- **The establishment and use of infrastructure required to deliver water to the site could be achieved without unacceptable impacts and the requirement for a planning permit can be reasonably expected to result in adequate protection of the environment;**

- **There is no legislative barrier to the supply of water from the GWM Water system and the prohibition of the use of this relatively high quality water at the site would not result in an increase in the amount of such water being made available for protection and enhancement of rivers and lakes and, even if it did, the difference made to the condition of the rivers and lakes would be negligible;**
- **The impacts of extracting water from the Avon Deep Lead have not been quantified but such quantification would be required in support of and application for the necessary groundwater extraction licence;**
- **There are reasonable expectations that the water required could be extracted from the Avon Deep Lead without unacceptable adverse impacts and that the requirements of the groundwater extraction licence application process can be expected to prevent the grant of a licence unless environmental protection is assured;**
- **Predictions of the following are credible but require confirmation by actual performance monitoring:**
  - **Impacts on groundwater levels at and around the proposed mine site during and post mining;**
  - **The separation distance between the slimes layer in the backfilled pit and the ground surface;**
  - **The fate of water and salt to be added to the mine pits during backfilling; and**
  - **The unlikelihood of development of a perched watertable above the slimes layer in the backfilled mine pits that would approach the root zone.**
- **As a result no adverse impacts are expected to result from the disposal of saline slimes in the backfilled pit or the changes to groundwater levels during or post mining;**
- **Impacts on groundwater quality, in terms of salinity and addition of chemicals, will not affect the beneficial use of the groundwater;**
- **Additional information is required to enable assessment of potential impacts of reactions between constituents of the groundwater and those of the water to be added to the groundwater;**
- **A comprehensive groundwater level and quality monitoring program is required, should be included in the Work Plan and evaluated prior to approval of that plan;**
- **Implementation of the groundwater monitoring program and the results produced by that program should be independently audited annually;**

- **The Environmental Review Committee provides an appropriate forum for:**
  - **Reporting of groundwater monitoring results;**
  - **Input from government departments, authorities and the community required to enable performance assessment by the DPI; and**
  - **Communication to and from the community via the community representatives.**

The Inquiry recommends that the Work Plan not be approved unless it contains:

- **Predictions of the following that are in general accordance with predictions provided in the EES:**
  - **The maximum extent of the area over which groundwater levels will be reduced during excavation of material from the mine pit;**
  - **The maximum level of the watertable in the area of the pit at anytime up to 5 years after pit backfilling is completed;**
  - **The minimum separation of the top of slimes layer in the backfilled pit and the surface level; and**
  - **The minimum separation of upper surface on any perched watertable that may form above the slimes layer in the backfilled pit and the surface level.**
- **A monitoring program that will enable testing of each of the above predictions; and**
- **A prediction of the results of any reactions between the constituents of the groundwater and that of water that may be added to the groundwater and the impacts of any products of such reactions.**

The Inquiry recommends that the following be included in the conditions attached to the approval of any Work Plan:

- **Sediment management will be conducted in conformance with EPA Publication 480 *Environmental Guidelines for Major Construction Sites;* and**
- **The licensee shall cause an audit to be conducted of the implementation of all aspects of the groundwater monitoring program described in the Work Plan and the results of that program with reference to predictions of impacts included in the Work Plan, with one year from the date of approval and then within one year of the date of the previous audit. The audit will be conducted by an Appointed Environmental Auditor under section 53S of the *Environment Protection Act* 1970 and will provide an audit report to the all members of the Environmental Review Committee and other parties as is directed by the District Manager.**

7. BIODIVERSITY AND HABITAT

7.1 Description

Biodiversity and habitat analysis was undertaken as part of the preparation of the EES and included as Supporting Study No 3 (SS3 – Flora and Fauna Assessment). The key findings and conclusions are identified in Section 6.3, pages 6-27 to 6-53 of the EES.

The EES identifies that the project area (including the superseded project area) is located in the Wimmera Bioregion and contains six Ecological Vegetation Classes (EVC's), including:

- Plains Woodland;
- Plains Savannah, dominated by Buloke;
- Low Rises Woodland, dominated by Slender Cypress Pine;
- Black Box Lignum Woodland, with an overstorey comprised of mature black box and a midstorey of Lignum;
- Ridged Plains Mallee, dominated by Bull Mallee; and
- Plains Grassland.

Each EVC patch in the original project area has been given a conservation significance rating. The Low Rise Woodland, Black Box Lignum Woodland and the Ridges Plains Mallee are identified as having very high conservation significance; and the Plains Woodland and Plains Savannah are identified in the EES as having high conservation significance.

Because of the extensive clearing of the area most of the remaining native vegetation exists as scattered patches or along roadsides. The EES identifies that the conservation status of each of the above EVC's in the Wimmera Bioregion are endangered.

Of the 154 plant species recorded in the original project area, 52 are introduced and 102 are native, including one species of national conservation significance (EPBC Act-listed), the Turnip Copperburr.

Five flora species of State conservation significance listed in the *Flora and Fauna Guarantee Act*, 1988 (FFG Act) were identified as follows:

- Bluish rasport;
- Buloke mistletoe;
- Pale flax lily;

- Plains joyweed; and
- Umbrella mulga.

Twenty three flora species of regional conservation significance were identified.

The EES Assessment Guidelines prepared by the DPCD required, inter alia, that biodiversity and habitat issues had to be assessed using the Victorian Government's *Native Vegetation Management Framework – A Framework for Action* (the Framework).

The Framework requires that there a net gain must be achieved when there is a proposal to removal native vegetation above specified thresholds. The primary aim of the Framework is to achieve:

> *A reversal, across the entire landscape, of the long-term decline in the extent and quality of native vegetation, leading to a net gain.*

There is a three step approach to ensuring net gain:

- avoiding adverse impacts to indigenous vegetation.
- if impacts cannot be avoided, minimising impacts through appropriate consideration in planning processes and expert input into project design and management.
- offsetting unavoidable impacts.

Under the Framework, offsets are assessed by:

- calculating the native vegetation loss – using the 'habitat hectare' approach and number of old trees;
- determining the net gain to be achieved;
- identifying the offset criteria and other relevant planning scheme objectives; and
- identifying an appropriate offset.

It should be noted that one of the criteria relevant to this proposal is the temporal nature of the loss (e.g. mining followed by rehabilitation).

In undertaking a net gain assessment, the following documents are relevant:

- *Victoria's Native Vegetation Management – A Framework for Action*. DNRE (2002)
- *Managing native vegetation in the planning system*: VPP Practice Note March 2006
- *Assessing applications involving native vegetation removal*. DSE (March 2006)

- *Native vegetation offsets – how to determine and provide offsets*. DSE (March 2006)
- *The Vegetation of North West Victoria: A report to the Central and Mallee Catchment Management Authorities*. DSE (2003)
- *Vegetation Quality Assessment Manual: Guidelines for applying the habitat hectares scoring method*. DSE (2004)
- *Native Vegetation: Guide for assessment of referred planning applications*. DSE (2006)
- *Native Vegetation: Scoring gain from an offset.* DSE (2006)
- *Native Vegetation: Revegetation Planting Standards – Guidelines for establishing native vegetation for Net Gain accounting*. DSE (2006)

A net gain assessment was undertaken for the EES by Ecology Partners Pty Ltd.

Mr Aaron Organ of Ecology Partners Pty Ltd submitted that approximately 101.26 hectares or 41.55 habitat hectares was affected by the proposal to construct the mine (i.e. the reduced project area). Based on the proposed development, approximately 44 hectares or 14.82 habitat hectares were proposed to be cleared.

In addition, a scattered tree analysis was undertaken at the sites proposed to be disturbed. There were 141 large old trees identified and 28 medium old trees identified.

Mr Organ provided the following summary of the habitat hectare and tree assessments applying to the reduced project area in his expert witness statement:

> *Based on the proposed development and vegetation clearance strategy (i.e. preferred mining scenario), there is an estimated 14.82 habitat hectares proposed to be cleared, including:*
>
> · *9.38 habitat hectares of Plains Woodland*
>
> · *4.34 habitat hectares of Plains Savannah*
>
> · *1.10 habitat hectares of Black Box Lignum Woodland*
>
> · *516 Large Old Trees from polygons*
>
> · *141 scattered Large Old Trees*
>
> · *38 scattered Medium Old Trees.*

Mr Organ's expert witness statement included the following conclusions with respect to the Framework's net gain approach:

- because of the decision by DMS to significantly reduce the overall mining area and to retain the most significant vegetation areas within the proposed reduced mining area, a significant amount of significant vegetation has been avoided;
- additional strategies to reduce direct impacts on vegetation remnants will be investigated, which include micro-siting of mining equipment, retaining vegetation in some roadsides and retaining vegetation on the edge of the mine plan, such as scattered old trees; and
- based on the proposed vegetation clearance in the reduced project area, there is a requirement to generate 20.32 habitat hectares, to protect 3268 Large Old Trees and 76 Medium Old Trees, and recruit/plant 17320 new trees within the Wimmera bioregion from a combination of Plains Woodland and Plains Savannah.

Assessing the net gain required based on the revised mining proposal and using the Framework's criteria, Mr Organ concluded that:

- up to approximately 3.33 habitat hectares of gains can be achieved via revegetation works (33.3 hectares), approximately 5.28 habitat hectares from rehabilitation works (44 hectares) and 11.4 habitat hectares from management of retained remnants (57 hectares). Accordingly, 20.01 habitat hectares offset is able to be provided on-site, resulting in 0.31 habitat hectare short of the required amount.

As well as a requirement to undertake a net gain assessment, the EES Assessment Guidelines required the proponent to undertake a fauna assessment. This was also undertaken for the proponent by Ecology Partners.

Ecology Partner's report stated that the site supports habitat for a range of native fauna species including several woodland dependent birds and ground dwelling species (mammals, reptiles, frogs).

During the field surveys, 94 terrestrial fauna species were detected, comprising 13 mammals (nine native, four introduced), 69 birds (63 native, six introduced), six native reptiles, five native frogs and one native fish.

In terms of faunal habitats, Ecology Partners stated that the site currently supports five broad habitat types: modified woodland/remnant trees, planted vegetation, irrigation channels, artificial waterbodies, exotic grass/ crops. The overall habitat value of these areas within the study area ranges from low for cropped and pasture areas, to high for irrigation channels and remnant woodland.

Ecology Partners provided analysis of the conservation status of the detected fauna, and identified the following:

- National – two nationally significant fauna (Growling Grass Frog, Hooded Robin), were recorded in the study area during the survey. In addition, there have been a further three national significant fauna species (Plains-wanderer, Lewin's Rail, Swift Parrot) recorded from the local area and identified in the Atlas of Victorian Wildlife (AVW).
- State – Three state significant fauna (Bush Stone-curlew, Brown Treecreeper, Diamond Firetail) were recorded during the survey. In addition, twelve state significant fauna are document in the AVW. However, the majority require specialised habitats which are not currently present within the study area.
- Regional/local – Eleven regionally significant fauna (one mammal, one reptile, nine birds were recorded during the survey. At least three regionally significant fauna have previously been recorded within the local area.

As well as significant fauna, there is one significant fauna community of State significance, the Victorian Temperate Woodland Bird Community.

The area supports suitable habitat and assemblage of birds that defines that community. Four woodland dependent birds listed in this threatened community were recorded during the survey (Hooded robin, Brown treecreeper, Bush stone curlew and Diamond firetail).

The community is listed as threatened on Schedule 2 of the FFG Act.

Two flora species (Buloke, Turnip Copperburr) and three fauna species (Hooded Robin, Growling Grass Frog, Diamond Firetail) are identified in the Flora and Fauna Guarantee Act, 1988 (FFG Act) as threatened species.

One community (Buloke Woodland) is identified in the FFG Act as threatened.

The EES states (Volume 2, Supporting Study 3, page 58) that the *Mineral Resources (Sustainable Development) Act,* 1990 (MRSD Act) provides an exemption to 'take' listed species under the FFG Act where a proposed mining project has been through an approved EES and Work Plan.

Under the EPBC Act, an action (which includes a project, a development, an undertaking and an activity or series of activities) which will have, or is likely to have, a significant impact on a matter of national environmental significance must be referred to the Commonwealth Environment Minister

for a decision on whether the action is a 'controlled action' requirement assessment and/or approval under the EPBC Act.

The Minister's delegate advised DMS on 24 November 2005 that the project was a 'controlled action' on the basis that the project could have a potential to impact on listed species and communities. On 6 February, 2006 the Minister accredited the EES as the assessment process for this project under the EPBC Act.

It should be noted that despite the accreditation the Commonwealth retains its decision making powers and will be required to issue an approval under the EPBC Act following completion of the Victorian assessment process.

Specifically, the species and communities identified in the EPBC Act relevant to the project include:

- threatened communities - all sites containing Plains Savannah, Plains Woodland, Ridged Plains Mallee and Low Rises Woodland that have Buloke present;
- endangered flora - the Turnip Copperburr;
- vulnerable fauna – Growling Grass Frog; and
- other listed fauna – Plains-wanderer, Swift Parrot.

The EES (page 6-51) and the specialist study on flora and fauna by Ecology Partners concluded that there would be no significant impact on any listed threatened species or communities.

7.2 Issues

Issues concerning biodiversity and habitat identified by the proponent, the proponent's consultants, submitters and the Inquiry include the following:

- the adequacy of the three step net gain assessment undertaken by the proponent's consultants;
- whether the proposal satisfies the requirements of the Native Vegetation Framework;
- whether the proposal will have a significant impact on any of the threatened listed species or communities under the EPBC Act;
- whether the proposal will have any significant impact on any of the listed species under the *Flora and Fauna Guarantee Act*, 1988; and
- appropriate matters to include in the Environmental Management Plan.

7.2.1 Adequacy of the net gain assessment

The DSE identified a number of concerns with the net gain assessment. Specifically, it stated that there were inconsistencies between the EES document and the supporting studies; that conservation significance had been determined in a manner contrary to the Framework; there was a failure to consider the requirements of the Framework in respect to clearing patches of vegetation of very high conservation significance; that it was possible that a larger off-set off-site may be required; and that the EES failed to acknowledge that offsets have to legally secured.

Further, DSE submitted that:

- more effective offsets could be provided off site in regionally significant areas including linkages; and
- there is legal doubt as to whether offsets can be provided off-site because the MRSD Act only applies to the land subject to a mining licence.

In response to the issues raised by DSE, Mr Bartley for DMS stated the following:

- further detailed mapping of vegetation to be removed will need to be undertaken at the time of preparation of the detailed mine plan and similar documents;
- DMS is willing to work with the DSE to identify more effective offsets that could, for example, improve linkages between remnants;
- it is accepted that that there will need to be legally enforceable offset agreements providing for the protection and maintenance of offsets for a period of 10 years in accordance with the Framework;
- it appears that the DSE is either unable or unwilling to identify appropriate strategic objectives for the targeting of net gain offsets; and
- the MRSD Act recognises offsite offsets as part of legal requirements for the Work Plan and Work Authority.

With respect to the concerns raised by the DSE that the approach to conservation significance had been determined in a manner contrary to the Framework, Mr Aaron Organ of Ecology Partners stated that it was an accepted practice to use criteria distinguishing matters of national, state, regional and local significance to determine ecological significance of species.

7.2.2 Whether the proposal satisfies the requirements of the Native Vegetation Framework

The DSE's original submission did not provide a clear position as to whether or not the Department was satisfied that the Framework's requirements had been satisfied. Accordingly, the Inquiry directed that the DSE provide further advice and the DSE submitted a revised submission prior to the commencement of the hearing.

In its revised submission, the DSE submitted that:

- it is satisfied that the 'avoid' principle has been largely addressed, by means of substantially reducing the mine footprint during the planning stages;
- the key to addressing the 'minimise' principle would be to require the proponent to prepare and implement a Vegetation Management Plan of the whole site; and
- it appears that much of the habitat hectare offset requirements could be met on-site within the project area, but that depending on the specific details of the offset sites and the offset action proposed at each site, it is possible that a larger off-set off-site may be required.

Other submissions commenting on flora and fauna issues were received from Shire of Buloke, Victorian National Parks Association Inc, Mr Ian Morgan, Mr Peter Drum, Mr Gil Hopkins and Mr John Martin. Main issues included the following:

- the flora and fauna surveys had not been undertaken over a sufficient period of time to ensure all species had been identified, and therefore were inconclusive in terms of the impacts of the mining proposal;
- some of the vegetated areas on the perimeter of the mine footprint could be protected, particularly the areas marked 22, 24 and 30 on Figure 6.10 of the EES;
- there should be no removal of significant habitat;
- it was important that rehabilitation of the site was properly done to reinstate the flora and fauna habitats;
- the areas that were deleted from the original mining proposal that contain remnant habitat patches must be permanently protected by conservation covenants or by purchasing as permanent public reserves;
- the large old Bulokes are incredibly important for biodiversity, and their expected removal in this project is not good enough;
- the identified offset requirements should be put in place prior to any vegetation removal, and it was important that they are followed; and

- there are range of moral and philosophical issues associated with removing native vegetation and its impact on fauna.

In response to these matters raised, Mr Bartley stated that the proponent would investigate whether remnant patches on the mine footprint could be retained.

Overall, Mr Bartley stated that the proponent has complied with the avoid, minimise and replace hierarchy, and that on this basis there was no reason why the project should not proceed.

7.2.3 Impact on any of the threatened listed species or communities under the EPBC Act

Mr Bartley for DMS stated that, because the EES process has been accredited by the Commonwealth for the purposes of the EPBC Act, it was important that the Inquiry expressly consider and recommend action in relation to the protection of matters of national environmental significance identified in the studies.

Mr Bartley stated that it was important to note that all of the sites were nationally significant species have been identified are outside the proposed mine and will not be affected by mining.

The DSE did not dispute these conclusions in their submission to the Inquiry.

7.2.4 Impact of any significant species listed under FFG Act.

The DSE stated that the exemption from the FFG Act to take a species listed under the legislation is limited to flora, not fauna.

Accordingly, the DSE stated that it was necessary for the proponent to seek authorisation on matters relating to fauna from the Secretary of the DSE under the *Wildlife Act*, 1975. The DSE therefore recommended that a Wildlife Management Plan be prepared which identifies the risks and provide a strategy for mitigation, regular monitoring, removal and relocation of any live animals found in mine areas.

DMS did not dispute the DSE's response on the roles of the FFG Act and *Wildlife Act,* and agreed to include a Wildlife Management Plan in the Work Plan.

7.2.5 Appropriate matters to include in the Environment Management Plan

Under the MRSD Act, DMS is required to submit an Environment Management Plan (EMP) to the Department of Primary Industries (DPI) for approval.

DMS tabled a contents structure which identified the range of matters to be included in the EMP, which included the following matters relevant to biodiversity and habitat:

- Construction Environmental Management Plan;
- Vegetation Management Plan;
  - Native Vegetation Offset Management Plan;
  - Native Vegetation Management Plan;
  - Weed Management Plan.
- Wildlife Management Plan.

In addition, it was suggested that a Pest Management Plan also be included in the EMP.

While DPI is the relevant authority for approval of the EMP, Ms Kathryn Friday of DPI advised the Inquiry that relevant government agencies are consulted in assessing the EMP and that DSE would be closely involved in the assessment of the EMP on flora and fauna matters.

7.3 Inquiry response

7.3.1 Adequacy of the net gain assessment

As noted above, the Framework requires an assessment of the removal of native vegetation under the three step approach of avoidance, minimise and offsets.

When avoidance cannot be achieved, it is then necessary to consider how impacts on native vegetation can be minimised.

And when impacts on native vegetation cannot be avoided nor minimised, it is then necessary to consider appropriate offsets.

While there may be concern that the loss of existing, mature native vegetation is irretrievable and morally questionable (which was the view of some submitters), the purpose of the Framework is to provide an opportunity in which there is not only compensation for the losses but opportunities to provide net gain – that is, a net benefit.

Another important matter is that Native Vegetation Framework must be considered against other relevant planning policies. As stated by the Victorian Civil & Administrative Tribunal (VCAT) in *Salta Constructions Pty Ltd v Hobsons Bay CC*:[3]

> *We also remark that the policy outcomes sought in the Native Vegetation Framework must be examined in the context of the entire State and Local Planning Policy framework.*

In other words, the approach to assessing proposals to remove native vegetation requires the consideration of competing objectives in the planning framework. In this case, in broad terms, the competing objectives relate to the economic and potential social benefits of the proposal on the one hand, and whether the loss of native vegetation can be addressed through offsets on the other hand.

Avoidance

The VPP Practice Note on *Managing Native Vegetation in the Planning System* (DSE, 2006) identifies a number of factors to consider whether removal can be avoided, including:

- *The purpose for which the land is zoned, relevant overlays, local policies and the intensity and scale of development*
- *The conservation significance of the native vegetation*
- *The extent of vegetation removal proposed*
- *The size and physical capacity of the site to accommodate the development in a different form or location*
- *The surrounding land use context*
- *Existing and potential threats to the extent and quality of vegetation.*

As can be seen from the above criteria, it is necessary to form a judgement as distinct from providing a quantitative analysis on determining whether or not adequate avoidance has been achieved.

It is important to bear in mind that if a proposal fails to adequately meet the avoid principle, a proposal is not necessarily rejected but can lead to a consideration of appropriate offsets.

The Inquiry considers this to be an important point in this matter, because where a resource to be won is directly beneath native vegetation it is not

[3] Salta Constructions Pty Ltd v Hobsons Bay CC [2008] VCAT 1253

practically possible in an open pit mine to avoid removing the native vegetation.

Indeed, it was the view of Mr Townshend, counsel for Iluka Resources Limited in the Murray Basin Stage 2 mineral sands project also considered by the same Inquiry members, that the principle of avoidance has little practical application to open pit mining.

State and local planning policies and intensity and scale of development

There are State and local policies that specifically encourage mining proposals, including Clause 17.08 of the State Planning Policy Framework (SPPF), which states:

> *To protect identified mineral resources, to encourage mineral exploration and mining in accordance with acceptable environmental standards and to provide a consistent planning approval process.*

Yarriambiack Planning Scheme contains a specific local policy that recognises the economic, social and environmental implications of sand mining, and includes the following objectives:

- *To facilitate and encourage the exploitation of mineral sand deposits to enhance the economy of the municipality and region.*
- *To allow mining, processing and associated research in an environmentally sensitive manner and with regard to the amenity of adjacent land.*
- *To enable the establishment of buildings and works necessary for such operations.*
- *To ensure that all land disturbed by mining operations is appropriately rehabilitated, in a form capable of supporting its previous use.*

Northern Grampians Planning Scheme contains similar strategies and objectives. The relevant objective is:

> *To promote and facilitate mining and extractive industry in the Shire in a responsible manner.*

The planning strategies are:

- *Encourage mining and extractive industry activities provided that the proposals adequately address environmental, amenity and rehabilitation issues to ensure the long term impacts of mining and extractive industry on the surrounding environment and community are minimised.*

- *Provide adequate separation and buffer areas between sensitive land uses and mining and extractive industry to ensure that adverse environmental effects, nuisance or exposure to hazards does not affect existing and future residents.*
- *Monitor and enforce land rehabilitation conditions on all mining and extractive industry permits.*

While the Farming Zone does not contain a specific purpose to encourage mining, mining is a Section 1 use (permit not required) use in the zone provided the requirements of Clause 52.08-2 are met.

Accordingly, State and local policies in the two relevant planning schemes and the zoning provisions clearly provide that mining generally and sand mining in particular are uses that are to be encouraged in the subject area provided environmental impacts are addressed.

In balancing the policies and provisions that encourage mining against the Framework principle of avoid, the Inquiry considers that there is policy support for the project despite the loss of native vegetation that will not be avoided.

Notwithstanding, the Inquiry considers that the decision by DMS to almost halve the size of the project and not proceed with the mining of the southern area will avoid existing, more extensive native vegetation remnants.

Conservation significance

As noted above, the conservation significance of two EVC's are classified as very high and three are classified as high.

Total habitat hectares of very high conservation significance to be removed is 1.10 and total habitat hectares of high conservation significance to be removed is 13.72.

Under the Framework, clearing of native vegetation that has very high conservation significance is not permitted unless exceptional circumstances apply. Approval of the Minister for Environment is required for removal of native vegetation of very high significance.

Removal of native vegetation of high conservation (and medium conservation significance) is "generally not permitted".

With applications involving the removal of vegetation of very high conservation significance, matters to be taken into account under the DSE's *Native Vegetation: Guide for assessment of referred planning permit applications*

(April 2007) include the vegetation to be retained, the extent and condition of the relevant EVC's and arrangements for offsets.

With applications involving the removal of vegetation of high conservation significance, matters to be taken into account include where removal of the vegetation is of a very limited scale to other native vegetation on the property, the economic or infrastructure significance of the projects under which an EES has been prepared and for small remnants where they have very low prospects of surviving.

Having regard to the above guidelines, the Inquiry considers that removal of vegetation of both very high conservation significance and high conservation significance is justified because:

- the economic significance of the project (which is estimated to be $750 million) and other social benefits of the project to the region;
- the extent of the native vegetation to be retained, including the remnant patches in the southern area of the superseded project area and the two remnant patches within the proposed project area;
- the prospect of retaining remnants on the perimeters of the mine's footprint; and
- the provision of offsets, while still to be finalised, will be able to be achieved.

In response to the DSE's concerns that the conservation significance has been determined in a manner contrary to the Framework, the Inquiry notes that while different criteria was undertaken for the flora and fauna assessment in the supporting study, the net gain assessment in the EES applied the conservation significance in an appropriate manner. The Inquiry further notes the DSE did not dispute the habitat hectare calculations prepared by Ecology Partners to determine offsets.

Extent of vegetation removed

Approximately 35% of the native vegetation is proposed to be removed by mining (14.82 habitat hectares out of 41.55 habitat hectares).

While there are no quantifiable standards or guidelines to provide a relative assessment, the Inquiry considers that by avoiding remnant patches in the project area that there has been a reasonable attempt to reduce the extent of vegetation removal.

Size of the site to accommodate the development in a different form or location

The below surface location of the mineral sands resource is a given, so it is not possible to consider alternative locations.

As noted above, DMS has made a significant change to the extent of development and has indicated it will consider further changes to the form of development to protect remnant patches on the perimeter of the mine footprint.

Surrounding land use context

Given the significant clearing that has occurred in the area since European settlement and the largely agricultural use of the land, this factor is not considered significant.

Existing and potential threats to the extent and quality of vegetation

The Inquiry is satisfied that the flora and fauna assessment undertaken by Ecology Partners for the proponent has identified existing and potential threats to the extent and quality of vegetation.

7.3.2 Minimising

The Framework states that if the removal of native vegetation cannot be avoided, the second step requires the amount of vegetation to be minimised through appropriate consideration in planning processes and expert input into project design or management. Factors to be considered in this step include:

- *The size, layout and density of the proposed development*
- *Project design and management that minimises removal*
- *Implementation of reasonable and practical measures to minimise vegetation loss.*

Size, layout and density

As noted above, the more significant remnants are to be retained within the project site and DMS have agreed to review whether some of the remnants on the perimeter of the mine footprint could also be retained.

Project design and management

Ecology Partners have suggested that additional strategies to reduce the direct impacts on vegetation remnants will be investigated including micro-siting of equipment, retaining vegetation in some roadsides and retaining vegetation on the edge of the mine footprint, such as scattered old trees.

Implementation of measures to minimise vegetation loss

This approach is addressed in the preceding paragraph.

The Inquiry considers that DMS has identified a range of appropriate measures to minimise the extent of native vegetation removal and therefore satisfies the Framework's guidelines. Further details of the minimise measures are to be included in the EMP's Native Vegetation Management Plan.

7.3.3 Off-sets

Once steps 1 and 2 have been considered, then off-sets or net gain targets can be calculated.

As noted in section 6.1 of the EES, Ecology Partners have identified 20.01 habitat hectares are required for offsets and all bar 0.31 habitat hectares can be provided on site.

Under the Framework, the loss of vegetation (except loss of old trees) are considered to be temporary with mining projects because of the capacity to rehabilitate former mining sites. Application of this criterion changes the total off-set amount. However, the DSE is satisfied that the above approach has been applied by Ecology Partners in their assessment.

The Inquiry considers the offset calculations developed by Ecology Partners is in accordance with the Framework's guidelines and is satisfied with DMS's response to the concerns raised by DSE, including the specific acknowledgement that offsets need to be secured by a suitable legal agreement.

7.3.4 EPBC Act requirements

The Inquiry considers that the project will not have a significant impact on any listed threatened species or communities under the EPBC Act provided the relevant mitigation measures identified by Ecology Partners on page 26 of Mr Organ's expert witness statement are implemented.

7.3.5 Flora and Fauna Guarantee Act, 1988

The Inquiry considers DMS's response to include a Wildlife Management Plan in the Work Plan to be appropriate, and suggests that it be submitted to DSE for approval as a requirement of the EMP.

7.3.6 Environmental Management Plan requirements

The EMP process will provide an opportunity for matters of detail including the final off-set required to be resolved.

The Inquiry considers that the draft EMP contents tabled by DMS include the relevant matters relating to biodiversity and habitat other than a requirement for a Pest Management Plan and therefore should be included in the EMP.

7.4 Findings and recommendations

The Inquiry finds that:

- **The decision by DMS to almost halve the size of the project and not proceed with the mining of the southern area will avoid existing, more extensive native vegetation remnants;**
- **Despite the removal of native vegetation that will not be avoided, there is local and State policy support for sand mining to occur in the area provided environmental matters are addressed;**
- **Having regard to the Framework's requirements, the Inquiry considers that removal of vegetation of both very high conservation significance and high conservation significance is justified because of:**
  - **The economic significance of the project (which is estimated to be $750 million) and other socio-economic benefits of the project to the region;**
  - **The extent of the native vegetation to be retained, including the remnant patches in the southern area of the superseded project area and the two remnant patches within the proposed project area;**
  - **The prospect of retaining other remnants on the perimeter's of the mine's footprint; and**
  - **The provision of offsets, whilst still to be finalised, will be able to be achieved.**
- **Ecology Partners for DMS has identified a range of measures to minimise the extent of native vegetation removal, which satisfies the Native Vegetation Framework's guidelines;**

- **Further details of measures to minimise native vegetation losses should be included in the EMP's Native Vegetation Management Plan;**
- **The offset calculations developed by Ecology Partners are in accordance with the Framework's guidelines, and is satisfied with DMS's response to the concerns raised by the DSE;**
- **The project will not have a significant impact on any listed threatened species or communities under the EPBC Act provided the relevant mitigation measures identified by Ecology Partners are implemented; and**
- **The draft EMP contents tabled by DMS include the relevant matters relating to biodiversity and habitat, and should be included in the Work Plan.**

The Inquiry recommends that the Work Plan not be approved unless the EMP contains:

- **Construction Environmental Management Plan**
- **Vegetation Management Plan**
  - **Native Vegetation Offset Management Plan**
  - **Native Vegetation Management Plan**
  - **Weed Management Plan**
- **Wildlife Management Plan**
- **Pest Management Plan**

The Inquiry further recommends that:

- **The Victorian Minister for Planning advise the Commonwealth Minister for Environment, Water, Heritage and the Arts that the Donald Mineral Sands project will not have a significant impact on any listed threatened species or communities under the EPBC Act provided the relevant mitigation measures identified by the proponent's flora and fauna experts are implemented.**

8. AIR QUALITY

8.1 Description

Air quality was considered as part of the preparation of the EES and is included as Supporting Study 1 (SS1 - Air Quality and Greenhouse Gases Assessment). The Air Quality assessment appears in section 6.4 of the EES, pages 6-53 to 6-65.

The proposed mining involves moving large volumes of materials, eg top soil, subsoil, overburden, and ore. In addition there would be the movement of large mining equipment and trucks, both within the mine pit and along the unsealed haul roads adjacent to the pit. As a consequence of these activities, dust particles will be generated. These particles, especially the very fine particles, will potentially be harmful to human health, may create amenity issues, might affect the quality of tank drinking water at nearby residences, and possibly be detrimental to photosynthesis in nearby crops.

The site work during the first 1 to 2 years will be of a **construction** nature, eg removal of vegetation, fencing, stripping and stockpiling of topsoil, subsoil and overburden from the initial mine pit, construction of offices, workshops, mining processing plant, formation of on-site roadways, laying pipelines, etc. These activities will generate far less dust than would come from the mining operation. For this reason, the air quality consultant has concentrated on the assessment of dust from the operational phase to evaluate the potential effects on air quality of the proposal.

The mining **operations** will generate significant dust, especially if the ore were to be transported by large trucks from the Mining Unit Plant to the Wet Concentrator Plant. The results of air quality modelling showed that the option of pumping the mined ore as a slurry instead of using trucks significantly reduced off-site dust impacts. Because of this, the proponent has opted to use the slurry method of transporting the mined ore thus reducing the dust generated. This Chapter of the Inquiry report therefore confines its commentary to the slurry pumping option.

The air quality modelling has used seven nearby residences as sensitive receptors, with two of these (identified as R2 and R5) being the closest to the proposed mining activities. Residence R2 would be 0.4 km south of the nearest mining in year 2 and Residence R5 would be 0.2 km west of the nearest mining in year 24. Two other residences (identified as D7 and D11)

are located in areas that will be mined and will need to be removed ahead of the mining, or if they are to be retained, the mining activity will occur around them. The proponent acknowledges that residents in these houses will need to be relocated ahead of the mining activity as the residences will be subjected to excessive dust levels when the mining is nearby.

The EES covers a number of options for **transporting** heavy metal concentrate (HMC) from the mine site to a shipping port for export overseas. One set of options is to use road transport to Melbourne, Geelong or Portland while the second set of options is to use road transport to a purpose-built rail siding south of the Minyip Township for on-forwarding by rail to Melbourne, Geelong or Portland. The rail options involve either the use of containers or bulk handling. Of the two handling methods, rail bulk handling was considered to have a greater likelihood of generating dust that might affect nearby residents to the proposed rail siding. Therefore modelling was confined to the rail bulk handling option.

The air quality consultant has used the Ausplume Gaussian dispersion model, which is the EPA approved (and preferred) regulatory model for air quality assessments. The modelling undertaken has included the incorporation of background levels of pollutants and has produced the output as the time-series plots for the most affected sensitive receptors, contour plots showing the geographic extent of maximum concentrations, and a general discussion on the analysis of the modelling results including the degree of uncertainty in the results.

Modelling undertaken was for several types of dust, viz., PM_{10}, $PM_{2.5}$, respirable crystalline silica, heavy metals and dust deposition. The dust from the proposed railway siding due to train loading activities was limited to modelling of PM_{10}, $PM_{2.5}$ and deposited dust.

8.1.1 Assessment criteria

To facilitate the assessment of future mining proposals, the Victorian EPA has recently released the *Protocol for Environmental Management – Mining and Extractive Industries* (Publication 1191, dated December 2007) (the PEM). Although the publication post dates the EES, a draft of the proposed protocol was available during the preparation of the EES. The air quality consultant was therefore able to use the draft as the basis for assessing the acceptability of the impacts on the air quality associated with the proposal. In addition, discussions were held with the EPA about the proposed modelling and the EPA assisted with the provision of background air quality data and meteorological data for use in the modelling. The proposal will be assessed against the requirements contained in the PEM.

The high annual extraction rate and the location of residences less than 500 m from mine means that the level of assessment specified under the PEM is a level 1 assessment, the most rigorous form of pre-mining assessment. It also means that the most demanding monitoring of air quality will be required, eg real-time continuous monitoring of PM_{10} and $PM_{2.5}$, and the nearest residences linked to a reactive management system, and regular monitoring of both respirable crystalline silica and metals.

The PEM lists criteria for air quality for the assessment of proposed mines as per the following table which has been copied from the PEM.

Table 4 Assessment criteria for mining and extractive industries

INDICATOR	CRITERIA	AVERAGING PERIOD
PM_{10}	60 µg/m^3	24-hour average
$PM_{2.5}$	36 µg/m^3	24-hour average
Respirable crystalline silica (as $PM_{2.5}$)	3 µg/m^3	Annual average
Arsenic (total inorganic)	0.003 µg/m^3	Annual average
Hydrogen cyanide	340 µg/m^3 9 µg/m^3	1-hour average Annual average
Nitrogen dioxide	0.14 ppm	1-hour average
Carbon monoxide	29 ppm	1-hour average
PAHs (as BaP)	0.3 ng/m^3	Annual average
Asbestos	0.2 µg/m^3 OR 0.05 PCM fibres/m^3	Annual average
Radionuclides [1]	As low as reasonably achievable	Annual average

Note 1: Radionuclides are included in a section 6.7 of the EES and is covered in Chapter 12 of this Inquiry report.

The PEM requires the proponent to assess the impact on air quality of various heavy metals that may occur in the mining materials. These include lead, antimony, copper, manganese, mercury, arsenic, beryllium, cadmium, chromium IV and nickel.

8.1.2 Requirements for "Best Practice" and "Maximum Extent Achievable"

The PEM also requires the proponent of a mining proposal to use "best practice" as used by the industry for the control of air pollutants. In the case of Class 3 indicators such as respirable crystalline silica (RCS), arsenic, hydrogen cyanide, PAHs and asbestos, the control requirement is for the use

of "maximum extent achievable" controls. The definitions of these levels of control are defined in the SEPP (Air Quality Management) and they have also been included in the PEM as follows:

> *SEPP (AQM) defines* ***best practice*** *as:*
>
> *'the best combination of eco-efficient techniques, methods, processes or technology used in an industry sector or activity that demonstrably minimises the environmental impact of a generator of emissions in that industry sector or activity'.*
>
> ***Maximum extent achievable*** *is defined in the SEPP (AQM) as:*
>
> *"a degree of reduction in the emission of wastes from a particular source that uses the most effective, practicable means to minimise the risk to human health from those emissions and is at least equivalent to or greater than that which can be achieved through application of best practice."*

The PEM is very clear on what is required, as the following extract shows:

> *In determining what may constitute best practice or MEA for a specific site the following information should be considered:*
>
> - *the most recent documented definition, expression or application of 'best practice' for the industry sector from national and international sources*
> - *the most recent documented definition, expression or application of 'best practice' for the industry sector in the Victorian context (if any)*
> - *performance standard or benchmarks for the industry, in terms of the management of emissions, wastes, energy and resources, and their impacts*
> - *any constraints that may apply to each situation (e.g. in the availability, affordability or practicability of technological options)*
> - *comparison of different approaches currently used in the industry.*
>
> *Based on these comparisons, a plan to demonstrate that best practice (or MEA) is being proposed for the premises must be developed.*
>
> *In addition the following sources should be consulted:*
>
> - *peak bodies or organisations for the sector (e.g. industry associations)*
> - *other members of the industry or activity sector, including producers, operators, suppliers and clients*

- *industry and environmental consultants and other experts/specialists*
- *overseas sources such as international agencies, industry bodies and consultants*
- *relevant reports and publications, both in printed form and on the internet*
- *relevant regulations*

8.1.3 Monitoring requirements

A considerable part of the PEM is devoted to monitoring requirements. These cover both the assessment of the proposed development and later the assessment of performance of the operating mine.

For a mining site that requires a level 1 assessment (as in this case), the PEM sets out requirements for 12 months of pre-mining background data (from the actual site or from a reasonably close monitoring site) as well meteorological data (from a meteorological station that would be reasonably representative of the proposed mining site). The EPA has assisted the proponent with the supply of these forms of data for use by the air quality consultant to undertake the modelling required for assessment against the various criteria in the PEM.

The operational monitoring requirements specified in the PEM for a level 1 assessment site are:

> *Real-time continuous monitoring of PM_{10} and $PM_{2.5}$ and nearest sensitive locations linked to a reactive management strategy.*
>
> *12 months of 1 in 6 day sampling for respirable crystalline silica to confirm results of modelling.*

8.1.4 Results of modelling of dust from mining

The modelling carried out by the air quality consultant concentrated on the two years when the mining would be closest to the two previously mentioned residents: R2 in year 2 and R5 in year 24. The modelling used the maximum mining rate envisaged (extraction of 7,500,000 tonnes per annum and a sand production of 492,000 tonnes per annum) to provide a degree of conservatism in the modelling.

Various emission factors and other assumptions are listed in SS1. The source of most of the emission factors was the National Pollutant Inventory document "*Emission Estimation Technique Manual for Mining*". These emission

factors incorporate estimated levels of dust control through the use of various control techniques such as the use of water sprays or dust suppressants on trafficked roadways, establishment of vegetation on the surface of stockpiles of extracted materials, enclosure of conveyors in ore processing, covering of loads during transportation off-site, etc.

Daily varying background dust levels and hourly varying meteorology data were used in the modelling in accordance with EPA's requirements.

The results of the modelling show that over a period of a year neither residence R2 nor R5 (and also all the other residences that are further away from the mining) are expected to experience dust levels that exceed the various criteria. That is, the total of the modelled incremental dust level due to mining plus the background level are below the criteria for PM_{10}, $PM_{2.5}$ and respirable crystalline silica.

The results of the modelling appear graphically as time-series graphs and as contour plots in the Appendices of SS1. Some of the contour plots appear in the EES on pages 6-62 to 6-64.

The PM_{10} time-series graph for residence R2 in year 2 shows only two days in a 12-month period when PM_{10} dust was likely to exceed 50 $\mu g/m^3$ compared with the criterion of 60 $\mu g/m^3$. A similar result was obtained for residence R5 for year 24.

Dust deposition, measured by using dust deposition gauges over monthly periods, is not a criterion in the PEM. However the PEM states that this form of dust measurement should be used as an indicator of the effectiveness of site management practices. Consequently modelling was also undertaken for this form of measuring dust and this showed that expected dust deposition rates would not exceed the monthly criterion at any of the residences.

The results of dust deposition modelling are shown in graphical form in an Appendix of SS1 and on page 6-61 of the EES.

The EES - on page 6-65 - reports on the potential for dust deposition to impact on vegetation and on drinking water. It concludes that based on the pumping the ore as a slurry, the dust deposition levels will not cause an unacceptable impact on nearby crops and tank water quality should also not be affected.

8.1.5 Results of modelling heavy metals emissions from mining

At the request of the EPA, additional modelling was undertaken by the air quality consultant to demonstrate expected levels of various heavy metals in dust from the mining activities. This information is not included in the EES as it was undertaken at a later time but the information was mentioned in the air quality consultant's statement submitted to the Inquiry. The modelling used the maximum concentrations of various heavy metals found in soil samples from the mining site. Eight heavy metals and fluorine were modelled as total suspended particles (TSP). The outcome was a statement that the predicted concentrations of the heavy metals at sensitive receptors (residences) were all well below the relevant assessment criteria.

8.1.6 Results of modelling dust emissions from rail siding

The modelling of dust from the two potential purpose-built rail siding for the bulk handling of the HMC showed that for either rail siding location, the criteria for both PM_{10} and $PM_{2.5}$ would easily be met at the respective nearest residence. See 2.7.2 of the air quality expert's witness statement.

8.1.7 Results of modelling on-site combustion emissions

Products of combustion from the use of diesel fuel by equipment to be used at the mine site were modelled for years 2 and 24 to estimate the levels of pollutants that might occur at residences, especially R2 and R5. Emissions of carbon monoxide (CO), nitrogen dioxide (NO_2), and polycyclic aromatic hydrocarbons (PAHs) as BaP, were estimated. In the case of NO_2, the formation of this secondary pollutant was based on the oxidation of other nitrogen oxides, principally nitric oxide (NO), which is the main form of nitrogen oxides produced from the combustion of hydrocarbon fuels.

Estimated concentrations of CO and PAHs, combining both on-site generated pollutants and background sources, were well below the relevant criteria. The estimated concentration of NO_2 was also below the relevant criterion.

8.1.8 Proposals for monitoring

The need to demonstrate compliance with air quality criteria by the operating mine by the use of monitoring was recognised by the air quality consultant – refer page 47 of SS1. There is no specific commentary as to what this is likely to be. The EES includes a conceptual Environmental Management Plan (EMP) that provides for dust monitoring using dust deposition gauges and the establishment of an on-site meteorological station.

8.2 Issues

Air quality issues identified by the proponent, the proponent's air quality consultant, submitters and the Inquiry include:

- the adequacy of the air quality assessment of dust;
- the adequacy of the air quality assessment of combustion emissions;
- the adequacy of the proposed mitigation and management measures to keep impacts of dust and combustion emissions at acceptable levels; and
- the adequacy of the proposed air quality monitoring program.

8.2.1 Adequacy of air quality assessments – dust

The EPA's view was stated in its presentation to the Inquiry: *"Modelling has been done in accordance with the requirements of the PEM for a level 1 assessment"*.

However, the EPA raised several matters that were felt to be in need of clarification or that should be considered further. These related to:

- the number of sensitive receptors included in the assessment;
- whether the use of water sprays had been taken into account for control of dust along haul roads;
- a lack of clarity as to how the default emission factors link back to site management practices; and
- the criteria for assessment of dust deposition assessments.

The EPA was concerned that the number of sensitive receptors included in the air quality assessment differed from the number used in the noise assessment. This discrepancy was able to be explained by the air quality consultant as being due to the changed ownership of properties between the time of the noise assessment and the air quality assessment. The effect was that some residences identified in the noise assessment were now owned by the proponent and these residences would not be occupied during any nearby mining. These residences were therefore not included in the air quality modelling.

The EPA was also concerned that "T*he emissions inventory does not appear to take into account the use of water sprays for control of dust from haul roads".* The air quality consultant advised that the modelling had used the default emission control factors from the *National Pollutant Inventory Emissions Estimation Technique Manual for Mining* and water spraying of haul roads had definitely been factored into the modelling process. He further advised that these and other dust control management practices will be incorporated in the EMP.

The EPA noted *"that default emission factors have been used and it is not clear how these link back to the site management practices"* and that a *"Link needs to be made to ensure that the dust controls assumed in the modelling are practicable for implementation on site"*. The air quality consultant responded that these and other dust control measures will be incorporated into the EMP.

With regard to dust deposition, the EPA noted that *"Nuisance dust monitoring* (is) *to be assessed using DPI criteria of 4 g/m^2 /month on a monthly basis (not an annual average) – no more than 2 g/m^2/month above background"*. The air quality consultant replied that the results shown in SS1 are monthly averages but it was acknowledged that the wording in the EES may have caused confusion.

In its presentation to the Inquiry, the EPA criticised the modelling because it did not clearly identify what was "best practice" for the industry and its adoption in the modelling for the mine site. The EPA had a similar criticism about "maximum extent achievable" for the Class 3 indicators mentioned above.

Modelling dust as a gas

The EPA presentation stated that PM_{10} and $PM_{2.5}$ must be modelled as a gas. This requirement only appeared in the final version of the PEM so the air quality consultant's modelling had not adopted this approach. As a result, the modelling undertaken did allow for deposition of the dust to occur. The effect of this is that if the modelling was to be repeated, but on the basis that dust was considered as a gas, the estimated dust concentrations in air would be slightly higher than those obtained by the air quality consultant's modelling.

Other submitters

Several other submitters, including the DPI, raised dust or air quality as a potential area of concern. However, none provided any substantive comment on the modelling methodology or on the results of the modelling. The main concern expressed in the submissions was that dust was a potential problem that needed to be controlled.

In relation to air quality, the DPI in its written submission to the Inquiry stated:

> *DPI considers the scope and rigour of the assessment was acceptable.*
>
> *DPI will require details on the implementation of air quality control measures and monitoring in the environmental management plan in the work plan.*

In his response to the second point raised by the DPI, the air quality consultant agreed that the information was required and stated that this had been acknowledged in Section 7.4 of the EES.

In its presentation to the Inquiry, the Northern Grampians Shire Council stated the following with respect to air quality:

> *Dust associated with the proposed mining operations has the potential to adversely impact on human health and the general amenity of residents in the area.*
>
> *Council agrees with the avoidance, mitigation and management measures that are proposed by DMS in the EES, which will need to be clearly articulated to the community.*

Mr Peter Drum submitted that:

> *The SUPPORTING STUDIES concludes that "it is anticipated that through application of good air quality management techniques, the quality of the local air shed should be maintained." (1, p.51) The report states that the conclusion is conditional upon this: that "[t]op soil and overburden removal by tractor and scrapper is only assumed to be conducted during the winter months (June, July and August) representing higher soil moisture content" (IBID p.28) However there is nothing in the MAIN REPORT (e.g. see 6.4.4 Avoidance, Mitigation and Management Measures pp 6-59, 6-60; Table 7.4 Air Quality p 7-12) by way an undertaking by DMS that it will comply with this condition.*
>
> *Therefore I submit that DMS is in serious breach of the Air Quality report, so until DMS commits to comply with it mining cannot proceed.*

In response, the air quality consultant stated:

> *DMS agrees to the principle of topsoil removal when it is moist, when ever that may occur. DMS has stated its intentions in Section 4.5.7 to mine 24 hours per day, 7 days a week and to manage and monitor dust as outlined in sections 7.4 and 7.5.*

8.2.2 Adequacy of air quality assessments – combustion emissions

The results of the modelling predict pollutant levels well below the relevant criteria in the PEM for CO and PAHs and below the criteria for NO_2. The EPA did not dispute the results of the modelling but they did have a comment about the modelling of NO_2.

The EPA observed that the NSW DECC document that the air quality consultant had used as a guide for his approach to modelling NO_2, provides

several modelling approaches which may be more appropriate than the one used in the modelling. In replying, the air quality consultant advised that the approach taken in the modelling is effectively a screening assessment approach to NO_2 emissions based on a set of highly conservative approaches. Despite these conservative assumptions, the predicted NO_2 concentrations are below the relevant criterion at all receptors.

In their presentation to the Inquiry the EPA stated that *"NO_2 and CO are unlikely to be of concern and it is unlikely that levels of these pollutants would exceed the assessment criteria set out in the PEM"*.

8.2.3 Adequacy of the proposed mitigation and management measures

On page 6-59, the EES identifies management and mitigation measures that will be employed to control air quality impacts. SS1 includes a short list of best practice emission controls and the results of modelling that show the reductions in predicted concentrations due to the ore pumping option over the ore haulage option. This is used as an example of best practice.

However, the EPA was concerned about the lack of demonstration that the proposed control measures were "Best Practice and "Maximum Extent Achievable". In their written submission, the EPA stated:

> *As discussed in the PEM (Mining and Extractive Industries) requires that emissions must be controlled by application of best practice or MEA. This needs to be defined and demonstrated in any proposal and it is the residual emissions after appropriate control practices have been put in place that are modelled.*
>
> *Although there is a list of controls in section 7.1 it is unclear how they relate to best practice for the industry sector. As detailed in the PEM (and in the draft PEM), best practice can be demonstrated by identification and discussion of what constitutes best practice for the industry sector internationally. This has not been done. There is also no mention or discussion on how the requirement for MEA has been met. This is important for all activities that generate respirable crystalline silica, PAHs and radionuclides. This is a significant omission from the report and does not meet requirements of SEPP (AQM) for control of Class 3 indicators.*

These views were reinforced in the EPA presentation to the Inquiry:

- *Best practice has not been clearly identified and demonstrated for the site*
- *No discussion of how the requirements for MEA will be achieved*

Relevant for RCS, PAHs and radionuclides

- *It is unclear how the emission rates that have been modelled for the site relate to best practice/MEA controls*
- *Modelling must be done on residual emissions - those remaining after appropriate emission controls have been applied*

In response, the air quality consultant advised that the proponent would provide clarification in the future EMP and that this would be part of the work plan prepared under the MRSD Act.

8.2.4 Adequacy of the proposed air quality monitoring program

A level 1 assessment of a mining proposal requires 12 months of pre-mining meteorology data and background air quality data. For this proposal the EPA has assisted the proponent with these types of data and they have been subsequently used in the modelling of air quality. Consequently there is no argument about the acceptability of these pre-mining monitoring data.

The PEM specifies that monitoring during the operational period of the mine requires compliance monitoring and monitoring at or near sensitive locations that is linked to a reactive management strategy.

The EES and the SS1 do not discuss monitoring during the mining activities in any detail. The conceptual environmental management plan shown as Table 7.3 in the EES only refers to dust deposit gauges, a weather station, and wind erosion on the site. The environmental commitments and mitigation measures shown as Table 7.4 in the EES includes a statement that the proponent "*will monitor air quality in accordance with the DPEMMEI* (the draft PEM) *and in consultation with the EPA and DPI"*.

The EPA in its appearance before the Inquiry pointed out that as a Level 1 site, there is a requirement for both compliance monitoring and monitoring for reactive management and that this has not been documented in the EES. The EPA also said that monitoring plans need to be developed and included in the site EMP and that such plans must be approved by EPA and DPI and are to be reviewed after 12 months.

8.3 Inquiry response

8.3.1 Adequacy of air quality assessments – dust

The recent finalisation by the EPA of the PEM for mining has provided a focus for proponents of future mining proposals. The clear exposition of the requirements for pre-mining data, the criteria for assessment of a proposal, and the operational monitoring should in the future be useful to both proponents and the EPA. In the case of this proposal, the PEM was evolving during the development of the EES so there was less certainty for the proponent and the air quality consultant. Nevertheless, the evidence provided by the modelling was quite compelling in terms of the generation, control and predictions of concentrations of the various forms of dust at nearby residences.

The Inquiry particularly notes that the highest PM_{10} and $PM_{2.5}$ levels occurred when the background levels were extremely high, while at the same time the dust emissions from the mine were very low. The modelling results in SS1 clearly show the predominance of background dust compared to mine generated dust. This is illustrated in the following table based on data in Tables 14 and 16 in SS1.

Table 5 Maximum PM_{10} and $PM_{2.5}$ at the most sensitive receptors, no ore haulage

Residence and year when mining closest to residence	Background	Increment attributable to mining	Background plus increment
PM10 – maximum 24-hour average ($\mu g/m^{-3}$) - Criterion 60 $\mu g/m^{-3}$			
R2 – year 2	55.7	1.4	57.1
R5 – year 24	55.7	3.1	58.8
PM2.5 – maximum 24-hour average ($\mu g/m^{-3}$) – Criterion 36 $\mu g/m^{-3}$			
R2 – year 2	22.3	0.9	23.2
R5 – year 24	22.3	1.2	23.5

However, as the EPA always stresses, results from modelling are really only a guide to the likely impacts of a new development or the expansion of an existing facility. The modelling results depend on how realistic the inputs have been, especially the assumptions made about the success of mitigation actions.

The Inquiry agrees with the concern raised by the EPA about residents in the houses that would be in the path of the mining activities (D7 and D11). The

houses will need to be removed or perhaps they could be retained if the mining occurs around them. The concern that was raised was the need for the residents in these houses to vacate them well ahead of the advancing mine so as to avoid any unacceptable dust impacts. The proponent acknowledges this, and as they now own the residences, they will be vacated before any mining takes place close to them.

With regard to the other matters raised by the EPA, the Inquiry considers that:

- the matter of whether the use of water sprays had been taken into account for control of dust along haul roads has been adequately answered by the air quality consultant;
- the lack of clarity as to how the default emission factors link back to site management practices can be covered in the EMP; and
- the criteria for assessment of dust deposition assessments has been resolved in that the criteria are clearly monthly averages and not yearly averages.

The results of the modelling of dust from the rail siding activities show that dust is unlikely to be a problem. The Inquiry notes that the nearest residences were estimated to be 0.8 km and 1.2 km from the northern and southern rail siding locations respectively. Furthermore, the volumes of materials expected to be handled in the loading operation are far less than the volumes of materials that would be handled at the mine site. In addition, the trucks would unload the HMC onto a stockpile inside a large shed.

Even more compelling data is that the predicted maximum dust concentrations at the 8 residences. Only one residence was predicted to be impacted at all by PM_{10} (from the northern location) and none by $PM_{2.5}$ dust from either rail siding location. Like the modelling of the mining activities, the maximum dust levels predicted are dominated by background levels.

With regard to heavy metals, the Inquiry accepts that on the information provided, it is unlikely that impacts of heavy metals associated with dust will be significant at nearby residences.

The Inquiry also accepts that the impacts of dust from mining are very unlikely to have unacceptable impacts on tank water or on nearby agricultural crops. As indicated by the dust monitoring results, the occurrence of elevated dust levels in areas surrounding the mine are more likely to be due to background dust than dust from the mining activities.

8.3.2 Adequacy of air quality assessments – combustion emissions

The Inquiry finds that on the basis of the results of modelling, the combustion emissions from operating plant, such as excavators, dump trucks, dozers, etc., will not result in unacceptable levels of combustion pollutants at nearby residences.

The Inquiry agrees with the EPA that the methodology used for modelling NO_2 was not the most appropriate and if a more appropriate methodology had been used the NO_2 predicted levels would have been lower than those predicted. However this does not alter the conclusion that NO_2 predicted levels are below the criterion for this pollutant.

8.3.3 Adequacy of the proposed mitigation and management measures

The Inquiry notes that the EES does list some avoidance, mitigation and management measures to control dust – refer pages 6-59 and 6-60. The Inquiry's view is that despite this list, the EPA criticism is valid because the proponent has not discussed from an industry perspective: What is "best practice"? What is "maximum extent achievable"?

The Inquiry notes that guidance on determining these matters is included in the PEM – refer page 5 – and understands that this was included in the draft PEM. Irrespective of this, these requirements are part of the SEPP (Air Quality Management) and so they should not be new to the proponent or the air quality consultant.

It is clear that the proponent has failed to meet the PEM requirement to show how the proposal meets "best practice" and "maximum extent achievable" with respect to control of air pollutants. While the Inquiry appreciates that the PEM was only in draft form during the preparation of the EES, it is surprised that these matters were not included in the EES. Nevertheless, the proponent will now have to include this information in the EMP if it is to satisfy the requirements of the PEM.

In this respect, the Inquiry also agrees with the EPA that the proponent needs to provide commentary to show how the proposed mitigation measures relate to site management actions. This especially applies to when a trigger level is reached as measured by a real-time monitor located at or near one of the potentially most exposed, nearby residences. The Inquiry expects that these management actions will be included in the EMP.

8.3.4 Adequacy of the proposed air quality monitoring program

The Inquiry would have preferred to have seen a more detailed outline of the plans for monitoring in SS1 and in the EES. It is clear to the Inquiry that the reliance on dust deposit gauges as proposed in the conceptual EMP is insufficient and not in accordance with PEM requirements.

The proponent will need to follow the compliance monitoring as specified in the PEM, i.e. real-time continuous monitoring of PM_{10}, $PM_{2.5}$ and respirable crystalline silica using monitoring equipment that complies with the Australian Standards for monitoring these particles.

With respect to monitoring for reactive management purposes, there are several instruments on the market capable on performing this form of monitoring. There is no need for these instruments to comply with the Australian Standards for monitoring particles.

Because there are two residences (R2 and R5) that will be quite close to the mining activities (R2 in year 2 and R5 in year 24), real-time monitoring will be needed at or near these residences so that mine management can be alerted when these residences are likely to be impacted by dust. This will involve the establishment of a trigger level of real-time dust monitoring that will lead to actions at the mine to reduce the dust movement towards these residences. With regard to trigger levels, the Inquiry notes that the PEM states on page 13: *"Hourly trigger levels will be provided by EPA that will allow site managers to identify when a problem may be arising on site."*

The inquiry appreciates that management actions in response to a trigger level being reached may be quite simple ones such as greater use of water sprays, or temporarily relocating some materials handling activities to another location. In the extreme case, the action might be the temporary cessation of certain dust generating activities until dust generation is no longer likely to cause an unacceptable impact at the residence.

The same approach to the use of real-time monitoring could be used at or near the residences that are in the path of the proposed mining – D5 and D 11. In these situations, the trigger level would need to be a low one so that plenty of time was available to enable the residents to vacate the house to another residence. On the other hand, the Inquiry would understand if the vacating of these residences were scheduled as a date well ahead of when the mining activities would have any unacceptable impact on the residents.

The Inquiry endorses the dust deposition monitoring using dust gauges as proposed. Although this form of monitoring is not a requirement of the PEM, it is recommended in the PEM that it be used as an indicator of the

effectiveness of site management practices and to indicate the potential for off-site nuisance dust to occur.

8.4 Findings and recommendations

The Inquiry finds that:

- **Input data used for dispersion modelling used to predict impacts on air quality and the results of that modelling show that predicted impacts from the proposed mining are significantly less than those from other, existing, sources;**
- **The results of the modelling predict that the concentrations in the air of:**
  - **PM_{10} and $PM_{2.5}$ and the rate of dust deposition can be expected to remain below the criteria specified in the *Protocol for Environmental Management – Mining and Extractive Industries* for those indicators;**
  - **respirable crystalline silica (RCS) as $PM_{2.5}$ and the products of the combustion of diesel fuel can be expected to be significantly below the criteria specified in the *Protocol for Environmental Management – Mining and Extractive Industries* for those indicators;**
- **The predicted margin by which compliance with the relevant criteria will be achieved provides significant confidence that emission control to achieve an acceptable result is possible;**
- **In order to satisfy the requirements of the *State Environment Protection Policy (Air Quality Management)* and the *Protocol for Environmental Management – Mining and Extractive Industries* the proponent needs to provide evidence in the Work Plan that the controls proposed for all relevant air quality indicators, as specified in the *State Environment Protection Policy (Air Quality Management)* are "best practice" and "maximum extent achievable" for indicators specified as Class 3 indicators;**
- **The proponent must develop a procedure that enables determination of the timing of the vacation of residences so as to avoid exposure of residents to air of a quality that is not in compliance with the relevant criteria specified in *Protocol for Environmental Management – Mining and Extractive Industries;* and**
- **Monitoring requirements specified in the *Protocol for Environmental Management – Mining and Extractive Industries* must be satisfied for:**
  - **compliance monitoring;**
  - **monitoring for reactive management purposes; and**

- **monitoring of dust deposition as an indicator of site performance.**

The Inquiry recommends that the Work Plan not be approved unless it contains:

- **Adequate information in the EMP to satisfy the requirements of the *Protocol for Environmental Management – Mining and Extractive Industries* to identify and evaluate "best practice" controls for all relevant indicators specified in the *State Environment Protection Policy (Air Quality Management)* and "maximum extent achievable" controls indicators specified as Class 3 indicators;**
- **A dust emission management strategy that includes actions that are considered "best practice" for the control of all relevant indicators specified in the *State Environment Protection Policy (Air Quality Management)* and "maximum extent achievable" control for indicators specified in Class 3 indicators;**
- **A procedure for determining the timing of the vacation of residences to avoid the exposure of residents of air of unacceptable quality, as specified in the *Protocol for Environmental Management – Mining and Extractive Industries;* and**
- **A compliance monitoring program in the EMP that satisfies the requirements of the *Protocol for Environmental Management – Mining and Extractive Industries*, including a reactive control strategy using real-time monitoring to prevent exceedances of air quality criteria at the nearest residences.**

9. GREENHOUSE GAS EMISSIONS

9.1 Description

Greenhouse Gas Emissions were considered as part of the preparation of the EES and is included as Supporting Study 1 (SS1 - Air Quality and Greenhouse Gases Assessment). The Greenhouse Gas Emissions assessment appears in Section 6.4 of the EES, pages 6-66 to 6-71.

The mining proposal will be a significant source of greenhouse (GHGs), primarily due to emissions of carbon dioxide (CO_2). The two dominant sources will be the combustion of hydrocarbon fuels by:

- the use of diesel fuel in mobile mining equipment, for on-site electricity generation, for off-site road transport of Heavy Metal Concentrate (HMC) and for diesel locomotives (if the rail is used to transport the HMC to a port); and
- the use of coal in the Latrobe Valley to generate electricity and then its distribution to the mine site to power plant and equipment and mine site facilities.

Important GHGs, other than carbon dioxide, that are likely to be emitted are carbon monoxide (CO), methane (CH_4), nitrous oxides (NOx) and non-methane volatile hydrocarbons (NMVOCs). Although CH_4 and nitrous oxide (N_2O) are more effective GHGs than CO_2, the amount of these gases emitted will be very small.

To estimate the annual emissions of CO_2-equivalent the greenhouse gas consultant has followed the procedures outlined in the *Protocol for Environmental Management – Greenhouse Gas Emissions and Energy Efficiency* (Publication 824, January 2002). For emissions from diesel fuelled equipment, the Australian Greenhouse Office document *AGO Factors and Methods Workbook, December 2005*, has been used. For emissions due to electricity generation, the Victorian Government's GHG coefficient of 1.444 kg CO_2-e/kWh has been used.

9.1.1 Mining activities

Because the proponent has decided to use the slurry method of transporting the mined ore from the Mining Unit Plant to the Wet Concentrator Plant rather than the ore haulage option, this Chapter of the Inquiry report will confine its commentary on GHGs to the slurry pumping option. This option

uses far less diesel fuel than the haulage option (that requires the use of a fleet of trucks) but there is no change in electricity usage as the energy for pumping the slurry will be by an on-site diesel generator that uses diesel fuel.

The total diesel fuel consumption has been derived from the scenarios used for the air quality scenarios, i.e. years 2 and 24, to which has been added an estimate of diesel fuel that would be used to transport the HMC to the proposed rail siding south of Minyip. Total electricity consumption has been derived from the types of electrical equipment expected to be used at the mine site.

The following table has been derived from Table 27 in Supporting Study 1 "*Air Quality and Greenhouse Gas Assessment"* (SS1). It omits data relating to the ore haulage option.

Table 6 Predicted Annual Greenhouse Gas Emissions from operations at the Project Site

Scenario	Predicted GHG emissions (kt CO_2-e)			Percentage Comparison with Australian 1990 Emissions [1]
	Electricity	Diesel [2]	Total	
Year 2 – No Haulage	35.3	30.4	65.7	0.012
Year 24 – No Haulage	35.3	34.3	69.6	0.013
Project Life (25 Years) [3]	882.5	857.5	1740	N/A

Note 1: From AGO (2006), National Greenhouse Inventory 2004

Note 2: Includes diesel used to transport HMC from mine site to rail siding south of Minyip

Note 3: Project Life calculations are based on continual Year 24 no haulage as a worst-case situation

The amount of energy to be ultimately used on the site easily exceeds the energy thresholds of both the Victorian *Environment and Resources Efficiency Plans* (EREP) and the Commonwealth *Energy Efficiency Opportunities* (EEO) programs. These programs will require the proponent to self-assess energy use, to register under the respective programs and prepare annual reports on energy use. The EREP also requires a plan to reduce energy use.

The EES provides the following information on how GHGs will be reduced:

> *DMS will therefore apply a range of measures to reduce greenhouse gas emissions during the construction and operational phases of the project. These include:*
>
> · *Developing and applying policies and procedures for energy efficient mine operation. This includes consideration of Commonwealth initiatives such as the Greenhouse Gas Abatement Program, where*

substantial emission reductions through cost-effective abatement will contribute toward meeting Australia's Kyoto Protocol targets.

- *Minimising haul distances and the use of haul trucks by using slurry pumping for ore transport from the pit to the processing plant.*
- *Monitoring energy consumption (e.g., diesel and electricity) and calculating greenhouse gas emissions.*
- *Identifying and assessing economically viable opportunities for improvement.*
- *Considering the use of alternative fuels (e.g., biodiesel) and technologies.*
- *Ensuring that vehicles (company-owned and contractors) are well maintained and correctly sized to maximise their fuel efficiency and minimise emissions.*
- *Reducing vehicle idling time.*
- *Considering the use of renewable energy technologies (e.g. wind, solar and biomass) when sourcing electricity from the grid.*

9.1.2 Transport activities

The greenhouse gas consultant has estimated the emissions of GHGs emitted by the transportation of the HMC from the site to the ports of Geelong and Portland. For each port, calculations of GHGs have been made for:

- road transport to a proposed rail siding south of Minyip and thence by train to the port; and
- road transport from the mine site to the port.

The following table has been derived from Table 1 in Appendix B of SS1. It omits data relating to the ore haulage option.

Table 7 Predicted Annual Greenhouse Gas Emissions from transportation of HMC to Port

Transport method	Port	Predicted GHG emissions (t CO_2-e)	Percentage Comparison with Australian 1990 Emissions
Road to Minyip, rail to port	Geelong	4,653	0.00084
Road to port	Geelong	8,851	0.0016
Road to Minyip, rail to port	Portland	4,284	0.00078
Road to port	Portland	10,834	0.0020

The use of road/rail transport offers potential benefits over road transport with respect to the amount of GHG emissions. Based on the above data, the road/rail options for the two ports produce much lower emissions of GHGs than the road options.

Energy used in off-site transport is not part of the EREP program.

9.1.3 EREP requirements

The EES refers to the *Protocol for Environmental Management – Greenhouse Gas Emissions and Energy Efficiency* (Publication 824, Vic EPA) (the PEM) in its discussion of GHGs. The PEM requires best practice with respect to energy use and this is defined in the following way:

> *'Best practice' means the best combination of eco-efficient techniques, methods, process or technology used in an industry sector or activity that demonstrably minimises the environmental impact of a generator of emissions in that industry sector or activity.*
>
> *'Eco-efficient' means producing more goods and services with less energy and fewer natural resources, resulting in less waste and pollution.*

A more recent initiative of the EPA has been the proclamation of the Environment Protection (Environment and Resource Efficiency Plans) Regulations 2007 and the EPA has assessed the EES against this new requirement.

The EREP program is a requirement for all large energy and water users who trigger one of the resource use thresholds – thresholds for energy and water usage but there is no current threshold for generation of wastes. The four-step process involves:

- Self-assessment and registration
- Development of an EREP
- Submission of an EREP to the EPA
- Implementation, monitoring and reporting

9.1.4 The potential for renewable and alternative energy supplies

There is a short discussion on energy supply in the EES – see 4.7.1 under Infrastructure and Transport – that deals with the supply of electricity from the grid. Other than this section, no specific section in the EES deals directly with options for the use of renewable and alternative energy. However there are some matters in the EES that do relate to these sources of energy and examples of these are:

- *Considering the use of alternative fuels (e.g., biodiesel) and technologies.* (Refer page 6-70 of the EES)
- *Considering the use of renewable energy technologies (e.g. wind, solar and biomass) when sourcing electricity from the grid.* (Refer page 6-70 and the Environmental commitments and mitigation measures (Table 7.4) of the EES.)

9.2 Issues

GHG issues identified by the proponent, the proponent's greenhouse gas consultant, submitters and the Inquiry include:

- reducing GHG gas emissions from mining;
- reducing GHG emissions from the transportation of HMC; and
- potential use of renewable and alternative energy.

9.2.1 Reducing greenhouse gas emissions from mining

The EES on page 6-70 outlines a number of measures to reduce GHG emissions. This list includes the use of the slurry pumping option that the proponent has already agreed to adopt. This option produces far less GHGs than the ore haulage option. Using data in Table 6.9 in the EES, the estimated reduction in total GHGs is approximately 35%.

In its written submission the EPA commented on the GHG emission data:

> *The energy use and greenhouse gas emission calculations shown in Tables 6.9, 6.10 and 6.11 are generally appropriate, although the road distances from the site to Portland and Geelong shown in Table 6.11, seem to be confused. The tables confirm that the site will be a significant energy user and easily trip the energy threshold for both the Victorian EREP program and the Commonwealth EEO program (annual usage approx 810 Tj/yr, EREP threshold 100 Tj/Yr, EO threshold 500 Tj/yr). Data in these tables and statements like those in section 6.5.5 that seek to downplay the significance of the site's greenhouse gas emissions in comparison to Australia's total emissions are irrelevant to any consideration of requirements for the site.*

With regard to the EREP, the EPA during its presentation to the Inquiry made the following comments about the proposal and an EREP:

> *The DMS will need to register for the Environment and Resource Efficiency Plans (EREP) program in the year after the program's threshold limits are exceeded (100 TJ/year energy and/or 120 ML/year water). Each site that exceeds one or more thresholds must register with*

EPA, prepare a plan that identifies actions to reduce energy, water use and waste generation, implement actions with a payback period of three year or less, and report on their performance annually.

While the EPA considered the measures to reduce greenhouse gases listed in the EES were appropriate, its written submission pointed out that the PEM requires that best practice measures be identified and adopted in relation to energy efficiency of plant and equipment. None of the measures addresses the energy efficiency of the processing plant as a whole, nor of the individual items of process equipment. The EPA was expecting that the proponent would install best practice processing equipment.

This attitude to "best practice" was exemplified in the EPA statement:

The EES discussed project alternatives that included options that may impact on greenhouse gas emissions (e.g. transport options, both on-site and off-site). However, options in relation to the choice of processing plant and associated equipment (if any options exist) are not discussed and may need consideration.

The DMS should commit to the installation of a best practice processing plant, with equipment that would include common best practice features such as:

- *optimally sized high efficiency motors;*
- *variable speed drives, where appropriate;*
- *direct drives, where appropriate;*
- *fuel efficient mobile plant;*
- *etc.*

Other submitters

Only a few submitters made any comment related directly or indirectly to GHGs. The Northern Grampians Shire Council stated that "*DMS should be encouraged to purchase carbon credits locally if such a trading scheme is created.*"

The Buloke Shire Council included the following in their written submission:

Green house gas emissions of some 2 million tonnes carbon dioxide (CO2) are envisaged over the life of the mine. Further contingencies for reduction of green house gas emissions should be considered.

Replacing the 700 removed (native vegetation) trees by 17,320 re-plantings (including many mature specimens) would also be a positive contribution to reduction of green house gases.

9.2.2 Reducing greenhouse gas emissions from the transportation of HMC

The data in Table 6.11 of the EES clearly shows that reduced GHG emissions are expected for the road/rail option of transporting HMC to port compared with the road option. This occurs for both ports – Portland and Geelong. The apparent percentage reductions are approximately 60% for transport to the Port of Portland about 47% for transport to the Port of Geelong.

As the EPA has pointed out, *"the road distances from the site to Portland and Geelong shown in Table 6.11, seem to be confused"*. This matter is further commented on in the Inquiry response section below.

9.2.3 The potential use of renewable and alternative energy

Mr Gil Hopkins, in his presentation to the Inquiry expressed concern about energy supply as per the following statement:

> *The project needs to consider how it can supply its own energy requirements. Both State and Federal governments have programs available to subsidise sustainable energy generation. There is a major opportunity here for a large energy consumer to add to the grid and help local power generation and Australia's conversion to 'green power'. This includes*
>
> - *Geothermal electrical generation*
> - *Solar power – PV or solar heating for electrical generation*
> - *Biodiesel, bio-ethanol and biogas, maybe in conjunction with local agricultural enterprises and projected installations at Donald and Murtoa*
> - *Wind power is an alternative that should be considered, and there are companies already looking for installation sites*

With regard to carbon emissions offsets, Mr Hopkins stated:

> *Looking ahead a lot of industry is thinking about carbon trading and purchasing carbon offsets. There was a major opportunity here for the proponent to commit to long-term biodiversity enhancement through carbon trading. CMAs and other organisations already have plans in place.*
>
> *Carbon offsets could be used in this project to enhance local indigenous biodiversity.*

9.3 Inquiry response

9.3.1 Reducing greenhouse gas emissions from mining

Large scale mining (as is the case with this proposal) is invariably associated with a great deal of energy usage. There are few opportunities to avoid the use of large earthmoving equipment that is not fuelled by diesel fuel and the consumption of electricity for powering processing plant.

The recent increases in the prices for fuels and electricity have increased the awareness amongst users of large amounts of energy of the need to seek improvements in the efficiency of energy usage. This reinforces both State and Commonwealth governments' established aims of achieving improved efficiency of energy use. In the case of Victoria, the EPA has introduced the *Protocol for Environmental Management – Greenhouse Gas emissions and energy Efficiency* and the *Environment Protection (Environment and Resource Efficiency Plans) Regulations 2007*. The Commonwealth Government's *Energy Efficiency Opportunities* (EEO) program has similar aims to the Victorian program but is more of an assessment and reporting process without specific plans for increasing energy use efficiency.

The proponent has already made progress in identifying its predicted energy use and assessing the resultant emissions of GHGs, which are steps required to be undertaken by the Victorian and Commonwealth energy efficiency programs. It is clear to the Inquiry that the proponent has further work to do with regard to energy efficiency, particularly the provision of "best practice" information on the processing plants to satisfy the requirements of the PEM.

The Inquiry agrees with the EPA that the greenhouse gas consultant has used the appropriate methodology to estimate the future emissions. The estimate is appropriate at this stage in the development of the proposal but an updated estimate would be appropriate when more specific plans for the mining and the equipment that will be used are known.

The inquiry has not identified any specific mention of the energy likely to be consumed if water is to be supplied to the mining site from the Avon Deep Lead located 25 km to the east of the site. The Inquiry appreciates that in the EES the water supply to the site has not been finalised. This may have led to the non-inclusion of this energy use in the estimations of GHGs. If the Avon Deep Lead is to be used to supply water for mining, the energy used for extracting and pumping will need to be incorporated into future estimations of energy use by the mine.

9.3.2 Reducing greenhouse gas emissions from the transportation of HMC

The GHG estimates for the various options for the transport of HMC to a port have been effectively presented in the EES. However the distances for the road transport to Geelong and Portland seem to be confused, as identified by the EPA.

While the quoted return rail distance for Portland (534 km) is shorter than the return rail distance for Geelong (586 km), the quoted return road distance for Portland (634 km) is greater than the distance for Geelong (518 km). These road distances are at variance with the estimates made by the Transport consultant. The Inquiry notes that the return road distances estimated by the consultant (see Supporting Study 8b) are 700 km for Geelong but only 580 km for Portland. While some differences in distance to the same port could be due to different routes assumed for the road travel, such differences are unlikely to be great.

This apparent miscalculation of distances in the EES and SS1 indicates that the greenhouse gas consultant's calculations for the transport of HMC may be unreliable. However, this does not affect the conclusion that transportation of HMC by road/rail produces less GHG than transportation by road.

Despite the above uncertainty, the Inquiry notes that the predicted annual GHG emissions from the transportation of HMC is approximately an order of magnitude less than the predicted annual GHGs produced by the mining. If major reductions in energy use are to be made, there appears to be greater scope for this at the mine than in the transportation of HMC to port.

If the only determinant for selecting a transport option was GHG emissions, then transport by the road/rail option to Geelong or to Portland would obviously be the preferred option with perhaps Portland being preferred over Geelong. However the Inquiry realises that such decisions are rarely so simple. It seems that transportation costs will be a very important economic factor for the proponent. For the road/rail option there are also matters like the standard of the existing rail infrastructure, the time needed to obtain approval for the rail siding and the cost and timing of its construction.

It seems quite possible that the proponent might begin the transportation of the HMC using road only and then change to the more GHG friendly road/rail option.

Mr Bartley made a clear statement on what the proponent was seeking in relation to transport of HMC:

> *DMS is seeking maximum flexibility in the transport options for HMC leaving the site to ensure the most competitive freight rates costs. The potential impact and management of each option has been assessed in the EES and approval is sought for all options.*

While the option for road/rail transportation of HMC is attractive from the perspective of GHG reduction, the reality is that there is no existing suitable rail siding for the proposal. Furthermore, it is likely that it would be some time before such an option could be operational. The Inquiry is also mindful from statements made during the hearing that the choice of port is still open. For these reasons the Inquiry agrees with the request included in the submission by Mr Bartley.

9.3.3 The potential use of renewable and alternative energy

The Inquiry notes that the Assessment Guidelines for greenhouse gas emissions for the proposal included the following:

- *Provide recommendations on potential GHG mitigation, for both direct (at site) and indirect (transportation) sources, including renewable power provision options.*

The Inquiry observes that the EES contains a minimum of information, and no significant recommendations with respect to renewable power options.

Mr Hopkins appeared to be the only submitter who overtly raised the issue of renewable and alternative energy supplies in the context of sustainability. In response to Mr Hopkins' original written submission (this did not contain the more specific matters of renewable and alternative energy); the greenhouse gas consultant said that:

> *DMS will reduce energy consumption where it is economically feasible to do so. Further measures to save energy will be considered in the preparation of the Energy and Resource Efficiency Plan (EREP) and has been addressed in Section 6.5.4 of the EES.*

The Inquiry considers that Mr Hopkins' concerns about the lack of consideration of potential alternative energy supplies are legitimate. In the view of the Inquiry, the EES has failed to give any in-depth consideration of renewable (and alternative) power options, despite the wording of part of the Assessment Guidelines.

9.4 Findings and recommendations

The Inquiry finds that:

- **Compliance with relevant sections of the *Protocol for Environmental Management – Greenhouse Gas Emissions and Energy Efficiency* should be required;**
- **The magnitudes of the proposed energy and water consumptions are such that the requirements of the *Environment Protection (Environment and Resource Efficiency Plans) Regulations 2007* will need to be satisfied and participation in the Commonwealth's *Energy Efficiency Opportunities* (EEO) program will be mandatory;**
- **The greenhouse gas emissions from the mining activities are far greater than the emissions from the transport of HMC to a suitable port for export, around an order of magnitude greater;**
- **The much greater greenhouse gas emissions from the mining than from the transportation indicate that it is likely that there will be more opportunities for greenhouse gas reductions at the mine;**
- **If the Avon Deep Lead is to be used as a water supply, the energy used in extraction and pumping water will need to be included in assessments of greenhouse gases from the project;**
- **The information provided in the EES and supporting documents identifying and committing to "best practice" does not satisfy the requirements of the *Protocol for Environmental Management – Greenhouse Gas Emissions and Energy Efficiency* however these requirements will need to be satisfied in the Work Plan;**
- **On the basis of greenhouse gas emissions, the road/rail options for transporting the HMC to port at Geelong or Portland are clearly preferred over road but other factors such as cost and status of infrastructure could out-weigh the desire to use road/rail transport because of its lower greenhouse gas emissions; and**
- **The EES has provided minimal consideration of renewable (and alternative) energy supplies despite renewable energy being included in the Assessment Guidelines.**

The Inquiry recommends that the Work Plan not be approved unless it contains:

- **An Energy consumption and Greenhouse Gas Emission Plan that demonstrates compliance, to the satisfaction of the EPA, with the requirements of the *Protocol for Environmental Management – Greenhouse Gas Emissions and Energy Efficiency* including the requirements to:**

  - **Estimate energy consumption and greenhouse gas emissions;**
  - **Identify and evaluate opportunities to reduce greenhouse gas emissions;**
  - **For on-going reporting to the EPA; and**
  - **Include a process providing regular review.**
- **A requirement in the EMP for plans to meet the requirements of both the Victorian *Environment and Resources Efficiency Plans* and the Commonwealth *Energy Efficiency Opportunities* programs when the relevant thresholds of energy use are reached;**
- **A Transport Management Plan that includes actions to be taken to investigate the option of transporting HMC to port by rail; and**
- **An Environmental Management Plan that includes actions to be taken to give consideration of the use of renewable and alternative energy supplies.**

10. NOISE

10.1 Description

Mining, processing and associated activities cannot be conducted without the emission of noise. In the case of this proposal, the main noise generating activities include the following:

- construction works including construction of the processing plant, the tailings storage facility, roads and infrastructure plus initial clearing works on the mine site;
- mine operation including topsoil removal, subsoil removal, over burden removal, ore extraction and rehabilitation works. These activities involve the operation of tractors, excavators, haul trucks and other earthmoving equipment;
- fixed processing plant operation; and
- heavy mineral concentrate (HMC) handling, including truck loading at the processing plant site, haulage along haul routes to a port or rail siding, truck unloading at the rail siding and train loading.

While there is no doubt that these activities will generate noise, assessment of the acceptability of such noise requires consideration of its impact. In some circumstances government policy specifies what should be considered to be acceptable. In the case of the Melbourne metropolitan area, the *State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No N-1* (SEPP N-1) provides maximum allowable noise levels at sensitive receptors that are statutory requirements. There is no such policy applying in the area of the proposed development, however, the EPA has published *Interim Guidelines for Control of Noise from Industry in Country Victoria N3/89* (N3/89), which provide guidance on acceptable noise levels at sensitive receptors.

N3/89 suggests the following:

- The application of noise limits for Day, Evening and Night with these periods being defined as in SEPP N-1, that is, as follows:

Day	7:00 am to 6:00 pm, Monday to Friday
	7:00 am to 1:00 pm, Saturday
Evening	6:00 pm to 10:00 pm, Monday to Friday
	1:00 pm to 10:00 pm, Saturday
	7:00 am to 10:00 pm, Sunday and public holidays
Night	10:00 pm to 7:00 am. Monday to Sunday

- Where background noise levels are comparable to those in metropolitan Melbourne, noise limits should be determined using the procedures prescribed in SEPP N1, which involves consideration of zoning and background noise levels; and

- Where background noise levels are very low (i.e. less than 25dB(A) at Night and 30 dB(A) in the Evening or Day) then the following limits should apply:

Day	45 dB(A);
Evening	37 dB(A); and
Night	32 dB(A).

N3/89 recognises that, during construction, additional noise should be allowed and suggests an increase in the Day limit of 10dB(A) up to a maximum of 68 dB(A).

The EPA provides further guidance with respect to noise during construction in *Noise Control Guidelines TG302/92* (TG302/92) in which guidance is provided on procedures to be used in construction and demolition and the following noise limits are suggested:

Evening	Background plus 10 dB(A) for up to 18 months after commencement; and Background plus 5 dB(A) after 18 months;
Night	Inaudible in a habitable room in a residence; and

No limit is suggested for the Day period.

It should be noted that the noise measurement methods suggested by TG302/92 differs from that of N3/89. N3/89 requires measurements of noise from industry to be of the equivalent continuous sound pressure level (Leq) over a period of 30 minutes and background noise levels measurements to be of the noise level that is exceeded for 90% of the time (L_{90}). Noise measurements prescribed by TG 302/92 are:

Noise from Industry	Maximum noise level (Lmax) defined as the average of maximum levels; and
Background	Minimum noise level defined as the average of the minimum levels.

Sleep disturbance criteria have been suggested by the World Health Organisation (WHO) and, in Australia the work of Professor Barbara Griefahn is often referred to in discussion on sleep disturbance. The WHO sleep disturbance criteria and the results Griefahn's work suggest that a single event resulting in a noise level of less than 45 dB(A) or 47 dB(A), respectively, will not cause sleep disturbance.

A noise assessment has been conducted by Heggies Pty Ltd with a report on that assessment being appended to the EES as Supporting Study 6 (SS6 – Noise Assessment)

SS6 includes the following:

- a discussion of the possibly relevant noise criteria;
- the results of measurements of background noise levels;
- modelling predictions of noise levels at sensitive receptors under neutral and worst case weather conditions for the following activities:
  - mine operation during three stages of development including initial site clearing, overburden and ore removal at natural ground level and overburden and ore removal below natural ground level;
  - the processing plant operating at full capacity;
  - HMC haulage on each of the alternative haul routes;
  - train loading at the two alternative train loading sites utilising both of the alternative train loading methods; and
  - reversing beepers; and
- a discussion of noise control options.

The background noise level measurements show the area to have extremely low background noise levels.

The modelling results for the operation of the mine and the processing plant were presented in terms of the buffer distance required to achieve a noise level at or below the maximum allowable noise levels prescribed by N3/89. Those results are shown in table 8.

Table 8 Buffer Distances Required to Meet N3/89 Limits

Period	Day		Evening		Night	
N3/89 Limit	45		37		32	
Noise propagation	Neutral	Worst	Neutral	Worst	Neutral	Worst
Mining						
Site Clearing	200	350	400	600	600	1000
Mining at Surface	650	800	1200	1800	1800	2700
Mining below Surface	300	700	900	1400	1500	2200
Processing Plant	300	400	600	700	800	1200

There are a number of residences that are located such that, at some time during the life of the mine, they will be well inside the buffer distances

shown in table 8 and therefore are likely to be subjected to noise levels in excess of the N3/89 limits.

SS6 indicated that the modelling had been done assuming no specific implementation of noise control to the mining process and considered a number of noise control options, including:

- earth mounds and barriers;
- noise control kits for mobile machinery;
- building treatments;
- administrative controls such as delaying/minimising works during particular climatic conditions; and
- temporary relocation of residents.

SS6 notes that:

- engineering noise control at the source (mounds, barriers and noise control kits) to an extent where noise levels at the four nearest residences would remain below the N3/89 limits was not possible;
- a combination of engineering noise controls and treatment of the residences may provide sufficient protection of night time amenity at the four nearest residences however relocation of the residents offers a more practical and complete solution; and
- engineering noise control at the source could be applied to reduce noise levels at residences at distances greater than 800 metres from the mine such that N3/89 noise limits are complied with.

It was also noted by the proponent that, since the location of mining changes significantly over the 25 year life of the mine, noise levels at residences will vary considerably with periods of predicted exceedances of the N3/89 noise limits at any particular residences being of short duration compared to the life of the mine.

The results of modelling of noise emissions from the processing plant showed that one residence would be subjected to noise levels above the N3/89 limits at all times.

Model predictions of the maximum noise levels created by a truck carrying HMC passing by a residence show that a separation distance between the truck and a residence of 150 metres is required to prevent sleep disturbance. One residence is located within 150 m of the northern haul route while four are located within 150 m of the southern haul route.

Model predictions of noise levels at the nearest residence to the alternative train loading sites and the alternative handling methods under worst case climatic conditions are shown in table 9.

Table 9 Predicted Noise levels at nearest residence to rail siding

	Rail Siding Site	
	North	South
Distance to Nearest Residence [m]	750	1250
Container Transfer Method [dB(A)]	38	31
Bulk Handling Method [dB(A)]	44	39

It can be seen from table 9 that exceedances of the N3/89 Day and Evening limits are predicted for the northern rail siding location, irrespective of the handling method. Noise levels resulting from emissions from the southern site are predicted to exceed the N3/89 Night limit if the bulk handling method is utilised.

SS6 suggests that, for the rail sidings, the noise reductions required to comply with all N3/89 limits could be readily achieved by the installation of noise barriers and that the container transfer method has a greater potential to produce high level impact (short term) noise.

Modelling of the impact of reversing beeper noise showed that the impact would be less than that of the noise of the machinery however it was noted that the character of the noise may cause disturbance.

SS6 did not include modelling of noise during construction; however it states that:

> *"The noise sources associated with the initial construction will generally be no noisier than actual mine operation equipment.*
>
> *Construction noise requirements are significantly less stringent than operational noise criteria."*

SS6 did not address the matter of noise monitoring; however there is a requirement under the MRSD Act that the Work Plan includes details of an environmental monitoring program addressing the key environmental issues.

10.2 Issues

Noise related issues identified by the proponent, the acoustic consultant, submitters and the Inquiry include the following:

- the appropriate noise limits to apply to protect the amenity of the area;
- the adequacy of the noise assessment; and
- the adequacy of the proposed mitigating measures.

Each of these issues is discussed in the following.

Appropriate Noise Limits

While both SS6 and the EES identify and discuss various noise criteria that might be applied, no firm recommendations of which limits should be applied are made. Despite this, use is made of the criteria suggested by N3/89 in discussion of expected compliance, or otherwise.

While the proponent indicated acceptance of both TG 302/92 and N3/89 it was also submitted by the proponent that:

> *"It should be recognised that the EPA Interim Guideline (N3/89) for Control of Noise in Country Victoria, N3, is an interim guide and is not binding. It is understood that the EPA accept that it cannot always be met by farming and industrial activities in rural areas."*

In submitting this the proponent suggested that sufficient flexibility should be provided so that acoustic treatments of residences providing amenity protection to the satisfaction of the owner/occupier should be accepted even though such treatment did not assist in complying with N3/89 limits as those limits are on noise levels outside the house.

The proponent emphasised that, while the intention was to negotiate mutually acceptable arrangements with owners/occupiers, it was not intended that this would amount to compensation for exceeding limits but rather to satisfy the amenity requirements of owners/occupiers.

In the EPA submission to the hearing, Mr James Nancarrow agreed with the proponent's submission in regard to the possibility of flexible application of N3/89 and acknowledged that acoustic treatment of residences could produce a satisfactory result. In doing so Mr Nancarrow reiterated the view of the EPA that such measures should be considered only as a last resort after all practical means of noise reduction had been considered and found not to be feasible.

The EPA submission recommended the application of N3/89 limits (which include a construction allowance in the Day) to both construction and operations and that noise emitted during the construction of buildings or structures such as the processing plant and rail loading facility should also comply with TG302/92.

The DPI submission stated that the DPI would defer to the EPA on whether TG302/92 or N3/89 should apply to construction, however, it was also stated that the DPI *"would appreciate the opportunity to have input on the activities included in the definition of construction and the definition of operation"*. DPI expressed the view that *"construction includes construction of buildings, plant and infrastructure, earthworks to construct sound barriers and initial overburden removal where this happened to be in association with the former activities."*

The EPA expressed the view that *"major non-mining activities such as the removal, stockpiling and replacement of overburden are continuous with the project and should not be considered construction noise"*, however the EPA also stated that *"construction includes initial site clearing and topsoil and sub-soil removal and stockpiling"*.

Adequacy of the noise assessment

The noise assessment conducted by Heggies Pty Ltd was widely accepted as adequate in predicting potential noise impacts although the EPA raised the following matters:

- while the modelling of reversing beeper noise shows it not to be an issue at greater than 1000 m when using the SEPP N-1 calculation, SEPP N-1 excludes reversing beepers from assessment. As a result, assessing reversing beepers as compliant under SEPP N1 may be misleading as their normal tonal characteristics may be intrusive and unreasonable even if decibel limits are met; and
- modelling results of processing plant noise excludes noise from haul trucks that should be included.

The proponent acknowledged both these matters and agreed with the EPA that appropriate mitigating measures need to be applied so that noise limits are complied with.

The EPA also criticised the assessment on the grounds that the full range of possible mitigating measures were not considered and that no definitive description of what mitigating measures will be applied was provided.

The matter of appropriate mitigating measures is discussed in detail in the following section, however the proponent acknowledged that more detailed

design was required and would be done during the preparation of the Work Plan.

Adequacy of proposed mitigating measures

The EES identifies the fact that noise emissions from mining operations will result in what may be considered unacceptable noise levels at a number of residences and lists the following possible mitigating measures:

- building upgrades specific to the receiving building;
- temporary relocation of some residents;
- relocation or delay of works in a particular area to minimise noise emissions, in response to complaints received by the Mine Manager or delegate; and
- selective construction activities during night time period to ensure inaudibility at receivers.

In its submission to the hearing the proponent stated that:

> *"In relation to noise generated by mining activities, it will be necessary to do one or a combination of a number of things:*
>
> · *Remove the receptors through acquisition*
>
> · *Temporary relocation of residents*
>
> · *Provide acoustic attenuation at the building, through treatments including double glazing, insulation, sealing of vents and façade treatment*
>
> · *Provision of mounds or noise reducing structures adjacent to the dwellings*
>
> · *Provision of mounds adjacent to the processing plant*
>
> · *Installation of noise kits for mobile machinery"*

While the proponent indicated that some mitigating measures aimed at reducing noise emissions could be applied, the effectiveness and practicality of such measures was questioned by Heggies who also stated that even if they were implemented the required noise reduction would not be achieved.

The proponent made the point that, while it is predicted that a significant number of residences would be subjected to noise levels in excess of the N3/89 limits, the actual impact was considerably less due to two factors:

- not all residences would be adversely affected at the same time; and
- a number of the houses that are predicted to be adversely affected will not in fact be in existence since they are in the area to be mined and must therefore be removed irrespective of noise considerations.

The EPA submitted that:

- *"Given the predicted exceedances, it is still necessary to protect the amenity of residents living in affected locations. All feasible noise control measures should be undertaken consistent with best practice;*
- *Measures should include the construction of earthen barriers even if ineffective under certain weather conditions as it will assist in minimising the total duration of excessive noise exposure;*
- *If noise levels cannot be controlled to meet desirable outcomes, EPA recommends that other options such as temporary re-housing of affected residents during periods of impact, purchase of house or to remove those impacted from the point of impact could be considered;*
- *Financial compensation is not a preferred means of offsetting a noise impact especially where sleep may be disturbed. Compensation for amenity loss is limited by legislation, premised on meeting stringent environmental amenity standards and may be negated if the occupancy of an affected dwelling changes;*
- *The cost implications of the option of extracting overburden and ore during the Day period only are not examined in detail, although it is stated to degrade the project's viability; and*
- *Best practice should be followed and low impact reversing beepers such as broadband beepers should be employed on all vehicles and mining equipment."*

At the hearing, the proponent indicated full agreement with all of the above, with the exception of the need to further analyse the option to restrict extraction of overburden and ore to the Day period, which was said to render the project non-viable.

In regard to noise mitigation measures at the processing plant, the EES states that the preferred approach is for the nearby residence to be purchased by DMS and to provide building upgrades to the next closest residence.

The EPA expressed the view that noise from the processing plant should be abated maximally or alternatively sited to achieve the required noise outcome at noise sensitive areas. In response the proponent agreed with the EPA submission on this matter and indicated that detailed design work required for the preparation of the Work Plan will address any need for additional noise shielding.

While the EES states that the northern haul route option is preferable, in terms of noise impact, no commitment was made to the use of that route nor was any noise mitigating measures proposed.

The EES states that noise mitigating measures to be adopted at the rail sidings include the following:

- noise barriers of materials such as earth, wood, hay bales or shipping containers;
- acoustic shrouds over the main conveyor drive system; and
- upgrades to the metal clad building.

The EPA suggested that a permanent built structure would be preferable as a noise barrier to other options suggested. The proponent noted the suggestion but made no commitment to implement.

The submission from the DPI included the following:

> *"Compliance with applicable noise standards will be a condition of work plan approval. If noise standards are not met, DPI will require DMS to modify their activities to achieve compliance and, if this is not successful, DPI could ultimately shut down the operation.*
>
> *DPI notes (E.E.S Section 6.3) that the EES explains what strategies would be adopted to manage noise and ameliorate impacts in a very general way.*
>
> *DPI will require a more detailed strategy to be set out in the environmental management plan, as part of the work plan".*

Other Noise Related Issues

Several other submitters expressed views on the matter of noise. These submissions and the proponent's response were as follows:

- Mr Peter Mercovich - The community needs to be assured that noise limits will be complied with.

  A detailed strategy for noise will be provided in the work plan; however it is unlikely that noise limits will be met during all phases of the project without some relocation of residents.

- Mr Peter Drum - Predicted exceedances of appropriate limits are unacceptable and the management measures proposed are absurd.

  Disagree. This is a view not shared by any other submitter including Government agencies and any resident within the project area providing tacit support for DMS's view. The noise management measures cited in Section 6.6.3 are accepted industry practice and recognise the need to discuss the issue with each affected resident.

- Buloke Shire - Noise will be a considerable issue when mining is underway but is likely to have minimal impact on Buloke residents.

  Agreed. Noise is not expected to affect residents of Buloke

10.3 Inquiry response

Appropriate noise limits

The Inquiry notes that there is general agreement with the proposition that N3/89 should, in general, be applied during both construction and operational phases. The Inquiry agrees with this view.

The Inquiry has significant concerns with the suggested "flexible" approach to the application of the guidelines.

While it is accepted that it would be possible to apply acoustic treatments to a residence to ensure that inside amenity is protected to an extent sufficient to eliminate the likelihood of sleep disturbance, such an approach does nothing to protect the amenity of the area in the vicinity of the residence (outside amenity). It is also accepted that elimination of the likelihood of sleep disturbance could well be sufficient to satisfy owners/occupiers during the Night but there is significant doubt that owners/occupiers would be satisfied with the outside amenity during the Day and Evening periods. It is important to note that Evening period includes Saturday afternoons and all day on Sundays and public holidays.

It is the view of the Inquiry that regular exceedance of N3/89 limits in the Day or Evening would create a high level of dissatisfaction, irrespective of any consents given or agreements made by the owners/occupiers. The Inquiry is firmly of the view that arrangements under which owners/occupiers contract out of their amenity requirements are seldom, if ever, successful.

The Inquiry is therefore of the view that N3/89 limits in the Day and Evening should be applied without opportunity to vary those limits.

The situation in regard to the Night is considered to be different. Although the N3/89 limits are set to control noise levels on the outside of residences, the primary purpose of the Night limit can be seen as protection from sleep disturbance and therefore the control of internal noise levels. The situation where internal noise levels in residences are maintained at or below a level unlikely to result in sleep disturbance during the Night is seen as satisfactory.

Noise levels of 45 dB(A) and 47 dB(A) have been suggested as appropriate levels to apply to provide protection from sleep disturbance and the Inquiry is of the view that the higher level, which is based on the work of Professor Griefahn, provides an appropriate criteria.

The work of Professor Griefahn shows that, providing the noise level from a single event, in a bedroom, does not exceed 47 dB(A) sleep disturbance is unlikely. It therefore follows that compliance with a limit on the maximum noise level in habitable rooms of 47 dB(A) would be a satisfactory substitute for compliance with the N3/89 Night limit. With such a limit it would be expected that permissible noise emission from the mine would be greater than if the N3/89 Night limit was applied.

The Inquiry considers that the substitution of an internal noise limit for the N3/89 Night limit requires the following:

- agreement of the owners/occupiers of the residence;
- independent assessment that maximum internal noise levels are not expected to exceed the limit; and
- monitoring of compliance.

Monitoring of compliance with internal noise limits often creates a greater disturbance than the noise itself so it is advisable to convert the internal noise limit to an external noise limit by way of an allowance.

SS6 suggests that the difference between external and internal noise levels would be 15 dB (A). Mr Nancarrow of the EPA confirmed this view but it was noted that the 15 dB (A) difference was for a house with all windows and doors closed. Mr Nancarrow advised that for a house with the windows open an allowance of 10 dB (A) would be appropriate.

As a result, a limit on the maximum external noise level of 57dB(A) would be appropriate without modification to the residence. If modifications are made to the residence that enable windows and doors to be shut at night without adversely affecting the internal amenity then a limit on the maximum external noise level of 62 dB(A) would be appropriate.

Consideration of the case where windows are open is important because preventing occupants from opening windows could have a significant impact on internal amenity, particularly in the warmer months. In some circumstances the provision of air conditioning and mechanical ventilation can overcome this problem but the acceptability of such measures is very much in the judgement of the occupants.

While the Inquiry is of the view that some flexibility in the application of the N3/89 Night limit should be allowed, it is essential that such flexibility does not result in a situation where owners/occupiers are simply compensated for the "pain" they agree to suffer. While the acceptance and consent of the owner/occupier to external noise levels above the N3/89 Night limit must be obtained, such agreement and consent is not considered to be sufficient. The

aim of the limit setting process must be the protection from sleep disturbance, not consent to suffer such disturbance. It is therefore necessary to require that internal noise levels are actually controlled so as to prevent sleep disturbance and that the judgement as to whether this is achieved is made by an appropriate regulatory authority rather than by way of agreement between the operator and the owner/occupier.

In regard to the matter of noise criteria to be applied during construction it is noted that two guidelines, both issued by the EPA, exist and the requirements of the two guidelines differ.

For the Day, N3/89 suggests a limit of 55 dB (A) while TG 302/92 does not prescribe a limit.

For the Evening N3/89 suggest a limit of 37 dB (A) while TG 302/92 suggests background plus 10 dB (A) for up to 18 months and background plus 5 dB (A) after 18 months. SS6 indicated that this would result of limits between 35 and 40 dB(A) although it appears that this estimate is of the Leq rather than the average maximum and is based on the background L_{90} rather than the "average minimum" specified in TG302/92.

For the Night N3/89 suggest a limit of 32 dB (A) while TG 302/92 suggests inaudibility in a habitable room.

It is apparent that N3/89 and TG 302/92 actually seek to control different types of noise. While N3/89 places limits on continuous noise TG 302/92 is concerned with limiting short term noise events that are common during the construction or demolition of buildings and structures.

Since the two guidelines seek to control different types of noise and it is accepted that both types of noise should be controlled, the Inquiry accepts the need for the application of the two sets of limits.

The Inquiry is unable to offer advice in regard to the definition of construction other than to suggest that it should be determined by the DPI in consultation with the EPA and the proponent.

Adequacy of noise assessment

The criticisms of the methodology applied in the noise assessment are considered to be valid but of no great significance.

The noise assessment provided was adequate for the purposes of the Inquiry in that it identifies and quantifies the range of potential impacts and mitigating measures that could be taken. The fact that it does not identify the

mitigating measures that will be taken, leaving that to the Work Plan, does not prevent the Inquiry completing its task.

Adequacy of proposed mitigating measures

The EES and SS6 provide what the Inquiry considers to be an adequate description of noise mitigation measures that could be applied. The submission of the EPA that the information provided does not precisely define what is proposed in all circumstances is accepted, however this is not seen as a serious shortcoming at this stage of the approval process. The information provided is sufficient to convince the Inquiry that sufficient noise mitigation is possible even if that mitigation must, in some circumstances, mean relocation of residents. There is no doubt that the mix of noise mitigation measures could be used to produce a satisfactory outcome.

The Inquiry's confidence in this position is enhanced by the clear statement by the DPI that compliance with applicable noise limits will be a requirement of Work Plan approval and that non-compliance could ultimately lead to an ordered shut down of operations. This provides a powerful incentive for the operator to find a way to achieve compliance. Precisely how compliance is achieved should be left in the hands of the operator as it will ultimately be the operator that will suffer the consequence of non-compliance.

It is noted that one of the major tools available to the operator is the relocation of residents either by purchase or by temporary relocation. The use of such a tool is dependent on the agreement of owner/occupiers and such agreements cannot be forced. The ability of the operator to negotiate appropriate agreements with owner/occupiers will be of critical importance to the success of the project. Owners/occupiers will be placed in a relatively strong bargaining position in that the consequence of a failure to reach agreement could be either large expenditure by the operator on additional noise mitigating measures, restrictions on operating hours or even denial of access to significant parts of the resource.

It is evident that there is considerable risk for the operator in this strategy however it is noted that the proponent has indicated a preparedness to accept such risk and confidence in being able to minimise if not eliminate the consequences.

10.4 Findings and recommendations

The Inquiry finds that:

- **Adequate protection of the acoustic amenity at residences will be achieved by:**
  - **Compliance with noise limits as specified in the *Interim Guidelines for Control of Noise from Industry in Country Victoria N3/89* (N3/89) during the Day and Evening as defined in N3/89; and**
  - **During the Night, as defined in N3/89, compliance with:**
    - **Noise limits specified in N3/89; or**
    - **A maximum noise level resulting in the noise level in any habitable room being 47 dB(A) or less; and**
    - **Application of guidance provided in section 12 of *Noise Control Guidelines* (TG302/92) including noise limits prescribed in that section.**
- **The noise assessment provided by the proponent and its acoustic consultant is adequate for the purposes of the Inquiry; and**
- **There is a reasonable expectation that recommended noise limits can and will be complied with and the ultimate consequences of non-compliance will be borne by the mine operator.**

The Inquiry recommends that:

- **The following be included in the conditions attached to the approval of any Work Plan:**
  - **The licensee must ensure that noise levels at any sensitive receptor not exceed the noise limits specified in *the Interim Guidelines for Control of Noise from Industry in Country Victoria* N3/89 except if the licensee provides the District Manager with a proposal for the substitution of a limit on the maximum noise level for the Night limit at a particular residence, or residences.**
  - **Any such proposal will:**
    - **Be for a limit on the maximum noise level outside the residence of no more than 62 dB(A);**
    - **Include evidence of the consent of the owner and/or occupier of the residence to the application of the proposed noise limit;**
    - **If the proposed noise limit is greater than 57 dB(A), include evidence that noise at the proposed limit will not result in**

a noise level in a habitable room of greater that 47 dB(A); and

- **Include details of a monitoring program that will enable demonstration of compliance, or otherwise.**

- **If the proposal is for a limit on the maximum noise level of 57dB(A) or less the District Manager will approve the proposal providing the he/she is satisfied with both:**
  - **The evidence of the consent of the owner and/or occupier; and**
  - **The adequacy of the proposed monitoring program, assessed in consultation with the EPA.**
- **If the proposal is for a limit on the maximum noise level of greater than 57dB(A) the District Manager will approve the proposal providing that he/she is satisfied with each of:**
  - **The evidence of the consent of the owner and/or occupier;**
  - **The adequacy, assessed in consultation with the EPA, of the proposed monitoring program; and**
  - **The evidence, assessed in consultation with the EPA, that noise at the proposed limit will not result in a noise level in a habitable room of greater than 47 dB(A).**
- **Once the proposal is approved the licensee must:**
  - **Ensure maximum noise levels at the residence during the Night do not exceed the approved limit; and**
  - **Implement the proposed monitoring program to the satisfaction of the District Manager.**
- **Management of noise emissions during construction activities, with such activities being defined by the District Manager in consultation with the EPA, will be in accordance with the guidance provided in Section 12 of Noise Control Guidelines TG302/92 and resultant noise levels at sensitive receptors must comply with the limits described in the Schedule in that Section of the guidelines.**

11. RADIATION

11.1 Description

The heavy minerals contained in mineral sands deposits, including the Donald mineral sands deposit, include ilmenite, rutile, zircon and monazite. Each of these minerals contain traces of the natural radioactive elements uranium and thorium, and their decay products. Typical radioactivity concentrations in these minerals are shown in Table 10.

Table 10 Radioactivity of heavy minerals

Mineral	Radioactivity Concentrations (Bq*/kg)	
	Uranium	Thorium
Ilmenite	120 – 250	200 – 2000
Rutile	500 – 1000	150 – 250
Zircon	1200 – 4000	500 – 1100
Monazite	12000 – 40000	200000 – 3000000

* Radioactivity is measured in Becquerel (Bq). One Bq equals one disintegration per second

It can be seen from table 10 that monazite has a significantly higher concentration of radioactive elements than that of the other heavy minerals. The radiation risks associated with the mining and processing of mineral sands are directly related to the radioactivity of the materials being handled and this is largely determined by the monazite content of these materials. This is reflected in the radioactivity concentrations shown in table 7, which contains data from Specialist Study 7 (SS7 – Radiation Assessment), *Donald Mineral Sands Pty. Ltd., Donald Project, North-west Victoria – Radiation Assessment*, Australian Radiation Services Pty Ltd.

The following can be noted from the data in table 11.

- the radioactivity of the topsoil at the proposed mine site is within the global range;
- the radioactivity of the overburden material is low; and
- the non-magnetic concentrate, which contains the majority of the monazite present in the ore, is relatively highly radioactive.

Potential adverse impacts resulting from the presence of radioactive materials in the ore and processing products arise primarily from the

potential for people to be exposed to radiation. Radiation exposure is measured in units of "effective dose" called sieverts (Sv).

Table 11 Radioactivity of various materials

Material	Radioactivity Concentration (Bq/kg)	
	Uranium	Thorium
DMS High Grade Ore	270 - 450	500 - 580
DMS Low Grade Ore	150 – 310	295 – 355
DMS Clay Overburden	< 40	51 – 63
DMS Topsoil	7 – 13	41 – 47
Global Topsoil	16 – 100	17 – 60
DMS High Grade HMC	4360	7380
DMS Low Grade HMC	3480	4720
Magnetic Concentrate	500	620
Non-magnetic Concentrate	5600	10300

DMS – Donald Mineral Sands
HMC – Heavy Mineral Concentrate

SS7 included predictions of the radiation dose that could be expected to be received, by various mechanisms, by workers involved in various activities. The results of these estimates are summarised in table 12.

Table 12 Predicted radiation dose of workers

Activity	Exposure mSv/year		
	External	Internal	Total
Ore extraction	1.4	0.09	1.49
HMC Handling	1.6	1.2	2.8
Handling non-magnetic concentrate	2.4	1.6	4
Working near HMC Stockpile	0.5	1.2	1.7
Working near NMP Stockpile	0.7	1.6	2.3
Transport HMC	0.49		0.49

HMC – Heavy Mineral Concentrate
NMC – Non Magnetic Product

SS7 also provides estimates of the maximum radiation dose that could be received by members of the public and found it to be less than 0.1 mSv/year.

The principle framework for radiation protection and radioactive waste management is provided by the *Radiation Act* 2005. The regulations

associated with this Act, Radiation Regulations 2007, prescribe radiation dose limits as follows:

- 20 mSv/year (averaged over 5 years) for workers exposed to radiation as an unavoidable part of their job; and
- 1 mSv/year for members of the public.

Comparison of the prescribed radiation dose limits with the predicted doses shows the predicted doses to be well below the prescribed limits.

The *Radiation Act* 2005 also prohibits the conduct of a "radiation practice", which is defined in the Act, unless a licence is obtained.

The EES acknowledges the possibility of requiring a license under the *Radiation Act* 2005 and that such a license would require compliance with the *Code of Practice on Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (2005)* (the Mining Code).

The Mining Code requires the preparation and implementation of a Radiation Management Plan, which includes:

- demonstrated access to appropriate professional expertise in radiation protection;
- a plan for monitoring and assessing radiation exposure of employees;
- appropriate equipment, staffing, facilities and operational procedures;
- details of inductions and training courses;
- record keeping and reporting;
- emergency plans; and
- systems of periodic assessment and review of the Radiation Management Plan.

The Mining Code also requires the preparation and implementation of a Radiation Waste Management Plan, which includes, inter alia:

- prediction of environmental concentrations of radionuclides and radiation doses to people from proposed waste management practices;
- a program for monitoring the concentration of radionuclides in the environment and assessment of radiation doses to members of the public arising from waste management practices; and
- systematic and periodic assessment and review of the Radiation Waste Management Plan.

11.2 Issues

Radiation related issues identified by the proponent, consultants to the proponent, submitters and the Inquiry include the following:

- the need for a management licence under the *Radiation Act* 2005;
- the adequacy of the radiation assessment; and
- the impacts of emission of radioactive dust on employees, the public and neighbouring properties.

Each of these issues is discussed in the following.

11.2.1 The need for a Management Licence under the *Radiation Act* 2005

In a written submission to the Inquiry, the Department of Human Services (DHS) stated that:

> *"Based on our understanding of the proposal, it is likely that the processing of mineral sands will trigger the licensing requirements of the Radiation Act 2005 in that the proponent may need to apply for a management licence to authorise the practice involved – the mining and processing of mineral sands."*

At the hearing Mr Morrie Facci, of the Radiation Section of DHS, indicated that licensing may be required but that the need for a licence had not yet been determined.

The DPI indicated an expectation of a requirement for a management licence under the *Radiation Act* 2005 by advising of the DPI's willingness to work with DHS to ensure the mining licence is compatible with a management licence under the *Radiation Act* 2005.

The proponent acknowledged and accepted the need for a radiation management plan but indicated that the intention is to negotiate with DHS regarding the need for a licence.

In responses to other questions the proponent indicated that it is expected that a radiation management plan would be submitted to DHS.

11.2.2 The adequacy of the radiation assessment

Mr Gil Hopkins expressed some doubt in regard to the adequacy of the radiation assessment on the grounds that the investigation was less thorough than that for other sand mines.

In response the proponent advised that the scope given to the experts was similar to that in other cases and that the qualified and well regarded experts that completed the assessment determined the work requirements.

Mr Lyndon Fraser, on behalf of the "Real River People", expressed the view that there was a significant discrepancy between published information on radioactivity levels in mineral sands deposits and the levels reported in SS7 for this deposit.

The proponent rejected this criticism stating that the work of Australian Radiation Services could be relied upon.

Mr Morrie Facci, of the Radiation Section of DHS, indicated his satisfaction with the assessment.

11.2.3 The potential impacts of radioactive dust.

Mr Hopkins submitted that dust containing radioactive elements could drift onto neighbouring properties causing real and perceived contamination of crops thus affecting the saleability of agricultural produce.

Mr Hopkins also expressed concern in regard to the potential impacts of such dust on flora and fauna.

The EES contains the following statement in regard to this matter:

> *"The off-site dust deposition exposure pathway is likely to lead to trivial doses to crops and other biota given the radionuclide concentration in the source, the inertness of the monazite mineral and the very low environmental transfer factors for the key radionuclides of radium and thorium"*

A number of submitters including Mr Hopkins, Mr George Powell and Mr Frank Drum expressed general concern about the potential impacts of radioactive dust.

In response, the proponent stated that these issues had been adequately addressed in the specialist study and the EES and that further detailed management plans would be developed and submitted to DHS.

11.3 Inquiry response

The need for a Management Licence under the *Radiation Act* 2005

The Inquiry sees the question as to whether a management licence under the *Radiation Act* 2005 will be required as an important issue in that it determines the conditions that should be applied to other approvals, including that of the Work Plan.

The Inquiry is confident that, if a management licence is required, the management regime that would result would provide appropriate protection from impacts associated with radiation. This confidence is based on the facts that:

- the conditions of such a licence will require the development and implementation of a Radiation Management Plan (RMP) and a Radioactive Waste Management Plan (RWMP) in conformance with the relevant code of practice; and
- DHS would be responsible for monitoring and enforcement of compliance

The relevant sections of the *Radiation Act* 2005 are as follows:

> ***12 Conduct of radiation practice prohibited unless licensed***
>
> *(1) A person must not conduct a radiation practice unless the person—*
>
> *(a) holds a management licence, that is in force, that allows the person to conduct that radiation practice*

A radiation practice, as defined in the Act, includes, inter alia:

- transporting radioactive material;
- mining radioactive material; and
- processing radioactive material.

The definition of "radioactive material" in the Act is as follows:

> ***"radioactive material** means—*
>
> *(a) any material that spontaneously emits ionising radiation that—*
>
> *(i) has an activity concentration equal to, or greater than, the amount prescribed by the regulations; and*
>
> *(ii) consists of, or contains, an activity equal to, or greater than, the amount prescribed by the regulations;"*

Under these definitions the heavy mineral concentrate and the non-magnetic mineral concentrate are "radioactive material" so it is reasonable to expect that a management licence issued under the *Radiation Act* 2005 is required to process and transport these materials.

Despite this the Inquiry notes that:

- the DHS was somewhat equivocal as to whether a licence would be required;
- the proponent indicated that the matter of licensing would be negotiated with DHS; and
- the *Radiation Act* 2005 contains provisions for exemptions from licensing (Section 16) and the declaration of materials not to be radioactive materials (Section 4).

If it is determined that a management licence under the *Radiation Act* 2005, is not required, which is a possibility, the regulatory requirement for a RMP and a RWMP in conformance with the relevant codes of practice, with oversight from DHS, may not be applied.

The Inquiry is of the view that, what are standard conditions of a management licence under the *Radiation Act* 2005, provide a satisfactory set of conditions, and that equivalent conditions should apply even if a management licence under the *Radiation Act* 2005 is not required.

11.3.1 The adequacy of the radiation assessment

The Inquiry is of the view that the adequacy of the radiation assessment provided should not be judged by comparison with assessments of other mineral sands projects. Mineral sands projects vary with some involving the return of the radioactive monazite to mined-out areas, which would present a different range of risks requiring a different assessment than for this proposal. The Inquiry considers the radiation assessment provided in this case to be adequate for this case.

While allegations were made of underestimation of radioactive levels, in light of the absence of any evidence of such underestimation and the proven capability and reputation of Australian Radiation Services as experts in the field, the Inquiry sees no reason to support such allegations.

11.3.2 Impacts of Radioactive Dust

While the matter of contamination of crops by radioactive dust was not addressed quantitatively in SS7, or the EES, the Inquiry is able to accept the view expressed that the quantity of radioactivity that will be deposited on crops is trivial. This view is reinforced by the following:

- the heavy mineral fraction of the ore, which carries the radioactivity, is in relatively coarse and dense particles that are significantly less likely to be lifted and transported as dust than other components of the ore; and
- the vast majority of the handling of heavy mineral concentrates will be done when the concentrate is wet.

General concerns with the potential of impacts from radiation are understandable as they are based on the common knowledge that radiation is bad. In the absence of quantification of dose, such concerns need to be considered as real. This however is not the case here. What the Inquiry considers to be sound, if conservative, are the predictions of radiation dose that have been provided. In the light of these dose predictions, the Inquiry is comfortable that these non specific concerns are unfounded.

11.4 Findings and recommendations

The Inquiry finds that:

- **Providing risks associated with radiation are managed in accordance with management plans developed and implemented in accordance with the *Code of Practice on Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (2005)* and the *Code of Practice for Safe Transport of Radioactive Material (2008)*, potential impacts of radiation will be eliminated or reduced to a satisfactory level; and**
- **The radiation assessment provided in support of the EES is of sufficient accuracy, is adequate and provides conservative estimates of potential impacts, including those of radioactive dust emissions.**

The Inquiry recommends that:

- **The Department of Human Services either determine that a management licence under the *Radiation Act* 2005 is required or agree to act as the regulatory authority on matters relating assessment and compliance testing of management plans relating to radiation and radioactive materials;**

- **The following be included in the conditions attached to the approval of any Work Plan:**
  - **Prior to commencement of the production of heavy mineral concentrate the licensee will provide the District Manager with either:**
    - **A copy of a management licence issued by the Department of Human Service under the Radiation Act 2005 for the conduct of radiation practices associated with the mining, processing and transport of radioactive materials; or**
    - **A copy of a Radiation Management Plan, Radioactive Waste Management Plan certified by the Department of Human Services as being in conformance with:**
      - **The Code of Practice on Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (2005); and**
      - **The Code of Practice for Safe Transport of Radioactive Material (2008).**
- **If the operations are not subject to a management licence issued by the Department of Human Service under the Radiation Act 2005, then the Department of Human Services will act as the regulatory authority on matters relating to the assessment and compliance testing of management plans relating to radiation and radioactive materials.**

12. VISUAL IMPACT

12.1 Description

Investigation of the visual impacts of the proposal was undertaken as part of the EES and included as supporting study No 13 (SS13 – Visual Assessment). The key findings and conclusions are identified in Section 6.8, pages 6-90 to 6-96 of the EES.

Visual impacts on the landscape will occur as a result of:

- site office and workshop buildings;
- overburden and soil stockpiles;
- pit;
- water storage ponds;
- wet concentrator plant;
- related project ancillaries (telecommunications, water supply pipeline and power supply);
- tailing dams; and
- sources of lighting.

A visual impact assessment was undertaken using the Visual Management System developed by the US Forestry Service whereby the visual impact resulting from a combination of visual modification and viewer (or visual) sensitivity is assessed.

As mentioned above, the project involves a moving pit so that as the cycle of clearance, mining and rehabilitation proceeds, impacts on the community and environment will vary.

According to the EES, the extent of which changes to visual amenity will impact on local residents will depend on:

- the level of visual modification;
- viewer sensitivity (including sensitivity to night lighting);
- the duration of the project-derived visual impact;
- the timing of the project visual impacts; and
- the effectiveness of mitigation and management measures carried out by DMS.

The EES concludes that the project will result in a significant modification to the existing landscape. Project staging will break the project area into a number of small, discrete locations resulting in high visual impacts which are confined to a local setting. Based on currently intended staging, these impacts are likely to last for 3 to 5 years at the following residences:

- 2 residences (D2 and D23) in the first 1 to 5 years;
- no residences in years 6 to 10; and
- 6 residences (D2, D23, D3, D9, D10, D11) in years 11 to 25.

The EES includes a number of key recommendations to mitigate visual impact, as follows:

- the area around the wet concentrator plant to be mounded and planted out;
- sections of the mine area adjacent to sensitive viewing locations to be planted out around the perimeter;
- adjacent to affected residences, or in the line of sight from those residences to the mine, planting and/or mounding is to be undertaken as a matter of priority;
- buildings to be painted with non-reflective materials of colours that echo those found in the Wimmera landscape;
- final land form shaping and vegetation restoration is to recreate and mimic the existing landscape; and
- operations are to be staged so that activities do not take place outside over burden stockpiles and lighting is to be confined within stockpile areas or otherwise shielded to avoid creating unnecessary glare.

12.2 Issues

Issues concerning visual impact identified by the proponent, the proponent's consultants and the Inquiry include the following:

- whether the visual impacts of the proposal are acceptable; and
- whether the proposed mitigation and management measures are appropriate.

Mr Bartley summarised the visual impact in the EES as follows:

> *The assessment indicates that 5 rural residences will experience a high visual impact, 10 residences will experience a moderate to high visual impact and 1 residence will experience a moderate visual impact. These impacts are largely due to the over burden and soil stockpiles and to a lesser extent the processing equipment.*

Mr Bartley noted that:

> *It is significant that despite local publicity about the project and the consultation process, no submissions have been received in relation to landscape impacts.*

However, he also noted that:

> *Implementation of landscaping of the stockpiles will be important to reduce the extent to which these stand out in the landscape.*
>
> *Overall, although the changes will be significant in a couple of locations given the generally flat topography, they are transitory and it is considered that they can be attenuated by means of appropriate planting.*

12.3 Inquiry response

The Inquiry agrees with Mr Bartley that it is significant that despite the high visual impacts of the mining proposal, that there have not been any submissions from local residents on this matter.

It would appear that local residents accept that a high visual impact is tolerable because of the transitory nature of the mining site and the wider social and economic benefits that arise from the project.

It is also noted that the area is not known for its landscape value (though that is not to say that there are not people who do value the Wimmera landscape).

It would also appear that DMS has carefully explained the visual impacts of the proposal, as there were no submissions that queried what the visual impact might be or questions its acceptability.

To ensure visual impacts are adequately managed, it is important that DMS implement the suggested attenuation measures as identified in the EES and report on these matters through the ERC.

12.4 Findings and recommendations

The Inquiry finds that:

- **The project will result in significant visual impacts, particularly for some residences;**
- **The transitory nature of the mine will confine the visual impacts to relatively limited periods of time;**
- **Planting on the outside boundaries of the stockpiles and other attenuation measures will be important to reduce visual impacts; and**
- **DMS should provide the ERC with on-going reports on the mitigation and management measures addressing visual impact.**

13. ROADS, TRAFFIC AND TRANSPORT

13.1 Description

The roads, traffic and transport issues were considered as part of the EES and included as supporting study No. 8a and 8b (SS8 – Roads, Traffic and Transport). Key findings and conclusions are identified in Section 6.9, pages 6-96 to 6-116 of the EES.

Mr Bartley for DMS stated that the main issues related to local traffic were:

- *Between 215 and 272 extra vehicles generated by the mine will use local roads in the vicinity of the project area on a daily basis. The increase in traffic will be perceptible on most roads, however is well within the environmental and design capacity.*
- *There will be an additional, average 60 heavy vehicle traffic movements per day on local roads or on State highways for delivery of concentrate to the rail head or Portland or Geelong.*
- *There will be changed traffic conditions as the additional volume will require more vehicles to move off the centre bitumen onto the crushed rock shoulder to allow vehicles to pass. There will also be some inconvenience when local roads are inaccessible due to the movement of heavy equipment (not unlike the movement of large farm machinery).*
- *On some sections of local roads increased road usage will lead to additional deterioration.*

The EES states that the HMC will be carried in bulk to the selected port by road. It further states this is the most likely option because it does not require the double handling of HMC that would be required if the HMC was sent by road/rail.

The EES did identify that if it was proposed to use rail, two train configurations sub-options exist:

- dedicated freight train option. This option runs a dedicated train at the Minyip siding, which exclusively carries DMS HMC;
- existing freight train option. This option attaches extra wagons to existing freight services, carrying containers of HMC.

The second option was considered to be highly unlikely.

13.2 Issues

Issues concerning roads, traffic and transport identified by the proponent, the proponent's consultants, submitters and the Inquiry include the following:

- whether local road and traffic impacts are acceptable; and
- rail option to haul HMC to port.

13.2.1 Local road and traffic impacts

Mr Bartley outlined the proposed methods to manage local road networks:

- *Improvements in road construction standard for roads comprising the road transport route.*
- *Intersection upgrades to meet VicRoads design guidelines.*
- *Monitoring of roads and traffic for the first 18 months to assess the need for further road upgrades.*
- *Preparation of a traffic management plan in conjunction with the local councils and emergency services. Key aspects of the traffic management are summarised in the EES (page 6-114).*
- *An appropriate process for road closures including stakeholder consultation.*
- *Additional traffic management measures for over-dimensional loads and other specific issues.*

Buloke, Yarriambiack and Northern Grampians Shire Councils submitted that a traffic management plan should be prepared to identify existing condition of roads, design standards needed to upgrade roads and a monitoring program to assess the impacts on roads.

Northern Grampians Shire Council tabled a condition that could be included on the Work Plan setting out the requirements of a Transport Management Plan.

It further noted that Council could require DMS to enter into an agreement under the *Road Management Act* 2004 to provide for the upgrade and maintenance costs that may be associated with the use of both local and State roads for the life of the project.

Yarriambiack stated that DMS should be responsible for all costs associated with upgrading roads, reinstating closed roads and for all maintenance costs for a period of five years after mine closure.

Mr Bartley stated that DMS should not be subject to an additional roads levy that was suggested by one council.

13.2.2 Rail option to haul HMC to port

Northern Grampians Shire Council and two submitters, Mr Gil Hopkins and Mr Harold Flett, urged DMS to use the rail option to transport HMC to port.

Mr Bartley stated that substantial improvements would need to be made to improve rail infrastructure for the rail option to be considered, but that there was a commitment to further investigate this option. Mr Peters of DMS advised the Inquiry that discussions were occurring with relevant government agencies.

13.3 Inquiry response

13.3.1 Local road impacts

Increase of traffic volumes are not considered to be significant. However, it is important that local roads are upgraded to cope with the nature of the traffic generated by the mine.

The Inquiry notes that DMS has expressly acknowledged that it has a responsibility to upgrade local roads (including intersections) as a result of the mine's operations.

The Inquiry further notes that DMS submitted that an appropriate framework to address detailed roads and traffic issues is a Traffic Management Plan. The requirement for this plan was included in the draft contents of the EMP tabled by DMS.

The Inquiry agrees that DMS should not be subject to a levy if it carries out local road improvements and on-going maintenance in accordance with an agreed Traffic Management Plan.

The Inquiry has reviewed the draft requirement for a Transport Management Plan tabled by Northern Grampians Shire Council, and considers that it would provide an appropriate framework for such matters to be addressed.

13.3.2 Rail option to port

The HMC will be carried in bulk to the relevant port. The Inquiry considers that significant environmental benefits could be achieved if a rail option was selected, particularly the reduction of greenhouse gas emissions (see Chapter 10 above). It would also accord with the State Government's *Growing Victoria Together* policy, which includes the following target:

- *The proportion of freight transported to and from ports by rail will increase from 10% to 30% by 2010.*

However, it is understood that there would need to be significant improvements to rail infrastructure for the rail option to be seriously pursued by DMS and that commercial considerations will need to be resolved.

Given the 25 year life of the mine, it would be appropriate for the rail option to be pursed even after the commencement of operations.

13.4 Findings and recommendations

The Inquiry finds that:

- **Expected traffic volumes generated by the mine are not significant;**
- **Significant improvements to local roads would need to be made to accommodate the safe movement of vehicles generated by the mine;**
- **The EMP should include a Transport Management Plan;**
- **The Transport Management Plan should include the range of matters in Northern Grampians Shire Council submission tabled at the Inquiry hearing;**
- **The Transport Management Plan should be developed by a working group comprising DMS, Yarriambiack, Buloke and Northern Grampians Shire Councils, VicRoads and relevant emergency service organisations; and**
- **DMS should continue its commitment to work with relevant State government departments to pursue the transport of HMC to port by rail.**

The Inquiry recommends that the EMP not be approved unless it contains a Transport Management Plan;

- **The Transport Management Plan includes the range of matters in the Northern Grampians Shire Council submission tabled at the Inquiry hearing. These are:**

- **An existing conditions survey of public roads in the vicinity of the mine facility that may be used for access, including details of the suitability, design and construction standard of such roads;**
- **The designation of appropriate construction and transport vehicle routes to the mine facility;**
- **The designation of vehicle access points to the mine from surrounding roads, including main roads access points to local access roads;**
- **The designation of operating hours and speed limits of trucks on relevant routes accessing the site so as to avoid the time and routes of passage of school buses, and to provide for resident safety;**
- **Any necessary pruning of street planting or roadside vegetation to provide for transport of materials to the site, and pruning practices to be followed;**
- **The designation of vehicle accessways and car parking areas;**
- **The requirements of Over Dimensional Load permits and escorting of long large loads along roads in the area;**
- **The need for road intersection upgrades to accommodate an additional traffic or site access requirements, whether temporary or ongoing;**
- **A timetable for implementation of any pre-construction works identified to be undertaken;**
- **A timetable for regular inspections to be carried out during the construction period to identify maintenance works necessary as a result of construction traffic; and**
- **The use and development must be carried out in accordance with the endorsed Traffic Management Plan and the cost of any works including upgrades and maintenance are to be at the expense of the work authority holder.**

- **The Transport Management Plan be developed by a working group comprising DMS, Yarriambiack, Buloke and Northern Grampians Shire Councils, VicRoads and relevant emergency service organisations; and**
- **The Inquiry further recommends that the Work Plan not be approved unless it contains a Transport Management Plan that includes actions to investigate the option of transporting HMC to port by rail.**

14. CULTURAL HERITAGE

14.1 Description

The cultural heritage issues were considered as part of the EES and included as supporting study No 2 (SS2 – Cultural Heritage Assessment) The key findings and conclusions are identified in Section 6.10, pages 6-116 to 6-125 of the EES.

Cultural heritage issues were undertaken for Aboriginal Cultural Heritage and Non-Aboriginal Cultural heritage.

A total of 32 Aboriginal cultural heritage sites were identified by the Study. Eighteen sites will be disturbed if the project proceeds. The sites contained either Artefact scatters or scarred trees.

As not all the area was surveyed, further Aboriginal cultural heritage sites could be identified.

Five sites of non-Aboriginal cultural heritage were located in the project area. Only one of these sites, the rural structure (shed) is considered to be of high scientific significance.

Under the *Aboriginal Heritage Act*, 2006, which was proclaimed before the cultural heritage assessment was completed, requires a Cultural Heritage Management Plan to be submitted and approved by Aboriginal Affairs Victoria.

14.2 Issues

Mr Bartley advised the Inquiry that DMS has, following discussions with DPCD and Aboriginal Affairs Victoria (AAV), agreed to undertake further detailed survey work and prepare a Cultural Heritage Management Plan (CHMP) as required under the *Aboriginal Heritage Act* 2006.

A submission addressing cultural heritage issues was received from Mr Guthrie. He identified a number of omissions in the EES. Mr Guthrie also tabled a number of annotated photographs of various Aboriginal and non-Aboriginal cultural heritage sites.

14.3 Inquiry response

As acknowledged in the EES, since the cultural heritage study was undertaken the *Aboriginal Heritage Act* 2006 was proclaimed there is now a statutory requirement for a CHMP to be prepared.

The processes recommended in the CHMP will govern the protection of Aboriginal heritage and the procedures to be followed if other matters are discovered during excavation.

Part of the CHMP will be to consult with the relevant Registered Aboriginal Party (RAP) or other agreed Aboriginal stakeholders.

Given Mr Guthrie's knowledge of such matters, it would also be prudent for the CHMP consultant to approach Mr Guthrie.

Mr Bartley also indicated that other European heritage sites (particularly archaeological sites) have protection under the *Heritage Act,* 1995.

14.4 Findings and recommendations

The Inquiry finds that:

- **a Cultural Heritage Management Plan (CHMP) should be undertaken in accordance with the *Aboriginal Affairs Act*, 2006; and**
- **the consultant engaged to undertake the CHMP should approach Mr Guthrie on identifying potential sites of Aboriginal cultural significance.**

15. REHABILITATION

15.1 Description

Soils and Mine Materials and Rehabilitation were considered as part of the preparation of the EES and are included as Supporting Study 5 (SS5 - Rehabilitation of Donald Mineral Sands Project). The Soils and Mine Materials assessment appears in the EES in Section 6.13, pages 6-142 to 6-148 and the Rehabilitation assessment appears in the EES in Section 6.14, pages 6-148 to 6-157.

The following includes several general descriptions which are summaries derived from information contained in SS5. The summaries are designed to give an overall view and are not a substitute for referring to the detailed information.

The current use of the proposed mine area is predominately agricultural with less than 5% of the project area supporting native vegetation. The agricultural land is mainly cleared open country with scattered trees and small areas of remnant native vegetation.

15.1.1 Agricultural land

Cropping is the dominant activity with sheep and cattle as subsidiary activities. There has been a swing away from mainly wheat growing to the growing of a much broader range of crops, including barley, oats, triticale, rye, canola, field pea, Faba bean, chickpea, lentils, etc. However, cereal cropping is still the major activity, albeit with more modern approaches such as integrated management for control of weeds, insect pests and diseases. Minimum tillage practices are becoming more widely adopted as is the use of global positioning systems for the accurate sowing and harvesting of crops, applying of herbicides, etc.

15.1.2 Native vegetation

The existing native vegetation is limited in area, is generally in poor condition, occurs in disconnected patches and provides limited habitat for native fauna. Five Ecological Vegetation Classes (EVCs) have now been recorded as existing in the project area:

- Plains Woodland
- Plains Savannah

- Low Rises Woodland
- Ridged Plains Mallee
- Black Box Lignum Woodland

All are considered by the DSE to be endangered in the Wimmera Bioregion. A sixth EVC (Plains Grassland) exists along roadsides in the area.

15.1.3 Soils

Previous broad scale soil surveys and the more recent specific site soil surveys have identified the land forms and dominating soil types that occur in the project area. These are described in the Table 3 of SS5 but the following brief descriptions of the landforms and the corresponding soil types are mainly extracts from the summary on page 6.

- the Murra Warra: moderately undulating plains, dominantly cracking clays, sodosols, about 80% of the area;
- the Kalkee: gently undulating plains, cracking clays, vertosols, about 5% of the area; and
- the Donald: lake lunettes and dunes, alkaline red duplex soils, sodosols, about 15% of the area.

The actual percentages of the soil systems in the area to be mined may be somewhat different to the above, as the mined area will be only about 40% of the project area.

The properties of each of these soil systems are explained in detail in the EES (6-143 and 6-144) and in SS5 (Section 2.4 Soils).

The Kalkee soil system is preferred for agriculture, while the Donald soil system is the more problematic for farming. All soil systems have the potential to contain soluble salts and toxic boron levels within the soil profile and to exhibit high sodicity. The occurrence of these phytotoxic materials within the root zone of plants has the potential to reduce plant growth and yield, depending on the type and variety of crop grown. Carbonaceous layers, which also inhibit root growth, are not common in these soil systems.

The removal of topsoil and subsoil to enable the mining to proceed does offer scope to bury these unwanted layers in the mine void. This would remove impediments to growth when the subsoil and topsoil are replaced and the land rehabilitated. This removal depends on the ease by which the undesired layers can be identified – by chemical analysis and/or observation of changes in the soil profile – and the competence of the operators in visually identifying and then isolating the undesired layers during the removal of the topsoil and especially the subsoil.

To do this, the rehabilitation consultants in their expert witness statement (page 11) said:

> *Our recommendation is that prior to mining a more extensive study of the soils about to be mined, be carried out to determine the depth of toxic boron, soluble salt concentrations and where significant changes in texture occur, which indicate increased sodicity. Such sampling would be undertaken over time, as the mine path progresses.*

To ensure that the components of the soil and the overburden are kept in separate stockpiles, the mining process described in the EES will remove materials in the following order:

- topsoil removal by scoops when the soil is moist (not wet or dry) and stockpiled on topsoil up to a height of 2 metres;
- subsoil removal by scoops when the soil is moist (not wet or dry) and stockpiled on subsoil up to a height of 5 metres - the topsoil will need to be removed from these stockpile areas beforehand and stockpiled as topsoil;
- overburden mining by excavators and haul trucks and stockpiled on overburden up to a height of 30 metres with non-saline overburden kept separate from saline overburden – the topsoil and subsoil will need to be removed from these stockpile areas beforehand and stockpiled as topsoil and subsoil; and
- ore mining by excavators and haul trucks and processed in the Mining Unit Plant (MUP), return of oversized material to the mine void, the ore slurry pumped to the Wet Concentrator Plant (WCP) with the sands and clays returned to the mine void or to the tailings storage facility (TSF) as appropriate.

15.1.4 Soil Management

The rehabilitation experts described the management of soils in SS5 (page 40) in the following manner:

> *As the soil horizons are thin and toxic levels of salt and boron are present at relatively shallow depths, it will be necessary to provide close control on the stripping depth of each unit. This will require:*
>
> - *Detailed sampling and assay of soil and overburden during premine drilling.*
> - *Interpretation of sampling and assay data and input into mine plan*
> - *Surveying of sandy rises (including volumes).*
> - *Precise handling of soil (especially topsoil). A scoop is the preferred equipment for this, although it can be done by elevating scraper or by*

windrowing with a grader and then picked up by an open bowl scraper.

- *Continuous supervision during the stripping process.*

Stockpiling should be managed to minimise damage to soil structure, soil biota, leaching of nutrients (or toxic constituents) and erosion by wind or water. This means keeping topsoil stockpiles low and not handling soil when it is very wet or very dry, so soil structure is not destroyed. All stockpile areas, other than for topsoil should be stripped of topsoil and, subject to the results of detailed chemical analysis, it may be necessary to strip subsoil from areas intended for overburden containing high levels of boron or other toxic constituents.

Drainage from stockpiles, haul roads, or any other disturbed areas must be contained within the mined area and not allowed to contaminate the adjacent topsoil and subsoil.

With regard to the protection of the stockpiled materials, the rehabilitation consultants stated (page 44 of the EES):

The topsoil and subsoil stockpiles should be protected from wind and water erosion. This can be achieved by various methods including cover crops, mulching and polymers. Where soil is intended for revegetation areas the use of agricultural cover crops is inappropriate, as the development of high levels of organic matter in these soils inhibits germination of native seeds – an allelopathic effect

In replacing the stockpiled materials, the rehabilitation consultants stated in SS5 (page 41) the following:

Replacement of topsoil and the underlying material requires similar care to the stripping process and, in particular, each layer must be left smooth before the next is placed. In the case of the barren sand and clay overburden, this is important to ensure even consolidation and settlement, while the subsoil and topsoil must be placed on a smooth surface, so that an even thickness can be achieved. If the topsoil is 200 mm thick, then the relief on the top of the subsoil should be less than 50 mm and this is best done by using a land plane. …..

15.1.5 Rehabilitation

In essence, the process of rehabilitation depends very much on the accurate removal and then replacement of the removed materials in the reverse order to which they were removed in the mining process. In particular, any saline materials, eg over sized material from the ore body, overburden affected by saline groundwater, etc., need to be placed in the mine void and covered

with non-saline overburden before the subsoil and topsoil are returned. This is essential to prevent saline materials causing salinisation of the soil that will be replaced above the returned overburden. This generally means no saline material within 3 metres of the rehabilitated soil surface.

The end result of mining will be an unavoidable increase in height of the restored mined area. Provided there is effective compaction of the redeposited materials in the mine void, it has been estimated that this "swelling" will increase the height of the rehabilitated mine site by 1 to 2 metres above the adjacent areas. Reshaping of this increased height needs to be done carefully to ensure that drainage flows are restored and flooding is avoided, except in areas designed to perform as ephemeral wetlands.

The importance of soil replacement is described in SS5 (page 45) in the following way:

> *The success of the soil replacement program depends primarily on the care taken in the management of the top soil and subsoil and the condition of the replaced overburden after mining. Ideally the combined topsoil and subsoil should be at least one metre in depth, but this will depend upon the amount of soil removed and discarded because of salinity and boron. Other non toxic material (such as the soils from the dunes) may be available to replace these layers.*
>
> *As noted above, it is important to return the overburden so that it is well compacted and then levelled to a condition where* (it) *does not contaminate the layer of subsoil placed on it. Likewise the subsoil should be landplaned to allow an even distribution of topsoil over the whole site.*
>
> *Any slopes built into the rehabilitation process to assist drainage from the mine site or to impound water to create wetlands must be built into the replaced overburden (and only mirrored in the subsoil and topsoil replacement). It is preferable to develop the slopes for drainage in the overburden and maintain constant depths of subsoil and topsoil across the land form under rehabilitation (See section 4.1 relating to wetland soils).*

A summary table of rehabilitated soil parameters appears in SS5 (refer Table 6 on page 38) and this table was also used by Mr Bartley in his closing submission on behalf of the proponent. The table is reproduced below.

Table 13 Rehabilitated Soil Parameters

PARAMETER	EFFECT	REMARKS
Lower organic carbon (oxidised when disturbed)	Reduced fertility & water holding capacity	Offset by establishing pasture/green manuring
Lower nitrogen & other nutrients	Reduced fertility	Can be offset with fertiliser
Lower soil biota	Reduced fertility	Recovers quickly with plant growth
Loss of soil structure	Reduced permeability & root penetration; erosion risk	Minimal if handled when moisture content optimum; ameliorated with gypsum where appropriate
Slightly higher elevation	Better surface drainage	Possible slight disadvantage in dry years
Lower density	Better penetration of water & roots	
No toxic horizons within root zone (~1.5 m)	No impediment to root penetration	Salt & boron horizons buried at depth, improved productivity
High content of gypsum	Improved soil texture; sodicity reduced	Effects depend on rain & take time (~1 year)

The rehabilitation consultants summarised the rehabilitation issues in their expert witness statement as:

- *Management of soils, so that the properties of topsoil and subsoil are preserved and deleterious constituents are kept below the root zone;*
- *Control of tailings and overburden, so that post mining settlement is minimised and is uniform, with minimal relief;*
- *Careful planning and land shaping, so that drainage is not impeded, other than in designed wetlands.*
- *Provision of suitable landforms and soils for native revegetation.*
- *Removal of all buildings, roads and other infrastructure not required for future agricultural activities.*

15.1.6 Rehabilitation options

The rehabilitation consultants have suggested three options for the approach to rehabilitation of the mined areas – refer section 4.9 of SS5. These are:

- *Restore the existing landscape as closely as possible to its original form.*
- *Restore an approximation of the existing landscape, with dunes and lunettes consolidated into fewer but larger areas.*
- *Construct a clay plain, eliminating all dunes and lunettes by burying sand.*

The first option was not recommended for a number of reasons, including the difficulty and cost, reconstruction of lakes/lunettes not being practical, the difficulty of stockpiling sandy soils because of their susceptibility to wind erosion, and that the existing topography is not ideal for agriculture as farmers prefer the clay plains.

The third option is both practical and acceptable for agriculture but it does not provide the opportunity to significantly expand the coverage by native vegetation and restore the endangered EVCs.

The second option is the preferred one as it is more amenable to the re-establishment of the EVCs, eg increase coverage from less than 5% up to 20% of the area. However it is recognised that this would not meet the preferences of individual farmers who would probably want their land returned for agricultural use. This option would be more feasible if the whole mined area were to be owned by the proponent rather than leased from individual landowners.

15.1.7 Rehabilitation strategy

SS5 provides a possible rehabilitation and revegetation strategy. This is based on around 80% of the mined area being returned to agricultural use and around 20% being revegetated with native vegetation.

The rehabilitation consultants have suggested the following as a possible native revegetation strategy – refer SS5, page 42.

- *Re-establish some of the larger dunes (say 5 per cent of total mined area = 200 ha). These may be in their original, pre-mine location, or nearby, depending on mining requirements.*
- *Eliminate small dunes and lake-lunette complexes, burying sand below subsoil in Murra Warra or Kalkee clay soil areas, leaving a*

clay plain (say 10 per cent of total mined area = 400 ha). In earlier years, the Donald soils can be used in the rehabilitation of stockpiles, thereby providing the appropriate soil for the native vegetation which requires lighter soil and better drainage.

- *Establish several wetland areas for flood control. Size and location derived from hydrological investigations combined with mine planning (say 5 per cent of total mined area = 200 ha).*

The recommended strategy would result in the approximate relationships between soil systems and revegetation type as shown in the following table. This table is based on information in Table 9 in SS5.

Table 14 Proposed approximate percentages of land use pre and post mining

Soil system	Pre-mine agriculture	Post-min agriculture	Pre-mine native vegetation	Post-mine native vegetation
Kalkee	5%	5%	0%	0%
Murra Warra	77%	65%	3%	15%
Donald	13%	10%	2%	5%
Total	95%	80%	5%	20%

15.1.8 Re-establishment of agricultural land

Section 5 of SS5 provides a great deal of information and guidance for the re-establishment of agricultural land. The following are summaries of some of the more important aspects of the information.

The upper surface of the returned overburden needs to be shaped to provide the necessary surface drainage flows in the area. Subsoil and topsoil need to be returned with the preferred timing being late autumn to early winter so as to avoid handling wet soils. These soil components need to be replaced with relatively constant depths over the mined out area and with the actual depths depending on the soil system being replaced. Shallow ripping is also desirable, especially on areas where stockpiles and internal roads have previously been located.

The rehabilitation consultants recommended that during the replacement of soil, gypsum be mixed with the subsoil and with the topsoil at recommended rates. The addition of gypsum improves soil structure and can have a marked effect on sodic soils due to the replacement of the sodium on the soil colloids by calcium from the gypsum.

Immediately after the return of the soil, pasture or a cover crop should be sown. A mixture of legumes and oats or other cereal could be sown for hay, grazing and turned in as green manure. This first vegetation cover is aimed at restarting the biological processes in the soil, eg increase in soil biota, and opening up the soil through the penetration of plant roots. The process can be repeated in the second year when with under-sowing with legumes, eg medics, lucerne, vetches, etc. to increase the nitrogen status of the soil. From the third year onwards, cereal crops can be grown and the cropping regime can revert to those typically used in the area.

Comparing the productivity of the rehabilitated soil with similar land nearby to show the efficacy of the rehabilitation will not be easy. Comparing the pre-mining productivity of an area of land with its productivity post-mining is even more difficult. Plant growth is very dependant on rainfall timing and amount and no two years are likely to be the same. Of special importance is the difficulty of comparing the more variable yields on undisturbed land with its varying topography with land with much less variability in elevation due to the rehabilitation processes.

SS5 provides specific commentary on the range of monitoring methods that might be used to demonstrate the effectiveness of the rehabilitation of agricultural land – refer sections 6.7 and 6.8. The following is a very brief summary of some of the information provided.

Monitoring will be frequent in the first year or two, eg quarterly assessments of plant growth. The reality is that it may take several years of comparison to show that there is no difference between unmined and mined areas. Similarly, it will be difficult to clearly demonstrate that the rehabilitated mined areas are superior to un-mined areas that are affected by soluble salts, toxic boron levels and the presence of sodicity. If the rehabilitation process occurs when rainfall is plentiful, it is likely that the land could be available for return or sale to farmers during or after three years. The occurrence of drought conditions will almost certainly delay the satisfactory completion of the rehabilitation and therefore defer any change in land ownership.

15.1.9 Re-establishment of native vegetation

Section 6 of SS5 provides a great deal of information and guidance for the re-establishment of native vegetation land. The following are summaries of some of the more important aspects of the information.

The aim of the re-establishment of native vegetation is the restoration of the five EVCs that originally occurred in the area - Plains Woodland, Plains Savannah, Low Rises Woodland, and Black Box Lignum Woodland. It is

suggested that the implementation of the previously mentioned rehabilitation strategy might result in the following – refer SS5 page 50:

- *Clay Plain (50%), mostly Murra Warra soil; Kalkee soils mainly retained for agriculture. EVCs Plains Woodland and Plains Savannah*
- *Wetlands (15%), Murra Warra soil system. EVC Black Box Lignum Woodland.*
- *Dunes (35%), Donald soil system (includes some lunette lakes/swamps). EVCs Low Rises Woodland and Ridged Plains Mallee*

Propagation of the native species depends on the species involved. It may be by seed, cuttings or division of plant material and the propagules need to be sourced from localities in the project area or within 10 km of the area. For those species where propagation by the above methods do not work or is difficult, transplanting of existing plant material will be needed. Seed collection may require sampling over a number of years and germination of different species may vary. In some species seed of various ages will be viable while for other species the seed must be "fresh" in order to obtain germination.

The handling of native vegetation soils will be the same as for agricultural soils except that the cover grown on the stockpiles will not be agricultural plant species.

Revegetation must aim at including all the species within the relevant EVC with special attention to those species that are listed as endangered or vulnerable on the National or State lists. Planting of rootstock is best done in early winter when soil moisture is adequate but in dry years watering will need to be applied to provide sufficient soil moisture. Protection of the young stock by the use of guards will be essential to prevent attack by rabbits and hares.

SS5 provides specific commentary on the range of monitoring methods that might be used to demonstrate the effectiveness of the rehabilitation of land for native vegetation – refer sections 6.7 and 6.8. The following is a very brief summary of some of the information provided.

Unlike the rehabilitation of agricultural land, it will be a number of years before the native vegetation rehabilitation can be classed as successful. It is clear that this process is a long one and like the rehabilitation of agricultural land, the occurrence of drought will delay the process. To assess the success of the rehabilitation of the EVCs, the existing DSE assessment procedures

using habitat-hectares will be a useful tool. However an intensive monitoring regime will be needed, involving regular inspections of the rehabilitated sites. Initially, inspections on a quarterly frequency will be needed and then moving to less frequent inspections, eg half-yearly. Surveys of flora and fauna will form part of the assessment of the rehabilitation and inspections and remedial actions will need to continue until the agreed criteria for the re-establishment of the EVCs is reached.

15.1.10 Other rehabilitation matters

The **tailings storage facility** will required special rehabilitation treatment to ensure that the saline material in the tailings is not disturbed or allowed to affect plant growth on the surface of the mounded area. Because of the mounding and the relatively steep side slopes of the rehabilitated surface, the tailings storage facility will not be suitable for agriculture. The area is to be revegetated with native species.

The construction of **pipelines for delivery of water** to the mine site will require consideration of potential impacts on native vegetation, including along roadsides. The preferred route for pipelines is on cleared farming land so as to avoid vegetated roadsides. Techniques such as minimising the width of clearing for pipe laying could be used to avoid removing or damaging high quality vegetation. The period of stockpiling of disturbed soil should be relatively short but soils will need rehabilitating as needed, eg use of gypsum on agricultural land.

15.2 Issues

Rehabilitation issues identified by the proponent, the proponent's rehabilitation consultant, submitters and the Inquiry include:

- the adequacy of the proposed measures to successfully rehabilitate land; and
- the effect of the ownership of the land on the proposed rehabilitation options and strategy.

15.2.1 The adequacy of the proposed measures to successfully rehabilitate land

A few submitters, some of whom were local farmers, expressed general concern that once the soils were disturbed there would be difficulty in reinstating them. This included the potential for soils exhibiting undesirable layers containing soluble salts, boron and sodicity to become mixed with other soils. Some of the submitters were concerned about soil moisture and changes in groundwater flows and the potential for salinity. In addition,

concern was expressed about the potential for saline water to impact on soils through spillage from pipelines, use of saline water for dust suppression and the migration of salinity upwards from the sub-surface.

The following are the longer submissions together with responses from the proponent and/or the rehabilitation consultants.

The DPI raised several matters in its original submission and in its presentation to the Inquiry. The following are matters that relate specifically to rehabilitation:

> *DPI notes (EES Section 6.14.3) that saturated saline fines will be placed in the tailing storage facility and that the rehabilitation method involves capping of the fines with 1 m of sub soil and 0.2 m of topsoil followed by revegetation with grasses, trees and shrubs.*
>
> - *Comment: DPI will require DMS to demonstrate in the work plan that 1.2 m of capping materials will be sufficient to avoid soil salinisation. The work plan will also need to include a monitoring program for the early stage of the project to confirm that soil salinisation is not occurring.*
> - *Comment: DPI will require a commitment to develop completion criteria to determine when rehabilitation has been achieved to the required standard in the rehabilitation plan as part of the work plan.*
>
> *DPI notes (EES Section 6.13) that the soils have boron and other toxicity issues at certain points in the soil profile. This material could inhibit rehabilitation if it is placed in the root zone. Therefore, careful management of soils and subsoils will be essential to ensure materials are not placed inappropriately.*
>
> - *Comment: DPI will require robust materials management controls in the work plan for problematic materials. This could include written procedures for the stripping, monitoring (soil quality and chemical characteristics), storage, recovery and reuse of soils and subsoils, training and induction for operators and arrangements for auditing.*
>
> *DPI notes (EES Section 6.13) that soils have been mapped and considers this will provide a good baseline for future reference.*
>
> *DPI notes (EES Section 6.14.3) that DMS has adopted DPI's* Environmental Guidelines for Management of Tailings Storage Facilities *and considers this appropriate. These guidelines address the design, construction, use and closure of tailings storage and handling facilities and DPI will assess the relevant aspects of the work plan against the standards set out in them.*

> *In the EES (EES Section 6.14.3), DMS proposes the gathering of native seed from within 10 km of the mine site. If this area is not big enough to get sufficient seed from in practice, it may be possible to extend the area of seed collection in consultation with DSE.*

The proponent's response was that they agreed with the DPI about the matters raised and that they would be included in the rehabilitation section of the work plan.

The Northern Grampian Shire Council in its original written submission stated the following:

> *The rehabilitation of the land to productive use is an imperative that DMS need to focus on. With an overall project life in the order of 25 years, the progressive rehabilitation would need to be scheduled to occur at the earliest convenience following the completion of the extraction activities, so as to minimise the timeframe required for the land to recover.*
>
> *DMS have developed a very good report on the plans to sequentially reinstate the layers of subsoil and topsoil. Also the addition of chemicals in the lower levels will allow for better water movement through the arable layers.*
>
> *It is anticipated this will address the concerns on compaction and its effects and remedial actions around surface water.*
>
> *The community are wanting reassurance that DMS will address the rehabilitation strategically so the long term operation of the area for cropping or similar is available.*
>
> *Also that the native vegetation rehabilitation will be addressed in the best interest of the native vegetation, to achieve net gain.*

The Wimmera Catchment Management Authority supported the management of the land for a return to agriculture with a 20% cover of native vegetation including the establishment of several wetland areas of Black Box Lignum Woodland. The Authority also supported the approach of sourcing propagules from within the project area and immediate surroundings.

Mr Gil Hopkins was concerned about soils and rehabilitation and provided the following comments:

> *I am concerned that the plans for rehabilitation of the mined area are inadequate. There are other mineral sand mines in the Wimmera with better plans. The land should be able to be left in better condition than the original. There needs to be greater recognition of replacing the strata*

in the correct order, without disturbing local and regional surface water and groundwater flow patterns.

There needs to be greater concern and planning for major storm events and effects on rehabilitation processes, and on slurry transfer.

There needs to be greater recognition of the disturbance that groundwater piping and slurry piping will have on soil and landscape, and biodiversity, and how these should be replaced and renovated/rehabilitated. We need to see the recommendations from the DSE in this regard.

All across Victoria there are abandoned mine sites. Extremely strong controls and restoration agreements are essential to prevent abandoned works occurring again.

The response by the proponent was that it *"is confident of the planned rehabilitation. It has been addressed in Section 6.14"*. The rehabilitation consultant provided an additional response as part of the expert witness statement:

Mr Hopkins raised concerns about the experience of the rehabilitation not being adequate to handle rehabilitation at the DMS Project. Both Mr Smart and myself have been involved (with) *all the rehabilitation plans for mines in the Wimmera, namely CRA Drung WIM 150 rehabilitation and an ongoing role with Iluka Resources Ltd., as they progressively rehabilitate the Douglas mine. We have prepared a rehabilitation proposal for the mineral sands mine at Mindarie, near Loxton in South Australia. I proposed a rehabilitation plan, accepted by the EES Panel for the Murray Valley Titanium Wemen mine near Robinvale.*

Mr Michael Burchell made a submission on rehabilitation as per the following:

In its EES report Donald Mineral Sands (DMS) has accessed information from "The Preliminary Study of Soils associated with the WIM 200 and WIM 250 Mining sites in the Yarriambiack Shire" by Alan Bedggood, Victorian Institute for Dry land Agriculture, Horsham Victoria. DMS acknowledges 'the presence of high levels of soluble salts and boron at relatively shallow depths'. In his publication, Bedggood states that 'the issues of salinity, sodicity and high pH will also impact on the ability to rehabilitate the sites if they were to be mined' (P.37, Appendix 9, Mineral Sands in the Wimmera). Bedggood goes on to add 'issues relating to these subsoils include:

- *The complete removal of the stockpiles from underlying topsoils (where that occurs) to present surface crusting and sealing, preventing water infiltration and crop emergence*
- *Rainfall runoff carrying the salts from subsoil stockpiles onto neighbouring topsoils*

The presence of Boron in the subsoils will also be of concern once they are brought to the surface and prone to rain induced erosion. Being readily soluble, the Boron will carry to neighbouring soils, with the potential to cause plant toxicity problems'.

There is also 'the concern of a property inheriting soils from some distance away' and 'concerns about property values and or compensation may arise'.

Given the scale of the proposed operation and the associated potential for mismatching of soils and the fact that historical data of rehabilitation sites drastically changed soil structures post mining, I submit that contrary to the assertions made by DMS, productivity of rehabilitated areas will be diminished.

The proponent disagreed and stated that these matters had been addressed in sections 6.13 and 6.14 of the EES and would be further discussed by the rehabilitation consultants at the hearing. At the hearing the rehabilitation consultants stated:

The points raised by Mr Burchell are at the centre of our approach to rehabilitation. The separation of toxic or problematic materials from the topsoils and subsoils not toxic to plants is the first priority in stripping these soils and returning the land to agriculture.

In more general terms, the rehabilitation consultants advised in their expert witness statement:

We recommend that all soil horizons with high boron or soluble salts be removed and placed in the post-mining soil profile, below normal rooting depth of crops and pastures. As previously outlined, systematic soil sampling to a depth of at least one metre should be carried out pre-mining to determine the location of toxic levels of boron and soluble salts in the soil profile. Recent work by Dr James Nuttall, DPI Horsham, Victoria has shown that in the soils found at the mine site there is a good correlation between salinity, boron and sodicity in soils, which indicates that rapid testing for these conditions is possible prior to the removal of the soil horizons for mining.

Mr Harold Flett's submission contained several matters, particularly matters relating to soil in the rehabilitation process. The following are some of the points made by Mr Flett:

> *The Donald soil system is a complex system, which, unlike the other landforms, consists of several distinctly different landforms and corresponding soils, such as lunettes, lakes, swamps and linear dunes. Because of this complexity, these separate units must be mapped immediately prior to mining to ensure that detailed plans for soil management and rehabilitation can be prepared.*
>
> *First point of concern is that the soil types intertwine with each other, in random pattern [see EES maps], whereas the mining process will be rectangular in plan, and effected by heavy earthmoving equipment. This type of equipment, even if guided by computer driven laser depth control, works mainly in straight lines, taking am even 'cut' of the soil it proceeds.*
>
> *While the EES covers the soil types and their composition in great detail, it does not give any practical examples of just how the earth moving machinery can deal with the infinite variation of the layers of soil just below the visible surface.*
>
> *In fact, under 6.4.13, Proposed Rehabilitation method, P. 6-153 under the heading Pipeline route, there is a statement that proves completely the reverse, that the writer of this section has no knowledge of earthmoving equipment and what can be achieved with it. I quote, "However, where the pipeline passes through a well vegetated area, this can be lifted like turf by a front end loader and relaid following construction. This is impossible, given the mode of action of a front end loader, and this once again raises the issue of credibility.*

The proponent disagreed with the points made by Mr Flett and referred him to Section 6.14 and advised that these matters would be further discussed by the rehabilitation consultants at the hearing. With regard to the Donald land system, the rehabilitation consultants stated at the hearing:

> *Mr Flett pointed out that the area involved in the project is noted for its wide variation in soil types. We believe that we have covered these concerns in Study 5 Rehabilitation Assessment. We have stressed throughout the Assessment that the various soil horizons must be accurately identified prior to mining and managed according to the agreed procedures fro stockpiling, burial of toxic layers, or stripped and returned to the mine path as the process continues.*

They also advised that:

> *The land forms of the Donald Land System, pose challenges to existing agriculture because the dunes occur irregularly in paddocks and across farm boundaries. The mining operation provides an opportunity to consolidate these areas into larger units and disperse the smaller dunes within the profile. We recommended this method of handling the dunes and farmers were generally supportive of these recommendations.*

Mr Warren Funcke, an affected landholder within the mine area, was concerned about measuring rehabilitated agricultural land.

> *I would like to take this opportunity to express my concern that the Water Use Efficiency method has not been used as a tool to determine successful rehabilitation of the land to pre-mining production levels.*
>
> *This is a recognised Department of Primary Industries methodology to allow Y o Y productivity comparisons. I feel the advantage in the use of this methodology is that it removes the seasonal and economic variations from the equation, thus providing a clearer picture of grain production per millimetre of rain.*
>
> *These measurements need to be taken on all individual farms to be mined, starting with this growing season. Although, based on current estimated timelines for mining, this does not allow for an accurate picture for land involved in the first years of mining activity, the commencement of these measures will provide clear data for later rehabilitations.*
>
> *For farmers returning to their land after mining, or for those coming onto this land in the area for the first time, this data is mandatory if we are to have a full and accurate understanding that rehabilitation to prior agricultural productivity levels has been successfully delivered by Donald Mineral Sands.*

At the inquiry hearing, the rehabilitation consultants responded to Mr Funcke as follows:

> *WUE* (Water Use Efficiency) *can be used for this purpose using existing data from paddocks on farms to be mined if the farmer keeps comprehensive records of rainfall, growing season rainfall and production inputs, along with any impacts of pests and diseases on the crops. WUE can be affected by the management decisions taken by individual farmers. However DMS may chose to use WUE as it rehabilitates the farmland post mining, so that future managers can use the data to judge the impact of the mine on the productive potential of the farm.*

A few submitters were concerned about the quality of water to be used for dust suppression. The proponent advised that it is committed to using low-salt water for dust suppression of topsoil stockpiles.

Mr Bartley, representing the proponent advised the Inquiry during the hearing that:

> *Rehabilitation has been addressed in the EES and the expert evidence presented to the Inquiry. Rehabilitation is being undertaken using techniques used on a number of recent projects (eg Wemen, Douglas).*
>
> *The rehabilitation requirements will be secured by means of a bond and the requirements of the Work Authority and approved work plan. There is no reason to suggest that the rehabilitation will not be carried out appropriately or will lead to unacceptable outcomes.*

In the proponent's closing submission, Mr Bartley summarised the rehabilitation process as follows:

> *There is no single measure of rehabilitation success. Even without disturbance no two years of cropping results in the same productivity. Weather is an important driver of crop productivity and its constant variation alone makes comparing crops year to year difficult. In addition to weather variation, crop varieties, fertilizer application rates and management systems change.*
>
> *To ensure that the soil is returned post mining to as a productive state as pre mining several soil and farming parameters will be measured and recorded prior to topsoil removal including but not exclusively: soil analysis of existing soil make-up, farm data/records, management systems, fertilizer records and rainfall.*
>
> *With regard to pre and post mining records – water use efficiency measures the actual yield per hectare against growing season rainfall under ideal management conditions. It is specially designed to measure farm practices and does not take into account the effect of rain at different times in the season which can also be a driver of crop success. It may however be useful to compare the actual yield of crops with yields of neighbouring properties containing the same soil type.*

A number of other points were included in the proponent's closing submission and some of these are listed below:

- *The changes in soil parameters are predictable ….. but the actual degree of change will vary.*
- *Must remember that no two years are the same weather – crops and varieties, and management systems change; therefore direct*

comparison is not possible, e.g. wheat yields have increased around 4% per year for the last 50 years. This may continue or not, because of climate change.

- *Recommend a monitoring program as in the rehabilitation report.*
- *Costean backfilled by CRA was badly done i.e. lumps of saline clay at the surface; no gypsum applied. Despite this, a barley crop was stunted; dry matter was lower but grain yield was not statistically different from the undisturbed paddock on same soil type (Longerenong College);*
- *All the evidence suggests that productivity would be just as good as the unmined land based on the experience already gained from the surrounding Mallee and overseas;*
- *DMS propose to use techniques that have been proven on other sites. There will be monitoring each year and action taken as necessary;*
- *The ERC could play a role in this. Possibly a subgroup of local farmers or landowners could be established.*

15.2.2 The effect of the ownership of the land on the proposed rehabilitation options and strategy

The rehabilitation consultants have clearly identified that the land ownership is a crucial factor in implementing their proposal for 20% of the land area be rehabilitated for the re-establishment of native vegetation. If all the land was to be owned by the proponent, there would be fewer difficulties in attaining the desired 20% native vegetation.

If the land were owned by several landholders, the desires of the landholders would need to be respected and could have a significant impact on endeavours to achieve the 20% land for native vegetation.

The rehabilitation consultants were aware of the potential complications of landownership to the fulfilment of the proposed strategy. They made the following comments on this matter in SS5 on page 42:

> *[As] This recommended strategy involves rehabilitation of significant areas, across several farms and the establishment of drainage lines, wetlands and vegetation zones across these farms. If possible, it is recommended that the farms be purchased from the existing growers, rather than leased. This will provide the Company with maximum flexibility in determining the future landscape of the farms and the total project area. Drainage off, through and from the project area can only be managed effectively on a project-wide basis. This will become a serious*

issue in later years if the issues of swell, mine advance and existing drainage patterns are not correctly managed.

A further comment on land ownership appeared on page 43.

In the event that a property can only be leased rather than purchased then several issues arise, which are exacerbated when large areas are to be mined as opposed to strandline mining. These include:

- *Stockpiling so that soils can be replaced in their original locations*
- *Increased difficulty in constructing original landform*
- *Management of swell/settlement to ensure original elevations are maintained long term*
- *Problems with long term stockpiles, which may be in place for many years*
- *Increased complexity in retaining original soils within correct property boundaries.*

15.3 Inquiry response

15.3.1 The adequacy of the proposed measures to successfully rehabilitate land

While the recommended procedures for the rehabilitation are very comprehensive and detailed, the Inquiry was somewhat surprised that more specific evidence wasn't presented on the success (or otherwise) of recent rehabilitations carried out in the Wimmera and elsewhere. In saying this, the Inquiry is mindful of the commentary in SS5, eg the statement on page 7:

Based on experience in the Wimmera and Mallee, we believe that mined land can be successfully returned to agriculture in three to five years, the actual time depending very much on the weather; for example, in drought conditions there is minimal plant growth. Therefore there is minimal restoration of soil structure, organic matter and biota, while soil conditioners such as gypsum are ineffective in the absence of water.

Again, on page 8, the comments are:

There is significant experience of rehabilitating costeans and similar excavations in the Wimmera, following the work of CRA/Rio Tinto at WIM 150, and in the Mallee. The former Wemen mine of Murray Basin Titanium (now Bemax) is in the Mallee and, while soil and climate are somewhat different, that site is in the process of being successfully rehabilitated to cropping in more challenging Mallee conditions. Revegetation of mined areas with indigenous species has been practiced

> *in Central Victoria for almost twenty years, while in recent years there has been extensive experience of establishing native vegetation in the Wimmera. Based on this experience, no difficulty is envisaged in successfully rehabilitating the Project Area either to agriculture or re-establishing indigenous vegetation where required.*

These comments are very reassuring to the Inquiry. However the Inquiry would have liked to have seen some more specific information about the results of previous rehabilitation work, especially with regard to native vegetation. Such information would have been useful in answering commentary by some of the individual submitters who questioned the success of previous rehabilitation efforts by the mining industry.

The Inquiry does not take the view that this lack of information about previous rehabilitations is a serious criticism of the SS5. Rather, the comments are made to emphasise the desirability to have relevant actual data as well as the detailed proposed actions and associated recommendations.

In an overall sense, the Inquiry acknowledges the detailed advice provided to the proponent by the rehabilitation consultants and accepts that it forms a sound basis for rehabilitation. The series of issues raised in the EES have in the Inquiry's view been adequately addressed:

- Donald land system;
- acid generation;
- soil compaction;
- soil swell and drainage; and
- salinity and other soil conditions detrimental to plant health.

The ability to effectively segregate the layers of soil (predominantly subsoil) that contain soluble salts, toxic boron levels and sodicity appears to the Inquiry as probably the most controversial matter raised in submissions. The rehabilitation consultants are very positive about being able to use a system based on soil sampling to identify these undesired layers of soil. The statement by the consultants that is especially relevant was provided in answer to a submission and is repeated here:

> *Recent work by Dr James Nuttall, DPI Horsham, Victoria has shown that in the soils found at the mine site there is a good correlation between salinity, boron and sodicity in soils, which indicates that rapid testing for these conditions is possible prior to the removal of the soil horizons for mining.*

The Inquiry also recognises that these phytotoxic layers have occurred in soils in other sand mining rehabilitations. It would have been useful for the Inquiry to have heard about the effectiveness of the segregation procedures used in these rehabilitations.

The proponent and the rehabilitation consultants have in the view of the Inquiry effectively answered the concerns raised by the submitters. This does not mean that the matters raised were unimportant. What it does mean is that the judgement by the Inquiry is that these concerns can be effectively managed to achieve the desired outcome of successful rehabilitation. The effective management will depend on the commitment by the proponent, the supervision by the DPI and the independent overview by the Environmental Review Committee, which the Inquiry assumes will be established.

The Inquiry notes that the DPI requirement for a commitment to develop completion criteria to determine when rehabilitation has been achieved is applicable to both agricultural land and native vegetation land. It is especially pertinent to native vegetation land because of the long term nature of this type of rehabilitation.

The view of the Inquiry is that further work will be needed to expand the generalised rehabilitation criteria contained in SS5. This especially applies to native vegetation in general and the re-establishment of the EVCs in particular. The Inquiry has observed that while there are a range of matters considered in SS5 in sections 6.7 and 6.8, the criteria for assessing rehabilitation are not provided in any detail. While the detailed description that identifies each EVC should supply an "end point" for their re-establishment, criteria are needed for evaluating the progress of the rehabilitation toward that "end point".

The Inquiry expects that the criteria for the rehabilitation of agricultural land will be less complicated (but not necessarily less controversial) than the rehabilitation of land for the re-establishment of native vegetation.

The inquiry agrees with the DPI that the rehabilitation of the tailings storage facility is a concern. Testing of the salinity in the upper layers of the deposited tailings and its potential to migrate should indicate whether a thicker cap than the proposed 1.2 metres is needed. This will certainly be important if deeper rooting shrubs and trees are used in the rehabilitation of the TSF as is currently planned. At the same time there is a need to prevent any potential drainage of saline drainage from the facility impacting any surrounding land.

15.3.2 The effect of the ownership of the land on the proposed rehabilitation options and strategy

There is no doubt in the Inquiry's view that the rehabilitation consultants would have preferred to have known what land was owned by whom and under what conditions. This probably would have enabled them to make clearer and more definite recommendations for rehabilitation and perhaps an initial site rehabilitation plan.

While the rehabilitation consultants believe their rehabilitation proposal is flexible enough to meet varying expectations of landowners, the Inquiry is not so convinced. The Inquiry is concerned that these different expectations may well clash with other components of the rehabilitation plan. Will landowners be willing to share the idea of native vegetation increasing from approximately 5% of the area to 20% and a commensurate reduction in agricultural land, if its effect is to excise a considerable area of their agricultural land? However, if the proponent owns much of the mined land, the preferences of other landowners will have less of an impact on reaching the 20%.

The Inquiry notes that the proponent advised the inquiry during the hearing that it did not have a "set policy" on the matter of land ownership but would work with landowners in a practical way to sort out the matter.

The Inquiry is not aware of the makeup of the ownership of the land to be mined or of the conditions where land will be leased by landowners to the proponent. This is a variable that the proponent and the rehabilitation consultants will need to deal with in developing the rehabilitation plan. The 20% objective may or may not be achieved. Irrespective of what the ultimate percentage is, the Inquiry expects that there will be a substantial net gain with respect to native vegetation re-establishment in the area.

15.4 Findings and recommendations

The Inquiry finds that:

- **The basis of the proposed rehabilitation, with its emphasis on soil systems, appears sound;**
- **The proposed methods to remove soluble salts, toxic levels of boron and sodicity and bury them in the mine void well below the rehabilitated soil surface appear practical but close supervision by staff with rehabilitation expertise will be needed;**
- **The rehabilitation of the tailings storage facility requires further assessment to determine the most appropriate depth of the cap over the tailings;**

- **There are realistic expectations that rehabilitated agricultural land will be as productive after a few years as the land was prior to mining and that land affected by materials detrimental to plant growth has the opportunity for its productivity to be improved above pre-mining levels;**
- **Rehabilitating land for the re-establishment of native vegetation should be successful; and**
- **The current lack of certainty about the ownership and/or leased status of the farm land to be affected by the mining, has made it more difficult to finalise a rehabilitation plan.**

The Inquiry recommends that the Work Plan not be approved unless it contains:

- **An adequate rehabilitation plan for agricultural land and native vegetation land based on the information and guidance provided in the report *Rehabilitation of Donald Mineral Sands Project;***

The Inquiry recommends that:

- **The DPI recommend to the Environmental Review Committee (ERC) when established, that the ERC consider the establishment of a sub-group of local farmers or landowners to participate in the evaluation of the assessment of the productivity of rehabilitated agricultural land.**

PART C: EVALUATION AND ASSESSMENT

16. TERMS OF REFERENCE

16.1 POTENTIAL ENVIRONMENTAL EFFECTS

The Inquiry's terms of reference require it to:

- inquire into and make findings regarding the environment effects of the proposed project, including impacts on relevant matters under the EPBC Act; and
- recommend any modifications to the project as well environmental mitigation and management measures that are needed to achieve acceptable environmental outcomes.

Below are the Inquiry's key findings and additional mitigation and management measures recommended to address the potential environmental impacts:

16.1.1 Water

Findings

- Given the implementation of the surface water management measures proposed and the application of guidance provided by EPA Publication 480 *Environmental Guidelines for Major Construction Sites*, impacts on surface waters will be acceptable;
- The establishment and use of infrastructure required to deliver water to the site could be achieved without unacceptable impacts and the requirement for a planning permit can be reasonably expected to result in adequate protection of the environment;
- There is no legislative barrier to the supply of water from the GWM Water system and the prohibition of the use of this relatively high quality water at the site would not result in an increase in the amount of such water being made available for protection and enhancement of rivers and lakes and, even if it did, the difference made to the condition of the rivers and lakes would be negligible;
- The impacts of extracting water from the Avon Deep Lead have not been quantified but such quantification would be required in support of and application for the necessary groundwater extraction licence;
- There are reasonable expectations that the water required could be extracted from the Avon Deep Lead without unacceptable adverse impacts and that the requirements of the groundwater extraction

licence application process can be expected to prevent the grant of a licence unless environmental protection is assured;

- Predictions of the following are credible but require confirmation by actual performance monitoring:
  - Impacts on groundwater levels at and around the proposed mine site during and post mining;
  - The separation distance between the slimes layer in the backfilled pit and the ground surface;
  - The fate of water and salt to be added to the mine pits during backfilling; and
  - The unlikelihood of development of a perched watertable above the slimes layer in the backfilled mine pits that would approach the root zone.
- As a result no adverse impacts are expected to result from the disposal of saline slimes in the backfilled pit or the changes to groundwater levels during or post mining;
- Impacts on groundwater quality, in terms of salinity and addition of chemicals, will not affect the beneficial use of the groundwater;
- Additional information is required to enable assessment of potential impacts of reactions between constituents of the groundwater and those of the water to be added to the groundwater;
- A comprehensive groundwater level and quality monitoring program is required, should be included in the Work Plan and evaluated prior to approval of that plan;
- Implementation of the groundwater monitoring program and the results produced by that program should be independently audited annually;
- The Environmental Review Committee provides an appropriate forum for:
  - reporting of groundwater monitoring results;
  - input from government departments, authorities and the community required to enable performance assessment by the DPI; and
  - communication to and from the community via the community representatives.

Additional mitigation and management recommendations

- That the Work Plan not be approved unless it contains:
  - Predictions of the following that are in general accordance with predictions provided in the EES:

  - The maximum extent of the area over which groundwater levels will be reduced during excavation of material from the mine pit;
  - The maximum level of the watertable in the area of the pit at anytime up to 5 years after pit backfilling is completed;
  - The minimum separation of the top of slimes layer in the backfilled pit and the surface level; and
  - The minimum separation of upper surface on any perched watertable that may form above the slimes layer in the backfilled pit and the surface level.
- A monitoring program that will enable testing of each of the above predictions; and
- A prediction of the results of any reactions between the constituents of the groundwater and that of water that may be added to the groundwater and the impacts of any products of such reactions.
- The following be included in the conditions attached to the approval of any Work Plan:
  - Sediment management will be conducted in conformance with EPA Publication 480 *Environmental Guidelines for Major Construction Sites;* and
  - The licensee shall cause an audit to be conducted of the implementation of all aspects of the groundwater monitoring program described in the Work Plan and the results of that program with reference to predictions of impacts included in the Work Plan, with one year from the date of approval and then within one year of the date of the previous audit. The audit will be conducted by an Appointed Environmental Auditor under section 53S of the *Environment Protection Act* 1970 and will provide an audit report to the all members of the Environmental Review Committee and other parties as is directed by the District Manager.

16.1.2 Biodiversity and habitat

Findings

- The decision by DMS to almost halve the size of the project and not proceed with the mining of the southern area will avoid existing, more extensive native vegetation remnants;
- Despite the removal of native vegetation that will not be avoided, there is local and State policy support for sand mining to occur in the area provided environmental matters are addressed;

- Having regard to the Framework's requirements, the Inquiry considers that removal of vegetation of both very high conservation significance and high conservation significance is justified because of:
  - The economic significance of the project (which is estimated to be $750 million) and other socio-economic benefits of the project to the region;
  - The extent of the native vegetation to be retained, including the remnant patches in the southern area of the superseded project area and the two remnant patches within the proposed project area;
  - The prospect of retaining other remnants on the perimeter's of the mine's footprint; and
  - The provision of offsets, whilst still to be finalised, will be able to be achieved.
- Ecology Partners for DMS has identified a range of measures to minimise the extent of native vegetation removal, which satisfies the Native Vegetation Framework's guidelines;
- Further details of measures to minimise native vegetation losses should be included in the EMP's Native Vegetation Management Plan;
- The offset calculations developed by Ecology Partners are in accordance with the Framework's guidelines, and is satisfied with DMS's response to the concerns raised by the DSE;
- The project will not have a significant impact on any listed threatened species or communities under the EPBC Act provided the relevant mitigation measures identified by Ecology Partners are implemented; and
- The draft EMP contents tabled by DMS include the relevant matters relating to biodiversity and habitat, and should be included in the Work Plan.

Additional mitigation and management recommendations

- That the Work Plan not be approved unless the EMP contains:
  - Construction Environmental Management Plan
  - Vegetation Management Plan
    - Native Vegetation Offset Management Plan
    - Native Vegetation Management Plan
    - Weed Management Plan
  - Wildlife Management Plan
  - Pest Management Plan

- That the Victorian Minister for Planning advise the Commonwealth Minister for Environment, Water, Heritage and the Arts that the Donald Mineral Sands project will not have a significant impact on any listed threatened species or communities under the EPBC Act provided the relevant mitigation measures identified by the proponent's flora and fauna experts are implemented.

16.1.3 Air quality

Findings

- Input data used for dispersion modelling used to predict impacts on air quality and the results of that modelling show that predicted impacts from the proposed mining are significantly less than those from other, existing, sources;
- The results of the modelling predict that the concentrations in the air of:
  - PM_{10} and $PM_{2.5}$ and the rate of dust deposition can be expected to remain below the criteria specified in the *Protocol for Environmental Management – Mining and Extractive Industries* for those indicators;
  - respirable crystalline silica (RCS) as $PM_{2.5}$ and the products of the combustion of diesel fuel can be expected to be significantly below the criteria specified in the *Protocol for Environmental Management – Mining and Extractive Industries* for those indicators;
- The predicted margin by which compliance with the relevant criteria will be achieved provides significant confidence that emission control to achieve an acceptable result is possible;
- In order to satisfy the requirements of the *State Environment Protection Policy (Air Quality Management)* and the *Protocol for Environmental Management – Mining and Extractive Industries* the proponent needs to provide evidence in the Work Plan that the controls proposed for all relevant air quality indicators, as specified in the *State Environment Protection Policy (Air Quality Management)* are "best practice" and "maximum extent achievable" for indicators specified as Class 3 indicators;
- The proponent must develop a procedure that enables determination of the timing of the vacation of residences so as to avoid exposure of residents to air of a quality that is not in compliance with the relevant criteria specified in *Protocol for Environmental Management – Mining and Extractive Industries;* and
- Monitoring requirements specified in the *Protocol for Environmental Management – Mining and Extractive Industries* must be satisfied for:
  - compliance monitoring;

- monitoring for reactive management purposes; and
- monitoring of dust deposition as an indicator of site performance.

Additional mitigation and management measures

That the Work Plan not be approved unless it contains:

- Adequate information in the EMP to satisfy the requirements of the *Protocol for Environmental Management – Mining and Extractive Industries* to identify and evaluate "best practice" controls for all relevant indicators specified in the *State Environment Protection Policy (Air Quality Management)* and "maximum extent achievable" controls indicators specified as Class 3 indicators;
- A dust emission management strategy that includes actions that are considered "best practice" for the control of all relevant indicators specified in the *State Environment Protection Policy (Air Quality Management)* and "maximum extent achievable" control for indicators specified in Class 3 indicators;
- A procedure for determining the timing of the vacation of residences to avoid the exposure of residents of air of unacceptable quality, as specified in the *Protocol for Environmental Management – Mining and Extractive Industries;* and
- A compliance monitoring program in the EMP that satisfies the requirements of the *Protocol for Environmental Management – Mining and Extractive Industries*, including a reactive control strategy using real-time monitoring to prevent exceedances of air quality criteria at the nearest residences.

16.1.4 Greenhouse gas emissions

Findings

- Compliance with relevant sections of the Protocol for Environmental Management – Greenhouse Gas emissions and energy Efficiency should be required;
- The magnitudes of the proposed energy and water consumptions are such that the requirements of the Environment Protection (Environment and Resource Efficiency Plans) Regulations 2007 will need to be satisfied and participation in the Commonwealth's Energy Efficiency Opportunities (EEO) program will be mandatory;
- The greenhouse gas emissions from the mining activities are far greater than the emissions from the transport of HMC to a suitable port for export, around an order of magnitude greater;

- The much greater greenhouse gas emissions from the mining than from the transportation indicate that it is likely that there will be more opportunities for greenhouse gas reductions at the mine;
- If the Avon Deep Lead is to be used as a water supply, the energy used in extraction and pumping water will need to be included in assessments of greenhouse gases from the project;
- The information provided in the EES and supporting documents identifying and committing to "best practice" does not satisfy the requirements of the Protocol for Environmental Management – Greenhouse Gas Emissions and Energy Efficiency however these requirements will need to be satisfied in the Work Plan;
- On the basis of greenhouse gas emissions, the road/rail options for transporting the HMC to port at Geelong or Portland are clearly preferred over road but other factors such as cost and status of infrastructure could out-weigh the desire to use road/rail transport because of its lower greenhouse gas emissions; and
- The EES has provided minimal consideration of renewable (and alternative) energy supplies despite renewable energy being included in the Assessment Guidelines.

Additional mitigation and management measures

That the Work Plan not be approved unless it contains:

- An Energy consumption and Greenhouse Gas Emission Plan that demonstrates compliance, to the satisfaction of the EPA, with the requirements of the Protocol for Environmental Management – Greenhouse Gas Emissions and Energy Efficiency including the requirements to:
  - Estimate energy consumption and greenhouse gas emissions;
  - Identify and evaluate opportunities to reduce greenhouse gas emissions;
  - For on-going reporting to the EPA; and
  - Include a process providing regular review.
- A requirement in the EMP for plans to meet the requirements of both the Victorian Environment and Resources Efficiency Plans (EREP) and the Commonwealth Energy Efficiency Opportunities (EEO) programs when the relevant thresholds of energy use are reached;
- A Transport Management Plan that includes actions to be taken to investigate the option of transporting HMC to port by rail; and

- An Environmental Management Plan that includes actions to be taken to give consideration of the use of renewable and alternative energy supplies.

16.1.5 Noise

Findings

- Adequate protection of the acoustic amenity at residences will be achieved by:
  - Compliance with noise limits as specified in the *Interim Guidelines for Control of Noise from Industry in Country Victoria N3/89* (N3/89) during the Day and Evening as defined in N3/89; and
  - During the Night, as defined in N3/89, *c*ompliance with:
    - Noise limits specified in N3/89; or
    - A maximum noise level resulting in the noise level in any habitable room being 47 dB(A) or less; and
    - Application of guidance provided in section 12 of *Noise Control Guidelines* (TG302/92) including noise limits prescribed in that section.
- The noise assessment provided by the proponent and its acoustic consultant is adequate for the purposes of the Inquiry; and
- There is a reasonable expectation that recommended noise limits can and will be complied with and the ultimate consequences of non-compliance will be borne by the mine operator.

Additional mitigation and management measures

- The following be included in the conditions attached to the approval of any Work Plan:
  - The licensee must ensure that noise levels at any sensitive receptor not exceed the noise limits specified in *the Interim Guidelines for Control of Noise from Industry in Country Victoria* N3/89 except if the licensee provides the District Manager with a proposal for the substitution of a limit on the maximum noise level for the Night limit at a particular residence, or residences.
  - Any such proposal will:
    - Be for a limit on the maximum noise level outside the residence of no more than 62 dB(A);
    - Include evidence of the consent of the owner and/or occupier of the residence to the application of the proposed noise limit;

    - If the proposed noise limit is greater than 57 dB(A), include evidence that noise at the proposed limit will not result in a noise level in a habitable room of greater that 47 dB(A); and
    - Include details of a monitoring program that will enable demonstration of compliance, or otherwise.
- If the proposal is for a limit on the maximum noise level of 57dB(A) or less the District Manager will approve the proposal providing the he/she is satisfied with both:
    - The evidence of the consent of the owner and/or occupier; and
    - The adequacy of the proposed monitoring program, assessed in consultation with the EPA.
- If the proposal is for a limit on the maximum noise level of greater than 57dB(A) the District Manager will approve the proposal providing that he/she is satisfied with each of:
    - The evidence of the consent of the owner and/or occupier;
    - The adequacy, assessed in consultation with the EPA, of the proposed monitoring program; and
    - The evidence, assessed in consultation with the EPA, that noise at the proposed limit will not result in a noise level in a habitable room of greater than 47 dB(A).
- Once the proposal is approved the licensee must:
    - Ensure maximum noise levels at the residence during the Night do not exceed the approved limit; and
    - Implement the proposed monitoring program to the satisfaction of the District Manager.
- Management of noise emissions during construction activities, with such activities being defined by the District Manager in consultation with the EPA, will be in accordance with the guidance provided in Section 12 of *Noise Control Guidelines TG302/92* and resultant noise levels at sensitive receptors must comply with the limits described in the Schedule in that Section of the guidelines.

16.1.6 Radiation

Findings

- Providing risks associated with radiation are managed in accordance with management plans developed and implemented in accordance with the Code of Practice on Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (2005) and the Code of Practice for Safe Transport of Radioactive Material (2008),

potential impacts of radiation will be eliminated or reduced to a satisfactory level; and

- The radiation assessment provided in support of the EES is of sufficient accuracy, is adequate and provides conservative estimates of potential impacts, including those of radioactive dust emissions.

Additional mitigation and management measures

- The Department of Human Services either determine that a management licence under the *Radiation Act* 2005 is required or agree to act as the regulatory authority on matters relating assessment and compliance testing of management plans relating to radiation and radioactive materials;
- The following be included in the conditions attached to the approval of any Work Plan:
  - Prior to commencement of the production of heavy mineral concentrate the licensee will provide the District Manager with either:
    - A copy of a management licence issued by the Department of Human Service under the Radiation Act 2005 for the conduct of radiation practices associated with the mining, processing and transport of radioactive materials; or
    - A copy of a Radiation Management Plan, Radioactive Waste Management Plan certified by the Department of Human Services as being in conformance with:
      - The Code of Practice on Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (2005); and
      - The Code of Practice for Safe Transport of Radioactive Material (2008).
- If the operations are not subject to a management licence issued by the Department of Human Service under the Radiation Act 2005, then the Department of Human Services will act as the regulatory authority on matters relating to the assessment and compliance testing of management plans relating to radiation and radioactive materials.

16.1.7 Visual impact

Findings

- The project will result in significant visual impacts, particularly for some residences;
- The transitory nature of the mine will confine the visual impacts to relatively limited periods of time;

- Planting on the outside boundaries of the stockpiles and other attenuation measures will be important to reduce visual impacts; and
- DMS should provide the ERC with on-going reports on the mitigation and management measures addressing visual impact.

16.1.8 Roads, Traffic and Transport

Findings

- Expected traffic volumes generated by the mine are not significant;
- Significant improvements to local roads would need to be made to accommodate the safe movement of vehicles generated by the mine;
- The EMP should include a Transport Management Plan;
- The Transport Management Plan should include the range of matters in Northern Grampians Shire Council submission tabled at the Inquiry hearing;
- The Transport Management Plan should be developed by a working group comprising DMS, Yarriambiack, Buloke and Northern Grampians Shire Councils, VicRoads and relevant emergency service organisations; and
- DMS should continue its commitment to work with relevant State government departments to pursue the transport of HMC to port by rail.

Additional mitigation and management measures

- That the EMP not be approved unless it contains a Transport Management Plan;
- The Transport Management Plan include the range of matters in the Northern Grampians Shire Council submission tabled at the Inquiry hearing. These are:
    - An existing conditions survey of public roads in the vicinity of the mine facility that may be used for access, including details of the suitability, design and construction standard of such roads;
    - The designation of appropriate construction and transport vehicle routes to the mine facility;
    - The designation of vehicle access points to the mine from surrounding roads, including main roads access points to local access roads;
    - The designation of operating hours and speed limits of trucks on relevant routes accessing the site so as to avoid the time and routes of passage of school buses, and to provide for resident safety;

- Any necessary pruning of street planting or roadside vegetation to provide for transport of materials to the site, and pruning practices to be followed;
- The designation of vehicle accessways and car parking areas;
- The requirements of Over Dimensional Load permits and escorting of long large loads along roads in the area;
- The need for road intersection upgrades to accommodate an additional traffic or site access requirements, whether temporary or ongoing;
- A timetable for implementation of any pre-construction works identified to be undertaken;
- A timetable for regular inspections to be carried out during the construction period to identify maintenance works necessary as a result of construction traffic; and
- The use and development must be carried out in accordance with the endorsed Traffic Management Plan and the cost of any works including upgrades and maintenance are to be at the expense of the work authority holder.

- The Transport Management Plan be developed by a working group comprising DMS, Yarriambiack, Buloke and Northern Grampians Shire Councils, VicRoads and relevant emergency service organisations; and
- That the Work Plan not be approved unless it contains a Transport Management Plan that includes actions to investigate the option of transporting HMC to port by rail.

16.1.9 Rehabilitation

Findings

- The basis of the proposed rehabilitation, with its emphasis on soil systems, appears sound;
- The proposed methods to remove soluble salts, toxic levels of boron and sodicity and bury them in the mine void well below the rehabilitated soil surface appear practical but close supervision by staff with rehabilitation expertise will be needed;
- The rehabilitation of the tailings storage facility requires further assessment to determine the most appropriate depth of the cap over the tailings;
- There are realistic expectations that rehabilitated agricultural land will be as productive after a few years as the land was prior to mining and that land affected by materials detrimental to plant growth has the

opportunity for its productivity to be improved above pre-mining levels;

- Rehabilitating land for the re-establishment of native vegetation should be successful; and
- The current lack of certainty about the ownership and/or leased status of the farm land to be affected by the mining, has made it more difficult to finalise a rehabilitation plan.

Additional mitigation and management measures

That the Work Plan not be approved unless it contains:

- An adequate rehabilitation plan for agricultural land and native vegetation land based on the information and guidance provided in the report Rehabilitation of Donald Mineral Sands Project.
- That the DPI recommend to the Environmental Review Committee (ERC) when established, that the ERC consider the establishment of a sub-group of local farmers or landowners to participate in the evaluation of the assessment of the productivity of rehabilitated agricultural land.

17. MATTERS OF COMMONWEALTH INTEREST

As noted above, under the EPBC Act an action (which includes a project, a development, an undertaking and an activity or series of activities) which will have, or is likely to have, a significant impact on a matter of national environmental significance must be referred to the Commonwealth Environment Minister for a decision on whether the action is a 'controlled action' requiring assessment and/or approval under the EPBC Act.

The Minister's delegate advised DMS on 24 November 2005 that the project was a 'controlled action' on the basis that the project could have a potential to impact on listed species and communities. On 6 February, 2006 the Minister accredited the EES as the assessment process for this project under the EPBC Act.

It should be noted that despite the accreditation the Commonwealth retains its decision making powers and will be required to issue an approval under the EPBC Act following completion of the Victorian assessment process.

Specifically, the species and communities identified in the EPBC Act relevant to the project include:

- threatened communities - all sites supporting Plains Savannah, Plains Woodland, Ridged Plains Mallee and Low Rises Woodland that have Buloke present;
- endangered flora - the Turnip Copperburr;
- vulnerable fauna – Growling Grass Frog; and
- other listed fauna – Plains-wanderer, Swift Parrot.

The Inquiry considers that the project will not have a significant impact on any listed threatened species or communities under the EPBC Act provided the relevant mitigation measures identified by Ecology Partners on page 26 of Mr Organ's expert witness statement are implemented.

The Inquiry recommends:

> **The Victorian Minister for Planning advise the Commonwealth Minister for Environment, Water, Heritage and the Arts that the Donald Mineral Sands project will not have a significant impact on any listed threatened species or communities under the EPBC Act provided the relevant mitigation measures identified by the proponent's flora and fauna experts are implemented.**

PART D: CONCLUSIONS AND RECOMMENDATIONS

18. CONCLUSIONS AND RECOMMENDATIONS

In broad terms, the Inquiry concludes that the proposed sand mine facility will have acceptable environmental impacts subject to compliance with the additional mitigation and management measures that have been provided in consolidated form in Chapter 17. Specifically, the Inquiry considers that impacts on water quality, air quality and noise can be mitigated and managed to acceptable levels; that native vegetation offsets can be provided in accordance with the net gain principles of the Native Vegetation Framework and that the site can be rehabilitated to a condition similar if not better than the existing condition of the land.

Further, the Inquiry considers that while it does not have sufficient information to make a clear recommendation on the preferred option to secure water to the site, there are no fundamental statutory or environmental barriers to either option and that the formal approval process that will require an assessment of criteria to ensure environmental impacts are considered.

The Inquiry acknowledges that there are a number of significant issues to be resolved through the approval mechanisms particularly the Work Authority and Work Plan. However, the Inquiry is confident that the process will be successful given the proponent's willingness to cooperate with relevant government departments and agencies and to engage with local farmers and landowners.

Moreover, the Inquiry considers that the Environment Review Committee (ERC) will be an important mechanism for continued communication between DMS, government departments and agencies and the local community to monitor compliance with the statutory requirements. As stated by DPI, the proponent has a powerful incentive to comply with the statutory requirements because the ultimate course of action DPI could take is to require closure of the mine operation. Given the approach of the proponent thus far, the Inquiry doubts whether matters would reach this point.

The Inquiry has collated the recommendations from the proceeding chapters and has grouped them into specific subject issues. It therefore recommends the following:

Overall recommendation

1. That the Minister for Planning should approve the proposed DMS sand mine project subject to the additional mitigation and managements measures recommended below.

Environment Review Committee

2. DPI establish an Environmental Review Committee (ERC) to monitor the environmental impacts, and should be set up, function and operate having regard to the recommendations of the DPI discussion paper on ERC's.

Water

3. That the Work Plan not be approved unless it contains:
   - Predictions of the following that are in general accordance with predictions provided in the EES:
   - The maximum extent of the area over which groundwater levels will be reduced during excavation of material from the mine pit;
   - The maximum level of the watertable in the area of the pit at anytime up to 5 years after pit backfilling is completed;
   - The minimum separation of the top of slimes layer in the backfilled pit and the surface level; and
   - The minimum separation of upper surface on any perched watertable that may form above the slimes layer in the backfilled pit and the surface level.
4. A monitoring program that will enable testing of each of the above predictions.
5. A prediction of the results of any reactions between the constituents of the groundwater and that of water that may be added to the groundwater and the impacts of any products of such reactions.
6. The following be included in the conditions attached to the approval of any Work Plan:
   - Sediment management will be conducted in conformance with EPA Publication 480 *Environmental Guidelines for Major Construction Sites;* and
   - The licensee shall cause an audit to be conducted of the implementation of all aspects of the groundwater monitoring program described in the Work Plan and the results of that program with reference to predictions of impacts included in the Work Plan, with one year from the date of approval and then within one year of the date of the previous audit. The audit will

be conducted by an Appointed Environmental Auditor under section 53S of the *Environment Protection Act* 1970 and will provide an audit report to the all members of the Environmental Review Committee and other parties as is directed by the District Manager.

Biodiversity and habitat

7. That the Work Plan not be approved unless the EMP contains:
   - Construction Environmental Management Plan
   - Vegetation Management Plan
     - Native Vegetation Offset Management Plan
     - Native Vegetation Management Plan
     - Weed Management Plan
   - Wildlife Management Plan
   - Pest Management Plan

8. That the Victorian Minister for Planning advise the Commonwealth Minister for Environment, Water, Heritage and the Arts that the Donald Mineral Sands project will not have a significant impact on any listed threatened species or communities under the EPBC Act provided the relevant mitigation measures identified by the proponent's flora and fauna experts are implemented.

Air quality

9. That the Work Plan not be approved unless it contains:
   - Adequate information in the EMP to satisfy the requirements of the Protocol for Environmental Management – Mining and Extractive Industries to identify and evaluate "best practice" controls for all relevant indicators specified in the State Environment Protection Policy (Air Quality Management) and "maximum extent achievable" controls indicators specified as Class 3 indicators;
   - A dust emission management strategy that includes actions that are considered "best practice" for the control of all relevant indicators specified in the State Environment Protection Policy (Air Quality Management) and "maximum extent achievable" control for indicators specified in Class 3 indicators;
   - A procedure for determining the timing of the vacation of residences to avoid the exposure of residents of air of unacceptable quality, as specified in the Protocol for Environmental Management – Mining and Extractive Industries; and

- A compliance monitoring program in the EMP that satisfies the requirements of the Protocol for Environmental Management – Mining and Extractive Industries, including a reactive control strategy using real-time monitoring to prevent exceedances of air quality criteria at the nearest residences.

Greenhouse gas emissions

10. That the Work Plan not be approved unless it contains:
    - Adequate information in the EMP to satisfy the EPA's requirements for demonstrating that "best practice" methods have been used for energy efficiency, especially for the on-site processing plants;
    - A requirement in the EMP for plans to meet the requirements of both the Victorian *Environment and Resources Efficiency Plans* (EREP) and the Commonwealth *Energy Efficiency Opportunities* (EEO) programs when the relevant thresholds of energy use are reached;
    - A requirement in the Transport Management Plan that identifies a course of action to investigate the option of transporting HMC to port to reduce greenhouse gas emissions; and
    - A requirement in the EMP for consideration of the use of renewable and alternative energy supplies.

Noise

11. The following be included in the conditions attached to the approval of any Work Plan:
    - The licensee must ensure that noise levels at any sensitive receptor not exceed the noise limits specified in *the Interim Guidelines for Control of Noise from Industry in Country Victoria* N3/89 except if the licensee provides the District Manager with a proposal for the substitution of a limit on the maximum noise level for the Night limit at a particular residence, or residences.
    - Any such proposal will:
        - Before a limit on the maximum noise level outside the residence of no more than 62 dB(A);
        - Include evidence of the consent of the owner and/or occupier of the residence to the application of the proposed noise limit;
        - If the proposed noise limit is greater than 57 dB(A), include evidence that noise at the proposed limit will not result in a noise level in a habitable room of greater that 47 dB(A); and

- Include details of a monitoring program that will enable demonstration of compliance, or otherwise.

12. If the proposal is for a limit on the maximum noise level of 57dB(A) or less the District Manager will approve the proposal providing the he/she is satisfied with both:
    - The evidence of the consent of the owner and/or occupier; and
    - The adequacy of the proposed monitoring program, assessed in consultation with the EPA.
13. If the proposal is for a limit on the maximum noise level of greater than 57dB(A) the District Manager will approve the proposal providing that he/she is satisfied with each of:
    - The evidence of the consent of the owner and/or occupier;
    - The adequacy, assessed in consultation with the EPA, of the proposed monitoring program; and
    - The evidence, assessed in consultation with the EPA, that noise at the proposed limit will not result in a noise level in a habitable room of greater than 47 dB(A).
14. Once the proposal is approved the licensee must:
    - Ensure maximum noise levels at the residence during the Night do not exceed the approved limit; and
    - Implement the proposed monitoring program to the satisfaction of the District Manager.
15. Management of noise emissions during construction activities, with such activities being defined by the District Manager in consultation with the EPA, will be in accordance with the guidance provided in Section 12 of *Noise Control Guidelines TG302/92* and resultant noise levels at sensitive receptors must comply with the limits described in the Schedule in that Section of the guidelines.

Radiation

16. The Department of Human Services either determine that a management licence under the *Radiation Act* 2005 is required or agree to act as the regulatory authority on matters relating assessment and compliance testing of management plans relating to radiation and radioactive materials;
17. The following be included in the conditions attached to the approval of any Work Plan:
    - Prior to commencement of the production of heavy mineral concentrate the licensee will provide the District Manager with either:

- A copy of a management licence issued by the Department of Human Service under the *Radiation Act* 2005 for the conduct of radiation practices associated with the mining, processing and transport of radioactive materials; or
- A copy of a Radiation Management Plan, Radioactive Waste Management Plan certified by the Department of Human Services as being in conformance with:
  - The *Code of Practice on Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing* (2005); and
  - The *Code of Practice for Safe Transport of Radioactive Material* (2008).

18. If the operations are not subject to a management licence issued by the Department of Human Service under the Radiation Act 2005, then the Department of Human Services will act as the regulatory authority on matters relating to the assessment and compliance testing of management plans relating to radiation and radioactive materials.

Roads, traffic and transport

19. That the EMP not be approved unless it contains a Transport Management Plan.
20. The Transport Management Plan include the range of matters in the Northern Grampians Shire Council submission tabled at the Inquiry hearing. These are:
    - An existing conditions survey of public roads in the vicinity of the mine facility that may be used for access, including details of the suitability, design and construction standard of such roads;
    - The designation of appropriate construction and transport vehicle routes to the mine facility;
    - The designation of vehicle access points to the mine from surrounding roads, including main roads access points to local access roads;
    - The designation of operating hours and speed limits of trucks on relevant routes accessing the site so as to avoid the time and routes of passage of school buses, and to provide for resident safety;
    - Any necessary pruning of street planting or roadside vegetation to provide for transport of materials to the site, and pruning practices to be followed;
    - The designation of vehicle accessways and car parking areas;

- The requirements of Over Dimensional Load permits and escorting of long large loads along roads in the area;
- The need for road intersection upgrades to accommodate an additional traffic or site access requirements, whether temporary or ongoing;
- A timetable for implementation of any pre-construction works identified to be undertaken;
- A timetable for regular inspections to be carried out during the construction period to identify maintenance works necessary as a result of construction traffic; and
- The use and development must be carried out in accordance with the endorsed Traffic Management Plan and the cost of any works including upgrades and maintenance are to be at the expense of the work authority holder.

21. The Transport Management Plan be developed by a working group comprising DMS, Yarriambiack, Buloke and Northern Grampians Shire Councils, VicRoads and relevant emergency service organisations; and

22. That the Work Plan not be approved unless it contains a Transport Management Plan that identifies a course of action to investigate the option of transporting HMC to port by rail.

Rehabilitation

23. That the Work Plan not be approved unless it contains an adequate rehabilitation plan for agricultural land and native vegetation land based on the information and guidance provided in the report Rehabilitation of Donald Mineral Sands Project.
24. That the DPI recommend to the Environmental Review Committee (ERC) when established, that the ERC consider the establishment of a sub-group of local farmers or landowners to participate in the evaluation of the assessment of the productivity of rehabilitated agricultural land.

Appendix A – Terms of Reference

TERMS OF REFERENCE

INQUIRY UNDER *ENVIRONMENT EFFECTS ACT 1978*

DONALD MINERAL SANDS PROJECT

1. BACKGROUND

Donald Minerals Sands Pty Limited (DMS) is proposing to develop a mineral sands mine approximately 17 km southeast of Minyip, near Horsham in western Victoria. Over its 25 year life the mine is expected to produce 398,000 tonnes of titanium and zirconium minerals, separated into a heavy mineral concentrate (HMC) for export.

On 2 December 2005, the Victorian Minister for Planning decided that an Environment Effects Statement (EES) was required to assess the proposed Donald Mineral Sands Project under the *Environment Effects Act 1978*. The EES was placed on public exhibition from 4 February until the 14 March 2008.

The primary Victorian approval for this project is under the *Mineral Resources (Sustainable Development) Act 1990*. Applications for a Work Authority and a proposed Work Plan under this Act will be considered by the Minister for Energy and Resources. The Work Authority can be granted after the mining proposal has been assessed under the *Environment Effects Act 1978* by the Minister for Planning.

The project requires a water supply of up to 4 gigalitres (GL) per year, which would be sourced from either the local water authority, or more available groundwater resources in the Avon Deep Lead 25km east of the project site. The later option would require a groundwater extraction licence and application under the *Water Act 1989*.

The proposed mine also requires approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), due to controlling provisions under sections 18 and 18A (listed threatened species and communities). The Victorian EES process has been accredited as the assessment approach required for this project under the EPBC Act.

The Minister for Planning has appointed an Inquiry for the Donald Mineral Sands Project under section 9(1) of the *Environment Effects Act 1978*. After the Inquiry provides its report to the Minister for Planning, the Minister will prepare an Assessment of the environmental effects[1] of the project under the *Environment Effects Act 1978*, to inform the relevant Victorian statutory decisions as well as the decision under the EPBC Act.

2. TASK

The Inquiry is required:

i. To inquire into and make findings regarding the potential environmental effects (impacts) of the proposed project, including impacts on relevant matters under the EPBC Act.

[1] Under the seventh edition of the *Ministerial guidelines for assessment of environmental effects* (June 2006), environment for the purposes of assessment includes the physical, biological, heritage, cultural, social, health, safety and economic aspects of human surroundings, including the wider ecological and physical systems within which humans live.

ii. To recommend any modifications to the project as well as environmental mitigation and management measures that are needed to achieve acceptable environmental outcomes, within the context of applicable legislation and policy.

iii. To recommend whether the project should proceed in light of its expected effects, assuming the measures recommended under (ii) were implemented.

3. METHOD

The Inquiry must consider the exhibited EES, any submissions received in response to the exhibited EES, the proponent's response to submissions and other relevant information provided to or obtained by the Inquiry.

The Inquiry must conduct a public hearing and make other such enquiries as are relevant to its consideration of the potential environmental effects of the proposed Donald Mineral Sands Project. The Inquiry must be conducted in accordance with the following principles:

- The inquiry hearings will be conducted in an open, orderly and equitable manner, in accordance with the rules of natural justice, with a minimum of formality and without the necessity for legal representation.
- The inquiry process will aim to be exploratory and constructive, where adversarial behaviour is minimised
- Parties without legal representation will not be disadvantaged – cross-examination will be strictly controlled and prohibited where not relevant by the inquiry chair.

The Inquiry will meet and conduct hearings when there is a quorum of at least two of its members present including the Inquiry Chair.

4. OUTCOMES

To prepare a report for the Minister for Planning presenting:

- The Inquiry's response to the matters detailed in section 2.
- Relevant information and analysis in support of the Inquiry's recommendations.
- A description of the proceedings conducted by the Inquiry and a list of those consulted and heard by the Inquiry.

5. TIMING

The Inquiry is required to report to the Minister for Planning in writing within eight weeks of its last hearing date.

6. FEES

The members of the Inquiry will receive the same fees and allowances as a panel appointed under Division 1 of Part 8 of the *Planning and Environment Act 1987*.

APPROVED:

JUSTIN MADDEN MLC
Minister for Planning
DATE: 15 APR 2008

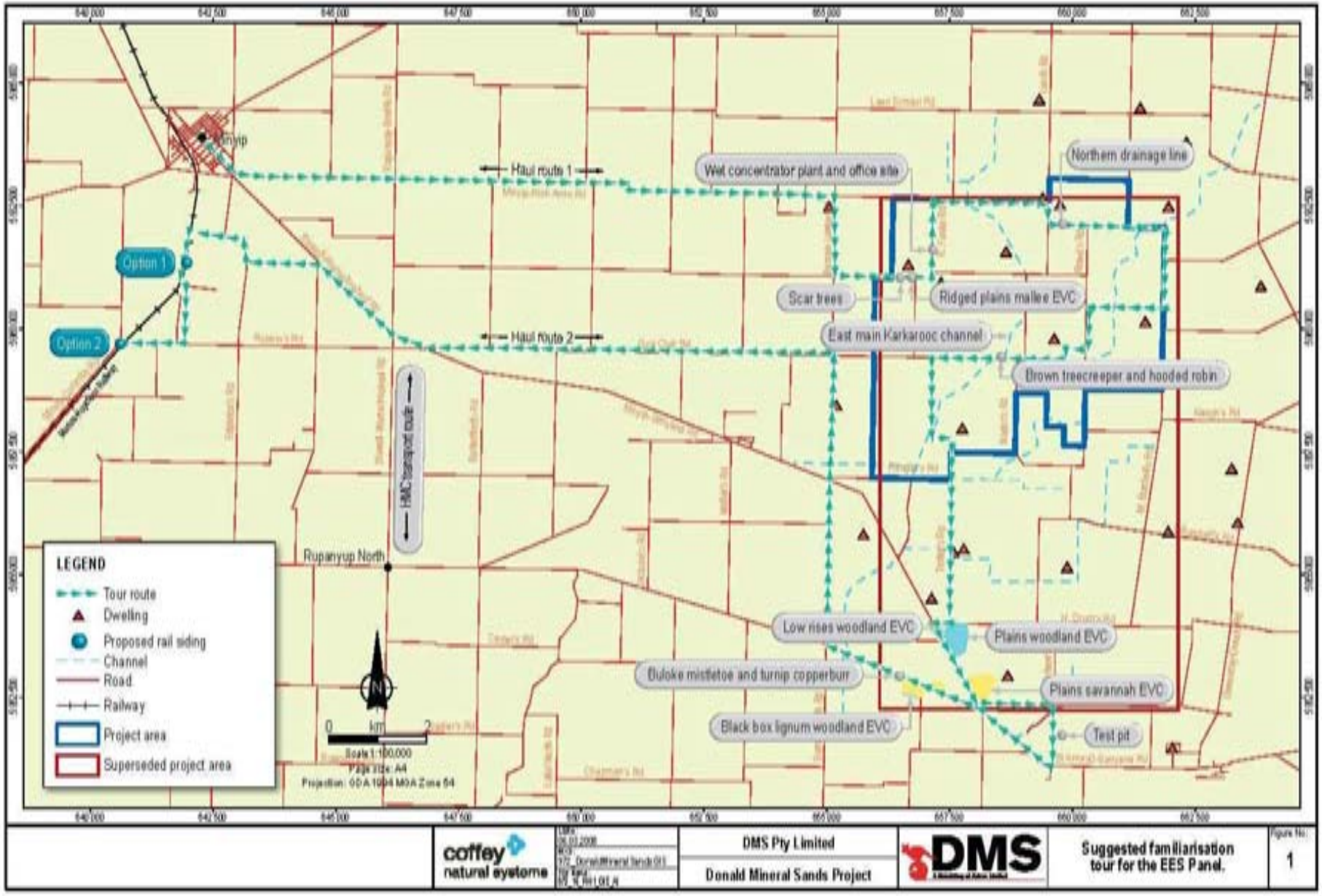
Appendix B - List of submitters

A list of all written submissions to the proposal is included in the table below:

Submitter	Organisation (if any)
Mr Andrew Osler	Hooz on Main Commercial Hotel
Mr Maurice Ahern	
Mr Jerry Pin	SNF Australia
Mr Jeff Cummins	EPA
Mr Frank Drum	
Mr Warwick Heine	Buloke Shire Council
Ms Jenny Barnett	Victorian National Parks Association
Mr Mark Thompson	Wimmera CMA
Mr Stuart White	
Mr Michael Burchell	
Mr Martin Duke	Northern Grampians Shire Council
Ms Kimberly Dripps	DSE
Mr Gil Hopkins	
Mr Oliver Guthrie	
Mr George Powell	
Mr Stuart Petering	
Mr Ian Morgan	
Mr Harold Flett	
Mr Peter Drum	
Mr Richard Bolt	DPI
Mr Don McAllister	
Father Paul Mercovich	St Arnaud Immaculate Conception Parish
Ms Susan Boyd	Minyip Pre-school
Mr Lyndon Fraser	Real River People of The Wimmera
Mr Rodney Clarke	Container Line Real Estate
Mr Nick McIntyre	
Mr John Marin	AAV

Submitter	Organisation (if any)
Mr Matthew Phelan	
Mr and Mrs J & A Drum	Minyip Meats
Ms Jessica Adler	
Mr John Martin	GWM Water
Mr James Magee	Yarriambiack Shire Council
Mr Warren Funcke	
Ms Jan Bowman	DHS

Appendix C – Inspection tour map


Rupanyup
Haul route 1
Haul route 2
Option 1
Option 2
HMC transport route
Rupanyup North
Wet concentrator plant and office site
Northern drainage line
Scar trees
Ridged plains mallee EVC
East main Karkarooc channel
Brown treecreeper and hooded robin
Low rises woodland EVC
Plains woodland EVC
Buloke mistletoe and turnip copperburr
Plains savannah EVC
Black box lignum woodland EVC
Test pit
LEGEND
Tour route
Dwelling
Proposed rail siding
Channel
Road
Railway
Project area
Superseded project area
0 km 2
Scale 1:100,000
Page Size: A4
Projection: GDA 1994 MGA Zone 54
coffey natural systems
DMS Pty Limited
Donald Mineral Sands Project
DMS
Suggested familiarisation tour for the EES Panel.
Figure No:
1

Appendix D – Regulatory framework for proposal