Cawse Nickel Project, 50 km north-west of Kalgoorlie

Centaur Mining and Exploration Limited

Report and recommendations
of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
Bulletin 825
July 1996

THE PURPOSE OF THIS REPORT

This report contains the Environmental Protection Authority's environmental assessment and recommendations to the Minister for the Environment on the environmental acceptability of the proposal.

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

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

APPEALS

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

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

ADDRESS

Hon Minister for the Environment
12th Floor, Dumas House
2 Havelock Street
WEST PERTH WA 6005

CLOSING DATE

Your appeal (with the $10 fee) must reach the Minister's office no later than 5.00 pm on 26 July 1996.

Environmental Impact Assessment Process Timelines

Date	Timeline commences from receipt of full details of proposal from proponent for public review	Time (weeks)
25/3/96	Proposal document released for public comment	
22/4/96	Public comment period closed	4
7/5/96	Issues raised during public comment period summarised by EPA and forwarded to the Proponent	2
14/5/96	Proponent response to the issues raised received	1
10/7/96	EPA reported to the Minister for the Environment	8

ISBN. 0 7309 5791 8
ISSN. 1030 - 0120

Assessment No.1001

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Summary and recommendations

This report and recommendations provides the Environmental Protection Authority's advice to the Minister for the Environment on the environmental factors relevant to the proposal by Centaur Mining and Exploration Limited (the proponent) to develop the Cawse Nickel Project.

The proposed nickel/cobalt ore mining and processing operation is located approximately 50km north west of Kalgoorlie, in Western Australia. The project involves the establishment of open cut mine pits, a processing plant and associated infrastructure. The project will produce refined products of nickel and cobalt.

A number of environmental topics generated by the proposal were considered by the Environmental Protection Authority (EPA). From these, the EPA has identified the major environmental issues requiring detailed evaluation as:

- impact on locally and regionally significant vegetation associations, Declared Rare and Priority flora;
- impact on Threatened and Priority fauna species and animal habitats;
- impact on the water table due to the extraction of groundwater;
- solid and liquid waste disposal (tailings dam);
- protection of groundwater quality from lakes forming in the mined out pits;
- gaseous emissions (including greenhouse gases and odours);
- noise;
- on-going environmental management; and
- the rehabilitation and decommissioning of the project.

The EPA considers that the major environmental issues identified during the assessment could be adequately managed through the proposal design and the proponent's environmental management commitments, in conjunction with approvals required from other agencies such as Department of Minerals and Energy, Water and Rivers Commission and the Department of Environmental Protection.

The EPA has concluded that, due to uncertainty regarding the development and performance of the tailings storage facility and in particular the long term management of leakage, potential for rehabilitation and decommissioning, the proponent should report on the development, operation and monitoring of the facility within five years following commencement of its operation.

The EPA also considers that the proponent should use all reasonable and practicable measures to minimise the discharge of wastes including gaseous emissions. In addition, a rehabilitation and decommissioning strategy should be developed as early in the project life as possible, so that rehabilitation can be best integrated with project planning.

Following evaluation of the environmental issues, the EPA has concluded that the proposal can be managed to meet the EPA's objectives subject to the proponent's commitments, and the conditions and procedures recommended in this assessment report.

Recommendation No.	Summary of recommendations
1	That the proposal can be managed to meet the EPA's objectives, subject to the successful implementation of the proponent's commitments and the EPA's recommended conditions and procedures.
2	That after five years the proponent should report on the development and performance of the tailings storage facility to the Environmental Protection Authority.

3	That the proponent include consideration of greenhouse gas emissions in the Environmental Management Plan to be prepared under Commitment 1.
4	That the proponent be required to prepare and implement a plan which describes the process for decommissioning and rehabilitation of the lease and which manages ground and surface water systems affected by the tailings storage facility, including development of a 'walk away' solution.
5	That, if the Minister provides environmental clearance that the proposal may be implemented, that clearance be subject to the Conditions set out in Section 6 of this report.

1. Introduction and background

1.1 Purpose of this report

This report and recommendations provides the Environmental Protection Authority's advice and recommendations to the Minister for the Environment on the environmental factors applicable to the proposal to develop a nickel/cobalt ore mining and processing operation 50km north west of Kalgoorlie and 9km east of Ora Banda.

1.2 Background

Centaur Mining & Exploration Limited (Centaur) is the nominated proponent for the project. Centaur proposes to develop a nickel/cobalt project involving open cut mining of a lateritic nickel deposit at an initial rate of approximately 1 million tonnes per annum (Mtpa) to a maximum depth of 60 metres. The mined ore will be beneficiated to produce approximately 500,000tpa of concentrate for processing. These mining and processing rates may be increased in the future to 2Mtpa and 1Mtpa, respectively, as processing plant modifications are made and operational efficiencies are achieved. This proposal also includes provision for the proposed processing plant to be duplicated to an ultimate capacity of 2Mtpa. A coincident mining rate of 4Mtpa would be required to sustain this processing rate. Processing of the concentrate will include high pressure acid leaching, purification and nickel/cobalt metal recovery. Mining and processing are expected to be conducted over a period of at least 20 years. This may vary depending on the rate of processing and extension of ore reserves.

In January 1996, the proponent referred the project to the Environmental Protection Authority which set the level of assessment at Consultative Environmental Review. Figure 1 is a location map for the project.

1.3 Structure of this report

This report is divided into 7 sections.

Section 1 introduces the report by stating its purpose, describing the historical background to the proposal and its assessment, and outlining the structure of the report.

Section 2 summarises the proposal. The proposal is described in more detail in the proponent's Consultative Environmental Review (Woodward-Clyde, 1996)

Section 3 explains the method of assessment and provides a summary of the topics raised through the setting of guidelines and in public submissions. From these topics and others raised throughout the assessment process, those considered to be issues that require further evaluation by the Environmental Protection Authority are identified. A table summarising this process is provided (Table 2).

Section 4 sets out the evaluation of the environmental issues associated with the proposal. Each issue is dealt with in its own subsection, which initially states the objectives of the assessment for that issue. The relevant Environmental Protection Authority policy is stated and any technical information is provided. Comments from key agencies/interest groups are summarised, and the proponent response is presented. No submissions from the public were received. The subsection on each issue is concluded with the Environmental Protection Authority's evaluation in terms of achieving the stated objectives.

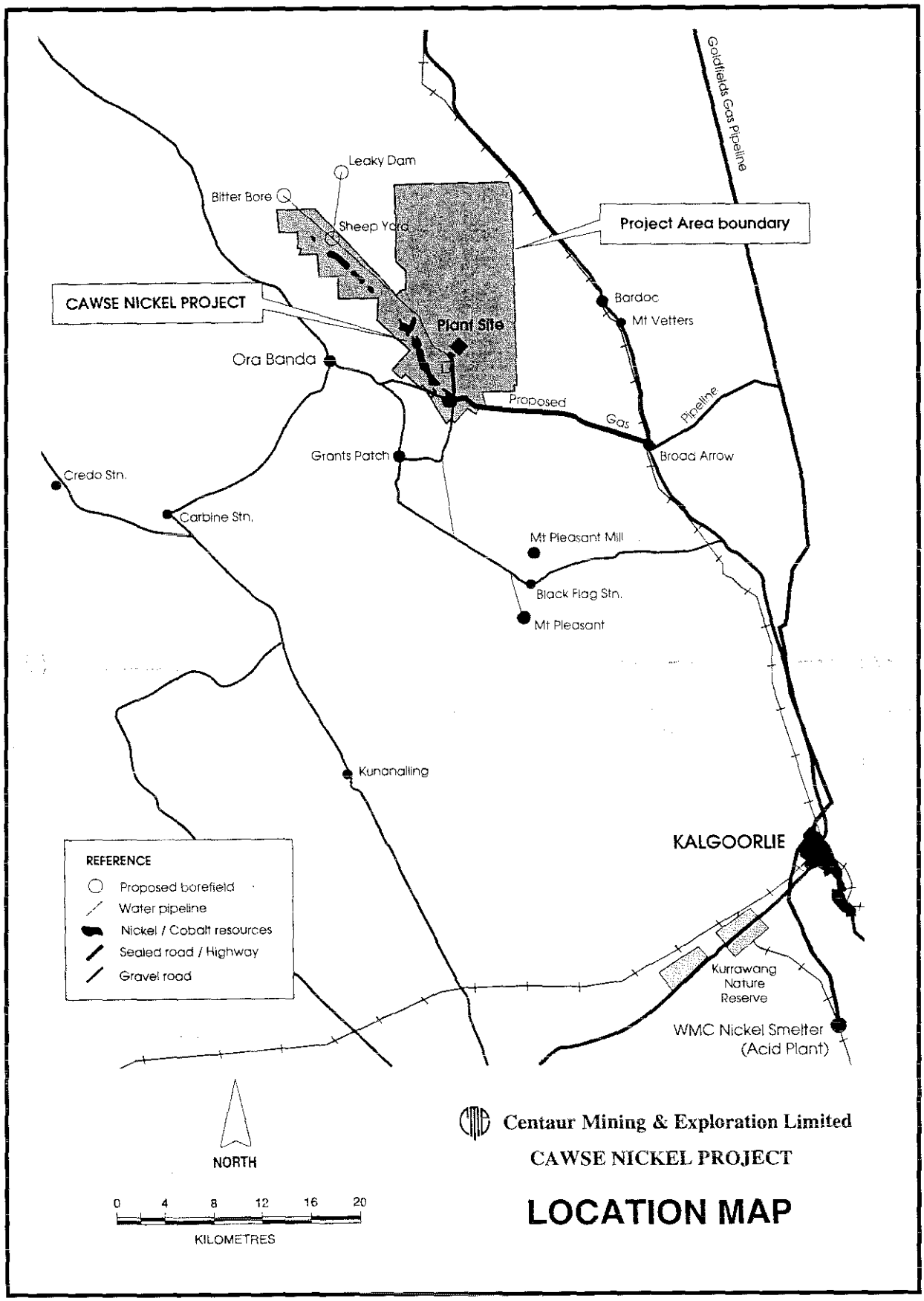


Figure 1. Location map (from Woodward-Clyde, 1996)

Section 5 summarises the conclusions and recommendations and includes a table summarising the evaluation of the environmental issues (Table 4). Section 6 describes the recommended environmental conditions. References cited in this report are provided in Section 7.

2. Summary description of the proposal

Centaur (Woodward-Clyde, 1996) indicate that the major components of the Cawse Nickel Project comprise:

- open-cut nickel-cobalt ore mining operations;
- a processing plant comprising:
  - ore pre-treatment facilities;
  - acid leaching process;
  - a neutralisation and clean-up process;
  - a mixed nickel/cobalt sulphide precipitation process (option to stop processing at this point and sell a nickel/cobalt sulphide precipitate to existing refineries);
  - an ammonia re-leach circuit; and
  - solvent extraction and electrowinning to produce cobalt sulphide and nickel metal.
- water supply borefields;
- solid and liquid waste disposal facilities (including a tailings dam and overburden stockpiles);

These mining and processing operations would be supported by:

- supply of sulphuric acid from the Western Mining Corporation's Nickel Smelter (rather than establishing an acid plant on-site and importing sulphur);
- a hydrogen sulphide plant (although no decision has been made by Centaur, the option to produce nickel/cobalt sulphide precipitate, identified above, would require development of a H_2S plant.)
- a gas supply pipeline and gas power station;
- on-site fuel and chemical storage facilities;
- product and raw materials handling systems;
- administration, plant support and plant control facilities;
- mine access road (approximately 5km) and haul roads (approximately 12km); and
- a construction workforce who will be accommodated in Kalgoorlie.

A detailed project description is provided in Section 2.0 of Centaur's Consultative Environmental Review (Woodward-Clyde, 1996). Key project characteristics provided in the CER, are indicated in Table 1.

3. Identification of environmental issues

3.1 Method of assessment

The purpose of the environmental impact assessment is to determine the environmental factors relevant to a proposal and to formulate conditions and procedures to which the proposal should be subject, should it proceed.

A set of administrative procedures has been identified (refer to flow chart in Appendix 1) in order to implement this method of assessment.

The first step in the method is to identify the environmental topics to be considered. A list of topics (or possible issues) was identified by the DEP, on behalf of the EPA, through the preparation of guidelines.

Table 1. Summary of project characteristics (from Woodward-Clyde, 1996)

Project Aspect	Initial Mining and Process Rate	Potential Expansion Duplication
Mining Rate	1-2 Mtpa	2 - 4 Mtpa
Average Stripping Ratio	1:1 - 6:1	1:1 - 6:1
Average Nickel Ore Grade	1.0 - 1.5%	1.0 - 1.5%
Beneficiation Throughput	1 - 2Mtpa	2 - 4Mtpa
Beneficiated Concentrate	500,000tpa - 1Mtpa	1 - 2Mtpa
Acid Leach Throughput	500,000tpa - 1Mtpa	1 - 2Mtpa
Workforce	170 - 200	250
Mine Pits (cumulative area of multiple mine pits)	517ha*	517ha*
Maximum Depth of Pits	60m	60m
Tailings Storage Facility (12 month starter embankment)	25ha	25ha
Final Tailings Storage	100ha	100ha
Water Requirement	4,700 - 6,000kL/day	6,000 - 12,000kL/day
Process Water Quality	30,000 - 60,000 ppm TDS	30,000 - 60,000 ppm TDS
Nickel Production	8,000 - 15,000tpa	15,000 - 30,000tpa
Cobalt Production	1,000 - 2,000tpa	1,000 - 2,000tpa

* Also includes overburden storages associated with some of the pits. It is important to note, however, that a large proportion of overburden will be returned to the mined out pits. This will substantially reduce the estimated area of disturbance (Woodward-Clyde, 1996).

These topics are then considered by the proponent in the Consultative Environmental Review both in terms of identifying potential impacts as well as making project modifications or devising environmental management strategies.

The CER was then reviewed to ensure that each topic had been discussed in sufficient detail prior to its release for public and government agency comment. The proponent's CER was available for public review for four weeks between 25 March 1996 and 22 April 1996, during which seven submissions were received.

Following completion of the public review period, the responses received were summarised by the Department of Environmental Protection. This process can raise additional environmental topics to be considered by the proponent.

Centaur was invited to respond to matters raised in the summary of submissions. Appendix 2 contains the summary of the submissions and the proponent's response to those submissions. The list of submitters is included in Appendix 3.

Seventeen environmental topics varying in significance have been identified. The EPA considers all the topics and identifies those that are considered to be issues of environmental significance that require further evaluation by the EPA. The remaining topics can be addressed through the processes of other agencies or are no longer relevant to the proposal.

For each environmental issue, the environmental impacts of the proposal, and the proponent's environmental management commitments, were evaluated in the context of the EPA's assessment objective and relevant policy and technical information. The complete list of the proponent's consolidated environmental management commitments is included in Appendix 4 of this report. If the commitments achieve the assessment objectives, there is no need for the EPA to make recommendations to the Minister for the Environment on that issue, otherwise the EPA may recommend conditions and procedures necessary to achieve the EPA's objectives. Where the proposal has unacceptable environmental impacts, the EPA can advise the Minister for the Environment. The Minister for the Environment determines whether the proposal should proceed and under what conditions.

Limitation

This evaluation has been undertaken using information currently available. The information has been provided by the proponent in the CER and supplementary documentation, by DEP officers utilising their own expertise and reference material, by utilising expertise and information from other State government agencies, information provided by members of the public and contributions from EPA members.

The EPA recognises that further studies and research may affect the conclusions. Accordingly, the EPA considers that if the proposal has not substantially commenced within five years of the date of this report, then such approval should lapse. After that time, further consideration of the proposal should occur only following a new referral to the EPA.

3.2 Public and agency submissions

Comments were sought on the proposal from the public, interest groups and local and State government agencies. During the public review period seven (7) submissions were received. A summary of these submissions was forwarded to the proponent for their response (Appendix 2). Of the seven submissions received, 6 were from State government agencies and 1 from a local government agency.

The principal topics of concern raised in the submissions were:

Biophysical Impacts

- changes to groundwater levels (supply);
- potential impacts on surface water systems;
- impact on vegetation communities;
- impact on fauna;

Pollution Potential

- management of wastes and emissions (especially sulphur dioxide);
- disposal of tailings;

Social Surroundings

- impacts on Aboriginal heritage;
- road transportation;

Other

- Environmental Management Programme and appropriate monitoring; and
- decommissioning and rehabilitation.

The EPA has considered the submissions received and the proponent's response in its evaluation of Centaur's proposal.

3.3 Review of topics

3.3.1 Identification of topics

Seventeen topics were raised during the environmental impact assessment process including those topics identified in the guidelines for the CER, subsequent consultations and the submissions described above. The topics are as follows:

Biophysical Impacts

- loss of land systems;
- changes to landform;
- impact on locally and regionally significant vegetation associations, Declared Rare and Priority flora;
- impact on Threatened and Priority fauna species and animal habitats;
- impact on surface water;
- impact on the water table due to the extraction of groundwater (supply);

Pollution Potential

- solid and liquid waste disposal (tailings dam);
- protection of groundwater (quality);
- disposal of waste (excluding tailings dam);
- gaseous emissions (including greenhouse gases and odours);
- dust;
- noise;

Social Surroundings

- Aboriginal heritage;
- risks and hazards;
- transportation issues;

Other

- Environmental Management Programme;
- decommissioning and rehabilitation.

The EPA has evaluated the above topics and considers that a number of them can be managed by the proponent in accordance with their environmental management commitments and in compliance with Department of Environmental Protection regulations and guidelines or through approvals required from other agencies (see Table 2). Each topic is discussed below in order to identify those issues warranting further evaluation by the EPA.

3.3.2 Identification of issues requiring EPA evaluation

Biophysical Impacts

Loss of land systems

Centaur (Woodward-Clyde, 1996) estimate that the development of the project, which lies within the Coolgardie Plateau of the Coolgardie Region physiographic unit, will disturb up to 637ha of land.

Impacts to land systems are reduced through a range of management measures such as protecting vegetation, reducing erosion potential, managing surface drainage, return of overburden to previously mined pits, and rehabilitation of disturbed areas. The general management principles and practices required to reduce impacts to land systems are common for most mining operations and are included in a number of other topics discussed. Factors which help to reduce the loss of land systems, such as project design, mine planning and management are inherent in the project's Environmental Management Programme which are evaluated in Section 4.8 of this report.

Separate evaluation of this topic by the Environmental Protection Authority is not required.

Changes to landform

Changes to the landform will result from the mine pits, initial overburden storage area, ore stockpiles, borrow pits, tailings storage facility and other mining and processing infrastructure. The proposal involves the mining of multiple ore bodies using conventional open-pit techniques. Mining of the nickel laterite resource will result in open pit mining to a maximum depth of 60m below ground level.

The Department of Conservation and Land Management has commended Centaur's proposal to minimise out-of-pit dumping. The potential impacts of changes to landforms are reduced through a range of management measures such as protecting vegetation, reducing erosion potential, managing surface drainage, return of overburden to previously mined pits, and rehabilitation of disturbed areas. The general management principles and practices required to reduce changes to landform are common for most mining operations and are included in a number of other topics discussed. For example, factors which help to keep the loss of landform to a practical minimum, such as project design, mine planning, rehabilitation and management are inherent in the project's Environmental Management Programme and in the decommissioning and rehabilitation of the project. These issues are evaluated in more detail in Section 4.8 and 4.9 of this report.

Separate evaluation of this topic by the Environmental Protection Authority is not required.

Impact on locally and regionally significant vegetation associations, Declared Rare and Priority flora

The establishment of the Centaur Nickel project would impact on vegetation and flora through:

- direct loss and degradation by land clearance and landform modification (up to 637ha);
- changes to surface drainage characteristics which may result in the 'shadowing' of some vegetation;
- changes to groundwater availability as a result of dewatering for mining;
- introduction of weeds, pests and diseases; and
- increased incidence of fire associated with increased human activity.

The general management principles and practices required to reduce impacts to vegetation are common for most mining operations and are included in a number of other topics discussed. For example, factors which help to reduce the loss of vegetation, such as project design, mine planning, management of surface drainage, rehabilitation and management are inherent in the project's Environmental Management Programme and in decommissioning and rehabilitation aspects of the project. These issues are evaluated in more detail in Section 4.8 and 4.9 of this report.

A number of plant communities were defined and mapped for the project area of which two are considered to be locally significant, and are possibly regionally significant, while another three are locally significant. CALM indicated its desire to have an input into the development of the EMP with regard to future management of vegetation communities noted in the CER as regionally and locally significant.

This topic has been identified as an issue requiring evaluation by the Environmental Protection Authority.

Impact on Threatened and Priority fauna species and animal habitats

The development of the mine pits, overburden disposal areas, tailings dam, evaporation pond and establishment of the processing plant and mine infrastructure will require clearing and disturbance to fauna habitat.

The proponent indicates that the project area has no exceptional regional or local qualities or unusually distinctive suites of fauna. CALM has advised that no indication is given in the CER of the survey effort for vertebrate fauna. A feral animal control programme and reporting of fauna deaths from road traffic impacts are also considered by CALM as relevant. The Department of Minerals and Energy (DME) suggests that methods for discouraging fauna from utilising the tailings storage facility should be investigated.

This topic has been identified as an issue requiring evaluation by the Environmental Protection Authority.

Impact on surface water systems

The introduction of landform changes discussed above, particularly land disturbed by mining (up to 517ha) and the tailings storage facility (up to 100ha), will modify surface drainage characteristics.

The proponent indicates that most of the project area including the mine, processing plant and tailings storage facility, is located at higher points in the landscape where natural drainage lines are well defined. Drainage lines which are interrupted by the proposed development will be diverted around the facilities and directed to re-enter the natural drainage system clear of the developed areas. Where it is not possible to avoid disturbance to natural drainage lines the proponent will develop and implement a site drainage and monitoring programme, as part of both construction and operational stages of an Environmental Management Programme (Commitment 2).

The general management principles and practices required to reduce impacts on surface water systems are included in the project's Environmental Management Programme which is evaluated in more detail in Section 4.8 of this report.

Separate evaluation of this topic by the Environmental Protection Authority is not required.

Impact on the water table due to the extraction of groundwater

The extraction of water from borefields for project use, (up to 6,000kL/day at a processing rate of 500,000tpa) will impact upon groundwater levels and may adversely affect water supply for other users (eg: pastoralists) and the environment.

State government agencies expressed concern at the adequacy of groundwater resources in the region to provide the process water requirements for the project. The Water and Rivers Commission (WRC) indicated that Centaur needs to look for another palaeochannel and that, as a result, further information is required.

This topic has been identified as an issue requiring evaluation by the Environmental Protection Authority.

Pollution potential

Solid and liquid waste disposal (tailings dam)

A tailings storage dam will cover a surface area of approximately 100ha after 20 years of operation of the project based on the initial 20Mt of proven ore reserves. The proponent indicates (Woodward-Clyde, 1996) that the tailings storage facility has been designed and will be constructed to minimise the potential for seepage of process water into the surrounding environment.

Government submissions commented on the lack of information on the geotechnical aspects of the tailings dam. The potential for and management of leakage from the tailings impoundment, the prospects for rehabilitation and decommissioning are also issues of concern.

This topic has been identified as an issue requiring evaluation by the Environmental Protection Authority.

Protection of groundwater

The storage of materials and mining and processing operations, particularly disposal of slurry to the tailings dam, has the potential to pollute the groundwater.

The Water and Rivers Commission indicate that the project is located in an area of highly saline groundwater resources located at a depth in excess of 40m and that the threat posed by leakage of contaminants is to vegetation and stock dams. The Department of Environmental Protection notes that salty lakes could form, after mining has ceased, in those mine pits which have intersected the water table.

The primary concern in relation to the protection of groundwater is associated with the performance of the tailings dam and accordingly, this is discussed as a separate topic (see above).

Storage of hazardous materials and management of other wastes with the potential to pollute groundwater are managed through approvals required by the Department of Environmental Protection, Department of Minerals and Energy, Water and Rivers Commission, Health Department and Local Government Agency processes.

The impact of possible salinising lakes forming in the mined out pits is a topic which has been identified as an issue requiring evaluation by the Environmental Protection Authority.

Disposal of waste (not including tailings dam)

The construction and operation of the project will generate a number of different types of waste. Other than wastes associated with tailings and process water discussed above, the wastes of most concern include general wastes and overburden. The EPA notes that general wastes, such as waste oils, scrap metal, tyres, sewage etc, should be managed in accordance with the requirements of local government authorities and relevant government departments. This issue is therefore manageable within the context of existing regulatory requirements.

Waste rock and low grade ore will be initially deposited in dumps adjacent to the mining area. Infilling of the mined out pits will commence once mining has progressed to a point where sufficient space is available and the areas beneath the open pits have been proven not to have deeper sulphide mineralisation. Overburden material will then be returned directly to mined out sections of the pit and low grade ore will be placed on the surface for future recovery.

The return of overburden to the mined out pits is an initiative which is supported by the EPA. Where overburden is unable to be returned to the mined out pits it should be stabilised and rehabilitated to agreed specifications. The management of waste dumps for the proposal can be undertaken in an environmentally acceptable manner, through compliance with the requirements of the Department of Minerals and Energy.

Further evaluation of this topic by the Environmental Protection Authority is not required.

Gaseous emissions (including greenhouse gases and odours)

Gaseous emissions of environmental concern relating to the operation of the project are oxides of nitrogen and carbon dioxide emissions from the power station's reciprocating gas engines. Carbon dioxide emissions are also generated from neutralisation of the process stream by adding limestone. No sulphuric acid will be produced on site which would be a potential source of sulphur dioxide, nitrogen dioxide and carbon monoxide emissions. A hydrogen sulphide plant, if required, could be a potential source of gaseous emissions, primarily hydrogen sulphide and sulphur dioxide. The proponent has not decided whether such a plant is required at this stage.

State and local government submissions comment on the need for further clarification on emission rates. The City of Kalgoorlie-Boulder has requested that the Minister for the Environment re-assess the *Environmental Protection (Goldfields Residential Area) (Sulphur*

Dioxide) Policy 1992. The Policy establishes standards for sulphur dioxide in ambient air in the region.

This topic has been identified as an issue requiring evaluation by the Environmental Protection Authority.

Dust

Construction and operational mining activities, materials transport and handling, stockpiles and storage of ore, low grade dumps and limestone will generate dust. The nearest residence is located approximately 9km to the west of the project area.

Dust management measures will be included in the Environmental Management Programme to be prepared by the proponent to the satisfaction of the EPA. Dust associated with processing facilities would also be addressed within the Department of Environmental Protection's works approval and licensing provisions under the *Environmental Protection Act* (1986). The EPA believes that adequate controls exist under the pollution control provisions of the *Environmental Protection Act* (1986) to control dust should a problem arise.

Further evaluation of this topic by the Environmental Protection Authority is not required.

Noise

Adverse noise impacts are potentially associated with the development of any mining and processing proposal. Minor blasting will be necessary in some areas to shatter silica-rich layers prior to excavation. The nearest residence is Ora Banda which is located approximately 9km to the west of the project area. The next nearest residences are at Broad Arrow (13km) and Mount Vetters (14km).

Compliance with the Noise Abatement (Neighbourhood Annoyance) Regulations is a requirement. The EPA believes that adequate controls exist under the pollution control provisions of the *Environmental Protection Act* (1986) to control noise associated with the processing plant should a problem arise. However, there are currently no statutory regulations that govern road traffic noise.

This topic has been identified as an issue requiring evaluation by the Environmental Protection Authority.

Impact on Aboriginal Heritage

The proponent indicates that archaeological and anthropological site surveys were conducted over the Cawse Project area to identify any sites of significance to Aboriginal people and has discussed Aboriginal Heritage in section 3.7 of the CER. The project site is also located on land which is currently subject to two native title claims.

The proponent must comply with the provisions of the *Aboriginal Heritage Act* (1972) and native title claims are subject to an independent assessment by the Native Title Tribunal. Therefore, the EPA considers that the predicted impacts of the project on Aboriginal heritage values can be adequately managed through processes outside the *Environmental Protection Act* (1986).

Further evaluation of this topic by the Environmental Protection Authority is not required.

Risks and hazards

The proponent has indicated that a qualitative risk assessment has not been conducted at this stage in the project planning as significant off-site hazards have not been identified. Hazards associated with the project may be created by either the processing operations or by materials brought to the site such as fuels and chemicals. The project is situated in an isolated area where the nearest residences are located at Ora Banda, 9km to the west.

On-site hazards to the workforce will be managed in accordance with the occupational health and safety provisions of the *Mines Safety and Inspection Act, 1995.* All hazardous materials will be transported, stored and handled in accordance with the *Dangerous Goods Regulations, 1992.*

Hazard and operability studies (HAZOP) will be conducted as part of the detailed design and construction phases of the project. Details of these studies will be included in applications for Works Approval and Licensing. Risks and hazards have been adequately addressed by the proponent in Section 4.15 of the CER and would be managed through compliance with the requirements of the Department of Minerals and Energy.

Further evaluation of this topic by the Environmental Protection Authority is not required.

Transportation issues

The project will require the transport of personnel, process materials, fuel and equipment, and product to and from the site. The transport of raw materials and products during the operations phase may cause impacts through spillage of loads and will also increase heavy vehicle traffic volumes along local and regional road systems.

Main Roads Western Australia (MRWA) has indicated concerns with the capacity of the Broad Arrow-Ora Banda Road to accommodate the forecast traffic loads without major upgrading. In addition, the road route for transport of limestone (8 road train movements per day) has not been defined and MRWA is concerned regarding the level of risk posed by increased transportation of hazardous goods and considers a risk assessment should be undertaken. The City of Kalgoorlie-Boulder has indicated that the proponent will be required to upgrade the Ora Banda Road to a sealed standard from the Kalgoorlie Meekatharra Road intersection to the Cawse Nickel project site turnoff, to the satisfaction of the City Engineer.

These matters should be addressed by the local government authorities and relevant State government agencies such as Main Roads Western Australia in conjunction with the proponent.

Further evaluation of this topic by the Environmental Protection Authority is not required.

Other

Environmental Management Programme

The development of a mining and processing operation of this scale requires the implementation of a comprehensive programme of environmental management and monitoring to ensure that the impacts of the project are appropriately managed during all project phases.

Consideration of an adequate Environmental Management Programme requires Environmental Protection Authority evaluation.

Decommissioning and rehabilitation

The EPA has in past assessments recognised that rehabilitation management should not impose short or long term costs on the community of Western Australia. This is particularly important when the probable success of rehabilitation cannot be evaluated in the short to medium term.

The issue of decommissioning and rehabilitation requires Environmental Protection Authority evaluation.

3.3.3 Summary

Table 2 summarises the process used by the EPA to evaluate the topics raised during the environmental impact assessment process. The table identifies the topics, the relevant proposal characteristics, and comments received from specialist government agencies and the public. If a topic is considered environmentally significant it becomes an issue and is further evaluated by the EPA (as summarised in Table 4). Section 4 of this report provides the detail of this evaluation.

The issues identified in Table 4 as requiring further evaluation by the EPA are:

- impact on locally and regionally significant vegetation associations, Declared Rare and Priority flora;

Topics	Proposal characteristics	Government Agency Comments	Public comments	Identification of issues
Biophysical impacts				
Loss of land systems	Construction and operation of the project will result in the loss of land systems within the region.			Considered in the evaluation of the Environmental Management Plan - refer table 4 (Issue 8). Separate EPA evaluation not required.
Changes to landform	Multiple open cut mine pits, overburden disposal areas, borrow pits, processing plant, process residue storage facilities will change the existing landform.	**CALM**-the proposal to minimise out of pit overburden dumping is commended.		Considered in the evaluation of the Environmental Management Plan - refer table 4 (Issue 8). Separate EPA evaluation not required.
Impact on locally and regionally significant vegetation associations, Declared Rare and Priority flora.	Direct disturbance (up to 517ha) will impact upon vegetation. 2 Priority species are known to occur on the project site. No DRF species have been found. Some plant communities could be locally and/or regionally significant. Indirect impacts such as changes to existing drainage patterns could lead to changes in vegetation.	**CALM**-would like input into development of EMP re management of locally and regionally significant vegetation.		EPA evaluation required.
Impact on Threatened and Priority fauna species and animal habitats.	Mine pit development, overburden disposal areas, tailings dam and mine and processing infrastructure will require clearing and disturbance of habitat.	**CALM**-no indication is given of the survey effort; a feral animal control program may cushion some impact on native fauna, particularly if carried out over the 600km2 of contiguous tenements; report road kills to CALM at 3 monthly intervals. **DME**-methods for discouraging fauna from utilising the tailings storage facility should be investigated.		EPA evaluation required.

Table 2. Identification of issues requiring Environmental Protection Authority evaluation

Biophysical impacts				
Topics	**Proposal characteristics**	**Government Agency Comments**	**Public comments**	**Identification of issues**
Impact on surface water.	Mining and processing activities, such as location of tailings dam, evaporation ponds, mine pits, haul roads and associated infrastructure will impact upon surface flow characteristics.			Considered in the evaluation of the Environmental Management Plan - refer table 4 (Issue 8). Separate EPA evaluation not required.
Impact on the water table due to the extraction of groundwater.	The extraction of water (up to 6000m^3 initially and potentially up to 12,000m^3) for project use, could impact upon groundwater levels and may adversely affect water supply for other users (eg: pastoralists) and the environment.	**WRC**-the CER does not include results of hydrogeological investigations and interpretations; unlikely that the initial water requirements can be met; proponent needs to look for another palaeochannel; proponent will have to apply for a groundwater abstraction licence.		Impact of water extraction on other users is managed through Water and Rivers Commission approvals and licensing process. Impact of abstraction on environment requires EPA evaluation.
Pollution potential				
Solid and liquid waste disposal (tailings dam).	A large impoundment structure (100ha after 20 years of operation) for storage of tailings will be required. There is the potential for leakage and contamination of the environment. Rehabilitation potential depends upon long term physical and chemical characteristics of waste.	**DME**- will require design details of tailing dam which follows current DME guidelines. **DEP**-human health effects of exposure to the tailings material; effect of tailings on native vegetation growth; no geotechnical description of tailings dam; potential for leakage and monitoring the effects of leakage. **WRC**-threat of contaminants leaking from tails dam, supply pipeline or process plant and entering surface water systems.		EPA evaluation required.

Table 2. Identification of issues requiring Environmental Protection Authority evaluation (cont'd)

Topics	Proposal characteristics	Government Agency Comments	Public comments	Identification of issues
Pollution potential				
Protection of groundwater (quality).	Storage of materials and operation of the plant, particularly disposal of slurry to the tailings dam and process water to the evaporation pond, has the potential to pollute groundwater. Potential for saline lakes to form in mined out pits.	**WRC**-project located in area of highly saline groundwater resources located at a depth in excess of 40m; the only water quality concerns posed by the project is the potential threat posed by leakage of contaminants to vegetation and stock dams.		Tailings dam addressed in waste disposal - Table 4 (Issue 5) and Environmental Management Plan - Table 4 (Issue 8). Storage of hazardous materials is managed through approvals required by the DEP, DME and WRC. Potential for saline lakes forming in mined out pits requires EPA evaluation.
Disposal of waste (excluding tailings dam)	Operation of the mine and plant will produce general wastes and overburden.			General wastes addressed by local government authority and relevant government agencies (eg: Health Dept.). DEP's works approval and licensing requirements also apply. Overburden disposal is considered in the evaluation of other topics - refer table 4 (Issues 8 and 9). Further EPA evaluation not required.

Table 2. Identification of issues requiring Environmental Protection Authority evaluation (cont'd)

Topics	Proposal characteristics	Government Agency Comments	Public comments	Identification of issues
Pollution potential				
Gaseous emissions (including greenhouse gases and odours)	No sulphuric acid will be produced on site which would be a potential source of SO_2, NO_2 and CO emissions. Emissions associated with the power station. A hydrogen sulphide plant (if required) could be a potential source of gaseous emissions (H_2S, SO_2)	**DRD**-the project has secured a suitable supply of sulphuric acid, thus reducing the potential for emission of SO_2. **DME**-if the hydrogen sulphide plant is required gaseous emissions will need to be addressed. Some air modelling may be necessary. **Shire of Kalgoorlie-Boulder**-request that the Minister for the Environment re-assess the Environmental Protection (Goldfields Residential Area) (Sulphur Dioxide) Policy 1992 relating to the amount of allowable sulphur dioxide emissions. **DEP**-the NO_x, CO, and SO_2 emission rates from the power station should be defined; discuss upset conditions for H_2S plant; .		EPA evaluation required.
Dust	Construction and mining activities, ore stockpiles, materials transport, handling and storage will give rise to dust.	**WRC**-how does the proponent intend to "limit the accumulation of salt in areas to be revegetated" when saline water is to be used for dust suppression.		Dust control addressed by the proponent in Section 4.10 of the CER and considered in the evaluation of the Environmental Management Plan (EMP) (Issue 8). Also subject to DME and DEP requirements. Further EPA evaluation not required.

Table 2. Identification of issues requiring Environmental Protection Authority evaluation (cont'd)

Topics	Proposal characteristics	Government Agency Comments	Public comments	Identification of issues
Pollution potential				
Noise	Mining and processing activities will increase ambient noise levels. The nearest residence is at Ora Banda, 9km away. Materials and product handling and transport will increase ambient noise levels.	**DEP**-Noise Abatement (Neighbourhood Annoyance) Regulations (1979) apply.		EPA evaluation required.
Social surroundings				
Impacts on Aboriginal Heritage.	Impacts on sites of significance to Aboriginal people. Project site is on land which is currently subject to two native title claims.			Impacts on Aboriginal heritage values can be managed through the *Aboriginal Heritage Act 1972*. Native title claims are subject to assessment by the Native Title Tribunal. Further EPA evaluation not required.
Risks and hazards	Operation of the plant will introduce risks and hazards. Project situated in isolated area where the nearest residence is located at Ora Banda (9km to the west).			Risk and hazard issues are subject to compliance with DME and the provisions of the *Mines Safety and Inspection Act, 1995*. Further EPA evaluation not required.

Table 2. Identification of issues requiring Environmental Protection Authority evaluation (cont'd)

Topics	Proposal characteristics	Government Agency Comments	Public comments	Identification of issues
Social surroundings				
Transportation issues	Potential for spill of raw materials, process chemicals and products whilst being transported. Increased vehicle movements on regional and local roads.	**MRWA**-information required on road route intended for cartage of limestone; Broad Arrow-Ora Banda Road could not accommodate a transport task of this size and major upgrading would be justified; risk posed by ever increased transportation of hazardous goods. **DME**-the CER does not describe the product transport and routes. **City of Kalgoorlie-Boulder**-proponent will be required to upgrade Ora Banda Road to a sealed standard.		This issue should be addressed by the local government authorities and Main Roads Western Australia in conjunction with the proponent. Transport, storage and handling of hazardous materials is subject to requirements of *Dangerous Goods Regulations, 1992*, administered by DME. No further evaluation required by EPA.
Other				
Environmental Management Plan (EMP).	An EMP is to be developed for environmental management of the project. This will be developed in two stages: 1. Project construction EMP. 2. Project operation EMP.			EPA evaluation required.
Decommissioning and rehabilitation.	Residual longer term impacts at the completion of mining operations will be mainly associated with the stabilisation of post-mining landforms, tailings dam and evaporation ponds.			EPA evaluation required.

Table 2. Identification of issues requiring Environmental Protection Authority evaluation (cont'd)

- impacts on Threatened and Priority fauna species and animal habitats;
- impact on the water table due to the extraction of groundwater;
- solid and liquid waste disposal (tailings dam);
- protection of groundwater quality (salinity) from lakes forming in the mined out pits;
- gaseous emissions (including greenhouse gases and odours);
- noise;
- Environmental Management Programme; and
- decommissioning and rehabilitation.

4. Evaluation of key environmental issues

4.1 Impact on locally and regionally significant vegetation associations, Declared Rare and Priority flora

Objective

To protect Declared Rare and Priority flora and avoid loss of locally and regionally significant vegetation associations and plant habitats, where possible.

Policy information

To meet the requirements of the *Wildlife Conservation Act*, (1950-1979) and maintain biodiversity in the State (EPA, 1996b).

The *Wildlife Conservation Act* protects Declared Rare Flora (DRF) and requires specific approval to be given before any known DRF are removed.

Technical information

A description of flora and vegetation is provided in Section 3.5 and Appendix B of the proponent's CER (Woodward-Clyde, 1996). The main points from the CER are as follows:

1. A total of 17 plant communities were defined and mapped for the project area of which two are considered to be locally significant, and may possibly be regionally significant, and three are considered locally significant.
2. A total of 131 vascular plant species (including two introduced species) from 65 genera and 34 families were recorded in the project area.
3. No Declared Rare Flora were located within the project area.
4. Two flora species, *Acacia kalgoorliensis* and *Eremophila pustulata*, listed as Priority Three - Poorly Known Taxa by the Department of Conservation and Land Management were located within the project area.

The proponent (Woodward-Clyde, 1996) indicates that the five significant community types occur outside the immediate orebody being considered in the CER and areas set aside for overburden storage, stockpiling and mine facilities. The location of the project infrastructure and stockpiles has been designed to ensure that disturbance to these plant communities will be avoided as far as practicable. However, development of one of the mine pits (North Pit #3), will affect 10% of vegetation community type 1b, (woodland of *Eucalyptus clelandii* over mid-storey of *Eremophila* over understorey of *Eremophila*, *Acacia* , *Frankenia* and *Atriplex* on slopes), which is considered locally and possibly regionally significant.

Comments from key agencies/interest groups

In relation to significant vegetation communities, CALM wishes to have an input into development of the Environmental Management Programme with regard to future management of these communities. In addition, if the tenure of the land is suitable (eg: company owned pastoral lease), CALM would wish to have input to the management plan to encourage exclusion of grazing from the significant vegetation communities.

Response from the proponent

The proponent's response to the issues raised in submissions and discussed above is included in Appendix 2 (Question 1.1). In its response, the proponent has indicated that it would liaise with CALM during the preparation of the Environmental Management Programme (EMP) to explore means of co-operation for management of significant vegetation communities. The proponent indicates that the project is located on a pastoral lease which is not held by Centaur and that the company is limited in its capacity to exclude grazing from areas which are peripheral to mining and processing activities. However, Centaur is prepared to discuss this matter with the pastoralist.

Environmental Protection Authority Evaluation

Elements of the project which pose the greatest impact to vegetation are likely to be those which involve large scale clearing and include the mining and tailings dam areas. Other elements such as borefields and infrastructure (eg: gas pipeline and water pipelines) also involve land clearing although the impacts are usually confined to narrow linear easements where there is greater potential to avoid sensitive areas or follow existing cleared alignments such as roads and fencelines.

Direct disturbance to vegetation through clearing or indirect disturbance as a result of changes to drainage patterns can be reduced through a range of measures including proper design and management of the project. The proponent has indicated that it will develop and implement procedures, as part of both construction and operational stages of the Environmental Management Plan, to avoid unnecessary disturbance to vegetation, especially significant associations, and flora (Commitment 6). An Environmental Management Plan will be prepared to the satisfaction of the EPA on advice from the Department of Environmental Protection, the Department of Minerals and Energy and other relevant agencies (Commitment 1). For this issue, the Department of Conservation and Land Management should be consulted, and the EPA notes that the proponent, in its response to submissions, has indicated that it will liaise with CALM during the preparation of the EMP.

The EPA has concluded that the commitments made by the proponent, and the measures outlined in the CER, meet the EPA's objectives in relation to the management of potential impacts on flora and locally and regionally significant vegetation associations.

4.2 Impact on Threatened and Priority fauna species and animal habitats

Objective

Threatened and Priority fauna species and their habitat should be protected.

Policy information

To meet the requirements of the *Wildlife Conservation Act*, (1950-1979) and maintain biodiversity in the State (EPA, 1996b).

The *Wildlife Conservation Act* protects Threatened and Priority fauna species and requires specific approval to take or kill protected fauna.

Technical information

The proponent (Woodward-Clyde, 1996) states that:

- a survey of vertebrate fauna was undertaken for the Cawse project area in November 1995, to identify fauna and habitats, and describe the conservation status of vertebrate fauna found within the area;
- the proposed project area is located on the "Mulga-Eucalypt Line" which marks the south-eastern limit of species adapted to the cooler, wetter south-west and the south-western limit of arid-adapted species;
- 35 species of bird, one species of native mammal, three species of introduced mammal and no frogs or reptiles were recorded during the field assessment;
- given intensive survey effort spread over a range of seasonal conditions, a total of 99 species of bird, 21 native mammals (including bats), six introduced or feral animals, four frogs and 66 reptiles may occur;
- the fauna habitats in the project area are well represented in surrounding uncleared country and in nature reserves;
- the loss of fauna habitat due to clearing may lead to the disturbance of some fauna and the tailings storage facilities and return process water ponds may attract waterbirds and other fauna which can result in entrapment in mud; and
- impacts to fauna and habitat will be reduced by a range of measures including:
  - the stockpiling of topsoil and plant debris for later use in rehabilitation. Debris such as logs, branches etc provides micro habitats for fauna, allowing early recolonisation;
  - avoiding unnecessary clearing;
  - undertaking rehabilitation of cleared areas as soon as possible, including disused tracks and gridlines;
  - controlled use of saline water for dust suppression;
  - controlling run-off from mining areas and access roads to reduce erosion and impact on fauna habitat;
  - restricting off road vehicle use to access roads and restricting speed limits;
  - investigating [and implementing] methods for discouraging fauna from using tailings storage facilities;
  - the integrity of all exploration drill hole caps will be periodically checked;
  - prohibiting firearms and domestic pets; and
  - discouraging scavenging fauna such as ravens, foxes and cats through adequate rubbish disposal procedures.

Comments from key agencies/interest groups

The Department of Conservation and Land Management (CALM) points out that no indication is given in the CER of the survey effort for vertebrate fauna and requests a copy of the consultant's report.

In regard to impacts on fauna, CALM considers that:

- a feral animal control program may cushion some impact, particularly if carried out over the 600km^2 of contiguous tenements. If Centaur considers developing such a program, it should liaise with CALM (Kalgoorlie office) regarding its design and implementation; and,

- increased traffic is likely to result in fauna deaths, although strict speed limits may reduce numbers killed. It would be useful for any uncommon native fauna killed between Broad Arrow and the mine, or on the mine site roads, to be reported to CALM (Kalgoorlie office) at 3 monthly intervals for its information.

The Department of Minerals and Energy considers that methods for discouraging fauna from utilising the tailings storage facility should be investigated.

Response from the proponent

Measures to minimise disturbance to fauna are outlined in Section 4.7 of the CER (Woodward-Clyde, 1996). In responding to issues raised in submissions (questions 1.2, 1.3, 1.4 and 1.8, Appendix 2), the proponent has indicated that:

- it will provide CALM with a full copy of the consultant's fauna survey report prior to development of the EMP;
- it will consult with CALM, in conjunction with the pastoral lease holder, on practicable means of mitigating impacts on fauna habitats. Agreed measures will be included in the project EMP;
- it will consult with CALM during the preparation of the EMP. The EMP will include an undertaking to provide regular reports of any fauna deaths that may occur as a result of activities associated with the project; and
- experience gained from operating tailings storage facilities throughout the Goldfields Region indicates that one of the most effective means of discouraging fauna is to design and operate the tailings storage facility to minimise the area of ponded surface water. As the tailings facility has been designed for maximum water recovery this will largely be achieved. Other factors which discourage fauna from the tailings storage facility include:
  - clearing of vegetation from the tailings area prior to discharge, thus removing roosting and shelter sites;
  - use of saline water in the process; and
  - location of the facility close to the processing plant and active mining areas.

Environmental Protection Authority Evaluation

The proponent has outlined a range of measures in Section 4.7 of the CER (Woodward-Clyde, 1996) to manage the potentially adverse impacts of the project on fauna. In addition, the proponent will develop and implement procedures, as part of both construction and operational stages of the Environmental Management Plan, to avoid unnecessary disturbance to fauna species and habitats (Commitment 7). An Environmental Management Plan will be prepared to the satisfaction of the EPA on advice from the Department of Environmental Protection, the Department of Minerals and Energy and other relevant government agencies (Commitment 1). For this issue, the Department of Conservation and Land Management would be relevant and the EPA notes that the proponent, in its response to submissions, has indicated that it will liaise with CALM during the preparation of the EMP.

The management measures outlined in the CER, and the commitments made by the proponent achieve the EPA's objective in relation to impacts on fauna and fauna habitat.

4.3 Impact on the water table due to the extraction of groundwater

Objective

To ensure that the proposed extraction of up to 6000m^3 per day (initially) of groundwater and potentially up to 12,000m^3 per day, is undertaken such that the ecological integrity of indigenous vegetation and existing user rights are maintained.

Policy information

The site falls within the Goldfields Groundwater Area and water resources use is administered via abstraction controls under Part III of the Rights in Water and Irrigation Act. The proponent should ensure that no detrimental impacts on water quality or availability occur as a consequence of the project (EPA, 1996c)

Technical information

Within the project area, the depth to groundwater is generally about 40-50m below ground level and the groundwater is saline with a typical total dissolved solids concentration in excess of 25,000 ppm. Significant quantities of reasonable quality processing water (<40,000 ppm TDS) are present in fractured rock aquifers along the strike of the orebody within 15km to the north-west of the plant site.

Approximately 4,700kL per day is required for the project at a processing rate of 500,000tpa. Tailings return water may provide up to 30% of this requirement. A processing rate of 1Mtpa would require approximately 6,000kL/day of make-up water from the borefields and expanded production to 2Mtpa, achieved through duplication of the processing plant, would require up to 12,000kL/day.

The proponent (Woodward-Clyde, 1996) indicates that additional water supplies are being investigated from palaeochannels up to 30km north of the project area, including potential palaeochannel borefields in the vicinity of Bitter Bore, Sheepyard Dam and Leaky Dam (see figure 2). However, at the time of release of the CER, the water supply borefields had not been confirmed. The proponent indicates (Woodward-Clyde, 1996) that groundwater levels at these borefields may be lowered as a result of water supply pumping. It is also suggested that adverse ecological impacts through lowering of the groundwater only occur where vegetation is reliant on freshwater aquifers. In the circumstance of the potential palaeochannel borefields, water is typically >30m deep with a salinity in excess of 30,000 ppm TDS, which is usually too saline for deep rooted vegetation (Woodward-Clyde, 1996).

Water is not of sufficient quality for other beneficial uses such as stock watering (Woodward-Clyde, 1996). Water use will be minimised by utilising recirculation and recovery techniques in the processing plant which will result in lower levels of abstraction. Water levels will be monitored to provide data for the assessment of aquifer behaviour and the revision of operational activities, as necessary.

Comments from key agencies/interest groups

The Water and Rivers Commission provided the following comments:

- based on previous hydrogeological investigations in the Kalgoorlie region, it appears that the forecast demand of 6000kL or even 12,000kL cannot be met from a single large borefield;
- it is unlikely that the initial water requirement of 4700kL can be met from a single borefield in hardrock;
- the potential palaeochannel in the vicinity of Bitter Bore and Sheepyard and Leaky Dams needs to be investigated, but is unlikely to meet project demands for supply;
- there are better groundwater prospects in the Goongarrie West Palaeochannel about 25km northwest of the proposed plant site; and

- upon application for a groundwater abstraction licence, the proponent is required to provide information, including a map showing the forecast areas of influence of drawdown in relation to time as the groundwater resource is utilised.

The Department of Resources Development indicated that the project has developed a processing regime which incorporates significant groundwater conservation measures.

Response from the proponent

The proponent's response to the issues raised in submissions and discussed above is included in Appendix 2 (Questions 1.6 and 1.7). In relation to securing suitable water resources for the project, Centaur has acquired the Ora Banda Gold Mine which sources process water supplies (<60,000 ppm TDS) from two borefields, the Basalt Borefield and the Flat Rocks Well Borefield, located close to the Cawse minesite (figure 2). The acquisition of the Ora Banda Gold Mine has provided Centaur with alternative options for rationalising water supplies between the two projects. It is proposed to use the Basalt Borefield and the Flat Rocks Well Borefield to meet some of the demands of the Cawse Nickel project.

However, following the proponent's response to submissions, the Department of Environmental Protection queried whether extraction from the proposed Flat Rocks Well Borefield may cause adverse impacts to any vegetation which may be supported by the shallow calcrete aquifer. In its response, the proponent has provided the following additional information to that provided in Appendix 2. The proponent indicates that it is proposed to establish a water supply scheme to provide 4,700kL/d to the Cawse project, comprising the following requirements:

- a new borefield in the saline (20,000 - 36,000 ppm TDS) Caprock aquifer, some 10 to 15km northwest of Cawse, comprising six production bores each supplying 600kL/d (3600 kL/d total). The Caprock aquifer is a fractured rock aquifer occurring approximately 35 metres below ground level;
- a new production bore to be installed in the existing Basalt Borefield, supplying 500kL/d at 25,000 - 50,000 ppm TDS;
- two existing bores in the Basalt borefield supplying 600kL/d total at 25,000 - 35,000 ppm TDS;
- remaining bores in the Basalt borefield to be maintained as standby bores, or commissioned if operational experience indicates the benefits of distributing the drawdown across the Basalt borefield; and
- the existing Flat Rocks Well borefield to be maintained as additional standby capacity.

The Flat Rocks Well Borefield has been in production since 1989 supplying water to the Ora Banda Gold Mine. It is not apparent that any vegetation monitoring has been undertaken for this borefield over its productive life. However, it is unlikely that either previous or future drawdown from this borefield has had or will have any adverse effect on vegetation given the salinity and depth of the groundwater.

Detailed design of the project will involve modelling of the groundwater resources including the preparation of a plan forecasting areas of influence of drawdown in relation to time as the groundwater is utilised. This information will be submitted in support of the groundwater abstraction licence.

Environmental Protection Authority Evaluation

The EPA notes that the project site falls within the Goldfields Groundwater Area and that a decision by the Water and Rivers Commission (WRC) on the acceptability of the proponent's borefields is required before a licence would be issued under Part III of the Rights in Water and Irrigation Act. Where uncertainties exist in relation to the adequate protection and management

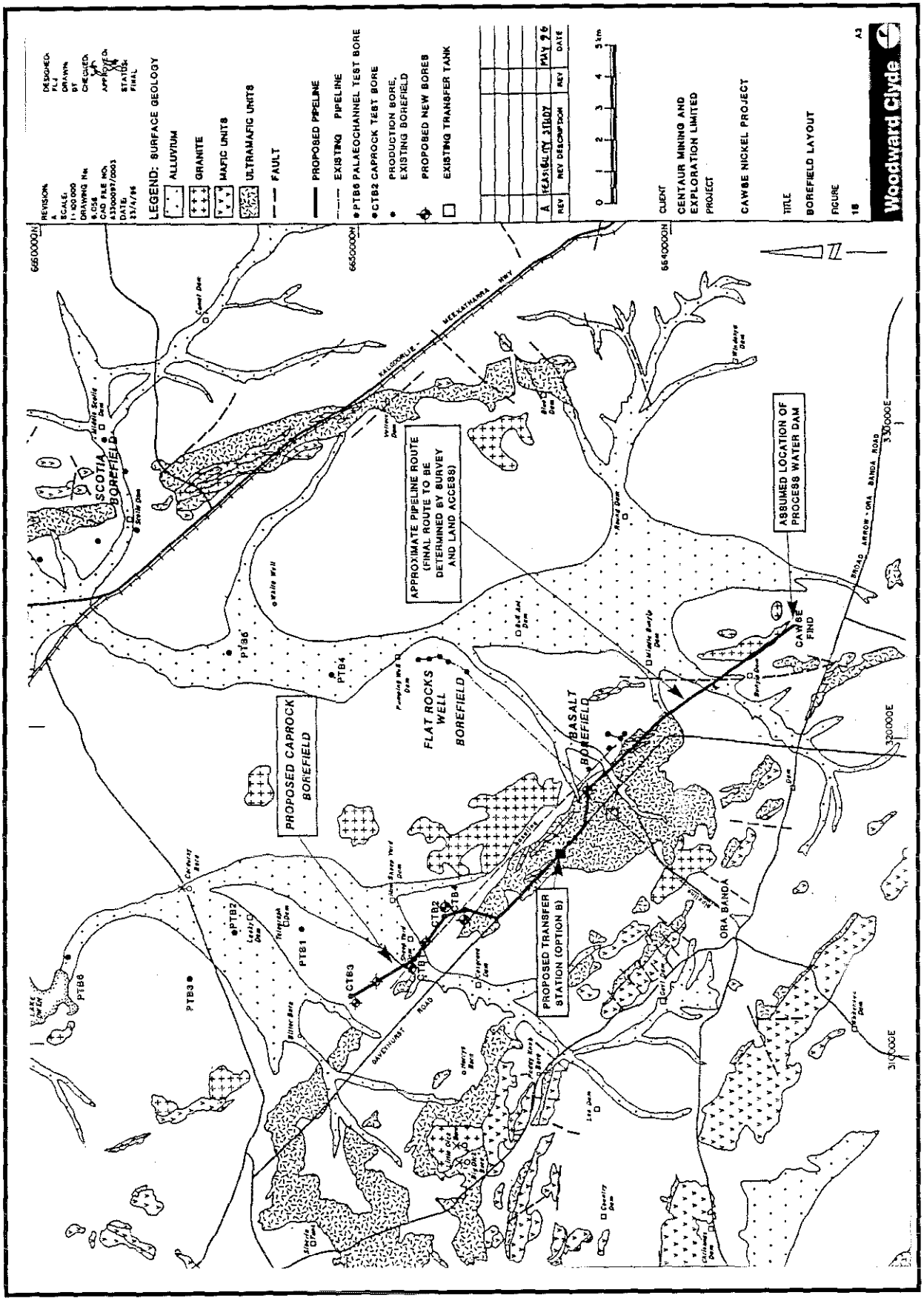


Figure 2. Borefield layout (provided by Woodward-Clyde)

of groundwater resources, the WRC has a responsibility to require developers to provide them with appropriate detailed studies prior to decision making or the granting of any approvals to develop a borefield. The environmental impact assessment process can indicate where such uncertainties exist. However, where such studies indicate that water supply issues cannot be adequately protected or managed then it is the responsibility of the WRC to refuse the abstraction application or seek alternative measures to address the issues of concern.

The proponent has suggested that the palaeochannel aquifers in the vicinity of the borefields are too deep and saline for use by deep-rooted vegetation and that the lowering of groundwater through abstraction of water is unlikely to cause adverse impacts. The EPA recognises that this is likely to be the case and notes the proponent's comment that vegetation in the vicinity of the existing Flat Rocks Well borefield has not been adversely effected.

The EPA has concluded that the measures outlined in the CER and in response to submissions, can meet the EPA's objectives in relation to the management of potential impacts on the water table due to the extraction of groundwater.

4.4 Protection of groundwater quality from lakes forming in the mined out pits

Objective

To avoid further salinisation of the groundwater from lakes which may form in the mined-out pits.

Technical information

It is expected that the open-cut mine, to a planned maximum depth of 60m below ground level, will occur mainly above the water table which typically ranges between 40 to 50m below ground level. The majority of the pits will be less than 40m deep and therefore the need for pit dewatering is expected to be minimal with minor seepage (if any) being controlled by the use of in-pit sumps. Future pits may intersect the water table later in the life of the project. Where this occurs, water produced will be pumped from mine dewatering bores and piped to the processing plant.

Comments from key agencies / interest groups

Following the proponent's response to issues raised in submissions, the Department of Environmental Protection indicated that it was not clear whether backfilling will occur in mine pits which intersect the groundwater table and have the potential to form lakes in the base of the pit at the cessation of mine dewatering.

The Water and Rivers Commission confirms that the project area is located in an area of highly saline groundwater resources located at a depth in excess of 40m.

Response from the proponent

In responding to this issue, the proponent has indicated that where practicable, waste material will be returned to mined out pits. Priority will be given to those pit areas where the groundwater is exposed to avoid further deterioration of groundwater quality through evapo-concentration. It should be noted, however, that groundwater in the area of the pits, typically has a salinity of greater than 25,000 ppm TDS.

Environmental Protection Authority Evaluation

The EPA recognises that the project is located in an area of highly saline groundwater resources. Notwithstanding this, the EPA considers that reducing further deterioration in water quality from evapo-concentration represents best practice environmental management in mining and should be implemented. The EPA notes from the CER (Woodward-Clyde, 1996) that integrated project planning will enable progressive infilling of mined out pits and from more recent advice that priority will be given to backfilling pits which intersect the groundwater table.

The EPA recognises that rehabilitation and safety issues associated with mined out pits is a responsibility of the Department of Minerals and Energy. Rehabilitation will be addressed in the proponent's Environmental Management Plan (Commitment 8) and is discussed in Section 4.8. The EPA has concluded that these measures meet the EPA's objectives in relation to the management of potential impacts associated with this issue.

4.5 Solid and liquid waste disposal (tailings dam)

Objective

To ensure that environmental impacts arising from the disposal of tailings are kept as low as practicable and that best practice is implemented.

Policy information

The construction and operation of tailings disposal facilities is subject to works approval and licensing requirements under Part V of the Environmental Protection Act and requires the approval of the State Mining Engineer. Under the provisions of Section 84 of the Mining Act, specific conditions may be imposed for the purpose of preventing, reducing, or making good, injury to the surface of the land on mining leases and general purpose leases.

Technical information

The proponent (Woodward-Clyde, 1996), indicates that processing of the nickel-cobalt ore will produce tailings from the leaching process in the form of a slurry containing approximately 40% solids by mass. The tailings will be deposited into an engineered storage impoundment which is designed and constructed to minimise the potential for seepage of process water into the surrounding environment.

Geological information on the surrounding area indicates that the basement rock underlying the tailings storage facility is low permeability granite and the proponent suggests that it is unlikely that there will be significant groundwater resources which would be affected by potential seepage. Lateral seepage of high salinity process/tailings water has the potential to adversely affect vegetation adjacent to the tailings storage facility.

A single impoundment cell measuring 500m x 500m will initially be constructed to contain tailings from the first 12 months of processing. During this time a second cell will be constructed as suitable overburden material is produced from mining operations. The operation of the two cells will allow alternate discharge and drying of the tailings. Two additional cells will be constructed over the 20 year life of the project covering a total area of approximately 100ha based on the initial 20Mt of proven ore reserves. Increasing the processing rate to 1Mtpa or even 2Mtpa would not require an increase in the overall size of the proposed tailings storage facility. However, the rate of deposition would be increased. The maximum height of the tailings storage embankment is 17m above the existing ground surface with embankment lifting carried out by the upstream construction method.

Maximising water recovery from the tailings storage facility is a key factor in achieving significant water savings while improving the consolidation of the tailings material. The water will be returned to a HDPE-lined return water storage pond at the plant site. The chemical

composition of the tailings material and indicative levels for tailings solution composition are provided in Appendix 5. The tailings material will not generate acid as the ore is totally oxidised.

The proponent has provided a commitment (Commitment 3) that, prior to the discharge of tailings, monitoring bores and piezometers will be installed around the tailings storage facility to detect any leakage that may occur. If leakage is detected which could adversely effect surrounding vegetation or water resources, remedial measures will be undertaken to rectify the problem to the satisfaction of the Department of Environmental Protection and the State Mining Engineer. Details of the tailings storage facility management and monitoring programmes will be included in the operational stage of the Environmental Management Plan.

Appendix D of the proponent's CER indicates that remedial measures may include interceptor bores, cut-off trenches, grouting and constructing additional containment cells over affected areas (within first five years).

Comments from key agencies/interest groups

The Department of Minerals and Energy (DME) indicates that it requires design detail of the tailing dam which follows current DME guidelines.

The Water and Rivers Commission is concerned that losses from the tailings dam, supply pipelines or the process plant leaking into surface drainage paths and entering surface dams used by local pastoralists for stock water supply is not adequately addressed in the CER.

The Department of Environmental Protection requested information on the following:

- whether exposure to the tailings material would be hazardous to human health and if so, how exposure would be managed during operation and decommissioning phases;
- clarification regarding how the potential for lateral seepage in the shallow sub-surface soil horizons will be prevented;
- how the permeability of the pond floor will be corrected, if significant seepage is detected by the groundwater monitor bores;
- whether the proponent will be able to provide a quantitative assessment of the potential for and likely extent of seepage from the tailings dam in the EMP; and
- the objectives in regard to protection of adjacent vegetation condition, including the criteria to be applied to assess monitoring data and trigger remedial action.

Response from the proponent

The proponent's response to the issues raised in submissions and discussed above is included in Appendix 2 (Questions 2.6 to 2.11). The proponent has indicated that:

- circumstances where humans are exposed to tailings materials over prolonged periods or other exposure pathways which may result in adverse effects to human health at such low concentrations of metals are difficult to envisage;
- a rehabilitation plan for the tailings surface will be developed through the life of the operations as trials are conducted to determine the most effective means of rehabilitation. These trials could include an assessment of potential uptake of metals in established vegetation, if appropriate to a future beneficial use such as grazing;
- toxicity of various metals in the tailings material to vegetation to be used in rehabilitation of the tailings disposal facility would also be assessed as part of developing an effective rehabilitation plan;
- the tailings storage embankment includes a cutoff key trench to control seepage under the embankment;
- final design plans will be submitted to the DME for approval prior to construction;

- Centaur's objective with regard to protection of vegetation adjacent to the tailings storage facility is that no vegetation deaths will occur as a result of saline water seepage from the storage facility;
- vegetation condition will be monitored as part of the EMP, in conjunction with regular monitoring of groundwater bores established adjacent to the storage facility to detect leakage;
- if leakage is detected or the condition of vegetation deteriorates as a result of leakage, amelioration measures may include:
  - remedial work on the embankment;
  - establishing interceptor trenches or bores; and
  - constructing the next cell of the tailings storage facility down gradient of the area where a leak is detected.
- specific criteria will be developed as part of the EMP for assessing monitoring data and triggering remedial action, including:
  - change of groundwater quality in monitoring bores indicative of process water eg: salinity;
  - general condition of adjacent vegetation; and
  - visual surface seepage adjacent to the tailings storage facility.

Environmental Protection Authority Evaluation

In relation to the tailings dam the EPA notes that the detailed design of the tailings disposal facility, including geotechnical investigations, are still being conducted by the proponent. The EPA considers that there remains a lack of certainty regarding the ultimate performance characteristics of the impoundment, including leakage management and recovery and the potential for rehabilitation and decommissioning. Therefore, while the EPA recognises that impoundment structures are essential for the project's operations, it is considered that a more detailed understanding of the performance characteristics will be necessary. This will be provided through additional work necessary to satisfy requirements under the Mines Act and Works Approval under the Environmental Protection Act and through the requirements of Commitments 1 and 3, as follows:

- Prior to discharge of tailings, the project operation EMP (Commitment 1) will be required to include details of the tailings storage facility management and monitoring programmes (Commitment 3). The EMP will be prepared and implemented to the satisfaction of the EPA on advice from the Department of Environmental Protection, the Department of Minerals and Energy and other relevant government agencies.

The EPA has concluded that the commitments made by the proponent (Commitments 1 and 3), and the measures outlined in the CER and in response to submissions can meet the EPA's objectives in relation to the management of potential impacts associated with the tailings dam. However, as the long term performance characteristics of the tailings material and the impoundment facility are not easy to predict, the EPA considers that the proponent should provide an updated report on the progress of the facility's development after five years of operation. At such time, the EPA could determine appropriate follow-up reporting requirements (Recommendation 2, Section 5).

4.6 Gaseous emissions (including greenhouse gases and odours)

Objective

To ensure that gaseous emissions, including greenhouse gases and odours, both individually and cumulatively, do not cause an environmental or human health problem in the area

surrounding the proposed processing plant. The proponent should use all reasonable and practicable measures to reduce the discharge of wastes, including gases (EPA, 1996a).

Policy information

The EPA has promulgated two Environmental Protection Policies (EPPs) for atmospheric pollutants for the Kwinana and Kalgoorlie areas. The EPA uses the Kwinana EPP standards and limits as guidelines for the assessment of new industrial projects (where there are no existing sources) and for existing industrial plants which are seeking approval for modifications (Environmental Protection Authority, 1992).

In the Kwinana EPP, a limit is defined as "a concentration not to be exceeded" and a standard is defined as "a concentration which it is desirable not to exceed". The standard is interpreted as the value which the ground level concentration must be below for 99.9% of the time.

The standards and limits for sulphur dioxide and particulates used in the EPP for the Kwinana policy area are summarised in Table 3 below.

Table 3. Standards and limits used in the EPP for the Kwinana Policy Area

Species	Area	Averaging Period	Standard ($\mu g/m^3$)	Limit ($\mu g/m^3$)
Sulphur Dioxide	Industrial Estate	1 hour	700	1400
		24 hour	200	365
		Annual	60	80
	Residential	1 hour	350	700
		24 hour	125	200
		Annual	50	60
Particulates PM_{10}	Residential	24 hour	-	120
		Annual	-	40

The National Health and Medical Research Council (NH&MRC) guidelines require that the ambient concentration of nitrogen dioxide (NO_2) does not exceed 0.16ppm or $320\mu g/m^3$ (as a one hour average, and not to be exceeded more than once a month).

Guidelines for maximum concentrations of oxides of nitrogen (NO_x) emissions from stacks and vents may also apply to industrial plants in addition to guidelines for ground level concentrations of NO_x emissions. The relevant (NH&MRC) guideline figure which is applicable to the proposed power station exhaust stacks (ie, for gas turbines greater than 10MW), is $0.07g/m^3$. Gas burners with low levels of NO_X production are available commercially.

Carbon dioxide (CO_2)is a greenhouse gas and worldwide industrial emissions are considered to be a major contributor to global warming. The Federal Government, in accordance with international agreements, has announced an intention to stabilise carbon dioxide emissions in Australia by the year 2000. The Commonwealth has urged a program of co-operative agreements between industry and the government to reduce greenhouse emissions.

The EPA recently considered greenhouse gas emission policies in general, including the approach taken by the Commonwealth government and the review undertaken by the DEP into the status of WA's approach.

The EPA has adopted the following provisional policy in relation to the assessment of individual energy intensive projects which are likely to emit significant quantities of greenhouse gases. This will enable the State to address the issue of anticipated industrial expansion and

substantial increase in greenhouse gas emissions in the next few years. Accordingly, the EPA considers that a proponent should, in their proposal documents:

1. calculate the greenhouse gas emissions associated with their proposals (using the methodology developed for Australia);
2. indicate the specific measures adopted to limit greenhouse gas emissions for that project;
3. as appropriate, whether on a project specific basis, company-wide arrangement or within an industrial grouping, enter into the National C21 'Greenhouse Challenge' voluntary agreement programme for the estimation, reporting and auditing of greenhouse gas emissions; and
4. estimate as appropriate, the global emission credit (greenhouse gas offsets) achieved through implementation of the proposal.

Technical information

In its CER (Woodward-Clyde, 1996), the proponent has indicated the following:

- no significant gaseous emissions will be produced from the high pressure leach, purification and nickel/cobalt recovery processes as these operate as closed circuits;
- where steam may be vented from the high pressure acid leach circuit, wet scrubbing will be employed to remove any sulphuric acid that may be contained;
- no gaseous emissions will be produced from the ammonia leach as it is a closed circuit with ammonia stripping and regeneration modules;
- no upset conditions are associated with these processes which could result in any significant gaseous emission;
- no sulphuric acid will be produced on site which would be a potential source of sulphur dioxide (SO_2), NO_2 and CO emissions;
- some minor emissions may be associated with the power station, primarily NO_x, CO, and CO_2;
- a hydrogen sulphide plant, if required, could be a potential source of gaseous emissions, primarily hydrogen sulphide and sulphur dioxide. No decision has been made by the proponent on whether such a plant is required at this stage.
- the nearest residences to the project area are in Ora Banda and Broad Arrow (9 and 13km respectively) and gaseous emissions from the processing plant and associated infrastructure are expected to be well below levels specified by the EPA.

Dust emissions are examined in Section 3 of this report and no further evaluation of this topic is required by the EPA.

Nitrogen Dioxide

Nitrogen dioxide is a reddish brown gas which is soluble in water and is a strong oxidant. The major sources of man-made emissions to the atmosphere derive from the combustion of fossil fuels. In most situations, nitric oxide is emitted and is then transformed into nitrogen dioxide in the atmosphere. At low concentrations, nitrogen dioxide can cause irritation of the mucous membranes and may cause or exacerbate respiratory problems such as asthma and bronchitis (EPA, 1996a).

In response to the Department of Environmental Protection, the proponent has indicated that nitrogen dioxide emissions from the Cawse project will be low ($0.022 g/m^3$ @ 15% O_2) and are primarily a product of combustion associated with the proposed power station. National guidelines published by the National Health and Medical Research Council 1986, indicate that the above level is within recommended standards.

Sulphur Dioxide

Sulphur dioxide is a colourless gas which has a pungent odour and can irritate and be absorbed in the respiratory tract. The sensitivity of humans to sulphur dioxide varies considerably and asthmatics may suffer adverse reactions at quite low levels.

The gas also dissolves in moisture forming dilute sulphurous acid, which then forms sulphuric acid and sulphates, which can be readily absorbed onto small airborne particles. This increases the potential for adverse effects on humans and for environmental impacts such as leaf damage to plants and reduced water quality in wetlands (EPA, 1996a).

No sulphuric acid will be produced on site which would be a potential source of sulphur dioxide. The proponent (Woodward-Clyde, 1996) indicates that the proposed power station comprising six reciprocating gas engines, will produce negligible sulphur dioxide emissions. A potential source of sulphur dioxide emissions would be the hydrogen sulphide plant, if this option is adopted by the proponent. The proponent has indicated in the CER (Woodward-Clyde, 1996) that if the option to establish a hydrogen sulphide plant is adopted:

- details of potential emissions and pollution control equipment will be provided in the application for Works Approval;
- any hydrogen sulphide which may be produced would be flared; and
- sulphur dioxide emissions are expected to be negligible and would be monitored to ensure that levels are below EPA specified criteria (ie: 350µg/m^3 at the nearest residence).

Carbon Dioxide

Carbon dioxide (CO_2) is a greenhouse gas and worldwide industrial emissions are considered to be a major contributor to global warming. It is estimated by the proponent (Woodward-Clyde, 1996) that, annual emissions of CO_2 and carbon monoxide (CO) from the power station gas engines is 13,156 tonnes per year. By way of comparison, the proponent, quoting from Government of Western Australia (1992), indicates that carbon dioxide emissions from energy use in Western Australia during 1988 amounted to 24.7 million tonnes. The Cawse total equates to 0.05% of this estimated 1988 Western Australian output (Woodward-Clyde, 1996).

Following discussion with the DEP, the proponent has indicated that approximately 44,000 tonnes per annum of CO_2 will be generated from neutralisation of the process stream by adding limestone following acid pressure leaching at a processing rate of 500,000 tonnes per annum. This equates to approximately 7.1 tonnes of CO_2 per tonne of nickel metal produced. By way of comparison, the Murrin Murrin Nickel-Cobalt Project will generate approximately 22.2 tonnes of CO_2 per tonne of nickel metal briquettes produced.

The DEP indicates that carbon dioxide emissions from the Cawse project will constitute a increase of approximately 0.2% of Western Australia's total carbon dioxide emissions based on the 1988 estimates used by the proponent.

Odour

A potential source of odorous emissions would be a hydrogen sulphide plant. The proponent (Woodward-Clyde, 1996) indicates that hydrogen sulphide at low concentrations (ie: >1.0µg/m^3) can have an offensive odour and any hydrogen sulphide which may be produced would be flared. At this stage, no decision has been made by the proponent on whether a hydrogen sulphide plant is required.

However, the proponent will include details of potential emissions and pollution control equipment in a Works Approval application to the Department of Environmental Protection, if a decision is made to establish a hydrogen sulphide plant (Commitment 12).

Comments from key agencies/interest groups

The Department of Environmental Protection requested additional information on the following:

- how the gaseous emissions from the power station would be exhausted (ie: via a chimney stack, height etc);
- the NO_x, CO, and SO_2 emission rates from the power station, expressed in $\mu g/m^3$ of exhaust gas; and
- some preliminary information on the hydrogen sulphide plant.

The Department of Minerals and Energy indicate that the hydrogen sulphide plant, if adopted, needs to deal with all environmental issues, especially gaseous emissions and that some air modelling may be necessary.

The Department of Resources Development indicate that as the project has secured a suitable supply of sulphuric acid the potential for emission of sulphur dioxide has been reduced.

Council for the City of Kalgoorlie-Boulder resolved at its full meeting on 22 April 1996, to request that the Minister for the Environment re-assess the Environmental Protection (Goldfields Residential Areas) (Sulphur Dioxide) Policy 1992 relating to [sulphur dioxide standards for the region to a level of not more than] $700\mu g/m^3$ average over one hour, as recommended by the National Health and Medical Research Council.

Response from the proponent

The proponent's response to the issues raised in submissions and discussed above is included in Appendix 2 (Questions 2.3, 2.4, and 2.5). In its response, the proponent has indicated the following:

- gaseous emissions from the power station will be directed through a boiler unit to produce steam for the acid pressure leach process. As the final design of the power station and waste heat boiler has not been completed, detailed specifications are not known at this stage;
- actual concentrations of gaseous emission components for the power station have not been determined in $\mu g/m^3$ as the output rates provided in the CER are indicative only. Since responding to submissions, the proponent has further advised the DEP that indicative emission rates for the proposed reciprocating gas engines are:
  - NOx $22mg/m^3$ @ 15% O_2
  - Particulates $<15mg/Nm^3$ (dry gas); and
- the most updated plant design does not include a hydrogen sulphide plant. Furthermore, if it is decided to include such a plant in the future, it would need to comply with any specified EPA limits and would be subject to Department of Environmental Protection Works Approval and Licensing;

Environmental Protection Authority Evaluation

Following advice from the Department of Environmental Protection and the proponent's response to questions raised, the EPA considers that gaseous emissions from the proposed Cawse Nickel project are manageable and acceptable, given its remote location. In arriving at this conclusion, the EPA notes that the predicted concentrations for nitrogen dioxide are within limits specified in guidelines to the proponent and that sulphur dioxide emissions are expected to be negligible due to the absence of a sulphuric acid plant and hydrogen sulphide plant.

It is the EPA's view that proponents should use all reasonable and practicable measures to reduce the discharge of wastes, including gases (EPA, 1996a). Detailed specifications for discharge of emissions, monitoring and reporting will be established by the Department of Environmental Protection in licence conditions set under Part V of the Environmental Protection Act. The proponent will monitor gaseous emissions from potential sources during commissioning of the processing plant and associated infrastructure to ensure that levels are

below EPA specified criteria to the satisfaction of the Department of Environmental Protection (Commitment 11). The proponent will specify emissions criteria in tender documents for the supply of equipment and undertake compliance testing during commissioning to confirm compliance (Commitment 13).

The EPA notes that the City of Kalgoorlie-Boulder Council in its submission resolved to request that the Minister for the Environment re-assess the *Environmental Protection (Goldfields Residential Areas) (Sulphur Dioxide) Policy 1992* (EPP) with a view to reducing the ambient air quality limit. The EPA notes that in accordance with the EPP Regulations, the ambient air quality limit has been reduced on 1 January 1996, from 1800µg/m^3 to 1600µg/m^3 averaged over 1 hour, and that a further reduction to 1400µg/m^3 is scheduled for 1 January 1997. The EPA also notes that the ambient air quality standard for the concentration of sulphur dioxide for the area covered by the EPP is already set at 700µg/m^3 when averaged over one hour. This is the concentration of sulphur dioxide which it is desirable not to exceed. Section 36 of the Environmental Protection Act ensures that the EPP must be reviewed in 1999.

The Cawse Nickel project is not considered a significant source with regard to the EPP and does not have to be brought within the operating framework of the Policy. The EPA is also satisfied that the timetable for review of the EPP is appropriate.

In view of its provisional policy position for greenhouse gases described above, the EPA considers that Recommendation 3 is appropriate.

4.7 Noise

Objective

To ensure that the amenity of surrounding residents is not unduly affected by noise emissions emanating from the project and associated activities (EPA, 1996b).

Policy information

There are currently no statutory regulations that govern road traffic noise. However, Main Roads Western Australia has a policy that traffic noise at residential locations should be restricted to an L_{10} 18 hour of 63dB(A) wherever practicable. The DEP considers that this level should be 58dB(A) wherever practicable (EPA 1996c). The DEP also considers that instantaneous (maximum) levels should not exceed 80dB(A) and preferably should be closer to 65dB(A).

The proposed plant would need to comply with the Noise Abatement (Neighbourhood Annoyance) Regulations (1979).

Technical information

The proposed development at Cawse Nickel Project will increase ambient noise levels within and immediately adjacent to the project area. The increased noise levels will be mainly attributable to the operation of mining plant and the ore processing plant. The impact of the mine site noise on the human inhabitants of the region will be almost entirely restricted to the mine workforce. The nearest residence is at Ora Banda which is located approximately 9km to the west of the project area.

Noise generated from the transport of acid, limestone and other reagents to the project area is not expected to result in unacceptable impacts due to the relatively low number of truck movements in an area used predominantly for mining activities. Centaur will ensure the contractors' vehicles meet appropriate standards for such vehicles.

Given the nature of the Cawse Nickel orebody, it will be necessary to undertake minor blasting in some areas to shatter silica rich layers prior to excavation. All blasting activities will be conducted below ground level apart from blasting required to remove the surficial caprock. The

nearest residences are all sufficiently distant and will not be affected by blasting noise. Blasting activities will be undertaken during daytime only.

Comments from key agencies/interest groups

The effect of blasting on noise levels at Ora Banda was raised by the Department of Environmental Protection.

Response from the proponent

In responding to submissions (Question 3.2, Appendix 2), the proponent (Woodward-Clyde, 1996) indicates that Ora Banda is located approximately 9km to the west of the proposed mining operations. Furthermore, several other mining operations are located in this general vicinity which have been operating for at least 10 years, including the Ora Banda Gold Mine which is immediately adjacent to the settlement. It is therefore considered unlikely by the proponent that blasting at Cawse will result in any perceptible change in noise levels at Ora Banda.

Environmental Protection Authority Evaluation

The EPA notes the management statements made by the proponent in the CER (Woodward-Clyde, 1996), in particular, that it will ensure the contractors' vehicles meet appropriate standards and that blasting activities will be undertaken during the daytime only.

The EPA believes that adequate controls exist under the pollution control provisions of the *Environmental Protection Act* (1986) to control noise associated with the processing plant should a problem arise. In relation to truck movements to the project site, the EPA notes the remote location of the project and considers that the potential for surrounding residents to be adversely affected by noise impacts is low.

The management measures outlined in the CER and in response to submissions are adequate to achieve the EPA's objective in relation to management of noise impacts.

4.8 Environmental Management Plan

Objective

To ensure the project is managed during construction, operational and decommissioning phases, to reduce unnecessary impacts and to properly manage unavoidable impacts to an acceptable level.

Technical information

The proponent is committed to achieving a high standard of environmental management at Cawse Nickel project and adhering to all environmental obligations relevant to its activities (Woodward-Clyde, 1996).

The proponent intends to develop an Environmental Management Plan (EMP) to include all aspects of environmental management and monitoring programmes for the operations at Cawse Nickel Project. It is envisaged by the proponent that the EMP will be periodically reviewed and updated to reflect the results of monitoring and changing industry practice.

The Environmental Management Plan will be developed in the context of the following:

- Environmental Protection Act Ministerial Conditions;
- Mining Lease Conditions;
- Commitments outlined in the CER (see Appendix 4);

- Environmental Protection Act Licence Conditions; and
- Water and Rivers Commission Groundwater Well Licence Conditions.

The EMP will be developed in two separate stages as follows:

1. Project Construction EMP - to be submitted to the EPA prior to commencement of construction.
2. Project Operation EMP - to be submitted to the EPA prior to commissioning.

This is reflected in proponent Commitment 1 (see Appendix 4). The CER (Woodward-Clyde, 1996) indicates the EMP will include procedures for management of:

- surface hydrology;
- tailings storage facility management and monitoring;
- process water supply, including details of water source, pipeline construction and management of potential leakage;
- landform;
- vegetation and flora;
- fauna species and habitats;
- rehabilitation;
- procedures for dust control; and
- greenhouse gas emissions.

The EMP will be prepared and implemented to the satisfaction of the EPA on advice from the Department of Environmental Protection, the Department of Minerals and Energy and other relevant government agencies (Commitment 1).

Comments from key agencies / interest groups

The Department of Resources Development points out that the proponent has committed to management strategies and policies that ensure that the project operates in an environmentally responsible manner. The proponent has made 13 specific commitments in the CER in relation to management of issues of major environmental concern and the implementation of an Environmental Management Plan.

Submissions expressed concern that the CER did not address the potential for leakage of saline process water to enter surface dams used by local pastoralists for stock water supply and questioned whether this would be addressed in the EMP.

Response from the proponent

The proponent's response to this issue is included in Appendix 2 (Question 3.1). Monitoring and management of potential leakages of saline water or other process liquids and solids to the environment and/or surface water retention facilities will be addressed in the EMP. In the unlikely event that the Cawse Nickel project results in any adverse impacts on surface dams used by local pastoralists for stock water supplies, Centaur will commit to replacing and/or restoring any dam that may be affected.

The proponent has also modified Commitment 1 to enable other relevant government agencies [eg: the Department of Conservation and Land Management, the Water and Rivers Commission] to provide advice on the preparation and implementation of the EMP.

Environmental Protection Authority Evaluation

The EPA considers it imperative that there be a management mechanism in place for the potential environmental impacts associated with the ongoing development of the project. This should also include appropriate monitoring frameworks so that, over time, management measures can be further refined as required.

The EPA also recognises that approvals for this project are required under the Mining Act , that the Water and Rivers Commission will set conditions under the Rights in Water and Irrigation Act for the abstraction of groundwater, and that Works Approval and Licensing is required under Part V of the Environmental Protection Act.

The EPA notes that the proponent is committed to achieving a high standard of environmental management and adhering to all environmental obligations relevant to its activities. In view of the pressures placed on the local environment, Centaur Mining has an on-going responsibility in its pursuit of sustainable development, to enlist the technologies and financial resources they command to reduce environmental degradation.

The EPA considers that the CER has demonstrated that the environmental issues arising from this proposal are capable of being adequately addressed through appropriate management and monitoring. The proponent has made commitments to ensure appropriate management and monitoring of the proposal. Of these, Commitment 1 requires the preparation of a two stage Environmental Management Plan for the construction phase and operation phase of the project. The EMP is to be prepared in consultation with the Department of Environmental Protection, the Department of Minerals and Energy, and other relevant government agencies.

The EPA concludes that the proponent's commitments and the detail contained in the CER and in response to submissions allow the achievement of the EPA's objective of managing the proposal during construction, operations and decommissioning, to avoid unnecessary impacts and to properly manage unavoidable impacts to an acceptable level.

4.9 Decommissioning and rehabilitation

Objective

To ensure an acceptable rehabilitation and decommissioning programme is put in place which incorporates a "closure strategy" agreed to by the Western Australian Government.

Policy information

Past assessments by the EPA of a range of mining proposals provide a policy framework for consideration of the rehabilitation and decommissioning phase of the project, and the expectations of the EPA.

The EPA has recognised that for rehabilitation to be most effective it must be integrated into the mining plans early on in the project's development, and not left to the conclusion of mining (EPA, 1991).

It is of paramount importance to the State that rehabilitation management does not impose short or long term costs on the community of Western Australia. This is particularly relevant when the success of rehabilitation cannot be evaluated in the short to medium term (EPA, 1994).

When approving other mining projects, the Minister for the Environment has required that there be a specific mechanism put in place for the development of the final decommissioning scenario for the site.

Technical information

The proponent (Woodward-Clyde, 1996) indicates that a rehabilitation programme will be designed in the course of the operations and that the overall objective of the rehabilitation programme will be:

- in the short term, to reduce dust and to stabilise disturbed mine landforms, ie: to reduce erosion; and

- in the long term, to establish a community of plants as stable, diverse and resilient as the pre-mining vegetation and which is compatible with the surrounding environment and land uses.

Rehabilitation requirements will be integrated with the operation of the mine and where practicable, waste material will be returned to the pit. This will be overlain by sub-grade material which is not presently economically viable to process. The returned material will be stabilised and contoured to reduce erosion as an interim measure until it becomes viable for the sub-grade material to be processed or the pit area is rehabilitated (Woodward-Clyde, 1996).

The proponent has committed to develop a rehabilitation programme as part of the operational stage of the Environmental Management Plan. The rehabilitation programme will be implemented in the course of operations and will be consistent with defined post-mining land use objectives (Commitment 8).

Operations at the Cawse Nickel project are expected to continue for a period of at least 20 years as the identified ore body is progressively mined (Woodward-Clyde, 1996). The longer term impacts arising from the completion of mining operations at the Cawse Nickel project will be mainly associated with the stabilisation of post-mining landforms and the tailings dam.

Environmental monitoring and ongoing research studies to be undertaken throughout the life of the mining operation at the Cawse Nickel project will assist in refining the environmental management practices to minimise longer term impacts (Woodward-Clyde, 1996). The proponent has committed to prepare a management plan for decommissioning at least 12 months prior to the completion of processing operations to the satisfaction of the Department of Environmental Protection and the Department of Minerals and Energy (Commitment 13).

Comments from key agencies / interest groups

Further detail needs to be provided to the Department of Minerals and Energy in respect to the actual areas of disturbance in the first 12 months of operation. This information is not readily obtained from the CER.

Response from the proponent

The proponent's response to this issue is included in Appendix 2 (Questions 4.9). The proponent recognises that further detail will need to be provided to the Department of Minerals and Energy on the actual areas of disturbance in the first 12 months of operation. This information is currently being compiled as part of the detailed mining study.

Environmental Protection Authority Evaluation

The EPA concludes that for some elements of the environment, there remains a lack of certainty regarding the extent of environmental change attributable to the long term operation of the Cawse Nickel project. In regard to the tailings dam, although the preliminary indications for management of this structure have been outlined, more detailed studies are still required. These studies will better define the long term performance characteristics and rehabilitation potential of the tailings dam and clarify the effect of these facilities on the environment. Some aspects of the project will also lead to irreversible impacts to the environment (eg: formation of mined out pits, overburden stockpiles, reduction of groundwater supply).

The management of rehabilitation and decommissioning is inherent in a number of the proponent's commitments and in information contained in the CER (Woodward-Clyde, 1996) and the response to submissions (Appendix 2). Attention to rehabilitation and decommissioning requirements at the earliest stage of project development will provide decision makers with a high degree of confidence that an acceptable post-mining condition can be achieved.

The EPA recognises that it may not be practical for Centaur to detail specific plans for the rehabilitation of the project site early in the project life, bearing in mind its life expectancy of 20 years, and that the end use of the land may not be clear at this stage. However, the EPA considers that the process of planning for decommissioning, and the development of a 'walk away' solution, should be formally instigated early within the mine life. Accordingly, a plan describing the process of decommissioning and rehabilitation should be developed within 5 years of commissioning the project (Recommendation 4, Section 5).

5. Conclusion and recommendations

5.1 Conclusion

Following review of the proponent's Consultative Environmental Review, the issues raised in submissions, advice received from government departments, relevant literature and the proponent's revised environmental management commitments, the EPA concludes on the information currently available, that the proposal by Centaur Mining and Exploration for the development of the Cawse Nickel project can be managed to meet the EPA's objectives.

5.2 Recommendations

Noting the conclusion reached, the EPA submits the following recommendations to the Minister for the Environment.

Recommendation 1

That the Minister for the Environment note that the EPA has concluded that the proposal can be managed to meet the EPA's objectives, subject to the proponent's revised environmental management commitments and the EPA's recommended conditions and procedures (see Recommendation 5).

Recommendation 2

Within 5 years following commencement of the operation of the tailings storage facility, the proponent should submit a report which includes, but is not necessarily limited to the following:

1. a description of the development of the tailings storage facility;

2. details of the operation of the tailings storage facility and issues arising from and variations required to its operations; and

3. monitoring results;

to the requirements of the Environmental Protection Authority. The reporting required by this condition should be repeated thereafter at five-yearly intervals to the requirements of the Minister for the Environment.

Note: The Environmental Protection Authority will subsequently advise the Minister for the Environment on the need for further five-yearly reports.

Recommendation 3

That the Environmental Management Plan (EMP) prepared by the proponent under Commitment 1, include the following information to the satisfaction of the Environmental Protection Authority on advice of the Department of Environmental Protection:

Greenhouse gas emissions :

- **calculate the greenhouse gas emissions associated with the proposal (using the methodology developed for Australia);**
- **indicate the specific measures adopted to limit greenhouse gas emissions for the project;**
- **as appropriate, whether on a project specific basis, company—wide arrangement or within an industrial grouping, enter into the National C21 'Greenhouse Challenge' voluntary agreement programme for the estimation, reporting and auditing of greenhouse gas emissions; and**
- **estimate as appropriate, the global emission credit (greenhouse gas offsets) achieved through implementation of the proposal.**

Reports of the results are to be submitted annually to the Department of Environmental Protection for audit, and are to be made publicly available.

Recommendation 4

Within five years of commissioning the Cawse Nickel project, or at such later time considered appropriate by the Minister for the Environment on the advice of the Department of Environmental Protection, the proponent should prepare and subsequently implement a plan which:

- **describes the process for the decommissioning and rehabilitation of the project area;**
- **provides for the long term management of ground and surface water systems affected by the tailings storage facility; and**
- **provides for the development of a 'walk away' solution for the decommissioned mine pits, the process plant, tailings storage facility, process water ponds and associated infrastructure,**

to the requirements of the Environmental Protection Authority on the advice of the Department of Environmental Protection, the Department of Minerals and Energy and the Water and Rivers Commission.

Note: A 'walk away' solution means that the site shall either no longer require management at the time the proponent ceases operations, or if further management is deemed necessary, the proponent shall make adequate provision so that the required management is undertaken with no liability to the State.

Recommendation 5

That, if the Minister for the Environment provides environmental clearance that the proposal may be implemented, that clearance be subject to the Conditions set out in Section 6 of this report.

Issues	EPA Objective	Evaluation Framework	Proponent's Commitments	EPA Recommendations
Biophysical				
1 Impact on locally and regionally significant vegetation associations, Declared Rare and Priority flora.	To protect Declared Rare and Priority flora and avoid loss of locally and regionally significant vegetation associations and plant habitats, where possible.	Compliance with provisions of Wildlife Conservation Act. Project aspects such as out-of-pit waste storages, processing plant, tailings storage facility and access road all located to avoid, where possible, significant plant communities.	The proponent will develop and implement procedures, as part of both construction and operational stages of the EMP, to avoid unnecessary disturbance to vegetation, especially significant associations, and flora. (Commitment 6) EMP to satisfaction of EPA on advice from DEP, DME (Commitment 1).	Proponent's commitments are considered adequate to meet EPA objective.
2 Impact on Threatened and Priority fauna species and animal habitats	Threatened and Priority fauna species and their habitat should be protected.	Compliance with provisions of Wildlife Conservation Act. Project area has no exceptional regional or local qualities or unusually distinctive suites of fauna.	The proponent will develop and implement procedures, as part of both construction and operational stages of the EMP, to avoid unnecessary disturbance to fauna species and habitats (Commitment 7). EMP to satisfaction of EPA on advice from DEP and DME (Commitment 1).	Proponent's commitments are considered adequate to meet EPA objective.
3 Impact on the water table due to the extraction of groundwater.	To ensure that the proposed extraction of up to 6000m^3 per day (initially) of groundwater and potentially up to 12,000m^3 per day, is implemented such that the ecological integrity of indigenous vegetation and existing user rights are maintained.	Water resources use in the area is administered by the Water and Rivers Commission. The project is located in an area of highly saline groundwater resources located at a depth in excess of 40m: Too saline for deep rooted vegetation.	A new borefield in the Caprock aquifer and new bores at the existing Basalt borefield will provide project water supply. The EMP for the project will be developed in context of Water and Rivers Commission Groundwater Well Licence Conditions. EMP to satisfaction of EPA on advice from DEP and DME (Commitment 1).	Proponent's commitments are considered adequate to meet EPA objective.

Table 4. Summary of Environmental Protection Authority recommendations

Issues	EPA Objective	Evaluation Framework	Proponent's Commitments	EPA Recommendations
Pollution potential				
4 Protection of groundwater quality from lakes forming in mined out pit.	Avoid further salinisation of groundwater from lakes forming in the mined-out pits.	Overburden will be progressively infilled into mined areas as a priority once the area below the pit has been sterilised. Groundwater is already saline to hypersaline.	The proponent has indicated that integrated project planning will enable progressive infilling of mined out pits and that priority will be given to backfilling pits which intersect the groundwater table.	Following confirmation from the proponent that priority will be given to backfilling pits which intersect the groundwater table, no EPA recommendation is required.
5 Solid and liquid waste disposal (tailings dam).	To ensure that environmental impacts arising from the disposal of tailings are kept as low as practicable and that best practice is implemented.	DEP Works Approval and Licence, and Mining Act requirements. Appropriate location, design, rehabilitation, monitoring, and decommissioning and the implementation of best practice.	Installation of monitoring bores, monitoring vegetation and undertaking remedial work if leakage detected or vegetation condition changes to be included in EMP (Commitment 3). The proponent will restore or replace stock dams affected by the project (Commitment 3). EMP to satisfaction of EPA on advice from DEP and DME (Commitment 1).	Report to EPA on leach residue disposal facility after five years of operations. RECOMMENDATION 2 Ensure the long term management of the leach residue disposal facility as part of an overall decommissioning and rehabilitation strategy. RECOMMENDATION 4

Table 4. Summary of Environmental Protection Authority recommendations (cont'd)

Issues	Objective	Evaluation Framework	Proponent's Commitments	EPA Recommendations
Pollution potential				
6 Gaseous emissions (including greenhouse gases and odours)	To ensure that gaseous emissions, including greenhouse gases and odours, both individually and cumulatively, do not cause an environmental or human health problem in the area surrounding the proposed processing plant. The proponent must use all reasonable and practicable measures to reduce the discharge of wastes, including gases. (EPA, 1996 Bull 804)	Potential pollutants are subject to DEP Works Approval and Licence requirements. Comply with EPA requirements for greenhouse gas emissions.	Monitor gaseous emissions during commissioning of the processing plant and associated infrastructure to ensure levels are below EPA specified criteria (Commitment 11). Include details of potential emissions and pollution control equipment in Works Approval application to DEP if decision to establish H_2S plant. (Commitment 12)	The proponent's EMP should include: • a monitoring and audit programme for all gaseous and odorous emissions, including greenhouse gases; • calculations of the greenhouse gas emissions (using methodology developed for Australia) and; • the proponent shall use its best endeavours to assist in the achievement of the governments desired position regarding the generation of greenhouse gas emissions. RECOMMENDATION 3
7 Noise	To ensure that the amenity of surrounding residents is not unduly affected by noise emissions emanating from the project.	Compliance with Noise Abatement (Neighbourhood Annoyance) Regulations (1979) for plant noise. As the project is located in a remote area, traffic noise levels have a low potential to affect surrounding residents. Section 4.12.1 of CER states that Centaur will ensure that contractors' vehicles meet appropriate standards which minimise the potential for unacceptable noise.		Required to comply with Noise Abatement (Neighbourhood Annoyance) Regulations (1979). Proponent documentation considered adequate.

Table 4. Summary of Environmental Protection Authority recommendations (cont'd)

Issues	Objective	Evaluation Framework	Proponent's Commitments	EPA Recommendations
Other				
8 Environmental Management Plan.	To ensure the project is managed during construction, operational and decommissioning phases, to avoid unnecessary impacts and to properly manage unavoidable impacts to an acceptable level.		Centaur intend to develop an EMP which includes procedures for: - surface hydrology; - groundwater; - process water supply; - landforms; - vegetation and flora; - fauna species and habitats; - rehabilitation; - dust; and - greenhouse gas emissions. Monitoring and management addressed by proponent in 2 stage EMP: 1. Project Construction EMP. 2. Project Operation EMP. (Commitment 1)	Proponent's commitments are considered adequate.
9 Decommissioning and rehabilitation.	To ensure an acceptable rehabilitation and decommissioning programme is put in place which incorporates a "closure strategy" agreed to by the Western Australian Government.	Precedent of past mining projects, which require that long term rehabilitation and decommissioning options are considered early on in the projects development, to best integrate rehabilitation options with the mine plan.	Prepare a management plan for decommissioning at least 12 months prior to completion of processing operations (Commitment 13).	The process for planning for decommissioning and the development of a 'walk away' solution, should be instigated earlier in the life of the project. RECOMMENDATION 4.

Table 4. Summary of Environmental Protection Authority recommendations (cont'd)

6. Recommended environmental conditions

Based on its assessment of this proposal and the recommendations in this report, the Environmental Protection Authority considers that the following Recommended Environmental Conditions are appropriate.

PROPOSAL: CAWSE NICKEL PROJECT, 50KM NORTH WEST OF KALGOORLIE (1001)

PROPONENT: CENTAUR MINING AND EXPLORATION LIMITED

This proposal may be implemented subject to the following conditions:

1 Proponent Commitments
The proponent has made a number of environmental management commitments in order to protect the environment.

1-1 In implementing the proposal, the proponent shall fulfil the commitments made in the Consultative Environmental Review and in response to issues raised following public submissions; provided that the commitments are not inconsistent with the conditions or procedures contained in this statement.

The consolidated environmental management commitments were published in Environmental Protection Authority Bulletin 825 (Appendix 4) and a copy is attached.

2 Implementation
Changes to the proposal which are not substantial may be carried out with the approval of the Minister for the Environment.

2-1 Subject to these conditions, the manner of detailed implementation of the proposal shall conform in substance with that set out in any designs, specifications, plans or other technical material submitted by the proponent to the Environmental Protection Authority with the proposal.

2-2 Where, in the course of the detailed implementation referred to in condition 2-1, the proponent seeks to change the designs, specifications, plans or other technical material submitted to the Environmental Protection Authority in any way that the Minister for the Environment determines, on the advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

3 Proponent
These conditions legally apply to the nominated proponent.

3-1 No transfer of ownership, control or management of the project which would give rise to a need for the replacement of the proponent shall take place until the Minister for the Environment has advised the proponent that approval has been given for the nomination of a replacement proponent. Any request for the exercise of that power of the Minister shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the project in accordance with the conditions and procedures set out in the statement.

4 Tailings Storage Facility
The tailings storage facility should be managed to protect the environment and facilitate rehabilitation and decommissioning.

4-1 Within five years following commencement of the operation of the tailings storage facility, the proponent shall submit a report which includes, but is not necessarily limited to the following:

1. a description of the development of the tailings storage facility;

2. details of the operation of the tailings storage facility and issues arising from and variations required to its operations; and

3. monitoring results,

to the requirements of the Environmental Protection Authority. The reporting required by this condition shall be repeated thereafter at five-yearly intervals to the requirements of the Minister for the Environment.

Note: The Environmental Protection Authority will advise the Minister for the Environment on the need for further five-yearly reports.

5 Greenhouse Gas Emissions

Greenhouse gas emissions should be addressed in the Environmental Management Plan.

5-1 At appropriate times, the proponent shall address, in the Environmental Management Plan to be prepared under Commitment 1, the following additional matters relating to greenhouse gas emissions:

1. calculation of the greenhouse gas emissions associated with the proposal (using the methodology developed for Australia);

2. indication of the specific measures adopted to limit greenhouse gas emissions for the project;

3. entry into the National C21 'Greenhouse Challenge' voluntary agreement programme for the estimation, reporting and auditing of greenhouse gas emissions, whether on a project-specific basis, company-wide arrangement or within an industrial grouping, as appropriate; and

4. estimation, of the global emission credit (greenhouse gas offsets) achieved through implementation of the proposal, as appropriate, with reporting on progress,

to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection.

6 Decommissioning

6-1 The proponent shall achieve the satisfactory decommissioning of the project, removal of plant and installations and rehabilitation of the site and its environs.

6-2 To achieve the objective of condition 6-1, within five years following commissioning, or at such later time considered appropriate by the Minister for the Environment on advice of the Department of Environmental Protection, the proponent shall prepare a plan which:

1. describes the process for the decommissioning and rehabilitation of the project area;

2. provides for the long term management of ground and surface water systems affected by the tailings storage facility; and

3. provides for the development of a 'walk away' solution for the decommissioned mine pits, the process plant, the tailings dam, the process water ponds and all associated infrastructure,

to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection, the Department of Minerals and Energy and the Water and Rivers Commission.

Note: A 'walk away' solution means that the site shall either no longer require management at the time the proponent ceases operations, or if further management is deemed necessary, the proponent shall make adequate provision so that the required management is undertaken with no liability to the State.

6-3 The proponent shall implement the plan required by condition 6-2.

7 Time Limit on Approval

The environmental approval for the proposal is limited.

7-1 If the proponent has not substantially commenced the project within five years of the date of this statement, then the approval to implement the proposal as granted in this statement shall lapse and be void. The Minister for the Environment shall determine any question as to whether the project has been substantially commenced.

Any application to extend the period of five years referred to in this condition shall be made before the expiration of that period to the Minister for the Environment.

Where the proponent demonstrates to the requirements of the Minister for the Environment on advice of the Department of Environmental Protection that the environmental parameters of the proposal have not changed significantly, then the Minister may grant an extension not exceeding five years.

8 Compliance Auditing

To help determine environmental performance and compliance with the conditions, periodic reports on the implementation of the proposal are required.

8-1 The proponent shall submit periodic Performance and Compliance Reports, in accordance with an audit programme prepared by the Department of Environmental Protection in consultation with the proponent.

Procedure

1 Unless otherwise specified, the Department of Environmental Protection is responsible for assessing compliance with the conditions contained in this statement and for issuing formal clearance of conditions.

2 Where compliance with any condition is in dispute, the matter will be determined by the Minister for the Environment.

Note

The proponent is required to apply for a Works Approval and Licence for this project under the provisions of Part V of the Environmental Protection Act.

7. References

Australian Environment Council, National Health and Research Council 1986, *National guidelines for control of emission of air pollutants from new stationary souces: Recommended methods for monitoring air pollutants in the environment*, Commonwealth of Australia

Environmental Protection Authority 1991, *Proposed Mesa J iron ore development - Pannawonica,* Report and Recommendations of the Environmental Protection Authority, Bulletin 574, Environmental Protection Authority, Perth, Western Australia.

Environmental Protection Authority 1992, *Development of an Environmental Protection Policy for Air Quality at Kwinana,* Bulletin 644, Environmental Protection Authority, Perth, Western Australia.

Environmental Protection Authority 1994, *Boddington Gold Mine: Rehabilitation Strategy:,* Report and Recommendations of the Environmental Protection Authority, Bulletin 766, Environmental Protection Authority, Perth, Western Australia.

Environmental Protection Authority 1996a, *Mid West Iron and Steel, Geraldton Steel Plant, Narngulu Industrial Estate, Geraldton,* Report and Recommendations of the Environmental Protection Authority, Bulletin 804, Environmental Protection Authority, Perth, Western Australia.

Environmental Protection Authority 1996b, *Nickel/Cobalt ore mining and processing operations, Murrin Murrin, 60km east of Leonora,* Report and Recommendations of the Environmental Protection Authority, Bulletin 816, Environmental Protection Authority, Perth, Western Australia.

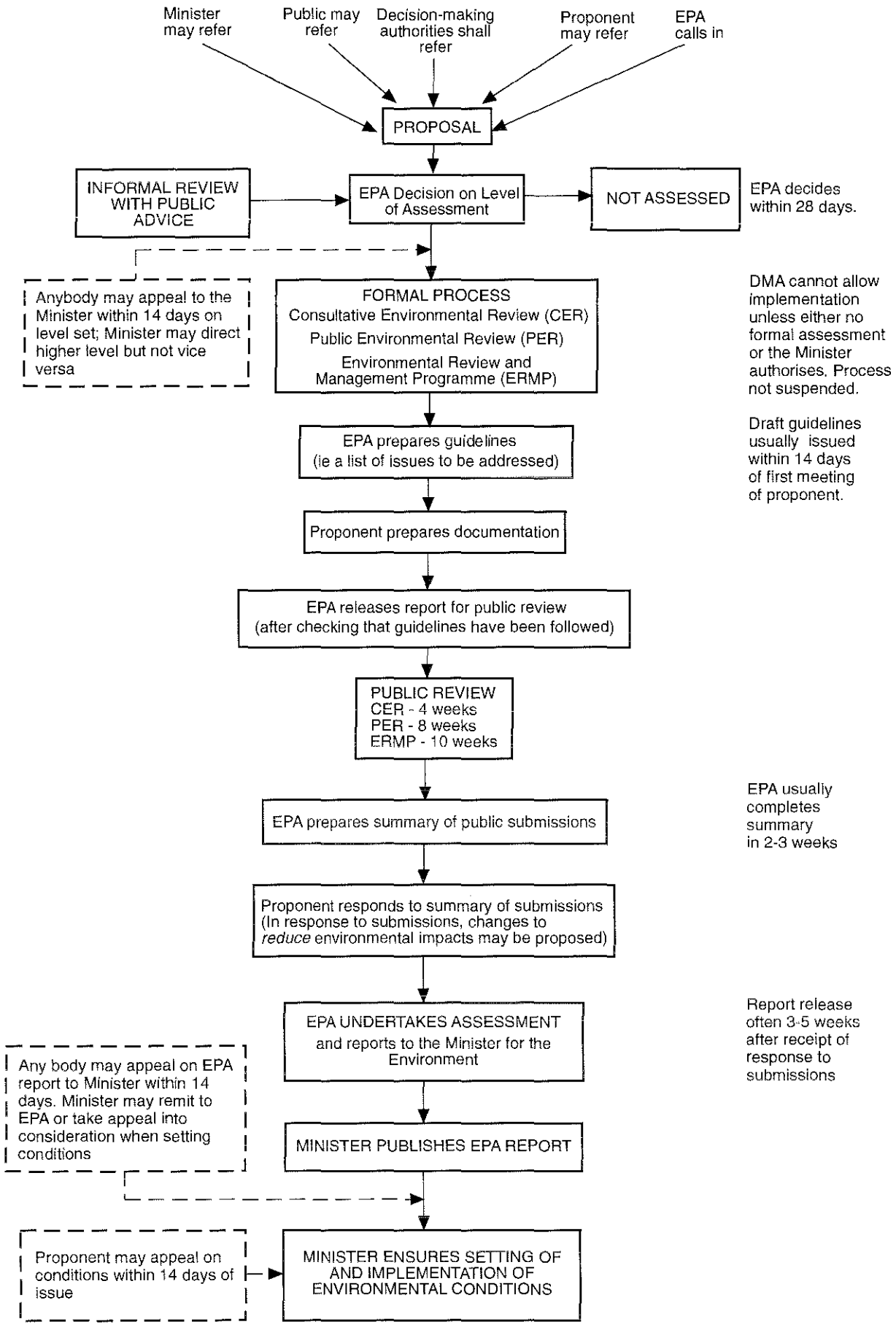
Environmental Protection Authority 1996c, *Narrikup export abattoir,* Report and Recommendations of the Environmental Protection Authority, Bulletin 808, Environmental Protection Authority, Perth, Western Australia.

Woodward-Clyde 1996, *Cawse Nickel Project*, Consultative Environmental Review, unpub.

Appendix 1

Environmental Impact Assessment flow chart

EIA PROCESS FLOW CHART



Appendix 2

Summary of submissions and proponent's response

CENTAUR MINING & EXPLORATION LIMITED
CAWSE NICKEL PROJECT

Responses to Issues Raised in Public Submissions on the CER

The following addresses issues raised in submissions on the CER that was prepared by Centaur Mining and Exploration Limited (Centaur) for the Cawse Nickel Project. The issues raised in the submissions were summarised by the Department of Environmental Protection under the following subject headings:

- Biophysical Impacts;
- Pollution Prevention;
- Social Surroundings; and
- Miscellaneous Issues.

1.0 BIOPHYSICAL IMPACTS

Q. 1.1 The commitment by the Proponent to develop and implement procedures, as part of the proposed EMP, to avoid unnecessary disturbance to vegetation is noted. The CER identifies locally and regionally significant vegetation communities and will mostly avoid these communities although Community Type 1b will be partially affected by the development. The direct loss and degradation of vegetation communities via mining could, in part, be ameliorated by pro-active management in areas peripheral to the mine to reduce the effects of other processes of degradation (independent of mining) which may be occurring. Will the Proponent liaise with CALM during preparation of the EMP to explore co-operative management of the significant vegetation communities, for example exclusion of grazing?

A. 1.1 Yes. Centaur will liaise with the Regional office of the Department of Conservation and Land Management (CALM) during the preparation of the Environmental Management Plan (EMP) to explore means of co-operation for management of significant vegetation communities. However, as the Project is located on a pastoral lease which is not held by Centaur, the company is limited in its capacity to exclude grazing from areas which are peripheral to mining and processing activities. Centaur is prepared to discuss this matter with the pastoralist.

Q 1.2 Section 3.6 states that a survey of vertebrate fauna was undertaken for the project in November 1995 by Ninox Wildlife Consulting. However the comparative fauna species list at Appendix C gives no indication of survey effort, including relative to the other surveys conducted. This needs to be clarified and a copy of the Ninox Wildlife Consulting report should be provided to CALM prior to development of the EMP.

A. 1.2 Full details of the vertebrate fauna survey were not included in the CER in an effort to keep the document concise. Centaur will provide CALM with a full copy of the Ninox Wildlife Consulting report prior to the development of the EMP.

Q. 1.3 Table 6.1 of the CER summarises the overall effect of the project on fauna as follows:

"A degree of impact is predicted for five of the Schedule fauna species".

The persistence of fauna species relies on adequate protection of habitat and management of other threatening processes, including feral predation. Will the Proponent consider implementation of some form of ameliorative fauna management within its tenement area, such as a feral animal control programme, to assist in mitigation of the direct fauna habitat impacts as a result of the project? This could be done via the EMP in liaison with CALM.

A. 1.3 Similar to the undertaking in A. 1.1 to liaise with the CALM Regional office on managing significant vegetation communities, Centaur will consult with CALM on practicable means of mitigating impacts on fauna habitats. This would be done in conjunction with the pastoral lease holder and agreed measures would be included in the Project EMP.

Q. 1.4 The CER recognises the potential for road kills of fauna as a result of increased traffic in the area and also the potential for fauna to utilise the tailings storage facility. To assist regional fauna management and data collection will the Proponent provide regular reports to CALM of any road kills of uncommon native fauna and/or fauna entrapment in the tailings storage facility?

A. 1.4 As indicated in the responses to Q. 1.1 and Q. 1.3, Centaur will consult with the CALM Regional office during the preparation of the EMP. This will include an undertaking to provide regular reports of any fauna deaths that may occur as a result of activities associated with the Project.

Q. 1.5 Potential leaks from the proposed water pipeline will result in a high salt load to the environment. Rehabilitation may therefore be difficult until adequate leaching of salts has occurred. This issue needs to be addressed in the EMP, however can the Proponent give some preliminary indication of how this issue may be managed?

A. 1.5 The primary strategy for managing this issue is to take all practicable measures to prevent leakage from occurring by ensuring that the pipeline is designed, constructed and operated to a high standard. As a reliable water supply is critical to the nickel/cobalt process there is a strong incentive to avoid loss of process water in addition to avoiding environmental impacts. Detailed design of the water supply pipeline is currently being undertaken and will incorporate the following:

- pipeline located in a trench and buried with earth cover of 300-400 millimetres. This will reduce expansion and contraction and the chafing associated with lateral movement of the pipeline which could cause pipeline failure. It also protects the pipeline from damage from vehicles etc. (note: conceptual design in CER proposed above ground pipe);

- pressure switches/sensors on all bore pumps and intermediate transfer pumps (if intermediate pumps are required) to automatically switch the pumps off in the event of pressure decreases (caused by pipeline burst) or increases (caused by pipe blockage or inadvertent valve closure);

- pressure testing of constructed pipeline to AS 2033; and

- regular inspection of the pipeline route as part of routine borefield inspections and prompt repair, if required.

A contingency and rehabilitation plan will be developed in the EMP in the event that there is a pipeline leakage. Specific action would be dependent on the extent and nature of such an event, but may include removal and replacement of salt affected

soil and/or preparing the area in such a way as to allow fresh water (rain or irrigation) to leach the salt from the surface soils eg. ripping.

Q. 1.6 Concern has been expressed at the adequacy of groundwater resources in the region to provide the process water requirements for the project. The CER states that the water supply borefields have not yet been confirmed. Groundwater abstraction from potential palaeochannels needs to be assessed carefully as it may not be able to meet the forecast demand. Can the Proponent provide any further information from its ongoing investigations in respect of water supply for the development?

A. 1.6 At the time of writing the CER, groundwater investigations were at a preliminary stage in identifying potential groundwater resources for the Project. Since this time, considerable progress has been made in securing suitable water resources. During these investigations three main aquifer systems were identified, one hypersaline (100,000+mg/L TDS) palaeochannel, one saline (around 60,000mg/L TDS) palaeochannel and one saline (around 30,000 to 40,000mg/L TDS) fractured rock aquifer. Also during the investigation, Centaur acquired the Ora Banda Gold Mine which sources process water supplies (of sub 60,000mg/L salinity) from two borefields located close to the Cawse minesite.

The closest groundwater supplies to the Project area are the existing Ora Banda borefields, the Basalt Borefield and the Flat Rocks Well Borefield. The former currently comprises four active bores and produces some 1,500 kL/d of saline water (25,000 to 35,000mg/L TDS) from a combined fractured basement/caprock type aquifer. The Flat Rocks Well Borefield mostly taps a shallow calcrete aquifer but some bores also intersect minor palaeochannel sands at depth. It currently produces about 1,000kL/d of saline water (15,000 to 55,000mg/L TDS) from six bores.

The acquisition of the Ora Banda Gold Mine has provided Centaur with alternative options for rationalising water supplies between the two projects.

It is therefore proposed to use these borefields (the Basalt Borefield and the Flat Rocks Well Borefield) to meet some of the demands of the Cawse Nickel Project. In addition, investigations are underway to assess and develop the lower salinity sources to supplement the Basalt and Flat Rocks Well Borefields to provide "low" salinity process water supplies to the Cawse Nickel Project and the hypersaline sources to supply the ongoing requirements of the Ora Banda Gold Mine.

These investigations are nearing completion and results to date indicate that up to 4,000 kL/d of relatively low salinity (sub 60,000 mg/L) would be available from the fractured rock aquifer and that up to 1,000 kL/d would be available to Cawse from the saline palaeochannel. The results also indicate that the entire process demand at Ora Banda (some 5,000 kL/d) could be met by the hypersaline palaeochannel.

Q. 1.7 In respect to borefields, Section 4.3.2 of the CER states that water levels will be monitored to provide data for the assessment of aquifer behaviour to enable revision of operational activity as necessary. Drawdown interference with bores and wells of other users should be kept to a minimum. Prior to borefield development, will the Proponent prepare a map showing the forecast areas of influence of drawdown in relation to time as the groundwater resource is utilised? (This information is recommended for inclusion in the application for a groundwater abstraction licence).

A. 1.7 Yes. The detailed design of the Project will involve modelling of the groundwater resources including the preparation of a plan forecasting areas of influence of drawdown in relation to time as the groundwater is utilised. This information will be submitted in support of the groundwater abstraction licence.

Q. 1.8 Can the Proponent provide a preliminary outline of potential methods for discouraging fauna from utilising the tailings storage facility? It is understood that these alternative methods would be investigated during the early operations phase of the Project.

A. 1.8 Centaur will investigate practical means of discouraging fauna from utilising the tailings storage facility during the preparation of the EMP to be implemented during the early operations phase of the Project. Experience gained from operating tailings storage facilities throughout the Goldfields Region indicates that one of the most effective means of discouraging fauna is to design and operate the tailings storage facility to minimise the area of ponded surface water. As the tailings facility has been designed for maximum water recovery this will be largely achieved. Other factors which discourage fauna from using the tailings storage facility include:

- clearing of vegetation from the tailings area prior to discharge, thus removing roosting and shelter sites;
- use of saline water in the process; and
- location of the facility close to the processing plant and active mining areas.

Q. 1.9 Is there any information on the degree of representation of the regionally significant vegetation types in secure conservation reserves? This information should have been provided in Section 4.6 notably in relation to Community Type 1b.

A. 1.9 It is difficult to determine the extent to which the various community types identified within the Cawse Project area are represented in secure nature reserves due to lack of detailed survey information on regional reserves. Some information has been provided on Kurrawong Nature Reserve. Such a determination would require a specific survey to be conducted within regional reserves to identify the extent of particular communities. This would only be warranted if it was determined that the Cawse Nickel Project is likely to have a major impact on a regionally significant community type. It is estimated that less than 10% of a potentially regionally significant community type (1b) will be affected by the proposed mining operations.

2.0 POLLUTION PREVENTION

Q. 2.1 It is noted that the Proponent intends to limit the accumulation of salt in areas to be revegetated. How will this be managed given that saline groundwater is to be used for dust suppression and the high evaporation rates in the area?

A. 2.1 Specific management procedures for the use of saline water for dust suppression will be developed and implemented through the EMP. It is intended, however, to restrict the use of saline water for dust suppression to highly trafficable areas such as haul roads pit access ramps and the plant site. These areas will require special treatment prior to final rehabilitation. Saline water will not be used on areas requiring progressive rehabilitation such as final waste storage area surfaces, borrow pits, topsoil stockpiles, tailings storage facility walls and drainage control structures.

Q. 2.2 Is the "acidic spent electrolyte" to be used in the electrowinning process, described in Section 2.3.7.1, the spent acid from the preceding scrubbing process?

A. 2.2 No. The acidified water used to scrub excess ammonia from the loaded organic will only be in the pH range of 4-6. This will most likely be returned to the acid pressure leach process. The acidic spent electrolyte is generated within the closed electrowinning circuit once the nickel is electrowon onto the cathodes.

Q. 2.3 How will the gaseous emissions from the power station be exhausted (ie via a chimney stack, height, etc)?

A. 2.3 Gaseous emissions from the power station will be directed through a boiler unit to produce steam for the acid pressure leach process. As the final design of the power station and waste heat boiler has not been completed, actual specifications are not known at this stage.

Q. 2.4 What are the No_x, CO and SO_2 emission rates from the power station, expressed in (g/m^3 of exhaust gas?

A. 2.4 Actual concentrations of gaseous emission components for the power station have not been determined in (g/m^3 as the output rates provided in the CER are indicative only, based on typical emissions for this type of duel fuel gas engine. Final specifications for the generators will be determined at the final design phase of the Project. However, it is anticipated that such emissions from high efficiency gas engines would be well below EPA specified limits.

Q. 2.5 It is acknowledged that no decision has been made regarding a potential hydrogen sulphide plant, however some preliminary information would be useful in the context of gaseous emissions assessment for the whole project. For example, a description of the infrequent upset conditions that would cause the H_2S plant to produce SO_2. Does the Proponent have any information on what SO_2 concentrations would be emitted from the plant under such conditions, and how often are upset conditions likely to occur from the type of plant which may be constructed?

A. 2.5 The most updated plant design does not include a hydrogen sulphide plant. Furthermore, if it is decided to include such a plant, in the future, it needs to be recognised that the design of these plants and alternative processes available for producing hydrogen sulphide can vary greatly. It is therefore difficult to anticipate specific operational parameters. The design and operation criteria for such a plant would need to comply with any specified EPA limits and would be subject to Department of Environmental Protection (DEP) Works Approval and Licencing.

Q. 2.6 Table 2.3 indicates that the tailings materials will contain concentrations of cobalt, copper, chromium and sulphur which exceed ANZECC/NHMRC Soil Investigation Guidelines. These guidelines are routinely used to identify if a site is potentially contaminated. Although exceedence of the guidelines does not necessarily indicate that the material is hazardous, it does signal the requirement for the consideration of possible human health and environmental risks. In this regard, comments are requested on the following:

- Would exposure to the tailings material be hazardous to human health? If so how will exposure be prevented or minimised to acceptable levels during project operation and following decommission?

- Are the metal concentrations in the tailings material likely to affect native vegetation regrowth? If so, what measures will be applied to ensure effective rehabilitation of the tailings dams?

A. 2.6 An assessment of potential impacts resulting from either direct or indirect exposure to specific metal concentrations in the tailings material has not been undertaken. Circumstances where humans are exposed to tailings materials over prolonged periods or other exposure pathways which may result in adverse effects to human health at such low concentrations are difficult to envisage.

A rehabilitation plan for the tailings surface will be developed through the life of the operations as trials are conducted to determine the most effective means of rehabilitation. These trials could include an assessment of potential uptake of metals in established vegetation, if appropriate to a future beneficial land use such as grazing.

Toxicity of various metals in the tailings material to vegetation to be used in rehabilitation of the tailings disposal facility would also be assessed as part of developing an effective rehabilitation plan.

Q. 2.7 Geotechnical investigations of the tailings dam have not been described in the CER, other than a summary of site geology in Appendix D. It is acknowledged in the CER that potential seepage of saline process water may adversely affect adjacent vegetation. However, it is not clear in Appendix D how the potential for lateral seepage in the shallow sub-surface (on the hardpan or in the gravel and sand lenses) will be prevented. Will the proponent clarify this aspect, along with its objective in regard to protection of adjacent vegetation condition? For example, if significant seepage is detected by the groundwater monitor bores, how will the permeability of the pond floor be corrected?

A. 2.7 Detailed design of the tailings disposal facility including geotechnical investigations of the tailing disposal site had not been undertaken at the time of publishing the CER. This work is currently underway. The tailings storage embankment includes a cutoff key trench to control seepage under the embankment. A conceptual design plan is attached to this response illustrating the proposed structure. The final design plans will be submitted to the Department of Minerals and Energy (DME) for approval prior to construction.

Centaur's objective with regard to protection of vegetation adjacent to the tailings storage facility is that no vegetation deaths will occur as a result of saline water seepage from the storage facility. Vegetation condition will be monitored, as part of the EMP, in conjunction with regular monitoring of groundwater in bores established adjacent to the storage facility to detect leakage. If leakage is detected or the condition of vegetation deteriorates as a result of leakage, appropriate action will be taken to ameliorate such impacts. It is difficult to specify actual amelioration measures as different measures would be used depending on the nature of any potential leakage. These may include:

- remedial work on the embankment;
- establishing interceptor trenches or bores; and
- constructing the next cell of the tailings storage facility down gradient of the area where a leak is detected.

Q. 2.8 The CER indicates that tailings dam leakage will be monitored. If leakage is detected which would adversely affect the surrounding vegetation, remedial measures will be undertaken (page 4-7). What criteria will be applied to assess monitoring data and trigger remedial action?

A. 2.8 Specific criteria will be developed as part of the EMP for assessing monitoring data and triggering remedial action. These will include:

- change of groundwater quality in monitoring bores indicative of process water eg. salinity;
- general condition of adjacent vegetation; and
- visual surface seepage adjacent to the tailings storage facility.

Q. 2.9 Please provide a diagram to clarify the proposed design for the tailings dam as discussed in Appendix D, with particular reference to process water recovery and prevention of lateral seepage in the shallow sub-surface. The design needs to conform to current DME guidelines.

A. 2.9 Conceptual design plans for the tailings storage facility are attached to this response. Centaur notes that the final design will need to conform to DME guidelines and will submit the final design plan to DME for approval prior to construction of the tailings storage facility. It is also noted that DEP Works Approval and Licensing of the tailings storage facility is also required.

Q. 2.10 What are the geotechnical properties of the silt-clay material and lateritic gravel material that will be used to construct the tailings dams? Using this information and other data as required, will the Proponent be able to provide a quantitative assessment of the potential for and likely extent of seepage from the tailing dams in the EMP?

A. 2.10 The geotechnical properties of the tailings embankment construction material is currently being investigated for the final tailings storage facility design. This information will be included in the application for Works Approval and the submission for DME approval.

Q. 2.11 Please provide more detail of the calculations and assumptions that were applied to determine the tailings storage water balance, presented in Appendix D.

A. 2.11 Dates, assumptions and calculations used for the water balance are as follows:

<u>Tailings Data</u>	
Slurry	40% solids (by mass)
Solids	87.8 tonnes/hour
Throughflow	7500 hours/year
<u>Assumptions</u>	
SG solids	2.65
SG water	1.00
Initial Tailings Dry Density	0.90 tonnes/m^3
Tailings Storage Area	25 ha
Average Annual Rainfall	224 mm
Average Annual Pan Evaporation	2943 mm
Storage Area Average Runoff	70%+ Annual Rainfall
Storage Area Average Evaporation	8.4% Pan Evaporation

Calculations

Slurry Water Content	132 m^3/hour (3168 kL/d)
Initial Tailings Water Content	64.5 m^3/hour (1548 kL/d)
Initial Slurry Water Release	67.5 m^3/hour (1620 kL/d)
Storage Average Rainfall Runoff	107 kL/d
Storage Average Evaporation Loss	169 kL/d
Average Decant Water Recovery	1558 kL/d

Q. 2.12 Concern has been expressed at the level of risk posed by continual increases in the transportation of hazardous goods along established roads in the region. There may not be any form of containment or emergency response management at sensitive locations. Therefore, it is considered that a risk assessment should be conducted for the transport of sulphuric acid to the site and that if any significant increase in risk is identified the appropriate Authorities should be consulted. Would the Proponent please comment?

A. 2.12 Centaur will commission a risk assessment for transport of sulphuric acid and develop an emergency response plan in consultation with appropriate authorities and the sulphuric acid supplier.

Q. 2.13 Page 2-4, Section 2.3.1, second paragraph mentions "deeper sulphide mineralisation". Are these sulphides potential materials for generation of acid drainage from the waste dumps or the tailings storage?

A. 2.13 All identified reserves of nickel/cobalt ore subject to this proposal are totally oxidised. The proposed acid leach process is consequently only suitable for this type of ore. If subsequent exploration identified sulphide mineralisation which could be economically exploited, a different process would need to be employed. This would be subject to a separate proposal which would necessarily include an assessment of potential for acid generation.

Q. 2.14 Page 4-9, Section 4.4.2.3 - Isolation of pipeline sections. The CER states that the process water pipelines from the borefields will have shut off valves to isolate sections from draining. Will these shut off valves also be automatic if a pressure drop occurs (eg with a pipe burst or leak)? Will pumps shut off through use of pressure sensors?

A. 2.14 Detailed design of the water pipeline is currently being undertaken and varies from the conceptual design presented in the CER. The pipeline will be buried instead of being located above ground. Nevertheless, the pipeline will incorporate several intermediate in-line valves to reduce the volume to be drained in order to permit repairs. Also, pressure switches/sensors will be installed on all bore pumps which will automatically switch off the power to the pumps if a significant increase or decrease in pressure is detected.

3.0 SOCIAL SURROUNDINGS

Q. 3.1 The CER outlines a management framework to manage the potential leakage of saline process waters to the environment. However it does not address the potential for leakage to enter surface dams used by local pastoralists for stock water supply. Will the Proponent address this matter in the EMP and make a commitment to restore and/or replace any stock water supply dams which are affected by contamination?

A. 3.1 Management of potential leakages of saline water to the environment and/or surface water retention facilities will be addressed in the EMP. In the unlikely event that the Cawse Nickel Project results in any adverse impacts on surface dams used by local pastoralists for stock water supplies, Centaur will commit to replacing and/or restoring any dam that may be affected.

Q. 3.2 What effect will blasting have on noise levels at Ora Banda?

A. 3.2 Ora Banda is located approximately 9 km to the west of the proposed mining operations. Several other mining operations are located in this general vicinity which have been operating for at least 10 years, including the Ora Banda Gold Mine which is immediately adjacent to the settlement. It is therefore unlikely that blasting at Cawse will result in any perceptible change in noise levels at Ora Banda.

4.0 MISCELLANEOUS ISSUES

Q. 4.1 The source of limestone has not been discussed in the CER other than it will be provided from a local supplier. There may be environmental impacts associated with the removal of 100,000 tonnes of limestone per annum which need to be assessed in the context of this development. Has the Proponent identified a local supplier and, if so, does this supplier have access to a limestone resource which has undergone adequate environmental assessment?

A. 4.1 Although a contract for the supply of 100,000 tonnes per annum of limestone has not been finalised to date, negotiations are underway with a local supplier. The required quantity of limestone can be supplied from existing operations which have been assessed and approved by the Department of Minerals and Energy.

Q. 4.2 The provision of limestone from a local supplier is inadequately defined. What roads will the transportation of 100,000 tonnes per annum impact upon? The potential impact from heavy vehicle usage of local roads needs to be assessed.

A. 4.2 The limestone will be transported by rail to Kalgoorlie, where it will be transferred to trucks for transportation to Cawse via the Kalgoorlie-Meekatharra Road and the Broad Arrow-Ora Banda Road. The road transportation route for the limestone is the same as that for most other materials being transported to and from the Project. This was included in estimations for road transport requirements in the CER (section 2.5.5 Transportation).

Q. 4.3 With respect to process additives, clarification has been sought for the source of sulphuric acid to the project. Is there a binding contract in place for Western Mining Corporation (WMC) to supply acid to the process plant? Who will be responsible for transport of the acid by road to the mine?

A. 4.3 Yes, a contract has been agreed with Western Mining Corporation for the supply of acid to the process plant. Western Mining Corporation will be responsible for the transport of the acid to the site.

Q. 4.4 It is noted that the Kalgoorlie-Meekatharra Road is of a standard suitable for the predicted increase in volume and composition of traffic. However the Broad Arrow-Ora Banda Road will require upgrading. Will the Proponent liaise with the City of Kalgoorlie-Boulder in regard to upgrading the road and/or potential increased maintenance costs?

A. 4.4 Yes, Centaur will liaise with the City of Kalgoorlie-Boulder and other relevant agencies regarding the upgrading and maintenance of the Broad Arrow-Ora Banda Road.

Q. 4.5 The figures provided in Section 2.5.5 on the number of truck movements per day are confusing. All of the vehicles listed at page 2-18 are in fact classified as heavy vehicles by Main Roads and Austroads. Is the 55 truck movements per day derived by applying the assumption of 50% as heavy vehicle movement? The distinction between 'truck' and 'heavy vehicle' is not clear. Additional traffic may also result such as from contractors and general service vehicles. Please clarify.

Q. 4.6 It is noted that there was some discrepancy in the classification of heavy vehicles in estimating road transport requirements for the Project. All of the vehicles listed on page 2.18 of the CER are included in the estimate of 55 truck movements per day. It is therefore accepted that if all of these trucks are classified as heavy vehicles, additional light vehicle traffic including general service and other vehicles also needs to be taken into account. Although it is difficult to estimate, it is expected that a similar number of light vehicles to that of heavy vehicles would visit the site. This would result in a total of approximately 110 vehicle movements to and from the site per day.

Q. 4.6 There appear to be errors and/or inconsistencies in the road transport figures provided in Section 4.14. For example the assumption is made that 40% of the vehicles associated with the Cawse project are heavy vehicles (a figure of 50% is used earlier in the document). Also the Main Roads data quoted for the 1995 vehicles count on the Kalgoorlie-Meekatharra Road is in the order of 1,300 vehicles per day not 12,000 as mentioned in the CER. Despite the above the total volume of traffic on the road is comparatively low in relation to other major roads elsewhere in the Sate, and the Kalgoorlie-Meekatharra Road is of a suitable standard for this transport and vehicle numbers. The Broad Arrow-Ora Banda Road will require upgrading as previously stated.

A. 4.6 An error is recognised in the 1995 vehicle count reported in the CER for this section of the Kalgoorlie-Meekatharra Road. A figure of 1200 vehicle movements per day was used to calculate the percentage vehicle increase, not 12,000 as reported in the CER. However, with reference to the response to question 4.5 above, the estimates have been revised using the figure of 1300 vehicle movements per day as follows:

- total estimated vehicle movements for the Cawse Nickel Project - 110 vehicles per day
- percent increase in total vehicle movements as a result of the Project - approximately 8.5%.
- estimate of current heavy vehicle movements on this section of the Kalgoorlie-Meekatharra Road - 312 vehicles per day
- percent increase of heavy vehicles as a result of the Project - 17.5%

It is noted that this volume of traffic is comparatively low in relation to other major roads elsewhere in the State, and that the Kalgoorlie-Meekatharra Road is of a suitable standard for this transport and vehicle numbers. Upgrading will be considered for the Broad Arrow-Ora Banda Road as previously stated in the response to question 4.4.

Q. 4.7 Is the Proponent aware that formal application will need to be made to the City of Kalgoorlie-Boulder for town planning approval, for which a Form 1 Application and Site Plan/Elevation/Section will be required?

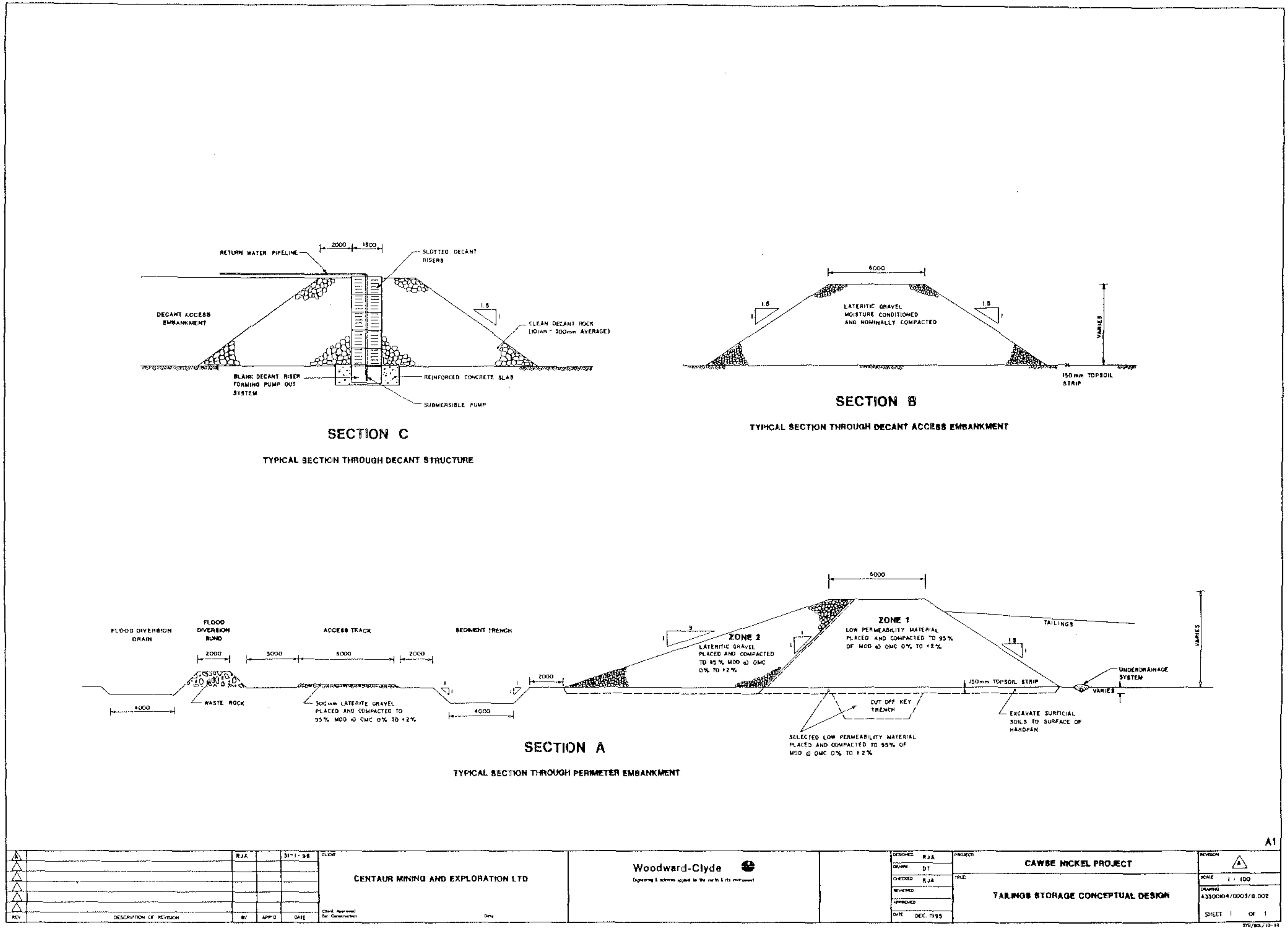
A. 4.7 Centaur is aware of the requirement for town planning approval to be given by the City of Kalgoorlie-Boulder and intends to submit the necessary Application and supporting information.

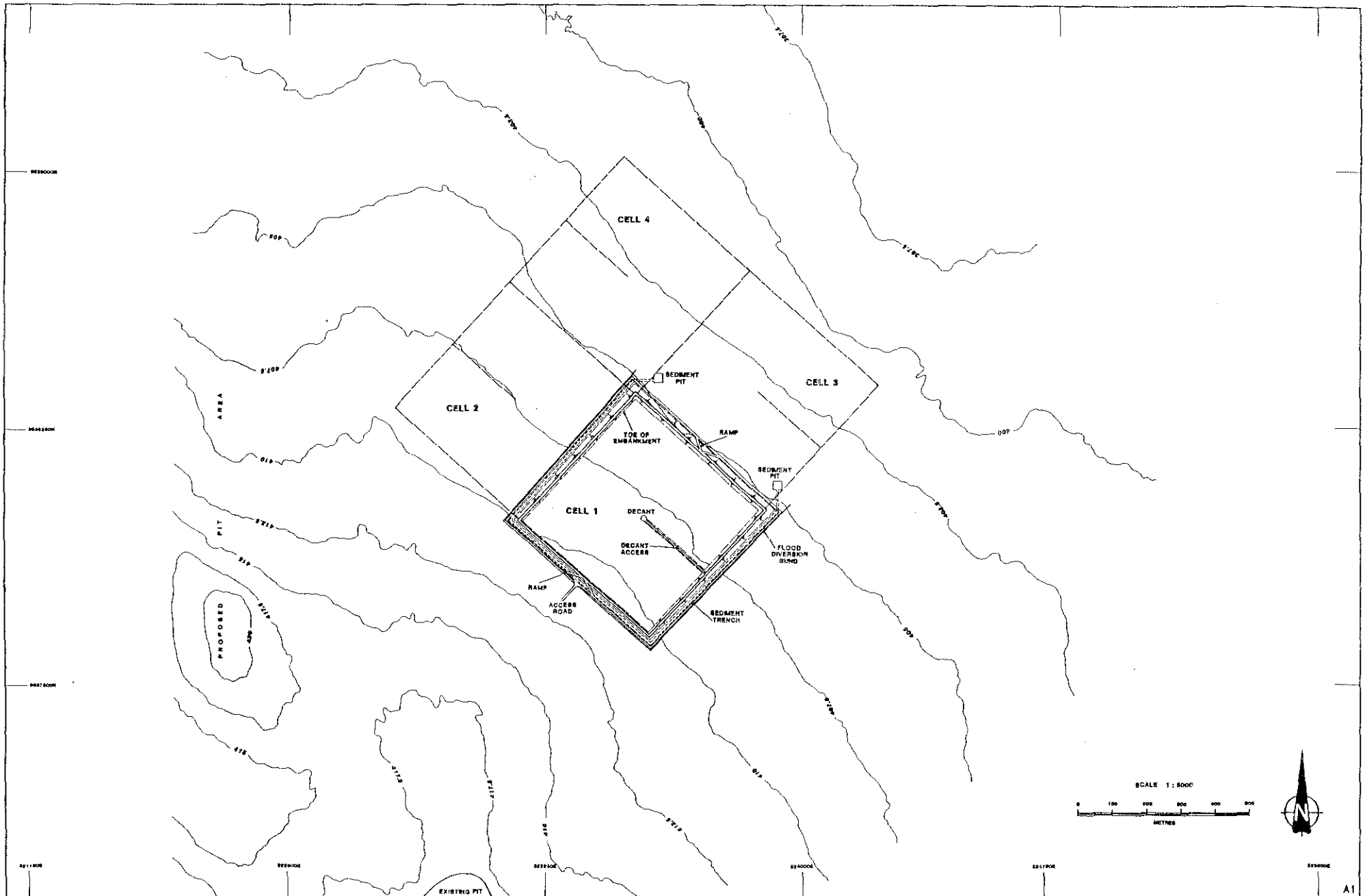
Q. 4.8 Further detail needs to be provided to the Department of Minerals and Energy in respect to the actual areas of disturbance in the first 12 months of operation. This information is not readily obtained from the CER.

A. 4.8 Centaur recognises that further detail will need to be provided to the Department of Minerals and Energy on the actual areas of disturbance in the first 12 months of operation. This information is currently being compiled as part of the detailed mining study which is underway.

Q. 4.9 The CER does not describe the product transport and routes. Are they from site to Kalgoorlie by road, then rail to Esperance or Perth, or road to export? Were alternatives considered, for example road from site to Broad Arrow then rail to export?

A. 4.9 The most likely product transport route from the Cawse Nickel Project will be directly to Esperance by road train for shipping overseas. It is possible that some of the product could also be trucked to Perth. This will depend on final markets and end users of the product. Either way, product transport will involve less than 1 truck movement per day and hence will not have a significant impact on existing traffic movements.


RETURN WATER PIPELINE
2000
1800
SLOTTED DECANT RISERS
DECANT ACCESS EMBANKMENT
1.5
1
CLEAN DECANT ROCK (10mm - 300mm AVERAGE)
BLANK DECANT RISER FORMING PUMP OUT SYSTEM
REINFORCED CONCRETE SLAB
SUBMERSIBLE PUMP
SECTION C
TYPICAL SECTION THROUGH DECANT STRUCTURE
6000
LATERITIC GRAVEL MOISTURE CONDITIONED AND NOMINALLY COMPACTED
VARIES
150mm TOPSOIL STRIP
SECTION B
TYPICAL SECTION THROUGH DECANT ACCESS EMBANKMENT
FLOOD DIVERSION DRAIN
FLOOD DIVERSION BUND
ACCESS TRACK
SEDIMENT TRENCH
2000
3000
6000
2000
4000
WASTE ROCK
300mm LATERITE GRAVEL PLACED AND COMPACTED TO 95% MDD @ OMC 0% TO +2%
4000
2000
3
ZONE 2
LATERITIC GRAVEL PLACED AND COMPACTED TO 95% MDD @ OMC 0% TO +2%
ZONE 1
LOW PERMEABILITY MATERIAL PLACED AND COMPACTED TO 95% OF MDD @ OMC 0% TO +2%
TAILINGS
1.5
150mm TOPSOIL STRIP
UNDERDRAINAGE SYSTEM
VARIES
CUT OFF KEY TRENCH
EXCAVATE SURFICIAL SOILS TO SURFACE OF HARDPAN
SELECTED LOW PERMEABILITY MATERIAL PLACED AND COMPACTED TO 95% OF MDD @ OMC 0% TO +2%
SECTION A
TYPICAL SECTION THROUGH PERIMETER EMBANKMENT
A1
RJA
31-1-96
CLIENT
CENTAUR MINING AND EXPLORATION LTD
REV
DESCRIPTION OF REVISION
BY
APP'D
DATE
Woodward-Clyde
DESIGNED RJA
DRAWN DT
CHECKED RJA
REVIEWED
APPROVED
DATE DEC. 1995
PROJECT
CAWSE NICKEL PROJECT
TITLE
TAILINGS STORAGE CONCEPTUAL DESIGN
REVISION A
SCALE 1 : 100
DRAWING A3300104/0003/0.002
SHEET 1 OF 1



REV	DESCRIPTION OF REVISION	BY	APP'D	DATE
A		RJA		31-1-96

CLIENT

Woodward-Clyde

Engineering & sciences applied to the earth & its environment

DESIGNED	RJA
DRAWN	DT
CHECKED	RJA
REVIEWED	
APPROVED	
DATE	JAN. 1996

PROJECT: CAWSE NICKEL PROJECT

TITLE: TAILINGS STORAGE LOCATION PLAN

REVISION	A
SCALE	1 : 5000
DRAWING	A3500104/0001/0.003
SHEET	1 OF 1

A1

Appendix 3

List of submitters

1. Main Roads Western Australia
2. Department of Resources Development
3. Department of Minerals and Energy
4. Water Corporation
5. Water and Rivers Commission
6. Department of Conservation and Land Management
7. City of Kalgoorlie-Boulder

Appendix 4

Proponent commitments

PROPONENT COMMITMENTS

1. The proponent will prepare and implement an Environmental Management Plan (EMP) for the Cawse Nickel Project to the satisfaction of the EPA on advice from the Department of Environmental Protection, Department of Minerals and Energy and other relevant government agencies.

   The EMP will be developed in two separate stages as follows:

   I. Project Construction EMP - To be submitted to the EPA prior to commencement of construction.

   II. Project Operation EMP - To be submitted to the EPA prior to commissioning.

   The EMP will be developed in accordance with statutory conditions applied to the approved operations. The EMP will be reviewed and updated as required.

2. The proponent will avoid disturbance to natural drainage lines, where possible. Where this is not possible, the proponent will develop and implement a site drainage plan and monitoring programme, as part of both construction and operational stages of the Environmental Management Plan to manage and assess the impacts of modified drainage on vegetation. This will be to the satisfaction of the EPA.

3. Prior to discharge of tailings, the proponent will install a series of monitoring bores adjacent to the tailings storage facility which will be monitored on a regular basis to detect any potential leakage of process water from the facility. If leakage is detected, remedial work will be undertaken to the satisfaction of the Department of Environmental Protection and the State Mining Engineer. Details of the tailings storage facility management and monitoring programmes will be included in the operational stage of the Environmental Management Plan.

4. The proponent will develop and implement management and monitoring procedures, as part of both construction and operational stages of the Environmental Management Plan, to avoid potential impacts associated with the process water supply. These will include details of the water source, pipeline construction and management of potential leakage.

5. The proponent will develop and implement procedures, as part of both construction and operational stages of the Environmental Management Plan, to avoid unnecessary disturbance to areas which are not required for mining, processing or infrastructure development.

6. The proponent will develop and implement procedures, as part of both construction and operational stages of the Environmental Management Plan, to avoid unnecessary disturbance to vegetation, especially significant associations, and flora.

7. The proponent will develop and implement procedures, as part of both construction and operational stages of the Environmental Management Plan, to avoid unnecessary disturbance to fauna species and habitats.

8. The proponent will develop a rehabilitation programme, as part of the operational stage of the Environmental Management Plan, The rehabilitation programme will be implemented in the course of the operations and will be consistent with defined post-mining land use objectives.

9. The proponent will comply with the provisions of the Aboriginal Heritage Act, 1972-1980.

10. The proponent will develop and implement a Hazardous Materials Management Programme in accordance with requirements, and to the satisfaction, of the Department of Minerals and Energy.

11. The proponent will monitor gaseous emissions from potential sources during commissioning of the processing plant and associated infrastructure to ensure that levels

are below EPA specified criteria to the satisfaction of the Department of Environmental Protection.

12. The proponent will include details of potential emissions and pollution control equipment in a Works Approval application to the Department of Environmental Protection, if a decision is make to establish a hydrogen sulphide plant.

13. The proponent will specify emissions criteria in tender documents for the supply of equipment for the plant. Compliance testing will be carried out by the proponent during the commissioning of the plant to confirm that the emissions from the plant equipment are within the specified limits. The commitment will be implemented to meet the requirements of the Department of Environmental Protection.

Appendix 5

Proposal characteristics

CHEMICAL COMPOSITION OF TAILINGS MATERIAL

Element	Concentration (ppm except as indicated)
Arsenic	12
Calcium	7.82%
Cobalt	232
Copper	122
Magnesium	5991
Aluminium	1.52%
Cadmium	<1
Chromium	6192
Iron	15.35%
Manganese	171
Sodium	1.25%
Lead	<5
Zinc	200
Sulphur (as sulphate)	10.56%

TABLE 2-4

TAILINGS SOLUTION COMPOSITION

Element	Concentration (g/L)
Sodium	14.3
Chloride	25.2
Manganese	1.4
Cobalt	0.01
Zinc	0.001
Magnesium	21.9
Calcium	1.33
Iron	0.003
Nickel	0.08