Boddington gold mine — Extended basement operation and changes to existing environmental conditions

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Worsley Alumina Pty Ltd

Report and recommendations
of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
Bulletin 850
April 1997

ISBN. 0 7309 8027 8
ISSN. 1030 - 0120

Summary

This report is to provide Environmental Protection Authority (EPA) advice and recommendations to the Minister for the Environment on the environmental factors relevant to a proposal by Worsley Alumina Pty Ltd (Worsley), through the Boddington Gold Mine (BGM) joint venture, to modify the approvals relating to the company's existing mining operations and to mine basement ore in the same location as Worsley's Boddington Gold Mine.

The proposal envisages substantial extension of basement ore mining, the mining of minor oxide ore deposits outside the existing mining area, the construction of an additional residue disposal area, an increase in ore processing and the release of excess water to the Hotham River and Thirty-Four Mile Brook.

It is the EPA's opinion that the following are the environmental factors relevant to the proposal:

a) declared rare flora, priority flora and vegetation communities;

b) threatened fauna, specially protected fauna and priority fauna;

c) water resource quality;

d) water resource quantity;

e) gaseous emissions including greenhouse gases and odours;

f) System 6 recommendation area C42 (Duncan MPA);

g) landform; and

h) mechanisms for environmental management.

The EPA is of the view that the proposal should be subject to the environmental conditions which currently apply to the existing gold mine except where the following recommendations or procedures supersede those conditions.

The EPA submits the following recommendations:

Recommendation 1

> That the Minister for the Environment note the relevant environmental factors and the EPA's objective for each factor as set out in Section 3 of this report.

Recommendation 2

> That subject to the satisfactory implementation of the EPA's recommended conditions and procedures of Section 4 of this report, including the proponent's environmental management commitments, the modified project can be managed to meet the EPA's objectives.

Recommendation 3

> That the Minister for the Environment impose the conditions and procedures set out in section 4 of this report.

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1. Introduction

This report is to provide Environmental Protection Authority (EPA) advice and recommendations to the Minister for the Environment on the environmental factors relevant to a proposal by Worsley Alumina Pty Ltd (Worsley) to modify the approvals relating to the company's existing mining operations and to mine basement ore in the same location as Worsley's Boddington Gold Mine (BGM) (Appendix 1).

Worsley currently operates the BGM subject to various environmental approvals and has sought to vary aspects of those approvals to accommodate the change in mining operations. Under Section 46 of the Environmental Protection Act, the Minister for the Environment has sought the EPA's advice in respect of the proposed changes to environmental conditions and this report provides that advice.

The proposal, known as the Extended Basement Operation (EBO), was referred to EPA in May 1996 and the level of assessment was set at Consultative Environmental Review. Agreement was reached between the EPA and Worsley to produce a single report which addressed new environmental matters arising from the proposal together with the request for changes to existing environmental conditions, set on 25 February 1995 by the Minister for the Environment (see Appendix 4). That report (referred to hereafter as the CER) (Welker Environmental Consultancy 1996) was made available for public review between 2 September 1996 and 30 September 1996.

Section 2 of this report outlines BGM's proposal and section 3 discusses environmental factors relevant to the proposal.

Conditions and procedures to which the proposal should be subject if the Minister determines that it may be implemented are set out in section 4, and section 5 presents the EPA's recommendations to the Minister for the Environment.

Appendix 1 provides maps relating to the proposal. A list of persons and organisations that made submissions in response to Worsley's CER is included in Appendix 2, and published information referenced in the report is listed in Appendix 3. Appendix 4 provides the existing environmental conditions and commitments that the current operation is subject to, while Appendix 5 lists the proponent's commitments for the current proposal.

2. The Proposal

The initial proposal by Worsley to develop the Boddington Gold Mine approximately 12km north-west of the town of Boddington was the subject of an EPA evaluation in 1985 (EPA 1985). An Environmental Management Programme was prepared and submitted in 1987 and the mine was commissioned in July 1987. Since that time environmental approvals have been given by the Minister for the Environment for two expansions of throughput, an additional water supply reservoir, the mining of basement and supergene ores, the mining of oxide ores from eastern anomalies and a rehabilitation strategy for the mining and residue disposal areas (EPA 1988, 1989, 1990, 1992 & 1994).

Worsley is seeking to increase the rate of ore processing in it's existing project from 8.6Mt/a to 11.55Mt/a, and also wishes to alter existing environmental conditions set by the Minister for the Environment on 25 January 1995 that apply to Worsley's current operation at the BGM. The increase in throughput is a result of improved plan efficiencies and would not require additional clearing or mining of additional ore outside the currently approved mining areas (Worsley, correspondence of 20 December 1996)

The EBO is a proposal to significantly alter operations at the existing mine. The proposal will result in substantial extension of basement ore mining, the mining of minor oxide ore deposits outside the existing mining area, the construction of an additional residue disposal area, an increase in ore processing and the release of excess water to the Hotham River and Thirty-Four Mile Brook.

A detailed description of the proposal is provided in the proponent's CER (Welker Environmental Consultancy 1996).

Table 1 provides a summary of the project characteristics.

Table 1. Summary of proposal.

Proposal	Description
1. Basement ore mining	Extension of basement ore mining resulting in a final pit of area 120 ha and up to 600 m deep
2. Oxide deposit mining	Mining of nearby oxide deposits as indicated on figure 2.
3. Ore processing - existing operation	Increase ore processing from 8.6 Mt/a to 11.55 Mt/a.
4. Ore processing - proposed operation (EBO)	Expansion of ore processing facilities to accommodate a processing rate up to 17.6 Mt/a
5. Residue disposal	Extension of existing capacity by 170 Mt with a potential to extend by 310 Mt
6. Clearing of vegetation	Clearing of about 1,200 ha of native vegetation – 17% of which is State Forest and 83% is owned by the proponent
7. Process facilities	Addition of process equipment including a crusher, 2 primary mills, 4 secondary ball mills, expansion of the carbon in leach vessel, 2 new thickeners, air separator, and expansion of the reagent storage area.
8. Atmospheric emissions	The proposal will increase atmospheric emissions from the furnaces and heaters by 100% from current levels. The predicted air emissions at 12 Mt/a mine production are 1300 t/a nitrogen oxides, 500 t/a carbon monoxide and 220,000 t/a carbon dioxide.
9. Stockpiles	Extension of storage for rock with sub-economic gold content to 310 Mt
10. Water storage	Conversion of existing redundant D1 reservoir into a decant water reservoir of 13,000 ML
11. Runoff and dewatering	For average rainfall and a mining rate of 12 Mt/a the excess water released will be up to 9500 ML/a. It is proposed to discharge this water via the Thirty-Four Mile Brook. Where this would impact on the natural seasonal flow of the Thirty-Four Mile Brook, the additional quantity of water will discharged to the Hotham River via a pipeline (see figure 2).
12. Bauxite mining and stockpiling	Additional mining and stockpiling of bauxite from beneath the proposed F1 residue disposal area for latter recovery and processing to alumina.
13. Rehabilitation	Implementation of an integrated rehabilitation strategy based on catchment management principles

3. Environmental Factors

3.1 Relevant environmental factors

In the EPA's opinion, based on the proponent's CER (Welker Environmental Consultancy 1996), submissions received (Appendix 2) and investigations undertaken by the Department of Environmental Protection, the following are the environmental factors relevant to the proposal:

a) declared rare flora, priority flora and vegetation communities;

b) threatened fauna, specially protected fauna and priority fauna;

c) water resource quality;

d) water resource quantity;

e) gaseous emissions including greenhouse gases and odours;

f) System 6 recommendation area C42 (Duncan MPA);

g) landform; and

These relevant environmental factors are discussed in sections 3.2 to 3.8 of this report.

3.2 Declared rare flora, priority flora and vegetation communities

Information

Development of the project will impinge directly and indirectly to some extent on 14 of the 15 plant community types identified within the proposal area. The community that will not be affected is the open scrub/tall shrubland with mallee (Welker Environmental Consultancy 1996).

The proposal requires clearing of approximately 1200ha including areas of open forest and wandoo woodland for the additional mining area, waste dumps, residue disposal area and infrastructure. Of this, 1075 ha is on private land owned by the proponent and 125ha is State Forest. The proponent will require agreement from the Land and Forest Commission to access the State Forest area.

At decommissioning the majority of this cleared area will be rehabilitated, with some areas remaining unvegetated as tracks and fire breaks. The proposal is not expected to result in the loss of any plant species.

The Boddington Gold Mine is located on the eastern margin of the northern jarrah forest. Jarrah and marri are predominant tree species in open forest of 7 of the communities whilst wandoo, blackbutt and rivergum predominate in open woodland of a further 5 communities. Open heath, shrubland and open scrub of mallee, hakea and melaleuca make up the remaining communities.

Statutory requirements for the protection of vegetation are included in the *Wildlife Conservation Act 1950.*

Assessment

The area considered for assessment of this relevant environmental factor is that shown as 'BGM Property' in Figure 2 (Appendix 1) but extended to the west to the ML258SA lease boundary.

The EPA's objective in regard to this environmental factor is to protect Declared Rare Flora and Priority Flora, consistent with the provisions of the *Wildlife Conservation Act 1950*, and to ensure the abundance, diversity, geographical distribution and productivity of vegetation communities are protected.

Of 437 plant species identified, 10 species are listed by CALM as Priority flora species; 5 of these have previously been recorded in Worsley's operational bauxite mining areas but 6 species recorded in those areas are not present in the BGM Project area (Welker Environmental Consultancy 1996).

No Declared Rare Flora have been identified in the areas to be cleared or areas likely to be affected through secondary processes such as water-logging, however priority species have been identified in 6 of the 15 plant community types and are affected to varying degrees by the proposal (Welker Environmental Consultancy 1996):

- in swamp and valley floors, 2 community types support *Verticordia heugelii* var. *decumbens*;

- in open heath, open scrub and tall shrubland, 2 community types support *E. aspersa, E. latens, Halgania corymbosa, Lasiopetalum cardiophyllum and Stenanthemum coronatum*; and
- in open forest, 2 community types support *Lasiopetalum glabratum.*

The proposed basement rock stockpile requires the clearing of about 114 ha including areas of open forest and wandoo woodland. The EPA is of the view that the proponent should review the need for such an extensive stockpile area and should give further consideration to backfill options and alternative locations.

In its submission on the CER, CALM has made it clear that it expects the proponent to minimise the impact on the proposal on priority flora and regionally significant vegetation and to liaise with CALM to ensure that potential impacts will not seriously affect the viability of individual species. CALM were also concerned that the existing fire control plan has possibly become outdated and needs to be reviewed. These matters are adequately dealt with in the proponent's commitments.

Having particular regard to:

a) the proponent's statutory obligations under the *Wildlife Conservation Act 1950* ,

b) the absence of Declared Rare Flora in areas to be cleared;

c) the recording of the affected priority species in the conservation estate outside the assessment area and in rehabilitation areas; and

d) the proponent's commitment to flora and fauna monitoring and research, which is aimed at establishing priority species in rehabilitated areas .

it is the EPA's opinion that the proposal to clear 1200ha of the vegetation types described is unlikely to compromise the EPA's objectives in relation to flora protection. However the proponent should examine options for the reduction of forest clearing, particularly in respect of the basement rock stockpile. The proponent should also seek rehabilitation of vegetation communities at are cleared, particularly those which have priority species.

3.3 Threatened fauna, specially protected fauna and priority fauna

Information

Fauna in the assessment area can be expected to be affected by the proposal to the extent that their habitat is disturbed or destroyed (see section 3.1). Fauna having conservation significance and likely to occur within the assessment area are:

- the Chuditch, Carnaby's Cockatoo, Baudin's Cockatoo, the Crested Shrike-tit and the Southern Brown Bandicoot all of which are 'declared threatened fauna';
- the Peregrine Falcon and the Carpet Python which are 'specially protected fauna'; and
- the Brush-tailed Phascogale, Western Brush Wallaby, Water Rat, Square-tailed Kite, Red-tailed Forest Black Cockatoo, Dell's Skink, Western Marsh Frog and the Red-eared Firetail which are 'priority fauna'.

As stated in section 3.1 the proposal requires clearing of approximately 1200ha.

The most significant fauna habitats in the vicinity of the proposal on the north-east margin of the jarrah forest are in drainage lines and their associated wetlands, the wandoo woodland and the areas of heath which contain a rich diversity of flora. These habitats are recognised as supporting a wide range of fauna likely to include declared rare, priority listed and specially protected species.

Statutory requirements for the protection of threatened fauna and priority fauna are included in the *Wildlife Conservation Act 1950* .

Assessment

The area considered for assessment of this relevant environmental factor is that shown as 'BGM Property' in Figure 2 (Appendix 1) but extended to the west to the ML258SA lease boundary.

The EPA's objective in regard to this environmental factor is 'to protect Threatened Fauna and Priority Fauna species and their habitats, consistent with the provisions of the *Wildlife Conservation Act 1950*".

All of the fauna likely to be located in the assessment area are known to have a geographical range extending well beyond the area and the most important habitats of drainage lines and heath are well represented beyond the areas directly affected by the proposal (Welker Environmental Consultancy 1996).

Having particular regard to:

a) the proponent's statutory obligations under the *Wildlife Conservation Act 1950* and the *Endangered Species Protection Act*;

b) the distribution beyond the assessment area of fauna of conservation value;

c) the proponent's commitment to a flora and fauna management strategy which has the potential for controlling feral species and re-establishing fauna habitat,

it is the EPA's opinion that the proposal is unlikely to compromise the EPA's objectives in relation to fauna protection.

3.4 Water resource quality

Information

The proposal has the potential to threaten water quality from:

- increased turbidity as a result of ground disturbance;
- pollution by process water discharges containing residual chemicals (cyanide), salt and metals; and
- accidental spillage of fuel and chemicals.

Acid mine drainage has been considered by the proponent through the performance of leaching tests, and is not expected to be significant.

In regard to the proposed increase in production from the existing operation, water resource quality is the environmental factor most relevant to assessment of the proposed change.

The proposal is located within the catchment of the Thirty-Four Mile Brook which flows into the Hotham River, a tributary of the Murray River which drains to Peel Inlet. Water quality in the Hotham River has been degraded by salt and nutrients, mainly generated in the upper reaches of its catchment. Water quality improves downstream of Boddington as a result of fresher flows from tributaries, particularly in the Mt Saddleback area.

Water quality in the Thirty-Four Mile Brook is generally fresh (≤1000 mg/L) where it flows through State Forest and uncleared land but deteriorates where it flows through agricultural land south of the project area (Worsley Alumina 1996). Both the Hotham River and Thirty-Four Mile Brook are reduced to a series of pools in summer. Fish kills occur in these pools as a result of water quality deterioration through evaporation and, on occasion, the flushing of nutrients into the pools by summer storms (Welker Environmental Consultancy 1996).

Limited monitoring of metals in the streams prior to any mining activity indicate copper and zinc concentrations above aquatic ecosystem guidelines.

The diversity of aquatic fauna in both the Hotham River and the Thirty-Four Mile Brook is low in comparison to relatively undisturbed jarrah forest streams.

The primary beneficial use of both the Thirty-Four Mile Brook and the Hotham River downstream from the BGM is water supply for agriculture, mostly sheep farming and some farms running cattle (Welker Environmental Consultancy 1996). Thus in relation to protection of water resource quality the main concerns are in relation to aquatic ecology and stock water supply.

The proposal is subject to Part V of the *Environmental Protection Act 1986* and the *Mining Act 1978.*

Assessment

The area considered for assessment of this relevant environmental factor is the catchment area of the Hotham River north of the Pinjarra Williams Road and west of Albany Highway (Appendix 1).

The EPA's objective in regard to this environmental factor is 'to ensure that the discharge of waste water from the BGM operations does not adversely affect the existing beneficial uses and ecosystems of the Hotham River and Thirty-Four Mile Brook in the vicinity of the BGM project'. This objective is applicable throughout the life of the mine and after de-commissioning.

The proponent has committed to management programmes and operational procedures which address increased turbidity as a result of ground disturbance (Commitments 12 Section 46), pollution by residual chemicals in process water discharges, and accidental spillage of fuel and chemicals (Commitment 14 Section 46).

Turbidity will be managed by limiting the extent of clearing, early rehabilitation of completed pits and by ensuring that there is no direct discharge of surface water from the site into Thirty-Four Mile Brook. All site run-off, including runoff from stockpiles and mining areas, is directed mostly via settling sumps to holding dams before discharge.

All run-off from the process area is to be directed to a lined process water pond for re-use. Water decanted from process residue will be recycled through the processing plant thus reducing the quantity of cyanide used and the quantity conveyed to the residue disposal areas (Commitment 11 Section 46). Solids collected in sumps associated with the mine pit areas will used as back fill, while solids collected in sumps associated with residue areas will be returned to the residue disposal areas. The proponent has made an undertaking to 'maintain awareness of emerging technology' in respect of cyanide destruction with a view to its future use if applicable.

Seepage flows from the residue disposal areas to date have occasionally shown elevated levels of cyanide and copper. When this occurs, most of the contaminated water is pumped back to the disposal areas, or intercepted and collected in decant water storage dams, D1 and D4. This management strategy will be continued and enhanced by the installation of additional monitoring bores (Welker Environmental Consultancy 1996).

Various options for residue disposal have been examined by the proponent. The EPA needs to be satisfied that the option chosen (down-the-valley thickened discharge) represents 'best practice' for the industry and is appropriate to the circumstances prevailing in the assessment area.

Concern has been expressed by the Water and Rivers Commission that seepage from the residue disposal area adjacent to the boundary of the South Dandalup catchment could result in contamination of that catchment. The proponent has mitigated against this possibility through the proposed use of thickened residue to reduce groundwater mounding and by directing run-off away from the catchment boundary. Furthermore, it is apparent that the administrative boundary of the South Dandalup catchment varies somewhat from the topographical boundary to the extent that such concerns may be unjustified. The proponent has undertaken to accurately delineate the surface and groundwater catchment boundary to ensure there is no impact on the catchment.

The EPA is satisfied that these measures, coupled with the installation of additional monitoring bores and a commitment to reclaim any seepage should it occur (Commitment 8 Section 46 and

Commitment 16 CER), are adequate to protect the South Dandalup catchment from contamination.

Having particular regard to:

a) the proponent's obligations under its *Environmental Protection Act* licence;

b) the selection of residue disposal methods;

c) the proponent's commitment to the design and implementation of an extensive monitoring programme;

d) the proponent's commitment to groundwater pumping in the event of contaminated seepage being detected;

e) the proponent's experience with water quality management for the existing operations;

f) the avoidance of any discharge into water courses; and

g) the existing quality of water in the Hotham River and the Thirty-Four Mile Brook ,

it is the EPA's opinion that the proposal is unlikely to compromise the EPA's objectives in relation to water resource quality but requires further evidence that the proposed method of residue disposal represents best practice in relation to cyanide management.

3.5 Water resource quantity

Information

The proposal involves several changes to the current water management regime for the existing mine.

The proposal will result in clearing, mining, re-contouring and rehabilitation within an area of about 23 km^2 of the Thirty-Four Mile Brook catchment. During mining, dewatering will lower water levels in the bedrock around the mine pit. Although the complexity of the groundwater system results in considerable uncertainty, the drawdown effect is expected to extend out to a distance of about 3 km. After completion of mining, increased evaporation from the resultant lake surface in the pit may reduce groundwater flow which in turn, may affect the maintenance of river pools and fringing vegetation in summer.

It is expected that there will be no requirement to withdraw water from the Hotham River; there will be a need to discharge excess mine dewatering water (via a holding dam) to Thirty-Four Mile Brook or the Hotham River; the water content of the residue will be reduced; and an existing reservoir will need to be expanded to store decant and seepage water (Welker Environmental Consultancy 1996).

The two significant aspects of management of the water resource quantity are the impact on surface and groundwater regimes during mining and long-term changes in surface and groundwater regimes when mining is completed. These are affected by the area of forest to be cleared, the quantity and water content of residues to be disposed and the dewatering of the pits.

The proposal is located within the catchment of the Thirty-Four Mile Brook which drains into the Hotham River. Streamflows in both the Hotham River and Thirty-Four Mile Brook vary by a factor of more than 150 between summer and winter.

Statutory requirements for the protection of water resources are included in Part V of the *Environmental Protection Act 1986.*

Assessment

The area considered for assessment of this relevant environmental factor is the catchment area of the Hotham River north of Pinjarra Williams Road and west of Albany Highway (Appendix 1).

The EPA's objective in regard to this environmental factor is 'to ensure that the quantity and seasonal variation in flow of surface and groundwater is maintained'. This objective is applicable throughout the life of the mine and after de-commissioning.

The proponent has committed to investigations which will lead to better understanding of the hydrology of the basement rock to enable improved catchment management to avoid significant adverse impacts (Commitment 18 CER).

The proponent has also committed to a programme of investigation and monitoring of wetlands and vegetation in the assessment area in collaboration with CALM to obtain a better understanding of potential impacts and to partake in catchment management aimed at protecting the ecological values of the Hotham River and Thirty-Four Mile Brook (Commitment 21 CER).

The discharge of water to the Hotham River is proposed to be managed to protect the beneficial uses of the Hotham River by storing and varying the discharge volume of water to mimic the natural river flow, avoid salinity increases and avoid scouring and erosion (Commitments 12 CER).

The Water and Rivers Commission expressed concern at the uncertainties associated with the data on aquifer yields. The proponent has based current estimations of dewatering volumes on data from basement bores and experience in the Jarrah Decline underground mine – on the expectation that this represents an aquifer with greater storage and transmissivity than that expected in the EBO pit (Welker Environmental Consultancy 1996). Nevertheless an extensive programme of drilling is under way to improve the data base.

Having particular regard to:

a) the proponent's obligations under its *Environmental Protection Act* licence;

b) the selection of best practice residue disposal methods;

c) the proponent's experience with water management for the existing operations;

d) the extensive monitoring and investigation programmes; and

e) the proponent's commitment to catchment management,

it is the EPA's opinion that the proposal is unlikely to compromise the EPA's objectives in relation to water resource quantity.

3.6 Gaseous emissions

Information

The proposal will increase emissions of gaseous products of combustion, fugitive emissions of hydrocarbons and generate additional greenhouse gases (see Table 1). Calculations for the first phase of the expansion to 12Mt/a (ie. a 41% increase in production) are shown in Table 2. The greater increase in gaseous emissions is primarily due to the nature of the proposed operation, which requires higher quantities of electricity for the processing of hard rock ore.

Prevailing air quality in the region is extremely good with the exception of occasional high levels of fine particulate matter (smoke) generated by bushfires and prescribed burning by CALM, local authorities and the farming community.

Statutory requirements for the protection of air quality are included in Part V of the *Environmental Protection Act 1986.*

Table 2. Existing and predicted greenhouse gas emissions for the EBO project (Welker Environmental Consultancy 1996)

Greenhouse Gas	1995 emissions (Gg) for mine production at 8.5 Mt/a	Predicted emissions for the EBO project for production at 12 Mt/a	Percentage increase (41% production increase)
NO_X	505	1300	157
CO	193	505	162
CO_2	146,000	219,000	50

Assessment

The area considered for assessment of this relevant environmental factor is an area of 30 km radius around the plant, except that for greenhouse gases, global issues are taken into account.

The EPA's objective in regard to this environmental factor is 'to ensure that gaseous emissions, including greenhouse gases and odours, both individually and cumulatively, conform to the agreed standards and do not cause an environmental or human health problem in the relevant assessment area' .

The nearest residence from the plant site is 7.24 km (see figure 2). There is limited potential for gaseous emissions from the proposal to impinge on any inhabited area at levels approaching acceptable air quality standards (Welker Environmental Consultancy 1996).

The proponent has committed (Commitments 42 and 43 CER) to a greenhouse gas management strategy which includes:

- improved energy efficiency through the benefits of scale afforded by the proposal;
- minimising the burning of forest debris;
- rehabilitating disturbed areas as soon as practicable;
- phasing out of halons in fire protection systems; and
- regular updating of the greenhouse gas inventory.

Having particular regard to:

a) the remoteness of the proposal from residential premises;

b) the low rates of gaseous emissions from the processing plant; and

c) the proponent's commitment to greenhouse gas management,

it is the EPA's opinion that the proposal is unlikely to compromise the EPA's objectives in relation to gaseous emissions. However, for projects of this magnitude the EPA believes it appropriate to apply a standard greenhouse gas emissions condition.

3.7 System 6 recommendation area C42

Information

The proposed north-western extension of the residue disposal area impinges on an area of State Forest recommended for reservation under System 6 (recommendation C42).

The proposal requires clearing of approximately 125 ha of vegetation within the 4600 ha System 6 area C42 (see figure 3). The area would be used as part of the residue dam.

The area in question is outside the boundary of land owned by the proponent; about one half of the area is outside the proponent's mining lease; and a small section is within Alcoa's mining lease area. The proponent is in the process of seeking the agreement of Alcoa to gain access to this land.

The System 6 recommendation for C42 (Duncan Management Priority Area) draws attention to its importance for open forest of jarrah, open woodland of wandoo, the presence of granite rocks and valleys containing white myrtle which has been severely depleted by dieback elsewhere in State Forest (Welker Environmental Consultancy 1996).

Proposals that affect System Six areas are usually subject to Part IV of the *Environmental Protection Act 1986.*

Assessment

The area considered for assessment of this relevant environmental factor is the 4600 ha comprising System 6 recommendation C42 and forest adjacent thereto.

The EPA's objective in regard to this environmental factor is 'to ensure that the conservation values of System 6 recommended areas are not compromised'.

CALM's 1994-2003 Forest Management Plan identifies the area for inclusion in the reserves system as a Conservation Park.

The EPA is always concerned when proposals for development impinge on System 6 recommendations. However the EPA recognises that many System 6 recommended areas are not unique but are representative of regional conservation values. The EPA is therefore willing to consider minor changes to System 6 recommendation boundaries if such a change can be shown to result in no loss of conservation area and the maintenance or enhancement of the area's conservation values.

The proponent's commitment to pay compensation for State Forest cleared or to negotiate a land swap is not adequate to ensure the maintenance of the **conservation values** of the area proposed to be cleared.

The EPA is therefore of the view that before any development takes place on the C42 area the proponent should undertake the necessary studies to define its conservation values and commit to a course of action which will ensure the maintenance or enhancement of those values.

3.8 Landform

Information

The scale of mining proposed means that there will be substantial permanent alteration to landforms. The creation of permanent lakes will introduce a new landform to the area. The proposal will also significantly alter the landform in the project area through the creation of mining pits, residue disposal areas and rock stockpiles. The final void of the main pit will cover an area of about 120 ha and extend to a depth of about 600 m.

The EPA has previously assessed a post-mining management strategy for the mining pits associated with the existing operation (EPA, 1994). The strategy will need to be modified to accommodate this proposal. Similarly, existing proposals for rehabilitation of residue disposal and rock stockpile areas will need to be revised.

Assessment

The area considered for assessment of this relevant environmental factor is the catchment of the South Dandalup public water supply area, Thirty-Four Mile Brook, and the Hotham River in the vicinity of the project (Appendix 1).

The EPA's objective in regard to this environmental factor is 'to ensure that, as far as is practicable, the post-mining landform is stable, and is integrated into the surrounding environment'.

The proponent's rehabilitation strategy includes a commitment to the creation of stable landforms ensuring that all altered surfaces are shaped to blend into the natural surrounding catchment topography. This strategy is an extension of that developed for the existing gold mining operation and previously assessed by the EPA (EPA, 1994). To the extent that they are applicable, the revised strategy takes into account the commitments made and environmental conditions relevant to that assessment.

Having particular regard to:

a) the currently approved post-mining management strategy;

b) the encouraging results of rehabilitation trials in cleared forest and on residue disposal areas; and

c) the proponent's commitment to further investigations and the development of rehabilitation and decommissioning plans in consultation with the BGM Liaison Group,

it is the EPA's opinion that the proposal is unlikely to compromise the EPA's objectives in relation to landform. However, the EPA is of the view that a detailed rehabilitation and decommissioning plan for the new Extended Basement Operation should be established and committed to by the proponent at least five years prior to decommissioning. A decommissioning and rehabilitation plan should be prepared for those parts of the existing operation which will not be continued, twelve months prior to the decommissioning of these elements.

4. Conditions and procedures

4.1 Conditions applying to the existing project

In the EPA's opinion, the modified project should be subject to the following conditions if implemented;

(a) the existing Ministerial Conditions applied to the project (Ministerial Statement 379, 25 January 1995), subject to modification of Conditions 1, 4, 5, 6 and 7 as set out in (b) and (c) below;

(b) the proponent's additional commitments made in the CER/S46 document (Worsley 1996) and summarised in Table 1 of this report.

(c) That at least twelve months prior to the decommissioning of the current operation, or such later time as is considered appropriate by the Minister for the Environment on advice of the EPA, the proponent should prepare and subsequently implement a decommissioning and rehabilitation plan which:

- provides for the long term management of the mined out pits, the residue disposal areas, process water ponds, non-mineralised rock stockpiles, water supply dams, processing plant site and associated infrastructure;
- provides for the long term management of the groundwater and surface water systems, in particular the South Dandalup public water supply catchment area, Thirty-Four Mile Brook and the Hotham River, affected by the project;

- demonstrates that waters discharged from the project site will not adversely affect the existing beneficial uses and ecosystems of the Hotham River and Thirty-Four Mile Brook in the vicinity of the project; and
- provides for the development of a 'walk-away' solution for the decommissioned mine pits, the residue disposal areas, process water ponds, non-mineralised rock stockpiles, water supply dams, processing plant site and associated infrastructure, to the requirements of the EPA on advice of the DEP, the department of Minerals and Energy, and the Water and Rivers Commission.

4.2 Conditions applying to the Extended Basement Operation proposal

In the EPA's opinion, the modified project should be subject to the following conditions if implemented;

(a) the proponent's commitments made in the CER/S46 document (Welker Environmental Consultancy 1996) and summarised in Table 1 of this report.

(b) that prior to a works approval or licence being granted under Part V of the Environmental Protection Act, the proponent should demonstrate that the strategy for the management of cyanide in D1 dam incorporates best practice environmental management.

(c) that prior to construction of the additional residue disposal area, the proponent should undertake a study to define in detail the conservation value of that portion of System 6 Recommendation Area C42 affected by the project. The study should specify proposed arrangements with the NP&NCA for the replacement or protection of the relevant portion of C42 land affected in State Forest such that the values of the Conservation Park proposed for that area are not adversely affected by the project, to the requirements of the EPA on advice of the DEP and the Department of Conservation and Land Management.

(d) that from the commencement of operation of the project and thereafter every three years, the proponent should address, in reports to be prepared under Commitment 5 of the CER, the following matters relating to greenhouse gas emissions:

- calculate the greenhouse gas emissions associated with the proposal (using generally accepted methods);
- indicate the measures adopted to limit greenhouse gas emissions for the project; and
- estimate the comparative greenhouse gas efficiency of the project (per unit of product and/or other agreed performance indicators) with the efficiency of other comparable projects producing similar product.

That the proponent should consider entry (whether on a project-specific basis, company-wide arrangement or within an industrial grouping) into the Commonwealth Government's "Greenhouse Challenge" voluntary cooperative agreement programme. The agreement would include an inventory of emissions, opportunities for abating greenhouse emissions in the organisation, a greenhouse gas mitigation action plan, regular monitoring and reporting of performance and independent performance verification; and

(e) That at least five years prior to the decommissioning of the new operation, or such later time as is considered appropriate by the Minister for the Environment on advice of the EPA, the proponent should prepare and subsequently implement a decommissioning and rehabilitation plan which:

- provides for the long term management of the mined out pits, the residue disposal areas, process water ponds, non-mineralised rock stockpiles, water supply dams, processing plant site and associated infrastructure;

- provides for the long term management of the groundwater and surface water systems, in particular the South Dandalup public water supply catchment area, Thirty-Four Mile Brook and the Hotham River, affected by the project;
- demonstrates that waters discharged from the project site will not adversely affect the existing beneficial uses and ecosystems of the Hotham River and Thirty-Four Mile Brook in the vicinity of the project; and
- provides for the development of a 'walk-away' solution for the decommissioned mine pits, the residue disposal areas, process water ponds, non-mineralised rock stockpiles, water supply dams, processing plant site and associated infrastructure,

to the requirements of the EPA on advice of the DEP, 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 mining 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. This could be in the form of an environmental bond such as those routinely held against mining rehabilitation success by the Department of Minerals and Energy.

4.3 Procedures

One of the EPA's objectives is to ensure that environmental matters are managed as an integral part of the operation of major undertakings through the use of quality assurance and environmental management systems. These should be established in accordance with the principles of emerging national and international standards such as the ISO 9000 and ISO 14000 series.

In relation to the current gold mining operation the proponent has established an environmental management system (EMS). The proponent has committed to a review of the EMS to take account of the new proposal and to ensure that it is in accordance with the principles of recognised national standards.

Decisions made from time to time by various government agencies in relation to the ongoing operation of the proposal, have the potential to impinge on environmental outcomes. The EPA is therefore of the view that such decisions should not be made in isolation.

Discussions between the proponent, the EPA and various affected government agencies have resulted in agreement to establish a Boddington Gold Mine Environmental Liaison Group with a formal role in reviewing the proponent's environmental performance and providing advice to government on the proponent's fulfilment of environmental conditions.

In the EPA's opinion, the proposal should be subject to the following procedure if implemented:

BGM Environmental Liaison Group

a) the State Mining Engineer should formalise the role of the BGM Environmental Liaison Group to review the environmental performance of the proponent;

b) the terms of reference for the BGM Environmental Liaison Group should be determined by the Group and submitted to the Minister for the Environment for approval, upon advice of the EPA;

c) the proponent should formalise its environmental management commitments in an environmental management plan which details the methods and procedures which the proponent will use in achieving its environmental commitments and objectives; and

d) the BGM Environmental Liaison Group should review the proponent's performance in accordance with the plan and, where appropriate, advise the Minister for the Environment and the State Mining Engineer on the proponent's compliance with environmental conditions

Oxide mining options

That in reports to be submitted annually under Commitment 5 of the CER, the proponent should examine options for mining the oxide ore bodies with the objective that out-of-pit placement of non-mineralised rock is reduced, as far as is practicable, to the requirements of the EPA on advice of the DEP and the Department of Minerals and Energy.

5. Recommendations

The EPA submits the following recommendations:

Recommendation 1

That the Minister for the Environment note the relevant environmental factors and the EPA's objective for each factor as set out in Section 3 of this report.

Recommendation 2

That subject to the satisfactory implementation of the EPA's recommended conditions and procedures of Section 4 of this report, including the proponent's environmental management commitments, the modified project can be managed to meet the EPA's objectives.

Recommendation 3

That the Minister for the Environment impose the conditions and procedures set out in section 4 of this report.

Table 3: Summary of relevant factors, EPA objectives, proponent's commitments and EPA's opinion

Relevant factor	Objective	Proponent's commitments	EPA's opinion
declared rare flora, priority flora and vegetation communities	to protect Declared Rare Flora and Priority Flora, consistent with the provisions of the *Wildlife Conservation Act 1950*, and to ensure the abundance, diversity, geographical distribution and productivity of vegetation communities are protected	• minimise clearing of native vegetation; • revegetation with local native species; • forest disease management; • revegetation as soon as possible after disturbance.	The proposal is unlikely to compromise EPA's objective. However the proponent should examine options for the reduction of forest clearing, particularly in respect of the basement rock stockpile.
threatened fauna, specially protected fauna and priority fauna	to protect Threatened Fauna and Priority Fauna species and their habitats, consistent with the provisions of the *Wildlife Conservation Act 1950'*	• re-creation of fauna habitats during rehabilitation; • collaborative feral animal control.	The proposal is unlikely to compromise EPA's objective.
water resource quality	to ensure that the.... quality (of surface and groundwater) is maintained consistent with the draft Western Australian Water Quality Guidelines for Fresh and Marine Waters	• thickening of residue for disposal; • cyanide control strategy; • all contaminated water contained within process water circuit; • spill and stormwater management; • comprehensive monitoring programme; • water release to mimic natural river flows.	The proposal is unlikely to compromise EPA's objective but requires further evidence that the proposed method of residue disposal represents best practice.
water resource quantity	to ensure that the quantity of surface and groundwater is maintained	• extensive investigation and monitoring of basement aquifer; • monitoring of impact on wetlands; • survey of fringing vegetation in Hotham River and Thirty-Four Mile Brook; • studies to establish acceptable conditions for release to Thirty-Four Mile Brook .	The proposal is unlikely to compromise EPA's objective.

gaseous emissions including greenhouse gases and odours	to ensure that gaseous emissions, including greenhouse gases and odours, both individually and cumulatively, conform to the agreed standards and do not cause an environmental or human health problem in the assessment area	• large separation distance to sensitive areas; • energy efficiency to reduce greenhouse gas emissions.	The proposal is unlikely to compromise EPA's objective. However the proponent should report every three years greenhouse gas emissions associated with the proposal, indicate adopted measures to limit greenhouse gas emissions, and estimate the comparative green house gas efficiency of the project.
System 6 recommendation area C42 (Duncan MPA)	to ensure that the conservation values of System 6 recommended areas are not compromised	• compensation or land swap for State Forest cleared.	Before any development takes place on the C42 area the proponent should undertake the necessary studies, in consultation with CALM and NP&NCA, to define its conservation values and commit to a course of action which will ensure the maintenance or enhancement of those values.
landform	to ensure that, as far as is practicable, the post-mining landform is integrated into the surrounding environment	• preparation of integrated rehabilitation plan with BGM Liaison Group; • rehabilitation to be in keeping with local landforms.	The proposal is unlikely to compromise EPA's objective. However, a detailed rehabilitation and decommissioning plan should be established and committed to by the proponent at least five years prior to decommissioning.

Table 4: Summary of changes to environmental conditions for the Section 46 component of the proposal.

Original Condition N°	Requirements (summarised)	Evaluation	Condition Text
Environmental Conditions			
1	Fulfil commitments	Modified to include the present changes to environmental conditions and commitments.	1 Proponent Commitments The proponent has made a number of environmental management commitments in order to protect the environment. 1-1 In implementing the proposals reported on in Environmental Protection Authority Bulletins 313, 361, 408, 430, 661, and 850, the proponent shall fulfil the commitments as modified in February 1997; provided that the commitments are not inconsistent with the conditions or procedures contained in this statement. In the event of any inconsistency, the conditions and procedures of this statement shall prevail to the extent of the inconsistency. A copy of the environmental management commitments of February 1997 is attached.
2	Implement proposal as described	Wording changed to recast condition into contemporary format.	2 Implementation Changes to the proposals 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 proposals 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 proposals and subsequently, as part of further consideration under Section 46 of the Environmental Protection Act. 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.

Original Condition No.	Requirements (summarised)	Evaluation	New Condition
3	Restrictions on pumping from Hotham River.	No change	4 Hotham River Diversion of water from the Hotham River may have an adverse impact on the Hotham/Murray River system, as well as on downstream users. 4-1 The proponent shall only pump water from the Hotham River when the river flow is in excess of 342 kilolitres per hour as measured at Marradong River bridge gauging station. 4-2 When pumping from the Hotham River, the proponent shall not cause the remaining river flow to be reduced below the level of 342 kilolitres per hour as measured at Marradong River bridge gauging station. Note: Water is extracted from the Hotham River in accordance with licence conditions set by the Water and Rivers Commission under the provisions of the Rights in Water and Irrigation Act 1914.
4	Develop an EMP for the "lakes strategy".	New Rehabilitation and Decommissioning condition set, as the "lakes strategy" of the previous S46 will now be reviewed due to the EBO and other changed circumstances.	5 Rehabilitation and Decommissioning 5-1 The proponent shall achieve the satisfactory decommissioning of the project, removal of plant and installations, and rehabilitation of the site and its environs, in accordance with the plan required by condition 5-3. 5-2 Within five years following the notification of the decision-making authorities under Section 45(7) of the Environmental Protection Act, and thereafter every five years, the proponent shall prepare a report which indicates rehabilitation and decommissioning objectives and performance for the project site, to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection. 5-3 Twelve months prior to decommissioning, or such later time considered appropriate by the Minister for the Environment on advice of the Department of Environmental Protection, the proponent shall prepare a decommissioning and rehabilitation plan which:

Original Condition No.	Requirements (summarised)	Evaluation	New Condition
			(1) provides for the long-term management of the mined-out pits, the residue disposal areas, process water ponds, non-mineralised rock stockpiles, water supply dams, processing plant site and associated infrastructure; (2) provides for the long-term management of the ground and surface water systems, in particular the South Dandalup public water supply catchment area, Thirty-Four Mile Brook and the Hotham River, affected by the project; (3) demonstrates that waters discharged from the project site will not adversely affect the existing beneficial uses and ecosystems of the Hotham River and Thirty-Four Mile Brook in the vicinity of the project; and (4) provides for the development of a 'walk away' solution for the decommissioned mine pits, the residue disposal areas, process water ponds, non-mineralised rock stockpiles, water supply dams, processing plant site and 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 mining 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. 5-4 The proponent shall implement the decommissioning and rehabilitation plan required by condition 5-3.
5	Rehabilitation	Incorporated into new Rehabilitation and decommissioning condition.	See new condition 5

Original Condition No.	Requirements (summarised)	Evaluation	New Condition
6	Discharge waters Develop and implement a management programme for the discharge of water from the D1 as part of the "lakes" rehabilitation strategy.	This condition is no longer relevant as the "lakes strategy" is to be reviewed. Long-term management of ground and surface water is included in the new Rehabilitation and Decommissioning condition.	See new condition 5, in particular, 5-3(2&3).
7	Decommissioning Prepare a decommissioning plan 12 months prior to decommissioning.	This requirement is now included as part of the new Rehabilitation and Decommissioning condition.	See new condition 5.
8	Change of proponent	No change	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.

Original Condition No.	Requirements (summarised)	Evaluation	New Condition
9	Compliance auditing	No changes	7 Compliance Auditing To help determine environmental performance and compliance with the conditions, periodic reports on the implementation of the proposals are required. 7-1 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.

Appendix 1

Figures

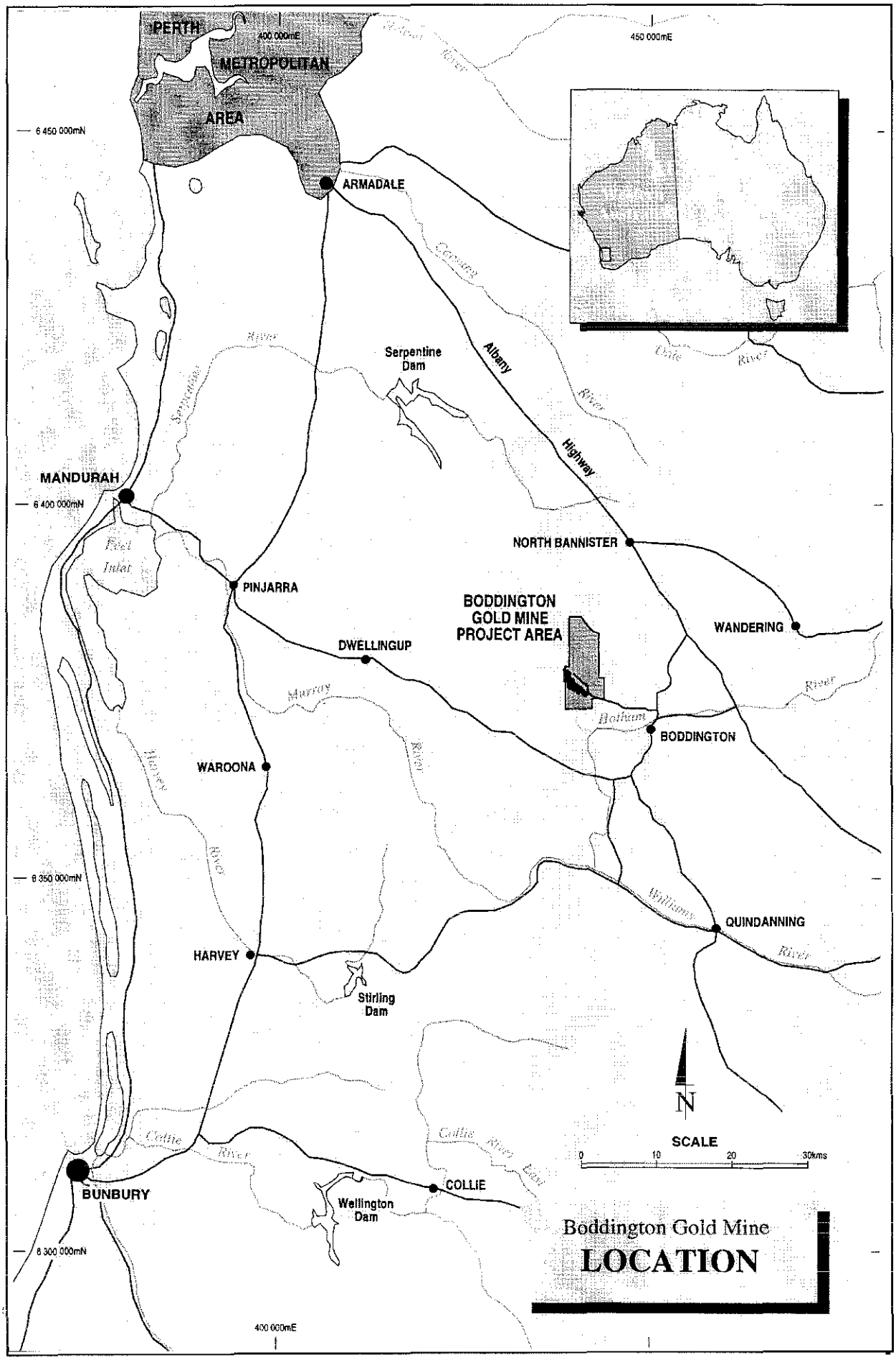

Figure 1. Location map (Source: Welker Environmental Consultancy, 1996).

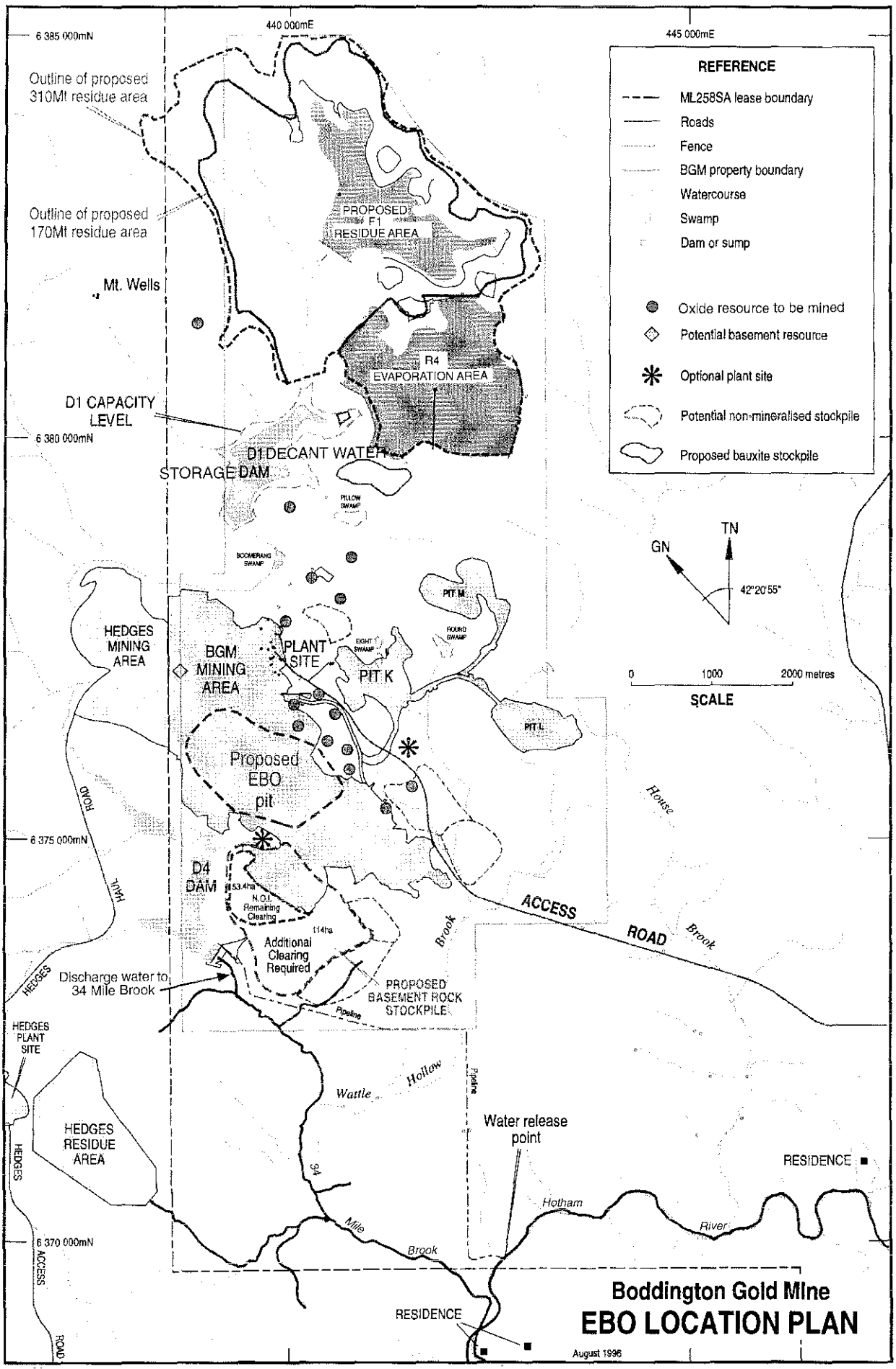

Figure 2. Boddington gold mine, EBOlayout (Source: Welker Environmental Consultancy, 1996).

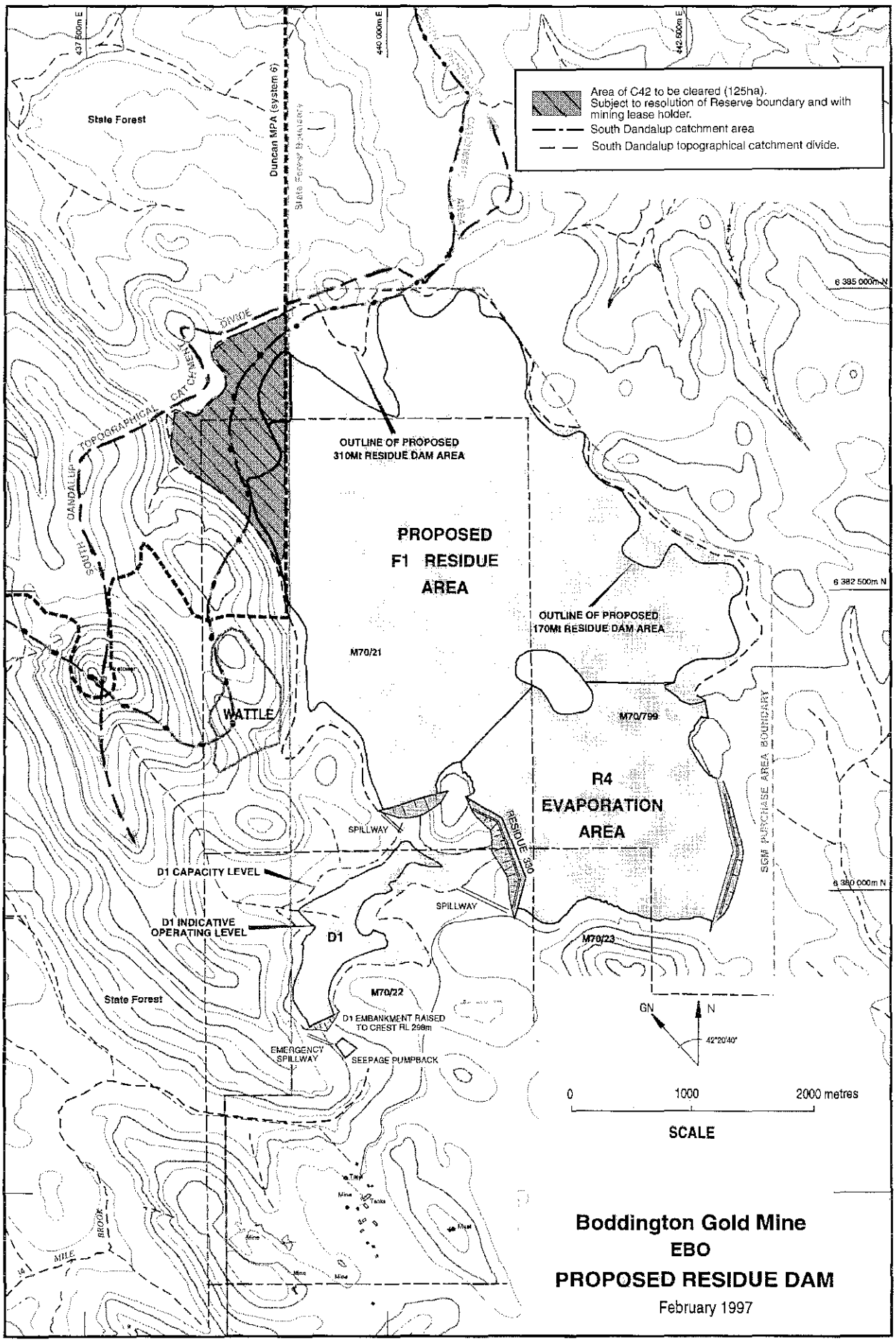

Figure 3. Residue management areas (Source: Welker Environmental Consultancy, 1996).

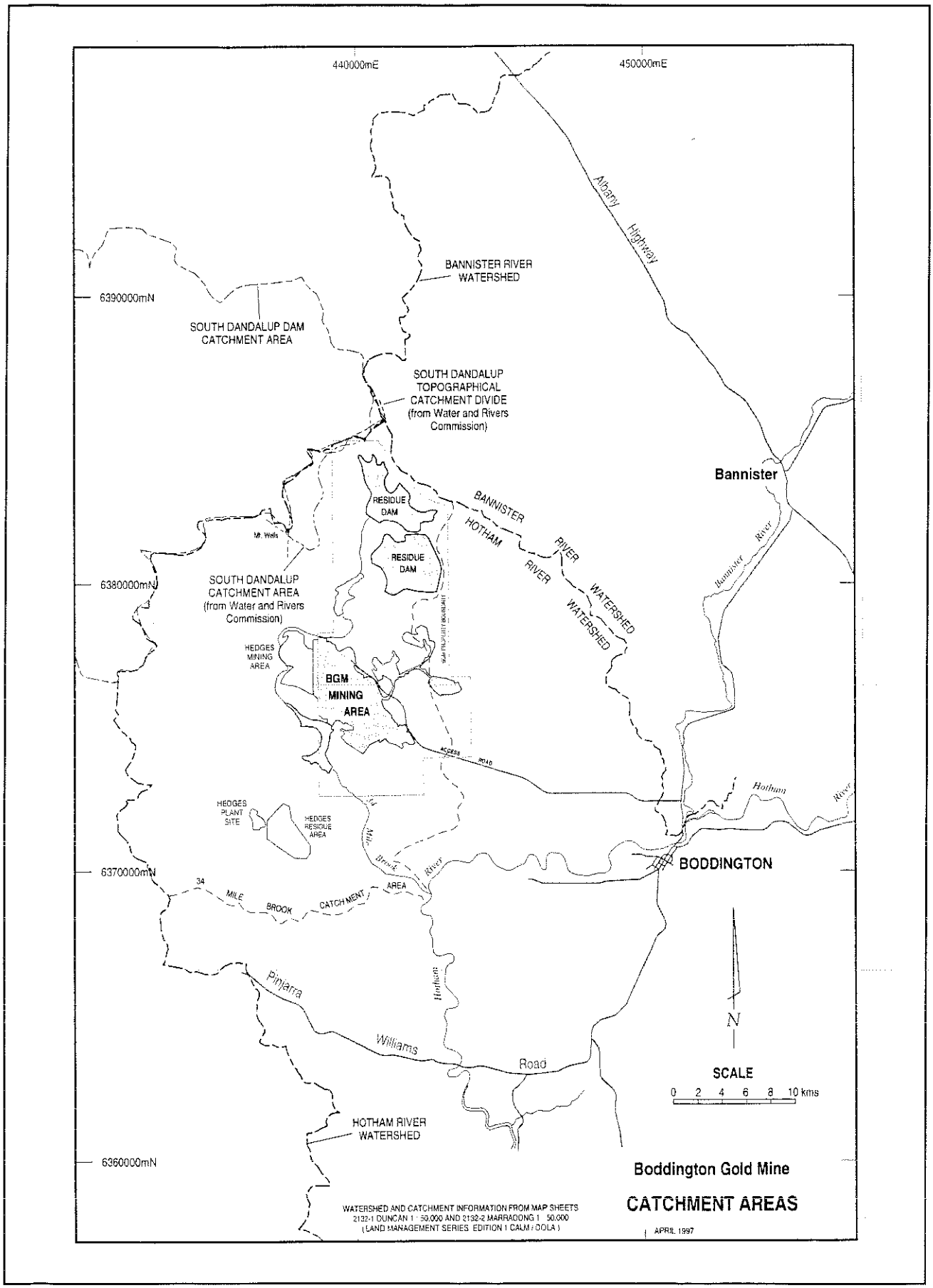

Figure 4. Catchment areas in the vicinity of BGM project.

Appendix 2

List of people and organisations that made submissions

Aboriginal Affairs Department
Boddington Shire Council
Department of Conservation and Land Management
Department of Minerals and Energy
Department of Resource Development
Main Roads Western Australia
Water Corporation
Water and Rivers Commission

Appendix 3

References

Environmental Protection Authority 1985, *Worsley Alumina Joint Venturers – Boddington Gold Mine Proposal – Environmental Protection Authority Report and Recommendations*, Bulletin 219.

Environmental Protection Authority 1987, *Boddington Gold Mine Project Enhancement of Facilities - Worsley Alumina Pty Ltd– Environmental Protection Authority Report and Recommendations*, Bulletin 313.

Environmental Protection Authority 1988, *Boddington Gold Mine Project Expansion of Facilities Stage 2– Worsley Alumina Pty Ltd - Environmental Protection Authority Report and Recommendations*, Bulletin 361.

Environmental Protection Authority 1989, *Boddington Gold Mine Project Mining and Processing of Supergene/Basement Ores - Worsley Alumina Pty Ltd – Environmental Protection Authority Report and Recommendations*, Bulletin 408.

Environmental Protection Authority 1992 *Boddington Gold Mine - Proposal for Development of Eastern Anomalies - Worsley Alumina Pty Ltd – Environmental Protection Authority Report and Recommendations*, Bulletin 661.

Environmental Protection Authority 1990, *Boddington Gold Mine Project - Worsley Alumina Pty Ltd – Modifications to Processing and Disposal of Supergene and Copper-Rich Basement Ores - Environmental Protection Authority Report and Recommendations*, Bulletin 430.

Environmental Protection Authority 1994, *Boddington Gold Mine: Rehabilitation Strategy – Worsley Alumina Pty Ltd – Proposed Changes to Environmental Conditions*, Bulletin 766.

Environmental Protection Authority 1993, *Western Australian Water Quality Guidelines for Fresh and Marine Waters – Draft*, Bulletin 711.

Welker Environmental Consultancy 1996, *Boddington Gold Mine – Proposed Extended Basement Operation (EBO)*, Consultative Environmental Review. Worsley Alumina Pty Ltd 1996

Appendix 4

Minister for the Environment's statement, 25 January 1995

WESTERN AUSTRALIA

MINISTER FOR THE ENVIRONMENT

STATEMENT TO AMEND CONDITIONS APPLYING TO PROPOSALS (PURSUANT TO THE PROVISIONS OF SECTION 46 OF THE ENVIRONMENTAL PROTECTION ACT 1986)

PROJECT:	BODDINGTON GOLD MINE (901)
PROPOSALS:	ENHANCEMENT OF FACILITIES (156) EXPANSION OF FACILITIES - STAGE 2 (182) MINING AND PROCESSING OF SUPERGENE/BASEMENT ORES (238 / 238-1) DEVELOPMENT OF EASTERN ANOMALIES (700)
CURRENT PROPONENT:	WORSLEY ALUMINA PTY LTD
CONDITIONS SET ON:	15 FEBRUARY 1988 8 DECEMBER 1988 22 NOVEMBER 1989 21 JANUARY 1993
CONDITIONS AMENDED ON:	8 JUNE 1990

The implementation of these proposals is now subject to the following conditions which replace all previous 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 proposals, including the modifications to the rehabilitation strategy described in the proponent's documentation of 1994 as reported on in Environmental Protection Authority Bulletin 766, the Enhancement of Facilities as reported on in Environmental Protection Authority Bulletin 313, the Expansion of Facilities - Stage 2 as reported on in Environmental Protection Authority Bulletin 361, the Mining and Processing of Supergene/Basement Ores as reported on in Environmental Protection Authority Bulletins 408 and 430, and the Development of Eastern Anomalies as reported on in Environmental Protection Authority Bulletin 661; the proponent shall fulfil the commitments made during the assessments, in documentation of 1994 in connection with modifications to the rehabilitation strategy, and the revised list of commitments of November 1994 (published in Environmental Protection Authority Bulletin 766 as Appendix 3, a copy of which is attached); provided that the commitments are not inconsistent with the conditions or procedures contained in this statement.

Published on

25 JAN 1995

2 Implementation

Changes to the proposals 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 proposals 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 proposals. Where, in the course of that detailed implementation, the proponent seeks to change those designs, specifications, plans or other technical material 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 Hotham River

Diversion of water from the Hotham River may have an adverse impact on the Hotham/Murray River system as well as on downstream users.

3-1 The proponent shall only pump water from the Hotham River when the river flow is in excess of 342 kilolitres per hour as measured at Marradong River bridge gauging station.

3-2 When pumping from the Hotham River, the proponent shall not cause the remaining river flow to be reduced below the level of 342 kilolitres per hour as measured at Marradong River bridge gauging station.

Note: Water is extracted from the Hotham River in accordance with licence conditions set by the Water Authority of Western Australia under the provisions of the Rights in Water and Irrigation Act 1914.

4 Development of Lakes in the Mine Pits

Detailed plans for the development and management of lakes are required.

4-1 At least 12 months prior to decommissioning the mine pits, the proponent shall prepare an Environmental Management Programme for the inclusion of lakes as final landform features within the mine pit areas, to the requirements of the Department of Environmental Protection on advice of the Water Authority of Western Australia, the Department of Minerals and Energy and the Department of Conservation and Land Management.

This Programme shall include, but not be limited to, the following:

(1) lake design, including:

(a) the proposed connection to Thirty-Four Mile Brook;

(b) the partial return of mine waste as backfill to mine pits where required for the necessary creation of shallow water areas or islands for wildlife use;

(c) inflow and outflow options for the management of water quality and quantity in the lakes and Thirty-Four Mile Brook, including options for isolating the lakes; and

(d) slopes and proposed vegetation types, including wetland plant species;

(2) target minimum, maximum and optimum water levels in the lakes based on stream flow in Thirty-Four Mile Brook, groundwater flow and run-off from surrounding areas;

(3) water quality criteria to ensure the maintenance of appropriate water quality in the lakes and Thirty-Four Mile Brook;

(4) predicted groundwater and surface water hydrological responses and impacts on long term salinity in the lakes and Thirty-Four Mile Brook; and

(5) the development of a comprehensive monitoring, management and reporting programme.

4-2 The proponent shall implement the Environmental Management Programme required by condition 4-1 to the requirements of the Department of Environmental Protection on advice of the Water Authority of Western Australia, the Department of Minerals and Energy and the Department of Conservation and Land Management.

5 Rehabilitation

In addition to waste stockpiles, mine pits and residue disposal areas, other project areas will need to be properly rehabilitated.

5-1 The proponent shall rehabilitate the Boddington Gold Mine site and environs and remove associated infrastructure, to the requirements of the Department of Environmental Protection and the State Mining Engineer with advice from other agencies, as appropriate.

6 Discharge Waters

A water management programme referred to in the proponent's documentation of 1994 for the residue disposal areas and the D1 Dam is important to ensure that the proponent controls metal levels in run-off waters. Following commitments made by the proponent, other relevant water quality parameters will also be managed. (See, for example, commitments nos 15 and 21 attached).

6-1 The proponent shall ensure that waters discharged to the Hotham River from the residue disposal areas and the D1 Dam permit the maintenance of the existing beneficial uses and the existing ecosystems of the River.

6-2 The proponent shall ensure that waters discharged to the Thirty-Four Mile Brook from the residue disposal areas and the D1 Dam permit the maintenance of the identified beneficial uses and the existing ecosystems of the Brook.

6-3 At least six months prior to discharge of waters from the residue disposal areas or the D1 Dam, the proponent shall demonstrate in a report to the Department of Environmental Protection how the discharges will be managed to meet conditions 6-1 and 6-2, to the requirements of the Department of Environmental Protection on advice of the Water Authority of Western Australia.

This report shall address, but not be limited to, the following:

(1) provision of further detail on the water management programme, referred to in the proponent's documentation of 1994, for the residue disposal areas and the D1 Dam;

(2) further characterisation of the receiving environments of the Hotham River and Thirty-Four Mile Brook; and

(3) determination of the likely effectiveness of the water management programme in meeting the objectives of conditions 6-1 and 6-2.

6-4 In the event that matters addressed in the report required by condition 6-3 demonstrate the need for variation of the water management programme referred to in the proponent's documentation of 1994, the proponent shall modify the water management programme to the requirements of the Department of Environmental Protection on advice of the Water Authority of Western Australia.

6-5 The proponent shall implement the modified water management programme arising from condition 6-4.

7 Decommissioning

The satisfactory decommissioning of the project, removal of the plant and installations and rehabilitation of the site and its environs is the responsibility of the proponent.

7-1 At least twelve months prior to decommissioning, the proponent shall prepare a decommissioning and rehabilitation plan, including development of a 'walk away' solution for the site, to the requirements of the Department of Environmental Protection and the State Mining Engineer.

Note: A 'walk-away' solution means that the site shall either no longer require management at the time the proponent ceases mining 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. This could be in the form of an environmental bond such as those routinely held against mining rehabilitation success by the Department of Minerals and Energy.

7-2 The proponent shall implement the plan required by condition 7-1 to the requirements of the Department of Environmental Protection and the State Mining Engineer.

8 Proponent

These conditions legally apply to the nominated proponent.

8-1 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.

9 Compliance Auditing

In order to ensure that environmental conditions and commitments are met, an audit system is required.

9-1 The proponent, in consultation with the Department of Environmental Protection, shall prepare an Audit Programme, which includes requirements for the preparation of periodic Compliance Reports.

9-2 The proponent shall subsequently implement the Audit Programme required by condition 9-1.

Procedure

1 The Department of Environmental Protection is responsible for verifying compliance with the conditions contained in this statement, with the exception of conditions stating that the proponent shall meet the requirements of either the Minister for the Environment or any other public authority.

2 If the Department of Environmental Protection, other public authority or proponent is in dispute concerning compliance with the conditions contained in this statement, that dispute will be determined by the Minister for the Environment.

Kevin Minson MLA
MINISTER FOR THE ENVIRONMENT

25 JAN 1995

Note

The proponent should apply for a Works Approval under the provisions of Part V of the Environmental Protection Act.

Proponent's Environmental Management Commitments

November 1994

BODDINGTON GOLD MINE (901)

(PREVIOUS ASSESSMENT NOs.156, 182, 238, 238-1 & 700)

WORSLEY ALUMINA PTY LTD

The proponent has made the following environmental management commitments:

1. Clearing for project activities will be kept to a minimum, consistent with safe operating practices.

2. Topsoil from areas cleared for project activities will be salvaged for use in decommissioning and other rehabilitation programmes.

3. Environmentally - sensitive construction and operational practices, including stringent forest hygiene measures, will be employed throughout the project area.

4. The State will continue to be compensated for clearing of State Forest under terms of the Alumina Refinery (Worsley) Agreement Act, 1973.

5. Alternative access from private land around the downstream Water Supply Reservoir to State Forest to the west of the project area will be maintained for local bush fire brigades and CALM.

6. Biological monitoring programmes, based on information provided to the State in the draft report on baseline biological investigations, will be developed in consultation with the State. Results of these monitoring programmes will be reported to the State and changes to management and procedures developed as necessary with the State.

7. A quantified assessment of likely impacts of project clearing on streamflow and quality of Thirty Four Mile Brook has been carried out with the Water Authority of Western Australia (see Appendix B of the April 1987 Environmental Management Programme). In consultation with the EPA and the Water Authority, surface and groundwater monitoring programmes will be developed and implemented to facilitate progressive planning and management of project activities, particularly mining and residue storage, to minimise adverse hydrological and hydrogeological effects.

8. If unacceptable quality is detected in groundwater monitoring bores around the Residue Disposal Area, the remedial actions described in Section 8.3.3 of the April 1987 Environmental Management Programme will be evaluated as part of the development of a response to such a situation.

9. Material from residue and reclaim pipeline leaks/breakages will be contained at low points along the residue pipeline route and transported to the Residue Disposal Area. If spills are not fully contained, WAPL will carry out clean-up and rehabilitation of affected areas in consultation with the State.

10. In the unlikely event of a dam failure, including the overtopping of the Process Water Pond, the Joint Venturers will assume responsibility for clean-up and rehabilitation to the satisfaction of the State.

11. All waste and spilt materials in the Metallurgical Treatment Plant area will be contained within the process operation for reuse, or disposed of as appropriate.

12. Caustic soda used in the Metallurgical Treatment Plant will have a mean mercury content of less than 100ug/L with a maximum value of 1,000ug/L.

13. Stormwater runoff from the cleared area of the Plant Site will flow into the Process Water Pond, which has been lined with clay and plastic to minimise leakage. The pond will have sufficient capacity to accommodate rainfall runoff from a one in one hundred year storm event.

14. Drainage will be installed around mine pits, haulroads, and stockpiles; water (other than acidic mine drainage) from these will either be used for dust suppression, or will drain via silt traps into natural watercourses.

15. The objective of the management of runoff from the mining operations will be to minimise the potential spread of forest disease and to reduce the long-term salinity and turbidity impact on Thirty Four Mile Brook.

16. Shallow mine pits will be contoured to slopes generally consistent with natural landforms.

17. Deeper pits will be rehabilitated if, at the time of completion of mining the weathered profile, no decision to mine bedrock has been made. Should a decision to mine bedrock to be [sic] made, detailed plans will be submitted to the State for approval.

18. Final rehabilitation will ensure that runoff will drain to natural watercourses or into the deeper pits.

19. Life-of-project land use plans will be prepared and submitted to the State on an annual basis.

20. The State will be provided with brief annual and comprehensive triennial environmental management reports as part of existing arrangements for the Worsley Alumina Project.

21. Prior to the commencement of rehabilitation BGM will develop detailed prescriptions for the residue areas which will be aimed at stabilising the residue surface, providing a sustainable vegetation system, and optimise [sic] the quality of any future runoff from those areas.

22. As a temporary measure following decommissioning, D1 Dam will be used to capture and control saline runoff from the BGM Residue Disposal Areas, which will be diverted to the Hotham River. This diversion of water will not cause an increase of more than 10% in the salinity of Hotham River at any time. Other than salinity this discharge will not exceed statutory guidelines for water used for livestock watering.

23. Unless authorised by the State, residue area runoff water which is released from D1 Dam into Thirty-Four Mile Brook will not exceed 3000 mg/l Total Dissolved Solids. This discharge will not exceed statutory guidelines for recreational waters.

24. During the initial period of lake filling following rehabilitation, BGM will endeavour to manage water flows so as to minimise drought stress in riparian vegetation in Thirty-Four Mile Brook.

25. When the quality of residue area runoff meets the criteria for discharge to Thirty-Four Mile Brook, BGM will continue to monitor and manage further runoff until sufficient data are available to demonstrate to the satisfaction of the State that (notwithstanding seasonal effects) the quality of this runoff has stabilised or is continuing to improve below those criteria. Final rehabilitation of D1 dam will not commence until this has been demonstrated.

26. BGM will include in the final landform lakes in the Pit G and Pit B areas, which will be linked to Thirty-Four Mile Brook. Detailed plans will be developed in consultation with and to the satisfaction of the State showing lake design, inflow and outflow structures, slopes, and proposed vegetation types, prior to final rehabilitation commencing. Measures to maximise the area of shallows in the lakes will be investigated and

implemented where practicable. The design will include predicted hydrological responses and impacts on long-term salinity in 34 Mile Brook.

27. Detailed rehabilitation prescriptions for the mining area will be developed with the primary objectives of stabilising surfaces, minimising erosion, minimising risk of saline groundwater seepage, and providing a sustainable vegetation system. Local provenance native species will be used where possible, although other species may be used where they provide advantages in meeting the primary objectives.

28. In the event of mine dewatering being necessary, BGM will ensure that the salinities of water bodies and water courses receiving discharges do not exceed 5,000mg/l TDS as a result of those discharges; and will monitor and report impacts of such release on downstream vegetation, and adjust procedures as appropriate.

29. BGM will continue to monitor surface and groundwater in the area, as part of the regional programme established in the early 1980's, and report findings to the State.

30. BGM will develop rehabilitation strategies and prescriptions in consultation with the State, and monitor and report on the success of rehabilitation.