Hedges gold project, Boddington - proposal for an increase in annual throughput from 2 Mtpa to 4 Mtpa — change to environmental conditions

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Alcoa of Australia Ltd

Report and recommendations
of the Environmental Protection Authority

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Summary

This report is to provide the Environmental Protection Authority (EPA) advice and recommendations to the Minister for the Environment on the environmental factors relevant to the proposal to increase the throughput of the Hedges Gold project from 2 Mtpa to 4 Mtpa.

It is the EPA's opinion that there is one environmental factor relevant to the proposal, namely:

- water quality.

The conditions and procedures, in the EPA's opinion, to which the proposal should be subject if implemented are in summary:

(a) the proponent's commitments should be made enforceable;

(b) the conditions currently applicable to this project; and

(c) the proponent should be required to have an environmental management system for the project.

The EPA submits the following recommendations:

Recommendation 1

That the Minister for the Environment note the relevant environmental factor 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 (Section 4), including the proponent's environmental management commitments, the proposed increase in ore throughput from 2 Mtpa to 4 Mtpa for the Hedges Gold project can be managed to meet the EPA's objectives.

Recommendation 3

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

Recommendation 4

That the Minister for the Environment request that the Minister for Mines and the Minister for Resources Development consider how ongoing review of environmental performance for Boddington and Hedges gold mines can be coordinated in respect of provisions relating to the projects under the Mining Act and State Agreement Act.

Contents

1. Introduction and background

This report is to provide the Environmental Protection Authority (EPA) advice and recommendations to the Minister for the Environment on the environmental factors applicable to the proposal to increase the throughput of the Hedges Gold project from 2 Mtpa (million tonnes per annum) to 4 Mtpa as described in the proponent's Section 46 Review (Hedges Gold Pty. Ltd. 1996).

The Hedges Gold project has been previously assessed by the EPA at the level of an Environmental Review and Management Programme. The EPA published its report and recommendations to the Minister for the Environment for the Hedges Gold project (EPA, 1987) in December 1987 and a statement of environmental approval, with conditions, was issued on 25 February 1988.

Hedges Gold mine commenced production in 1988. In 1996 the proponent proposed to increase the annual throughput of the project from 2 Mtpa to 4 Mtpa.

Further information on the proposal are given in Section 2 of the report. 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. Section 5 presents the EPA's recommendations to the Minister.

Appendix 1 provides maps relating to the proposal. A list of government agencies that made submissions is included in Appendix 2, and references are listed in Appendix 3. The existing Ministerial Conditions applying to the project are presented in Appendix 4.

2. The proposal

The approved proposal, as assessed by the EPA in 1987, is to mine and process up to 2 Mtpa of lateritic gold ore from the Hedges deposit, which is located in State Forest 4 km south of Mt Wells and 12 km north west of the town of Boddington (Figures 1&2). Ore is extracted through an open cut mining operation and is hauled 7 km to the carbon-in-leach treatment plant where the gold is recovered and the tailings deposited in a tailings dam. Process water for the treatment plant is supplied from the raw water supply dam which is replenished by pumping from the Hotham River. The treatment plant, tailings dam, and raw water supply dam, are located on private land either owned or leased by the proponent.

The Hedges deposit is part of the same ore body being mined at the adjacent Boddington Gold Mine

The currently proposed change is to increase the rate of mining and processing of gold ore to 4 Mtpa. The implication of the proposed change compared with the currently approved project is to bring forward the provision of additional tailings storage.

Hedges Gold Pty Ltd is a wholly owned subsidiary of Alcoa of Australia Ltd.

3. Environmental factors

3.1 Relevant environmental factors

It is the EPA's opinion, based on the submissions and material listed in Appendices 2 and 3, that there is one environmental factor relevant to the proposal, which is:

- water quality.

3.2 Water quality

Aspects of water quality

The proposed change may require an earlier expansion of the tailings dam capacity. There is the potential to pollute surface water and groundwater in the surrounding area.

Tailings from the gold processing plant are discharged into a tailings dam where the solids settle and the liquor forms a decant pond. Available liquor is then returned to the gold processing plant for re-use as process water. The tailings liquor contains cyanide which is a toxic substance. In recognition of the pollution potential of the tailings containing cyanide, the project is currently subject to an environmental condition which requires that the proponent prevent any discharge of water containing measurable concentrations (0.05 ppm) of cyanide beyond the property boundary (Appendix 4, Condition 5). This cyanide limit is taken to refer to the level of weak acid dissociable cyanide in surface water.

As reported in the most recent annual report (Hedges Gold Pty. Ltd. 1996), the tailings dam management programme to date has effectively been one of total containment.

Since the commencement of this project, the tailings dam storage capacity has been increased via a number of lifts of the tailings dam wall. In August 1996 Hedges Gold Pty Ltd, a subsidiary of the proponent, submitted designs for another lift of the tailings dam wall to a level of RL 282.5 metres AHD which increased the tailings storage capacity from 26 Mt to 37.5 Mt. Should sufficient ore reserves exist to necessitate further increase in capacity, there is scope for one more lift, to RL 285 m AHD. Increasing the throughput to 4 Mtpa would mean that the lift to RL 285 m AHD would be required in approximately 3 years, compared with 6 years at the currently approved throughput of 2 Mtpa.

To prevent any adverse impacts on water quality the tailings dam is designed to contain all surface water and to prevent seepage of liquor into the underlying aquifer. In addition, regular monitoring and reporting of downstream surface water and groundwater quality is carried out. In 1994, a review of the monitoring results (Nield Consulting Pty Ltd 1994) found that in general the dam has not had major impacts on groundwater quality in the downstream valley floor, and that the limit for cyanide set in Environmental Condition 5 was unlikely to be exceeded under planned operating conditions. The management measures referred to above were included in the design for the recent lift of the tailings dam to RL 282.5 m AHD which was evaluated by the Department of Environmental Protection (DEP). A Works Approval, under Part V of the *Environmental Protection Act 1986*, was issued for this expansion on 10 December 1996. Any expansion of the tailings dam capacity would require similar evaluation by the DEP.

Assessment

The area considered for assessment of this relevant environmental factor is the catchment of the Thirty-four Mile Brook in the immediate vicinity of the tailings dam, as it is this area which would be affected by any leakage from the tailings dam.

The EPA's objective in regard to this environmental factor is "to ensure that the beneficial uses of surface water and groundwater can be maintained, consistent with the *draft Western Australian Water Quality Guidelines for Fresh and Marine Waters* (EPA, 1993)".

The tailings dam is located on an ephemeral stream which is a tributary of Thirty-four Mile Brook. In relation to water quality objectives, the beneficial use of this stream is limited to livestock watering. The beneficial uses of Thirty-four Mile Brook are considered to include the maintenance of an aquatic ecosystem.

The EPA notes that construction and operation of a tailings dam requires a DEP Works Approval and Licence. There are also proponent commitments to continue water quality monitoring of the water residue system and to monitor stream flow for quality and quantity in Thirty-four Mile Brook upstream and downstream of the mine.

The Hedges Gold project and the Boddington Gold project are located within the same geographic area. Both projects mine the same ore body and all associated facilities are within the 15 km of each other (refer Figure 2). In particular, both operations fall within the catchment of Thirty-Four Mile Brook and the Hotham River. Both operations employ similar ore processing methods and operate similar tailings disposal facilities. Given the similarity and closeness of these two projects, the EPA believes that there are obvious advantages to having a coordinated review of the environmental performance of both projects. This could be achieved by establishing a group of government agencies along similar lines to the proposed Boddington Gold Mine Liaison Group (Welker Environmental Consultancy 1996).

Having particular regard to:

(a) existing environmental conditions and commitments relating to the tailings dam;

(b) the requirement for Works Approvals and Licences under Part V of the *Environmental Protection Act 1986* for the construction and operation of the tailings dam; and

(c) previous performance of the tailings dam,

it is the EPA's opinion that the increase in throughput is unlikely to compromise its objective in regard to water quality. However, the EPA believes that, due to the close proximity of the Hedges and Boddington gold projects, it is desirable that there be integrated environmental oversight of both projects (Recommendation 4).

4. Conditions and procedures

In the EPA's opinion, the proposal should be subject to the following conditions and procedures if implemented.

4.1 Proponents commitments.

The commitments made by the proponent through the course of the original environmental impact assessment at the level of Environmental Review and Management Programme, as set out in the Minister's statement of 25 February 1988, and summarised in Table 1, should remain enforceable conditions.

4.2 Existing environmental conditions.

The conditions which currently apply to the Hedges Gold project should continue to be applied to the project operating at the higher throughput of 4 Mtpa. Some minor changes to the form of the conditions should be made to update the conditions into the currently accepted format. These include the addition of conditions and procedures related to:

- implementation of the proposal and non-substantial changes to the proposal;
- changing the proponent;
- time limit on the environmental approval; and
- compliance auditing,

and modification of existing condition 5 to specify the level of weak acid dissociable cyanide in surface water as the relevant parameter.

4.3 Environmental management system

The proponent should be required to prepare and implement an environmental management plan and environmental management procedures in order to implement the proposals and manage the relevant environmental factors to ensure the EPA's objectives (Section 3) are met. The plan should adopt quality assurance principles (such as those adopted in Australian Standards ISO 9000 series) and environmental management principles (such as those adopted in the voluntary Australian Standards ISO 14000 (Int):1995 series), with appropriate monitoring and auditing to ensure compliance with this condition.

4.4 Integrated environmental oversight of Hedges and Boddington gold projects

The Minister for the Environment should request that the Minister for Mines and the Minister for Resources Development consider how ongoing review of environmental performance for Boddington and Hedges gold mines can be coordinated in respect of provisions relating to the projects under the Mining Act and State Agreement Act.

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 (Section 4), including the proponent's environmental management commitments, the proposed increase in ore throughput from 2 Mtpa to 4 Mtpa for the Hedges Gold project can be managed to meet the EPA's objectives.

Recommendation 3

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

Recommendation 4

> That the Minister for the Environment request that the Minister for Mines and the Minister for Resources Development consider how ongoing review of environmental performance for Boddington and Hedges gold mines can be coordinated in respect of provisions relating to the projects under the Mining Act and State Agreement Act.

Table 1: Summary of relevant factors, objectives, proponent's commitments, and EPA's opinion.

Relevant factor	Objective	Proponent's commitments	EPA opinion
1. Water quality	To ensure that the quality of surface water and groundwater is maintained consistent with the *draft Western Australian Water Quality Guidelines for Fresh and Marine Waters*	Carry out detailed investigations and design of tailings impoundment in accordance with Government requirements. Minimise seepage from the tailings dam by provision of an underdrainage system, by selection of suitable low permeability materials for dam wall construction, and inclusion of seepage cutoff features in the design of the dam wall. (Commitment 24) Monitor surface water quality in streams immediately downstream of the tailing dam (and plant site) and the water supply dam. Monitor groundwater quality downstream of the tailings dam and implement a detailed monitoring, recovery and recycle/treatment strategy if elevated pollutant levels and detected in seepage or groundwater. (Commitment 25) In the event of contaminated groundwater being detected, be prepared to establish a recovery bore system downflow of the tailings ares. (Commitment 26) Modify residue management system and operations to the reasonable satisfaction of the State if unexpected problems occur. (Commitment 27)	There exist adequate controls over the operation of the tailings dam to ensure the EPA's objective can be met. Construction and operation of the tailings dam are subject to Works Approvals and Licences under Part V of the Environmental Protection Act. In addition, this project is subject to existing conditions which require no measurable discharge of cyanide off-site.

Appendix 1

Figures

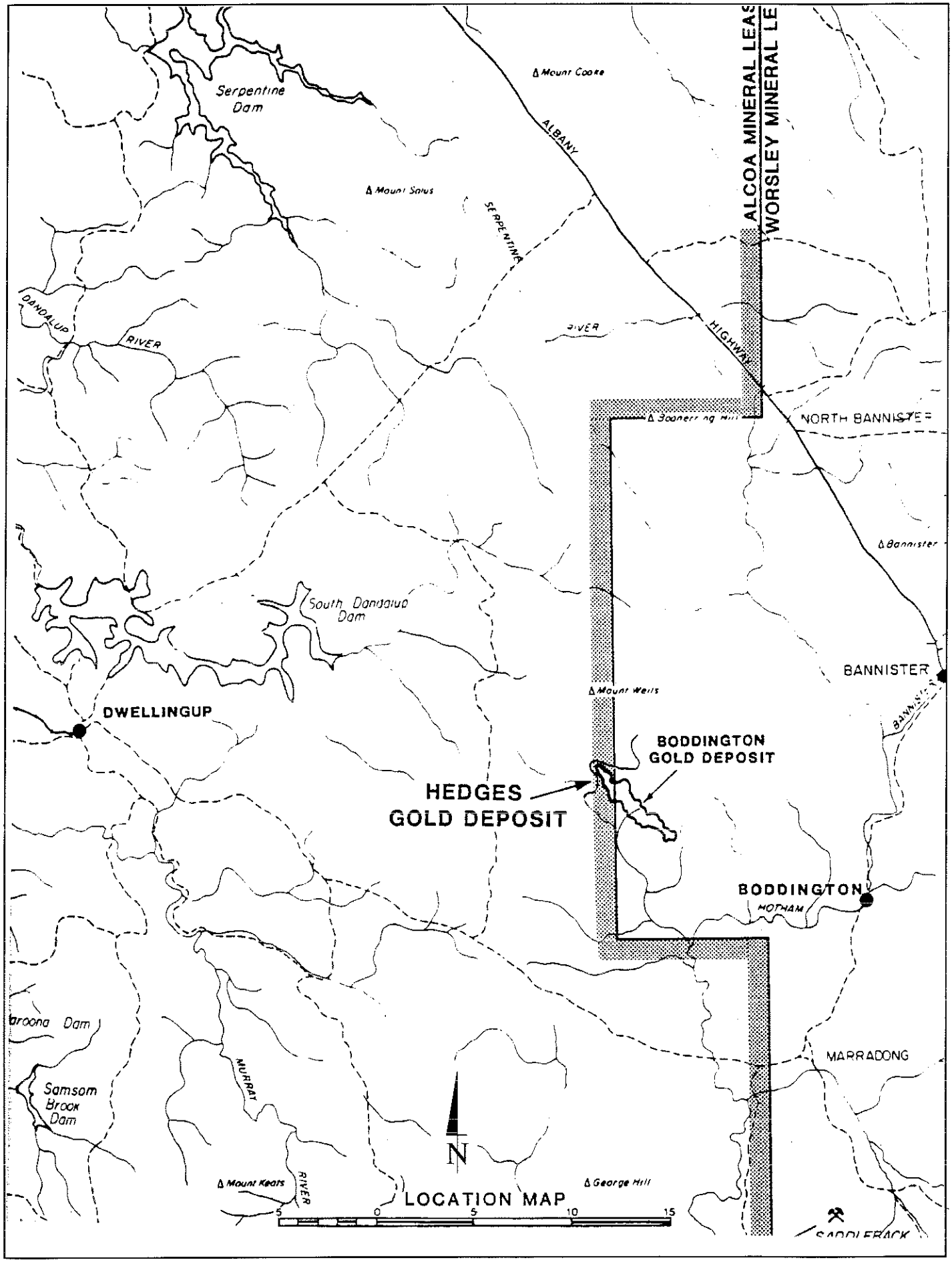

Figure 1. Location map (Source: Hedges Gold Pty Ltd, 1996).

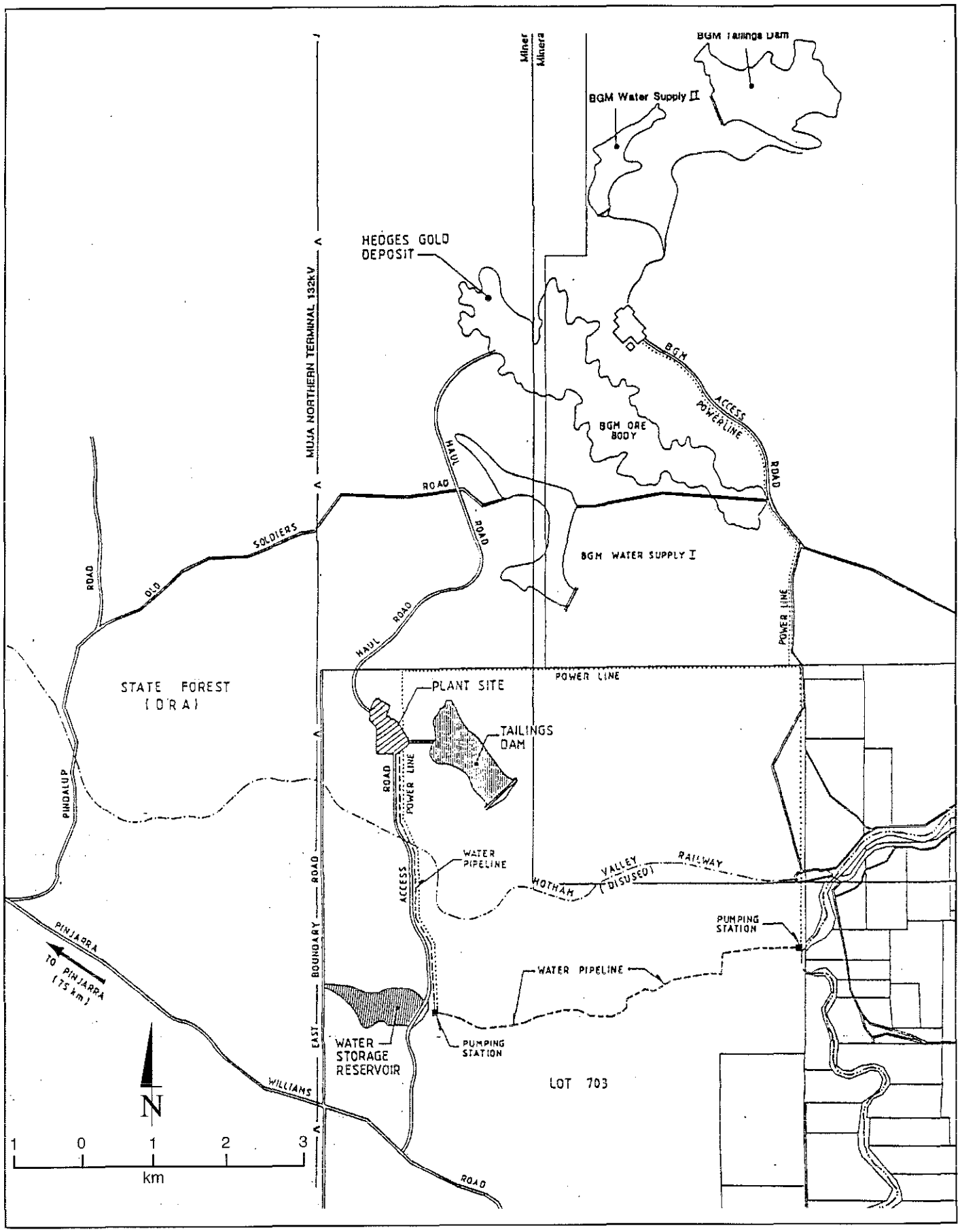

Figure 2. Hedges Gold Project layout (Source: Hedges Gold Pty Ltd, 1996).

Appendix 2

List of people and organisations that made submissions

State and local government agencies

Water and Rivers Commission

Department of Environmental Protection, Pollution Prevention Division

Appendix 3

References

Hedges Gold Pty. Ltd. 1996, *Proposal for an increase in approved annual throughput from 2 Mtpa to 4 Mtpa: Section 46 Review*, Hedges Gold Pty. Ltd.

Environmental Protection Authority 1987, *Hedges Gold project: Report and recommendations of the Environmental Protection Authority*, Bulletin 314, Environmental Protection Authority, Perth, Western Australia.

Environmental Protection Authority 1993, *draft Western Australian Water Quality Guidelines for Fresh and Marine Waters*, Bulletin 711, Environmental Protection Authority, Perth, Western Australia.

Nield Consulting Pty Ltd 1994, *Hedges Gold Mine: Assessment of Tailings Dam impact on Waters*, Alcoa of Australia Limited.

Welker Environmental Consultancy 1996, *Boddington Gold Mine: Proposed Extended Basement Operation (EBO): Consultative Environmental Review and Section 46 Review*, Worsley Alumina Pty. Ltd

Appendix 4

Existing conditions applying to the project

MINISTER FOR ENVIRONMENT

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED (PURSUANT TO THE PROVISIONS OF THE ENVIRONMENTAL PROTECTION ACT 1986)

HEDGES GOLD PROJECT

ALCOA OF AUSTRALIA LTD

This proposal may be implemented subject to the following conditions:

1. The proponent adhering to the proposal as assessed by the Environmental Protection Authority and fulfilling the commitments made for this project (copy of commitments attached).

2. The proponent shall comply with hygiene measures for jarrah dieback disease, to the satisfaction of the Department of Conservation and Land Management, in the detailed design and implementation of the project.

3. The alignment of the haul road in the State Forest shall be to the satisfaction of the Department of Conservation and Land Management.

4. The proponent shall prepare, to the satisfaction of the Environmental Protection Authority, a biological baseline report prior to commissioning of the plant. Any changes from the biological baseline, as determined by an ongoing biological monitoring programme, and any consequent changes to management, must be documented and shall be provided to the Environmental Protection Authority for assessment.

5. The proponent shall not cause or allow any waters emanating from the property boundary of the project to be contaminated with cyanide in excess of current measurable limits of detection (ie 0.05 ppm).

6. The proponent shall use low mercury caustic soda in which the mercury level does not exceed those limits set for the use of caustic soda in the alumina industry in Western Australia.

. rehabilitation of haul roads in State Forest, to the satisfaction of the Department of Conservation and Land Management;

. rehabilitation of the water supply dam, to the satisfaction of the Water Authority of Western Australia; and

. rehabilitation of the tailings dam, to the satisfaction of the Department of Mines.

14. With the exception of the material used in road construction, mine waste shall be returned as backfill to mine pits during the life of the project. If it is decided not to process marginal ore, this material shall also be returned to mined out pits. Should a decision to mine bedrock be made in the future, then detailed plans must be submitted to the Environmental Protection Authority for further assessment.

15. The proponent shall ensure that noise levels generated by blasting operations do not exceed 115 dB peak linear. Noise levels from machinery will be set during works approval and licensing under the Environmental Protection Act, 1986.

16. The proponent shall produce an environmental management programme to the satisfaction of the Environmental Protection Authority, prior to each separate construction or development stage being implemented. These reports shall be consolidated into a document suitable for public information and include information provided subsequent to conditions 2, 4, 8, 12 and 13.

17. Following its review of the monitoring and management reports required to be submitted by the proponent to the Environmental Protection Authority pursuant to condition 16, the Environmental Protection Authority shall make these reports available to the public.

18. The proponent shall provide decommissioning plans for:

    . the tailings dam;

    . the water supply dam; and

    . the removal of waste and equipment.

    Plans shall be finalised at least twelve months prior to the proposed date for decommissioning and be to the satisfaction of the Environmental Protection Authority and appropriate Government agencies.

Barry Hodge, MLA
MINISTER FOR ENVIRONMENT

25 FEB 1988

7. The proponent shall submit the tailings dam design including safety features, recovery systems and underdrain design to the Environmental Protection Authority, the Department of Mines and the Water Authority of Western Australia and dam construction is prohibited until such design be found to be acceptable.

8. A groundwater monitoring programme shall be developed by the proponent and approved by the Environmental Protection Authority before commissioning of the tailings dam. The groundwater monitoring programme shall include:

   - measurements of dissolved salts, pH and cyanide;
   - monitoring results and notification to the Environmental Protection Authority of any detected seepage, and
   - proposals of remedial action, to the Environmental Protection Authority's satisfaction, in the event that seepage is detected.

9. Pumping from the Hotham River shall only take place when the river flow is in excess of 342 kilolitres per hour. Total pumping from the river shall not cause the remaining flow to be reduced below a flow of 342 kilolitres per hour (River flow measured at Marradong River bridge gauging station). The proponent shall negotiate agreements, to the satisfaction of the Minister for Water Resources, with any other major user of water from the Hotham River in order to ensure that overall pumping does not reduce flow below 342 kilolitres per hour.

10. The minimum flow rate of 342 kilolitres per hour shall be reviewed by the Water Authority of Western Australia after two winter flows and advice given to the Environmental Protection Authority as to whether this rate is having undesirable environmental impacts.

11. Subsequent to receiving the advice of Water Authority of Western Australia pursuant to Condition 10, the Environmental Protection Authority may modify the minimum flow rate set in Condition 9.

12. The proponent shall conduct hydrological studies to determine changes in salinity in surface water and groundwater arising from mining operations. A programme for such studies shall be submitted to the Environmental Protection Authority and its approval gained prior to commissioning.

13. The proponent shall present proposals for rehabilitation of areas affected by the project within 12 months of commissioning, as follows:

   - rehabilitation of landscape, soils and vegetation appropriate for the land use priority for that area within State forest and to standards appropriate to bauxite mining, to the satisfaction of the Department of Conservation and Land Management;
   - rehabilitation of areas affected by chemical spills should they occur and monitoring of chemical concentrations until they decline to background levels, to the satisfaction of the Department of Mines;

(13) in consultation with CALM, plan and apply appropriate disease control strategies for the haul road alignment through, and mining operations in, State Forest;

(14) apply appropriate dieback management procedures to activities conducted in other forest areas;

(15) conduct forest upgrading planting in disease affected State Forest immediately adjacent to operations, if required and considered appropriate by CALM;

(16) develop a sanitary landfill area for the disposal of office and domestic wastes generated by the project;

(17) if necessary, provide accommodation for the construction workforce following discussions with local authorities;

(18) control fugitive dust from the Project Area;

(19) monitor faunal populations in the Project Area;

(20) restrict human and non-avian faunal access to potentially hazardous areas by fencing. If necessary, contruct and place avifaunal deterrents in the tailings impoundment;

(21) monitor noise levels in the Project Area and its surrounds; use Blast Acoustic Modelling procedure developed at Alcoa's bauxite mine sites to predict and reduce noise impact on Boddington town site and neighbours;

(22) advise nearby populations and relevant Government officers of likely blasting times;

(23) utilise requisite safety equipment and procedures in the handling and storage of hazardous chemicals;

(24) carry out detailed investigations and design of tailings impoundment in accordance with Government requirements. Minimise seepage from the tailings dam by provision of an underdrainage system, by selection of suitable low permeability materials for dam wall construction, and inclusion of seepage cutoff features in the design of the dam wall;

(25) monitor surface water quality in streams immediately downstream of the tailing dam (and plant site) and the water supply dam. Monitor groundwater quality downstream of the tailings dam and implement a detailed monitoring, recovery and recycle/treatment strategy if elevated pollutant levels and detected in seepage or groundwater;

(26) in the event of contaminated groundwater being detected, be prepared to establish a recovery bore system downflow of the tailings area;

(27) modify residue management system and operations to the reasonable satisfaction of the State if unexpected problems occur;

SUMMARY OF COMMITMENTS TO ENVIRONMENTAL MANAGEMENT

The following represents a summary of commitments made by Alcoa of Australia Limited in respect of environmental management of the Hedges Gold Mine.

Alcoa of Australia Limited would:

(1) comply with the requirements of applicable Acts and Regulations;

(2) minimise clearing of land consistent with safe and efficient operations;

(3) compensate the State for all clearing of State Forest;

(4) establish environmental regulations for both construction and permanent workforces; ensure that these regulations are complied with through environmental education, supervision and enforcement; take full responsibility for the environmental performance of both permanent employees and sub-contractors;

(5) establish ongoing liaison with Mines Department for pit safety and face stability;

(6) progressively rehabilitate mined areas during the project, if mining sequence and production drilling data indicate that this is possible. Alternatively, rehabilitate all areas after project completion;

(7) where practicable, return waste to mined areas. Landscape and rehabilitate the remaining waste stockpile according to principles in (8);

(8) return affected areas to appropriate and achievable land uses in accordance with agreements with the State Government and Worsley Timber Company, using prescriptions developed in consultation with relevant State Government authorities;

(9) monitor and maintain rehabilitated pits, waste stockpile, haul road and reside disposal areas until such time as it is agreed, with the State, that the objectives of such rehabilitation have been met;

(10) design and operate a water quality, drainage and stormwater management system throughout the project area which will minimise the discharge of turbid water, plant chemicals or tailings spills into nearby streams, and minimise erosion.

(11) ensure mining operations do not have a negative impact on the long term quality of water in the BGM water supply reservoir, by developing and implementing appropriate drainage control and rehabilitation programmes;

(12) monitor stream flow for quality and quantity in 34 Mile Brook upstream and downstream of the mine;

SUMMARY OF COMMITMENTS TO ENVIRONMENTAL MANAGEMENT (cont.d)

(28) notify the Water Authority, EPA and downstream users promptly if any spillage occurs which has potential to affect downstream water users; conduct clean-up or containment operations if necessary;

(29) remove contaminated material and carry out appropriate rehabilitation if a tailings pipeline failure occurs;

(30) establish surface contouring and drainage to prevent the rise of contaminated waters in residue areas during rehabilitation, and permit vegetation establishment. Establish a drainage collection system to retain runoff so that it can be monitored and if necessary treated prior to discharge;

(31) continue monitoring the water residue system until it is decided, in consultation with the State, that such activity is no longer required;

(32) carry out investigations in conjunction with WAJV, or independently, on residual process chemicals in the gold tailings and their possible effects on underlying soils and groundwater. Include a comprehensive survey after the first 12 months operation of the chemical status of the tailings deposit;

(33) keep abreast of developments in gold tailings disposal technology for possible future application in treating contaminated seepage or runoff if it proves necessary;

(34) provide access for CALM and local Bush Fire Brigades;

(35) submit an annual report of environmental management and monitoring programmes, then content of which is to be determined by agreement with the State;

(36) construct more positive cut off features or seepage collection systems for the tailings dam, if unacceptable seepage occurs;

(37) design the initial tailings dam and its extensions to store runoff from a net year with a 1:1000 year frequency;

(38) carry out or sponsor studies on the interactions between tailings leachate and foundation soils after the commencement of operations;

(39) carefully monitored water quality changes prior to and following start-up and if adverse trends develop then measures will be taken to protect downstream uses;

(40) in the event that unacceptable water pollution occurs downstream, carry out remedial action to the satisfaction of the State;

(41) process make-up water would be drawn from the Hotham River during the winter months when salinities can be in the range 1000-9000 mg/l;

(42) commence a hydrogeological monitoring and assessment programme prior to start-up and would update it continuously;

(43) monitor the water and salt balances for the tailings circuit;

(44) ensure that mining of the stream zone orebody only took place during summer months and that rehabilitation of this part of the pit would commence immediately mining was completed;

(45) with regard to monitoring of water quality and quantity of 34 Mile Brook, coordinate monitoring with that of BGM and WAWA requirements;

(46) ensure that domestic waste disposal within the the 34 Mile Brook Catchment would use self contained toilets and enclosed garbage bins;

(47) establish a correlation between the minimum flow at the Marradong Gauging Weir and the river level at pump suction. An automatic cutoff system would ensure that pumping ceases at this time;

(48) transport chemicals according to standard government safety requirements;

(49) provide access for fire control purposes; and

(50) take action to the reasonable satisfaction of the State if actual or potential risks, not adequately addressed in this ERMP, occur.