

**Sodium Cyanide Plant Debottlenecking  
Australian Gold Reagents Pty Ltd**

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

Environmental Protection Authority  
Perth, Western Australia  
Bulletin 427 February 1990

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## Contents

|  | Page |
|--|------|
| Summary and recommendation   | i    |
| 1 Introduction   | 1    |
| 2 Description of the proposal  | 1    |
| 2.1 The proposal   | 1    |
| 3 Potential environmental impact identified in the Consultative Environmental Review | 1    |
| 4 Review of submissions  | 1    |
| 5 Environmental assessment and conclusions   | 2    |
| 5.1 Introduction   | 2    |
| 5.2 Environmental Protection Authority's assessment and conclusions                  | 2    |

## Figure

|   |   |
|---|---|
| 1 Risk contours for individual risk for proposed 40,000 tonnes/annum sodium cyanide plant | 3 |
|---|---|

## Appendices

|  |   |
|--|---|
| 1 Submissions received by the Environmental Protection Authority   | 5 |
| 2 Ministerial Conditions placed on Australian Gold Reagents Pty Ltd's proposal to expand its sodium cyanide plant from 15,000 tonnes/annum to 30,000 tonnes/annum. | 7 |



## Summary and recommendation

In December 1988 Australian Gold Reagents Pty Ltd submitted to the Environmental Protection Authority a proposal to expand its existing sodium cyanide solution plant at Kwinana and increase its annual production from 15,000 tonnes per annum to 40,000 tonnes per annum. This would be achieved by doubling the number of reactors and by removing engineering obstacles to utilise the major items of plant at their optimum capacity, otherwise known as debottlenecking. This would permit an increase in the flow rates of the feed gases (natural gas and ammonia), product and waste gas streams through the plant. The storage capacity would also be increased to 8833 tonnes of sodium cyanide solution.

The Environmental Protection Authority has assessed the environmental issues associated with this proposal (Bulletin 387). The Environmental Protection Authority concluded that expansion to 30,000 tonnes per annum was environmentally acceptable as Australian Gold Reagents Pty Ltd had provided a (quantified) preliminary risk analysis to a level of 30,000 tonnes per annum. Before approval for expansion to 40,000 tonnes per annum could be given, a satisfactory preliminary risk assessment to 40,000 tonnes per annum production level was required. The Authority informed Australian Gold Reagents Pty Ltd that such a risk analysis would be assessed at Consultative Environmental Review level.

Accordingly, Australian Gold Reagents Pty Ltd submitted a Consultative Environmental Review which was released for a four week public review period. Three submissions were received from Government agencies and one from a member of the public.

During its assessment, the Environmental Protection Authority sought expert opinion on the issue of public risk resulting from the proposed debottlenecking. The Environmental Protection Authority examined the risks and hazards and concluded that the total risks and hazards for the approved plant and its debottlenecking fall well within the "individual risk level" as defined in the Authority's published guidelines and are therefore acceptable to the Authority. The Environmental Protection Authority also noted the extensive list of commitments given by the proponent covering these aspects of the the overall proposal (Bulletin 387) and also recognises the proponent's satisfactory operation of the existing plant to date.

The Authority has assessed the revised risk analysis and found an increase of production to 40,000 tonnes per annum to be environmentally acceptable, subject to the Authority's recommendations in Bulletin 387 and to the

commitments originally given by the proponent in the Public Environmental Review (Bulletin 387). These commitments cover issues such as: safety, risks and hazards, and modifications to existing plant; construction and commissioning procedures; gas emissions, wastewater management and environmental monitoring; storage and transport of increased volume of product; and fire protection and emergency planning. The Minister for Environment's Statement of 24 August 1989, which gave approval to proceed with expansion to 30,000 tonnes per annum, incorporates the requirements of the Environmental Protection Authority's recommendations in Bulletin 387 and the proponent's commitments.

## Recommendation

**The Environmental Protection Authority concludes that the proposal to debottleneck the existing sodium cyanide plant and the previously approved sodium cyanide plant expansion, from a total production capacity of 30,000 tonnes/annum of sodium cyanide to 40,000 tonnes/annum, as described in the Consultative Environmental Review, is environmentally acceptable, and recommends that the proposal could proceed subject to the same conditions contained in the Statement issued by the Minister for Environment on 24 August 1989 which approved expansion of plant production to 30,000 tonnes/annum.**

## 1. Introduction

In December 1988 Australian Gold Reagents Pty Ltd produced a Public Environmental Review describing its proposal to expand its existing sodium cyanide solution plant at Kwinana (Figure 1) and increase its annual production from 15,000 tonnes per annum to 40,000 tonnes per annum. In its assessment, the Environmental Protection Authority concluded that the only issue not fully addressed was that of risks and hazards. The proposal only quantitatively addressed risks and hazards for a 30,000 tonnes per annum plant. Consequently, the Environmental Protection Authority only approved a plant expansion to 30,000 tonnes per annum. The Environmental Protection Authority notified Australian Gold Reagents Pty Ltd that if it wished to expand the plant to its proposed 40,000 tonnes per annum production it would have to address the issue of quantified risk analysis covering the additional 10,000 tonnes per annum. The Environmental Protection Authority also informed Australian Gold Reagents Pty Ltd that such a proposal would be assessed at Consultative Environmental Review level.

Australian Gold Reagents Pty Ltd submitted a Consultative Environmental Review to the Environmental Protection Authority which outlined the preliminary risk assessment of the expansion of its approved plant from 30,000 tonnes per annum to 40,000 tonnes per annum in December 1989. The Consultative Environmental Review was released for a four week public review period, commencing 27 December 1989 and finishing 24 January 1990. The Environmental Protection Authority received four submissions on this project, three from Government agencies, and one from a member of the public. The Environmental Protection Authority has assessed only the additional risks and hazards associated with the increase in production from 30,000 tonnes per annum to 40,000 tonnes per annum in this report as all other issues had been previously assessed (Bulletin 387).

## 2. Description of the proposal

### 2.1 The proposal

The proposal in the Consultative Environmental Review is to increase production from the approved 30,000 tonnes per annum sodium cyanide plant to a capacity of 40,000 tonnes per annum by "debottlenecking" the plant. This process involves expanding the capacity of minor items of plant and interconnections so that the spare capacity of the major items of plant can be more fully utilised. This would incorporate increasing the flow rates of both feed gases (ammonia and natural gas) into the reactor chamber and the condensing and cooling systems, and increasing waste gas incineration

capacity. In addition, the total storage capacity would be increased to 8,833 tonnes of 30% sodium cyanide solution using an additional storage tank. The additional storage tank would be sited on concrete supports surrounded by impermeable bunds as are the existing tanks. This storage does not significantly affect the risks and hazards associated with the plant, because the solution is alkaline and stable and would not give off any gaseous emissions.

## 3. Potential environmental impact identified in the Consultative Environmental Review

The potential environmental impact associated with the total extension (including this proposal) have already been assessed and recommended upon in the previous assessment of the Public Environmental Review (Bulletin 387). In that assessment the Authority noted that the only outstanding issue was "submitting to the Environmental Protection Authority a quantitative risk and hazard analysis which covered the proposed 40,000 tonnes per annum sodium cyanide plant". The Consultative Environmental Review covers that issue in full. It shows no significant increase in risk resulting from this proposal, and that risk falls well within the Environmental Protection Authority's guideline for acceptable risk. The guideline states that an additional increase in risk of less than one fatality per million per year in residential zones is acceptable.

## 4. Review of submissions

The Consultative Environmental Review was released to the public and Government departments in December 1989 for a four week review period. A total of four submissions were received: three from Government agencies and one from a member of the public (Appendix 1). All submissions have been analysed and the only issues raised were:

- an objection to sodium cyanide plants in the Kwinana area;
- incremental approvals for such plants; and
- the issue of storage of sodium cyanide solution.

All these issues had been previously addressed in the Environmental Protection Authority's earlier assessment (Bulletin 387).

## **5. Environmental assessment and conclusions**

### **5.1 Introduction**

The Authority has previously assessed all of the potential environmental issues associated with the suitability of the plant in the Kwinana area and potential impact on the receiving environment. These assessments also included the potential impact on local residents (Bulletins 274, 284 and 387). In those assessment reports the Environmental Protection Authority approved the establishment of the plant and its extension subject to several recommendations which have since been embodied in conditions set by the Minister for Environment.

### **5.2 Environmental Protection Authority's assessment and conclusions**

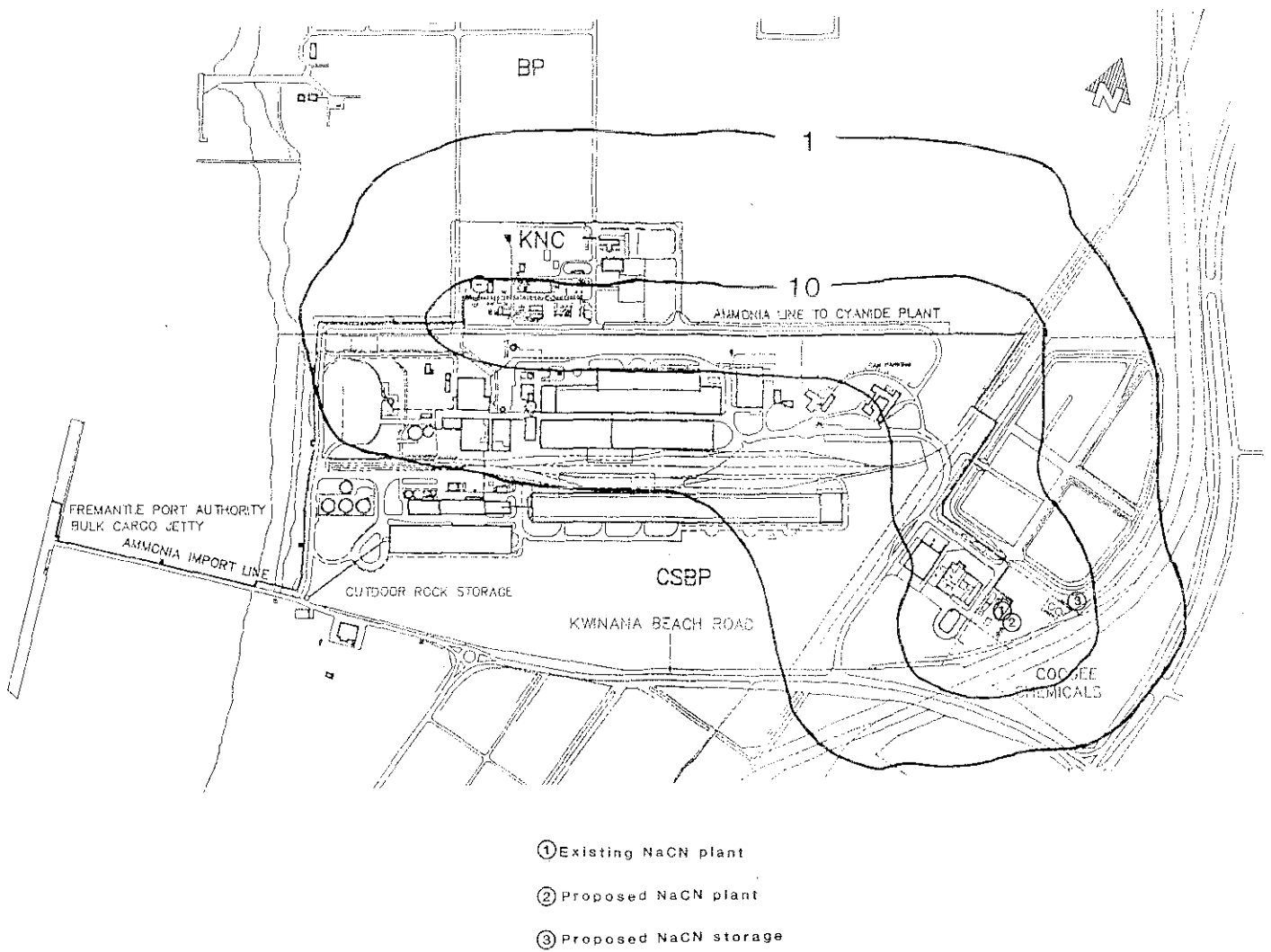
In its present assessment of the Consultative Environmental Review, the Environmental Protection Authority considered the proposal in the context of additional risk only as all other issues had been previously assessed in Bulletin 387. The Authority found that there would be no significant public risk associated with the debottlenecking of the plant allowing production to increase from 30,000 tonnes per annum to 40,000 tonnes per annum. In reaching its conclusion the Authority sought expert opinion from the Explosives and Dangerous Goods Division of the Western Australian Department of Mines. The Authority considers the project to be environmentally acceptable and that it could proceed subject to the management commitments given by the proponent in the original Public Environmental Review for the expansion (Bulletin 387, Appendix 1) and to the Authority's recommendations in Environmental Protection Authority Bulletin 387 and subsequent Ministerial Conditions (Appendix 2). The management commitments cover a number of issues including:

- safety, risks and hazards, and modifications to existing plant;
- construction and commissioning procedures;
- gas emissions, wastewater management and environmental monitoring;
- storage and transport of increased volume of product; and
- fire protection and emergency plans.

### **Recommendation**

The Environmental Protection Authority concludes that the proposal to debottleneck the existing sodium cyanide plant and the previously approved sodium cyanide plant expansion, from a total production capacity of 30,000 tonnes/annum of sodium cyanide to 40,000 tonnes/annum, as described in the Consultative Environmental Review, is environmentally acceptable, and recommends that the proposal could proceed subject to the Statement issued by the Minister for Environment on 24 August 1989 which approved expansion of plant production to 30,000 tonnes/annum.





**Figure 1:** Risk contours for individual risk for proposed 40,000 tonnes/annum sodium cyanide plant

**Source :** Cremer and Warner, 1989



## **Appendix 1**

**Submissions received by the Environmental Protection Authority**

Submissions were received from the following government agencies and a member of the public:

Water Authority of Western Australia

Mines Department of Western Australia

Department of Resources Development

Mrs E.Quinn, Rockingham WA 6168

## **Appendix 2**

**Ministerial conditions placed on Australian Gold Reagents Pty Ltd's  
proposal to expand its sodium cyanide plant  
from 15,000 tonnes/annum to 30,000 tonnes/annum**



WESTERN AUSTRALIA  
MINISTER FOR ENVIRONMENT

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

SODIUM CYANIDE PLANT EXTENSION - KWINANA

AUSTRALIAN GOLD REAGENTS PTY LTD

This proposal may be implemented subject to the following conditions:

1. The proponent shall adhere to the proposal as assessed by the Environmental Protection Authority and shall fulfil the commitments made in the Public Environmental Report and in responses to questions raised during assessment (copy of commitments attached) and subject to the assumptions made in the risk assessment.
2. The proponent shall prepare, prior to commencement of each stage, a comprehensive hazard identification and risk management programme, to the satisfaction of the Minister for Environment and on advice from the Department of Mines.

The programme should include the following:

- . hazard and operability studies (HAZOP) of the process units, to be completed and submitted before mechanical construction commences;
- . safety engineering design;
- . quantified risk assessment;
- . implementation systems; and
- . safety reviews during the life of the plant at intervals to be determined by the Authority.

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3. The proponent shall;
  - . maintain the process equipment, instrumentation and alarm systems consistent with the safety and reliability assessment of the plant; and
  - . install very high integrity instrumentation for the control of the plant and for the detection of and response to any unplanned releases;

to the satisfaction of the Minister for Environment, following advice from the Department of Mines.
4. Prior to the construction of the extension, the proponent shall revise the present site emergency plan to the satisfaction of the Environmental Protection Authority to cover the proposed extension. The plan shall also meet the requirements of the Kwinana Integrated Emergency Management System.
5. The proponent shall revise the previous construction and operational stage management plans to cover the proposed extension. Each revised plan should be submitted to, and be to the satisfaction of the Environmental Protection Authority following advice of the Department of Mines before that stage of the development commences. The plans shall include the following:
  - . management of stormwater runoff from the site;
  - . emergency response for site workers in the case of present plant failure;
  - . storage and bunding requirements of additional sodium cyanide storage; and
  - . storage requirements for additional ammonia.
6. Prior to commissioning the extended plant, the proponent shall revise, to the satisfaction of the Environmental Protection Authority, the present wastewater and solid waste management plan to take into account the additional effluent resulting from expansion of the plant.
7. The proponent shall install in the ammonia pipeline, remotely operated, fast action, safety valves which can isolate each plant from the pipeline and the other plant.
8. The proponent shall be responsible for decommissioning the plant and rehabilitating the site and its environs to the satisfaction of the Environmental Protection Authority. The proponent shall, at least six months prior to decommissioning, prepare a decommissioning and rehabilitation plan to the satisfaction of the Environmental Protection Authority.

9. 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 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.



Bob Pearce, MLA  
MINISTER FOR ENVIRONMENT



## SUMMARY OF MANAGEMENT COMMITMENTS

The commitments that the proponent has made to environmental management during the design, construction and operation of the expanded facilities are as follows:

Prior to implementing any modifications to the design of the existing plant, the following safety checks will be undertaken:

- referral of the proposed modification to the process licensor, Roehm GmbH;
- liaison with the risk consultant on the proposed changes if they are likely to affect the risk analysis.
- HAZOP analysis of the proposed modifications to the plant design.
- . Construction of the proposed expansion will be undertaken in accordance with a Construction Stage Management Report similar to that prepared for the existing plant but recognising the potential hazards of the existing plant, together with relevant conditions imposed by the EPA.
- . All construction materials and practices will be in accordance with the relevant Australian codes and international standards where appropriate.
- . The plant design will ensure that emissions of nitrogen oxides during normal operating conditions will be within the NH&MRC recommended guidelines and will also comply with guidelines adopted by the Victorian EPA.
- . Safety features incorporated into the existing plant will be incorporated into the expanded facilities.
- . Wastewater from the plant will be managed according to the wastewater management strategy approved by the EPA for the existing plant.
- . The process and storage areas will be sealed and banded so that any washings, contaminated stormwater runoff or spills will be collected and directed to the wastewater treatment plant sump, and analysed and treated prior to disposal. Any discharge of treated wastewater into Cockburn Sound will comply with the criteria specified in Bulletin No. 103 or the terms of the EPA licence for the existing plant.
- . Any additional storage of sodium cyanide will be approved by the Chief Inspector of Explosives and Dangerous Goods.
- . A fire protection system will be incorporated into the expanded facilities in accordance with the requirements of the plant design and the Western Australian Fire Brigade Board. CSBP works' personnel will be trained in the appropriate fire-fighting techniques. In addition to the fire-fighting capability of CSBP's Kwinana works, the fire-fighting co-operative established by the industrial operators in the Kwinana district will be available for emergency assistance. CSBP has been participating in the development of the Western Australian Hazardous Materials Emergency Management Scheme.

APPENDIX 1 (Cont'd)

- . All employees will be trained in the safe work practices and emergency procedures appropriate to the operation of the plant and handling of all associated materials. The management structure for the expanded facilities will incorporate at least two tiers of personnel technically qualified to manage hazardous chemical operations.
- . On-site emergency facilities at CSBP's Kwinana works will continue to include a dedicated emergency response vehicle, fire tender and an ambulance at all times, and an occupational health sister during normal working hours.
- . A detailed operating manual has been prepared for the existing plant from information supplied by the licensor, covering all process work, including start-up, and shut-down, plant testing, inspection and emergency action. The procedures manual will be amended as necessary to include the expanded facilities.
- . The proponent will arrange for observers from the licensor to be at the plant during commissioning of the duplicate plant if it is deemed necessary by the licensor and the proponent.
- . The duplicate plant and any interconnections to the existing plant will be subject to a full HAZOP study and follow-up prior to commissioning.
- . Stocks of neutralizing agent (ferrous sulphate) are located along the transport routes at agreed locations. They will be inspected regularly to ensure that they are in good order.
- . Emergency response practice sessions will take place on a basis agreed with the relevant authorities.
- . CSBP as the plant operator will maintain a dedicated emergency response vehicle at the Kwinana works and this will be available to service any off-site incident involving the transport of sodium cyanide.
- . Upon commissioning, monitoring of the existing plant will be undertaken in accordance with a comprehensive EMMP, and the proposed expansion will be incorporated into this EMMP to the satisfaction of the EPA.
- . Liaison with local Shires, the EPA, the Department of Mines, Westrail and counter-disaster groups will occur as appropriate in regards to proposed changes to the agreed transport routes or the addition of new market areas.
- . Subject to final regulations becoming law, AGR will prepare a Total Hazard Control Plan to the satisfaction of the Safety Coordinator, Explosives and Dangerous Goods Division of the Department of Mines, for the existing sodium cyanide plant at Kwinana. The plan will be extended to cover the operation of the duplicate solution plant.