

# **Alluvial diamond mine expansion, Smoke Creek**

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**Argyle Diamond Mines Pty Ltd**

**Report and recommendations of the  
Environmental Protection Authority**

**Environmental Protection Authority  
Perth, Western Australia  
Bulletin 583  
Assessment No 607  
September 1991**

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Environmental Protection Authority**

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## **Summary and recommendations**

In April 1991 Argyle Diamond Mines Pty Ltd the company submitted a proposal to extend the mining of alluvial diamonds downstream from its current operations in Smoke Creek. The proposal falls within its existing mining lease area. The Environmental Protection Authority decided to assess the proposal formally at the level of Consultative Environmental Review (CER).

The project is expected to process about 12 million tonnes of gravels over a period of five years, beginning later this year and would be planned to progress in stages. The mining and rehabilitation methods currently used at Smoke Creek would be employed to work a total of 282 hectares in a strip parallel to the course of Smoke Creek. The existing alluvial treatment plant would be used, with minor modifications, and tailings would be disposed of into the existing dam immediately north of the alluvial treatment plant.

Exploration in areas further downstream is continuing and could lead to future proposals.

The large area of disturbance to riverine areas is of some concern to the Authority because of the potential for increased soil erosion and the loss of habitat. However, the proponent has demonstrated successful rehabilitation of areas formerly mined in Upper Smoke Creek. Given moderate rainfall each season the proposed rehabilitation programmes are expected to be successful.

The Authority has concluded that the proposed mining of alluvial deposits, although extending over a large area, will not result in unacceptable environmental impacts provided the commitments made by the company are kept and subject to the Authority's recommendations.

### **Recommendation 1**

**The Environmental Protection Authority concludes that the proposal to extend alluvial mining down Smoke Creek as described in the Consultative Environmental Review is environmentally acceptable. In reaching this conclusion, the Authority identified the main factors requiring detailed consideration as: the environmental significance of the area to be mined, soil erosion control, the movement of surface and ground waters along the creek course and the effectiveness of proposed rehabilitation of the mined areas.**

**The Environmental Protection Authority considers that these and other issues have been addressed by studies and environmental management commitments given by the proponent or by the Authority's recommendations in this report. Accordingly the Environmental Protection Authority recommends that the proposal could proceed, subject to:**

- the proponent's commitments; and**
- the Authority's recommendations in this report.**

### **Recommendation 2**

**The Environmental Protection Authority recommends that where spontaneous regeneration of native seedlings in rehabilitated areas is inadequate, in the opinion of the Environmental Protection Authority, the proponent should supplement the vegetative cover in those areas with seed or seedlings, to a standard acceptable to the Environmental Protection Authority in consultation with the Department of Mines.**



## **1. Introduction**

Argyle Diamond Mines Pty Ltd proposes to mine and process additional diamond-bearing gravels held within its existing leases along Smoke Creek, within the Argyle State Agreement Area M259SA. The project area is approximately 100km south-south-west of Kununurra and located on 'Lissadel' Pastoral Lease in the East Kimberley region (see Figure 1).

Clause 10 of the Diamond (Ashton Joint Venture) Agreement Act 1981 requires the proponent to submit proposals when intending to significantly expand or otherwise vary their activities beyond those specified in previously approved proposals. Because of the considerable areas proposed for mining and the potential to exacerbate soil erosion in the headwaters of the Ord catchment area the proposal was referred to the Environmental Protection Authority who decided to assess the proposal under Part IV of the Environmental Protection Act, at the level of Consultative Environmental Review (CER).

The document was released for a four week public review period closing in early July 1991.

## **2. Project description**

The proposal encompasses the mining and processing of approximately 12 million tonnes of alluvial gravels extending for a distance of 2.5km downstream beyond current mining operations in Smoke Creek. Figure 2 shows where the proposed mining would take place in relation to the existing processing facilities. The company proposes to begin mining later in 1991 and the programme is expected to take five years to complete. Additional areas under consideration downstream pending feasibility studies will be the subject of later referrals if mining is proposed.

The mining is expected to affect about 282 hectares in a broad swath along the creek. Both the mining and the rehabilitation would be progressive and continuous, as in the current operation. The same methods would be used for both operations as for the current alluvial programme, in which ore is extracted by hydraulic excavator from a "slot" or cross section of the creek. This slot may be up to 500 metres long and is usually less than 10 metres wide. A front end loader transfers the ore to a field screening unit which separates the diamond-bearing portion from the uneconomic fine and coarse fractions. In the current operation as much as possible of these residual gravels is returned directly to the mining face, while the ore is taken to the treatment plant in trucks.

Processing facilities are in place for the current mining and there is no change proposed to these, apart from a modification to the plant processing circuit with the introduction of a new load station. The treatment circuit produces a fine fraction which goes to the tailings dam as a slurry, and a coarse fraction, which is returned to the mine area. This is an improvement over the original operation where the coarse reject fraction was put into waste dumps. With the return of this material to the mined area it means that it is now possible to rehabilitate the creek section to almost the same level as it was prior to mining.

A more complete description of the mining method is given in the proponent's CER.

## **3. Existing environment**

The mine is located on a pastoral lease on Lissadel Station in the East Kimberley region, about 20km upstream (south) from Lake Argyle along Smoke Creek.

The climate is tropical monsoon, with a distinct dry winter and wetter summers. Rainfall often occurs in short duration, high-intensity storms. Because of the pronounced topography of the minesite rainfall is generally channelled via well defined drainage systems and erosion is a problem on overgrazed or un-rehabilitated areas.



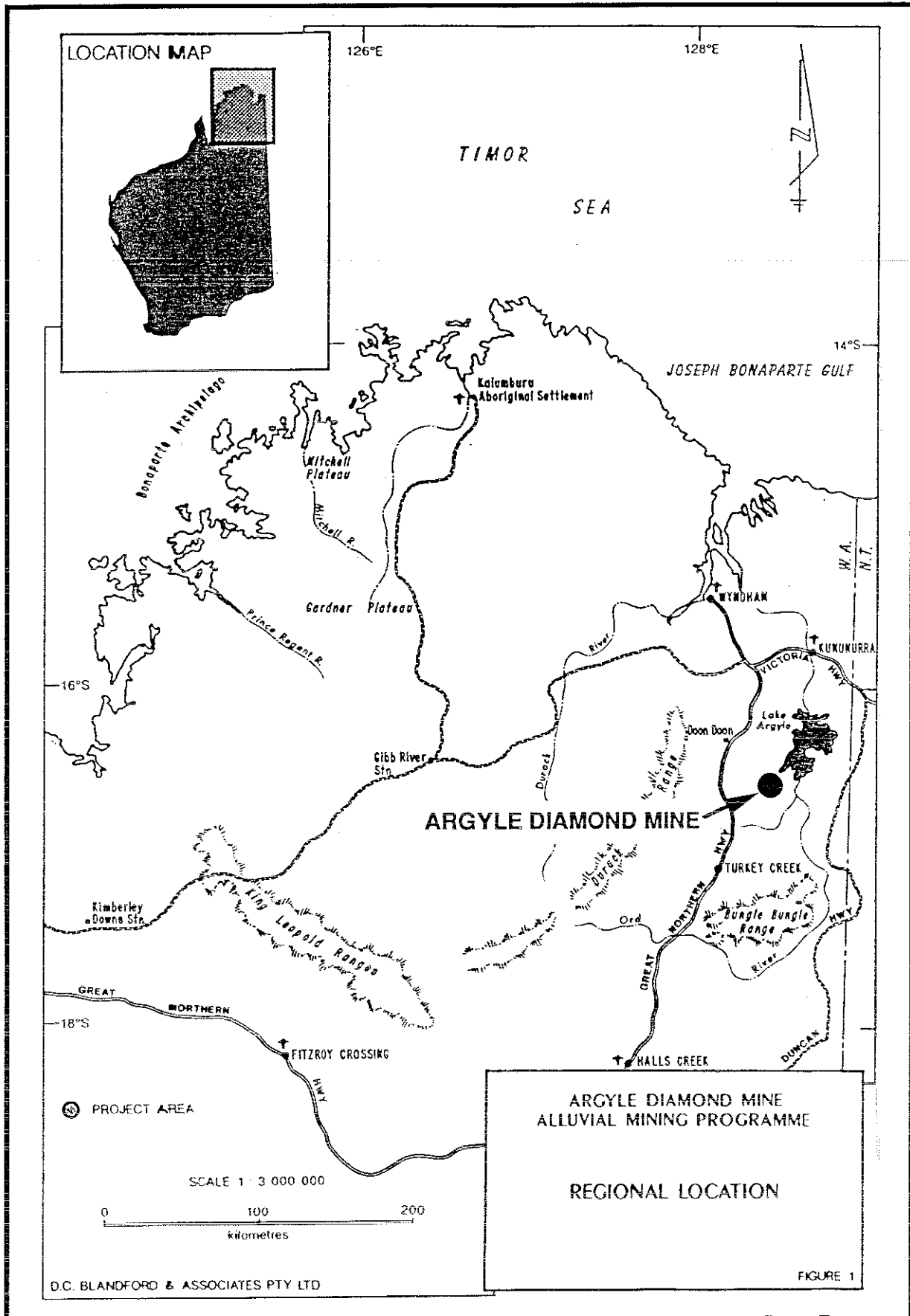


Figure 1. Location plan

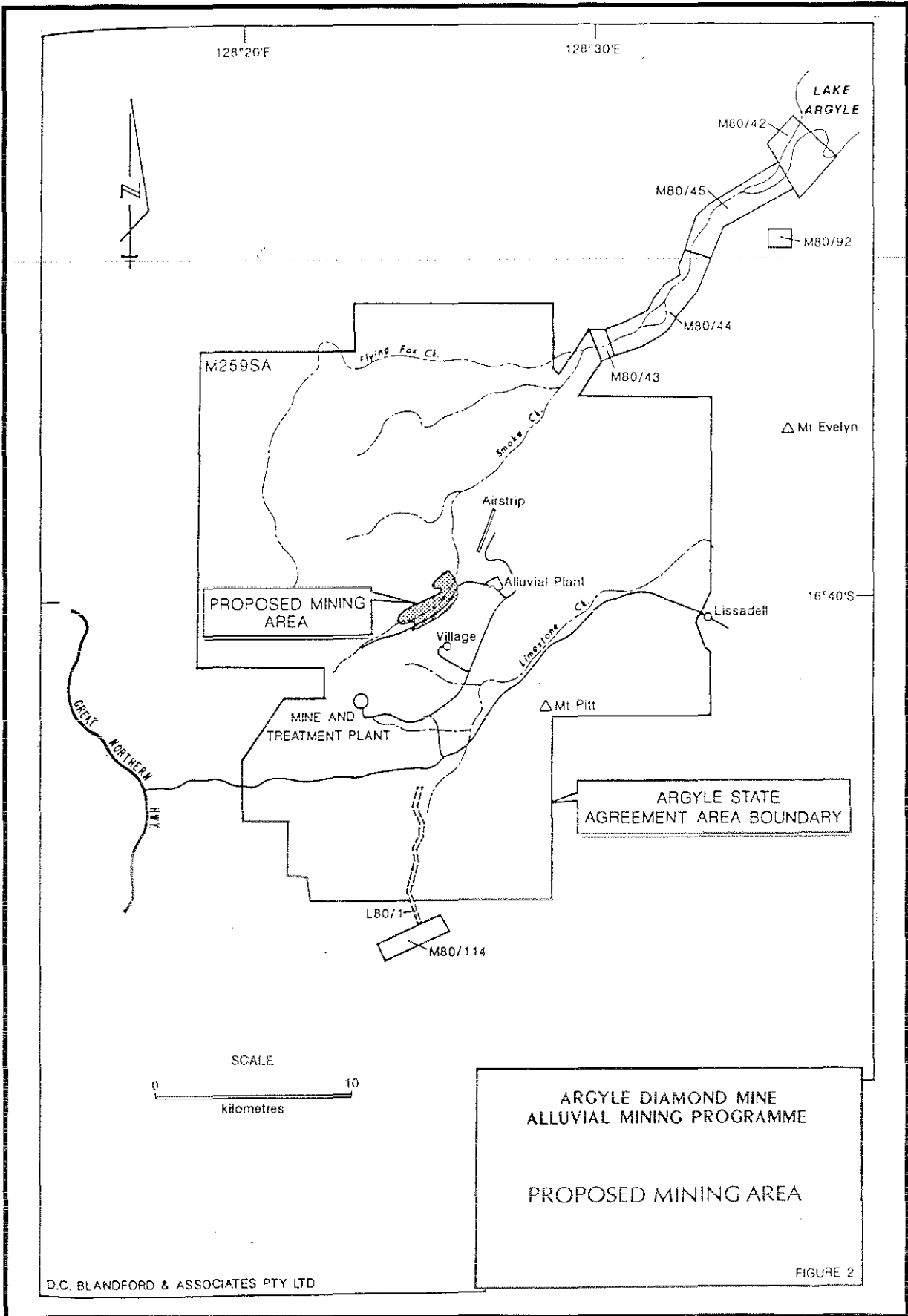


Figure 2. Proposed alluvial mine area

The creek in the area is not deeply incised and consists of a number of braided channels supporting riverine vegetation, fringed with a levee - terrace upper story tree complex. Several species of grasses are also common. A fuller description is given in the CER.

Data obtained from the original ERMP (Ashton Joint Venture, ERMP, Argyle Diamond Project, Dames & Moore 1982) and 1991 Smoke Creek project area flora and fauna surveys indicate there are no rare or endangered species known from the proposed mining area.

The company has stated that no known Aboriginal sites will be disturbed by operations associated with this proposal.

#### **4. Issues raised in submissions**

Three submissions were received. Two were from Government departments about water flows and sediment control.

A third submission and some correspondence were received from Aboriginal resource groups. The issues of social impact raised in these are of great importance to many Aboriginal people in the area. These concerns are not new and are well documented in other studies and reports.

The Environmental Protection Authority has been advised and acknowledges that there were significant social impacts resulting from the original Argyle Diamond Mine establishment and that many of these impacts are ongoing and have not been fully addressed.

However this particular proposal does not add significantly to the establishment impacts and the issues raised are therefore difficult to address in this assessment.

It is important though to acknowledge the concerns of Aboriginal people about this development. The Environmental Protection Authority has published the submission as part of Appendix 2 of this report.

#### **5. Management of impacts**

Areas of potential concern which the Authority targeted in its assessment centred around the size of the cleared area at any time, its environmental values, the length of time for which topsoil would be stockpiled, the potential for soil erosion and the method of rehabilitation of mined areas. Streamflow characteristics were included within these considerations.

The proponent has identified that there are no gazetted rare flora or fauna in the path of mining and also has a policy of leaving boab trees in place and mining around them. The Authority commends the company on this approach which assists vegetation to re-establish by providing shade and a stock of seedlings, as well as giving the area a more established appearance. Because the width of the mining slot is quite narrow (usually <10 metres) there is generally no need to clear large areas in advance of the active mining face. The narrow mining slot also makes possible the return of the stockpiled topsoil to mined areas in the minimum time, which helps to maximise the viability of the contained seed stock.

Rehabilitation of currently mined areas starts with the re-establishment of the creek bed, which is designed to meander. This is a sensitive approach to rehabilitation which improves the appearance of the final product. Creating pools of water by excavating to the water table at intervals is also part of the planned design of the creek bed. This is desirable because one of the effects of the rehabilitation (due to greater infiltration) is to reduce surface water flows. This also reduces the amount of soil which can be washed away, which is an important benefit in an area which is subject to heavy rainfall. Quantitative data on stream flow volumes and sediment loads would continue to be collected from the new monitoring station further downstream on Smoke Creek but there is not expected to be any significant reduction in the volume of water which flows down the creek.

The final profile is ripped, and vegetation stockpiled during the clearing phase is respread over the surface to speed recolonisation of the area by plants and animals. To help reduce exposure to the erosive effects of heavy rain the company uses a two stage approach, beginning with the planting of quick-growing species such as sorghum. This is progressively succeeded in the second stage by spontaneous re-establishment of native species from the seedstock in the respread topsoil. While the company considers that there is little to be gained from applying native seed to areas under rehabilitation the Authority wishes to ensure that this option would be used if spontaneous regeneration of native vegetation was inadequate.

#### **Recommendation 2**

**The Environmental Protection Authority recommends that where spontaneous regeneration of native seedlings in rehabilitated areas is inadequate, in the opinion of the Environmental Protection Authority, the proponent should supplement the vegetative cover in those areas with seed or seedlings, to a standard acceptable to the Environmental Protection Authority in consultation with the Department of Mines.**

## **6. Conclusion**

The Authority is satisfied that the proposed management of mining and rehabilitation is effective after having inspected areas previously mined and currently under rehabilitation in Smoke Creek. Accordingly the Authority concludes that the proposal is environmentally acceptable.

#### **Recommendation 1**

**The Environmental Protection Authority concludes that the proposal to extend alluvial mining down Smoke Creek as described in the Consultative Environmental Review is environmentally acceptable. In reaching this conclusion, the Authority identified the main factors requiring detailed consideration as: the environmental significance of the area to be mined, soil erosion control, the movement of surface and ground waters along the creek course and the effectiveness of proposed rehabilitation of the mined areas.**

**The Environmental Protection Authority considers that these and other issues have been addressed by studies and environmental management commitments given by the proponent or by the Authority's recommendations in this report. Accordingly the Environmental Protection Authority recommends that the proposal could proceed, subject to:**

- **the proponent's commitments; and**
- **the Authority's recommendations in this report.**



## **Appendix 1**

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**Proponent's list of environmental commitments**



## MANAGEMENT COMMITMENTS

Major commitments to environmental management by Argyle Diamond Mines Pty Limited are summarised as follows:

1. A continuous monitoring programme will be carried out to determine the effectiveness of measures taken for protection and rehabilitation of the environment. Reports will be submitted to the Minister for State Development when reasonably required by the Minister.

Argyle Diamond Mines currently submits environmental reports on an annual and triennial basis, and this procedure will be continued for this proposed programme.

2. Clearing of vegetation, stockpiling of topsoil, and stockpiling of barren overburden, will be carried out progressively and in accordance with the rate of mining.
3. The amount of land cleared in advance of the mining face will be restricted to that necessary for a practical but efficient operation.
4. Individual trees and clumps of trees, where appropriate, will be identified and retained as part of the rehabilitation programme.
5. As the mining face advances, reject material from the alluvial process plant will be returned to the mined area and re-spread to form an undulating surface.
6. The Smoke Creek drainage line will be reinstated by either re-shaping and construction, or by modifying the mining operation so that the mining face lies parallel to the direction of stream flow. In this latter situation, complete backfilling will not occur and a channel will be created by the void. Application of this technique will be subject to the need for practical and efficient movement of ore trucks in the mining operation.
7. On completion of backfilling, alluvial overburden will be re-spread if it has been stockpiled, and topsoil will then be re-spread across the surface.
8. Deep ripping will be carried out where practicable to break down areas compacted during the backfilling operation and to incorporate the surface material into the upper surface of the gravels.
9. Vegetation material cleared in the site preparation operation will be returned to the area and re-spread to provide the basis for habitat restoration.
10. If erosion control works or absorption banks are required as part of the rehabilitation process, these will be designed and installed prior to the onset of the wet season.
11. Monitoring of revegetation work carried out as part of the current mining programme suggests that seeding and fertiliser application may not be a worthwhile strategy within the overall rehabilitation programme. However, a seeding and fertilising trial will be carried out in areas suitable and this operation will be generally timed to coincide with the onset of the wet season.
12. During the wet season, specific monitoring programmes will be carried out to confirm hydrologic design parameters and to assess the overall performance of techniques being utilised.
13. The rehabilitation programme commences immediately after mining with re-shaping of backfilled gravels. Re-spreading of topsoil and vegetation material generally occurs within several weeks, and earthworks will be constructed before the onset of the wet season.
14. The environmental management programme and associated works will be carried out to the satisfaction of the EPA on advice from the Department of Mines, and in accordance with practices relevant at the time.



## **RESPONSIBILITY**

Argyle Diamond Mines Pty Limited will carry out the proposed alluvial mining operation using a reputable mining and earth-moving contractor. Conditions relating to environmental protection will be developed by ADM and will form part of all contracts for the programme.

Environmental staff at Argyle diamond mine will supervise all aspects of the operation that relate to environmental management including review of contractor performance.

Detail design work will be carried out by staff of the Environmental section who will also supervise construction and be accountable for the implementation and completion of rehabilitation programmes.

Consultation is carried out on a regular basis with officers of the Department of Agriculture in Kununurra, and these consultations and inspections will continue through the proposed programme. Similarly, appropriate officers within the EPA will be expected to visit the operation and contribute to environmental management strategies being implemented or proposed.

The proposed alluvial mining operation will be continually monitored and evaluated by site personnel. This action is necessary to ensure the adequacy of site-specific design and, in terms of overall environmental management, to ensure that strategy goals will be achieved.

## **Appendix 2**

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### **Submissions and responses**



# D. C. BLANDFORD & ASSOCIATES PTY LTD

Consultants in Environmental Earth Sciences and  
Terrestrial Resource Management

Box 467 P.O. Kalamunda W.A. 6076  
Telephone (09) 291 6593

ADM90/007  
DCB/eb

30th July, 1990

ENVIRONMENTAL PROTECTION AUTHORITY	
31 JUL 1991	
File No. 17/79/	Initials DCB

Mr Doug Betts,  
Environmental Protection Authority,  
1 Mount Street,  
PERTH, W.A. 6000

Dear Sir,

**re: CER - Alluvial Mining Programme - Water Authority Response**

We have reviewed the response submitted by the Water Authority of Western Australia and provide the following comments:

Question: Do groundwater/dewatering aspects need to be considered?

Answer: Experience indicates that year-round alluvial mining can be carried out in low-lying areas of Smoke Creek. There may be short periods of time during the wet season when discharge through the Smoke Creek system hampers the mining operation. Surface runoff and groundwater tend to accumulate in the trench formed by the mining operation, but as a general rule, this accumulation of water does not interfere with the mining operation.

Question: What does the proponent propose to do about sediment control and streamflow through the site during mining?

Answer: The potential for sediment discharge from the area of mining will be minimised by the following strategies:

- (a) Surface soil and alluvial overburden are removed as part of site preparation and so the source of sediment is virtually eliminated.
- (b) The coarse and highly permeable nature of the exposed cobble surface will reduce overland flow and surface runoff thereby minimising sediment movement in the area.
- (c) Absorption banks will be designed and constructed where appropriate to further contain potential sediment movement by minimising surface runoff.

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30th July, 1990

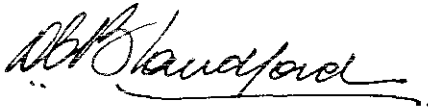
Environmental Protection Authority

A drainage line will be formalised through the area of mining so that discharge in Smoke Creek will not be restrained during the wet season. The intent is to apply mining, engineering, and environmental management strategies that will minimise sediment production and transport.

Question: What is the depth of excavation?

Answer: The depth of excavation is highly variable throughout the proposed mining area, but will generally range to three metres.

Yours faithfully,  
D. C. BLANDFORD & ASSOCIATES PTY LTD.

A handwritten signature in cursive script, appearing to read 'D. C. Blandford', with a horizontal line underneath.

D. C. Blandford,  
Principal.



DEPARTMENT OF MINES  
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Your Ref:  
Our Ref: CM:CPE: 1202/91  
Enquiries to: Mr C Mills  
Telephone: 222 3541

ENVIRONMENTAL PROTECTION AUTHORITY	
22 JUL 1991	
File No	17/79/1
Initials	DSE ✓ G

Chairman  
Environmental Protection Authority  
1 Mount Street  
PERTH WA 6000

Attention: Mr D Betts

ARGYLE DIAMOND ALLUVIAL MINING CER

Thank you for the opportunity to comment on the CER for the extended alluvial mining operations by Argyle Diamond Mines in Smoke Creek. The document has been reviewed by the Department and suitable management practices were identified to overcome any potential difficulties. Consequently this Department has no comment to make on the CER and considers the project could proceed with minimal environmental impact.

The EPA is welcome to use this submission in their assessment on the project and may publish the comments if desired.

  
H Jones  
ASSISTANT DIRECTOR  
RESEARCH & TECHNICAL SERVICES

9 July 1991

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Waringarri

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17 July, 1991

The Chairman  
Environmental Protection Authority  
1 Mount Street  
PERTH W.A. 6000

ENVIRONMENTAL PROTECTION AUTHORITY	
18 JUL 1991	
File No. 17/79/1	Initials DBE ✓

**ATTENTION: D.BETTS**

Dear Sir

**Re: Consultative Environmental Review / A.D.M. Pty Ltd.**

We have been invited to comment on the Consultative Environmental Review (C.E.R.) prepared for Argyle Diamond Mines Pty Ltd (A.D.M.). The C.E.R. demands a comprehensive response but it needs to be noted that at Waringarri our resources are stretched to the point of ensuring that we are unable to do so adequately.

However the membership of the Waringarri Aboriginal Corporation, which consists of Kununurra town communities and twenty three (23) outstations, includes many members who have strong connections to the country in which A.D.M. is working and proposes to work. It is therefore appropriate that we signify some areas of concern.

Section 4.8 suggests that all appropriate consultation and procedures were observed by C.R.A. Exploration before activity commenced in the "Argyle Diamond Area". To the contrary, many breaches of procedure are documented in relation to the Aboriginal Heritage Act (W.A.) between November, 1979 and September 25, 1980. They do not need to be listed again here but reference may be made to "Aborigines and Diamond Mining" edited by R.A. Dikon and M.C. Dillon published by U.W.A. Press in 1990.

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It is also implied in Section 4.8 that the Agreement of 26 July, 1980 was signed by all the appropriate traditional owners and custodians. There is a large body of evidence to suggest that this is not the case, but particular reference is drawn to the Australian Institute of Aboriginal Studies sponsored study by Palmer and Williams entitled "Aboriginal Relationships to Land in the Southern Blatchford Escarpment Area of the East Kimberley", released 6 June, 1980. (Seven weeks before the signing of the Agreement). Apart from the unrepresentative nature of the Agreement, it has consistently been argued that it was signed by the Aboriginal people concerned in an alien environment (Perth C.B.D.) and in an overall atmosphere of fear and duress.

The "Good Neighbour Policy" is referred to in Section 4.9. Questions may be posed in respect of the quantity of monies involved as a percentage of sales revenues, as well as it's use in current form as an instrument of social control over Aboriginal people. By denying any real Aboriginal control over the management of funds, the policy contributes to the "hand out

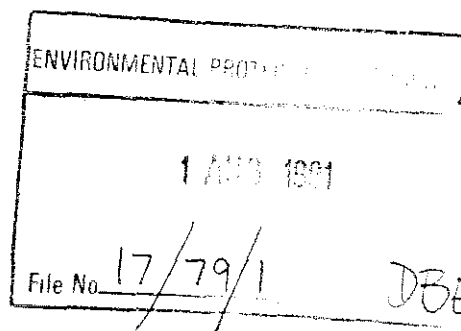


Ref: NB:MS/3157/AF300



26 July 1991

Mr Doug Betts  
Environmental Protection Authority  
1 Mount Street  
PERTH WA 6000



Dear Sir,

**RE: C.E.R. ALLUVIAL MINING PROGRAMME - ADM WARRINGARRI  
ABORIGINAL CORPORATION RESPONSE**

The issues raised by Warringarri in their response 17 July do not specifically relate to the C.E.R. in question. The points they raise are their opinions on an operating agreement that has been approved by the Western Australian Government and in operation for some 9 years. They do not address any issues in the current proposal.

Yours faithfully

A handwritten signature in cursive script, appearing to read "Butcher".

**NEIL BUTCHER**  
**ADMINISTRATION MANAGER**

48785 INFO