ASSESSMENT REPORT

PROPOSED SYERSTON NICKEL COBALT PROJECT REPORT ON THE ASSESSMENT OF A DEVELOPMENT APPLICATION (DA 374-11-00) PURSUANT TO SECTION 79C OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

Department of
Urban Affairs and Planning

1. INTRODUCTION AND BACKGROUND

1.1 The Applicant

Black Range Minerals Pty Limited (BRM).

1.2 Overview of the proposal and its location

Black Range Minerals (BRM) is seeking development consent to develop an open cut nickel cobalt mine in Central Western New South Wales (refer to Figure 1). The applicant is seeking approval to produce up to 3 million tonnes of nickel and cobalt ore per annum through a series of open cut pits. Although the consent for which approval is sought is valid for 21 years, the predicted life of the resource is predicted be more than 30 years, and has an estimated cost of $340 million*. The proposal is expected to provide a construction workforce of up to 1000 for the construction period of approximately 24 months. The operation workforce for the proposed project is expected to peak at approximately 371 full time jobs and 100 direct permanent contractors.

The proposed Syerston Project will comprise components that will extend into the Shires of Parkes, Forbes and Lachlan. The open cut mine, processing facility, natural gas pipeline and part of the water pipeline are located within Lachlan Shire, the water borefields and the remainder of the water pipeline are located within Forbes Shire and the Limestone Quarry and rail spur are located in Parkes Shires (refer to Figure 2).

The Mine and Processing Facility (MPF) would comprise the majority of the infrastructure and operations associated with the Project, including

- the development of an open pit mine comprising up to 11 pits;
- transfer of ore by haul road to a processing facility;
- production of reagents including sulphuric acid, hydrogen sulphide, hydrogen, oxygen and nitrogen for process requirements at the MPF site;
- electricity and steam generation at the MPF site in a natural gas fired co-generation plan;
- disposal of overburden, process tailings and process water in mine waste emplacements, dams and evaporative ponds, and
- water treatment facilities, administration offices and workshop/maintenance facilities.

The following ancillary components are located outside the MPF site :

*This figure is the value provided by the applicant as the estimated cost of the project for determination of the Development Application fee under the Environmental Planning and Assessment Regulation 2000. It is this value that the Department uses in its assessment of proposals in general. The applicant however has advised that an overall expenditure of $650 million will be incurred comprising $340 million construction costs for the process plant, utilities and services with an additional $310 million of indirect costs relating to project management and support.

- a limestone quarry and crushing plant;
- upgrades of road and rail transport facilities to accommodate transport movements associated with the Project in the vicinity of the mine including the provision of a dedicated rail siding and a materials transport route between the limestone quarry, rail siding and the MPF;
- provision of up to 6,300 ML per annum of process water from two borefields to the south in the Lachlan Valley Palaeochannel, and an associated water supply pipeline; and
- provision of natural gas for electricity, steam and hydrogen generation via a buried pipeline from the existing Moomba to Sydney Gas Pipeline located south of Condobolin.

1.3 State Significant, Integrated, Designated Development

The proposal is defined as State Significant Development and integrated development under the Environmental Planning and Assessment Act 1979 (the Act). As such, the Minister for Urban Affairs and Planning is the consent authority for the DA.

The proposal is also designated development under the *Environmental Planning and Assessment Regulation 1994* (the Regulation) and an EIS has been prepared. The integrated approvals required are:

- an approval from the Environment Protection Authority under the *Protection of the Environment Operations* Act, 1999;
- a permit from the Department of Land and Water Conservation under Part 3A of the *Rivers and Foreshores Improvement Act* 1948, and a license under Section 116 of the and the Water Act 1912;
- consent from the National Parks and Wildlife Service under Section 90 of the *National Parks and Wildlife* Act 1974;
- approvals from the Lachlan Shire Council, Parkes Shire Council and Forbes Shire Council under Section 138 of the *Roads Act* 1993.

The approval bodies have submitted their general terms of approval, which have generally been adopted as conditions in the recommended instrument of consent.

1.4 Lodgement of DA and exhibition

On 6 November 2000, Black Range Minerals Pty Ltd lodged the DA and EIS with the Department of Urban Affairs and Planning. The Department undertook an extensive notification process to account for the scale of the proposal and the geographic separation of the components. The entire DA area traverses three local government areas, resulting in a high number of adjoining land holders to the development application area, while the various aspects of the proposal also have the potential to impact beyond these properties in different ways. The notification was subsequently based on notifying the adjoining landowners to the development application area and those properties potentially impacted by noise, air quality (including dust and chemicals), visual, and blasting impacts.

The DA and EIS were publicly exhibited from 10 November 2000 to 13 December 2000 in accordance with the Environmental Planning and Assessment Act 1979. Submissions were formally received until close of the exhibition period. A summary of submissions is included in Appendix 1 and further discussed in the subsequent sections. The Department is satisfied that the requirements for public exhibition of the EIS and public participation have been fully met.

1.5 Local Councils' position

The various components of the Syerston project cover three separate local government areas – Lachlan, Parkes and Forbes – and all have been actively involved in the consultation process for this project. During the exhibition period, the three councils made an extensive joint submission to ensure a co-ordinated approach to addressing the concerns at the local government level. In addition, each council made an individual submission to highlight the concerns particular to the respective Shire. Each council is in general support of the proposal, however all raised a number of concerns. These concerns relate to the capacity and condition of the road network; settlement, and infrastructure; and provisions for community enhancement.

In order to clarify and address these concerns the Department has conducted a number of consultative meetings with the councils and the Mayors of each region so as to ensure council involvement in the assessment process. The consultative process with the local councils has been extensive due to the unprecedented magnitude of such a development in this locality and the predicted impact on the natural and socio-economic environment. All three councils are in general support of the application, subject to general terms of approval, and, other conditions.

1.6 Government agencies' position

The NPWS, DLWC, and EPA have provided general terms of approval for the project. All submissions received during the exhibition period were forwarded to the approval bodies as required by clause 53A of the Regulation.

In total 19 submissions were made by government authorities in regard to the project. No agency or authority objected to the proposal provided appropriate consent conditions were applied to the Project.

1.7 Local community position

A total of 19 private submissions were received during the exhibition of the DA and EIS. The submissions either supported, objected to or raised some concerns about the proposal. The concerns and objections principally related to:

Roads

Various concerns were raised regarding the potential impact of the proposal on the roads.

- Current capacity of road network to accommodate increased vehicular movements
- Impacts of mine traffic on road conditions and the burden of road maintenance
- Increase in heavy vehicle movements;
- Road safety, eg. heavy vehicles on school bus route and increase in road accidents;
- Transport of hazardous substances;
- Stock and machinery crossing; and
- Lighting of intersections

Gaseous emissions

Concerns expressed related to impacts on gaseous emissions on:

- human health,
- agricultural land,
- drinking water,
- crops, and
- domestic stock.

Noise

Residents expressed concern regarding noise emanating from a number of sources including, :

- Heavy machinery and excavation during construction
- Operation of the mine
- Operation of the limestone quarry
- Haulage route and increased traffic

Water

A number of concerns were raised regarding the impact of the proposal on ground and surface water resources.

- Groundwater

Significant concern was expressed by land holders in regard to the impact on bore fields, quantity and quality of bores, groundwater levels, and seepage from tailings storage facility and evaporation dams.

- Surface water

Concerns were expressed regarding increased surface water flows and the subsequent impacts downstream.

Dust

Similar issues as regarding the gaseous emissions, relating to:

- impacts on health from increased particulate matter in the air
- Deposition on agricultural land
- Deposition on crops etc

Hazards

A range of hazards issues were raised in the public submissions including,

- movements of dangerous goods on the road network
- bush fire
- on-site emergencies and capacity of mine to respond
- off site emergencies, eg. pipeline rupture or hazardous chemicals spill
- capacity of existing emergency services to deal with off-site emergencies

Loss of rural lifestyle/depreciation of property values

Residents raised a number of concerns, including that,

- Development is to be established in a tranquil rural environ with little existing industrial development and any increase in background levels will be noticeable.
- Dusts and gaseous emissions
- Increase in Traffic
- Visual amenity
- Odours
- Lighting

Flora and fauna

- Residents raised concerns regarding:
- Destruction of remnant vegetation
- Impact on Threatened Species and other local wildlife

1.8 Request for Commission of Inquiry

In response to the exhibition period, the Department received two submissions requesting a Commission of Inquiry (COI). These were from Lachlan Shire Council and the Fifield Progress Association. Lachlan Shire Council provided the following reasons for a COI:

- The proposal is significant in size for not only the region but for NSW
- The project will have a long term effect on the region with widespread ramifications for roads, social serves housing and the provision of local governance
- Significant volumes of traffic to be generated
- Large volumes of groundwater to be extracted
- The large geographic extent of the proposal
- The ability of the small towns to assimilate and service the town.

Fifield Progress Association sought a COI to discuss the prospect of Fifield having the proposed water pipeline continue to the village.

These requests and the matters raised have been considered, but the Department does not consider that a COI is warranted. It is considered that a COI would not add any further value to the assessment process. The key issues have been addressed to the satisfaction of the Department and other government agencies, and a number of stringent consent conditions have been recommended to ensure the predicted impacts from the mine can be adequately managed and mitigated.

2. THE PROPOSAL

2.1 Site details and Infrastructure

The site for the proposed Syerston Nickel Cobalt project is shown on ***Figure 2***.

2.1.1. Mine and Processing Facility

The general landscape of the MPF site is flat to very gently undulating and is bisected by a shallow drainage line running diagonally across the site to the northeast. Several areas of low hills occur across the site with broad shallow valleys between. Surface elevations in the MPF site vary from, approximately 325 m down to approximately 275 m in the northeastern section.

The surrounding landscape of the project area and its environs is characterised by cleared lands that reflect long term use for cropping and sheep cattle grazing and, and previous mining operations. The mine and processing site can be divided into two main areas, a northern zone where earlier mining activities took place, and a southern zone where pastoral and cropping has predominated, comprising ploughed paddocks. Belts of remnant and regrowth vegetation separate the paddocks, however such vegetation is generally restricted to elevated areas along drainage lines. Less disturbed areas of remnant vegetation occur in the north of the MPF site within the Fifield State Forest and on the western extremity of the development application area

2.1.2. Limestone Quarry

The limestone quarry is situated approximately 20 km southeast of the MPF and adjacent to the Fifield to Trundle Road. The site is approximately 330 ha in size and consists of cleared land currently used for grazing and occasional cropping. BRM is proposing to mine the Gillenbine limestone deposit which occurs as a low hill (approximately 10 m high) in the middle of the Gillenbine Creek plain.

2.1.3. Rail Siding and Materials Transport Route

The rail siding occupies an area of approximately 4 ha. The site is flat and located on the eastern side of the existing Tottenham to Bogan Gate Railway adjacent to the Fifield to

Trundle – Tullamore to Bogan Gate Road. The site is located in predominantly cleared dry sclerophyll woodland country.

The materials transport route follows the existing Fifield to Trundle and Tullamore to Bogan Gate Roads, except in the vicinity of Fifield village where a bypass of Fifield will be constructed.

2.1.4. Associated Infrastructure

Raw water for the project would be sourced from two borefields located in the Lachlan River palaeochannel. The reticulation system from the borefields to the MPF site would be constructed with the capacity of approximately 17.5 ML/day and is expected to provide water to the project at a rate of 10.5 ML/day. The western borefield is located along the western boundary of the property "Astron Park", while the eastern borefield is located on "Gloaming" The pipeline linking the eastern and western borefields would also be located on these privately owned properties.

Each of the two borefields would contain three bores. Two bores in each field would be actively pumped. To reduce mutual interference effects, the standby bore would be located between the primary pumping bores and would only be activated in the event of breakdown to scheduled maintenance on the two production bores.

2.1.5. Pipelines

Gas Pipeline

The proposed natural gas pipeline is 90 km long and would connect the MPF site with the existing Moomba to Sydney natural gas pipeline. The pipeline will be constructed from steel with an anti-corrosion coating and have a diameter of 168 mm. For the majority of the route the pipeline would buried 750 mm below the surface, and would be bored at river crossings. For all but 15 km the pipeline would follow along roads and tracks within existing road easements. For the remaining 15 km, the pipeline would be located on private properties and would follow fence lines, tracks and partially cleared paddock.

Water Pipeline

The pipeline route follows existing road reserves from the water supply borefields to the MPF site. The pipeline is to be laid below ground within existing road corridors. A 12 km spur line would be connect the main pipeline to the limestone quarry. The main water supply pipeline would have a diameter of 457 mm, constructed from mild steel cement-lined pipe and fitted with a polyethelyene sleeve for corrosion protection. The capacity of the main pipeline would be 720m^3/hour. The spur line would be only 121 mm in diameter, constructed from mild steel cement -lined pipe, and capable of transporting water at 10m^3/hour.

2.2. Land Ownership and Land Use

2.2.1. Mine and Processing Facility

The land within the area proposed for the MPF is a combination of privately owned land, State Forest, Crown Reserve and Crown Land. The majority of the proposed MPF infrastructure is located on the property "Syerston", owned by Messers K & Q Williams, "Slapdown" owned by Mr B Strudwick and "Kingsdale" owned by UAL Pty Ltd

BRM has purchased, or has an option to purchase, the private land which is the subject of the MPF as well as the land for the limestone quarry and rail siding. It has a compensation agreement with State Forests regarding the affected forest and has an option to obtain

easements for the water and gas supply pipeline and road upgrades. It is not required to purchase the vacant crown land.

2.2.2.. Limestone Quarry and Rail Siding

These components of the development are located on two privately owned properties, owned by MF Blowes and TW Quade. Black Range Minerals has secured options to purchase both these properties. The materials transport route is located on Crown Road reserves.

2.2.3.. Materials Transport Route

Access to the MPF site from the rail siding, limestone quarry and Tullamore to Bogan Gate Road will be provided by the construction of the Fifield bypass, upgrades of the Fifield to Trundle Road and sections of the Condobolin to Tullamore Road and the Fifield to Wilmatha Road. The proposed Fifield bypass will link the Fifield to Wilmatha Road with the Condobolin to Tullamore Road, allowing traffic to bypass the village of Fifield. The Fifield bypass consists of a Crown road reserve and two parcels of private land. These parcels of land are owned by Mr Galvin of "Wanda Bye" and Mr Quade.

2.2.4.. Natural Gas Pipeline

With the exception of the northern section, the natural gas pipeline is situated within road reserves and a rail corridor where it crosses the Orange to Broken Hill Railway Line. The northern section of the natural gas pipeline is located on private property.

2.2.5.. Water Supply pipeline

The main water supply pipeline is situated within road reserves for the majority of its length. The company will enter into a lease arrangement with the relevant council to construct the pipelines in road reserves. A component of the main water supply pipeline is also proposed to be constructed within the road reserve of the proposed Fifield bypass.

The water supply spur line, from its connection with the main water supply pipeline to the limestone quarry, will be located within the road reserve of the Fifield to Trundle Road. The spur line crosses privately owned land within the limestone quarry MLA, however BRM has secured options to purchase this property. The main water supply pipeline also crosses the Orange to Broken Hill rail corridor.

2.2.6. Borefields

The western borefield is located along the western boundary of the property "Astron Park", currently owned by FM Hayes. The eastern borefield is located on "Gloaming", owned by AH & MA Ridley. The pipeline linking the western and eastern will also be located on the above privately owned properties.

2.3 .Production Process

2.3.1. Mine and Processing Facility

Mining Operations

The development of the Syerston deposit would involve conventional open pit mining methods to an average depth of 35 m with localized deeper areas up to approximately 55 m below the surface. The proposed mine plan includes development of multiple open pits to access areas of shallow, high grade ore in the initial stages of the project. Ore would be

stockpiled separately as high and low grade, while the open pits are further developed and expanded.

The project would involve the development of 11 relatively shallow open pits in the first 5 years of operation. In the first 5 to 10 years, mining will be conducted from the numerous shallow open pits spread over the orebody. Each open pit would be excavated in shallow benches and stepped in accordance with slope stability requirements. The rate of ore production would be adjusted as necessary to maintain a process plant feed rate of approximately 2 million tonnes per annum (Mtpa) following the removal of ore material. The pits would be mined in a sequence to meet the process plant production requirements. As the individual open pits are expanded they will be amalgamated to form a total of two pits by year 20 and one pit at the end of the project life, that is in excess of 30 years.

Mining will be confined within an area of 2 km (north-south) by 3 kms (west -east). Selective mining will be carried out on 2 to 4 m benches using 100 tonne backhoe excavators loading 86 tonne off-highway rear dump trucks Approximately 125 Mt of waste rock will be produced over 21 years. The quantity of waste rock produced annually will vary over the mine life but is expected to average some 6 Mt per annum.

Waste Emplacements

Mine waste removed from the open pits during mining would be stored in two waste emplacements. The western waste emplacement has been designed to contain most of the mine waste generated during the mine life. The emplacement would be located adjacent to the Melrose to Gillenbine Road and the Fifield to Wilmatha Roads and to the north and west of the western open pits. The initial construction of the emplacement would commence in Year 1, and continue for the remainder of the mine life. By year 20 the emplacement would reach a height of 30 m and would contain approximately 80 Mt of mine waste.

The eastern waste emplacement would be smaller in area and constrained by the Melrose to Gillenbine Road to the north and the Condobolin to Tullamore Road to the east ,as well as by the location to the eastern pits. At Year 20 the dump would reach a height of 30 m and would contain approximately 45 Mt of mine waste.

Processing Plant

The process plant would process 2 Mtpa of ore to produce saleable nickel and cobalt products. Figure A2-7 of the EIS provides a block diagram of the 8 stage ore processing circuit. This process would require chemicals as inputs to various stages throughout the circuit. The design of the MPF allows for the on-site production of some of these chemical inputs.

Tailings Disposal

Tailings from the mineral processing circuit would be deposited in a tailings storage facility. Approximately 50 Mt of tailings would be produced over the term of the EIS with a tailings production rate of approximately 2.55 Mtpa at 48% solids. Two adjoining tailing storage cells would be constructed in the southeast of the MPF with a combined area of approximately 220 hectares. The TSF would have sufficient capacity to contain tailings for more than 20 years and would be of conventional sub-aerial design.

The saline nature of tailings water prevents reuse within the ore processing system and an evaporation system is required to remove excess supernatant (layer of water above the settled solids) water from the tailings storage facility. The evaporation system would comprise seven adjoining evaporation ponds and evaporation surge dam. The evaporative

system would have a combined system of some 3,900 ML and combined surface area of approximately 180 ha.

2.3.2. Limestone quarry

Crushed limestone will be delivered to the site from a quarry located at the Westella deposit approximately 20 km to the southeast of the MPF site. Limestone will be quarried by conventional methods. Topsoil and waste rock will be stripped by excavator/front-end loader and the limestone quarried by drill and blast techniques. The blasted material will then be free dug using front-end loaders, and transported to the crushing facility or waste dump as appropriate using 40 tonne articulated dump trucks.

The crushed limestone will be transported to the MPF in covered side-tipping road trains. The haulage fleet will operate 260 days of the year and be capable of a maximum delivery rate of approximately 2000 tonnes/day with 100 truck movements per day.

2.3.3. Borefields

Bores and pump stations at the proposed eastern and western borefield would be raised above flood level and each bore fenced. The bores would be approximately 140 m deep and connected via an underground pipeline to a pump station near the western borefield. The water supply pipeline would link the pump station to the MPF. The borefields are located approximately 7 km part and would be linked by an access road following along the alignment of the pipeline joining the borefields.

2.4 Annual production, hours of operation and employment

Production

Production is estimated to commence in Year 3 after 32 months of construction, and site and infrastructure preparation. In the initial five years of the mine life, mining would be preferentially undertaken in areas of the resource which are accessible with high nickel and cobalt grades and low percentage of silica reject material. The proposed mining schedule for year 1 to 20 of the operation is presented in Table A2-2 of the EIS. The average rate of production will be 2 tonnes per year.

Hours of operation

Differing hours of operation apply to the various aspects of the Project. Once operational, the mine would operate 24 hours a day, 7 days a week. Quarrying at the limestone quarry would only occur during daytime hours. The hours of operation are shown in ***Table 1***.

Table 1 - Hours of operation

Phase	Location	Operating hours
Construction phase	Main project site • Maintenance, process plant construction and testing • Construction earthworks	24 hours, 7 days/week 0700-1800 7 days/week
	Haul road	0700-1800 7 days/ week
	Limestone quarry	0700-1700 7 days/week
	Rail Siding	0700-1800 7 days/week
	Gas and water pipelines	0700-1600 7 days/week
Operating phase	Main project site	24 hours 7 days/week
	Haul road	24 hours 7 days/week
	Limestone quarry	0700-1700 Monday to Sunday
	Rail Siding	days/week

2.5. Employment

2.5.1 Construction period

The actual construction period will be approximately 24 months in duration. The construction workforce will peak at 920 persons in month 14 and average 611 persons over the peak year of the construction period. From a review of the employment data provided by the Applicant, the socio-economic consultant concludes that approximately 21% of the jobs are expected to be filled by residents from within 100 km of the mine. The balance of skilled labour and the balance of other skill categories will be drawn from outside the region.

It is anticipated that the construction workforce will adopt a 12 hour shift roster system which will allow extended periods of work, followed by up to four day breaks.

2.5.2. Operational period

The operational workforce for the proposed Project is expected to peak at approximately 371 full time jobs in year 4 over the predicted life of the Project of more than 30 years, although the current application is for a period of 21 years. However it is expected that 73% of the workforce will be non-local and there will be an increasing need to import labor for many of the processing and some of the mining jobs.

2.6 License requirements

Other approvals that will be required following the granting of consent, include:

- a mining lease and mining approval from the Department of Mineral Resources under the Mining Act 1992;
- Licensing under Dangerous Goods Act 1975 for the use, carriage and storage of explosives;
- Approval from the Dam Safety Committee to construct large dams under the Dam Safety Act 1978.
- Permit for the construction of the pipeline from Ministry of Energy and Utilities

2.7 Justification

The Syerston deposit has been identified to comprise significant quantities of nickel and cobalt and potentially significant by-products of platinum and scandium. It is estimated that the Syerston Project will be one of the largest cobalt producers in the world. The EIS indicates that alternatives available to the Applicant for the mining and processing of nickel and cobalt are limited. The company has not at this stage located, at sufficient levels of certainty, any alternate nickel and cobalt resources, and there no alternative sites considered.

Sixty-five percent of primary nickel consumption will be used in the manufacturing of stainless steel with other uses including non-ferrous alloys, plating, foundry, alloy steels and batteries. World production of cobalt is predominantly used in the manufacturing of chemicals with other uses including super alloys, magnets, carbide and diamond tools, hard facing and HS steel.

The establishment and operation of the project would stimulate demand in the local and regional economy leading to increased business turnover in a range of sectors and increased employment opportunities.

3. STATUTORY PLANNING MATTERS

Various State and local statutory planning provisions apply to the proposed mine. The proposal is a "designated development" under Schedule 3 of the Environmental Planning and Assessment Regulation 1994 and an EIS has been prepared. Procedures relating to the preparation and public notification of the EIS have been followed.

3.1. Local Planning Considerations

The project is located within three local government areas; Lachlan, Parkes and Forbes. The majority of the project is located within Lachlan local government area and the land is zoned 1(a) Rural Agricultural Zone under the Lachlan Local Environmental Plan 1991. Within this zone, the development of the proposed works is permissible with development consent from the consent authority.

The limestone quarry and rail siding is located within the Parkes local government area. This land is zoned 1 (a) (Rural "A" Zone) under the Parkes Local Environmental Plan 1990 (Parkes LEP). Within this zone, the development of the proposed works is permissible with development consent from the consenting authority.

The water supply borefields and the southern section of the water supply pipeline are located within the Forbes local government area. The land is zoned 1(a) Rural Zone under the Forbes Local Environmental Plan 1986. Within this zone, the development of the proposed works is permissible with development consent from the consenting authority.

3.2. Regional Environmental plans

No regional environmental plans apply to the development proposal.

3.3. State Environmental Planning Policies

- **State Environmental Planning Policy No. 11 – Traffic Generating Development**

SEPP 11 applies to the subject development as the proposal involves mining as specified in paragraph (m) Schedule 1 of the Policy. The policy requires the DA to be referred to the Roads and Traffic Authority (RTA) to be granted the opportunity to make any representations on the proposal.

The RTA has been consulted and supports the proposal and endorses comments made by the Western Region Development Committee

- **State Environmental Planning Policy No. 33 – Hazardous and Offensive Development**

SEPP 33 was introduced in 1992 to ensure that in considering any application to carry out potentially hazardous or offensive development, the consent authority has sufficient information to assess whether the development is hazardous or offensive and to impose conditions to reduce or minimise any adverse impact.

The Department reviewed the hazards related issues with this proposal and concluded that there was unlikely to be any threat to people or the environment outside the site boundaries.

The Preliminary Hazard Analysis provided in the EIS was considered to be adequate. The Department is therefore satisfied that the provisions of SEPP 33 have been complied with.

- **State Environmental Planning Policy No 34 – Major employment generating industrial development**

SEPP 34 applies to major employment generating industrial development which is which would empty 100 or more people on a full time basis, or has a capital investment of $20 million or more.

- **State Environmental Planning Policy No 44 – Koala Habitat Protection**

SEPP 44 requires the consent authority for any development application in certain local government areas to consider whether the land, which is the subject of the development application, is "potential koala habitat" or "core koala habitat". The policy applies to Forbes and Parkes as identified in Schedule 1 of the policy which identifies local government areas where koalas are known to occur. The assessment of flora and fauna information presented in the EIS indicates that the lands are not potential or core Koala habitat.

3.4. Other legislation

- Schedule 3 of EP&A Regulation

The proposal is designated development under Schedule 3 of the EP&A Regulation 1994 and an EIS was accordingly prepared.

- Threatened Species Conservation Act, 1995

An assessment of the significant effect of the proposal on threatened species, population and ecological communities and their habitats was undertaken in the EIS through an 8-part test in accordance with section 5A of the EP&A Act. The EIS concluded that no threatened species, population or ecological communities will be significantly impacted by the proposal. The Department's assessment has concluded that with the implementation of appropriate mitigation measures and monitoring as provided in the conditions of consent, the development is unlikely to have a significant impact on threatened species or their habitats. A Species Impact Statement (SIS) was therefore not required to support the DA. This issue is discussed in greater detail in the assessment section of this report.

3.5. Conclusion

The proposal is in accordance with the provisions of all the relevant environmental planning instruments.

4. MINE SITE AND PROCESSING FACILITY ASSESSMENT

Key Issues

In the Department's opinion, the key issues for assessment, taking into consideration the submissions received on the proposal and the contents of the EIS, are impact from or impact on:

- Air quality - Gaseous air emissions
  - Dust
- Water - Ground water
  - Surface water
- Noise emissions
- Flora and fauna
- Land management
- Heritage - Aboriginal archaeology
  - European heritage
- Hazards

4.1. Air quality

4.1.1. Gaseous Emissions

- ***The Applicants position***

With respect to the Nickel/ Cobalt Processing Facility, the EIS indicates that the most significant air quality concern will be gaseous emissions, as opposed to dust generation. Gaseous emissions from the Facility will consist of:

- low pressure steam let-down from the sulfuric acid plant;
- water vapour from the cooling water system;
- sulfur dioxide from the sulphuric acid plant and hydrogen sulphide flare;
- nitrogen oxides from the power plant and nitric acid dissolution of cobalt;
- oxygen, hydrogen and water vapour from electrowinning cells;
- carbon dioxide from the power plant, neutralisation circuits and hydrogen plant;
- hydrogen sulphide from the hydrogen sulphide plant and process circuits; and
- process steam.

The Applicant highlights that the emissions listed above are expected under normal operating conditions. In the event of a process upset or emergency, the nature, composition and quantity of those emissions could vary considerably. Such scenarios have been dealt with specifically as hazardous incidents and the risk impacts assessed (refer to Section 8 of this assessment report).

With respect to the emission of water vapour from the development, the EIS states that these emissions pose no environmental impact as a result of the interaction of the water with surrounding land uses. However, excessive venting of steam will ultimately impact on the water consumption of the development. As a result, it is the Applicant's best interests to minimise unnecessary water vapour (steam) releases. The Applicant indicates in the EIS that, wherever possible, steam will be reused for heating purposes and condensate collected for heating or reuse.

Carbon dioxide (CO_2) is a greenhouse gas that will be produced at a number of points within the Nickel/ Cobalt Processing Facility. The Applicant has estimated that the total CO_2-equivalent of greenhouse gases emitted from the development each year will be in the order of 300,000 tonnes. The majority of this will result from the combustion of natural gas at the development's power station to supply the Processing Facility and ancillary development components with electricity (approximately 140,000 tonnes of CO_2 per annum). A large proportion of carbon dioxide will be liberated during lime-neutralisation of acidic process streams (approximately 130,000 tonnes of CO_2 per annum). The remainder of greenhouse gas contributions will be contributed as hydrogen reformer stack gases and combustion gases from flare stacks. While carbon dioxide does not pose a direct impact on the locality, it will contribute to the wider "global issue" of the Greenhouse Effect. While the Applicant has recognised this issue in the EIS, no mitigating measure has been proposed. There has been a commitment from the Applicant to minimise energy consumption (and hence carbon dioxide emissions from the development's power plant) in an effort to reduce operating expense. The Applicant has indicated that it will keep an inventory of greenhouse gas emissions from the development.

The EIS presents atmospheric dispersion modelling undertaken for emissions of sulphur dioxide (SO_2), oxides of nitrogen (NO_x) and hydrogen sulphide (H_2S). A standard Gaussian plume model (AUSPLUME) was employed for this purpose, taking into consideration emission rates of each gaseous species, meteorological conditions and time/ distance from the emission point.

Modelling of SO_2 dispersion indicates that at no time will the development lead to an exceedence of the National Environment Protection Measure (NEPM) average criteria for one hour (572 μgm^{-3}), 24 hours (229 μgm^{-3}) or one year (57 μgm^{-3}). The EIS also highlights that under the *Clean Air (Plant and Equipment) Regulation, 1997* sulphuric acid plants, such as those to be used at the development, must not emit SO_2 at concentrations greater than 2.8 gm^{-3}. The proposed sulphuric acid plant has been designed, as indicated by the Applicant, to emit SO_2 at a concentration of 1.5 gm^{-3}, which is well below that required by the Regulation. The Applicant does not intend to employ any specific measure to reduce the quantity of SO_2 emitted from the development. Rather, it is proposed that the vent stack from the acid plant will be up to 80 metres high to ensure full dispersion of the gas and minimise any potential impact on surrounding land uses.

In a similar manner to the modelling undertaken for SO_2 emissions, ground-level concentrations of NO_x were calculated for areas outside the site boundary. Under all circumstances examined, results of the modelling present in the EIS suggest that the development will not cause an exceedence of the NEPM NO_2 goals for one hour (246 μgm^{-3}) and one year (61 μgm^{-3}). The Applicant states that the projected continuous emissions of NO_x will not exceed those limits specified by the *Clean Air (Plant and Equipment) Regulation, 1997*. The EIS highlights that although the nitric vent fan is the single greatest contributor of NO_x from the development, emissions from this source will be intermittent. Further, it is proposed that the gas stream from this source be emitted through a 10-metre stack. The Applicant argues that nitric oxide from this source will disperse very rapidly given the stack exit temperature of 873K (848^oC).

Maximum ground-level concentration of hydrogen sulphide were modelled as three-minute averages. This was to allow an easy comparison with ambient design criteria recommended by the Victorian EPA (the NSW EPA currently has not ambient design limit for H_2S). Results of this modelling presented in the EIS indicate that the development will not exceed the recommended three-minute average of 0.14 μgm^{-3} under all conditions considered. Further, the EIS highlights that emission of H_2S from the site (equivalent to 0.07 mgm^{-3}) will not exceed the *Clean Air (Plant and Equipment) Regulation, 1997* limit of 5 mgm^{-3}. The EIS indicates that under normal operating conditions vent streams that may

contain residual H_2S will be scrubbed to ensure minimal emission of that gas.
Under emergency situations, H_2S will be directed to the Process Facility's hydrogen sulphide flare. The Applicant indicates that the flare has been designed to allow 100% destruction of H_2S (producing SO_2 and H_2O).

Other gaseous emissions from the development will include oxygen (O_2) and hydrogen (H_2). As oxygen is a naturally occurring gas in the atmosphere (accounting for about 21%), the Applicant does not propose to implement any measure to minimise or mitigate the emissions of O_2. Similarly, hydrogen is a colourless, non-toxic gas that disperses quickly in the atmosphere. Oxygen and hydrogen do, however, pose a hazard risk through fires and explosions. These issues were addressed in the EIS as part of the Preliminary Hazard Analysis for the development (refer to section 8 of this assessment report).

The Applicant proposes to implement a routine gaseous emissions monitoring program.

- ***Issues Raised in Submissions***

The Department received a number of submissions from the public raising concerns regarding atmospheric emissions from the Nickel/ Cobalt Processing Facility. These submissions indicated that the possible toxic effects of sulphur dioxide, oxides of nitrogen and hydrogen sulphide were of significant importance as well as the long-term effects of exposure to these compounds. Generally the submissions questioned the dispersion of the aforementioned gases and the possibility that sufficiently high concentrations of the gases may reach residential areas and cause injury/ irritation or fatality. The public was also concerned that accumulation of these gases, or extended exposure to them, could have a detrimental effect on human health and the viability of their livestock and crops. The issue of greenhouse gas emissions was not raised. Although dust generation from the Nickel/ Cobalt Processing Facility was not highlighted in any public submissions, it is assumed that general concerns regarding dust from the development as a whole included any concerns specific to the Facility.

The submission made by Lachlan Shire Council highlights that public concern regarding gaseous emissions from the Processing Facility have been brought to its attention. Generally the public are concerned that gaseous emissions from the development may cause human health problems, affect the health or yield of crops and livestock, and give rise to odour impacts. No other Council raised atmospheric emissions from the Nickel/ Cobalt Processing Facility as being of concern.

The EPA has indicated that it generally concurs with the method and findings of the gaseous emission modelling undertaken by the Applicant. From the results of this modelling the EPA has been able to draft and submit to the Department a series of General Terms of Approval which aim to control atmospheric emissions (both gas and particulate) through:

- imposition of emission concentration limits for SO_x (including SO_2, SO_3 and H_2SO_4), oxides of nitrogen (including NO and NO_2), heavy metals and solid particulates for all stationary discharge points associated with the Processing Facility;
- a requirement for the Applicant to minimise the emission of dust at all times;
- a requirement that no offensive odour shall be emitted from the site;
- imposition of monitoring for SO_x (including SO_2, SO_3 and H_2SO_4), oxides of nitrogen (including NO and NO_2), heavy metals, solid particulates and emission conditions (temperature, velocity, flowrate, moisture etc) for all stationary discharge points associated with the Processing Facility;
- a requirement for the Applicant to undertake meteorological monitoring prior to the commencement of operation of the development to verify the validity of

meteorological assumptions made in the dispersion modelling presented in the EIS;

- specification of minimum design parameters for stacks associated with the development (height and diameter) to ensure adequate emission dispersion as suggested in the EIS; and
- imposition of maximum ground-level concentrations for sulphuric acid, sulphur dioxide, nitrogen dioxide, nickel compounds and solid particulates, in accordance with the predicted dispersion of the pollutants from site stacks.

During the exhibition of the subject development application, the EPA requested additional information related to the carcinogenicity of certain nickel compounds. At the time, the EPA was concerned about the potential health effects of nickel carbonyl and nickel subsulphide. Discussions between the EPA and the Applicant resolved that such compounds were confirmed carcinogens associated with nickel smelters. The Applicant highlighted that the development, although it was to process nickel, was not a nickel smelter. The likelihood of formation of these compounds is low at the proposed development and the Applicant demonstrated to the EPA that because the development will be employing a wet process, the formation of dust is also low. The EPA indicated it was generally satisfied with this position.

No other government agency raised atmospheric emissions from the Nickel/ Cobalt Processing Facility as being of concern.

- ***Department's Position***

The Department considers that the most significant air quality issue associated with the Nickel/ Cobalt Processing Facility is gaseous emissions. Both the Department and the EPA concur with the approach and the findings of the emissions modelling presented in the EIS. The EPA's General Terms of Approval relating to the emission concentrations of gases, stack heights and meteorological monitoring have been incorporated in to the recommended instrument. From the results of the gas dispersion modelling, the Department is satisfied that risk of significant impacts from the Processing Facility on human health and the biophysical environment is minimal.

The Department also considers it appropriate for the Applicant to be required to develop a Gaseous Emissions Management Plan. The aim of the Plan, as distinct from the General Terms of Approval supplied by the EPA, is to put in place a system of management procedures and protocols to not only ensure that the proposed development does not exceed those impacts predicted in the EIS, but regularly examines the potential to reduce emissions further than those predicted. The Plan has been drafted to require the Applicant to develop a philosophy of minimisation of gaseous emissions by examining and addressing the choice and handling of feed materials to the process. Further, the Plan requires that protocols be established to facilitate continual environmental improvement with regard to gaseous emissions from both point and diffuse sources. The Department is satisfied that the Gaseous Management Plan, as it stands in the recommended instrument of consent, represents an appropriate means of gaseous emissions management.

Public submissions have raised the issue of "dust fall-out" from SO_2, H_2S and NO_2 and the effects of this fall-out on the health of the human population, crop and livestock production and the surrounding environment. Sulphur dioxide (SO_2), hydrogen sulphide (H_2S) and nitrogen dioxide (NO_2) are all gases and there are no conceivable circumstances under which it is possible for these chemicals to form a dust on the surrounding land. SO_2 and NO_2 are, however, recognised as being precursors to acid rain. Acid rain is a phenomenon associated with regions the subject of significant densities of industrial development with the regional air shed receiving high levels of these compounds. Under these conditions SO_2 and NO_2 may react with water in the atmosphere, decreasing the pH of the rain water

(ie make rain acidic). In the case of the Syerston development, the emission rate of SO_2 and NO_2 from the site, combined with atmospheric dispersion and low rainfall indicates that the potential for noticeable pH changes in rainwater is extremely low. It is also noted that rainwater is naturally slightly alkaline, permitting a minor buffering effect to any SO_2/ NO_2 reaction with atmospheric moisture. Acid rain is not considered to be an issue with the proposed development.

All three compounds (SO_2, NO_2 and H_2S) can be toxic to humans at elevated concentrations. Given a high enough concentration of any of these compounds, off site fatality can be expected. At lower concentrations, it is possible for each compound to cause irritation to the respiratory tract and mucous membranes. Common symptoms in these instances are a tightening of the windpipe with an associated difficulty in breathing, burning sensations in the throat and nose, and watering of the eyes. These effects are not of a particular health concern when experienced by healthy people. However, asthmatics, the elderly or the young may be adversely affected by concentrations lower than those required to affect "healthy people". Guidelines, such as the National Environment Protection Measure (NEPM) have been produced to provide an upper "safe" limit for concentrations of these gases. For example, the NEPM 1 hour limit for SO_2 is 572 μgm^{-3} (20 pphm). At this level, most people will be unaffected by SO_2, with the possibility of some very sensitive people (for example extreme asthmatics) to experience irritation and discomfort. For the Syerston development, the EIS shows that NEPM criteria will be met at all locations outside the site boundary, suggesting that the local community will be unaffected by the emission of SO_2, NO_2 and H_2S. It is considered extremely unlikely that severe asthmatics, the elderly or the very young will be located at the boundary of the site (worst case concentration of these pollutants) or at the nearest most affected residence (where these compounds will be monitored), approximately 1 kilometre from the point of emission.

Although SO_2, NO_2 and H_2S may cause fatality or injury/ irritation, there is no evidence that these compounds may have a long-term effect, even with asthmatics. Generally the effects of these gases is either fatality at high concentrations, or irritation at lower concentrations. Having experienced irritation from any of these compounds, the affected person returns to "normal" once the irritant has dispersed. The duration of the exposure to the irritant does not appear to alter its effects (ie 5 minutes of irritation from SO_2 has the same health effect as 1 hour at the same concentration). Again, criteria such as NEPM have been developed to avoid fatality, injury and irritation in most people.

The Department is not satisfied that the Applicant has given adequate consideration to the issue of greenhouse gas production. Although there was some commitment made in the EIS that energy consumption would be minimised (and indirectly minimised greenhouse gas production) and that greenhouse gas inventories would be kept, there was no clear commitment to taking action to minimise emissions of these gases. Therefore the Department recommends that an Energy Management Plan be incorporated into the instrument of consent. As the single largest producer of carbon dioxide associated with the development is the power plant, minimisation of energy consumption at the development will indirectly reduce carbon dioxide emissions.

With regard to the emission of hydrogen and oxygen from the development, the Department recognises that these materials do not pose an environmental risk in terms of toxicity. They do, however, represent a fire/ explosion hazard. This issue has been addressed as part of the hazard/ risk consideration presented in this report.

The Department is satisfied that the Applicant has adequately identified and assessed atmospheric emission impacts associated with the Nickel/ Cobalt Processing Facility.

4.1.2. Dust

- ***The Applicants Position***

The EIS indicates that fugitive dust particles will be introduced to the rural environment of the site by a variety of construction and operating activities including clearing, compacting of the base areas, trench excavation and the hauling, placing and compacting of selected mine overburden or borrow materials.

The EIS indicates that the Nickel/ Cobalt Processing Facility will employ a largely "wet process" for the treatment of nickel and cobalt ore. All process streams will be handled as slurries under normal operating conditions. As such, the Applicant suggests that the formation of dust from the process is unlikely. There is, however, some potential for dust generation from stockpiles of ore, limestone and elemental sulfur to be employed in the process. In a similar manner to dust suppression during construction, the Applicant intends to employ water sprays on stockpiles to minimise the emission of dust.

Existing environment

A monitoring program of dust deposition rates was established by the Applicant in September 1997 to characterise the existing air quality in terms of atmospheric dust prior to the construction of the mine and processing plant. Five monitoring sites within the MLA were selected to be representative of the general surrounding local environment. Dust deposition gauges were installed at these sites to determine monthly rates of dust fall. The results showed a mean dust deposition over a period of 32 months ranging from 1.01 g/m^2/month to 1.35 g/m^2/month.

The EIS predicts rates of dust emission into this environment for mining activities in year 1, year 5, year 10 and year 20. The study is conducted with reference to EPA amenity based criteria under which the maximum acceptable increase is $2g/m^2$/month, as it applies to environs where the existing rate of dust deposition does not exceed $2g/m^2$. The EIS follows this criteria and all results of the modelling are discussed in this context. All references to Figures in this discussion are contained in Appendix A to the EIS. The estimated rates of dust emissions were determined using on-site meteorological data in a recommended computer model of dust dispersion. The results of dust modeling are graphically represented in Appendix A of the EIS.

Emissions in Year 1 (Construction)

The EIS predicts that the most active period, in terms of emissions of atmospheric particulates will be between the 9th and 20th month of an anticipated 2 year construction period, when both the southern tailings storage and the evaporation ponds will be constructed. Figure 6.1 in the EIS indicates that mean annual increments of $4g/m^2$/month will be confined to the MLA area. Increments of $2g/m^2$/month were also predicted to be restricted to the MLA with the exception of a narrow strip of land to the east of MLA139. All non-company owned residences located to the east of the MLA, as well as the township of Fifield, were predicted to experience mean annual increments of less than 0.2 g/m^2 month. Two residences “Wanda Bye” and “Glenburn” will experience a predicated increase of 0.3 g/m^2/month, however, this remains within the EPA amenity incremental criterion of $2g/m^2$/month.

Year 5 (operation)

The results of the EIS modelling as shown in Figure 6.2 of the EIS, indicate that the predicted increments in the annual dust deposition rate of $2g/m^2$/month will be confined to

the MLA area. All the non-company owned residences located in the vicinity of the proposed development are predicted to receive increases in the mean annual dust deposition rate of less than 0.4gm2/month and in most cases less than 0.2 g/m2/month.

Year 10 (operation)

The predicted increase in dust deposition during Year 10 is illustrated in Figure 6.3 of the EIS. The results indicate that an increase of 2g/m^2/month will remain confined almost entirely to the MLA area. A small section of land immediately north of MLA 140, encroaching onto the property of "Currajong" Park is predicted to experience a rate of between 2 and 3 g/m^2/month. The predicted increase at the "Currajong Park" residence was approximately 0.5g/m^2/month. The increases at all other non-company owned residences will be restricted to 0.2g/m^2/month or less.

Year 20 (operation)

The predicted increase during Year 20 of operation are contained in Figure 6.4 of the EIS. This indicates that an increase of 2g/m2/month will be fully confined to the MLA area. An increase of about 0.4g/m^2/month is predicated for Currajong Park. The nearest residences to the southwestern direction of the MLA, "Sunrise" and "Flemington," were predicted to receive an increase of about 0.3g/m^2/month.

Total suspended particulates (TSP)

The air quality consultants engaged by the Applicant in the preparation of the EIS for the for the project state that there no records of concentrations of total suspended particulates and particles with a diameter less than 10 microns in the ambient air at Syerston. Given the recorded low levels of dust deposition, the concentrations of particles with a diameter of less than 10 microns are also expected to be correspondingly low. Mean annual concentrations of not more than 20 to 30 micrograms/m3 are not normally found in areas similar to the area which includes the project site. The existing mean concentrations in the area are estimated to be about 20 to 30 micrograms or less.

The National Health and Medical Research Council of Australia (NMMRC) recommended annual concentrations of 90 micrograms/m^3 as the maximum permissible level of total suspended particles in the air to protect public health in residential environments. Applying the NHMRC criterion of 90 micrograms/m3, the EIS states that an increase of at least 60 micrograms would thereby be needed to reach the specified upper limit.

Year 1

The predicted increase in the mean concentration of TSP during the most intensive 12 months of construction activities are shown in Figure 6.5 of the EIS. The EIS indcates that increments of 60 micrograms/m3 and higher will be contained within the MLA area. The modelling indicates that the increase will be less than 5 micrograms/m3 at all non company owned residences.

Year 5

The predicted increases in the mean annual concentration of TSP in the ambient air are shown in Figure 6.6. The EIS predicts that an increase of this magnitude was predicted to be fully contained in the MLA. Increments of 40 micrograms/m^3 will also be largely confined to the MLA. The "Currajong Park" residence was predicated to receive an increase in the mean annual concentration of TSP of about 15 micrograms/m^3. All other residences will experience increases of less than 10micrograms/m^3 of TSP.

Year 10

The EIS predicts that, in all but a section outside the northern boundary of MLA 140, the increases in TSP of 60 micrograms/m3 will be confined to the MLA area, as shown in Figue 6.7 of the EIS. Currajong Park will have an increase of 20 micrograms/m^3, with all other non-company owned residences increasing by less than 10 microgram/m^3.

Year 20

Increments of 60 micrograms/m3 will be restricted to within the MLA boundaries except for a small proportion to the north of the MLA which encroaches onto the Rosehill (company owned) and Currojong Park property. The homestead at "Currajong Park" will receive approximately 20 micrograms/m3, and "Sunrise" and "Flemington" about 15 micrograms/m3

The EIS describes a range of air quality safeguards will be implemented during construction and operation to achieve air quality objectives. These will include restricting the size of the surface area disturbance at any given time; regular watering of dusty surfaces; collection of fines from drilling; prevention of truck overloading and spillage; regular maintenance of haul roads; and progressive rehabilitation of the waste emplacements.

- ***Issues raised in Submissions***

The EPA, as part of their General Terms of Approval stipulated activities must be carried out in a manner that will minimise emissions of dust from the premises. The EPA also required the applicant to undertake a program of monitoring for PM_{10}, TSP and deposited matter at the nearest affected residences, or as identified in the EIS.

A number of public submissions were received during exhibition of the EIS concerning dust deposition from the mining operations. These were primarily from local landholders who expressed concern regarding health impacts and the effect of dust being blown into drinking water and onto cropping land. The Tullamore Concerned Citizens Committee made a submission concerning the impact of the waste emplacement which will be formed up to the boundary lines of three adjoining properties; "Victoria Park", Rosehill" and "Currajong Park". This submission expressed concern of the height of the waste emplacement and the potential dust impacts from this land form.

- ***The Department's position***

With regard to the construction of the Processing Facility, the Department considers that the mitigation measures proposed to minimise the generation of dust are satisfactory. During the operation of the Processing Facility, although the proposed process is "wet" the Department considers that there is potential for the generation of dust should the process be allowed to dry out. Such situations include the initial start-up of the process, or shut-down of the process, either in a controlled or emergency situation. If there are insufficient, or inappropriate management procedures protocols in place there may be extended periods during which process streams are permitted to dry (either intentionally or accidentally). To address this issue, the Department has required procedures and protocols to be developed and included in the Dust Management Plan for the development to address the potential for process streams to dry out and generate dust. The Dust Management Plan has been incorporated in the recommended instrument of consent. Further, the EPA's General Term of Approval related to dust minimisation at the development has been included in the instrument.

With regard to the possible carcinogenicity of nickel compounds, it is noted that a number of compounds found in nickel smelter/ refinery dust, including nickel subsulphide and

nickel oxide have been shown to cause cancer in humans, and nickel carbonyl, copper-nickel oxides and nickel sulphates are suspected of possibly causing cancer. The Applicant has emphasised the fact that the proposed development is not a "traditional" nickel smelting and refining facility, and because the process to be employed is "wet", there is no path for the release of any compound known or suspected of being carcinogenic. Both DUAP and the EPA generally support this position. It is further highlighted that given the chemistry of the proposed process, the formation of compounds such as nickel sulphates, nickel carbonyl and copper-nickel oxides is very low.

With regard to dust emissions from mining operations, it is noted that the solubility of nickel/ cobalt ore and associated extracted material is extremely low. In the event that any significant quantity of the extracted material finds its way into local rainwater tanks, it is most likely that the material will settle to the bottom of the tank without altering the quality of the water in the tank. It is noted that if nickel/ cobalt materials were easily soluble, the applicant would not need to process the extracted material at high pressure and in the presence of strong acid and hydrogen sulphide (they would simply dissolve it in water). Dust dispersion modelling presented in the EIS indicates that dust deposition rates on neighbouring land uses as a result of mining operations is very low (0.2-0.6 g/ month/ m^2), further supporting the conclusion that the effects of dust on the locality will be minor. The applicant proposes to further mitigate these impacts through dust suppression techniques outlined in the EIS. DUAP is also requiring the preparation of a Dust Management Plan as a condition of consent.

The conditions of consent for the project recommend that a Dust Management Plan to be prepared prior to the commencement of the mine/quarry operations. This plan is to include identification of all potential dust sources, mitigation measures, and community consultation. The conditions also require the Applicant to undertake dust monitoring at locations described in the Dust Management Plan, which incorporate the EPAs GTAs. The Department is of the position that dust impacts will be adequately managed and mitigated by the conditions of consent and the measures outlined in the EIS.

4.2. Water

4.2.1 Groundwater

- ***Applicants Position***

Hydrogeology

Golder Associates (2000) were engaged by the Applicant to conduct a detailed drilling, testing and hydrogeological modelling investigation across the MPF site. Groundwater sampling and water analysis were also undertaken.

The Golder investigations identified three types of aquifers likely to occur on the MPF site. These were alluvial, fractured rock and chemical. The site specific investigations indicated that local aquifers were rare and confined to one occurrence of a fractured rock aquifer in the northwest of the site. No perched aquifers were found.

The EIS noted that recharge within the region is generally confined to catchment divides, where outcrops of basement rock occur. These outcrops have open fractures and joints exposed to the atmosphere and are therefore able to receive rainfall. Local recharge associated with this recharge is generally fresh to brackish. A groundwater recharge zone was identified in the northwest of the MPF site.

The Golder investigations noted no major surface expressions (ie wetlands, local lakes or rivers) into which groundwater discharge is expected to occur, were located in the MPF

site or surrounds. Some waterlogged areas that exist on the MPF site are, however, likely to become periodic zones of groundwater discharge.

The EIS assessed that the general flow of groundwater wast to the northeast, following the direction of the fall in topography. Hydraulic conductivities measured at the site were low.

Groundwater Quality

Groundwater sampling and analysis from 10 boreholes within the MPF site and two boreholes off site was undertaken by the Applicant in September 1999. The results showed that groundwater quality within the MPF site is generally poor but highly variable, and expected to range from saline (>10,000 mg/L) when sourced from zones of low permeability and slow groundwater movement and/or groundwater discharge areas, to fresh (<1000 mg/L) adjacent to areas of recharge.

The pH varied from acidic to mildly basic. Trace metal analyses revealed that the samples from the MPF site were generally within the ANZECC (1992) guideline values for the protection of aquatic ecosystems. Monitoring at one groundwater site (FGW 1) revealed elevated lead concentrations in almost half the samples.

The Applicant reported that the groundwater is suitable for stock watering at selected locations, with the exception of water sourced from “Berrilee” where it is of acceptable standard for domestic purposes.

- **Impact Assessment**

To assess the potential impacts of the MPF on local groundwater systems in the vicinity of the Tailings Storage Facility (TSF), evaporation ponds and surge dam, the Applicant engaged Golder and Associates to undertake a hydrogeological study. The modelling was performed using the SEEP-W computer model, to simulate groundwater flow in the partially-saturated zone above the watertable, and saturated zone below the water table.

In order to assess the potential for seepage migration from the TSF, detailed analysis and modelling was undertaken for a 50 year period to simulate the placement of tailings over a period of 20 years, followed by the capping of the TSF with a low infiltration surface treatment. The addition of a low permeability compacted layer on the base of the TSF was also modelled to examine the influence of such a layer on seepage movement. Model runs also included a proposed seepage collection system along the internal toe of the TSF perimeter embankment.

The EIS predicts that acid drainage should not occur in the TSF over the life of the mine. The tailings would be neutralised in the process plant and discharged at a pH of apprximately 7 to 7.5 with excess limestone. The near neutral pH would also reduce the risk of Cr, Fe, and Ni becoming soluble.

The EIS states that process water stored in the evaporation ponds and surge dam is expected to contain elevated TDS concentrations (predominantly magnesium sulphate-epsom salts) due to evapo-concentration effects. The EIS states that the quality of any limited seepages from these storages would reflect these elevated concentrations.

The hydrological studies undertaken by the Applicant indicate that seepage from the TSF and evaporation ponds and surge dam is likely to have negligible impact on existing groundwater levels or quality. Based on the hydrological modelling, the potential groundwater impacts include the following:

- Saturation of soils underlying the TSF and evaporation ponds over the first five years of operation.
- Lateral spreading of the groundwater mound is expected with rises in water table elevation extending to a maximum distance of some 825m from the TSF and evaporation ponds footprint after 50 years.
- Potential for seepage of liquor from the TSF, evaporation ponds and surge dam is constrained by low permeabilities in the underlying and adjacent soil and rock and also the maximum height of saturated tailings and shall depth of water (typically less than 2.5m) in the evaporation ponds.
- Beyond the zone of raised groundwater velocities induced by the operation of the TSF, evaporation ponds and surge dam, the groundwater system is inferred to have low to very low velocities. Accordingly, the localised groundwater mound associated with the TSF, evaporation ponds and surge dam is expected to dissipate in the order of 50 to 100 years from the cessation of activities.

In assessing these impacts, the Applicant did not record any groundwater use within 5km down gradient of the MPF TSP site, and localised groundwater quality in the vicinity of the MPF site was assessed as saline with limited beneficial use.

The Applicant proposes a number of mitigate measures to minimise impacts from the development on groundwater resources. These include pre-stripping of soils beneath embankment footprints, construction of low permeability clay liners under the TSF, evaporation ponds and surge dam storage areas, installation of an underdrainage and seepage interception drain, and a network of monitoring bores. The seepage control measures proposed by the Applicant are designed to provide a physical control barrier to limit seepage from the TSF and evaporation ponds. The Applicant also proposes rehabilitation and water monitoring strategies to facilitate long-term rehabilitation of mine landforms including the management of any seepage issues.

- ***Issues raised in submissions***

The EPA provided conditions in their General Terms of Approval designed to ensure that any seepage of tailings from the TSF evaporation basins and surge dam was contained within the boundary of the premises. These conditions addressed the design of the clay liner, the inclusion of a tailings water recovery system over the liner to collect and recover tailings water above the liner, and a decant system to recover water from the TSF. The EPA required the designs to be reviewed by an independent person to certify the required permeability of the liner had been achieved prior to construction.

The DLWC required the construction of the TSF and evaporation ponds to be in accordance with standard engineering requirements and the requirements of the Dam Safety Committee (DSC). The DLWC endorsed the proposal by the Applicant that a single, suitably qualified organisation will undertake the supervision and control of all technical aspects of the TSF, evaporation pond and surge dam including design, construction and testing.

DLWC deemed that groundwater occurring beyond the current mine lease boundary should be protected and supported outline proposals by the Applicant for seepage interception should the predicted behaviour of the seepage front becomes unacceptable. The DLWC sought careful consideration of the location of groundwater monitoring bores to take into account the presence of fracture zones, and an increase in the proposed network of monitoring bores to the north and in pre-development groundwater flow paths.

The DLWC provided conditions in their GTAs requiring the Applicant to prepare a contingency plan that ensures that any plume of contaminated water generated by the

facilities are contained within the mine lease area. Other conditions relate to groundwater monitoring and reporting conditions.

The requirements of the EPA and DLWC have been incorporated in the recommended conditions.

Six public submissions expressed concern at the impact of seepage on groundwater quality and quantity in bores used for irrigation and stock watering. Comments on the draft conditions circulated to the community reinforced concerns regarding the impact of the MPF on groundwater quality and quantity. In particular, measures to rehabilitate affected bores or to provide an alternative water supply have been raised. The source and quality of the alternative water supply also needs to be identified.

- **Independent Consultant Report**

The Department engaged Peter Dundon and Associates (2001) to undertake an independent assessment of the groundwater investigations undertaken by the Applicant. This report is attached in Appendix 2. The consultant considered that the model adopted by Golder and Associates for the MPF site to be an appropriate modelling package for this purpose, and the investigation program adequate for the characterisation of the site and evaluation of potential impacts.

Dundon identified that in addition to fractured rock aquifers, saturated and/or unsaturated alluvial palaeochannels may occur on the site. Sediments contained within the palaeochannels may contain zones or lenses of higher permeability, which could constitute preferred pathways for sub-surface flow away from the site if they become saturated by seepage from the TSF or evaporation ponds during or after mining.

Dundon reported that the Golder study makes no comments on the quality of the TSF seepage water, other than that it would be saline, but probably of better quality than the tailings input solution or tailings pore water, due to natural mixing/retardation and adsorption effects.

Dundon recommended that because the existing licensed bores in the region are predominantly located in palaeochannels, the Applicant's monitoring bore network include appropriate palaeochannel bores to allow early detection of any more rapid seepage migration towards the palaeochannels.

Dundon noted that rates of migration are expected to be so slow that long term effects will be negligible. However, in the event that preferred pathways of higher permeability are present, longer-term effects may become important. For this reason, Dundon recommended the Applicant establish and maintain appropriate monitoring of seepage around the TSP and evaporation pond facility, so that model predictions can be verified.

Dundon concluded that notwithstanding that some seepage from the TSF and evaporation pond areas is expected to reach the groundwater and migrate away from these facilities, proposals for the MPF site have a generally low potential for impact on the region's groundwater resources.

- ***The Department's Position***

The Applicant was provided with the report from Peter Dundon & Associates (2001) for comment and indicated agreement with the conclusions of Dundon. In particular, the Applicant indicated that it proposed to locate monitoring bores not only in the "palaeochannels" as recommended by Dundon, but generally around the site to identify

and predict any seepage before it leaves the site so preventative action can occur prior to any impact on existing groundwater users.

The Department considers that there is unlikely to be an impact on groundwater supply to surrounding groundwater users as a result of the MPF. However, the extent of the seepage plume from the TSP, evaporation ponds and surge dam may not be able to be contained within the premises, and impacts on surrounding groundwater users cannot be confirmed. Information presented in the EIS predicts that the groundwater plume may extend beyond the boundary of the premises. A number of landowners have raised concerns regarding the extent of groundwater impacts on farm water supplies drawn from bores in the vicinity of the MPF and measures proposed to rehabilitate the bore and/or provide an alternative source of water need to be addressed.

A number of conditions are proposed to protect groundwater resources. These include a requirement that any seepage of tailings to the groundwater is to be minimised and contained within the boundary of the premises. The recommended conditions also include details of the design of the clay liner and in particular permeability requirements. The conditions also require that the design is to be assessed by an independent suitably qualified person approved by the EPA certifying that the specifications have been met, prior to commissioning. The Applicant is also required to construct the tailings dams to the requirements of DMR, EPA and DSC and in consultation with DLWC.

Conditions also require the applicant to install a series of monitoring bores around the TSF to monitor the chemical quality of the groundwater and to confirm compliance with the seepage model predictions. If the predicated behaviour of the TSF seepage front becomes unacceptable, ie, too close to the surface or a risk to beneficial users, then seepage interception measures will be required to be implemented.

In addition, conditions are recommended requiring the Applicant to detail measures to be undertaken in the event that groundwater quality in bores of adjoining neighbours deteriorate as a result of seepage from the operations. Where it is required to provide an alternative source of water, then the source and quality of the water supply is to be identified and approved. Conditions requiring independent monitoring, and acquisition, where appropriate, are also recommended.

The Department recognises that the actual nickel/ cobalt processing facility as separate from the mine poses only a minor risk to the underlying water table, unless there is a significant spill incident at the facility, or spills occur on a frequent basis. In the recommended instrument of consent, the Department has required the Applicant to bund all dangerous goods stores, undertake a Hazard and Operability Study (which will identify areas of possible leaks and spills) and has required the preparation of a Water Management Plan (including process water provisions for overall water cycle management).

The Department considers that these measures will ensure that impacts on groundwater quality will be adequately managed.

4.2.2. *Surface Water*

- ***Applicants position***

The proposed development, including the nickel/ cobalt processing facility, will be located in the headwaters of Bullock Creek, within the Murray-Darling Basin. Bullock Creek, at its closest point, lies approximately twenty kilometres north-east of the subject development site and drains towards the north to Bogan River. The proposed site for the nickel/ cobalt

processing facility and surrounding land areas are characterised by ephemeral streams, two of which trisect the site.

Potential surface water impacts from the mine site are reported by the Applicant to include impacts on water quality from runoff, seepage or the uncontrolled release of water from construction or operation areas. Surface water runoff from landforms, disturbed areas and infrastructure areas could potentially contain contaminants such as sediments, dissolved solids, oil, grease, process reagents and by products.

The nickel/ cobalt processing facility employs processes that handle ore, intermediate compounds and finished products in an aqueous slurry state. The Applicant indicates that the nickel/ cobalt processing facility has the potential to impact surface water quality through waste streams directed to the tailings storage facility. Other than this, the processing facility is essentially a closed system that cannot impact on surface water quality unless there is a significant release of process material. To mitigate against this potential impact, the Applicant intends to bund all areas associated with significant materials handling (and hence posing an increased potential for spillage) and to closely monitor process variables such as flowrate and pressure that may indicate a leak or spill should the relevant variable deviate from that expected under normal operating conditions.

The EIS proposes a MPF water management system to control runoff from construction and operation areas, while diverting upstream water around such areas. The water management system would be progressively developed during the construction and operation of the MPF as diversion and containment requirements change. This system will include the development of two surface water diversion channels which will be developed to divert surface water flows around areas of disturbance and items of infrastructure. The Northern diversion channel would allow upper catchment surface runoff to flow around the southern and eastern limit of open pits in the west of the MPF site and back into the existing drainage line. The southern diversion channel would allow upper catchment surface runoff to flow around the southern and eastern perimeter of the evaporation ponds and back to the existing drainage path.

An internal drainage system is also proposed by the Applicant to ensure control of waters generated within development/construction areas and operation areas. This system would consist of a series of permanent small drains designed to act as internal catchment divides and deliver water from disturbed areas to sediment dams. Sediment control structures such as sediment dams and sediment fences would be employed where necessary within, and downstream of, individual areas of disturbance and infrastructure.

In order to assess the potential drainage from the waste emplacements, the Applicant conducted a geochemical assessment of mine waste material. The EIS indicates that results of testing of a selected number of samples indicated that all waste was naturally alkaline and slightly to moderately saline. The EIS concludes that the results of the geochemical investigations indicate a very low to nil risk of developing acid drainage from discharges at Syerston. The EIS indicates that weathering of exposed waste rock will produce some saline run-off, but waste rock will be managed and controlled by the proposed Integrated Erosion and Sediment Control Plan which will ensure no run-off from wast rock dumps will leave the site.

- ***Issues raised in submissions***

The DLWC expressed concern that the diversion channels as described in the EIS would not provide a stable waterway in a 1:100 storm because the velocity proposed is too high. Velocities ranging from 1.2 – 2.5 m/s are quoted. Local practice in soil conservation design limits water velocities to 1.0 m/s. If this lower velocity is used, DLWC submitted that the diversion channels will need to be impractically wide. As proposed, DLWC

indicate these specifications will not provide a long term stable waterway and may put other structures in danger of being flooded. The issues were raised with the Applicant, who agreed that if detailed design shows that runoff flows are indeed larger, then a larger diversion would be provided. DLWC required the Applicant to consult with DLWC throughout the development of plans for these diversions and storages, and that such designs are to be approved by DLWC.

During the submission period, the Department of Mineral Resources requested further clarification regarding the geochemical assessment of waste rock; especially the omission in the EIS of the concentration of nickel in the waste rock sample. The BRM response indicated that waste soil material carries elevated levels of nickel, as expected, when compared to non-mineralised areas. Background water analysis presented in the EIS indicated that existing metal levels in adjacent creeks and water holding structures are extremely low, and hence the metals are immobile. Onsite background water monitoring from adjacent existing waste soil dumps at Syerston has reportedly continued since the EIS was prepared and these surveys have confirmed extremely low to undetectable metal concentrations in runoff.

The Department did not receive any submissions from the public, councils or agencies related to the impact of the processing facility itself. It is noted, however, that submissions were received that highlight the potential impacts of the tailings storage facility on surface- and groundwater quality and the quantity of groundwater extracted to serve the development.

- ***The Department's position***

The Department has conditioned that the Applicant prepare a Water Management Plan for the mine sites to manage surface water impacts from the mine site. In order to address the concerns of DLWC, and those of landholders downstream, the Department has stipulated that this plan must be prepared in consultation and to the satisfaction of DLWC and of the Director General. The plan will specifically include the need to provide details of design and maintenance of all storages, diversions, transmission channels and sedimentation basins for the site.

This plan is to include measures to be implemented to protect or maintain the quality of surface water prior to project operation. In relation to concerns about drainage from the waste emplacement, the Water Management Plan must also address measures for assessing chemical water quality impacts of the development on surface water quality, a program for reporting on the effectiveness of the water management systems and performance against the objectives of the approved site water management plan and EIS.

The conditions of consent also impose a monitoring requirement on the applicant which includes the preparation of a detailed monitoring program in respect of surface water quality and quantity during operations. The monitoring program is to identify frequency of sampling, the parameters to be measured, the need for contingency plans, the reporting procedures, and determination of appropriate cut-off criteria for monitoring purposes.

The Department has also conditioned that the Applicant prepare an Integrated Erosion and Sediment Control Plan, which includes details of sediment and erosion control systems, management of erosion and sedimentation of surface water courses/water; measures to be employed to minimise soil erosion and the discharge of sediment, and measures to construct banks, channels and similar works away from disturbed surfaces.

The Department considers that these measures will ensure that surface water impacts can be adequately managed.

4.3. Noise

- ***Applicants position***

The assessment of the background noise levels and potential acoustic impacts of the development was undertaken by Richard Heggie Associates (2000). The findings of the investigations are presented in full in Appendix K in the EIS. The EPA Industrial Noise Policy (INP) has been used in the EIS to determine the operational noise criteria for the mine. The intrusive criterion adopted requires that the equivalent continuous noise level (L_{Aeq}) of the mine should not be more than five decibels (dB) above the minimum background level (L_{A90}) noise level. If the L_{Aeq} noise level is exceeded by more than 5 to 10dB(A), then it is likely to produce complaints. The amenity criteria is based on the particular landuse, which in this case is rural-residential.

The mine is to be established in a rural environment with little existing industrial noise, and land use characterised by grazing and cropping activity and sparsely distributed residences. The EIS indicates that unattended background noise monitoring was conducted between 11 November and 25 November 1999 at seven residences which were considered to be representative of the areas in the vicinity of the Project, to provide an assessment of the character and duration of acoustically significant ambient noise sources. Environmental noise loggers were used to record noise levels continual at the respective monitoring locations over the survey period. The results, from the unattended noise loggers, were qualified with operator attended noise measurements conducted at the same residences.

The data indicates that $LA90_{(15\ minutes)}$ Rating Background Noise levels at these monitoring locations ranged from 31 dBA to 35 dBA during the daytime, 28dBA to 36 dBA during the evening and 26dBA to 30 dBA during the night time. The Noise assessment report indicates that the measured background levels are typical of those of a rural environment with little transportation noise and no industrial noise sources.

The assessment of noise impacts presented in the EIS was based on a range of scenarios which accounted for the various stages of development and operation of the mine under differing meteorological conditions and times of operation. These scenarios included the construction phase (calm conditions at 4 weeks, 4 to 26 week and 26 weeks), Year 5 (daytime; evening and night time) and Year 20 (daytime, evening and night time). The assessment was conducted in accordance with the EPA's INP which provides that noise assessment is conducted under prevailing meteorological conditions. However the project specific criteria apply under adverse meteorological conditions, and are presented in Table 2.

Table 2

tion	d	ct Specific Noise Limits
		sive Criteria L_{eq} (15 minute) dB(A)
klyn	Day Evening Night	 35 35
ajong Park	Day Evening Night	 35 35
hill	Day Evening Night	 35 35
ington	Day Evening t	 39 35
ise	Day Evening t	 40 35
da Bye	Day Evening t	 41 35
burn	Day Evening t	 41 35
d	Day Evening t	 35 35
awindi	Day Evening t	 39 35
down	Day Evening t	 39 35

Note : Daytime (between the hours of 7am and 6pm); evening (between 6pm and 10pm) and night time (between 10 pm and 7 am). Noise emission limits apply for winds up to 3m/sec and Pascall stability classes A,B,C, D and F.

Construction

The EIS predicts daytime noise emissions during the first year of mine construction at 10 residences within three kilometres of the mine. As construction is only expected to occur between daylight hours and in accordance with the INP policy, the assessment addressed noise emissions only during these times.

The results of the modeling in the EIS indicate that all noise emissions at residential locations are well below the recommended assessment criteria under prevailing calm meteorological conditions. All sites are predicted to experience only low increases in noise levels, and are at least 20 dBA below the noise criteria.

Operation

Year 5 - Daytime

The results of the noise modelling for the mine operations during Year 5 at surrounding residences under calm meteorological conditions are presented in Table 9.2.1 of Appendix K of the EIS. The results indicate that the predicted noise emissions at the surrounding residences are below recommended criteria at all measured sites.

Year 5 - Evening

The predicted noise emissions for the mine operation at surrounding residents under prevailing adverse wind conditions are presented in Table 9.3.1 Appendix K of the EIS. These results indicate that the evening LAeq (15 minute) noise emissions are below recommended assessment criteria at all residences except “Currajong Park”. Noise emissions at “Currajong Park” are marginally (1dBA ad 2dBA respectively) above the recommended autumn and winter assessment criteria under adverse wind conditions.

Year 5 - Night time

The predicted night time noise emissions for operations during Year 5 are presented in Table 9.4.1 Appendix K of the EIS for both prevailing adverse wind and prevailing adverse temperature inversion conditions. The modelling indicates that noise increments at all residences will be below the recommended assessment criteria under these conditions expect at “Currajong Park”. Noise levels at “Currajong Park” are expected to be marginally (1dBA) above the recommended criteria for prevailing adverse wind; and moderately above (3dBA) the recommended assessment criteria under prevailing adverse inversion (plus wind).

Year 2O - Daytime

The results for noise emissions for the proposed operations during Year 20 under calm meterological conditions are presented in Table 9.5.1 Appendix K of the EIS. The results of this assessment indicate that noise emissions at all residences are predicted to be below the recommended assessment criteria during calm meteorological condition.

Year 20 - Evening

The results of noise emissions modelling for the operation under prevailing adverse wind conditions for both autumn and winter are presented in Table 9.6.1 of Appendix K of the EIS. The results of this noise assessment indicate that noise emissions at all assessment locations are below the recommended assessment criteria except at “Currajong Park”. The predicated noise impacts at “Currajong Park” are moderately (3dBA and 4dBA respectively) above the recommended autumn and winter assessment criteria under adverse wind conditions.

Year 20 - Night time

The results of predicted night-time noise emissions for the mine during Year 20 of operations under both prevailing adverse wind and prevailing adverse temperature inversions conditions are presented in Table 9.7.1 of Appendix K of the EIS . The results indicate that noise emissions at all assessment locations are below the recommended assessment criteria except at "Currajong Park". The predictions are moderately (3dBA) above the recommended assessment criteria under prevailing adverse wind moderately (5dBA) above prevailing adverse inversion (plus wind) conditions.

The EIS proposes that confirmatory monitoring will be undertaken throughout operations of the MPF. Particular attention is proposed to be paid in the later stages of operation of the MPF life, when exceedances of up to 5dBA at "Currajong Park" are predicted. Should the monitoring program substantiate these predictions, the EIS commits that mitigative actions will be introduced to ameliorate these impacts.

- ***Issues raised in submissions***

The EPA provided their general terms of approval (GTA) that require noise levels to not exceed the project specific noise levels indicated in Table 2. These criteria have been included in the conditions of consent. The EPA also submitted in accordance with Section 8 of INP that since project specific levels are exceeded at certain residences under different operating scenarios, the Applicant will need to demonstrate that all feasible and reasonable mitigation measures have been incorporated in the proposal.

The Applicant has emphasised that these predicted exceedances do not occur until late in the life of the mine, which will provide significant opportunity to implement best practice on haul trucks and other operative sections of the mine. In accordance with EPA Policy, this may include the attenuation of noise at the source or at the receiver. Attenuation may take the form of earthern bunds on the MPF site or noise controls on mobile equipment. The EIS also indicates that where necessary, property acquisition could also be undertaken.

During exhibition, a number of submissions were received from local residents expressing concern about the noise impact from the mining operations. These submissions emphasised concern regarding the intrusiveness of the noise and the subsequent impact on the existing rural lifestyle. Residents emphasised that, although they accept that the noise limits will be within EPA criteria, due to the existing characteristics of the local environs, any increase in noise levels will be detrimental to the peace and tranquillity of their existing rural lifestyle.

- ***The Department's position***

The conditions of consent incorporate the EPAs GTAs for the project specific noise levels as contained in Table 2. This condition applies where a landholder considers that noise from the project, at their dwelling, is in excess of the noise levels, or that a landowner considers that the noise levels are being exceeded over more than 25% of their vacant land. The conditions include a requirement for the Applicant to consult with the land owner or occupants affected to determine their concerns, make arrangements for appropriate independent noise investigations and modify the activities in accordance with a noise reduction plan.

Should the background noise levels be exceeded by more than 10 dBA, as provided in Tables 13, 14 and 15 of the consent, the conditions require the Applicant to acquire the property if requested by the property owner. The EIS does not however indicate that any properties will fall within the affectation area.

The conditions also impose a requirement for the Applicant to prepare a Noise Management Plan which is to include details of noise investigations and monitoring programs, protocols for handling complaints and mitigation measures to limit noise emissions. In order to minimise noise disturbance during construction, further conditions require the Applicant to prepare a Construction Noise Management Plan which addresses compliance standards, community consultation, complaint handling/monitoring system and mitigation measures

The Department considers that the conditions of consent combined with the mitigative actions proposed by the Applicant will adequately address noise concerns.

4.4. Flora and Fauna

4.4.1. Applicants position

- **Flora**

Bower and Kenna (2000) were engaged by the Applicant to survey the MPF site, which was undertaken between 26-29 December, 1998 on 17 October 1999. The survey found that the least disturbed plant communities were the Open Woodland Formation, found in the Fifield State Forest. By contrast the drainage lines dominated by Yellow Box / White Cypress Pine woodland have a more dense cover of native grasses and herbs. Where these drainage lines have been disturbed, introduced weeds are now dominant. Parts of the Crown reserve and much of the Crown land has been disturbed by past mining activities and are being recolonised by native and introduced plant species. The cropping paddocks contain virtually no native plant species apart from scattered trees retained to shade stock.

The survey conducted by Bower and Kenna did not identify any plant species listed as threatened under the NSW Threatened Species Conservation Act, 1995 or the Commonwealth Biodiversity Protection Act, 1999 in the vicinity of the mine. No plant communities listed under these provisions were recorded.

- ***Fauna***

Despite the relatively disturbed vegetation of the MPF site, the EIS indicates that existing patches of remnant vegetation provide opportunities for foraging, breeding and or/nesting; predator avoidance; and movement between areas. The mine site was surveyed for avifauna, mammals, reptiles and amphibians between 5-10 January, 1999 by Mount King Ecological Consultants on behalf of the Applicant.

The survey found that a range of birds utilise the extensive areas of grassland habitat at the MPF site and a variety of parrots feed within the grassland habitat. Species of raptors were observed hunting over the grassland habitat. Few bird species were observed utilising the water filled mine-pits however farm dams supported a greater diversity of ducks.

The survey recorded twenty two species of mammals, including five introduced species at the mine site. The Eastern Grey Kangaroo was the most frequently sighted mammal in the grassland and woodland habitats, but there were also several sightings of Swamp Wallabies within the shrub and woodland near the water-filled pits on the MPF site. The common Brushtail Possum was the only arboeal marsupial located at the MPF site and there was evidence of the presence of the Short beaked Echidna in Fifield State Forest. The common Dunnart and House Mouse were also trapped on site. Four reptiles were recorded in the MPF site including the Eastern Blue-tongued Lizard, Shingleback Lizard, Common Dwarf Skink and Eastern Brown Snake and only one species of frog; the common Eastern Toadlet.

A bat survey of the main habitats at the mine site was undertaken over two weeks in December 1998 encompassing the four major habitat of the site. Database records showed that up to 17 bat species had the potential to be present in the area if habitat requirements and food resources were available. Twelve of these 17 species were

recorded at the site, two of which are threatened species listed as vulnerable under the TSC Act.

An eight part test of significance was completed for each of the threatened fauna species listed in the EIS. It was determined that no threatened species would be significantly affected by the MPF to the extent of undermining the viability of a local population of that species. However it was concluded that the removal of large trees that may contain roosting bats has the potential to impact upon on local bat fauna, including threatened species.

4.4.2. Issues raised in submissions

The NPWS is in general agreement that the mine site has experienced high level disturbance from previous land use activity, but considers that remnant native vegetation still retains importance.

NSW Fisheries made objection to the proposal because aquatic habitat and species had not been addressed in the EIS. Further information was sought from the Applicant and subsequently assessed by NSW Fisheries as satisfying their concerns.

One resident in close proximity to the mine site expressed concern over the endangered species the Superb Parrot and Major Mitchell Cockatoo. The landholders submitted a concern that the EIS failed to address that the mine site is a breeding ground and possibly a nesting ground for these species.

4.4.3. The Department's position

The Department is generally satisfied that the EIS provides an adequate assessment of the impacts of the proposal on threatened fauna and flora. The conditions of consent provide for the preparation of a Flora and Fauna Management Plan prior to the commencement of mining/quarrying operations. The plan is to include measures for the preservation of vegetation, protection of fauna and habitat and reconstruction of native bush land. A further condition requires that pre-clearance surveys be undertaken to establish the number of roosts in trees required to be removed and relocated away from the impact areas. A number of artificial roosts (bat houses) are also proposed to be provided at strategic locations in the mine site and surrounds as a strategy to replace any roosts that may be lost.

In response to concerns about the Superb Parrot, and any other threatened species as may be identified, the Department proposes conditions for development of a protocol for identifying and managing significant impacts on any threatened fauna species not identified in the EIS.

It is anticipated that the impacts on flora and fauna will be minimised by these conditions and the measures proposed in the EIS. It is also considered that the management plan will address any existing uncertainties regarding flora and fauna species, and any unforeseen impacts which may arise throughout the life of the mine.

4.5. Land Management

4.5.1. Topography and landscape features

- ***Applicants position***

The EIS indicates that the MPF will have in parts, a permanent and significant impact on the existing topography of the MPF site. These modifications will result from the construction/establishment of the TSF, evaporation ponds and surge dams; waste emplacements, pits, hardstand areas, erosion and sediment control feature and surface water management structures.

The TSF will involve the construction of perimeter embankments ranging from 10 m to 30 metres above the existing topography. The EIS indicates that once the mining is completed, the TSF would comprise a rehabilitated area of approximately 220 hectares and would comprise a permanent landform change.

The evaporation ponds would be low-set terraced structures surrounded by 3 metres perimeter embankments. The EIS describes that on the completion of mining these these ponds will be rounded, flattened and rehabilitated to accommodate grazing. The EIS considers that the evaporation ponds would not comprise a significant change to existing topography.

The evaporation surge dam would be a conventional dam with an approximately 8 metre high embankment. The external embankment batter would be revegetated at the completion of construction and would potentially remain as water storage for stock watering. The dam would comprise a permanent change to the existing topography, but the EIS considers that this change is not inconsistent with the surrounding landscape.

The western and eastern waste placements will result in a significant change to the existing site topography. Both waste emplacements will have a final height of approximately 30 metres and comprise a total rehabilitated area of approximately 400 hectares.

Development of the western and eastern pits would also comprise a significant change to site topography. The EIS proposes that the pits would remain as permanent voids with selective revegetation across the portions of their bases and internal batters. The eastern and western pit would cover a total area of approximately 415 hectare with depths generally less than 50 metres and a maximum depth of approximately 65 metres.

The EIS describes that the development of hardstands, temporary erosion and sediment control structures would not constitute a significant change in topography. Once mining is completed, these areas would be revegetated to the target end landuse of grazing pastures.

As a general principle, the EIS describes that progressive rehabilitation would be used to integrate constructed landforms with surrounding landscape

- ***Issues raised in submissions***

The NSW Department of Agriculture submission highlighted the need to ensure that rehabilitation efforts support a long-term stable landform. No submissions were received from the public directly relating to the topography and landscape features of the site. However landholders made submissions regarding the loss of rural lifestyle and visual amenity which may be indirectly linked to changes in site topography.

- ***Departments position***

The Department requires as a condition of consent that the Applicant shall carry out all mine/quarry areas in accordance with the requirements of any Mining Lease and ensure the progressive rehabilitation of the area to the satisfaction of DLWC. Further, the conditions provide that immediately upon finishing mining of any disturbed areas the site must be restored to an environmentally stable, safe and revegetated condition. The Applicant must also prepare a Landscape and Revegetation Management Plan, which will detail, amongst other requirements, the establishment of vegetation and the progressive rehabilitation of the mine site. The Department is satisfied that the implementation of these management plans and the rehabilitation strategy proposed in the EIS, will ensure that the site meets final landuse objectives and provides a stable landform once mining is completed.

4.5.2. Soil quality and erosion potential

- ***Applicants position***

The EIS describes that MPF has the potential to impact on soils of the site in a number of ways. These include loss of in situ soil resources from beneath mine landforms; alteration of physical and chemical soil properties; reduction in soil quality from long term stockpiling, contamination of soil, and erosion. The EIS indicates that Integrated Erosion and Sediment Control Plan (IESP) will provide details of methods for the control of erosion and sediment generation from areas disturbed by the construction and operation of the MPF; and the prevention the uncontrolled runoff from disturbed areas to downstream watercourses.

The EIS also proposes that constructions works would be sequenced to minimise the area of disturbance at any one time. A range of specific mitigation measures to control soil erosion and sediment migration are also proposed. The EIS further proposes management strategies for soil stripping and stockpiling of soils to ensure the long time viability of the resource. The company intends to provide further details of quantification of soil resources, stripping and re-application scheduling and stockpiles inventories as par of the Mining Operations Plan (MOP) for the MPF.

- ***Issues raised in submissions***

The DLWC submitted that overall there were no major concerns relating to the impact the development will have on soils, however raised concerns as to the level of information provided on the soils of the development area. DLWC supports the stockpiling of soils for future use but emphasises that this must be done In accordance with the Topsoil Management component of the Site management Plan. The NSW Department of Agriculture provided a general submission to ensure that the effects of development on agricultural land use is minimised. No submissions on soil or erosion impact were received from the public**.**

- ***The Departments position***

The Department has included as a condition of consent that the Applicant prepare an Integrated Erosion and Sediment Control Plan. This plan will incorporate the measures detailed in the EIS. In addition the Department also provides that the plan is to include a program for reporting on the effectiveness of these procedures and incorporates specific conditions provided by the EPA. The requirement for a Soil Stripping management Plan is also required as a condition of consent. This plan will include methods for the management and conservation of topsoil which is excavated from disturbed areas and stockpiled for later rehabilitation. The plan will incorporate the measures described in the

EIS to aid in the maintenance of the long term viability of this resource. The Department is of the view that these measures will ensure that soil quality will be maintained to the greatest possible extent and soil erosion will be minimised.

4.5.3. Land Use

- ***The Applicants position***

The MPF is characterised by cleared, grazing and cropping lands with areas of State Forest, Crown reserve and Crown land. The EIS describes that agricultural suitability classes for the land subject to the DA are classes 3, 4 and 5; and the rural capability classes III, IV, VI and VII. The land on which the processing facility is to be located is classified as being "class 4 agricultural suitability". Class 4 land is considered appropriate for grazing, but not cultivation. The EIS predicts that changes would occur to these existing classes of land due to mining and processing activities. The classification of areas not disturbed by mining would not change however the isolation of portions of these areas would result in loss of land otherwise suitable for agricultural production. The EIS indicates that the rehabilitation land use objective is to provide for stable landforms revegetated to grazing pastures or endemic woodland.

The Applicant recognises that the proposed development would remove the development site from the inventory of available agricultural land in the area, at least for the term of the development's operation. Further, land not specifically underlying the development, but within the boundary of the site may develop problems with weeds and vermin if not managed correctly. The Applicant intends to develop plans and strategies for the management of these issues. In addition, rehabilitation of the land would be developed into a plan for implementation after the eventual closure of the development.

- ***Issues raised in submissions***

The NSW Department of Agriculture and several private submissions raised concern about the long term viability of the land and the surrounding environs for agricultural activity. This submission stated that NSW Agriculture wishes the Department to consider the potential impacts of the development on surrounding agricultural landuses. Further, rehabilitation of the site should support a long-term stable landscape and maintain the agricultural context of the area.

- ***The Departments position***

The Department supports the Applicant's position that given the soil quality and topography of the area, the proposed development site is suited to grazing, and not appropriate for cropping. This position is further supported by the observation that the proposed development site and surrounding land uses are currently primarily used for sheep and cattle grazing

Although the construction and operation of the nickel/ cobalt processing facility will see the loss of some agricultural land in the area, the Department considers that this loss is not significant. It is noted that surrounding land uses are currently characterised by open, largely-uninhabited grazing areas. Loss of access to the development site, when compared with remaining open space for grazing is a negligible issue. Further, as grazing and rural land uses essentially surround the development site, the processing facility will not lead separation or fragmentation of the remaining agricultural land uses. In this regard, the Department notes that neither NSW Agriculture, nor the Forbes Rural Lands Protection

Board raised loss of agricultural land to the development as an issue of concern. NSW Agriculture did, however, indicate the impacts of the development (such as gaseous and particulate emissions) on adjacent agricultural land should be an issue for consideration by the Department. These impacts have been considered in the relevant sections of this assessment report.

As the development site will be fenced and no longer used for grazing, the Department considers it important that those areas of the development site not underlying the processing facility be properly maintained. In the absence of maintenance, it is possible that weed and vermin infestations could develop, which in turn may adversely affect surrounding agricultural land. Further, excessive uncontrolled growth of weeds on the development site would pose an increased bushfire safety issue. To address these issues, the Department has incorporated a requirement for a Land Management Plan in the recommended instrument of consent. This Plan is to provide protocols and strategies for the management of remnant pastures and vegetation on the site, the control of vermin/ noxious weeds/ feral animals and the rehabilitation of the degraded land areas.

4.5.4. Land contamination status

- ***The Applicants position***

The EIS states that there is potential for contamination of land under and around the proposed processing facility. In particular, the development will receive deliveries of fuels and oils which may be spilled during transport, storage or handling. Process reagents including sulfuric acid may also be released from the processing plant in the event of a hazardous incident. These issues were considered in the Preliminary Hazard Analysis prepared for inclusion in the EIS (refer to section 8 of this report, relating to hazards and risk management issues). Mitigating measures proposed by the Applicant include impervious bunding of all environmentally hazardous materials in accordance with relevant Australian standards, considered selection of qualified transporters and emergency notification and shut-off measures in the event of an uncontrolled release.

The EIS proposes a range of mitigation measure to prevent or reduce the potential for the contamination for land. These will include appropriate licensing of carriers of potentially hazardous goods and the provision of a communication system to allow for prompt notification in the event of an accident. Bunds would be constructed around fuel, oil and process reagents stores/stockpiles to provide for the containment of spills and detection of leaks.

- ***Issues raised by submission***

The Department received no submissions from the public related to the issues of land contamination however a number of submissions did highlight that hazardous events were of concern. Neither the Environment Protection Authority nor the Department of Land and Water Conservation raised concern regarding the nickel/ cobalt processing facility's impact on the land on which it is to be sited. It is noted that the EPA has required, as a General Term of Approval, that all hazardous materials stores be bunded. Although this is a hazards management measure, it has the added effect of minimising the potential for chemical impacts on soil quality (and hence rehabilitation and possible future land use).

- ***Departments position***

The Department is satisfied that these management and mitigation measure will adequately address the potential risks of land contamination from the project.

4.5.5. Bushfire hazard

- ***The Applicants position***

The Applicant notes that fires moving onto or from the site present potentially serious impacts to surrounding properties and the MPF itself. The EIS describes that site and surrounding areas have generally low tree density resulting in scattered leaf litter accumulation and low ground fuel loads, although the grass areas have the potential to act as a moderate fire hazard under certain growth and climatic conditions. However the EIS maintains there is a low risk of grass fires due to continual high intensity grazing.

The EIS predicted that the extensive areas of pasture surrounding the MPF would restrict the movement and magnitude of any bushfire. Notwithstanding, bushfire management procedures would be developed for the site as part of the Site Management Plan. In addition, all MPF workers would undergo training in bushfire prevention and management strategies.

Related to the management of weeds on the site, and the possible release of fuels from the development is the issue of bushfire hazard. The Applicant highlights that surrounding grazing lands are not highly conducive to bushfires. However, the Applicant intends to reduce the potential of the processing facility to initiate a bushfire, or be affected by one, through weed management, fire safety infrastructure on the site, consideration of landscaping of the site and the development of bushfire management procedures in consultation with the local bushfire brigades.

- ***Issues raised in submission***

Concerns regarding the risk of bushfire was raised both in the joint submission from the Councils and also in the individual submission from Lachlan Council. The submissions did not dispute the findings of the EIS however raised concern as to the capacity of the Fifield /Trundle bush fire fighting services to respond in an emergency situation. The Councils acknowledged that the mine will operate their private emergency service on site, however requested that the local fire service be upgraded so as allow adequate response in bushfire emergencies. The NSW Farmer's Association raised the question of the role of the local rural fire brigades and the prospect for training of these members to deal with increased hazards and different fire characteristics. A local resident also expressed concern regarding the risk of fire spreading to adjoining lands.

- ***Departments position***

The Department has conditioned the Applicant to prepare a Bushfire Management to the satisfaction of Council. This plan must provide adequate fire protection for the project component, including at least one emergency fire fighting unit on the mine site. This plan also provides that all workers at the project site undergo training in bushfire prevention and management.

Further, the Applicant is to enter into an Emergency Services Cooperation Agreement in consultation with State Emergency Services at Trundle and Condobolin and bushfire

fighting services in the Fifield/ Trundle areas. The Agreement is to consider the supply of hazards information to the State Emergency Services and bushfire fighting services; details of any agreement for the provision of firefighting/ emergency response equipment from the Project in the event of a bushfire or emergency; access to water stores at the development in the event of a bushfire; and the provision of suitably qualified employees from the Project in the event of a bushfire or emergency.

The Department is satisfied that the provisions in the conditions of consent will provide adequate measures to minimise the potential for bush fire risk and in the event of bushfire to ensure an appropriate and co-ordinated response.

4.6. Heritage

4.6.1. Aboriginal Heritage

- ***Applicants position***

The Applicant engaged a heritage consultant to identify any Aboriginal sites or places of significance and to propose recommendations for the management of these sites. The archaeological survey identified artefacts at three locations and a scarred tree beside the Fifield to Wilmatha Road. The tree was recorded as an Aboriginal site, because, although the derivation of the scar on this tree is difficult to determine, it appears to be similar to that typically identified with “shield scars”.

The EIS concludes that one site (Syerston 2 in the EIS) and the scarred tree are the only two sites that provide useful information indicating that Aboriginal people occupied the area. The Condobolin LALC, evaluated the two sites (Sy 2 and Sy 1) as being of cultural significance, but the two isolated artefacts were of low cultural significance. However, none of the four sites were identified in the EIS to be of any further research potential. Notwithstanding, the Applicant has advised that details of the four sites will be lodged with NPWS for listing on the Aboriginal Sites Register. The consequence of such a listing is that it will be necessary to obtain written consent for the destruction of any of the sites from the appropriate land council.

The analysis conducted by the Applicant indicates that the provisional plan for the mine may impact on the two sites (Sy1& 2), but neither the third site (Sy 3) nor the scarred tree will be impacted by the development of the mine. Sy 2 is in the vicinity of the proposed Floodwater Culvert and considered in the EIS to be of high potential to be directly impacted or disturbed. The EIS indicates that the preferred option would be to fence the site, but if this is not practical, a consent to destroy would be obtained from NSW NPWS.

- ***Issues raised in submissions***

The NPWS indicated that the EIS documentation on Aboriginal Heritage had been reviewed and accepted by the service as correct and adequate for the information currently available. The NPWS supports the evaluation of low significance of the isolated finds but submits as a general terms of approval that the Condobolin Local Aboriginal Land Council or the Wiradjuri Branch of the NSW Aboriginal land Council be invited to collect the isolated artefacts prior to the development commencing. In addition NPWS also request that all sites identified should be clearly identified and provided with appropriate protection.

No concerns relating to Aboriginal issues were raised in any submissions by the public.

- ***Departments Position***

The Department has conditioned the Applicant to prepare an Archaeology and Cultural Management Plan with details of protective measures for the two archaeological sites potentially affected and the scarred tree. It also conditioned that the Condobolin Local Aboriginal Council or the Wiradjuri Branch of the NSW Aboriginal Land council will also be invited to collect artefacts identified at Sy 1 prior to the commencement of construction. It has not been conditioned that the artefacts be identified with signage due to the heightened risk of vandalism that such measures may attract. The Department believes that the conditions of consent and protective measures in the EIS are adequate to either preserve the sites *in situ* or provide opportunity to collect any artefacts at risk.

4.6.2. Mining heritage

- ***Applicants position***

Heritage management consultants were engaged by the Applicant to undertake a European heritage survey of the mine site. The survey found that the early mining activities had created large open-cut pits with associated overburden mounds, and areas of scarped land. The EIS concludes that while the past mining at the site is of regional historical interest and importance, the physical evidence of that history is substantially impacted by previous site rehabilitation, and little fabric of the heritage significance survives. The mining site is therefore considered in the EIS as being of local significance, but degraded, and no relics under the *Heritage Act* have been identified.

The two homesteads, “Kingsdale” and “Syerston” within the project area, are considered in the EIS as being of heritage significance. The remains of a bunk house, woolshed and associated sheep and horse yards and a standing building housing a single pan toilet occur on the western boundary of the site. These buildings are interpreted in the EIS to be post 1958 structures and not a relics under the *Heritage Act*, however these items are locally significant.

The EIS recommends that the development should consider pastoral heritage sites and where practicable and feasible avoid disturbance to the sites. Should the pastoral site not be able to be retained the EIS proposes to be implemented in the event that the pastoral site to be able to be retained, or alternatively record the site prior to disturbance.

- **Issues raised in submissions**

The NSW Heritage Office supports the recommendations presented in the Heritage Management Consultants report. It is further suggested by the NSW Heritage Office that if during the construction process any evidence of any previously unidentified European heritage items and/or archaeological relics one found, all work on the site to cease and the Heritage office contacted immediately.

- ***The Department’s position***

The Department has included a condition that the Applicant prepare an Archaeology and Cultural Management Plan in consultation with NSW Heritage Office. This Plan will include management procedures for the pastoral out station incorporating either retention of the site or recording of the site prior to disturbance. Conditions are also incorporated indicating that should the Applicant become aware of any other heritage material not previously identified, all work likely to affect the material shall ceases immediately and NSW Heritage Office consulted about an appropriate course of action. The Department considers that this management plan will provide that meausres will be taken to preserve the site where

practicable and feasible. Should preservation of the site not prove possible, the conditions provide that adequate records will be made for historical purposes.

4.7. Visual Assessment

- ***Applicants Position***

The EIS notes that regional views of the MPF site from areas outside a 1km radius are limited due to the lack of public vantage points, the relatively flat topography and the obscuring roadside vegetation. The southern portion of the MPF site is visible from Condobolin to Tullamore Road when heading north from Fifield. In addition, the site is visible from both the northern and southern approaches on the Fifield to Wilmatha Road. The view looking south from this road is limited due to the vegetation along the northern boundary of the site. Of the surrounding properties, "Wanda Bye" has the only clear view which looks through sparse vegetation to the proposed tailings storage facility and evaporation pond sites.

The EIS details that there are no homesteads located within 1 kilometre of the MLA boundary. However, local views of the MPF site are available from public roads, specifically :

- Fifield to Wilmatha Road – views partially obscured by scattered vegetation in most areas.
- Melrose to Gillenbine Road – runs along the northern boundary of the site, however views of the site are blocked due to vegetation along the length of the northern MPF boundary.
- Condobolin to Tullamore Road - views partially obscured by scattered vegetation in most areas.

Partially obscured local views are predicted to occur from the properties "Slapdown", "Brooklyn", "Currajong Park" and "Sunrise". The views from "Slapdown" and "Currajong Parks" are partially obscured by vegetation between the residences and the mine site. The view from "Brooklyn" looks across cleared paddocks to the previous mining areas directly east of MLA 132 and onto section of State Forest in the north-eastern section of the mine site. Vegetation within the road reserve obscures the view to the mine site.

Further visual impact may also result from lighting of the MPF and active pits, which will be required to facilitate 24 hour operation. The EIS suggests that the main regional impact of the light emissions is that a glow would be seen in the night sky above the MPF. Locally, fixed (buildings and stacks) and mobile lights would be seen from some roads and on occasions at some of the surrounding properties. The general lighting and flare associated with the higher stacks are likely to be visible from parts of "Wand Bye" and "Sunrise".

The EIS predicts that the visual impact of the MPF would be limited by the proposed boundary vegetation screens, existing vegetation and the absence of elevated public view points. The effect of the proposed mitigation measures in year 5 and 20 are illustrated in Figures A4-4 to A4-5 of the EIS. It is also proposed to progressively rehabilitate the waste emplacements which should reduce the visual impact and minimise the contrast with the surrounding areas.

Consideration is also given in the EIS to the architectural detailing of the proposed buildings in moderating the visual impact. It is conceded in the EIS that the general arrangement of all the proposed buildings is fixed by the functional requirements of the process and equipment located within the buildings. However the EIS suggests that

careful colour selection, for example beige, would help the infrastructure blend in with the surrounding grasslands. The EIS proposes that impacts of night lighting would be minimised by only lighting those areas required and using directional lighting where possible to reduce light spill.

- ***Issues raised in submissions***

No submissions were received from government agencies in regard to the visual impact of the mine site. No submissions received from landholders raised any direct concerns regarding the visual impact of the mine site. However, the visual presence of the mine may be seen to contribute to the aforementioned loss of rural lifestyle and amenity of the environment which did form the basis of many concerns from local residents.

- ***The Department's position***

The conditions of consent provide that the Applicant submit a detailed Landscape and Revegetation Management plan prior to commencement of operations. This plan shall detail measures to minimise the impacts of the development on local visual amenity and to provide details of, and management procedures for, landscaping the development. The conditions also stipulate that night lighting should only be used where required and lighting should be directed downwards away from roads and residences. The Department considers that these measures combined with the mitigation proposals described in the EIS will satisfactorily limit the visual impact of the mine site.

4.8. Waste management issues

- ***Applicant's Position***

The Environmental Impact Statement provides considerable analysis of the waste production of the proposed development and the impacts of this waste on the surrounding environment. However, the waste considered in this analysis is primarily associated with mining activities the subject of the development application and the wastewater discharged from the nickel/ cobalt processing facility to the tailings storage facility.

It is noted from the information presented in the EIS that approximately 400 full-time employees will be required for the operation of the proposed development. In addition, employment at the site will peak at 1,000 during construction. No comment is provided in the EIS regarding the potential waste impacts of employees. Further, it is indicated in the EIS that the nickel/ cobalt processing facility will include infrastructure that may require replacement during the operation of the development. Such infrastructure includes electrodes, pump parts and valves, all of which may require replacement due to attrition or through regular maintenance activities. There is no comment made in the EIS with regard to the likely reuse, recycle or disposal of these materials.

- ***Issues Raised in Submissions***

There were no submissions received by the Department from the public, councils or agencies related to the generation or handling of wastes other than those associated with mining activities or the tailings storage facility.

- ***Department's Position***

The Department considers that the projected employment figures during the construction and operation of the MPF represents a significant waste generation potential. Much of the waste likely to be produced in this regard is "domestic waste" that may be appropriately disposed to waste management facilities (landfill). However, it is recognised that the quantity of this type of waste generated represents a significant increase in domestic waste management requirements over and above that already in existence in the area. The Department is concerned that the waste may pose adverse strain on the local councils' waste current management services. As such, the Department considers it important that waste management practices are implemented at the development with the aim of minimising waste generation wherever possible. Practices such as the minimisation of resource consumption (such as paper), recycling within the development and segregation of wastes generated for appropriate off-site recycling would reduce the impacts of domestic waste from the development.

In a similar manner, the Applicant should consider appropriate handling methods for waste generated by the process component of the development. In particular, electrodes used in nickel/ cobalt refining will need replacement over time. Regular maintenance activities at the development may see the replacement of infrastructure that has failed or become worn (for example pump parts, valves etc). Not only will these "waste" parts need to handled in an appropriate manner, but the replacement parts may be delivered in packaging that will also need to reused, recycled or disposed.

To address the issue of waste at the development, other than mining waste or those wastes directed to the tailings storage facility, the Department has included a requirement for a Waste Management Plan in the recommended instrument of consent. The Plan aims to document those issues and measures associated with waste that were not adequately addressed in the Environmental Impact Statement. The Applicant is required to identify all wastes generated at the development during construction and operation. Having identified the wastes, the Plan requires that appropriate procedures be development and implemented to minimise waste generation. Once waste streams have been minimised, a program of reuse, recycling or treatment/ disposal is to be implemented, where appropriate. The Waste Management Plan also requires that programs be developed to include all staff in an active waste management mentality for the development. The Department considers that the Waste Management Plan is an appropriate and effective method for the mitigation of waste impacts from the development.

5. LIMESTONE QUARRY

Key issues relating to the limestone quarry are:

- Noise and Blasting
- Dust
- Impacts on surface and groundwater resources
- Traffic Impacts

5.1. Noise

- ***Applicants Position***

The assessment of the existing acoustic environment and potential acoustic and blasting impacts of the development was undertaken by Richard Heggie Associates (2000). The findings of the investigations are summarised in the EIS and the consultants report presented in full in Appendix K in the EIS.

The EIS predicted contributed $L_{Aeq(15\ minute)}$ noise emissions from the quarry operations under the prevailing meteorological conditions for year 5. The noise modelling presented in the EIS predicts that the daytime $L_{Aeq(15\ minute)}$ noise emissions at surrounding residential locations would be below the recommended EPA criteria during prevailing meteorological conditions except at "Moorelands", "Lesbina" and "Eastbourne". Table 3 presents the findings of the noise modelling.

Table 3 - predicted daytime quarry operating noise emission in year 5 – db(a)

Location "	**$L_{Aeq(15\ minute)}$ Noise Emission**	**$L_{Aeq(15\ minute)}$ Noise Criteria**
		Daytime (0700-1700hrs)
'Reas Falls"	30	37
"Moorelands"	**42**	37
"Gillenbine"	36	37
"Lesbina"	**38**	36
"Hillsdale"	24	37
"The Troffs"	33	36
"Eastbourne"	**38**	36

Source: Table B4-3 EIS.

The table shows that the predicted $L_{Aeq(15\ minute)}$ noise emission at "Lesbina" and "Eastbourne" would be 2dB(A) and at "Moorelands", 5dB(A) above EPA goals under prevailing meteorological conditions, respectively.

The EIS indicates that the progressive construction of the waste emplacement to a height of 7m on the southern, eastern, and northern sides will progressively provide noise screening of in-pit activities. No other noise mitigation measures are proposed. The EIS indicates that the company will "if necessary", conduct further noise monitoring, discuss with property owners, and consider mitigation measures (e.g., point source attenuation, acoustic barriers or dwelling treatments).

- ***Issues Raised in Submissions***

The EPA provided noise limits in its GTA and these limits have been included in the recommended conditions. No other specific issues relating to noise have been raised by other Government agencies.

Parkes Shire Council sought adequate controls and safeguards to be incorporated in consent conditions to manage the operations to ensure no adverse impacts from noise at nearest residences or the receiving environment.

Five residents surrounding the limestone quarry have expressed concern regarding predicted noise levels and effects on lifestyle and welfare.

- ***The Department's Position***

Only two of the five background noise monitoring sites detailed in the EIS are in the vicinity of the limestone quarry. The remaining sites are located on the MPF site or in Fifield. The sites relevant to the limestone quarry are BG5 "Reas Falls" and BG6 "Danganmore". Background noise levels of 31 to 32 dB(A) were recorded for these two residences. Table 6.1.1 (p31) in Appendix K and Table B3-1 in the main text to the EIS provides background noise readings for the limestone quarry at all sites monitored. Given the significant distance between the MPF and the limestone quarry, readings for those sites, other than BG5 and BG6, cannot be accepted as background noise results for the limestone quarry.

The applicant advised that construction activities are minor and for this reason, noise modelling for the initial site construction and site establishment was not undertaken. The Applicant advised that Year 5 was used for noise modelling as it represented "worse case". There are no details on the rate of construction of the waste emplacement which is designed to form a visual and noise barrier to surrounding residents. Figures B2-1 shows the waste emplacement completed on the southern half of the site at the end of Year 5, and B2-2 shows that the waste emplacement is complete around the site at Year 21. The figure does not indicate if waste emplacement is continuous up to year 21 or is completed prior to this time.

The Department is not of the view that noise modelling on Year 5 as presented in Figure B2-1 would represent the worst case for noise impacts for residences to the north of the limestone quarry. There will be noise impacts from the on-going emplacement of waste that encroaches further to the north than the extent of operations shown for Year 5, until such time as the emplacement forms a noise shield to residences to the north. No details of that timing have been provided.

Only a vibrating screen and secondary crusher have been used for predictions in the noise modelling for the processing plant (Appendix K). Given the projected output of the limestone operations of 560,000 tonnes per annum, this number and type of equipment for the processing plant does not appear to be adequate for noise modelling purposes.

It is the Department's view that noise impacts at nearest residences are likely to be understated, particularly for residences to the north and for residences to the south prior to completion of the waste emplacement. Given the predicted levels presented in the EIS, the Department concludes that the predicted $L_{Aeq(15\ minute)}$ noise emission at "Lesbina" and "Eastbourne" would be 2dB(A) and at "Moorelands", 5dB(A) above EPA goals under prevailing meteorological conditions. Predicted levels for residences to the north of the limestone quarry and waste emplacement area could be expected to be higher than those modelled and shown on Figure B4-7.

Conditions are recommended setting noise goals for all residents surrounding the site and including a requirement for the preparation of a Noise Management Plan to address on-going monitoring, and mitigation measures to ensure compliance with noise goals, including, if necessary, acquisition of affected properties. The EPA noise limits as provided in the GTA reflect this requirement and have been adopted in the recommended conditions. These measures are designed to ensure that noise from the quarrying and processing operations can be adequately managed to meet acceptable EPA criteria at nearest residences.

5.2. Blasting

- ***Applicants Position***

The EIS predicts that ground vibration at surrounding residential properties will comply with the EPA structural damage criterion of 5mm/s recommended for low-rise residential buildings for blasting during daylight hours. (Monday to Saturday 0900 to 1700 hrs). It also predicts that peak airblast at all residential properties will be well below the EPA structural limit of 132 dB Linear; and will comply with the EPA human comfort criteria of 115 dB Linear for daytime blasting (Monday to Saturday 0900 hours to 1700 hours).

- ***Issues Raised in Submissions***

The EPA has included overpressure and ground vibration limits, as well as blast monitoring requirements in its GTA. These limits and requirements have been adopted in the recommended conditions. No other specific issues relating to blasting have been raised by other Government agencies.

Parkes Shire Council sought adequate controls and safeguards to be incorporated in consent conditions to manage the operations to ensure no adverse impacts from blast vibration and overpressure at nearest residences or the receiving environment.

Five residents adjoining the proposed limestone quarry expressed concern at the impact of vibrations on their properties.

- ***The Department's Position***

The Department is in agreement with the predicted levels of ground vibration and overpressure presented in the EIS. A condition has been incorporated in the consent conditions requiring the applicant to prepare a Blast Management Plan detailing proposals for mitigation, management, assessment and monitoring of blasts. This condition is designed to ensure that impacts from blasting can be adequately managed.

5.3. Air Quality

- ***Applicants Position***

An assessment of the impacts of dust from the limestone quarry was undertaken by P. Zib & Associates (2000) and the consultants report presented in full in Appendix A to the EIS. The findings are summarised in the EIS.

The EIS presents the results of modelling the dispersion of atmospheric dust from the limestone quarry and crushing operations for Years 5 and 21. Year 5 was adopted as

indicative of general operational conditions during the majority of the EIS period and Year 21 was adopted as the potential worst case year, due to the increased elevation of the waste emplacement.

The EIS predicts that EPA amenity criteria for dust deposition would be met for all non-company owned or optioned residences. Exceedances of the criteria is predicted for a small area of farmland to the south of the Fifield to Trundle Road and the"Westella" property (BRM optioned) to the west of the MLA during Years 5 and 21. (Figures B4-3 and B4-4 in the EIS).

The EIS indicates a range of safeguards that will be employed to minimise the generation of dust. These include watering of disturbed areas, prevention of truck overloading and spillage during loading and hauling, use of dust suppressants or cover crops on stockpiles, installation of fogging water sprays on crushing and screening operations, and progressive rehabilitation of disturbed areas.

The results of TSP modelling presented in the EIS indicates compliance with the NHMRC goal of 90$\mu g/m^3$ (annual concentration) at all non-company owned or optioned residences. The EIS predicts that the NHMRC guideline may be exceeded on occasion in a small area to the west of the MLA boundary within the "Westella" property (BRM optioned) during Year 21 (Figures B4-5 and B4-6 in the EIS).

- ***Issues Raised in Submissions***

The EPA provided requirements for air monitoring in its General Terms of Approval (GTA) and these requirements have been included in the recommended conditions. No other specific issues relating to dust have been raised by other Government agencies. Parkes Shire Council sought adequate controls and safeguards to be incorporated in consent conditions to manage the operations to ensure no adverse impacts from dust at nearest residences or the receiving environment.

One nearby resident (DF & JA Quade) expressed concern regarding the accuracy of dust predictions with respect to his properties.

- ***Department's Position***

No background dust monitoring has been conducted around the limestone quarry. However, the Department is in agreement with reported background estimates, given the sparse development and land use of the area. The Department accepts the predicted dust deposition and TSP levels presented in the EIS at nearest residences based on the adoption of appropriate dust controls for the quarry, hauling and processing operations detailed in the EIS. Conditions have been included requiring the applicant to prepare a Dust Management Plan detailing procedures for dust mitigation, management, assessment and monitoring. This condition is designed to ensure that dust impacts from the development can be adequately managed.

The EIS indicates that limestone haulage to the MPF site would be by side-tipping road trains. Because of the fine particulate nature of ground limestone dust that will adhere to the crushed limestone, it is essential that an effective and complete seal of the limestone load is provided to prevent the generation of fugitive dust from trailer loads during the haul to the MPF site.

The Department is satisfied that dust impacts can be adequately managed and mitigated by the measures contained in the EIS and recommended consent conditions.

5.4. Surface Water

- ***Applicants Position***

The construction and operation of the quarry and processing plant have the potential to contribute uncontrolled sediment-laden runoff to downstream surface waters. In addition to the transport of sediment, other potential pollutants are dissolved solids, fuel, oil and lubricants. The EIS indicates that all potentially contaminated water generated within construction and operational areas would be controlled via drainage channels and dams, while uncontaminated water would be diverted around these areas. The EIS details the range of water management strategies that will be employed to control runoff from the site. In addition, the Company proposes to prepare an Integrated Erosion and Sediment Control Plan (IESCP) in conjunction with relevant Government agencies prior to the commencement of construction activities. The IESCP will detail specific mitigation measures to control soil erosion and sediment migration and therefore protect downstream surface water resources.

- ***Issues Raised in Submissions***

The EPA requires the preparation of a Soil and Water Management Plan prior to the commencement of construction of the limestone operations in its GTA. The EPA also provided its requirements for surface and groundwater monitoring and these requirements have been included in the recommended conditions. The EPA also indicated that conditions will be included in its Licence of the management of waste water and sought full details of the design of the sewage treatment plant. These requirements have been included in the recommended conditions.

The Department of Land and Water Conservation (DLWC) raised no specific issues with respect to the limestone quarry and provided their General terms of Approval. The DLWC did raise some general issues with respect the level of detail provided in the EIS with respect to soils, flooding and groundwater. These include the suitability of soils as a construction and rehabilitation medium, lack of details on catchment areas used in flood estimates, and groundwater modelling concerns. The concerns raised by the DLWC have been incorporated in the recommended conditions for the development. No other specific issues relating to water management at the quarry site have been raised by other Government agencies.

Parkes Shire Council sought adequate controls and safeguards to be incorporated in consent conditions to manage the operations to ensure no adverse impacts on water quality in the receiving environment.

- ***The Departments Position***

No details are provided on the adequacy of the waste water system at “Westella” to service the proposed development, nor of the proposed package water treatment plant for potable water. Conditions have been included requiring details of these facilities to be provided.

The Department considers that with the incorporation of the water management controls proposed in the EIS, impacts on surface water and soil erosion can be adequately managed. Conditions are recommended requiring the preparation of a Water Management Plan to address mitigation, management, assessment and

monitoring of water quality. A condition requiring the preparation of the IESCP as proposed in the EIS and as required by the EPA is also recommended. The requirement of the EPA for full details of the design of the sewage treatment plant has also been incorporated in the recommended conditions of consent.

5.5. Groundwater

- ***Applicants Position***

The EIS has identified that the quarry excavation will intersect some groundwater containing structures. Flow from these structures into the void would be expected to create a localised drawdown effect within the host rock. The EIS predicts that these effects will be minimal and, since there are no registered groundwater extraction licences or users in the immediate vicinity of the quarry, no specific measures to reduce the groundwater effects are proposed. Groundwater level monitoring and the measurement of underground flow rates are proposed during the operation of the quarry to evaluate the drawdown effects of the quarry excavation. The EIS does not present the results of any monitoring of groundwater quality on the quarry site to establish existing groundwater quality or impacts on groundwater quality.

- ***Issues Raised in Submissions***

The EPA provided requirements for monitoring of groundwater in its GTA. This requirement has been adopted in the recommended conditions. No other specific issues relating to groundwater at the quarry site have been raised by other Government agencies. Parkes Shire Council sought adequate controls and safeguards to be incorporated in consent conditions to manage the operations to ensure no adverse impacts on groundwater.

The resident who has two bores within 1500 metres of the quarry site, that had not been identified in the EIS, expressed concern at the likely impact of the quarry operations on groundwater supply and usage.

- ***The Departments Position***

The Department is in agreement with the conclusion reached in the EIS that impacts on groundwater will be low. Conditions are proposed requiring the applicant to prepare a Groundwater Management Plan addressing the management of groundwater on site, and measures proposed to minimise the impact of the development on groundwater resources, including providing a replacement supply. This condition is incorporate to ensure that impacts on groundwater are minimised.

5.6. Transport

- ***Applicants Position***

Loading and hauling of crushed limestone to the MPF would be conducted five to six days per week, 52 weeks of the year. It is estimated that haulage would occur on approximately 260 days per year. Up to 40 truck loads would be required per 24 hour period, resulting in a maximum delivery rate of some 2000t/day of crushed limestone to the 20,000 t MPF ROM limestone stockpile. Trucks will be side-tipping road trains of 50 tonne capacity which will operate 24 hours per day (ie 2 by 12 hour shifts).

Limestone will be transported from the quarry to the mine using the same road trains that will be used for sulphur transport. Each trailer will have a side tipping container with 24 tonne capacity. Thus each trip will carry 48 tonnes of limestone. There will be a maximum of 9 two way vehicle movements per hour on SR64 between the quarry and the mine. On average, there will be about 36 limestone deliveries per day but less when sulphur is being transported and more when it is not.

The applicant proposes that haul trucks will not operate on public roads between the MPF and the quarry at times during which the school bus is operating.

- ***Issues Raised in Submissions***

No specific issues relating to haulage have been raised by Government agencies. Parkes Shire Council sought adequate controls and safeguards to be incorporated in consent conditions to manage the operations to ensure no issues of traffic safety.

The West Trundle Landcare Group and a number of residents along the Fifield to Trundle Road (SR64) expressed concern at the impact of heavy truck movements on the movement of stock and farm machinery. The residents indicated that they frequently drive stock and farm machinery along, and across the road between properties, under a permit, at a frequency reportedly to be up to 20 times a year. The size and number of truck movements was a safety and property management concern to these residents.

- ***The Departments Position***

Conditions have been developed requiring the applicant to prepare a traffic management plan incorporating measures to limit truck movements to those predicted in the EIS, the preparation of a truck driver protocol, and measures for road upgrading. Conditions limiting truck movements during the hours of school buses, and the preparation of a Stock Crossing Management Plan are also proposed. These measures will ensure that impacts on roads and road users will be minimised.

5.7. Land Management

5.7.1. Topography and Landscape features

- ***The Applicants Position***

The EIS notes that the limestone quarry has the potential to appreciably impact on the topography and landscape of the area through excavation of the quarry, construction of the waste emplacement, and construction of level hardstand areas for buildings/workshops. To minimise the impact on topography and the landscape, the EIS indicates that the waste emplacement has been designed to progressively encircle the quarry and act as a visual screen to traffic travelling along the Fifield to Trundle Road. The final shape of the waste emplacement would resemble a low mesa-shaped hill with a crest slightly lower (ie 1-2m) than the original limestone knoll (9m). Progressive rehabilitation will integrate the constructed landforms with the surrounding landscape.

The EIS indicates that at the end of quarrying, the void will be 35m deep and occupy an area of 48 hectares. It is expected that the void will gradually fill with water with contributions from groundwater, direct rainfall and runoff to an equilibrium depth level of approximately 16 to 21m deep. The void will be fenced and public warning signs

provided along the fence. The EIS indicates that in the longer term there may be opportunities to develop wetland habitat adjacent to the final waterbody.

- ***Issues Raised in Submissions***

The EPA expressed concern at the lack of detail as to the materials and placement of material that will be used in the rehabilitation of the waste emplacement. No other specific issues relating to rehabilitation at the quarry site have been raised by other Government agencies. Parkes Shire Council sought adequate controls and safeguards to be incorporated in consent conditions to adequately manage the operations to ensure adequate site rehabilitation.

- ***The Department's Position***

The Department is of the view that the rehabilitation strategy proposed in the EIS will ensure a stable landform at the completion of quarrying operations. The Department considers, however, that additional measures are required to ensure that a range of rehabilitation options, including details of materials, are adequately addressed including the potential use of the water in the void, further details on the final shape of the waste emplacement, and materials used in rehabilitation.

Conditions are recommended requiring the preparation of a land management plan detailing measures for management of pastures, rehabilitated lands, control of weeds, vermin and feral animals.

5.7.2. Soil Quality and Erosion Potential

- ***Applicants Position***

The EIS recognises that the limestone quarry has the potential to alter soil structure beneath hardstand areas and roads, to lead to increased erosion and sediment movement during construction, and alteration of physical and chemical soil properties during stripping and stockpiling operations. The EIS indicated that the proposed Integrated Erosion and Sediment Control Plan will provide details of measures for the control of soil erosion and sediment generation from areas disturbed by quarrying and construction activities, and measures to maintain water quality in local watercourses. A range of established measures to control soil erosion and to manage soil resources during construction and operation are proposed in the EIS. In addition, the Company proposes to provide further detail with respect to the quantification of soil resources, stripping and re-application schedules and stockpiling inventories in the Mining Operations Plan (MOP) prepared for the Department of Mineral Resources. Environmental Management Plans (EMP) are also proposed for construction and operation of the limestone quarry.

- ***Issues Raised in Submissions***

The EPA expressed concern that there was a sufficient depth of fertile soil available to support the growth of vegetation used in rehabilitation. The DLWC raised some general issues relating to the use of soil in rehabilitation, soil management, and use as a construction medium. No other specific issues relating to soil erosion at the quarry site have been raised by other Government agencies. Parkes Shire Council sought adequate controls and safeguards to be incorporated in consent conditions to adequately manage the operations to minimise soil erosion. No issues were specifically raised by local residents.

- ***The Departments Position***

The Department considers that the proposed measures outlined in the EIS and proposed in the IESCP will ensure that soil quality will be maintained and soil erosion minimised. Conditions are recommended requiring the preparation of the Integrated Erosion and Sediment Control Plan (IESCP) detailing measures for the control of soil erosion during construction, and operation of the quarry and processing operations, including issues raised by the DLWC and EPA. Compliance with this condition will ensure that potential impacts on soil resources and erosion will be minimised.

5.7.3. Land Use

- ***Applicants Position***

The EIS indicates that Class 3 and Class 4 agricultural land will be disturbed by the limestone quarry and processing operations. The overall rehabilitation strategy presented in the EIS is to revegetate disturbed areas with a mixture of pasture and native woodland species, to return the land to an agricultural land use.

- ***Issues Raised in Submissions***

No specific issues relating to land use have been raised by Government agencies. No specific or direct issues relating to land use have been raised by local residents. Indirect concerns have been raised relating to impacts from noise, blasting and material haulage on local rural activities and lifestyle.

- ***The Departments Position***

The Department is of the view that the rehabilitation strategy proposed in the EIS will ensure a stable landform at the completion of quarrying operations and provide an opportunity to return the land to an agricultural land use. As indicated above, the Department considers that further rehabilitation strategies need to be examined, particularly use of water in the quarry void.

The inclusion of conditions requiring the preparation of a Environmental Management Plans for soil management, dust, noise, vibration and land management, including rehabilitation strategies, will minimise the impact of the development on surrounding rural land uses.

5.7.4. Land contamination status

- ***Applicants Position***

Mitigation measures are proposed to prevent or reduce the potential for contamination of land from fuels and oils at the limestone quarry include appropriate bunding of fuel and oil stores for containment of spills, and the installation of appropriate pipework above ground for detection of leaks.

- ***Issues Raised in Submissions***

The EPA provided its requirements for bunding in its GTA and these have been adopted in the recommended conditions. No other specific issues relating to land

contamination at the quarry site have been raised by other Government agencies or local residents.

- ***The Departments Position***

The Department is of a view that proposals for bunding of fuel and contaminants will minimising or reduce the potential for land contamination. Conditions are recommended for appropriate bunding and control of spillage from the operations.

5.7.5. Bushfire Hazard

- ***Applicants Position***

Areas around the limestone quarry are predominantly cleared grazing land assessed in the EIS as having a low to moderate bushfire potential. A number of management strategies are proposed in the EIS to increase the awareness of fire risk. It is also indicated that bushfire management will be addressed in the EMP.

- ***Issues Raised in Submissions***

No specific issues regarding bushfire hazard have been raised by Government agencies, Council, or the general public.

- ***The Departments Position***

Conditions regarding bushfire management and fire control have been included in the consent conditions.

5.8. Flora and Fauna

5.8.1. Flora

- ***Applicants Position***

The EIS has assessed that all proposed disturbance areas have limited value for flora conservation. Vegetation clearing would mostly be restricted to areas of open farm land with predominantly native grasses and scattered trees.

No plant species listed as threatened under the NSW *Threatened Species Conservation Act 1995*, or the Commonwealth *Protection of the Environment Biodiversity Conservation Act, 1999* were found within the quarry site. In addition, no plant species listed in *Rare or Threatened Australian Plants* (ROTAP) were recorded in this area.

Mitigation measures proposed in the EIS to minimise impacts on flora include the development of a vegetation clearing protocol during construction, detailing clearing, harvesting and recycling procedures; the development of a weed control programme, and progressive rehabilitation using endemic woodland and grass species.

- ***Issues Raised in Submissions***

No specific issues regarding native flora have been raised by Government agencies or the general public.

- ***The Departments Position***

The Department is of the view that the proposed development will have minimal impact on native vegetation occurring on the site.

5.8.2. Fauna

- ***Applicants Position***

The EIS indicates that the existing patches of remnant vegetation provide opportunities for fauna habitat which will be reduced as a result of clearing.

Measures proposed to minimise impacts of fauna include pre-clearance surveys to identify fauna habitats, relocation of fauna, maintenance of a rubbish-free environment, employee education programs, and feral animal control programs.

No threatened species were identified under the Threatened Species Conservation Act 1975 on the proposed quarry site.

- ***Issues Raised in Submissions***

No specific issues regarding fauna or fauna habitat have been raised by Government agencies or the general public.

- ***The Departments Position***

The Department is of the view that the proposed development will have minimal impact on fauna or fauna habitat occurring on the site.

5.9. Heritage

- ***The Applicant's position***

The EIS reports that no Aboriginal sites were identified in the NSW NPWS Aboriginal Sites Register or during surveys conducted by Aboriginal Surveys and Reports (2000). The EIS noted that, while there was some potential for individual artefacts to be buried in the topsoil, the highly disturbed nature of the majority of the proposed operational areas, made this highly unlikely. The EIS proposes that if stone artefacts or discrete distributions of shell are found during site works, then operations will cease and the Local Aboriginal Land Council and representatives of the NPWS would be informed. No work would recommence in the immediate area until the find had been inspected and permission given for work to proceed. A "Consent to destroy" would be sought from the NPWS should it become necessary to disturb or destroy any archaeological site during the development.

No sites of European heritage significance were identified during a site survey. The Parkes LEP does not list any sites of European heritage significance on the limestone quarry project site.

- ***Issues Raised in Submissions***

No specific issues regarding heritage matters have been raised by Government agencies or the general public.

- ***The Departments Position***

The Department is of the view that the proposed development will have minimal impact on fauna or Archaeological sites or heritage items occurring on the site.

5.10.Waste

- ***Applicants Position***

The EIS proposes that non-hazardous refuse generated in the administration and workshop facilities would be stored in marked containers on-site and periodically removed to a municipal tip by a licensed contractor or disposed within the waste emplacement. Waste oil from fixed and mobile equipment would be stored temporarily on site and periodically collected for recycling or disposal at a licensed facility.

- ***Issues Raised in Submissions***

The EPA has included conditions relating to waste management on site and these requirements have been included in the consent conditions.

No specific issues have been raised by the general public regarding waste disposal or management.

- ***The Departments Position***

The Department supports in general proposal for the disposal of waste from the site. However, the proposal to dispose of waste within the waste emplacement is not supported due to the potential for long-term contamination of air and water, if waste disposal is not carried out in accordance with the current stringent requirements for landfill in NSW.

Conditions are proposed in relation to the management of refuse generated on the site.

5.11. Socio-Economic

The EIS indicates that during the three month quarry construction period, approximately 15 to 20 personnel will be employed. During operation, the EIS predicts that approximately 30 people will be required.

5.12. Visual

- ***Applicants Position***

The EIS predicts that permanent landscape impacts associated with the limestone quarry are the construction of the quarry open pit and waste emplacement. The EIS predicts that impacts from operations, and lighting in the open pit and infrastructure area, will be progressively screened from view as the waste emplacement and topsoil stockpiles are developed and the quarry operations extend below the ground surface.

The EIS proposes that batters on the emplacement closest to the Fifield to Trundle Road would be developed first in order to screen the operations, and that progressive revegetation of the outer batters would soften the visual impact of the emplacement. In

addition, a vegetation screen would be planted between the quarry infrastructure areas and the Fifield to Trundle Road.

- ***Issues Raised in Submissions***

No specific issues have been raised by Government agencies or the general public regarding visual impacts.

- ***The Departments Position***

The EIS states that only loading and haulage operation will be carried out on a 24 hour basis. Consequently, the Department is of the view that there is no requirement for night lighting in the quarry area. Night lighting is required only for the loading areas. Conditions in relation to night lighting are recommended.

The Department considers that the operations will be visible until the waste emplacement has been constructed and revegetated. The completion of the outer parts of the southern portions of the emplacement initially is supported by the Department as this will provide visual screening to the Fifield-Trundle Road. The EIS indicates that this will be completed within 5 years.

However, the EIS does not clearly indicate the time for completion of the entire outer part of the northern portion of the waste emplacement area. Until completed, there will be medium to long term visual impacts for residences located north of the development until the wall is completed. Short term visual impacts will also occur for residences south and east of the development until completion of the emplacement.

Conditions are recommended requiring the completion of the waste emplacement as soon as possible to minimise visual impacts from the development.

6. TRANSPORT AND ROADS

The EIS indicates that the daily traffic volumes on the local road networks will increase to varying degrees. Tables A4-13 and B4-7 of the EIS give comparisons of existing traffic volumes and those predicted.

6.1. Applicant's Position

6.1.1. Haulage route

The largest increase will be along the proposed haulage route which is to run from the proposed rail siding to the limestone quarry and nickel/cobalt mine site. This route is proposed to be upgraded by the applicant, and is shown on figure B1-1 of the EIS. It includes the construction of a by-pass around the village of Fifield, and upgrades of a number of road junctions along the haul road, including two intersections with lighting.

The road will carry materials to and from the rail siding, the limestone quarry, and the mine site and will be in use 24 hours a day, 7 days a week. The EIS however indicates that haul trucks will not operate on public roads between the MPF and the quarry at times during which the school bus is operating.

6.1.2. Other Roads

The EIS identifies a number of other roads that will experience an increase in traffic from both light and heavy vehicles. These include in the Parkes Shire: the Middle Trundle Road (SR83); part of the Bogan Gate to Tullamore Road (MR350); and part of the Parkes to Condobolin Road (State Route 90). In the Lachlan Shire the roads include: part of the Parkes to Condobolin Road (State Route 90); part of the Condobolin to Tullamore Road (MR57); part of the Springvale Road (SR60); part of the Melrose to Gillenbene Road (SR44); and part of the Fifield to Wilmartha Road (SR 34).

The EIS estimates that most traffic generation will occur between the mine site and Parkes, but that a level of increase will be experienced between the mine site and Condobolin.

Various mitigation measures are proposed in the EIS for many of these roads including the sealing of the unsealed parts of the Middle Trundle Road for the use of light traffic (predicted to be used by light mine traffic going to/from the mine site to/from Parkes), and the sealing of parts of the Melrose to Gillenbene, and the Fifield to Wilmartha Roads (predicted to be used by mine workers between the mine site and Condobolin). Additionally, the EIS identifies a number of junctions that will be required to be upgraded.

6.2. Issues Raised in submissions

6.2.1. Haulage Route

No specific issues relating to haulage have been raised by Government agencies. Parkes and Lachlan Shire Councils sought adequate controls and safeguards to be incorporated in consent conditions to manage the operations to ensure issues of traffic safety on the haulage route are addressed, and have provided General Terms of Approval (GTAs) for the haulage route upgrade. These have been generally incorporated into the consent conditions.

The West Trundle Landcare Group and a number of residents along the Fifield to Trundle Road (SR64) expressed concern at the impact of heavy truck movements on the movement of stock and farm machinery. The residents indicated that they frequently drive stock and farm machinery along, and across the road between properties, under a permit, at a frequency reportedly to be up to 20 times a year. The size and number of truck movements was a safety and property management concern to these residents.

6.2.2. Other roads

A number of private submissions raise a level of concern about transport of hazardous materials on roads in general (this issue is separately addressed in the Hazards section of this report).

Lachlan, Parkes, and Forbes Shires provided General Terms of Approval for works in road reserves for roads where the EIS considers works will be required, and also additional works not identified in the EIS. The roads not considered in the EIS for works/upgrades but recommended by Lachlan and Parkes Councils respectively include: the upgrade of the Springvale Road (SR60) in Lachlan Shire to a 7.5 metre wide two lane sealed carriageway in accordance with AUSTROADS specifications at full cost to the applicant; and the upgrade of the Middle Trundle Road (SR83) and Bogan Gate Road (MR350) between the junction of SR 83 and SR 171 in the Parkes Shire to a 7.5 metre wide two lane sealed carriageway for heavy traffic in accordance with AUSTROADS specifications. Parkes Shire Council also provided conditions to ensure that a number rail crossings be audited to ensure they meet certain standards.

All Councils requested that a Road Maintenance agreement be put in place to compensate for damage/maintenance to roads from mine related traffic.

The Western Region Development Committee indicated a number of concerns need to be addressed including need for vehicles to comply with designated routes and conform with State rules and regulations, road works/upgrades to be undertaken in accordance with set standards, adequate signage, and auditing of level crossings.

A submission from the MR354 Committee considers that the upgrade of Main Road 354 is required as it is the shortest and most practical regional road to Dubbo and Newcastle from the mine site and is likely to be used by traffic travelling to/from the mine site to/from Dubbo/Newcastle.

6.3. Department Position

6.3.1. Haulage Route

The Department considers that the measures proposed in the EIS and Council GTAs are adequate for the management of the construction and operation of the haulage route. These are contained in conditions 7.2-7.5. The Department also recommends conditions requiring the applicant to prepare a traffic code of conduct which is to include operators conforming to designated haulage routes, hours of operation, speed limits, vehicle maintenance, load coverage, and protocols with school bus operations (condition 7.1). The preparation of a Stock Crossing Management Plan is also recommended (condition 7.8) which is to detail measures to be undertaken by the applicant to ensure adequate and safe crossing of the haulage route for stock and farm machinery.

6.3.2.Other roads

The Department considers that all the recommendations of the EIS for other roads be undertaken by the applicant as identified in Appendix C of the EIS. This requirement is reflected in condition 7.2 of the recommended consent conditions.

Construction timing

The consent conditions also require the applicant to prepare a road construction program detailing the timing and scheduling of road construction required by the recommended conditions to reflect the level of project construction and operation activity and associated road usage. The program is to be prepared in consultation with the Lachlan and Parkes Shire Councils and to the satisfaction of the Director-General, prior to commencement of construction.

Springvale Road

The issue of the upgrade of Springvale Road (SR60) in the Lachlan Shire as recommended by Lachlan Council is not considered necessary as an upfront requirement for the applicant to undertake because the road is currently sealed and the amount of mine traffic that may use this road is not predicted to be a significant number (179 vehicles/day).

However, the Department recommends a condition requiring the applicant to enter into a Road Maintenance Agreement with the local council(s) for roads likely to be used by traffic to the project site. The Agreement is to include: the requirement for a traffic monitoring and reporting process to be developed and implemented at the Applicant's expense, to identify the use of roads by mine traffic, and mechanisms to calculate road maintenance contributions commensurate with mine traffic use (condition 7.5). The conditions also require that any upgrades to the Springvale Road are to be negotiated as part of the Road Maintenance Agreement except for those portions of SR 60 that may require upgrading for safety reasons, unless otherwise agreed by the Director-General.

Any portions of the road that require upgrading for saftey reasons is to be determined by an independent surveyor/engineer agreed to and funded equally between the mine company and Lachlan Council, with the works carried out at the expense of the company. It is considered that these measures will ensure an adequate road standard is maintained along the Springvale Road.

Sealing of Shire Roads SR 34 and 44, and potential alternative

The EIS recommends the sealing of part of SR 34 and 44 (12 kms approx) which forms part of the road network from Condobolin to the mine site. These recommendations are included in the consent conditions. Lachlan Council however have suggested an alternate new road to be constructed from the Springvale Road direct to the mine site. This would allow for a shorter and quicker passage from the mine site to Condobolin, and negate the need for SR 34 and 44 to be particularly used by traffic to/from the mine site. This option was not considered in the EIS.

Consequently the Department recommends a condition which stipulates that if the company and Council can mutually agree to construct the new road, known as Route E, subject to the necessary approvals, the obligation to seal SR 34 and 64 would not apply. Additionally, in the event Route E is mutually agreed upon, the conditions require the mine company to contribute as a minimum funds for the road construction

which would equate to the distance of the sealing of SR 34 and 44. Any additional contribution towards the road upgrade shall be agreed between the Council and company as part of the mutual agreement, and may be based on predicted/actual traffic usage of the route by mine traffic. It is considered that these provisions should ensure an adequate access road between Condobolin and the mine site.

Middle Trundle and Bogan Gate Roads

The matter of the upgrade of the Middle Trundle Road (MTR) in the Parkes Shire to a heavy vehicle standard as suggested by Parkes Council is not proposed in the EIS. The heavy vehicle route from Parkes to the mine site is proposed to go via State Route 90 to Bogan Gate and north along MR 350 to the main haulage route between the rail siding and mine site. Parkes Shire Council maintains it would be beneficial to upgrade the MTR to a heavy vehicle standard as it is a shorter route, and would negate the need for an intersection upgrade at Bogan Gate and potential upgrades of MR350 south of the junction with the MTR. Additionally, the Council indicates that it may be prepared to contribute to the upgrading of Shire Road 83 to a heavy vehicle standard, beyond those costs attributable to the sealing of the road for light vehicle use.

Additionally, the EIS does not indicate that upgrades of the proposed heavy vehicle route along the Bogan Gate Road (MR350) between Bogan Gate and the rail siding are required, though Parkes Council considers that parts of MR350 between Bogan Gate and the rail siding are required for safety reasons.

The applicant has further discussed the matter of upgrading the MTR with Parkes Council and it has been agreed that the applicant shall seal the gravel section of the MTR to a heavy vehicle standard and also contribute $300,000 for the upgrade of the remainder of the MTR to a heavy vehicle standard. This matter is reflected in the consent conditions (Condition 7.2).

The Department considers that the safety of the part of the Bogan Gate Road to be used by heavy mine traffic must be maintained as the mine will generate a substantial increase in heavy traffic along part of that road (between the junction of SR 83 and SR 171). As such, the Department recommends a condition which stipulates that the company upgrade those parts of MR350 between the Middle Trundle Road and the rail siding. The portions of road that require upgrading for safety reasons shall be determined by an independent surveyor/ engineer agreed to and equally funded by the company and Parkes Council. The conditions also require that any upgrades to this stretch of road other than those identified for safety required upfront, shall be negotiated as part of the Road Maintenance Agreement.

MR 354

In relation to the concerns of the MR 354 Committee, the applicant has advised the Department that it will specify in contracts for haulage that this road cannot be used for haulage of material to the mine site. The EIS stipulates that all haulage is to come to the site via State Route 90. As mentioned above, draft consent conditions recommend that the applicant prepare a Code of Conduct for all haulage vehicles associated with the Syerston Project operating within the Lachlan, Parkes and Forbes Shires prior to commencement of construction and to the satisfaction of local councils, requiring these haulage vehicles to comply with the Code (condition 7.1(a)).

Part of the Code is to include clear stipulation that MR 354 shall not be used by haulage vehicles travelling to/from the Project site, and that any contracts with hauliers have this prohibition clearly stated in the contract. Additionally the Code of Conduct

shall also include measures that will be undertaken by the Applicant in the event it is established that haulage vehicles have not complied with the Code. The Department considers that these provisions are adequate to ensure heavy traffic to the mine site does not use MR 354.

The Department is satisfied that the issues of road upgrades and matters relating to traffic associated with the Syerston project can be adequately provided for and managed.

7. BOREFIELDS

The key issue relating to the borefields is:

- Groundwater Impacts

7.1. Groundwater

- ***Applicants Position***

The EIS states that the borefied is the sole source of water for the project and that main water usage is associated with ore processing at the MPF. Other water supply requirements include cooling water, water for dust suppression on haul roads and internal access roads, potable and non-potable uses around the site for both the MPF and the limestone quarry.

Hydrogeology

Groundwater contained within the Lachlan River alluvial aquifers was identified in the EIS as a potential source of raw water supply for the Project. Two borefields within the Lachlan River palaeochannel, at the intersection with the Bland Creek palaeochannel approximately 65km south of the MPF site, have been assessed in the EIS as the source of water for the Project.

The assessment found that groundwater movement in the aquifers is generally from east to west. Between Jemalong Gap and Bogandillon Gap, the major aquifer is the deep, confined sands and gravels of the Lachlan Formation. It is overlain by the shallower Cowra Formation aquifer.

The EIS reports that the Cowra Formation aquifers are generally extensive, however the potential for groundwater supplies is limited compared with the Lachlan Formation as there is less water level drawdown and the aquifer is more permeable. Groundwater yield from the Cowra Formation is generally less that 60 L/s. Soil salinisation and water logging is a recognised problem in the Jemalong-Wyldes Plains area, south of the Lachlan River, especially near the Bogandillon Range.

The EIS studies found that the Lachlan Formation aquifer is restricted to the entrenched bedrock section of the Lachlan River valley and contains the more productive aquifers. The sand and gravel confined aquifers are irregularly distributed, hydraulically interconnected and vary considerably in thickness. The Lachlan Formation aquifers between Jemalong Gap and Bogandillon Gap are generally extensive, although the palaeochannel is restricted in width to a few kilometres at each Gap. Licenced bore data indicates that groundwater yields from the Lachlan Formation in this area are up to 195 L/s.

Groundwater Quality

The EIS reports that salinity varies substantially in the Lachlan River Valley from less than 500 mg/L to in excess of 30,000 mg/L. Salinity tends to increase away from rivers, creeks and channels towards basement rock outcrops. There is also a natural increase in salinity downstream along the groundwater flow path from east to west.

The EIS reports that groundwater salinity from investigation bores in the Lachlan Formation aquifer varies from 760 mg/L to 870 mg/L (low salinty). The pH is slightly alkaline and nutrient levels (ammonia and total phosphorus) are elevated. Metals are at low concentrations and within ANZECC (1992) criteria. Groundwater within this aquifer was found to be sodium/chlorine/bicarbonate dominant. Groundwater in the shallow Cowra Formation is bicarbonate/sodium/magnesium dominant.

Groundwater Levels

Water levels in the Lachlan River and Bland Creek Valleys have been measured in DLWC observation bores over a period of some 30 years. These bores show that groundwater levels in the Lachlan River Valley between Jemalong Gap and Condobolin and in the Bland Creek Valley to the south range from 0.3 m to 69.5m below surface.

The EIS reports that the piezometric surfaces in the Lachlan Formation and the contact with the Cowra Formation are responsive to regional recharge events and have been assessed in the Coffey studies as being hydraulically interconnected. The EIS concluded, based on the height of piezometric surfaces and the responsiveness of the surface of the Cowra Formation to recharge events, that the hydraulic connection between the Lachlan Formation and upper Cowra Formation aquifer is not significant and there is no recharge from shallow to deeper aquifers at this location under current steady state condition.

- ***Impact Assessment***

A hydrological assessment of the borefields component of the project was undertaken by Coffey Geosciences (Coffey Geosciences Pty Ltd 2000). Two numerical groundwater models were constructed to simulate groundwater flow behaviour in the vicinity of the proposed borefields and the surrounding aquifer and to identify any drawdown effects and impacts on other groundwater users. In terms of potential "drawdown" Model 1 is considered to be the "worst case" scenario and Model 2 the "best case" scenario. The studies found that the following impacts will occur:

- A deletion of the aquifer during the extraction period due to the proposed maximum extraction rate of 200L/s which is greater than the aquifer's recharge rate;
- A predicted drawdown of about 3-4m after 30 years of extraction around the aquifer boundaries in Model 1 and up to 0.5m in Model 2. The water level drawdown in the vicinity of the production borefields after 30 years is predicted to be approximately 3.5m to 14m;
- Variable impacts on shallow bores in the Cowra Formation dependent on the depth of bore screens and their proximity to the Syerston borefields;
- Increased recharge from the Lachlan River to the groundwater system which may result from pumping in the borefields;

- A lowering of the groundwater mound beneath Jemalong-Wyldes Plains.
- A reversal of groundwater flow direction near the groundwater mound beneath Jemalong-Wyldes Plains resulting in restoration of the original groundwater flow path northwards from the Bland creek Palaeochannel to the Lachlan River Palaeochannel.
- A decrease in groundwater levels in deeper aquifers of the Lachlan River valley resulting in induced vertical infiltration from shallow aquifers; and
- An additional 1m to 5m (Model 1) groundwater level drawdown in the proposed Cowal Gold Mine production borefield (located approximately 25km south of the Syerston borefields).

The study by Coffey Geosciences predicted that since Lake Cowal, Nerang Cowal and Bogandillon Swamp are generally hydraulically isolated from the Lachlan aquifer system, it is predicted that they would not be affected.

The EIS proposes a number of mitigation measures to minimise impacts. These include the development of a Borefield Management Plan in conjunction with the DLWC which would include a bore census of all bores within a 10km radius of the borefields and the recording of groundwater levels and groundwater quality. The Applicant proposes that should monitoring show that disruption to surrounding groundwater bores occurs, due to water table drawdown, then amelioration measures such as bore reconditioning, lowering existing pump sets and/or refitting would be undertaken.

To minimise impacts on groundwater reserves and surrounding bores, the EIS proposes that six month sequential pumping of each alternate borefield is proposed to reduce the impact on groundwater levels at each extraction area. In addition, only the two furthest bores in each field would be actively pumping. A standby bore would only be activated in the event of breakdown or scheduled maintenance on the alternate production bore.

- ***Issued Raised in Submissions***

The DLWC did not object to the proposal on the basis on the information presented in the EIS but expressed concern that the two models did not allow the confident prediction of the long-term impacts of the operation of the borefields. In particular, Model 1 did not provide for river leakage, and Model 2 overestimated river recharge. DLWC also recognised that there were limitations in the required amount of input data to the river packages. Other concerns raised by DLWC related to the presentation and discussion of the methodologies used which affected the outcome of the modelling and left a number of key issues to be addressed.

In summary the DLWC considered that the drawdown predicted by Model 2 seemed to have been overestimated. DLWC considered that irrigation bores mostly drawing groundwater from the Lachlan Formation should be incorporated in the model in order to assess impacts on their productivity. The possible impacts of pumping on relatively shallow stock and domestic bores presently depending on the Cowra Formation should also be assessed.

The DLWC provided their general terms of approval and recommended a number of conditions for inclusion in the Department's consent conditions aimed at assessing the long-term impact of the borefields on groundwater resources. These conditions included boundary constraints on the location of bores, measures for recording water flows from pumping bores, reporting and access arrangements for DLWC staff, and

the preparation of a Bore Impact Mitigation Plan that demonstrates, to the satisfaction of DLWC, how the impact on neighbouring bores will be ameliorated.

The EPA required the Applicant to prepare an environmental management plan prior to commencement of construction to ensure adequate controls during construction of the borefield infrastructure. The EPA required the plan to address measures for control of surface water discharges, minimisation of erosion, and protection of water quality.

Seven submissions were received from the public, expressing concern at the potential impact of the borefields on the quality and quantity of groundwater in their dependent bores. Other concerns raised were the small number of test bores and the restricted area monitored by the Applicant. Comments on the draft conditions circulated to the community reinforced concerns regarding the impact of the borefields on groundwater quality and quantity.

- ***Independent Consultants Report***

The Department engaged Peter Dundon & Associates Pty Ltd (2001) to undertake an independent assessment of the groundwater investigations undertaken by the Applicant. The major focus of the Dundon review was the groundwater model of the Lachlan Valley groundwater system used by Coffeys, and its appropriateness for predicting impacts of the proposed groundwater extraction. The reliability of the model was considered critical to assessing whether the aquifer system is able to sustain the proposed water supply, without unacceptable impacts on the resource and other users.

The assessment concluded that the investigation program undertaken by the Applicant in broad terms is considered adequate to have developed a reliable understanding of the groundwater flow system, and to have determined the potential of the Lachlan Formation to support the project's water supply.

Dundon reported that, although acknowledging the impeding influence of clays in the Cowra Formation, Coffeys assumed in the groundwater model that the Cowra Formation is an aquifer rather than an aquitard, and that recharge to the Lachlan Formation occurs by downwards leakage from the surface through the Cowra Formation. The abundance of low permeability clays between the surface and the Lachlan Formation suggested to Dundon that recharge in the area of interest is more likely to be derived from lateral flow within the aquifer itself, from some more distant source, either around the margins of the valley or somewhere upstream. The consultant noted that although the upper Cowra Formation aquifer would be recharged from the surface, and there is the potential for leakage to occur slowly through the clay layers down to deeper horizons, Dundon believed that the middle and lower Cowra Formation aquifers would be recharged by lateral flow from some more distant recharge source.

Dundon used hydrographic information, existing drawdown effects from the upstream Parkes town/ Northparkes mine borefield, and the results of pumping tests to present evidence against downward leakage from the surface through the Cowra Formation as the recharge mechanism.

Dundon concluded that since the model was based on vertical rather than lateral recharge of the aquifer, and other technical factors relating to the model parameters, the model was not a completely reliable indication of long-term impacts on groundwater users.

Dundon concluded that technically, the proposed water supply would be available from the proposed borefields in the Lachlan Formation in the Lachlan palaeochannel. The supply would be met partly from depletion of groundwater storage and partly from interception of recharge. Dundon further concluded that extraction of this supply is expected to have both local and more distant impacts on groundwater levels which can be expected to have an impact on other users, however, the magnitude of these impacts cannot be predicted. Dundon recommended that the Applicant commit to comprehensive monitoring and appropriate mitigation measures, which are flexible enough to accommodate impacts that may arise.

The full Peter Dundon and Associates (2001) report is enclosed in Appendix 2.

Groundwater Quality

No assessment of the impacts of groundwater withdrawal on water quality in adjoining bores has been undertaken by the Applicant. The EIS predicts that in the event of a pipeline rupture, groundwater would be unlikely to have a significant impact on surface water quality. This is due to the low salinity, slight alkalinity, low metal concentrations, and moderately elevated nutrient levels in the groundwater.

- ***The Department's Position***

The Applicant was provided with the report by Peter Dundon & Associates (2001) for comment and indicated general agreement with the overall conclusions reached by the consultant.

The Applicant advised that it understood that the DLWC believed that the actual result for the aquifer will be something between models 1 and 2 with the models determining the best and worst cases. The Applicant also commented that only very long term aquifer stressing and monitoring will determine in a more exact way any impacts on existing groundwater users in the region.

The Applicant also notes that the Dundon review predicts that effects on shallow Cowra bores have been overestimated, according to Dundon's assessment of the Coffey report, which also, according to Dundon's review, predicts an overestimate of loss of water from the Lachlan River. The Applicant agrees that the modelling drawdown effect has been underestimated for the Lachlan Formation.

The Applicant considers that on this basis, there will be less impacts/complaints about shallow Cowra bore drawdowns, less complaints about dewatering of the river, and more complaints about dewatering the irrigation bores.

The Applicant notes that any changes in the regional aquifer around the Syerston borefield will be recorded through extensive monitoring program and monitoring bores as agreed with DLWC, and which will form part of a Bore Impact Mitigation Plan.

The basic principal of the Bore Mitigation Plan is to predict, from groundwater monitoring and modelling, whether the Syerston bore pumping will adversely impact upon groundwater users. Monitoring information together with pumping volumes of the Syerston and irrigation bores in the region will be used annually to refine the groundwater model for the area. The model results will then be used to predict likely impacts on existing bores in the region. This will then trigger preventative action in water supply to any affected landholder.

The Department considers that while there is an adequate water supply for the project from the borefields, there will be an impact on groundwater supplies in adjoining bores. The extent and severity of these impacts, however, cannot be quantified. The EIS predicts that groundwater extraction will drawdown the aquifer in the vicinity of the borefields. The independent studies conclude that the model used to assess drawdown effects is flawed and does not give a reliable indication of the long-term impacts on groundwater users; a conclusion agreed to by the Applicant. A number of landowners have raised concerns regarding the extent of impacts on farm water supplies drawn from bores in the vicinity of the borefields.

In view of the concerns raised by Government agencies, local landowners, and the Department's consultant, and the response from the Applicant to the independent report, the Department proposes stringent conditions for monitoring of groundwater quantity and quality in, and surrounding the proposed borefields. These conditions include:

- Development of a groundwater monitoring program including the installation of an array of monitoring bores to measure groundwater quality and quantity. Bore locations and details are to be selected with the approval of the DLWC, EPA and the Director-General.

- Incorporation of automatic recording devices in each of the extraction bores to record the volumes of water extracted and to provide details of these measurements to the DLWC.

- To restrict the volume of water extracted until it can be demonstrated to the satisfaction of the DLWC how impacts on neighbouring bores will be ameliorated;

- To demonstrate to the satisfaction of the DLWC that the borefield is capable of sustainably extracting the allocated volume before commencement;

- To prepare a Bore Impact Mitigation Plan (BIMP) prior to commencement of construction in consultation with DLWC, FSC and landowners within 10km radius of the borefield, to be approved by DLWC. The plan is to address rehabilitation measures if adverse impacts on groundwater supply are identified; details of the groundwater monitoring program, independent monitoring, and details of consultation with landowners;

- For the Applicant to fund an independent review of the BIMP prior to its approval. The independent review will be considered by the Director-General and DLWC in any approval of the BIMP, and the review to be made publicly available at FSC as well as to landowners within 10km of the borefields;

- Acquisition of affected properties in the event that bore rehabilitation does not adequately protect the quantity and quality of groundwater drawn from the affected bore(s).

The Department considers that these measures will provide effective mechanisms to closely monitor the potential impacts of the borefields on groundwater quantity, quality and supply to surrounding groundwater users.

7.2. Surface Water

- ***The Applicants Position***

The EIS states that surface water runoff from disturbed areas associated with the construction of pumping infrastructure could potentially contain sediments or traces of contaminants (eg diesel). During the operational phase, potential surface water impacts include sedimentation or water quality impacts upon surface waters associated with rupture of water pipelines.

Mitigation measures proposed by the Applicant during construction include minimising areas of disturbance, installation of temporary sediment retention ponds and silt fences and progressive rehabilitation. During operation, the water supply pump system would be fitted with an automatic, pressure sensitive shutdown system to rapidly cease pumping in the event of pipeline rupture. The EIS predicts that in the event of a pipeline rupture, groundwater from the water supply pipeline would be unlikely to have a significant impact on surface water quality.

- ***Issues Raised in Submissions***

No specific issues with respect to surface water in relation to the borefields have been raised by Government or in public submissions.

- ***Department's Position***

The Department considers that the proposed measures for mitigating surface water during operation will ensure that potential impacts can be adequately managed. Conditions are recommended requiring the Applicant to detail erosion controls, measures to separate clean and dirty water runoff, contingency plans for managing adverse impacts on surface water, and rehabilitation measures during construction as part of the Borefields Environmental Management Plan. These measures will ensure that impacts on surface water quality will be minimised.

7.3. Soil Quality and Erosion Potential

- ***Applicants Position***

The EIS indicates that there is a potential for erosion downslope of and in disturbance areas during the construction phase. Measures proposed by the Applicant to mitigate impacts are minimising the area disturbed, incorporation of temporary erosion control works and rehabilitation of disturbed areas as soon as practicable following completion of construction. These measures are proposed to be detailed in a construction environmental management plan.

- ***Issues Raised in Submissions***

The EPA and the DLWC require the Applicant to prepare an Integrated Sediment and Erosion Control Plan to detail measures proposed to prevent soil erosion and the entry of sediment to any river, lake, waterbody, wetland or the groundwater system. No specific matters relating to erosion controls during construction of the borefields have been raised in public submissions.

- ***Departments Position***

Conditions are recommended requiring the Applicant to incorporate details of erosion control measures, including details of temporary systems to be used during construction, in the Borefields Environmental Management Plan. The Department considers that these measures will ensure that impacts on soil resources are minimised.

7.4. Air Quality

- ***Applicants Position***

The EIS indicates that no quantitative studies have been undertaken to assess existing air quality for the borefields. It states, however, that ambient air quality, would be determined by local land management activities (eg., farming and road traffic). Particulate matter and dust would be expected to represent the majority of foreign material found in ambient air.

The EIS concludes that the construction and operation of the borefields is not anticipated to introduce any major sources or air pollutants in the area although minor dust emissions from disturbance areas during construction may occur.

Measures proposed to minimise dust emissions include watering of disturbed areas and progressive rehabilitation. The Company also proposes the preparation of a Construction Environmental Management Plan (CEMP) detailing the proposed clearing, stripping, excavation, bedding, pipelaying, backfilling and rehabilitation activities to be undertaken during the construction phase.

- ***Issues Raised in Submissions***

Impacts on air quality from the borefield have not been raised as an issue by Government agencies or the local community.

- ***Departments Position***

The Department considers that there is potential for fugitive dust to be generated during the construction phase. Recommended conditions require the Applicant to detail proposed dust mitigation measures during construction as part of a Borefields Environmental Management Plan.

7.5. Noise

- ***Applicants Position***

The EIS reports that no specific background noise assessment has been undertaken of the borefields and predicts that existing background noise levels would not be expected to exceed those typically measured in most rural settings due to the remote and mostly rural location of the borefields area.

No specific noise mitigation measures are proposed and the EIS predicts that any increase in noise levels is unlikely to result in any significant impact.

- ***Issues Raised in Submissions***

Noise impacts from the borefield have not been raised as an issue by Government agencies or the local community.

- ***Departments Position***

The Department considers that there is potential for some to be generated during the construction phase. Recommended conditions require the Applicant to detail proposed noise mitigation measures during construction as part of a Borefields Environmental Management Plan. In addition the plan requires the Applicant to detail construction hours, noise compliance standards, complaints handling and monitoring and noise mitigation measures.

7.6. Land Contamination

- ***Applicants Position***

The EIS reports that during construction, liquids such as diesel, paints and herbicides may be stored at the borefields and spillage could potentially result in localised impacts.

Mitigation measures proposed include removal of all wastes from construction areas to facilities authorised to accept such materials.

- ***Issues Raised in Submissions***

No specific issues relating to land contamination have been raised by Government agencies or in public submissions.

- ***Departments Position***

Recommended conditions address requirements for the control of hazardous materials and waste, assessment of risks, and the preparation of a waste management plan detailing measures to minimise the production of waste and to effectively reuse, recycle, treat and dispose of waste . The Department considers that these measures will ensure adequate management of wastes on the site.

7.7. Bushfire Hazard

- ***Applicants Position***

The EIS acknowledges that the pipeline infrastructure could be susceptible to bushfires. To minimise risk, the Applicant proposes to keep the borefield infrastructure clear of vegetation.

- ***Issues Raised in Submissions***

No specific issues relating to bushfire risk have been raised by Government agencies or in public submissions.

- ***Departments Position***

The Department recommends the inclusion of conditions requiring the preparation of a bushfire management plan prepared in consultation with the local Local Government

agencies. The Department considers that bushfire risk will be minimise by the preparation and adoption of the bushfire management plan.

7.8. Flora and Fauna

- ***Applicants Position***

The EIS reports that the borefields are situated in cleared agricultural land. Flora and fauna surveys conducted by consultants engaged by the Applicant indicated that no threatened flora species under the *Threatened Species Conservation Act 1995* were identified during the survey of the borefields.

Three species of birds were recorded in the borefields, but no mammals, reptiles or amphibians. None of the species recorded are recorded threatened fauna species.

- ***Issues Raised in Submissions***

No specific flora and fauna issues were raised by Government agencies or in public submissions.

- ***Departments Position***

A condition is proposed requiring the preparation of a Flora and Fauna Management Plan as part of the Borefields Environmental Management Plan. The Department is satisfied that the borefields development will have minimal impact on flora and fauna.

7.9 Heritage

- ***Applicants Position***

The EIS indicates that there no Archaeolgical sites have been recorded in the vicinity of the borefields or recorded in the NSW NPWS Aboriginal Sites Register.

The EIS indicates that given that the general borefields area is open paddocks with no evidence of homestead or shed development, there is little likelihood of sites of historical interest being present.

- ***Issues Raised in Submissions***

No specific heritage issues were raised by Government agencies or in public submissions.

- ***Departments Position***

A condition is proposed requiring the preparation of a Archaeological and Cultural Management Plan as part of the Borefields Environmental Management Plan. The Department is satisfied that the borefields development will have minimal impact on heritage sites and areas.

8. HAZARDS AND RISK IMPACTS

8.1. Applicant's Position

The Applicant indicates that the proposed development is "potentially hazardous" as defined by *state Environmental Planning Policy No. 33 - Hazardous and Offensive Development* (SEPP 33). That is, in the absence of all risk mitigating measures, the development would pose a significant risk to surrounding land uses. In accordance with the requirements of SEPP 33, the Applicant prepared a Preliminary Hazard Analysis (PHA) for inclusion in the Environmental Impact Statement. The PHA aimed to demonstrate that although the development is "potentially hazardous", it is not "hazardous" (ie the proposed risk mitigating measures are appropriate to lower off-site risk to an acceptable level).

Classification of the development as "potentially hazardous" was based on the fact that:

- the development involves the storage of greater quantities of dangerous goods that the criteria listed in the Department's publication *Applying SEPP 33*; and
- the process to be employed to treat nickel/ cobalt ore involves elevated pressures (above ambient).

The Preliminary Hazard Analysis provided the results of a hazard identification exercise undertaken by the Applicant to establish credible events that may contribute to risk impacts from the development. Major scenarios identified were:

- fires and explosions (deflagration) involving elemental sulphur at the sulphuric acid plant and rail siding;
- toxic effects of sulphuric acid and sulphur dioxide releases from the sulphuric acid plant;
- fires and explosions involving hydrogen gas at the hydrogen sulphide plant and electrolytic cells;
- fires, explosions and toxic effects of hydrogen sulphide releases from the hydrogen sulphide plant and flare;
- contribution of oxygen from the oxygen/ nitrogen plant to the scale and intensity of fires;
- toxic effects of chlorine releases from the water treatment plant;
- fires involving diesel fuel at the Processing Facility, the limestone quarry and the rail siding;
- fires involving the extraction solvent at the Processing Facility;
- fires and explosions involving natural gas at the Processing Facility and the natural gas pipeline; and
- fires and explosions involving ammonium nitrate fuel oil at the limestone quarry.

The PHA provides a consideration of each of the above situations to determine whether any would have a credible off-site impact. In all cases only individual risk has been considered. Individual risk assumes that a single person is continuously standing at particular point. The Applicant argues that there is little need to examine societal risk, which takes into consideration the actual population density at a particular point. Given the rural nature of the locality, the Applicant has assumed that the population density on land uses surrounding the development will be very low, and as such the societal risk posed by the development will be correspondingly low.

Below is a summary of the Applicant's position on individual fatality, injury and irritation risk (where relevant) posed by the development for different types of hazardous events.

8.1.1.Fires

The Applicant highlights that inventories of flammable materials associated with the proposed development are located at considerable distances from the development's site boundaries. In the case of the Nickel/ cobalt processing facility, the closest site boundary is approximately one kilometre away, with the closest residence more than three kilometres. Diesel storage on the limestone quarry site is in excess of 100 metres from the site boundary. Therefore, the Applicant argues in the PHA that the consequence of a fire event impacting on an adjacent land use is very low. To verify this position, results of heat radiation modelling is presented in the EIS. Four types of fires were investigated in the PHA:

- Jet fires;
- Flash fires;
- Pool fires; and
- Fires involving warehouse storing dangerous goods.

Jet fires relate to the release of a liquid or gas under pressure from a pipe or vessel, forming a long stable flame. The only areas of the development in which jet fires could therefore occur are hydrogen supply lines, hydrogen sulphide supply lines and pipes carrying natural gas. Jet fires were modelled for each of these scenarios, and the effect distance of each was calculated for a radiant heat level of 4.7kWm^{-2}. This radiation level will produce pain after 15 to 30 seconds and cause second degree burns for longer exposures. Results of jet fire modelling, as presented in the PHA are summarised below in Table 4.

Table 4

Release Scenario	Distance to 4.7kWm^{-2} (m)
Hydrogen supply to H_2S plant	7
Hydrogen supply to reformer	<2
Hydrogen sulphide at precipitation vessels	<5
High pressure natural gas supply to site	21
Low pressure natural gas distribution on-site	27

The PHA highlights that all scenarios yield an effect distance significantly less than the distance to the nearest site boundary (one kilometre). In the case of the high pressure natural gas supply pipeline to the site, the Applicant argues that given the choice of route for the pipe, and the fact that the pipe is underground for the greatest part of its route, the likelihood of a jet fire and the consequent risk impact is extremely low.

The Applicant also suggests that there may be potential for ignition of hydrogen gas emanating from the hydrogen vent stack. The likelihood of ignition of this stream is extremely unlikely during normal operating conditions, and a direct lightning strike to the stack would be required for ignition. In the event that this lightning strike did occur, a jet fire approximately seven metres long at a height of 36 metres above

ground level (the proposed height of the stack). The Applicant concludes that such an event would not pose a significant fatality risk to surrounding land uses.

Flash fires may also occur at the proposed development. These types of fires occur when a cloud of flammable gas mixes with air and ignites, and therefore are only feasible for areas of the development handling hydrogen, hydrogen sulphide or natural gas. The PHA argues that a flash fire is a short-lived incident for which the explosive effects are more significant than the radiation effects. As such, modelling was undertaken to calculate the effect distance to an explosion overpressure of 70kPa. At this overpressure, it is expected that fatality is 100% assured. Effect distances for major scenarios, as presented in the PHA, are listed below in Table 5.

Table 5

Release Scenario	Distance to 70 kPa (m)
Hydrogen supply to H_2S plant	35
Hydrogen supply to reformer	30
Hydrogen sulphide at precipitation vessels	37
High pressure natural gas supply to site	50
Low pressure natural gas distribution on-site	59

The Applicant concludes, in a similar manner to that for jet fires, that given the large separation distances between the development's operations and surrounding land uses, there will be negligible off-site risk impacts from flash fires.

Unlike jet and flash fires, pool fires involve flammable or combustible liquids that accumulate in a pool on the ground and evolve vapours (through evaporation) which subsequently ignite. The Applicant lists areas with potential for pool fires as being extraction solvent stores associated with the Nickel/ cobalt processing facility and diesel stores at both the Processing Facility and the limestone quarry. Modelling for each of these scenarios produces results as summarised below in Table 6. Effect distances were calculated for 4.7 kWm^{-2}, 12.6 kWm^{-2} and 23 kWm^{-2}. These radiant heats represent human pain, human injury (with significant probability of fatality) and failure of structures (with 100% likelihood of fatality).

Table 6.

Release Scenario	Distance to 4.7 kW m^{-2}	Distance to 12.6 kW m^{-2}	Distance to 23 kW m^{-2}
Loss of containment of 5 tonne extraction solvent	9	4.5	2.5
Loss of containment of extraction solvent in process area	55	30	25
Loss of containment of 50,000 litre diesel tank	19	10	7

For incidents associated with the Nickel/ cobalt processing facility (combustion of extraction solvent), the PHA highlights that the effect distances in all cases examined are much less than the one kilometre separation distance to the site boundary. Therefore these incidents pose negligible off-site risk impacts. There is, however, potential for knock-on effects, should process equipment lie within 25 metres of a pool fire in the solvent extraction area. The Applicant argues that this issue has been taken into account in the design of the development, with generous separation distances between plant equipment being provided. Further, fire protection measures, including alarms and sprinklers are proposed.

With respect to pool fires involving diesel fuel, the Applicant indicates that these events may occur at any of the four diesel storage areas associated with the development (ie the Nickel/ cobalt processing facility, the rail siding, the mining contractors' area of the limestone quarry). A maximum inventory of 50,000 litres of diesel was assumed in each case. The Applicant states that for each diesel store, the distance to the nearest structure is greater than seven metres, and to the nearest boundary greater than 19 metres. The PHA highlights that diesel is a combustible liquid (as opposed to a flammable liquid) and does not readily ignite.

The Applicant argues that the potential for fires to start in any of the dangerous goods stores associated with the development are minimal. This argument is based on the fact that all storage areas are to be designed in accordance with relevant Australian Standards.

Consideration of bushfires resulting from incidents at the development has also been provided in the EIS. The Applicant states that adequate separation distances will be provided between development infrastructure and vegetation to minimise the potential for the generation of, or impact from, bushfires.

8.1.2. Explosions

Vapour Cloud Explosions (VCE) can occur when a cloud of flammable gas, mixed with air, ignites. VCE's differ from flash fires in that the flammable gas has leaked for a greater period of time and ignition has been delayed. The PHA indicates that the same scenarios were examined for VCE's as for flash fires (as the two are essentially the same with different ignition timings). In all cases the explosion overpressures

modelled at the site boundary were less than 1 kPa. The PHA states that this is insufficient pressure to cause human injury or fatality, or lead to structural damage.

Although explosives will be used for excavation of the limestone quarry, components of the explosives will be transported, stored and handled separately, in accordance with Australian Standards and best practice. The Applicant indicates that there may be need to employ explosives for excavation work associated with the Nickel/ cobalt processing facility, water pipeline and natural gas pipeline.

8.1.3. Toxic Gas Releases

The PHA states that the only types of hazardous events that may occur on the site and lead to significant off-site impacts are releases of toxic gases. Of the toxic gases used and/ or produced at the development, only sulphur dioxide (SO_2) and hydrogen sulphide (H_2S) were identified as posing a significant risk to off-site receptors. Other gases, including nitrogen dioxide (NO_2) and chlorine (Cl_2), although posing a fatality, injury or irritation risk in some situations, were not considered to be present in sufficient quantities, or under the appropriate conditions to exert a significant risk. It is highlighted in the PHA that both H_2S and SO_2 are toxic gases that may cause fatality if at sufficiently high concentrations. At lower concentrations, each compound represents an injury and irritation risk.

Hydrogen sulphide (H_2S) events that were considered as part of the PHA include:

- catastrophic failure of a vessel containing H_2S. Such vessels include the sulphide precipitation vessel and hydrogen sulphide reactor associated with the Nickel/ cobalt processing facility;
- piping and vessel failures (other than catastrophic failure). A number of leak sizes were considered for major H_2S-containing pipes and vessels; and
- release from the site's flare system. This may occur if the hydrogen sulphide flare fails to operate and hydrogen sulphide is directed to atmosphere.

Modelling indicates that the greatest quantity of H_2S that could be released in the event of an emergency would come from the fracture of an 80 millimetre pipe with the Processing Facility operating at full capacity. As result of this scenario, the concentration of H_2S at the site boundary (worst case) would be no greater than 876 ppm. The PHA indicates at this concentration, a human experiences less than a 1% probability of fatality. Therefore, it is concluded in the PHA that a release of H_2S from the site poses, at worst, a minimal risk of fatality to surrounding land uses. Other boundary concentrations for events modelled are summarised in the table 7 below. All concentrations have been calculated under the "worst" meteorological conditions (ie calm and stable).

Table 7.

H_2S Release Scenario	Peak H_2S Concentration at Site Boundary (ppm)
Fracture of 80 mm pipe	876
Catastrophic failure of sulphide precipitation vessel	772
Catastrophic failure of hydrogen sulphide reactor	619
50 mm hole in vessel or pipe	364

Although H_2S does not pose a significant fatality risk, the predicted maximum concentration of 876 ppm at the site boundary exceeds those levels considered to cause injury (300 ppm) and irritation (150 ppm). The Applicant argues that the concentrations of H_2S required to bring about injury or irritation are based on extended exposure times (1 hour in the case of injury, and 3-4 hours for irritation). For all scenarios considered, the total available inventory of H_2S available on the site is low, given that there will be no storage of hydrogen sulphide. Further, in the event of an emergency, shutdown of the plant would be rapid, stopping production of H_2S that would contribute to the quantity of gas released. Therefore, the Applicant considers that the potential for exposure to H_2S for periods extending beyond a few minutes is extremely unlikely. In addition, given the rural, open nature of the locality, should a receptor be affected by a release of H_2S, there is no impediment to that person moving from the path of the release.

With regard to a release of H_2S from the flare (flare failure leading to no combustion), modelling presented in the PHA indicates that the ground-level concentration of H_2S resulting such a release fall s below the irritation level at no greater than 231 metres from the flare. This distance is well within the site boundaries. As such, an uncombusted H_2S release from the flare will not pose a fatality, injury or irritation risk at the site boundary (or beyond).

Sulphur dioxide (SO_2) events that were considered as part of the PHA include:

- catastrophic failure of a vessel or pipe containing SO_2; and
- piping and vessel failures (other than catastrophic failure). A number of leak sizes were considered for major SO_2-containing pipes and vessels.

Modelling indicates that the greatest quantity of SO_2 that could be released in the event of an emergency would come from the catastrophic failure of a process vessel containing SO_2. As result of this scenario, the concentration of SO_2 at the site boundary (worst case) would be no greater than 1010 ppm. The PHA indicates that this concentration poses a significant, 83% fatality risk. All other events modelled posed less than 1% fatality risk. Boundary concentrations for events modelled are summarised in the table 8. All concentrations have been calculated under the "worst" meteorological conditions (ie calm and stable).

Table 8.

SO_2 Release Scenario	**Peak SO_2 Concentration at Site Boundary (ppm)**
Catastrophic failure of vessel or pipe	1010
50 mm hole in vessel or pipe	25
25 mm hole in vessel or pipe	5

Although the consequence of a catastrophic failure of a vessel or pipe containing sulphur dioxide (83% fatality risk), the PHA indicates that the likelihood of such an event ever occurring is in the order of 1.0×10^{-4} per year. Taking the likelihood of the catastrophic failure into account, the frequency of conducive wind conditions (ie stable and calm) and the consequence of the event, the PHA concludes that the off-site risk posed is approximately 1.6×10^{-6} per year (1.6 per million per year). This figure is compared with the Department's recommended maximum risk levels for residential areas of 1.0×10^{-6} per year (noting the difference between "residential" and "rural" in the sense of the proposed locality). Given the conservative nature of the modelling undertaken, the PHA concludes that the proposed development will not pose any greater off-site fatality risk than the maximum recommended by the Department for normal residential areas. The Applicant further argues that given the rural nature of the locality (low population density) and that fatality risk is only posed by toxic gas releases, any affected receptor has the ability to move from the area of affectation.

The PHA conservatively assumes irritation and injury concentrations of SO_2 as being 4 ppm and 20 ppm respectively. Based on these figures, SO_2 poses an injury/ irritation to surrounding land uses. The PHA combines the irritation risks posed by SO_2 and H_2S to derive that the risk of irritation to a person located at the site boundary (worst case) is in the order of 30×10^{-6} per year. The Applicant argues that this figure compares favourably with the Department's recommended irritation criterion of 50×10^{-6} per year for a residential area. Further, the Applicant states that given the rural nature of the locality, the Department's criterion is conservative as rural receptors do not exhibit population densities as high as those in (urban) residential areas and rural receptors are less restricted in possible escape routes.

In a similar manner, injury risks have been combined for both H_2S and SO_2, with the conclusion presented in the PHA that a person located at the site boundary is exposed to a cumulative injury risk of 23×10^{-6} per year. This figure exceeds the Department's recommended injury risk criterion for residential areas of 10×10^{-6} per year. The Applicant highlights that, as with irritation risk, the Department's risk criterion is provided for (urban) residential development. The rural environment surrounding the development would not only provide for greater dispersion of gas releases, but is also indicative of a low human population.

8.1.4. Societal Risk

The PHA highlights that risk considerations presented in support of the proposed development are on an individual fatality/ injury/ irritation basis. This basis considers the risk posed to a "hypothetical individual" that may or may not be located at a particular point. In comparison, societal risk considers the actual population at a particular point

and represents the frequency of a multiple fatalities (or injuries/ irritations) at that point in reality.

In the case of the proposed development, the Applicant states that the largely rural nature of the locality means that the population density of the area, and therefore the potential for an actual person to be impacted by the development, is low. As such, the Applicant argues that there is no need for calculation of societal risk impacts from the development.

8.1.5. Transport Risk Impacts

The EIS lists a number of dangerous goods that are to be transported to and from the development by road and rail. The major dangerous good transported will be sulphur (Class 4.1 PGIII, flammable solid). Transport of Class C1/ C2 combustible liquids (diesel) and Class 8 corrosive substances (NaOH) will also be required. All other significant dangerous goods handled, consumed or stored at the development (for example SO_2, H_2S, H_2) will be generated on the site, with no requirement for transport.

Elemental sulphur is expected to be the major material transported to the development by rail. Once unloaded at the proposed rail siding, the sulphur will be transferred to trucks for movement to the nickel/ cobalt processing facility. As sulphur is a flammable solid, the PHA states that the only conceivable hazardous incidents involving this material would be fire (with the production of toxic SO_2 as a result of the fire). To minimise the potential for fires, the Applicant proposes to only receive sulphur in a prilled form, minimising the generation of ignitable dust from the bulk shipment. Further, water sprays at transfer points and avoidance of sparking, static or incompatible materials will mitigate against situations conducive to sulphur combustion. The Applicant considers the proposed measures are adequate to address hazards associated with sulphur transport.

Caustic soda (NaOH) may be transported by road or rail. The PHA considers the situation in which the caustic is transported by rail, as this transport route involves additional handling of the material (unloading trains, loading trucks etc), and therefore represents a greater potential for hazardous situations. The Applicant states that caustic will be transported in robust containers and handled by appropriate loading and unloading equipment, thereby minimising the risk of caustic leaks and spills. In a similar manner, mixed sulphide product from the nickel/ cobalt processing facility will be store and transported in bulka bags to minimise the possibility of the material drying out and spontaneously combusting.

Materials such as diesel, solvent extraction diluent, magnesium oxide and flocculant will be transported by road to the development on a regular basis. During start-up of the nickel/cobalt processing facility, sulphuric acid, nitrogen and oxygen will need to be trucked to the site. Limestone will be brought to the processing facility from the limestone mine by road. Magnesium oxide and limestone are classified as dangerous goods and therefore do not represent a fatality or injury/ irritation risk in the event of an incident. The Applicant indicates that all other materials to be transported by road will be carried in accordance with the *Australian Code for the Transport of Dangerous Goods by Road and Rail* by approved transport companies, contracted on consideration of the companies' safety management systems and emergency response plans.

8.2. Issues Raised in Submissions

There were no public submissions that raised specific concerns regarding hazardous incidents associated with the development. However, a number of submissions made comment that the impacts of gases such as sulphur dioxide and hydrogen sulphide on the health of humans, crops and livestock was of concern. Although the public was

specifically concerned about the long-term effects of these materials, the Department considers the acute effects of these materials was an implicit concern provided in the public submissions received.

Further concern was raised in public submissions about the ability of local emergency services and fire brigades to handle a major incident resulting from activities associated with the development (transport or operation). Concern was raised that in the event of a transport emergency, there is no requirement for an emergency response from the Applicant. In such a case, the local fire brigades would respond to the incident. The public raised the issue that the fire brigades do not currently have training or experience in addressing hazardous incidents that the proposed development may initiate.

Concern over the ability of the existing emergency service and fire brigade resources to cover incidents associated with the proposed development was mirrored by the Lachlan, Forbes and Parkes Shire Councils in their individual and joint submissions. A major concern for the councils in this regard was that the local emergency services are not HAZMAT (Hazardous Material) trained to respond to spills of materials transported to and from the development. In addition, the councils commented on the fact that both the local emergency services and the fire brigades were small in number with ageing equipment that may not be able to adequately address an emergency or fire resulting from the development. The councils also reiterated the public's concern over the health effects of compounds such as SO_2 and H_2S.

The Department received a submission from the State Emergency Services (SES) highlights the Services' concerns about the adequacy of the Trundle SES (closest to the proposed development) and Condobolin SES. The Trundle SES is currently equipped for a distinctly different risk than would be presented with the operation of the proposed development. That is, the current service is focussed on rural issues such as bushfires, low traffic volumes (and hence accident numbers) and natural disasters. There is no current capability to handle significantly higher numbers of traffic movements, spills of dangerous goods or major fire events. The SES indicated that improvements (in terms of quality and quantity) in equipment, personnel and communications would be needed to adequately address emergencies associated with the proposed development.

The Dams Safety Committee of NSW reviewed the subject development application and Environmental Impact Statement with regard to proposed dams. The Committee, in its submission to the Department, indicated that the tailings storage facility, evaporation ponds and evaporation surge dam would be "prescribed" dams and would be required to meet the standards set by the Committee in relation to design, construction, maintenance and decommissioning. The submission highlighted that the EIS provided insufficient information to determine the hazard rating of the dams in question, but the Committee would seek the necessary information after detailed design. Despite the lack of information in the EIS with regard to the dams, the Dams Safety Committee indicates that from a preliminary assessment, loss of human life from a dam failure is not an issue, although there could be significant impact on the surrounding environment in such an event.

The Department of Mineral Resources (DMR) did not raise any specific hazards or risk issues in its submission. It did, however, highlight the unique relationship between DUAP and DMR in the context of conditions of consent imposed for developments within a mining lease area. Under the *Mining Act 1992* a consent authority may not impose a "special purpose condition", which includes, *inter alia*, safety measures to be adopted, either before mining operations are commenced, while they are being carried on or after they have ceased. DMR also has jurisdiction over safety on the site under the Mines Inspection Act and Occupational Health and Safety Act.

The submission received from the Environment Protection Authority did not provide any General Terms of Approval specifically directed at risk and hazards issues. However, the EPA provided a General Term requiring the Applicant to provide impervious bunding around fuel, oil and chemical stores. While the Department considers that the intent of this General Term was to contain chemical spills that may impact on the surrounding environment, bunding would also minimise the spread of fires resulting from such spills.

8.3. Department's Position

The Department generally concurs with the findings presented in the Preliminary Hazard Analysis and the risk assessment methodologies employed. It is noted that the PHA has been prepared in accordance with the Department's guidelines *Hazardous Industry Planning Advisory Paper No. 6 - Guidelines for Hazard Analysis* and *Multi-Level Risk Assessment*.

8.3.1. Fires

Modelling results presented in the PHA for jet fires indicates that events involving hydrogen or hydrogen sulphide on the nickel/ cobalt processing facility site have a small area of affectation (maximum of 7 metres) with respect to the radiant heat criterion for human injury of 4.7 kWm^{-2}. Both gases are generated on the site, and the Applicant has indicated that neither gas will be stored in bulk. As such, one could expect that under stable conditions, the maximum discharge rate of H_2 or H_2S to feed a jet fire would be no greater than the rate of production of the subject gas. Further, once a jet fire had been detected (whether visually, or through a process pressure drop), employees at the nickel/ cobalt processing facility could take measures to isolate those areas of the plant contributing to the fire, or perform an emergency shut down of the gas production units. The likelihood of a jet fire lasting for any significant period is therefore very low. Despite this, the PHA presents the worse-case scenario in which gas supply to the jet fire is constant with respect to time, with no pressure reduction or supply isolation. The Department supports this approach as it illustrates the consequence of no mitigating action being taken (and therefore all other scenarios should, in reality, represent a reduced consequence). The primary concern in relation to H_2 or H_2S jet fires is the potential the jet (or radiation effects) to impinge on nearby pipework and vessels, initiating a knock-on situation that may escalate to produce greater consequences than the original fire. Although the Applicant has indicated that sufficient separation distances between plant equipment will be provided, the Department considers that this matter should be considered further during the detailed design of the development. As such, the recommended instrument of consent includes requirements for the preparation and submission of a Final Hazard Analysis (FHA) and Fire Safety Study (FSS). The FHA aims to update the PHA in the event that there is a significant change in the design of the development between determination and construction. The FHA would address any change in the handling of flammable gases, and provide a more accurate (as opposed to conservative) representation of the risk impacts of the development than the PHA. The Fire Safety Study is to be approved by both the Director-General and the Commissioner of the NSW Fire Brigades. The Study will demonstrate that the fire safety infrastructure and management practices on the site are adequate to deal with hazardous events, including jet fires. Further, the FSS will address the containment of contaminated fire-fighting water (refer to consideration of water quality impacts from the nickel/ cobalt processing facility). The Hazard and Operability Study required under the consent will address the issue of appropriately placed isolation points in the event of a jet fire.

The PHA suggests that jet fires involving natural gas will have a greater affectation area than either H_2 or H_2S. For the main gas supply to the site, a jet fire would extend some 21 metres, while supply lines on the site would extend 27 metres. At these distances, fires associated with the on-site supply lines would not impact surrounding land uses. With regard to the main gas supply line, the Applicant has highlighted the fact the pipe will, for the majority of its route, be laid underground and meet the requirements of Australian Standard AS 2885, Pipelines - Gas and Liquid Petroleum. A number of measures, including corrosion protection, materials consideration, flow monitoring and signage will be employed to prevent breach of the pipeline and to detect a breach should it occur. The Department supports these measures, in addition to the Applicant's efforts to avoid sensitive land uses (both ecological and human-settlement) in the selection of the natural gas supply pipeline route. The FSS and FHA required under the recommended instrument of consent will address jet fire issues associated with natural gas in a similar manner as for H_2 and H_2S.

The Department concurs with the Applicant's statement in the PHA that flash fires are generally of brief durations and serious injury is not likely unless the person is within or very close to the flame. The more serious effect of a flash fire is the resultant explosion overpressure. Flash fires differ from jet fires in that there is a delay period between pipe trauma (either a hole or full-bore rupture) and ignition of an accumulated gas cloud. The Department notes that for such a cloud to accumulate, the pipe trauma would need to go unnoticed for an extended period of time (the PHA assumes 10 minutes). Hydrogen, hydrogen sulphide and natural gas are all employed at the nickel/ cobalt processing facility for continuous combustion/ reaction. Should a significant leak of any of these gases occur, the Applicant argues that the facility controllers would indirectly notice the leak through a drop in, or loss of, combustion/ reaction. Therefore, 10 minutes of gas accumulation is stated in the PHA as being conservative. The Department supports this position. It is further noted that flash fires will not have a significant effect beyond the site boundary, in terms of fatality, injury or structural damage. The Fire Safety Study and Final Hazard Analysis, as required under the instrument of consent aim to identify areas of weakness in the development's defence against the causes and effects of flash fires. In this case, the Department considers that the FHA is the most important hazards study as it will confirm affectation areas (with regard to explosion overpressure) for flash fires, thereby indicating to the applicant whether designed separation distances between critical site equipment and isolation points are adequate. As flash fires are generally short-lived, the Fire Safety Study will ensure that events leading to gas leaks, and conducive to sparking are minimimal, thus reducing the potential for flash fires to be initiated.

With regard to the storage of dangerous goods on the development site, the Department notes and supports the Applicant's intention to store all materials in accordance with relevant Australian Standards. One of the Environment Protection Authority's General Terms of Approval requires that all hazardous materials stores associated with the development be the subject of impervious bunding to no less than 110% of the volume of the largest storage vessel (tank, vessel or package etc) within the bund. The Department supports this General Term and has incorporated it into the recommended instrument of consent. This approach to the storage of hazardous materials is considered best practice.

As considered in the land management section of this report (refer to Section 4.5), it is noted that the development site will be characterised by largely open, rural grazing style land uses. Having been closed off from regular grazing, these areas may become overgrown without appropriate management. This may lead to greater potential for the development to initiate a bushfire, or to be affected by one. As such, the Department has incorporated a condition of consent into the recommended instrument that necessitates the preparation and implementation of a Bushfire Management Plan.

With regard to fires generally, the inclusion of conditions in the recommended instrument relating to Emergency Plans and Safety Management System address overall site safety and procedures in the event of a hazardous incident/ emergency.

8.3.2. Explosions

The Department supports the Applicant's observation that vapour cloud explosions (VCE's) can be considered as flash fire events that have experienced a delay in ignition, and therefore accumulated a greater "fuel cloud". It is noted from the modelling presented in the PHA that significant heat radiation and explosion overpressure effects from VCE's are contained to the development site. The most important issue therefore is the potential effect of a VCE on site infrastructure. As highlighted for fire events, the Department considers that hazards studies (in particular the Final Hazard Analysis) will address this issue.

8.3.3.Toxic Gas Releases

The Department notes from the modelling results presented in the PHA, that the only conceivable hazardous event associated with the proposed development that has a significant off site impact is the catastrophic failure of an SO_2 pipe or vessel. Other events resulting in the release of the toxic gases SO_2 and H_2S contribute to the injury/ irritation risk at the boundary of the development site. The Department concurs with the hazard identification, modelling and conclusions presented in the Preliminary Hazard Analysis.

It is noted from the derived fatality risk for the development that the fatality risk at the site boundary (mine and processing facility component) is 1.6×10^{-6} per year. This risk is contributed solely from a catastrophic SO_2 pipe or vessel failure, with all other events failing to exert a comparatively significant fatality risk at the site boundary. It is noted that the Department recommends that cumulative fatality risk in a residential area not exceed 1.0×10^{-6} per year. However, the Department concurs with the Applicant's position that land uses surrounding the proposed development site are characterised as "rural" and therefore the 1.0×10^{-6} per year fatality risk criterion does not strictly apply. This criterion was development for urban residential areas in which there is a higher local population (and population density) than present in the vicinity of the proposed development. The likelihood of an individual being present at the site boundary (worst case, noting that fatality risk diminishes with distance from the boundary) is therefore very low. The Department therefore considers that the fatality risk posed by the development at its boundary is not prohibitively high. It is noted that the Preliminary Hazard Analysis established conservative assumptions to ensure that the modelled fatality risk posed by the proposal would not underestimate reality. The recommended instrument of consent requires the Applicant to prepare a Final Hazard Analysis once detailed design of the development has been completed. At that stage a more accurate, less conservative outcome will be possible. The Department expects (and requires) that the Final Hazard Analysis will demonstrate that the fatality risk from the development is less (and at least no worse) than that predicted by the Preliminary Hazard Analysis.

The Department notes that of the gases handled and/ or stored at the development, only H_2S and SO_2 have the characteristics, and are present in sufficient quantities, to exert a significant injury/ irritation risk at the development site boundary. The cumulative injury risk posed by the proposed development is 23×10^{-6} per year, which exceeds the Department's residential injury risk criterion of 10×10^{-6} per year. For similar reasons as discussed above, the Department supports the Applicant's position that the

recommended residential criterion is not strictly relevant to the subject development (ie the local rural, sparsely populated environment). Further, in comparison to urban residential areas, the rural setting adjacent to the development offers a greater number of escape routes in the event of a major gas release. It is noted that H_2S and SO_2 require extended periods (up to 3-4 hours) to cause injury from the concentrations predicted from the modelling presented in the PHA. The Department considers it unlikely that the H_2S or SO_2 could be released continuously from the development, causing an injury to off-site receptors for several without the incident being brought to the Applicant's attention. Further, it is highly unlikely that an individual would remain stationary for a number of hours while being injured by an SO_2 or H_2S gas release. Irritation risk posed by the development (30×10^{-6} per year) does not exceed the Department's recommended irritation criterion for residential areas of 50×10^{-6} per year. The Final Hazard Analysis required under the recommended instrument of consent will provide more accurate, less conservative predictions of individual injury and irritation risks. An Emergency Plan is also required, which will outline the Applicant's response to accidents, incidents and emergency associated with the development.

The Department considers that the most effective method of limiting the risk posed by H_2S and SO_2 production and handling on the site (other than to prohibit the location of these materials on the site) is to limit the maximum inventory of these gases present on the site at any time. As such, the recommended instrument of consent includes the restriction that SO_2 and H_2S must not be stored on the site, other in quantities required to maintain process continuity (in piping, surge vessels and balance tanks etc). This restriction will ensure that in the event of an emergency (in the worst case, releasing all SO_2 or H_2S on site), the total quantity of gas released, and therefore maximum concentration at the site boundary, will be minimised. The Department considers that this is an effective means of minimising the potential risk impacts of the development with respect to SO_2 and H_2S incidents.

The suite of hazards studies included in the recommended instrument of consent, including an Emergency Plan, Safety Management System, Hazard and Operability Study and Final Hazard Analysis, represent key components in the Department's risk mitigation and management strategy for the proposed development. Preparation and submission of these studies will assist in addressing hazards issues (as they stand at the detailed design stage of the development) prior to construction/ operation of the development.

8.3.4. Societal Risk

As noted above, the local setting for the proposed development is one characterised by open, largely-uninhabited rural land uses. As such, the Department supports the Applicant's decision not to generate societal risk data. This support is warranted, given that societal risk is a representation of the likelihood of a particular number of fatalities from a given development. Societal risk, as opposed to individual risk (the type of risk considered above), takes into account the actual population affected by the risk exerted by a particular development. As the actual population density in the vicinity of the proposal is very low, it is expected that societal risk would also be very low (ie a low likelihood of multiple fatalities).

8.3.5. Transport Risk Impacts

The Department recognises that the transport of elemental sulphur to the development site represents the most significant potential transport risk impact in relation to the proposal. Sulphur, in a powdered form ignites readily, forming sulphur dioxide as a

combustion product. Explosive mixtures of sulphur dust in air have been known to form as a result of agitation of sulphur powder in transit. However, from the information presented in the Environmental Impact Statement, the Department notes that the elemental sulphur is to be brought to the site in a prilled form. The Department considers that this measure will greatly reduce the potential for sulphur fires, due to the lack of fine sulphur dust that may ignite more readily than prills. Further, the Applicant intends to transport the sulphur in accordance with relevant standards and the Australian Dangerous Goods Code.

Other dangerous goods transport to the site (diesel, extraction solvent and NaOH being the major materials) is considered to pose a minor risk to land uses along the proposed haulage routes. Diesel and the extraction solvent are both combustible liquids (Class C1/C2), which as distinct from flammable liquids, have relatively high flash points (above 61^{o}C). These materials are recognised as being "less hazardous" than flammable liquid such as petrol, kerosene etc, and are not classified within the Dangerous Goods Code. The Department considers that these hydrocarbons, although posing a fire hazard under certain circumstances, do not pose a significant risk provided they are transported and handled in accordance with relevant standards. With regard to sodium hydroxide (NaOH), this material is a class 8 corrosive solution and does not by itself represent a fire or explosion hazard. It does however pose a contact risk (corrosive) to structures, a health impact risk and environmental impact risk in the event that a spill occurs in a built-up or environmentally sensitive area. As such, the Department fully supports the Applicant's intention to only contract transport companies on the

Consideration and control of the transport of dangerous goods to the development site is afforded by the Transport Safety Study required as a condition of consent. This Study must include protocols and procedures for the safe transport of dangerous goods, including selection of haulage routes to avoid sensitive receptors (both human and environmental).

With regard to the use of explosives at the development, the Department notes that the control of explosives (including storage, handling and use) on a mine site is the statutory responsibility of DMR (refer below). However, the Applicant suggests that the use of explosives may be required for excavation at the nickel/ cobalt processing facility, the water pipeline and the gas pipeline. To ensure that these potential activities are adequately controlled, without restricting the statutory role of DMR, the recommended instrument of consent limits the transport of explosives (as opposed to the storage or use). The Applicant must ensure that explosives are transported to the limestone quarry as their component parts (thereby removing the explosion hazard). If the Applicant intends to transport and use explosives at the nickel/ cobalt mine, nickel/ cobalt processing facility, water pipeline or natural gas pipeline, the instrument of consent requires that an additional risk assessment be undertaken, including consideration of transport risk impacts. It is noted that the use of explosives at these sites (all components of the development other than the limestone quarry) were not specifically considered as part of the Preliminary Hazard Analysis.

8.3.6. Interaction with the Emergency Services

The Department notes the community's and Council's concerns with regard to the local emergency services' ability to handle a major incident associated with the proposed development. In particular, it is noted in the submissions received from the Forbes, Lachlan and Parkes Councils that the Trundle and Condobolin SES are not equipped to deal with the HAZMAT (hazardous materials) risks posed by the development. This position is supported by submission made by the SES units in question.

As a condition of consent, the Applicant is required to have at least one emergency fire-fighting unit on the site. In addition, an Emergency Plan must be prepared and approved by the Director-General. The Department recognises that in the event of an emergency, the responsibility for leading a response lies, by law, with the emergency services. It is apparent that the Applicant will have knowledge and infrastructure to deal with an emergency associated with the development, but will not have the power to take response matters into its own hands in the event of an emergency. Therefore, the Department considers it imperative that there be an established cooperation agreement between the Applicant and the local emergency services teams. As such, the recommended instrument of consent has been drafted to include an Emergency Services Cooperation Agreement. The Agreement will specifically detail:

- communication arrangements between the Applicant and the emergency services both generally (for example information regarding the location of dangerous goods on the site) and during an emergency (ie relevant contact people and communication lines;
- arrangements for the supply of infrastructure, such pumps, hoses etc, from the development for use by the emergency services;
- arrangements for access to water stores at the development by the emergency services; and
- arrangements for the provision of suitably qualified employees of the development (whether for physical assistance, knowledge or experience) to assist the emergency services in the event of an emergency.

Further to this Agreement, the local councils may determine that some of the funds contributed to the Community Enhancement Plan (refer to Section 11 of this assessment report) should be used to augment the local emergency services.

8.3.7. Statutory Role of DMR

The Department notes from the submission received from the Department of Mineral Resources (DMR) that DMR has a statutory responsibility under the Mining Act in relation to mining safety. It is recognised that this responsibility is applicable to the subject mining operation and does not extend to off-site risk impacts from the nickel/ cobalt processing facility, for example. As such, the recommended conditions of consent have been carefully worded to ensure that there is no overlap between the roles of this Department and DMR, with respect to control of hazards and risk issues.

The Department considers that risk and hazards management is a significant issue associated with the proposed development, particularly the nickel/ cobalt processing facility. However, the Department is satisfied that the measures proposed by the Applicant, and the requirements of the recommended instrument of consent will adequately manage, monitor and mitigate the risk impacts posed by the development.

9. PIPELINES ASSESSMENT REPORT

It is to be noted that approval for the pipelines cannot be determined under the Environmental Planning and Assessment Act (EP&A Act) by virtue of provisions of the Pipelines Act. The conditions therefore recommended in the assessment below will not be included in the recommended instrument of consent. However, an assessment of the pipelines can be undertaken under the EP&A Act for the purpose of granting a permit for the pipelines under the Pipelines Act by the Minister for Energy. The Minister for Energy is also required under the Pipelines Act to consult the Minister Urban Affairs and Planning regarding the permit, prior to any approval of the permit.

It is consequently recommended that on referral of the matter to the Minister for Urban Affairs and Planning, the Minister requests the Minister for Energy to incorporate the Department's recommended conditions for the pipelines in any approval that may be granted under the Pipelines Act. The Department's recommended conditions for the pipelines are contained at Appendix 3.

Key issues relating to the gas and water pipelines are:

- Flora and fauna impacts
- Impacts on Archaeological sites

9.1. Flora

- ***Applicants Position***

The EIS predicts that the construction of the natural gas and water supply pipelines would require the removal/modification of vegetation. The northern part of the natural gas pipeline would be located on private property, which has been cleared for agricultural activities. The remainder of the natural gas and water supply pipelines would be situated within predominantly cleared existing road corridors, where some clearance of remnant vegetation may be required.

The EIS predicts that the land disturbance activities associated with the construction of the pipelines has the potential to act as a catalyst for weed invasion.

The EIS reports that while no threatened species listed in the *Threatened Species Conservation Act 1995* were identified by the Applicants consultants, Bower and Kenna (2000) during the surveys of the natural gas pipeline, water supply pipeline and borefields, the Austral Pillwort (*P. novae-hollandiae*) has previously been recorded in the vicinity of Site 23 on the natural gas pipeline. Although not threatened under the Threatened Species Conservation Act 1995, the Club-leaved Phebalium (*P. obcordatum*) recorded at Site 39a on the water supply pipeline route is considered to be rare by *Briggs and Leigh (1996) Rare or Threatened Australian Plants.*

In addition, the Applicants consultants considered two areas to contain areas of significant roadside vegetation. These were:

- The West Wyalong to Condobolin Road which retains a significant sample of the Central Lachlan Valley flora particularly the Myall *(Acacia pendula*) alliance, and

- The Ootha to Fifield Road in the vicinity of Sites 9 to 11a which support well developed box-pine woodland containing good species diversity with relatively few weeds.

The Applicant acknowledged that the significant flora described above could potentially be impacted by the clearance activities along the pipeline routes.

The Applicant proposes a number of measures to mitigate potential impacts on flora associated with the construction of the natural gas and water supply pipelines. These include:

- Minimising tree and shrub clearance. The Applicant proposes to replant two trees for every tree removed as a result of the pipeline development;
- Retention of mature remnant tress where feasible;
- Adoption of vegetation clearance protocols during construction, which would include progressive clearing where practicable, maximum harvesting of cleared timber resources, recycling or disposal of other non-harvestable parts, and delineation of "management zones" described below;
- Avoidance of the gilgai areas at Site 23 on the natural gas pipeline route when constructing the pipeline, to prevent potential damage to the local population of the threatened Austral Pillwort;
- Protection of the population of the Club-leaved Phebalium at Site 23a on the natural gas pipeline would be protected, if practicable, by minimising vegetation disturbance;
- Minimising impacts on the valuable Myall alliance community on the natural gas pipeline route and significant remnants of box-pine woodland from Sites 9 to 11a on the water supply pipeline route.

- ***Issues Raised in Submissions***

The NPWS recommended that consideration be given to re-routing the pipelines to avoid the vegetation communities located within the Travelling Stock reserve (TSR) on the West Wyalong-Condobolin Road and the Ootha –Fifield Road between sites 9 and 11a. The Service also recommended that the gilgai areas at Site 23 on the gas pipeline route be avoided, and the population of Club-leaved Phebalium should be protected from disturbance if possible during construction, as proposed by the Applicant.

The DLWC supported the concepts proposed by the Applicant to clear only when absolutely necessary and to replace on a 2 for 1 basis, any trees that must be cleared. The DLWC also stressed the importance of understorey and recommended that any replanting include endemic understorey species.

Two submissions were made during the exhibition of the EIS concerning impacts on remnant vegetation along the pipeline routes and disturbance of vegetation through road widening.

In commenting on draft conditions, the Derriwong/Ootha Landcare Group expressed concern that the construction of the pipeline will damage remnant native vegetation on the road corridor and requested the vegetation not be destroyed. One resident offered to provide a pipeline route across cleared parts of their property parallel to the road reserve, if necessary, to minimise disturbance of native vegetation

- ***The Departments Position***

The Department considers that the gas pipeline should be located to avoid areas where populations of the threatened species, the Austral Pillwort have been previously identified. The Department also supports proposals by the Applicant to prepare and implement vegetation clearance protocols, and to minimise impacts on native vegetation.

Conditions are recommended requiring the Applicant to prepare a Flora and Fauna Management Plan for the gas and water pipeline routes detailing proposals for avoidance of the recorded areas of Austral Pillwort, measures for the protection of important vegetation communities, detailing vegetation clearance protocols, and rehabilitation measures.

9.2. Fauna

- ***Applicants Position***

The EIS predicts that construction of the pipelines may necessitate the removal of some trees and middle to lower storey vegetation which has the potential to reduce habitat opportunities for fauna. The Applicants consultants, Mt King Ecological Surveys (2000) identified several areas along the natural gas and water supply pipeline routes to be of high habitat value.

The EIS predicts that the construction and maintenance of the pipelines could create "gaps" in the linear habitat (corridor) provided by the road reserve vegetation, of varying importance to fauna. The trench constructed for the pipeline has the potential to act as a "pit trap" for ground fauna moving across the pipeline routes. Dust and noise during construction of the pipeline has the potential to impact on fauna, but this impact has been assessed as temporary.

The Applicant completed Eight Part Tests of Significance for 21 threatened species known to occur or considered to possibly occur in the Project area. Based on the information presented in the Eight Part Tests and the mitigation measures proposed for flora and fauna, the EIS determined that no threatened fauna species would be significantly affected by the construction of the pipelines to the extent of undermining the viability of a local population of that species.

A number of measures were proposed in the EIS to mitigate impacts on fauna associated with the construction of the gas pipelines. These include:

- Positioning pipelines in cleared sections of road reserves;
- The pipeline corridors to be kept as narrow as possible;
- Avoidance of trees of high habitat value;
- Inspection of large trees for fauna prior to removal and relocation of any animals found to alternative suitable habitat;
- Care to be adopted in areas of high habitat value;
- Rehabilitation of disturbed areas with endemic species;
- Minimising exposure of trenches with ramps at ends to allow large fauna to escape
- Regular inspections; and
- Constructing temporary fencing along the exposed trench.

- ***Issues Raised in Submissions***

The NPWS supported the proposed mitigation measures for the pipelines. However, the NPWS recommended that consideration be given to avoiding the specific areas of vegetation identified as having a high habitat value by the Applicant's consultants.

No specific issues relating to fauna were raised in public submissions.

- ***The Departments Position***

Conditions are recommended requiring the Applicant to prepare a Flora and Fauna Management Plan. The Plan is to detail the measures proposed for the protection of fauna habitat identified during the surveys, and mitigation measures to minimise impacts on fauna communities.

The Department considers that measures proposed in the EIS and in the recommended conditions will minimise impacts on native fauna.

9.3. Aboriginal Archaeology

- ***Applicants Position***

An archaeological investigation of the borefields routes was undertaken by the Applicants consultants, Archaeological Surveys and Reports (2000), assisted by the Condobolin and the Wiradjura RALC. Thirteen sites were recorded within the area during the survey.

Two sites were recorded on the natural gas pipeline route, viz, an isolated artefact (Iso.F1) and a camp site on Humbug Creek (Humbug CS1). The EIS indicated that the isolated find is likely to be destroyed during the construction of the pipeline. The camp site is considered of high cultural significance and research potential. It is located within the pipeline corridor and could be potentially disturbed.

The investigations recorded no sites of archaeological significance were located within the water supply pipeline corridors.

The Applicant indicates that a written agreement should be obtained from the Condobolin LALC or the Wiradjura RALC of the destruction of the isolated find and an application for a Consent to destroy lodged with NPWS. The Applicant advises that the Humbug Creek site is largely avoidable by locating the natural gas pipeline in the area already disturbed between an existing bridge and side track.

Mitigation measures proposed by the Applicant include locating the pipeline within existing disturbed areas when crossing Humbug Creek, laying the pipeline within the existing "graded" profile of the road for at least 75m south to 50m north of the bridge, and erecting highly visible temporary flagging to delineate the working area.

9.4. European Heritage

- ***Applicants Position***

Assessment of European heritage sites was undertaken by heritage Management Consultants (2000).A pine log structure of local heritage significance and a series of telephone poles of local historical interest are located within the natural gas pipeline

corridor. The Applicant noted that these sites may potentially be disturbed during pipeline construction works.

The Applicant proposes to avoid and leave undisturbed the old telephone poles. The pipeline will be located no nearer than 15m from the pine log site, as there is evidence that artefacts may be spread around the site. If this is not possible, the immediate surrounds of the site would be fenced to protect the site.

- ***Issues Raised in Submissions***

The NPWS advised that the isolated find will require a Section 90 consent to destroy under the *National Parks and Wildlife Act 1974*. The NPWS supported the assessment of low significance of the isolated find and requested that a consent condition be included requiring either the Condobolin Local Aboriginal Land Council or the Wiridjura Branch of the NSW Aboriginal Land Council (whichever is the more local group at the time of application) be invited to collect the isolated artefacts prior to development commencing. The Service provided a number of specific conditions to protect all sites on the pipeline route, and to maintain a buffer around the Humbug Creek site. These conditions have been included in the recommended conditions of consent.

No specific issues relating to archaeological sites were raised in public submissions.

- ***The Departments Position***

The Department is in agreement with the Applicants proposals to protect the identified archaeological sites. Conditions are recommended requiring the Applicant to prepare an Archaeology and Cultural Management Plan for the pipeline routes detailing measures for the protection of archaeological sites incorporating the General Terms of Approval from the NPWS. These measures will ensure that impacts on archaeological sites can be adequately managed.

9.5. Surface Water and Groundwater

- ***The Applicants Position***

The EIS states that surface water runoff from disturbed areas associated with the construction of pipeline infrastructure could potentially contain sediments or traces of contaminants (eg diesel). In addition where pipelines cross watercourses, there is increased potential for erosion, sedimentation or contamination.

During the operational phase, potential surface water impacts include sedimentation or water quality impacts upon surface waters associated with rupture of water pipelines.

Mitigation measures proposed by the Applicant during construction include minimising areas of disturbance, installation of temporary sediment retention ponds and silt fences and progressive rehabilitation.

At major watercourse crossings, the EIS proposes that the natural gas pipeline would be bored under the stream channel and the water supply pipeline would be suspended above streams on elevated structures.

During operation, the water supply pump system would be fitted with an automatic, pressure sensitive shutdown system to rapidly cease pumping in the event of pipeline

rupture. Loss of contained water would therefore be generally limited to waters contained in the pipeline and upslope of the pipeline break.

The EIS predicts that in the event of a pipeline rupture, groundwater from the water supply pipeline would be unlikely to have a significant impact on surface water quality due to the low salinity, slight alkalinity, low metal concentration and moderately elevated nutrient levels of the groundwater.

- ***Issues Raised in Submissions***

The DLWC expressed concern that no details of the proposed self supporting structures proposed for stream crossings had been provided in the EIS. The Department advised that under the *Rivers and Foreshores Improvement Act*, a 3A Permit is required for any excavations in the bed or within 40 metres of the bank of a stream or lake or to do anything which may or will obstruct or detrimentally affect the flow of water. The DLWC included a condition in their GTAs requiring the Applicant to obtain a 3A Permit for the stream crossings.

Forbes Shire Council sought the inclusion of emergency management plans should a pipeline leak or rupture.

Three residents expressed concerns regarding the passing of the pipeline through their property and on travelling stock reserves and in particular, effects on fences, stock movements, and the activities of machinery around the pipelines.

One resident sought consideration of extending the gas pipeline to Condobolin.

- ***Department's Position***

The Department considers that the proposed measures for mitigating surface water will ensure that potential impacts can be adequately managed. Conditions are recommended requiring the Applicant to detail erosion controls, measures to separate clean and dirty water runoff, contingency plans for managing adverse impacts on surface water, and rehabilitation measures during construction as part of the Pipelines Environmental Management Plan. These measures will ensure that impacts on surface water quality will be minimised.

The Department considers that the pipelines will have negligible effect on groundwater resources.

9.6. Soil Quality and Erosion Potential

- ***Applicants Position***

The EIS indicates that there is a potential for erosion downslope of and in disturbance areas during the construction phase. Measures proposed by the Applicant to mitigate impacts are minimising the area disturbed, incorporation of temporary erosion control works and rehabilitation of disturbed areas as soon as practicable following completion of construction. These measures are proposed to be detailed in a pipelines construction environmental management plan.

- ***Issues Raised in Submissions***

The EPA and the DLWC require the Applicant to prepare an Integrated Sediment and Erosion Control Plan to detail measures proposed to prevent soil erosion and the entry of sediment to any river, lake, waterbody, wetland or the groundwater system. No specific matters relating to erosion controls during construction of the pipelines have been raised in public submissions.

- ***Departments Position***

Conditions are recommended requiring the Applicant to incorporate details of erosion control measures, including details of temporary systems to be used during construction, in the Pipelines Environmental Management Plan. The Department considers that these measures will ensure that impacts on soil resources are minimised.

9.7. Air quality

- ***Applicants Position***

The EIS indicates that no quantitative studies have been undertaken to assess existing air quality for the gas and water supply pipelines. It states, however, that ambient air quality, would be determined by local land management activities (eg., farming and road traffic). Particulate matter and dust would be expected to represent the majority of foreign material found in ambient air.

The EIS concludes that the construction and operation of the pipelines is not anticipated to introduce any major sources or air pollutants in the area although minor dust emissions from disturbance areas during construction may occur.

The EIS predicts that vehicle emissions are expected to occur for a short period of time during the construction phase but are unlikely to have a significant impact on air quality.

Measures proposed to minimise dust emissions include watering of disturbed areas and progressive rehabilitation. The Company also proposes the preparation of a Construction Environmental Management Plan (CEMP) detailing the proposed clearing, stripping, excavation, bedding, pipe laying, backfilling and rehabilitation activities to be undertaken during the construction phase.

- ***Issues Raised in Submissions***

Impacts on air quality from the pipelines have not been raised as an issue by Government agencies or the local community.

- ***The Departments Position***

The Department considers that there is potential for fugitive dust to be generated during the construction phase. Recommended conditions require the Applicant to detail proposed dust mitigation measures during construction as part of a Pipelines Environmental Management Plan.

9.8. Noise

- ***Applicants Position***

The EIS reports that no specific background noise assessment has been undertaken of the pipelines and predicts that existing background noise levels would not be expected to exceed those typically measured in most rural settings due to the remote and mostly rural location of the pipeline Project areas.

No specific noise mitigation measures are proposed and the EIS predicts that any increase in noise levels is unlikely to result in any significant impact.

- ***Issues Raised in Submissions***

Noise impacts from the pipelines have not been raised as an issue by Government agencies or the local community.

- ***Departments Position***

The Department considers that there is potential for some to be generated during the construction phase. Recommended conditions require the Applicant to detail proposed noise mitigation measures during construction as part of a pipelines Environmental Management Plan. In addition the plan requires the Applicant to detail construction hours, noise compliance standards, complaints handling and monitoring and noise mitigation measures.

9.9. Land Contamination

- ***Applicants Position***

The EIS reports that during construction, liquids such as diesel, paints and herbicides may be stored at pipeline sites and spillage could potentially result in localised impacts.

Mitigation measures proposed include removal of all wastes from construction areas to facilities authorised to accept such materials.

- ***Issues Raised in Submissions***

No specific issues relating to land contamination have been raised by Government agencies or in public submissions.

- ***Departments Position***

Recommended conditions address requirements for the control of hazardous materials and waste, assessment of risks, and the preparation of a waste management plan detailing measures to minimise the production of waste and to effectively reuse, recycle, treat and dispose of waste . The Department considers that these measures will ensure adequate management of wastes on the site.

9.10. Bushfire Hazard

- ***Applicants Position***

The EIS acknowledges that the pipeline infrastructure could be susceptible to bushfires. To minimise risk, the Applicant proposes to keep the pipeline infrastructure clear of vegetation.

- ***Issues Raised in Submissions***

No specific issues relating to bushfire risk have been raised by Government agencies or in public submissions.

- ***Departments Position***

The Department recommends the inclusion of conditions requiring the preparation of a bushfire management plan prepared in consultation with the Local Government agencies. The Department considers that bushfire risk will be minimise by the preparation and adoption of the bushfire management plan.

9.11. Transport

- ***Applicants Position***

The EIS reports that construction of the pipelines has the potential to disrupt traffic on these roads. In addition the natural gas pipeline crosses the Orange to Broken Hill Railway at the Condobolin to Tullamore Road rail crossing, while the water supply pipeline crosses the same railway to the west of Ootha. Construction of the pipelines has the potential to interrupt rail transport during this period.

The EIS proposes safety and control measures during construction in accordance with the requirements of relevant road and rail transport authorities.

- ***Issues Raised in Submissions***

The locally affected Councils raised concerns relating to possible damage to roads where pipelines were laid.

The Forbes Rural Lands Protection Board advised that the Applicant must apply for written consent from the Board for any pipeline laid on travelling stock reserves.

No specific issues relating to archaeological sites were raised in public submissions.

- ***The Departments Position***

Conditions have been recommended requiring the Applicant to seek agreements for easements in Council Road Reserves. In addition, the affected local Councils provided conditions in their general terms of approval that have been incorporated in the Department's recommended conditions. Further general discussion of this issue is contained in Section 6 of this assessment report.

10. RAIL LOADING FACILITY

The key issues relating to the rail loading facility are:

- Noise Impacts from rail and operation of the facility
- Traffic generation and impacts on local roads

10.1. Noise

- ***Applicants Position***

The EIS predicts that during the three month construction period of the rail loading facility, noise levels will be below a daytime construction noise criteria of 42 dB(A) (background plus 10 dB(A) at the nearest residences "Glen Rock" (750m to the southwest) and "Ballenrae" (1.5km to the east).

Rail traffic noise emissions have also been assessed at the nearest residences. Richard Heggie Associates (Appendix K EIS) calculated the 24 hour equivalent continuous noise level (L_{Aeq}) and the maximum passby level at these two residences with the additional train movements. The predicted levels are presented in Table 9.

Table 9 - Predicted noise levels due to rail transportation

Receiver	**Max train movements/day**	**Predicted Noise Level**		**EPA Criteria**	
		$L_{Aeq(24\ hour)}$	L_{Amax}	$L_{Aeq(24\ Hour)}$	L_{Amax}
"Glen Rock"	4	35 dB(A)	38 dB(A)	60 dB(A)	85 dB(A)
"Ballenrae"	4	33 dB(A)	14 dB(A)	60 dB(A)	85 dB(A)

The table shows that predicted noise levels are below the EPA criteria for $_{LAeq(24\ hour)}$ and maximum levels (L_{Amax}) at the two residences modelled.

No train noise assessment has been conducted at "Spring Park" ,1.5km to the north of the rail loading facility.

The EIS does not address noise impacts from the general operation of the rail loading facility.

- ***Issues Raised in Submissions***

Parkes Shire Council sought adequate controls and safeguards to be incorporated in consent conditions to manage the operations to ensure no adverse noise impacts at nearest residences. No specific noise issues relating to the operation of the rail loading facility have been raised in submissions from the general public.

- ***The Departments Position***

The Department is in agreement with the noise predictions at the nearest residences from the movement of trains.

However, the Department considers that noise at nearest residences has not been adequately addressed for the operational phase of the rail loading facility. Noise will be generated by trains idling at the siding during loading/unloading activities, from the operation of forklifts loading/unloading trains and trucks, and the movement of trucks into, out of, and moving around the rail loading site.

Conditions are proposed limiting noise impacts from the operational phase of the loading facility to 37 dB(A), ie, background plus 5 dB(A) at the three nearest residences ("Ballenrae", "Glen Rock" and "Spring Park".) Conditions are also recommended requiring construction of the facility to be undertaken during daylight hours.

10.2. Air Quality

- ***Applicants Position***

The construction of the rail load facility will involve the construction of a rail spur line, installation of appropriate switching and rail signals, construction of loading and unloading facilities, hardstands, access road upgrade, rail crossing upgrade and administration facilities. The EIS states that the construction and commissioning of the rail siding would take approximately 3 months.

The EIS states that all raw materials delivered to the rail siding will be in either sealed purpose-built tipping containers (prilled elemental sulphur) or sealed conventional side opening, lockable containers (other raw materials). These will be unloaded by forklift and stored on a hardstand area prior to loading and delivery to the MPF site.

No assessment of dust has been provided in the EIS for the construction phase of the development. For the operational phase, the EIS states that the rail loading facility is not considered to be dust generating activities as the majority of vehicle movements will be on sealed road surfaces.

- ***Issues Raised in Submissions***

Parkes Shire Council sought adequate controls and safeguards to be incorporated in consent conditions to manage the operations to ensure no adverse impacts from dust on nearby residences. No specific issues regarding dust have been raised by Government agencies or in submissions from the general public.

- ***The Departments Position***

The Department considers that a level of fugitive dust will be generated during the construction phase of the rail loading facility. Conditions are recommended requiring the preparation of a dust management plan to address matters to be employed to minimise dust during the construction phase. Conditions are also recommended to ensure that trafficked and storage areas used during operation of the facility are adequately sealed to minimise soil loss and the generation of dust.

10.3. Transport

10.3.1. Rail

- ***Applicants Position***

The EIS states that approximately six rail movements on the Tottenham to Bogan Gate Railway would be required each week for the transport of sulphur, other consumables and cobalt and nickel products. Usually there would be no more than two rail movements per day – one each way. The rail loading facility will operate 24 hours per day, seven days a week.

Each train is proposed to have 44 wagons, 39 of these will each carry two purpose special 6m long tipping containers for prilled sulphur. The other five will carry conventional containers in which miscellaneous materials will be transported. The containers will have 24 tonne capacities so each train will carry about 1872 tonnes of sulphur.

Caustic sulphur will be transported in containers, by rail or road, although for the purposes of investigations in the EIS, rail was assumed. The containers will offloaded by forklifts and trucked to the mine in the same way as sulphur. Transport of the annual load of 10,000 tonnes of caustic sulphur will require on average about one delivery every two days. Miscellaneous bulk materials will also be transported by containers, requiring on average, two deliveries per day.

Approximately 25,000 tpa of nickel and cobalt (or 42,000 tpa of nickel cobalt sulphide precipitate) will be backloaded in containers bringing sulphur to the mine.

The EIS concludes that there is adequate capacity on the railway lines serving the area to accommodate the rail traffic that will be generated by the mine. The EIS acknowledges that the increased road traffic accessing the rail siding via the existing level crossing adjacent to the site has the potential to interrupt rail traffic. No specific mitigation measures have been proposed in relation to the movement of trains.

- ***Issues Raised in Submissions***

No specific issues relating to the movement of trains to and from the site has been raised by Government agencies or the public.

- ***The Departments Position***

The Department considers that the proposed rail movements are unlikely to be a significant inconvenience to other rail traffic on the rail lines to be used. Conditions have been recommended limiting train movements to those nominated in the EIS.

10.4. Roads

- ***Applicants position***

Containers will be offloaded from the train by forklift and placed in a temporary storage area. From this they will be loaded progressively onto a shuttle fleet of road train truck rigs each of which will transport two containers to the mine site. A fleet of five truck rigs is proposed including one B-double combination and four road train combinations. These will also carry limestone to the mine. Transport of the total annual load of 210,000 tonnes of sulphur from Newcastle will require on average about 12 deliveries per day to the mine site. However, on some days the truck fleet will carry only sulphur and on other days only limestone, so the actual numbers will vary considerably from day to day.

Material from the rail loading facility to the MPF will be transported along the Fifield to Trundle Road (MR24), Fifield Bypass, and the Fifield to Wilmatha Road to the MPF. The EIS predicts that during the operational phase that at the Fifield Bypass there will be an increase of approximately 449 vehicles comprising approximately 196 trucks and 253 light vehicles. These movements include employee and general transport movements and road haulage of consumables and products.

The EIS predicts that during the peak of construction at the rail siding, about 50 vehicle movements per day along the materials transport route will be generated over three months. It is noted that the period of construction of facilities at the limestone quarry will also be three months and generate a similar level of traffic, but that these periods will not overlap.

A number of road upgrading measures are proposed in the EIS to mitigate impacts on the road system, including upgrading of the adjoining rail crossing. The intersection of the rail siding access road and the Tullamore to Bogan Gate Road would be constructed to AUSTROADS guidelines. The road would be constructed to 8.5m sealed pavement and would cross the rail line to the north of the rail siding and then run down the eastern side of the siding complex to the haul truck entry point.

The EIS predicts that subject to the improvements and management measures proposed in the EIS, the materials transport route would be able to satisfactorily accommodate the increase in traffic associated with the construction and operation phase of the mine.

- ***Issues Raised in Submissions***

A number of local Councils and members of the general public raised issues relating to the impact of truck traffic on local roads.

- ***The Departments Position***

The Department concurs with the findings of the traffic studies presented in the EIS. Conditions are recommended requiring the Applicant to prepare a traffic management plan for all traffic associated with the proposed mine. Conditions raised by the local Councils have also been incorporated in the consent conditions.

10.5. Hazards/Risk

- ***Applicants Position***

The EIS identifies the primary land contamination risks as spills of diesel or oil storage areas and off-site spills of diesel as a result of vehicle accidents. Bunding measures are proposed to control diesel spills.

Rail transport hazards have been identified as loss of containment of sulphur or other consumables, dust explosion or fire related to sulphur transport, and road transport hazards relating to loss of containment of liquid or solid materials, or fires relating to flammable liquid transport. Mitigation measures proposed include the design of the sulphur containers, shipping the sulphur in prill form to minimise dust, and minimising rehandling of container goods.

It is noted that the EIS proposes that sulphuric acid, rather than sulphur, would be transported from Newcastle by truck during the start-up phase.

- ***Issues raised in Submissions***

No specific issues relating to risks at the rail loading facility have been raised in submissions.

- ***The Departments Position***

The Department considers that the mitigation measures proposed are in accordance with best practice and designed to minimise risk. However, conditions are recommended addressing risk issues.

10.6. Surface water

- ***Applicants Position***

The construction and operation of the rail loading facility has the potential to contribute uncontrolled sediment-laden runoff to downstream surface waters. In addition to the transport of sediment, other potential pollutants are reagents and product from spillages, fuel, oil and lubricants. The EIS indicates that all potentially contaminated water generated within construction and operational areas would be controlled via drainage channels and dams, while uncontaminated water would be diverted around these areas. The EIS details the range of water management strategies that will be employed to control runoff from the site. In addition, the Company proposes to prepare an Integrated Erosion and Sediment Control Plan (IESCP) in conjunction with relevant Government agencies prior to the commencement of construction activities. The IESCP will detail specific mitigation measures to control soil erosion and sediment migration and therefore protect downstream surface water resources.

- ***Issues Raised in Submissions***

No specific issues relating to water management at the rail loading site have been raised by Government agencies.

Parkes Shire Council sought adequate controls and safeguards to be incorporated in consent conditions to manage the operations to ensure no adverse impacts on water quality in the receiving environment.

- ***The Departments Position***

The Department considers that with the incorporation of the water management controls proposed in the EIS, impacts on surface water and soil erosion can be adequately managed. Conditions are recommended requiring the preparation of a Water Management Plan to address mitigation, management, assessment and monitoring of water quality during the construction and operation phase of the rail loading facility. A condition requiring the preparation of the IESCP as proposed in the EIS is also recommended.

10.7. Groundwater

- ***Applicants Position***

The EIS states that the activities proposed at the rail siding and materials transport route are not predicted to create any impact on groundwater resources in the area. All activities are conducted at ground level and are similar to normal rail and road activities.

- ***Issues Raised in Submissions***

No specific issues relating to groundwater at the proposed siding have been raised in submissions.

- ***The Departments Position***

The Department considers that, based on the information presented in the EIS, the proposed activities at the siding will not impact on groundwater resources and no specific conditions relating to groundwater at the siding are proposed.

10.8. Land Management

10.8.1. Topography and Landscape Features

- ***Applicants Position***

The EIS states that the rail siding would require minimal alteration of the existing topography, due to the absence of any significant cut and fill and no specific mitigation measures are proposed to minimise impacts on the landscape.

- ***Issues Raised in Submissions***

No specific issues relating to topography and landscape alteration at the proposed siding have been raised in submissions.

- ***The Departments Position***

The Department considers that, based on the information presented in the EIS, proposed activities at the siding will not significantly impact on the topography of the rail siding and no specific conditions are proposed.

10.8.2. Soils and Erosion Potential

- ***Applicants Position***

The EIS recognises that the rail loading facility has the potential to alter soil structure beneath hardstand areas and roads, to lead to increased erosion and sediment movement during construction, and alteration of physical and chemical soil properties during stripping and stockpiling operations. The EIS indicated that the proposed IESCP will provide details of measures for the control of soil erosion and sediment generation from areas disturbed during construction activities, and measures to maintain water quality in local watercourses. A range of established measures to control soil erosion and to manage soil resources during construction and operation are proposed in the EIS.

- ***Issued Raised in Submissions***

No specific issues relating to topography and landscape alteration at the proposed siding have been raised in submissions.

- ***The Departments Position***

The Department considers that the proposed measures outlined in the EIS and proposed in the IESCP will ensure that soil quality will be maintained and soil erosion minimised. Conditions are recommended requiring the preparation of the Integrated Erosion and Sediment Control Plan (IESCP) detailing measures for the control of soil erosion during construction of the rail loading facility . It is also recommended that trafficked and storage areas are adequately sealed to minimise soil loss and the generation of dust. Compliance with this condition will ensure that potential impacts on soil resources and erosion will be minimised.

10.8.3. Land Use

- ***Applicants Position***

The EIS identified that the predominant land use in the vicinity of the rail loading facility is agricultural production. The agricultural suitability of land is classified as Class 3 and/or Class 4, although no specific map showing the distribution of soil types is presented.

The EIS states that the construction of the rail siding would also result in a minor loss of agricultural land. The EIS also states that the rehabilitation and decommissioning of the infrastructure would be determined in accordance with the requirements of the relevant government agencies and as determined by future land and facility use. This strategy would determine if the loss of agricultural land would be permanent (ie if the siding is retained) or temporary (ie infrastructure is decommissioned and the site revegetated).

- ***Issues Raised in Submissions***

No specific issues relating to land use at the facility has been raised in submissions by Government agencies or the public.

- ***The Departments Position***

The rail loading facility occupies a total area of 4.2 hectares. Consequently, the Department is of the view that this loss of agricultural land overall, whether temporary or permanent will result in minimal impacts on agricultural land availability. Proposed rehabilitation measures will ensure that the land is returned to a productive use.

10.8.4. Land Contamination Status

- ***Applicants Position***

The primary land contamination risks at the rail siding have been identified in the EIS as spills of diesel, reagents and products. The EIS notes however, that these materials would be packaged in covered rail/road containers and that, long-term storage of containers at the rail siding is not proposed. The EIS considers that the water management system for the siding hardstand areas would provide for the containment of runoff from these areas.

- ***Issues raised in Submissions***

No specific issues relating to land contamination at the facility has been raised in submissions by Government agencies or the public.

- ***The Departments Position***

The Department is of the view that the proposed water and land management measures will minimise the potential for land contamination. Recommended conditions for the sealing of trafficked and storage areas for the control of dust will also minimise the potential for land contamination.

10.8.5. Bushfire Hazard

- ***Applicants Position***

Areas around the rail loading facility are predominantly cleared grazing land assessed in the EIS as having a low to moderate bushfire potential. A number of management strategies are proposed in the EIS to increase the awareness of fire risk. It is also indicated that bushfire management will be addressed in the EMP.

- ***Issues Raised in Submissions***

No specific issues regarding bushfire hazard have been raised by Government agencies or the general public.

- ***The Departments Position***

Conditions regarding bushfire management and fire control are recommended in the consent conditions.

10.9. Flora and Fauna

10.9.1. Flora

- ***Applicants Position***

A flora survey of the site was undertaken by Bower and Kenna (2000) and the findings summarised in the EIS. The survey noted that the site was characterised by native grassland vegetation with a wide diversity of native grasses and herbs. The adjoining roadside trees and few remaining paddock trees suggest that prior to European disturbance, the area was predominantly a grassy, open Poplar Box (*E. populnea*) woodland.

The EIS has assessed that all proposed disturbance areas had limited value for flora conservation. Vegetation clearing would mostly be restricted to areas of open farm land with predominantly native grasses and scattered trees.

No plant species listed as threatened under the NSW *Threatened Species Conservation Act 1995*, or the Commonwealth *Protection of the Environment Biodiversity Conservation Act, 1999* were found within the quarry site. In addition, no plant species listed in *Rare or Threatened Australian Plants* (ROTAP) were recorded in this area.

Mitigation measures proposed in the EIS to minimise impacts on flora include the development of a vegetation clearing protocol during construction, detailing clearing, harvesting and recycling procedures; the development of a weed control programme, and progressive rehabilitation using endemic woodland and grass species.

- ***Issues Raised in Submissions***

No specific issues regarding native flora have been raised by Government agencies or the general public.

- ***The Departments Position***

The Department is of the view that the proposed development will have minimal impact on native vegetation occurring on the site. Conditions have been included requiring the Applicant to prepare a Flora and Fauna Management Plan detailing measures for the protection of remnant flora on the site.

10.9.2. Fauna

- ***Applicants Position***

A detailed assessment of fauna occurring on the site of rail siding was undertaken by Mount King Ecological Surveys (2000) and the results of the survey presented in the EIS. Survey techniques used included Elliot trapping, pit traps, hair tubes, spotlighting for noctural fauna, herpetofauna (reptiles and amphibians) searches, nocturnal bird call playback and general observations. A survey of bat fauna was undertaken by Greg Richards and Associates (2000). All results from the detailed surveys presented in Appendix J are summarised in the EIS.

The survey recorded the Common Dunnart and the Eastern Grey Kangaroo as the only mammals occurring on the site out of a total of seven mammals recorded overall on all project site areas. The rail loading site was assessed as having low quality bat habitat.

Measures proposed to minimise impacts of fauna include pre-clearance surveys to identify fauna habitats, relocation of fauna, maintenance of a rubbish-free environment, employee education programs, and feral animal control programs.

Six threatened species were recorded during the fauna surveys of the Project area, of which one; the Little Pied Bat (Chalinolobus picatus); was identified in the Fifield to Trundle Road corridor near the eastern boundary of the limestone quarry MLA area. No threatened species were identified on the site of the rail loading facility. An eight part test for the Little Pied Bat was included in the EIS which concluded that the roads works required to upgrade the materials transport route would not involve removal of significant areas of known habitat for the Little Pied Bat.

- ***Issues Raised in Submissions***

No specific issues regarding fauna or fauna habitat have been raised by Government agencies or the general public.

- ***The Departments Position***

The Department is of the view that the proposed development will have minimal impact on fauna or fauna habitat occurring on the site. The eight part-test of fauna species has demonstrated that a SIS is not required.

Conditions have been included requiring the Applicant to prepare a Flora and Fauna Management Plan detailing measures for the protection of remnant fauna habitat.

10.10 Heritage

- ***Applicants Position***

The EIS reports that no Aboriginal sites were identified in the NSW NPWS Aboriginal Sites Register or during surveys conducted by Aboriginal Surveys and Reports (2000). The EIS noted that, while there was some potential for individual artefacts to be buried in the topsoil, the highly disturbed nature of the majority of the proposed operational areas, made this highly unlikely. The EIS proposes that if stone artefacts or discrete distributions of shell are found during site works, then operations will cease and the Local Aboriginal Land Council and representatives of the NPWS would be informed. No work would recommence in the immediate area until the find had been inspected and permission given for work to proceed. A “Consent to destroy” would be sought from the NPWS should it become necessary to disturb or destroy any archaeological site during the development.

No sites of European heritage significance were identified during a site survey. The Parkes LEP does not list any sites of European heritage significance on the rail loading site.

- ***Issues Raised in Submissions***

No specific issues regarding heritage matters have been raised by Government agencies or the general public.

- ***The Departments Position***

The Department is of the view that the proposed development will have minimal impact on fauna or Archaeological sites or heritage items occurring on the site.

Conditions are recommended requiring the Applicant to prepare a Archaeology and Cultural Management Plan for the site detailing measures proposed for the protection of archaeological sites that may be found during site construction works.

10.11. Waste

- ***Applicants Position***

No specific comments are made in the EIS regarding the disposal of non-hazardous refuse generated by the operation of the facility.

- ***Issued Raised in Submissions***

The EPA has included conditions relating to waste management on site and these requirements have been included in the consent conditions.

No specific issues have been raised by the general public regarding waste disposal or management.

- ***The Departments Position***

Conditions are proposed in relation to the management of refuse generated on the site. It is recommended that these wastes be stored in marked containers on-site and periodically removed to a municipal tip by a licensed contractor.

10.12.Socio-Economic

The EIS indicates that during the three month quarry construction period, approximately 15 personnel will be employed. During operation, the EIS predicts that approximately 4 people will be required. Further general discussion is contained in Section 11 of the assessment report.

10.13. Visual

- ***Applicants Position***

The EIS states that the rail siding is located between a band of remnant vegetation to the east and the Tullamore to Bogan Gate Road and the Tottenham to Bogan Gate Railway to the west. The site has limited relief and views are available from the Tullamore to Bogan Gate Road, the Tottenham to Bogan Gate Railway and the "Glen Rock" residence.

The EIS predicts that permanent landscape impacts associated with the rail loading facility will be the construction of the rail spur line, administration building, siding and associated hardstand area. The EIS has assessed that these permanent landform changes would be minor.

The EIS notes that views of the proposed rail siding would be possible from the intersection of the Fifield to Trundle Road and the Tullamore to Bogan Gate Road and also along the northern and southern approaches to the siding along the Tullamore to Bogan Gate Road. Views of the siding would be obscured in part by vegetation on land adjacent to the site, however, views of the siding would be available at close proximity as there is limited screening vegetation between the road, rail line and proposed siding.

The EIS notes that views from the "Glen Rock" residence (750m southwest of the siding) towards the proposed rail siding would be possible, however, the level of visual impact would be minimal due to the proposed lowset rail siding infrastructure.

The EIS states that lighting required for the proposed facility would include focussed spotlights and shielded lighting to reduce the potential for light spillage off-site.

Mitigation measures proposed include the provision of vegetation screens at either end of the site to reduce the extent of views from the Tullamore to Bogan Gate Road.

No assessment of views has been provided from the two other residences; Ballenrae" (1.5km to the east) or Spring Park" (1.5km to the north).

- ***Issues Raised in Submissions***

No specific issues have been raised by Government agencies or the general public regarding visual impacts.

- ***The Departments Position***

The Department considers that the facility will provide medium to long-term views for local residences and motorists on nearby roads until screen plantings reach an acceptable level of maturity to screen the site. It is also considered that supplementary screen planting along the road verges west of the line and along the boundary to the east, adjoining the public road, will provide additional visual screening to the facilities and soften night lighting.

Conditions have been incorporated in conditions requiring the preparation of a Landscape Plan for the facility detailing areas, species and density of proposed plantings and for minimising the impacts of night lighting on nearby residents and road users.

11. Community Enhancement Interests

- ***Applicants position***

The EIS identified the potential social and economic implications for the LGA's covered by the Parkes, Lachlan Shire and Forbes Councils, and gave a qualified analysis of the relative influences on each.

In summary, the EIS concluded that there would be minimal adverse impact on the health and educational facilities during the operations phase, although there may be increased demands for health services during the construction phase.

The EIS reviewed the influence that the projected population changes would have on the house and land availability, and indicated that Condobolin's stock may be inadequate. It also recognised that the infrastructure of the Trundle Tullamore and Fifield villages was inadequate to cope with residential expansion without augmentation.

- ***Departmental Consultations with Councils and Applicant***

Early representations from the Councils to the Department established that the socio-economic issues were of concern to each, and particularly the Lachlan Shire and Parkes Councils.

As a result, the Department circulated a short position paper to each Council that outlined the types of issues it felt warranted consideration (eg health, education, transport matters.). From this, the three Councils collaborated on the preparation of a collective submission on the EIS. Both are attached at Appendix 4.

The Department analysed the submissions and organised a meeting between the proponent and the Councils for early February 2001 to negotiate a suitable response. This identified four key issues:

(a) None of the three Councils has a s.94 Plan in place that prescribes an obligation by the proponent to contribute financially for social enhancement of the region.

(b) There would most likely be a change in the road transport patterns in the area of the mine, and between Parkes and Condobolin in particular. Funding was sought to mitigate the impacts of this.

(c) The influx of new workers to the mine could stress the housing markets in the region.

(d) A case was made for supplementing the drinking water supplies to the villages of Tullamore, Fifield and Trundle in the vicinity of the mine, which currently lack reticulated water.

- ***Department position***

The Department accepted the argument presented by the Councils that the development of the mine could generate both short and long term social and economic changes in the region, and these would be both positive and negative. DUAP argued however, that any obligation placed upon the company to compensate the regional community for these changes should be based on a clear demonstration of a nexus between the impacts and the operations of the mine. It emphasised that this position did not preclude the company from entering into further voluntary agreements with any of the Councils for the funding of additional activities of interest to it.

In view of the fact that there were no s.94 Plans available, DUAP emphasised to each Council that any financial support stipulated by the Conditions of Consent would be by negotiation with the company. DUAP did however, advise the Lachlan Shire Council that it rejected its position arguing for substantial financial support for housing developments in Condobolin. This was seen to be an issue that would be addressed by the property market were accommodation pressures to arise. The Council accepted this argument at its full meeting on 12.March 2001.

DUAP negotiated the submission presented by the Councils with the proponent. The outcome was an offer by the proponent to contribute an indexed minimum of $300,000 per annum for 15 years from the commencement of construction. Condition 12 makes this offer mandatory, and describes the approach that is to be followed to ensure that it is implemented equitably across the three LGA's, taking into account the nexus with the mine impacts. Each Council was consulted on the development of the Condition and agreed to participate in the drawing up of a Community Enhancement Plan that is to be submitted to the Director-General for approval and which will describe how the funds are to be deployed. The Plan is to be reviewed every three years in consultation with the Councils.

DUAP accepted that both the construction and operations phases of the mine would have implications for road maintenance. Where the Councils identified impacts governed by s.138 of the Roads Act, these were generally incorporated as General Terms of Approval. Additional concerns not covered by this provision are also addressed in the Conditions, but the obligation imposed on the mine is to monitor road usage in accordance with a Road Maintenance Agreement to be developed between the Applicant and the three Councils.

DUAP did not form an opinion on the merits of the argument that reticulated water should be provided by the proponent to the three villages near the mine. Instead it concluded that this project should be addressed within the context of the Community Enhancement Plan.

DUAP considers that the approach to community enhancement negotiated with the proponent provides for a reasonable investment in the region over the period in which the impacts of the mine will most likely occur.

It also considers that the negotiations over the Conditions implementing the requirement with both the company and the relevant local councils were comprehensive. It notes that the approach described in the Conditions is supported by each of these Councils.

Site security and crime management

One socio-economic impact that was not specifically addressed in the Environmental Impact Statement was the generation of opportunities for and locations conducive to crime. It is noted that in terms of public safety, the Applicant proposes to fully fence the development and provide secured access points to the development. While these measures may be adequate to prevent unauthorised access to the site, the Department suggests that further consideration of crime impacts should be provided by the Applicant.

It is noted that a guideline entitled *Crime Prevention and the Assessment of Development Applications* was recently released by the Department and the NSW Police Service. The guideline recommends that a consent authority considers the potential for a development to create opportunities for crime when assessing development applications. In particular, it recommends that consideration be given to such factors as lighting, site security and how the transition between public space and the development is treated.

The Department considers that given the scale of the proposed development and the projected increase in population in the area in response to the employment requirements of the development, consideration of crime impacts is warranted. As such, the recommended instrument of consent includes a Site Security and Crime Management Plan, to be prepared and implemented by the Applicant. The Plan aims to include consideration of crime issues in the detailed design of the development. In particular, the Applicant is required to consider fencing requirements of the development, appropriate boundary lighting and other design features (such as manned security gates at entrances). In the event that crime or inappropriate activities do occur at the development or its boundary, such as vandalism, dumping of waste or bill-posting, the Plan includes a requirement for protocols and procedures to be in place to ameliorate and/ or remove the result of such activities. These measures are documented and recommended in the *Crime Prevention and the Assessment of t Development Applications* guideline. The Department is satisfied that the Site Security and Crime Management Plan is an effective means to address the issue of potential crime generation as a result of the proposed development.

12. ECOLOGICALLY SUSTAINABLE DEVELOPMENT (ESD)

The requirements of ESD are specifically addressed in Section 5 of the Introduction to the EIS for the proposal, with specific reference to the National Strategy for ESD, and Schedule 2 of the EP&A Regulation 1994. The EIS states that the principles of ESD have been applied to all aspects of the project and have been incorporated in the overall development description.

Schedule 2 of the EP&A Regulation 1994 states that an EIS must include reasons justifying the carrying out of development in the manner proposed having regard to amongst other things, the principles of ESD. For the purposes of Schedule 2 the 'principles of ESD are:

(a) The precautionary principle - namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

(b) Inter-generational equity - namely, that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

(c) Conservation of biological diversity and ecological integrity.

(d) Improved valuation and pricing of environmental resources.

The Department is satisfied that the EIS and subsequent information have addressed the four ESD principles, and that the principles can be reinforced through appropriate conditions of consent.

The Department considers that overall appropriate information is available to justify consistency with the ESD principles. However, in recognition of the environmental sensitivity of the project, and to ensure the environmental impacts of the proposal are properly managed consistent with the ESD principles, the Department would recommend the establishment of a special high level and comprehensive environmental management regime which would include special provisions for independent auditing and monitoring of the project.

13. SCOPE OF CONDITIONS OF CONSENT

The recommended conditions of consent tagged "A" have been prepared taking into consideration the General Terms of Approval and other issues raised by Government agencies, Councils and all other submitters including land owners, community groups and independent organisations.

The recommended conditions of consent provide for appropriate management and monitoring of the impacts associated with the project, including key impacts relating to noise, dust, and ground and surface water, specifically including mitigation measures for any bore impacts. The conditions of consent also include specific provisions for managing road and traffic impacts, community enhancement, complaints, and also requirements for establishment of a Community Consultative Committee, the preparation of a number of environmental management plans, Annual Environmental Management Report and an Independent Environmental Audit every three years. A summary outlining key consent conditions is attached at Appendix 5.

The Department has undertaken extensive consultations with the Applicant concerning the content and intent of the conditions of consent, and the Applicant accepts the

conditions. All three councils are also in general support of the recommended conditions.

14. CONCLUSION

The Department believes that through the application of the consent conditions, which incorporate the General Terms of Approval of the EPA, DLWC, NPWS, Lachlan, Forbes and Parkes Shire Council, the environmental impacts of the proposal can be adequately managed, mitigated and where necessary, compensated. The proposal is also consistent with State and regional planning objectives, and with the local planning instruments.

15. RECOMMENDATION

It is RECOMMENDED that the Minister approve the development application as submitted by Black Range Minerals subject to the attached conditions of consent.

Endorsed

Richard Lloyd
Senior Environmental Planning Officer

Sam Haddad
Executive Director

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Appendix 1

SUBMISSIONS SUMMARY

GOVERNMENT AUTHORITIES

1. Lachlan Shire Council RW Bailey General Manager PO Box 216 CONDOBOLIN NSW 2877.	Support for Application, but request for a Commission of Inquiry, for the following reasons : • Significant is size for not only region but for NSW • Will have a long term effect on the region with wide-spread ramifications on roads, social services, housing and the provision of local governance • Significant volumes of traffic to be generated • Large volumes of groundwater to be extracted • The large geographic extent of the proposal • The ability o the small towns to assimilate and service the project
2. Roads and Traffic Authority Western Region Road and Traffic Development 51-55 Currajong Street PO Box334 Parkes nsw 2870	Supports the project and endorses comments made by the Western Region Development Committee.
3. NSW Department of State and Regional Development PO Box N818 Grosvenor Place SYDNEY NSW 1220	Support for the proposal : • based on the economic benefits. • The central western region and the Lachlan shire can be expected to derive significant economic benefits. • Construction phase will generate significant employment opportunities. • Ore deposit should ensure mine and refinery remain in operation for t least 30 years. • Large generation of annual revenues in payroll tax and mining royalties • Make a significant contribution to the GNP • Government is committed to encouraging further investment in this industry • Infrastructure improvements
4. Western Region Development Committee PO Box 334 PARKES NSW 2870	Do not oppose, but following concerns : • Design of roads need accommodate the maximum size vehicle expected to use the facility • Route to be taken by all restricted access vehicles must conform to the designated routes • All vehicles must conform to the rules and regulations set down by State laws. • Installation of signage • Road re-designing must comply with local council requirements • During carrying out of road works, traffic management plans are to be prepared and adhered to. • Appropriate sedimentation plans are to be put in place during road works • Vegetation screens must not impair driver sight lines. • Provision of adequate on-site parking • Appropriate warning signs • Each level crossing must be audited • All hauled materials must be appropriately covered • Appropriate lighting of intersections where vehicles are turning
5.Narromine Shire Council Chambers 124 Dandaloo Street NARROMINE NSW 2821	Concerns: • Concerns about heavy vehicular movements on Main Road 354 route and other rads. • Transportation of materials by road • No guarantee that rail will be an ongoing mode of transport throught the life of the mine. • Failure to consider possibility of increased use o local roads inorth of the development outside the Lachlan Shire

6. National Parks and Wildlife Service	Support assessment of Aboriginal conditions, but submits the following : • Local Aboriginal Councils be invited to collect artefacts Suggested conditions • all cultural sites be clearly identified with a highly visible protective buffer • construction restrictions around the Humbug CS1 site • east-west boundaries of the creek crossing shall be clearly identified by way of temporary flagging and restrictions placed on activity outside the flagging • further development of the rehabilitation plan • box woodland remnants which do not need to be disturbed should be maintained and enhanced • consideration give to re-routing the pipelines to avoid the communities located in the TSR • avoidance of the gilgai sites when constructing the pipeline • avoiding specific areas of high habitat value vegetation
7. Parkes Shire Council PO Box 337 PARKES NSW 2870	Support for the project, but following issues to be addressed: • adequate infrastructure • adherence to World Best Practices and ESD Principles • adequate controls and safeguards to ensure no adverse impacts to residents from the limestone quarry and the rail siding.
8. Dams Safety Committee PO Box 3720 PARRAMATTA NSW 2124	• insufficient information to determine final hazard rating of the dam; • dams likely to be "prescribed"
9. Lachlan, Forbes and Parkes Shires Joint Submission	Support, but following concerns • must ensure upgrading and maintenance of road system • resolution of settlement and infrastructure issues, EIS provides only a superficial examination of these issues. • Current essential and community based services struggling to maintain acceptable standards, Council maintains that the company must assist with the provision of these services that will be required given a sharp increase in the population. These include community services worker; emergency services medical services; police and ambulance • Company should extend the provision of the mobile phone service to cover areas between Condoboln and Parkes. • Contribution should be made to commmunity enhancement.
10. State Emergency Service Parkes Local Controller	• concerns about capability of the Trundle SES to carry out necessary SES services – terms of equipment, personnel, communication • equipped for different perceived risk that that which may eventuate during operation of mine. • Likely to be in crease in number of road incident – resources must be increased accordingly.
11. NSW Heritage Office Locked Bag 5020 PARRAMATTA NSW 2124	Should the proposal be approved, following conditions Recommendations in Appendix L be implemented. If any evidence of any other Aboriginal archaeological site or relic identified, then work must cease immediately If during construction any previously unidentified European heritage is identified all work is to cease and the Heritage office contacted.
12. Forbes Shire Council	Support for the project, but the following concerns • disagree that Forbes will be outside the primary employment catchment area –resultant impact on Forbes needs to be considered • impacts on smaller villages such as Ootha has not been considered • possible damage to the roads where pipelines will be layed • emergency management plans should a pipeline leak or rupture • protection of the Ootha water supply pipeline during excavation for the installation of the pipeline
13. Lachlan Shire Council	Support for the proposal but the following concerns to be viewed In conjunction with the joint proposal : • Transport and road issues • Settlement and infrastructure • Health, education and community services – concern regarding lack of community

	services worker; medical and dental services; rural fire and state emergency services • Community enhancement contributions – including need to upgrade preschool day care after school care, library services, parks and gardens and village Also includes an "Accommodation report and strategy".
14. NSW Fisheries	Objects to proposal as currently outlined for the following reasons : • Aquatic habitat and species concerns have not been adequately addressed in the documentation supplied • Impact on the Silver Perch and Macquarie Perch • No detail regarding structures for suspending pipelines above the watercourses and potential impacts this will have on in stream habitat • Does not outline mitigation measures for disturbance of in-stream habitat • No information on fish species is presented • EIS has not adequately assessed the potential impact of the works on fish passage • Any causeways or culverts must be in accordance with NSW Fisheries policy
15. Department of Mineral Resources	Support for the project and the EIS, but following concerns : • Resource data – more info on the size and grade of the deposits • Environmental geochemical assessment of waste rock • Tailings geochemistry
16. NSW Department of Agriculture	Concerns: • Effects of the development on agricultural land use, ongoing agricultural potential should not be diminished • Rehabilitation efforts to support a long-term stable landscape are important
17. Forbes Rural Lands Protection Board	Not in opposition, but following concerns : • Applicant must apply for written consent from the board for any pipeline laid on travelling stock reserve • Any activity or structure which may significantly impact on TSR requires consultation and consent of the Board.
18. Department of Land and Water Conservation	<u>Vegetation</u> • Future management of native vegetation should be an integral component of the EMP. • Supports intention of retaining existing vegetation where possible. • Quarry should consider the Mid Lachlan Regional Environmental Plan, <u>Soil issues</u> • No major concerns relating to the impact the development will have on soils, however express concern about the level of information provided on the soils. • Supports practice of stockpiling of stripped soils, but recommended this is done accordance with the Topsoil Management Plan, and in consultation with the Department • Concerns about the soils as a construction medium and considered testing of soils inadequate <u>TSF and evaporation ponds</u> • must be in accordance with DSC requirements. • Support that a single, suitably qualified organisation will undertake supervision and control of technical aspects of the TSF and storage dams <u>Flood discharge calculations</u> Concern expressed regarding the specifications for the diversion channels. Believe would not provide a stable waterway in a 1:100 storm because the velocity proposed is too high. If the lower recommended value is used, the diversion channels will need to be impractically wide. BRM has indicated that if detailed design shows the flows are larger than those calculated than larger diversion would be provided. <u>Tailings storage facility</u> Concerns regarding, • slikensides – offer permeable fracture zones which can become contaminants conduits • floor permeability • long tern stability.

	Groundwater issues Recognise groundwater as a scarce, poor quality and highly variable resource. Groundwater occurring beyond the current mine lease should be protected. Monitoring Concurs with proposed monitoring in the EIS Rehabilitation Endorses proposed rehabilitation of the sites. Borefield/Modelling issues Considers modelling to have deficiencies and further work to be required. Pipeline issues Generally satisfied with the level of information provided. Vegetation Support for clearing where only necessary and 2 for 1 replacement of trees stresses important of understorey vegetation Stream crossings Note lack of information as to the type of raised structures for stream crossings.
19. Environmental Protection Authority	A number of concerns were raised regarding noise and air impacts of the proposal, which have now been resolved.

PRIVATE INDIVIDUALS

1. Mr Ross Smith "Yarralee" Trundle Road CONDOBOLIN NSW 2877	Support for proposal • Increased employment opportunity • Economic boost for surrounding towns • Revenue raising for the State and Federal government from various taxes • Potential for Condobolin to be connected to the gas pipe line which is to be constructed • Road safety restrictions planned • Rehabilitation
2. William J. Dietrich PO Box 19 CONDOBOLIN NSW 2877	Support for the proposal • Economic, social, infrastructure and services boost for Condobolin
3. Heidi J. Dietrich 18 Innes Street CONDOBOLIN NSW 2877	Support for the proposal • Economic, social, infrastructure and services boost for Condobolin
4. A.J Sunderland "Currajong Park" FIFIELD NSW 2875	Concerns : • Water from the project flows though his/her property currently supplying dams for stock and for household use • Noise, dust and smell impact • Health impacts
5. Colin Quade "Moorlands" TRUNDLE John Hall, "Kara Kara" TRUNDLE Peter Hall "Gillenbine" TRUNDLE Mick Hall "Lesbania" TRUNDLE Geoff Quade "Tara Moira" FIFIELD Ben Kerin "Limestone" TRUNDLE Denis Quade "Reasfalls" TRUNDLE	Concerns : • Movement of dangerous goods along the roads • Movement of stock and machinery along road SR64 particularly regarding safety issues with the increase in daily traffic
6. Yvonne and Warren Artery "Rosehill" TULLAMORE 2874	Concerns about proposal : • Loss of rural life style and depreciation of land value • Dust • Noise – although will be within Australian standards, will be a marked increase in existing levels
7. Name witheld	Object to proposal Flora and fauna – need pre-emptive and immediate revegetation works; proposes

	rehab is not sufficient Does not appear to be any commitment to carry out revegetation on neighbouring properties to establish buffer zones • Widening of the Fifield to Trundle road and impact on native vegetation • Effect of depletion of aquifer on the groundwater dependant ecosystems • Amount of salt which will be poured on to the land. • Operation hours – transportation of goods 22 hours a day – increase in traffic, noise, dust and chemical hazards. Hours for transportation of materials should be restricted • Economics : figures show only a modest profit with a profit line which highly erodible profit line • Landscape impact – flora and groundwater section leaves a lot to be desired; "say as little" and "commit as little" approach; concerns the company has the technical knowledge or experience to manage such high impact project. • Concerns over who owns the project – new possible overseas investors providing backing for the project could have a controlling interest and , an profits could therefor go overseas. • Project as its stands has no merit in being approved..
8. Colin Quade "Moorlands" TRUNDLE Ben Kerin "Limestone" TRUNDLE Peter Hall "Gillenbine" TRUNDLE TE Hall "Lesbaina" TRUNDLE West Trundle Landcare Group	Concerns : • Noise concern about the properties around the limestone quarry which will experience noise levels marginally and moderately above the recommended criteria. Concerned regarding effect on lifestyle and welfare. • Vibrations • Land valuations – depreciation of land values expected; land should be valued prior to commencement of the project to assess the impact. • Transport – need assurances that transportation of hazardous materials do not pose and safety/health hazard to regular uses of the road.
9. Name withheld	Objection • Concern regarding chemical emission; Uncertainty as regards the settling of this material on soil, grain, water and livestock.
10. Palmers Solicitors and Conveyancers on behalf of Kevin Simmonds ("Stockton") and Ian and Tom Simmonds ("Green Grove")	Concerns : • Test bores too selective and no tests made east of Yarrabandai Road • A cap should be placed on the amount water to be extracted if bore licenses are granted. • Fear groundwater levels will drop substantially if large quantities of water are pumped. Oppose the granting of any bore license to the Company until more precise testing is undertaken
11. Colin McDonald Chair Lachlan Valley Branch National Parks Association of NSW 30 Orange Street PARKES	Concerns: • Uncertainly over final resting place for sulphur compounds and effects these will have on the urban areas • Fuel should be transported by rail and piped to the mine rather than hauled by road • concern for remnant native vegetation with routing of gas/water services and use of roads and travelling stock route.
12. Mr DF & JA Quade "Reas Falls"	Concerns • disputing measurement of certain distances, and concerned that were incorrect and perhaps used when calculating impacts • concern over calculation noise emissions predictions are calculated • concern over calculation of dust emission readings • failure to recognise "Reas Falls" as one of the closest residences to the limestone quarry. • Concerns that no background dust deposition monitoring has been undertaken to date at the limestone quarry
13. AJ GJ & NU Sunderland Currajong Park	Concerns: • Water – increase flow and its impact on downstream

FIFIELD. NSW 2001	- seepage from the Southern Diversion System - concern regarding the tailing cells and the heavy water flow from the • Dust – dust will be blown into drinking water and cropping land • Noise • Land value – decrease values, loss of rural lifestyle
14. RW Marriott 32 Logan Street EGLINGTON NSW 2795	Concerns: • Gaseous emissions and effect on health, livestock, water and saleability of land. • Education about the use of such chemicals. • Whether extreme weather occurrences have been factored into the management regime • Use of heavy property around the pipelines • What are the legal liability and precautions to be exercised by both Black Range and private landholders.
15. Des and Sandra Ward "Berrilee" TULLAMORE NSW 2874	Concerns • Groundwater -Use of borewater -Seepage control for the tailings dam and the evaporation ponds • Decrease in land values • Noise • Impact of emissions on air quality and long term effects • Danger of fire spreading to rural areas •Fauna – fails to identify the breeding ground for the endangered species the Suberb Parrot and also the Major Mitchell Cockatoo
16. BC and WJ Nelson "Sunrise" FIFIELD NSW 2875	Objection: • Air quality and environmental effects caused by emmisions of Hydrogen Sulfide and Sulphur Dioxide, Gas and diesel • Dust, lighting and noise levels will impact on tranquillity of life • A calculation of Societal risk should have been undertaken. • Project will suppress land values • Concern regarding level of Public liability and other insurance coverage.

SPECIAL INTEREST GROUPS

1. MR354 Committee Mr Jack Harris (Secretary) "Glenconnor" PEAK HILL	• Support for the project, providing Main Road 354 is upgraded. • The road is described to be the shortest and most practical regional road to Dubbo and Newcastle. • Deemed to be inadequate for current use
2. Concerned Citizens Committee Syerston Nickel Cobalt Project C/- "Berrilee" TULLAMORE NSW 2874	Concerns • Traffic movements – safety concerns for increase traffic movements and transportation of hazardous substances • Dust • Air quality – toxicity of chemical being emitted an transfer to water supply; impact on • Noise • Water – channel diversion design will increase flow – concerned regarding the impact downstream – -seepage from the Southern Diversion System • Seepage of Tailings Dam and Evaporation ponds – believe insufficient testing has been conducted.
3. Mrs Janet Mortimer	Concerns :

Secretary, NSW farmers' Association Tullamore Branch C/-"Rosedale" PO Box 17 TULLAMORE NSW 2874	- Role of local rural fire brigades - limited experience of local volunteers - Trafficking of hazardous materials and the ability of the local services to deal with any accidents Will Volunteers be trained, equipment supplied?
4. Fifield Progress Association C/o "Sunnyside" Fifield NSW 2875	Support for the project • Presumed potential for potable water pipeline to continue to Fifield • Currently 18 vacant blocks in Fifield available for additional accommodation • Availability in Fifield of amenities • Request for Commission of Inquiry

OTHER INTERESTED PARTIES

1.Tony McGrane OAM MP Member for Dubbo	Support for the Main Road 354 committee
2. John Turner Member for Myall Lakes Deputy Leader of the National Party Shadow Minister for Roads (plus other positions)	Support for the Main Road 354 committee

LATE SUBMISSIONS

GOVERNMENT AUTHORITIES

Mid Western Public Health Unit Webb's Chamber 175 George Street BATHURST NSW 2795	Following concerns : i. Water for domestic purposes need comply with National standards ii. Recycled effluent to comply with EPAs guidelines iii. Emissions from MPF and limestone quarry to comply with EPA standards iv.. Silica levels in the limestone need to be assessed for any potential hazard and mitigation v. Construction camp should comply with requirements for a caravan park to ensure that adequate health standards are applied vi. Facilities for Fifield, Condobolin and Parkes should be considered; in accordance with expected increase in population. vii. EMP plans should be formulated at regional levels to ensure adequate emergency response viii. Increased risk of road accidents and additional loads on Health services ix. A monitoring program should be implemented to ensure groundwater not adversely affected

LOCAL RESIDENTS

1. J.S. Peters Burrawong South FORBES NSW 2871	Residents located within 5km of the proposed site of water extraction. Following concerns : • Potential impact on groundwater resources Request feedback about monitoring program, and appropriate remedial action should any impact be detected. Request that

	these details be incorporated in the Environmental Management Plan.
2. R.L. and M.R. Moon "Osterly" OOTHA NSW 2875	Residents located within 5km of the proposed site of water extraction. Following concerns : • Potential impact on groundwater resources Request feedback about monitoring program, and appropriate remedial action should any impact be detected. Request that these details be incorporated in the Environmental Management Plan.
3. Alan and Elizabeth McGufficke "Kokum" OOTHA NSW 2875	Following concerns : Possible damage to the existing Ootha pipeline • Road and fence damage during construction of the pipelines

SPECIAL INTEREST GROUPS

Central West Environmental Council	Direct that particular attention be given to the following concerns • Sulphur dioxide emissions – consider proximity to other mines and the possible combination of these chemicals over time • Remnant vegetation along the gas and water routes • Use of rail should be maximised • Use of natural gas should be preferred. • Water quality from the bore field

OTHER INTERESTED PARTIES

Tony Lawler Federal Member for Parkes	Support for submission by MR54 road committee

Appendix 2

Department of Urban Affairs and Planning

REVIEW OF HYDROGEOLOGY ASPECTS OF SYERSTON NICKEL COBALT PROJECT ENVIRONMENTAL IMPACT STATEMENT

by

Peter Dundon and Associates Pty Ltd

30 January 2001

Table of Contents

1. Introduction

Black Range Minerals Ltd (BRM) proposes to develop the Syerston Nickel Cobalt Project, north of Fifield in the Central Western Region of New South Wales. The project includes the construction, operation and rehabilitation of a nickel-cobalt mine, processing facility and service infrastructure to provide access, water and natural gas to the site (BRM, 2000).

The proposal is for the production of an average of 2 Mtpa[1] of nickel cobalt ore, mined from a series of open pits. The ore will be treated in a process plant constructed adjacent to the mine site, with tailings disposal to a tailings storage facility (TSF) also at the mine site. Production plants for certain ore processing reagents are also to be constructed at the mine site. Because of metallurgical difficulties with re-use of tailings reclaim water in the process, it is proposed to dispose of excess tailings reclaim water from an evaporation pond facility adjacent to the TSF.

BRM also proposes to mine limestone for use in the process plant from a small quarry to be developed south-east of Fifield, about 20 km from the mine.

It is proposed to obtain the 6,300 ML/year water supply for the project from two borefields 50-60 km south of the mine site. The two borefields would draw water from a paleochannel aquifer in the Lachlan Formation, beneath the Lachlan River floodplain. Water would be transported to the site via a water supply pipeline to be constructed for the project.

It is proposed to construct a gas pipeline about 80 km from a connection point on the existing Natural Gas Pipeline about 40 km south of Condobolin, to supply energy to the project.

Nickel and cobalt products from the operation would be transported by road to a new railway siding about 25 km south-east of the mine site.

The company has prepared an Environmental Impact Statement (EIS) which outlines the proposals, the likely environmental impacts of the project, and the proposed mitigation measures (BRM, 2000).

This report presents a review of groundwater aspects of the EIS. The review has addressed relevant sections of the Executive Summary, Main Report and Appendices D and E of the EIS. Supporting documents to the EIS prepared by Coffey Geosciences Pty Ltd (Coffeys) and Golder Associates Pty Ltd (Golder) have also been reviewed, and discussions have been held with officers of the Department of Land and Water Conservation. The letter report submitted by BRM on 12 January 2001 in response to a 22 December 2000 meeting between the DLWC, EPA, BRM and Golder concerning aspects of the proposed tailings storage facility (BRM, 2001) has also been reviewed. A brief site visit was also made as part of the review.

[1] Mtpa = million tonnes per annum

The major focus of this review has been the groundwater model of the Lachlan Valley groundwater system used by Coffeys, and its appropriateness for predicting impacts of the proposed groundwater extraction. The reliability of the model is critical to assessing whether the aquifer system is able to sustain the proposed water supply, without unacceptable impacts on the resource and other users.

Other factors covered by the review include the potential for impact on the local or regional groundwater of mining and tailings disposal at the mine site, and the limestone quarry.

In this review, each relevant project component is discussed in turn, starting with the water supply borefield development in the Lachlan Valley, then the mine site area, and lastly the limestone quarry.

This review has been prepared by Peter Dundon, of Peter Dundon and Associates Pty Ltd, for the Department of Urban Affairs and Planning, Development and Infrastructure Branch.

2. Proposed Water Supply Borefield Areas – Lachlan Valley Paleochannel

2.1 Existing Groundwater Environment

The Lachlan Valley is underlain by up to more than 140 m of alluvium, comprising Quaternary to Tertiary age fluvial clay, silt, sand and gravel sediments. The sediments are contained within the Cowra Formation and the underlying Lachlan Formation.

The Lachlan Formation occupies the deeper parts of the Lachlan Paleo-Valley alluvials, where it occurs as a relatively narrow (generally 2-8 km wide in this area) paleochannel incised into the underlying Silurian basement rocks. The Lachlan Formation is not exposed at the surface, and in the area of interest occurs between about 80 and 140 m below ground surface, but with a developed thickness of around 20-40 m. The Lachlan Formation consists of light grey interbedded sands and gravels, with minor silts and clays.

The Cowra Formation overlies the Lachlan Formation, but has a much broader occurrence within the Lachlan Valley, where it reaches up to 20 km in width to the east of the proposed water supply area. Thus the Cowra Formation is underlain by Lachlan Formation sediments in the central (deeper) parts of the valley, and by Silurian basement rocks near the (shallower) flanks of the valley. The Cowra Formation consists of orange-brown and brown interbedded clays and silts, with minor sands and gravels. The Cowra Formation reaches a maximum thickness of about 100 m in the area of interest.

The Lachlan Paleo-Valley is aligned roughly east-west, and is joined by the north-south Bland Creek paleochannel tributary close to the proposed water supply area. The Lachlan Paleo-Valley becomes progressively deeper to the west along with an increasing thickness of the Cowra Formation. Groundwater flows generally downstream within the paleo-drainage system, ie northwards within the Bland Creek tributary, and from the east to the west within the main Lachlan Valley. [Local reversals of flow may have occurred in some places, at least in the shallower, near-surface groundwater, as a result of lowered groundwater levels due to pumped extractions, or elevated groundwater levels due to increased recharge from irrigation.]

The principal aquifer is the Lachlan Formation. This aquifer is confined by the less permeable clays and silts of the overlying Cowra Formation, and probably induces leakage from the Cowra Formation under pumping conditions. The Lachlan Formation has previously been developed in the area of interest, mainly for irrigation water supplies, while upstream of Jemalong Gap to the east of the project area, it has been developed for town water supply for the town of Parkes and for mine water supplies to the Northparkes Copper-Gold Mining Project.

The Cowra Formation also contains a number of sandy clay and gravel aquifers separated by thick silty clay beds. The individual aquifer horizons are believed to be reasonably extensive, and are able to support useful water supplies. However, the potential for water supply development is considered to be much less than for the Lachlan Formation. The Cowra Formation is tapped by a number of licensed water supply bores in the general vicinity of the proposed water supply area.

2.2 Groundwater Investigation Program

The Applicant engaged Coffeys to carry out groundwater investigations and make recommendations for the project water supply.

Coffeys were first engaged around September 1998. The work subsequently carried out by Coffeys included:

- Construction of two 250 mm diameter test production bores, with screens in the Lachlan Formation;
- Installation of two 50 mm diameter PVC cased monitoring piezometers in the Lachlan Formation;
- Pumping tests (one short multi-stage test and a 72-hour constant rate test) on each of the two test production bores;
- Assessment of aquifer hydraulic properties, based on the pumping test results and other data;
- Sampling and water quality assessment of the Cowra and Lachlan Formation aquifers;
- Computer modelling of the groundwater system to assess potential hydrogeological and hydrochemical impacts due to pumping at 200 L/sec (6,300 ML/a); and

- Computer simulation of potential long-term changes in groundwater salinity.

Two groundwater modelling exercises were carried out by Coffeys. After review of the first exercise by DLWC, Coffeys made significant changes to the model, and redid the model calibration and simulation modelling of impacts.

2.3 Adequacy of the Investigations

The investigation program summarised above in broad terms is considered adequate to have developed a reliable understanding of the groundwater flow system, and to have determined the potential of the Lachlan Formation to support the project's water supply.

However, as discussed in the following sections, I do not believe that Coffeys have demonstrated that the supply would be sustainable without causing an unacceptable impact on other users. My principal concern relates to the mechanism for recharge of the Lachlan Formation, which I believe has been misrepresented in the groundwater model by Coffeys. As a consequence, the predictive modelling performed using their groundwater model cannot be considered a reliable indication of long-term impacts. [The water supply may well be available without unacceptable impact, but this cannot be established from the work completed by Coffeys.]

2.4 Recharge

Coffeys state at page 26 of their report (Coffey Geosciences, 2000):

> *"The Lachlan Formation gravels are potentially confined beneath the Cowra Formation clays and sands. Recharge to the Lachlan Formation and the lower portion of the Cowra Formation is indirect due to laterally extensive clay layers … The Cowra Formation comprises a number of confined aquifers that are linked more directly in the lateral rather than vertical direction."*

and further:

> *"…the Lachlan Formation is recharged by the lower portion of the overlying Cowra Formation. Vertical flowpaths which could potentially enable recharge to the Lachlan Formation may be impeded by clay layers …"*

Although acknowledging the impeding influence of clays in the Cowra Formation, Coffeys assumed in the groundwater model that the Cowra Formation is an aquifer rather than an aquitard, and that recharge to the Lachlan Formation occurs by downward leakage from the surface through the Cowra Formation.

The abundance of low permeability clays between the surface and the Lachlan Formation suggests to me that recharge to the Lachlan Formation in the area of interest is more likely to be derived from lateral flow within the aquifer itself, from some more distant source, either around the margins of the valley or somewhere upstream. Although the upper Cowra Formation aquifer would be recharged from the surface, and there is the potential for leakage to occur slowly through the clay layers down to deeper horizons, I believe that the middle and lower Cowra Formation aquifers would be recharged in a similar way to the Lachlan Formation, ie predominantly by lateral flow from some more distant recharge source.

Evidence against downward leakage from the surface through the Cowra Formation as the recharge mechanism includes the following:

- In almost every case where hydrographs are available from multiple levels in the DLWC monitoring wells, groundwater pressure levels in the upper part of the Lachlan Formation are higher than those in the lower parts of the Cowra, and higher in turn than in the middle and upper parts of the Cowra Formation – refer Figure B1 [GW036089], Figure B3 [GW025151], Figure B4 [GW036079] and Figure B7 [GW036526] in Appendix B of Coffey (2000). In two other monitoring wells, GW036523 and GW036552 (Figures B8and B9) the groundwater pressure levels are higher in the lower part of the Cowra Formation than in the upper Cowra Formation.

  This pattern of increasing head with depth has prevailed for up to 30 years or more.

  Accordingly, if there is vertical flow of groundwater between aquifers, it would be upwards, rather than downwards, meaning that the Cowra Formation would be recharged by the Lachlan Formation, not the other way.

- The similar trends in the hydrographs for piezometers at different levels at the one site suggests a common source for recharge, rather than recharge from one aquifer to another.

- Formation of a water table mound in the (upper) Cowra Formation (the Warroo Groundwater Mound) within the Jemalong-Wyldes Plains Groundwater Management Area to the south of the proposed water supply area, has not been accompanied by a corresponding mound in the deeper aquifers within the Cowra Formation or the underlying Lachlan Formation.

- Several years' abstraction from the Parkes town / Northparkes mine borefield upstream of Jemalong Weir, at a rate of up to 4,000 ML/a, from a similar borefield to that proposed for the Syerston project, has reportedly led to drawdowns of around 20 m in the Lachlan Formation, and around 5 m in the lower Cowra Formation, but has caused negligible impact in the

upper Cowra Formation (Brereton, pers comm[2]).

- The pumping tests carried out on test bores PB-E1 and PB-W2 by Coffeys (2000) showed no evidence of leakage or delayed yield in the water level data from the pumped bore. Such effects may become apparent after a longer period of pumping, but their non-appearance during the 72 hours of pumping in those tests indicates that if leakage is to occur, the leakage rate from the overlying clays would be quite low.

2.5 Groundwater Modelling

2.5.1 Modelling Objectives

Coffeys (2000) carried out modelling of the groundwater system, with the following stated aims:

- *"identify regional drawdown effects from groundwater extraction from the proposed borefields for up to 30 years; and*
- *identify potential impacts of groundwater extraction on other groundwater users in the area."*

Coffeys undertook two modelling exercises, described in their reports and in the EIS as Model 1 and Model 2.

2.5.2 Model Code

Coffeys used the MODFLOW package (McDonald and Harbaugh, 1988) to model the Lachlan Valley groundwater system. The choice of the MODFLOW package is considered appropriate.

2.5.3 Model Geometry

The model set up by Coffeys comprises two active layers, the uppermost representing the Cowra Formation aquifer, and the lower layer representing the Lachlan Formation aquifer, underlain by zero permeability representing the low permeability Silurian basement rocks. The geometry of the two aquifer layers in the model has been derived from a combination of data sources, including drilling results from the Syerston water supply investigation, the DLWC bore records, contours of depth to basement prepared by the Australian Geological Survey Organisation (AGSO), and results of previous investigations in the general area. The lateral extent and thickness of the Cowra Formation and the Lachlan Formation assumed in the model are considered appropriate.

[2] Telephone discussion with Greg Brereton, DLWC Dubbo.

Cell size in the model ranges from 200 m square in the central part of the model occupied by the proposed borefields, expanding gradually to a maximum of 1000 m square in some of the outer model cells. This is considered appropriate.

The boundaries of each layer were determined by the known or inferred geological extent of each layer, determined as described above, except that artificial boundaries were set at distances of about 20 km from the proposed borefield area in the upstream (easterly) direction, the downstream (westerly) direction along the main Lachlan paleo-valley, and upstream in the Bland Creek tributary to the south. Both the Cowra and Lachlan Formations are known to continue beyond this distance in those three directions. The appropriateness of these artificial boundaries at 20 km distance is dependent on the likely extent of impact from pumping, and/or the boundary conditions assumed at those limits. The implications of the boundary assumptions adopted by Coffeys is discussed below in Section 2.5.7.

The boundary conditions assumed for the Cowra Formation and Lachlan Formation layers were “no flow” conditions at all natural boundaries, and “constant head” conditions at the eastern (RL 222 m) and western (RL 189 m) artificial boundaries along the Lachlan Valley (corresponding to Jemalong Weir and Mt Wollomundry respectively). No comment was made in the Coffeys report about the assumed condition at the southern (Bland Creek) boundary, so it is assumed that a “no flow” condition was adopted at this boundary as well. The implications of these assumptions is discussed below in Section 2.5.7.

2.5.4 Recharge

As detailed above in Section 2.4, Coffeys described recharge as occurring laterally rather than vertically, yet in their model they assumed a layer configuration and hydraulic parameters that represent recharge as occurring by downwards leakage through the Cowra Formation.

Their model (Section 5.1, page E-14 of Appendix E of the EIS) comprises two active layers, both aquifers. The uppermost layer corresponds to the Cowra Formation aquifer, and it is underlain by another aquifer, the Lachlan Formation. Coffeys have defined a VCONT (or leakance) value to represent the presence of a confining layer between the two aquifer layers. However, the VCONT values they have used in their modelling are very high values (in the range 0.01 to 0.1 day^{-1} in Model 1, and in the range 0.002 to 8.0 day^{-1} in Model 2), suggesting very little impedance between the two aquifers, with the effect that the model represents the sequence as hydraulically continuous virtually from the Lachlan Formation right through to the surface. The model will therefore allow recharge to the Lachlan Formation by vertical flow from the surface through the Cowra Formation, contrary to Coffeys’ description of the recharge mechanism, and the considerable evidence against this mechanism as described in Section 2.4 above.

Based on an examination of the bore logs presented in the EIS and in Coffey (2000), and to be consistent with the description of the recharge mechanism given by Coffeys in the EIS, an appropriate VCONT value for the clay confining beds within the Cowra Formation would more likely be around 10^{-6} to 10^{-7} day^{-1}. With such VCONT values, the model would then require recharge of the Lachlan Formation to occur predominantly by horizontal flow.

However, a more appropriate representation of the important aquifers and their hydraulic inter-relationship would be to assume three aquifer layers (representing the upper Cowra Formation, middle and lower Cowra Formation, and the Lachlan Formation respectively), and a low permeability confining layer between the upper Cowra Formation and the middle Cowra Formation. Thus there would be four active model layers, instead of two.

In order to allow for recharge to the Lachlan Formation, and to the middle and lower Cowra Formation aquifers, it would then be necessary to introduce a recharge component either around the margins of the catchment, and/or upstream from the area of interest. Steady state calibration modelling would be needed to determine appropriate recharge rates to the relevant cells in the model.

2.5.5 Model Hydraulic Parameters

Coffeys undertook two modelling exercises. The first, described in the EIS as Model 1, had the Lachlan River represented as a "drain". Hydraulically, this would allow water to discharge from the upper Cowra Formation aquifer to the river, but would not allow water from the river to recharge the aquifer. This is unrealistic, and led to a second modelling exercise, referred to in the EIS as Model 2, in which the river was represented as a "river" rather than as a "drain". In Model 2, flow could take place from the river to the aquifer, or from the aquifer to the river, depending on the relative water levels at any time in the simulations.

However, as well as this change between Models 1 and 2, Coffeys also made substantial changes to the assumed hydraulic parameters values in the model, as follows:

Formation	Parameter	Value – Model 1	Value – Model 2
Cowra	Horizontal hydraulic conductivity (K_h)	2 – 0.5 m/d	7 – 30 m/d
	Specific Yield (S_y)	0.2	0.02
Lachlan/Cowra	Leakage (VCONT)	0.01 – 0.1 m/d/m	0.002 – 8.0 m/d/m
Lachlan	Transmissivity (T)	200 – 2000 m^2/d	30 – 600 m^2/d
	Storage Coefficient (S_c)	0.0001	0.008

No explanation was given for such wholesale changes.

For example, the transmissivity value for the Lachlan Formation aquifer at the site of test bore PB-W2 appears to have been 1000 m^2/d in Model 1, but only 30 m^2/d in Model 2 (Figures G2 and H3 in Coffey Geosciences, 2000).

Coffeys' interpretation of the test pumping of PB-W2 suggested the transmissivity at that site is around 600-1000 m^2/d (Section 4.2.1, page E-10 of the EIS).

Secondly, the spatial distribution of hydraulic conductivity values for the Cowra Formation, transmissivity values for the Lachlan Formation, and leakage coefficient values between the Cowra and Lachlan Formations (Figures G1 to G3 and H1 to H3 in Coffey Geosciences, 2000) are vastly different between Models 1 and 2. So, rather than the model values being based on the results of the test pumping, it appears that it must have been necessary to vary the parameters until the model calibrated.

Both models have leakage coefficient values for all cells in the model occupied by Cowra Formation, even those cells where the Cowra Formation is underlain by basement rather than the Lachlan Formation. While this may not be significant mathematically, it is conceptually incorrect.

Finally, Coffeys have reported the results of Models 1 and 2 as "worst case" and "best case" respectively, and have indicated that the *"… actual conditions will be between the two scenarios."* These statements imply that both models have validity. However, it is difficult to see how both models can have validity, when the input parameters are so different.

This, in addition to the mis-representation of recharge in the model, causes me to lack confidence in the model outcomes.

2.5.6 Model Calibration

Coffeys' calibration results are presented in Appendix E of the EIS as plots comparing observed and simulated groundwater levels for various DLWC monitoring bores during the 15 year period 1985-1999 (Figures E-18 to E-21). More details are presented in Coffey Geosciences (2000).

Coffeys stated that they were unable to simulate actual river stage heights, and so they were not able to accurately simulate the actual recharge events during that period. However, they reported that they did assume a seasonal rise and fall in river stage. Accordingly, the simulated water level plots would not be expected to match the observed data in detail. However, it would be expected that the simulated plots would show fluctuations of similar magnitude to those observed, even if they did not match up in detail.

This is not the case. The simulated plots generated by the model may yield similar ***average*** water levels to the observed data, but if the model is unable to simulate fluctuations of similar magnitude to those observed, it cannot be considered a good calibration.

I consider this further evidence that the representation of recharge in the model is incorrect.

2.5.7 Model Boundaries

The model boundary conditions assumed are very important. Since recharge to the middle to lower Cowra Formation and the Lachlan Formation aquifers occurs principally by lateral flow to the area of interest, it is likely that significant inflows occur either from the adjacent (and underlying) basement rocks, and/or from upstream within those aquifers. [It is certain that *somewhere* recharge would be occurring through the overlying Cowra Formation confining beds, but the relative water levels in DLWC monitoring bores indicates that this mechanism is not active within the area modelled by Coffeys.]

Consequently, recharge has to be accommodated in the model by inflows at the model boundaries. Coffeys' assumption of a constant head boundary at the downstream (western) and upstream (eastern) boundaries of the Lachlan Formation would be appropriate, providing the model predictions indicate negligible drawdown at these boundaries under long-term pumping. However, if predicted drawdowns at these boundaries are not negligible, then it would be necessary either to expand the size of the model, or change the nature of these boundary conditions to allow for realistic ongoing inflow rates across these boundaries. A constant head condition would not do this accurately, nor would a no-flow condition.

The boundary condition assumed by Coffeys for the Lachlan Formation at the southern boundary, in the Bland Creek tributary paleochannel, is not clear from Coffeys' reports. I consider that this boundary should also allow inflow. Again the appropriate boundary condition for this boundary would depend on whether there is negligible drawdown predicted at this boundary under long-term pumping conditions.

Because of the shortcomings of Coffeys' model, it cannot be confirmed that drawdowns will be negligible at these boundaries. This has implications for the assessment of impacts of the proposed borefield on other users, ie it cannot be verified that the borefield will have no impact on the Parkes town / Northparkes mine or Forbes borefields to the east of Jemalong Gap, or the proposed Lake Cowal project to the south.

Although some recharge to the Lachlan Formation aquifer is likely to occur by inflow from the enclosing basement rocks, the groundwater contours suggest that it is more likely to occur from upstream within the Lachlan Formation itself. It may therefore be appropriate to assume a no flow boundary condition for all other boundaries of the model, as Coffeys have done, although this would have to be confirmed by calibration modelling after a more appropriate recharge mechanism were incorporated in the model.

2.5.8 Conclusions Concerning the Modelling

In conclusion, I consider that: the modelling carried out by Coffeys is not reliable, for the following reasons:

- The model does not incorporate the "confining" nature of the low permeability clay layers within the Cowra Formation. I believe the model should include an additional low permeability layer between the upper Cowra Formation and the middle to lower Cowra Formation.
- The model incorrectly represents recharge as occurring from surface infiltration into the upper Cowra Formation, then by downward leakage to the underlying Lachlan Formation. I believe that recharge to the middle to lower Cowra Formation and to the Lachlan Formation should be represented in the model as occurring around the catchment margins, and/or upstream.
- Coffeys have made substantial changes to the input hydraulic parameters, and their spatial distributions, between Model 1 and Model 2, without adequate justification or explanation.
- Model calibrations carried out were not able to simulate the patterns of seasonal fluctuations in water levels observed in DLWC monitoring wells.

Consequently, any long-term predictions made using the model (both Models 1 and 2) cannot be considered reliable.

2.6 Potential Impacts of the Proposed Water Supply Borefield

The EIS has detailed the following potential impacts:

- Depletion of water levels in the aquifer[3], since the proposed extraction rate is greater than the estimated recharge rate;
- Drawdown of up to 3-4 m around the aquifer[3] boundaries, and up to 14 m near the proposed bores, at the end of 30 years pumping;
- Variable impacts on shallow bores in the Cowra Formation;
- Increased recharge from the Lachlan River to the groundwater system;
- Lowering of the groundwater mound beneath Jemalong-Wyldes Plains;
- Reversal of groundwater flow near the groundwater mound beneath Jemalong-Wyldes Plains, restoring flow to a northwards direction from the Bland Creek paleochannel;
- Lowering of groundwater levels in deeper aquifers; and
- An additional drawdown[4] of up to 5 m in the proposed Lake Cowal Gold Mine water supply borefield.

The EIS further states that no impacts are predicted on Lake Cowal, Nerang Cowal and Bogandillon Swamp.

Because of shortcomings with Coffeys' model, the predictive modelling cannot be used as a reliable indication of the likely impacts of the proposal.

[3] Note – the EIS does not specify which aquifer this impact refers to. It is presumed to be the shallow upper Cowra Formation aquifer.
[4] No aquifer is specified – it is presumed that this comment refers to the Lachlan Formation aquifer.

The proposed borefields are within the DLWC Upper Lachlan Groundwater Management Area 11, near the southern boundary of Zone 5 where it borders on Zone 6. Hence, extractions from the borefields would be expected to initially impact water levels in Zones 5 and 6.

Coffeys reported that the Area 11 Groundwater Management Plan for the years 1997-2002 listed available groundwater allocations in Zones 5 and 6 as 125,801 ML/year and 71,443 ML/year respectively. These figures have since been reduced by DLWC, who now consider the sustainable yield of Zone 5 to be 50,000 ML/a and of Zone 6 to be 35,000 ML/a (Brereton, pers comm[5]). Coffeys reported (Section 3.4.2, page E-6 of the EIS) that current allocations (at December 1999) were only 18,537 ML/year and 16,704 ML/year in Zones 5 and 6 respectively. However, these entitlements are not fully used, and current usage is probably only around 1,000 ML/a in total from these two Zones (Brereton, pers comm[5]). The proposed Syerston project extractions of 6,300 ML/year would increase the current Zone 5 allocation by around 34% to around 25,000 ML/year, which would represent about 50% of the currently estimated sustainable yield of that Zone.

As an independent check, I have made a crude assessment of the groundwater storage potentially commandable by the proposed borefields. Assuming a specific yield value of 15 % for the shallow sediments, and assuming that it is possible to recover water by dewatering those sediments, then it is calculated that 150 ML could be released from storage from each square kilometre of sediments per metre of dewatering. Accordingly, to meet the project's requirement of 6,300 ML/year for 30 years from storage alone, it would be necessary to dewater a volume of sediments equivalent to around 125 km^2 in area to a depth of 10 m. Such a volume is clearly present in storage, so extraction of the required volume of water is considered technically feasible. [This calculation makes no allowance for recharge, which would of course reduce the volume that would need to be extracted from storage.]

Based on the DLWC assessment of available groundwater allocations, and the independent assessment of potentially commandable groundwater storage, it would seem that the desired water supply would feasibly be available from the Lachlan Valley groundwater system. However, without a reliable model, it is difficult to assess the potential impacts on other users, both local users and the more distant Parkes, Forbes and Lake Cowal borefields.

The best available indication of potential impact from the proposed Syerston project water supply borefields is the experience at the Parkes borefield. It is reported (Brereton, pers comm[5]) that after several years' pumping from the Parkes town borefield at up to 4,000 ML/year, groundwater levels have been drawn down by around 20 m in the Lachlan Formation, by around 5 m in the lower parts of the Cowra Formation, but with negligible impact in the upper Cowra Formation. It is reasonable to expect that similar impacts will be

[5] Telephone discussion with Greg Brereton, DLWC Dubbo.

experienced in the proposed Syerston borefield area, but possibly of a larger magnitude, and over a larger area of impact than at the Parkes borefield, because the size and duration of the proposed water supply are greater than seen at the Parkes borefield to date.

Hence, it can be expected that some existing water users will be impacted by the proposed project. Existing nearby water supplies from shallow bores in the Cowra Formation may suffer minimal impact in the short term, based on performance of the Parkes borefield. Deeper bores, into the lower Cowra Formation or Lachlan Formation aquifers, are likely to be impacted, probably throughout the area covered by Coffeys' model.

BRM has suggested (Section C4.2.2, page C 4-3 of the EIS) that *"… (s)hould disruption to surrounding bores occur, due to water table drawdown, then ameliorative measures such as bore reconditioning, lowering existing pump sets and/or refitting would be undertaken."* These measures may be appropriate, however it is possible that in some instances, the existing bores may not be suitable for reconditioning or lowering of the pump (eg if the bore is not deep enough to allow the pump to be lowered), in which case a replacement bore may be required.

Increased recharge from the Lachlan River is only likely to occur in areas where the pumping induces drawdowns in the shallow upper Cowra Formation aquifer. Based on the performance of the Parkes borefield, this may not be a significant impact.

Similarly, the groundwater mound below the Jemalong-Wyldes Plains area will only be lowered if the pumping induces drawdowns in the shallow upper Cowra Formation aquifer, which appears unlikely, at least in the short term. [Hydrographs of DLWC monitoring bores from this area suggest that the mounding in the shallow groundwater has not been reflected in a change in groundwater levels in the deeper aquifers. Accordingly, while there may have been a reversal of flow in the shallow groundwater, I do not believe there has been a reversal of flow in the deeper Cowra Formation or Lachlan Formation aquifers.]

BRM's proposal to alternate pumping from each of the two borefields on a six-monthly cycle is considered likely to have minimal effect on the extent of impact on other users. It may limit the magnitude of drawdown in the source aquifer close to the pumping bores, by reducing the amount of mutual interference between pumping bores, but is expected to make little difference to long-term drawdown levels further afield.

2.7 Conclusions Concerning the Proposed Water Supply

I am confident that the proposed water supply for the Syerston project would (technically) be available from the proposed borefields in the Lachlan Formation in the Lachlan paleaochannel. The supply would be met partly

from depletion of groundwater storage, and partly from interception of recharge.

The extraction of this supply is expected to have both local and more distant impacts on groundwater levels, which can be expected to have an impact on other users. However, it is not possible, because of shortcomings in Coffeys' model, to predict the magnitude of impacts.

It is important therefore for BRM to commit to comprehensive monitoring, and appropriate mitigation measures, which are flexible enough to accommodate whatever impacts may arise.

3. Mine and Processing Facility

3.1 Site Components

The major infrastructure components of the Mine and Processing Facility (MPF) are:

- Open pits
- Waste rock emplacements
- Ore stockpiles
- Process plant area
- Tailings storage facility (TSF)
- Evaporation ponds and evaporation surge dam
- Topsoil stockpiles; and
- Roads and haulroads.

The minesite groundwater conditions have been investigated by Golder Associates Pty Ltd, and the results presented in two reports (Golder, 2000a and 2000b). The results are summarised in Appendix D of the EIS, as well as in relevant sections of the EIS Main Report.

Further information on the potential impacts of tailings disposal on groundwater quality have been provided in a BRM letter report (BRM, 2001).

3.2 Existing Groundwater Environment

Golder (2000a) identified three types of aquifers likely to occur in the region, viz alluvial, fractured rock and chemical aquifers.

Alluvial aquifers are apparently of limited development in the MPF vicinity. Sediments occupying paleochannels were identified by Golder as a potential significant aquifer, but there are conflicting statements in the Golder reports and BRM letter report about whether the paleochannels crossing the site are saturated or not. Golder reported [page 9, Section 5.1 of Golder, (2000a)]

that an unsaturated paleochannel (ie above the water table) was observed crossing the mine lease, although other information presented by Golder suggests that it is more likely partly saturated, viz:

- Figure 6 (Golder, 2000a) shows the water table to be within paleochannel sediments,

- Table 5 (Golder, 2000a) reports that water was intersected at 10 m depth in paleochannel bore GAM16, and

- Section 6.2, page 23 of Golder (2000b) states that saturated gravel and/or sand was intersected in one monitoring bore in the paleochannel.

Irrespective of the present saturated or unsaturated state of the paleochannel sediments at the site, nevertheless these sediments are likely to contain zones or lenses of higher permeability, which could constitute preferred pathways for sub-surface flow away from the site if they become saturated by seepage from the TSF or evaporation ponds during or after mining.

Fractured rock aquifers occur in association with fault zones, and are generally only locally important. Fractured faults are reported by Golder to be present at the mine site, generally in the western part of the mine lease. One fractured rock aquifer was identified in the north-west of the site, and it is possible that other permeable fractured zones may occur.

Chemical aquifers may exist where chemical alteration has enhanced the permeability of the basement rocks.

Golder reported (Golder, 2000a) that no aquifers were identified within the potential zone of influence of the TSF and evaporation ponds. Nevertheless, groundwater was detected in many of the test bores drilled at the site, albeit in most cases associated with low permeability.

Based on groundwater levels measured in the test bores, Golder have interpreted a groundwater divide extending in a north-easterly direction from beneath the proposed site of the TSF. Therefore, groundwater can be expected to flow both to the east and the west from beneath the TSF. The evaporation ponds are situated on the eastern side of the groundwater divide.

Groundwater levels were measured in the test bores at depths of 25 to 65 m below ground surface. [Golder reported that no perched aquifers were interpreted to exist at the site. However, Table 3 on page 12 of Golder (2000b) shows that in four test bores (GAM-3, GAM-7, GAM-9 and GAM-16) water was intersected at a level above the static water level subsequently measured, suggesting that there may in fact be perched aquifers. It is noted that three of these four are within the main paleochannel that crosses the site. In any event, there may be zones of permeability above the present water table that could be avenues for enhanced flow of seepage from the TSF or the evaporation ponds once a groundwater mound develops beneath them.]

3.3 Groundwater Investigation Program

The mine site hydrogeology was investigated by a program involving:

- Drilling of 17 test bores and installation of monitoring piezometers;
- Permeability testing, using rising or falling head tests on the piezometers, and packer testing of cored geotechnical investigation holes;
- Groundwater sampling and analysis, from the test bores and from Anderson's Pit;
- Groundwater/seepage modelling of the proposed TSF and evaporation ponds.

Most bores intersected groundwater. Permeability testing revealed that the rocks are generally poorly permeable, with hydraulic conductivity values generally in the range 1×10^{-7} to 5×10^{-11} m/sec, only one bore (bore GAM-1) giving a value above this range, at 10^{-4} m/sec.

Groundwater quality was found to range from fresh to saline (214 mg/L TDS at bore GAM-1 to 10,100 mg/L at bore GAM-11). The water sample collected from Anderson's Pit had a measured TDS of only 70 mg/L, and is probably (predominantly) surface water.

The groundwater is slightly alkaline, with measured pH values in the range 7.3 to 8.5. The groundwater contains trace levels of heavy metals, but none were measured at concentrations in excess of the livestock drinking water criteria (ANZECC, 1992).

3.4 Adequacy of the Investigations

I consider the investigation program is adequate for the characterisation of the site, and evaluation of potential impacts.

3.5 Assessment of Groundwater Impacts

Golder undertook groundwater modelling of a section beneath the TSF and evaporation pond areas, to investigate the development of seepage from the base of these facilities. Golder used the SEEP-W computer model, which is a two-dimensional finite element numerical modelling package for variably-saturated groundwater flow. The model is able to simulate groundwater flow in the partially-saturated zone above the water table, and the saturated zone below the water table. It is considered an appropriate modelling package for this purpose.

Golder assumed four layers in the model, an upper layer for the surface alluvium, two intermediate layers for very weathered rock and moderately weathered rock respectively, and a lower layer for (unweathered) basement rock. The model was run using a range of possible hydraulic parameter

values for the model layers, and for a range of TSF and evaporation pond construction and operation scenarios, including the use of liners, toe drains, etc.

The results of Golder's modelling were:

- High initial seepage rates are predicted to occur, but are seen to reduce with time as the ground saturates and as the TSF becomes lined with low permeability tailings that reduce the rate of downward seepage.
- Within 6 years from commencement of mining operations, a groundwater mound is predicted to be developed under both the TSF and the evaporation ponds, or after 8 years with a clay liner.
- By this time, there would be no seepage visible at the ground surface beyond the edges of the TSF or evaporation pond areas.
- With no liner, total seepage flux through the base of the TSF over a 20 year life is predicted to be 5,300 ML, or 9 % of the total water component of the tailings deposited into the TSF.
- With a clay liner, total flux is predicted to be 4,600 ML, or 15 % less than the seepage predicted without a liner.
- Smaller fluxes are predicted through the base of the evaporation ponds, at 1900 ML without liner and 1600 ML with liner.
- It is predicted that the saline seepage from the TSF would migrate up to 850 m from the edge of the TSF by 50 years after commencement of mining, for an unlined TSF, or 800 m for a clay-lined TSF.
- Effective lateral groundwater velocities of the seepage, at the outer edge of the TSF or ponds, is predicted to be 5 to 10 m/year, for both lined and unlined cases, compared with natural groundwater velocities of around 0.1 m/year.

The Golder study makes no comment on the quality of the TSF seepage water, other than that it would be saline, but probably of better quality than the tailings input solution or tailings pore water, due to natural mixing/retardation and adsorption effects (BRM, 2001).

BRM (2001) also states that the seepage flow will be *"… controlled by the mean permeability"*. This would be true if there are no zones or lenses of enhanced permeability that extend for some distance from the TSF area. Such zones of enhanced permeability could allow migration of seepage to greater distances than predicted by use of mean values of permeability. It is unlikely that any bedrock fracture zones would extend for significant distance, but permeable zones within the paleochannel sediments (either above or below the existing water table) could be quite extensive.

The Golder modelling (Golder, 2000a and 2000b) and sensitivity modelling (BRM, 2001) indicate that the presence of enhanced permeability in the paleochannel sediments would only be of possible concern in the case described as "Upper Bound Permeability" [Figures 5 and 6, BRM (2001)]. This case assumes a clay liner permeability 10 times higher, and underlying weathered rock profile 10 times higher, than the base case. All other model

runs suggested that the seepage plume would not have migrated as far as the main paleochannel even after 50 years.

It is therefore considered to have a low probability of occurrence. Nevertheless, because the existing licensed bores in the region [Figure 2 of BRM (2001)] are predominantly located in the paleochannel environments, it is recommended that BRM's monitoring bore network include appropriate paleochannel bores to allow early detection of any more rapid seepage migration towards the paleochannels.

Further, the modelling has predicted the fate of seepage for up to 50 years, but no comment is made about longer time periods. Based on the base case modelling results, the rates of migration are expected to be so slow that long term effects can be safely ignored. However, in the event that preferred flowpaths of higher permeability are present, longer-term effects may become important. Once again, this requires that BRM establish and maintain appropriate monitoring of seepage around the TSF and evaporation pond facility, so that the model predictions can be verified.

3.6 Conclusions Concerning the Mine and Processing Facility Hydrogeology

Notwithstanding that some seepage from the TSF and evaporation pond areas is expected to reach the groundwater and migrate away from these facilities, I consider the proposals for the Mine and Processing Facility to have a generally low potential for impact on the region's groundwater resources.

4. Limestone Quarry and Other Project Facilities

The limestone quarry and other proposed facilities are considered to have minimal potential for groundwater impact.

5. References

Australian and New Zealand Environment and Conservation Council (ANZECC), 1992. *Australian Water Quality Guidelines for Fresh and Marine Waters.* November 1992.

Black Range Minerals Ltd, 2000. *Syerston Nickel Cobalt Project, Environmental Impact Statement*, October 2000. Prepared by Resources Strategies for BRM.

Black Range Minerals Ltd, 2001. *Syerston Project EIS, Tailings Facility Response, January 2001.* Letter report prepared by BRM.

Coffey Geosciences Pty Ltd, 2000. *Black Range Minerals NL, Syerston Nickel Project Water Supply Study, Warroo, NSW*, September 2000. Consulting report prepared for BRM.

Golder Associates Pty Ltd, 2000a. *Regional and Local Hydrogeological Impacts of the Proposed Syerston Nickel Mine, Fifield NSW*, March 2000. Consultant report prepared for BRM.

Golder Associates Pty Ltd, 2000b. *Hydrogeological Impacts of the Tailings Storage Facility of the Proposed Syerston Nickel Mine, Fifield NSW*, March 2000. Consulting report prepared for BRM.

McDonald and Harbaugh, 1988. *A Modular Three-Dimensional Finite-Difference Groundwater Flow Model*. Techniques of Water Resources Investigations, Chapter 6. USGS, 1988.

APPENDIX 3

7.9 *Pipeline Environmental Management Plan*

(a) Prior to construction commencing, the Applicant shall prepare a **Pipeline Environmental Management Plan (PEMP)** in consultation with DLWC, FSC, LSC, PSC, and the satisfaction of the Director-General.

(b) The PEMP shall include but not be limited to:

(i) soil landscape maps for the routes of the natural gas pipeline and the water supply pipelines;
(ii) maps of the pipeline routes at a suitable scale that clearly shows the pipeline routes and landscape features such as watercourses, floodplains, topographical features, etc;
(iii) details of the watercourses to be crossed by the pipelines and nomination of those crossings to be bored and alternative techniques for the crossing of the other watercourses;
(iv) Details of the potential environmental impacts associated with hydrostatic testing and commissioning of the pipelines and methods for mitigating impacts.
(v) Evidence that the Applicant has consulted with affected service authorities and made arrangements satisfactory to those authorities for the protection or relocation of services affected or crossed by the pipelines.
(vi) Erosion control measures during construction including details of temporary sediment and erosion control systems to be used during construction, topsoil management and measures for the protection of watercourses.(refer Condition 3.5)
(vii) Water management proposals during construction including separation of clean and dirty water runoff, and contingency plans for managing adverse impacts on surface and groundwater during construction.
(viii) Details of rehabilitation proposals for disturbed areas (refer Condition 3.6).
(ix) Proposals for on-going maintenance of fences and pastures and control of weeds, vermin, and feral animals.
(x) Measures for the control of dust during construction.
(xi) Details of landscaping and measures to blend surface structures with the surrounding landscape.
(xii) Preparation of a **Flora and Fauna Management Plan** for construction consistent with the requirements of Condition (3.4). This plan shall include, but not be limited to :

- details of native vegetation to be cleared,
- measures to minimise vegetation clearance, particularly in road reserves
- measures for the retention of mature trees where feasible,
- details of vegetation clearance protocols during construction, including progressive clearing where practicable, maximum harvesting of cleared timber resources, recycling or disposal of other non-harvestable parts,
- proposals for avoidance of the gilgai areas at Site 23 (as identified in the EIS), on the natural gas pipeline route when constructing the pipeline to prevent potential damage to the local population of the threatened Austral Pillwort.
- measures for the protection of the population of the Club Leaves Phebalium at Site 23a on the natural gas pipeline.
- proposals for minimising impacts on the Myall alliance community on the natural gas pipeline route and significant remnants of box-pine woodland from Sites 9 to 11a (as identified in eth EIS) on the water supply pipeline route.
- rehabilitation measures

(xiii) Preparation of an **Archaeological and Cultural Management Plan** for construction consistent with the requirements of Condition (3.3). The Applicant must also ensure that the following matters are included in respect of the site

known as Humbug CS1 (as identified in the EIS) located on the natural gas pipeline;

a. construction of the natural gas pipeline shall be confined to a construction corridor, as identified in the EIS, defined by a line 10 metes to the west of the current bridge crossing and a by a line 5 metres parallel to and east of the existing side track, but the pipeline should preferably cross between the bridge and the sidetrack.
b. The natural gas pipeline shall also be laid in the existing graded profile of the road at 75 metres south and at least 50 metres north of the bridge
c. The east-west boundaries of the creek crossing and the break between the graded and natural surfaces (south and north of the bridge) shall be clearly identified by way of temporary flagging and no plant, vehicles, material dumps or construction facilities shall be allowed outside the flagging
d. A representative of the Condobolin Local Aboriginal Land Council or the Wiradujuri Branch of NSW Aboriginal Land Council should be on site to monitor earthworks for the pipeline within the north-south approaches to the bridge described above.

(xiv) Measures for minimising noise during construction including:

- Construction hours,
- compliance standards;
- community consultation;
- complaints handling monitoring/system;
- site contact person to follow up complaints;
- mitigation measures;
- the design/orientation of the proposed mitigation methods demonstrating best practice;
- contingency measures where noise complaints are received;
- monitoring methods and program

(xv) Measures to be undertaken during blasting including the matters described in Condition 6.2.3).

(c) A copy of the PEMP, , shall be forwarded to FSC, LSC and PSC within 14 days of approval by the Director-General, EPA and DLWC.

(d) Detailed designs of the stream crossings crossed by pipelines are to be approved by NSW Fisheries prior to construction, where disturbance of the river bed will occur.

(e) The Applicant shall replant two trees for every tree removed as a result of the pipeline development.

(f) [1] The water pipeline located in the Lachlan, Parkes and Forbes Shires shall have a minimum depth to obvertat all locations of 500 millimetres. All excavations in roads shall be fully reinstated to prevent settlement. Suitable marking of the pipeline showing the location, depth, and contact details for pipeline information, shall be installed at 250 metre intervals and at all points of direction change.

(g) [2] Gas pipelines shall be installed to a minimum of Australian Standard AS2885 – Pipelines – Gas and Liquid Petroleum and all relevant statutory requirements. All excavations in roads shall be fully reinstated to prevent settlement. Suitable

[1] LSC, PSC, FSC General Terms of Approval
[2] LSC, PSC, FSC General Terms of Approval

marking of the pipeline showing the location, depth, and contact details for pipeline information, shall be installed at 250 metre intervals and at all points of direction change.

(h) [3]The Applicant shall inspect pipeline trenches monthly for 12 months after construction to identify and reinstate any settlement, in consultation with LSC, PSC and FSC. Identified settlement on public roads or private property accesses shall be reinstated as soon as practicable after identification.

(i). [4]The Condobolin Local Aboriginal Land Council or the Wiradjuri Branch of the New South Wales Aboriginal Land Council (whichever is the more local group at the time of application) be invited to collect the isolated artefacts prior to construction commencing.

[3] LSC, PSC, FSC General Terms of Approval
[4] NPWS GTAs

Appendix 4

Please note

Appendix 4 does not appear in this electronic version of the assessment report.

To view or obtain copies, contact the Deparment of Urban Affairs and Planning's Development and Infrastructure Assessment branch on 02 9391 2056.

Appendix 5

SUMMARY OF CONDITIONS FOR SYERSTON

OVERVIEW

The recommended Conditions of Consent provide for:

- preparation of 22 Management plans which will contain the detail of the management and mitigation measures for potential impacts from the proposal, particularly for air quality and water issues;
- water bore impact mitigation/compensation;
- preparation of a road maintenance agreement with the local councils for roads that are to be used by traffic to the project site, and a number of road upgrade requirements;
- preparation of a traffic code of conduct to ensure that all haulage vehicles conform to designated haulage routes and other behavioural and operational requirements.
- independent noise and dust monitoring, and acquisition where relevant noise/dust limits are demonstrated to be exceeded;
- establishment of a complaints management mechanism to ensure appropriate management of complaints;
- establishment of a Community Consultative Committee for community input to the operation and management of the mine;
- requirement for an Annual Environmental Management Report for an annual review of the performance of the mine
- an Independent Environmental Audit to be conducted every 3 years to review the performance of the mine and assess compliance with the consent conditions.
- contributions for a community enhancement fund

Environmental Management Plans

The conditions of consent require the Applicant to prepare 22 management plans relating to issues such as air quality (gaseous emissions and dust), surface and ground water management (including the water borefields), noise, erosion and sediment control, land management, landscaping, flora and fauna, archaeology and cultural heritage, and stock routes.

These plans contain the detail of the management and mitigation measures for these issues to be undertaken by the applicant. The plans are to be approved by the Director-General of DUAP in consultation with the relevant government authorities prior to either construction or operation of the Nickel/Cobalt Project.

An Environmental Management Strategy for the project components is also to be prepared by the applicant which is to give a broad overview of the management plans and their inter-relationship.

Gaseous Emissions

The Applicant is to prepare a gaseous emissions management plan detailing measures to minimise impacts on local and regional air quality, and the project must operate within specified concentration limits and comply with strict monitoring requirements.

Water Management

The Applicant is required to prepare a Water Management Plan which will include details of the management procedures to be implemented to protect or maintain the quality of surface and ground water, and a comprehensive water monitoring program. The Applicant is also required to prepare a Bore Impact Mitigation Plan (BIMP) for potential impacts from the use of the water borefield on private landowners' bores. The plan is to detail mitigation/compensatory measures which include provision for bore/well reconditioning, additional energy costs, alternative water supplies, and provision for private agreements between the company and affected landholders to be established. The BIMP will also detail

monitoring programs, and provide for an independent dispute resolution process if agreement cannot be reached regarding any proposed mitigation measures in accordance with the plan. Additionally, the Applicant is required to provide a replacement water supply for any impacts on private landowners' water bores from the mine/quarry operation.

Road construction and maintenance

The conditions recommend that the Applicant is required to fund the construction/upgrade of specified public roads to be used by mine generated traffic and enter into a road maintenance agreement with the relevant local Councils (Lachlan, Parkes and Forbes) for roads that are likely to be used by traffic to the project site. The key roads to be upgraded include the road between the mine site and rail siding (Fifield-Trundle Road), with a by-pass to be constructed around Fifield village, the Middle Trundle Road in Parkes Shire, and various roads in the Lachlan Shire between Condobolin and the mine site, including the Springvale Road.

Traffic Code of Conduct

The Applicant is to prepare a Traffic Code of Conduct for all haulage vehicles associated with the Syerston project. This Code shall include that operators conform to the designated haulage routes, including a clear stipulation that MR354 shall not be used by haulage vehicles; abide by hours of operations and speed limits; maintain vehicles to a satisfactory standard, and exercise certain protocols in relation to school bus operations.

Noise/dust management including acquisition and independent monitoring

No properties are required by the conditions to be acquired up-front as noise and dust limits are predicted to be below the relevant acquisition criteria at all non-mined residences. The consent conditions however enable any private landowner to request independent monitoring should they consider that noise or dust emissions from the mine is in excess of the consent condition noise/dust criteria at their dwelling. If the independent monitoring demonstrates that the noise/dust levels are consistently above the relevant noise/dust acquisition criteria, the applicant is to purchase the property, if requested by the landowner.

Management of complaints

The consent conditions provide mechanisms which require the applicant to adequately manage complaints received from the community. The applicant is required to undertake various actions if complaints are received. These impacts may be identified through the independent monitoring process outlined above. Where impacts from the mine are identified the applicant has to undertake mitigation measures to reduce noise/dust to an acceptable level.

The conditions also require the applicant to put in place complaint handling procedures requiring the establishment and maintenance of a system for recording complaints on a dedicated publicly advertised telephone line, 24 hours per day, 7 days a week, and ensuring that an initial response is provided to the complainant within 24 hours.

Community Consultation

The consent conditions require the establishment of a Community Consultative Committee for the proposal. The Committee is to comprise two representatives of the Applicant, one from each Council and four community representatives (2 from Lachlan Shire, 1 from Forbes Shire and 1 from Parkes Shire). The Committee will be chaired by an independent chairperson appointed by the Director-General. The Committee may make comments and recommendations about the preparation and implementation of the environmental management plans, monitor compliance with the consent conditions and other matters relevant to the operation of the mine. The Applicant is to consider the recommendations and comment of the committee and provide a response to the Committee and Director-General of DUAP.

Community consultation is also required in the handling of complaints, as outlined above.

Reporting and Independent Auditing

The conditions require the Applicant to provide an Annual Environmental Management Report to the Department which is to review performance of the mine against the consent conditions, and other licences and approvals relating to the mine. In addition, an Independent Environmental Audit is to be undertaken at the expense of the applicant to essentially assess compliance with the consent conditions and other approvals, and assess the development against predictions made in the EIS. The Audit is to be undertaken by a duly qualified independent person approved by the Director-General.

Community Enhancement Contributions

The conditions provide that the Applicant is to contribute an indexed minimum of $300,000 per annum for 15 years from the commencement of construction to a Community Enhancement Fund. This fund is to be implemented equitably across the three LGA's (Lachlan, Parkes and Forbes Shires), taking into account the nexus with the project impacts. The conditions also require the preparation of a Community Enhancement Plan by the Applicant in consultation with the three councils. The plan is to be submitted to the Director-General for approval and which will describe how the funds are to be deployed. The Plan is to be reviewed every three years in consultation with the Councils. The three Councils have agreed with the community enhancement provisions.