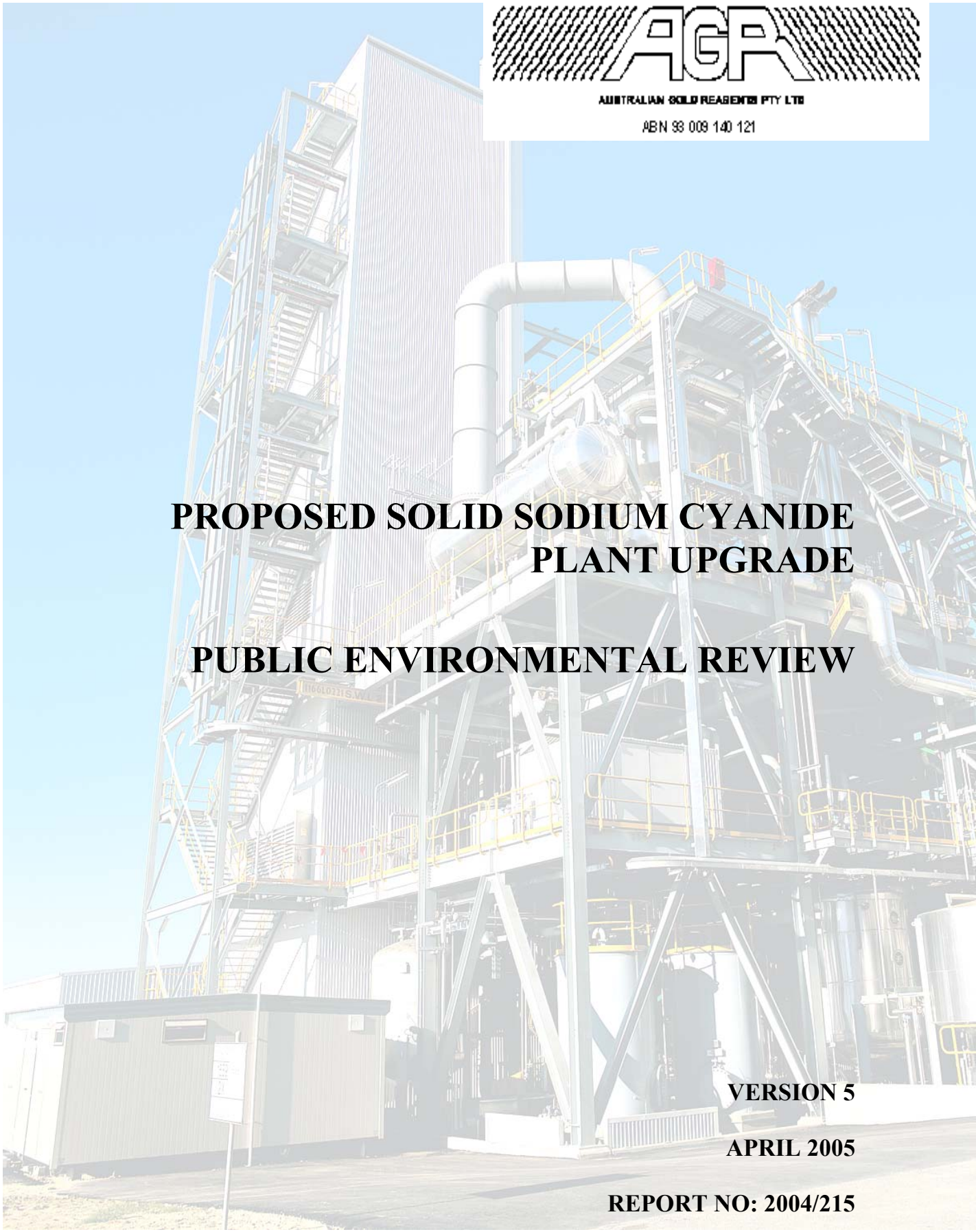

AUSTRALIAN SODIUM REAGENTS PTY LTD

ABN 93 009 140 121

PROPOSED SOLID SODIUM CYANIDE PLANT UPGRADE

PUBLIC ENVIRONMENTAL REVIEW

VERSION 5

APRIL 2005

REPORT NO: 2004/215

AN INVITATION TO COMMENT ON THIS PUBLIC ENVIRONMENTAL REVIEW

The Environmental Protection Authority (EPA) invites people to make a submission on this proposal. If you are able to, electronic submissions emailed to the EPA Service Unit project officer would be most welcome.

Australian Gold Reagents Pty Ltd proposes to increase the production rate of solid sodium cyanide at its Sodium Cyanide Manufacturing Facility, located within the CSBP Kwinana Industrial Complex, through debottlenecking and installation of new equipment. In accordance with the Environmental Protection Act, a Public Environmental Review (PER) has been prepared which describes this proposal and its likely effects on the environment. The PER is available for a public review period of 4 weeks from 11 April 2005 closing on 9 May 2005.

Comments from government agencies and from the public will help the EPA to prepare an assessment report in which it will make recommendations to government.

Why write a submission?

A submission is a way to provide information, express your opinion and put forward your suggested course of action - including any alternative approach. It is useful if you indicate any suggestions you have to improve the proposal.

All submissions received by the EPA will be acknowledged. Submissions will be treated as public documents unless provided and received in confidence subject to the requirements of the Freedom of Information Act, and may be quoted in full or in part in the EPA's report.

Why not join a group?

If you prefer not to write your own comments, it may be worthwhile joining with a group interested in making a submission on similar issues. Joint submissions may help to reduce the workload for an individual or group, as well as increase the pool of ideas and information. If you form a small group (up to 10 people) please indicate all the names of the participants. If your group is larger, please indicate how many people your submission represents.

Developing a submission

You may agree or disagree with, or comment on, the general issues discussed in the PER or the specific proposals. It helps if you give reasons for your conclusions, supported by relevant data. You may make an important contribution by suggesting ways to make the proposal more environmentally acceptable.

When making comments on specific elements of the PER:

- clearly state your point of view;
- indicate the source of your information or argument if this is applicable; and
- suggest recommendations, safeguards or alternatives.

Points to keep in mind

By keeping the following points in mind, you will make it easier for your submission to be analysed:

- attempt to list points so that issues raised are clear. A summary of your submission is helpful;
- refer each point to the appropriate section, chapter or recommendation in the PER;
- if you discuss different sections of the PER, keep them distinct and separate, so there is no confusion as to which section you are considering; and
- attach any factual information you may wish to provide and give details of the source. Make sure your information is accurate.

Remember to include:

- your name;
- address;
- date; and
- whether and the reason why you want your submission to be confidential.

Information in submissions will be deemed public information unless a request for confidentiality of the submission is made in writing and accepted by the EPA. As a result, a copy of each submission will be provided to the proponent but the identity of private individuals will remain confidential to the EPA.

The closing date for submissions is: 9 May 2005

Submissions should ideally be emailed to graham.storey@environment.wa.gov.au

OR

addressed to:
Environmental Protection Authority
PO Box K822

OR

Westralia Square
PERTH 141 St George's Terrace
WA 6842 PERTH WA 6000
Attention: Graham Storey.

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1.1 The Proposal

1.1.1 Proposal Overview

Australian Gold Reagents Pty Ltd (AGR) owned by CSBP Limited (75%) and Coogee Chemicals Limited (25%) is the manager of the joint venture between these companies and was formed to manufacture and distribute sodium cyanide. The Sodium Cyanide Manufacturing Facility is located within the CSBP Kwinana Industrial Complex in the Kwinana Industrial Area (Figures 1, 2, 3).

Since AGR presented the initial proposal in 1987 to build a liquid sodium cyanide plant there have been a number of changes and expansions to the initial proposal. AGR currently operates two liquid sodium cyanide plants and a downstream solid sodium cyanide processing plant (Figure 2), which are collectively referred to as the Sodium Cyanide Manufacturing Facility.

The AGR facility is a prescribed premise within Schedule 1 of the *Environmental Protection Regulations.* The facility is therefore licensed under Part V of the *Environmental Protection Act 1986* and subject to the conditions contained within that licence. A copy of the current facility licence is provided in Appendix 1.

AGR is now proposing to increase its existing solid sodium cyanide production through debottlenecking and installation of new equipment. The proposed increase in the production capacity of solid sodium cyanide is driven by opportunities for increased sales in overseas markets.

1.1.2 Proposal Location

The Sodium Cyanide Manufacturing Facility is located within the CSBP Kwinana Industrial Complex in the Kwinana Industrial Area (KIA), approximately 40km south of Perth, Western Australia (Figures 1, 2, 3). The entire CSBP Kwinana Industrial Complex encompasses an area of 138ha, with BP Kwinana to the north and a railway corridor to the east.

1.1.3 Project Schedule

Progressive commissioning of the upgraded plant is proposed to commence in July 2005. Recommendations arising from the Environmental Protection Authority's assessment of this proposal and Ministerial Conditions of approval will be accommodated throughout the project implementation.

1.2 The Proponent

1.2.1 Proponent Contact Details

The proponent for the proposed solid sodium cyanide plant upgrade is:

Australian Gold Reagents Pty Ltd
Kwinana Beach Road
Kwinana WA 6167

The key contact for the proposed solid sodium cyanide plant upgrade is:

Laurinda Shaw
Environmental Adviser
CSBP Ltd
Kwinana Beach Road
KWINANA WA 6966

Tel: 9411 8821
Fax: 9411 8233
E-mail: Laurinda.Shaw@csbp.com.au

1.2.2 Proponent Background

The Kwinana Sodium Cyanide Joint Venture is an unincorporated joint venture between Chemical Holdings Kwinana, a wholly owned subsidiary of CSBP Limited (CSBP) (75%) (itself a wholly owned subsidiary of Wesfarmers Limited) and Coogee Chemicals Limited (25%). The joint venturers have appointed AGR as manager of the joint venture. AGR has appointed Chemical Holdings Kwinana Pty Ltd, a wholly owned subsidiary of CSBP (previously Wesfarmers CSBP Limited) as Operator and Sales Agent under the Operations and Sales Agent Agreements dated 31 July 1987.

AGR leases 4.3ha of land in the south east corner of the CSBP Kwinana Industrial Complex (Figure 2) for the purposes of conducting the sodium cyanide operations. CSBP as operator and sales agent is responsible for the day to day activities of the Kwinana Sodium Cyanide Joint Venture.

1.3 This Public Environmental Review Document

1.3.1 Purpose of this Document

This proposal to upgrade the existing AGR solid sodium cyanide production through debottlenecking and installation of new plant was initially referred to the Environmental Protection Authority (EPA) in November 2004. The EPA determined that the proposal raised a number of significant environmental factors sufficient to warrant formal assessment under the provisions of the *Environmental Protection Act 1986* and subsequently set the level of assessment for the project as a Public Environmental Review (PER), as requested by AGR. This level of assessment is typically applied to proposals of local or regional significance that raise a number of significant environmental factors, some of which are considered complex and require detailed assessment to determine whether approval should be granted, and if so how potential environmental impacts will be managed.

For proposals where the level of assessment has been set as a PER, the proponent is required to prepare an Environmental Scoping document. This document is required to include a summary description of the proposal, a preliminary impact assessment and a scope of works setting out the proposed environmental and other surveys/investigations to be carried out as part of the environmental impact assessment for the preparation of the PER.

AGR submitted the scoping document to the EPA in mid November 2004 and the EPA accepted the document and specifically, the proposed scope of works, in mid December 2004.

A PER is a public document, and for this proposal, is subject to a four week public review period, during which time the public, stakeholders and other interested groups are invited to make submissions to the EPA, which in turn have to be responded to by the proponent. The EPA will then submit its report and recommendations to the Minister for the Environment on the environmental acceptability of the proposal along with any environmental conditions, which should apply if the proposal is to proceed.

The EPA's report will be published in the form of a Bulletin and the public may appeal to the Minister against the recommendations or content of the report. The Minister for the Environment will assess any appeals received and ultimately determine whether or not the project can proceed. If the Minister determines that the project can proceed, legally binding conditions, dictating the environmental requirements with which the proponent will have to comply, will be set pursuant to Section 45 of the *Environmental Protection Act 1986.*

1.3.2 Structure of Document

This document aims to identify and assess the environmental effects of the proposal and to describe the management strategies the proponent will adopt to manage and minimise any adverse environmental impacts. The document provides the following information:

Section 1: Introduction to the proposal, proponent details, purpose of this document.

Section 2: Project justification and evaluation of alternatives.

Section 3: Legislative framework.

Section 4: Proposal description.

Section 5: Environmental setting.

Section 6: Assessment and management of environmental factors.

Section 7: Stakeholder consultation.

Section 8: Environmental commitments.

Section 9: References.

1.4 Management Commitments

AGR is committed to ensuring that the expansion will be undertaken in a manner to minimise impacts on the surrounding biophysical and social environments.

Accordingly, AGR has proposed numerous management commitments. These management commitments are intended to meet EPA objectives for the identified environmental factors, which were initially outlined in the environmental scoping document and summarised in Table 20 in Section 8.

1.5 Sustainability

The United Nations Industrial Development Organisation (UNIDO) defines sustainable industrial development as:

"*…a pattern of development that balances a country's concerns for competitiveness, social development and environmental soundness either absolutely or comparatively.*"

According to the UNIDO, such development accomplishes three things:

- Encourages a competitive economy, with industry producing for the domestic as well as the export market.
- Increases productive employment, with industry bringing long-term employment and increased prosperity.
- Protects the environment, with industry efficiently utilising non-renewable resources, conserving renewable resources and remaining within the functional limits of the ecosystem (UNIDO, 1998).

The first comprehensive policy relating to ecologically sustainable development (ESD) in Australia was the *National Strategy for Ecologically Sustainable Development* (NSESD) (Environment Australia, 1992). All States and Territories in Australia adopted the NSESD in 1992.

Subsequent to the release of the *State Sustainability Strategy*, the Environmental Protection Authority published a Preliminary Position Statement entitled *Towards Sustainability* to add to the community discussion and understanding of this issue. This Statement has subsequently been revised and was republished in August 2004. It contains a useful provisional check list of questions to be asked when proposals are being considered, as presented in Table 1.

TABLE 1
SUSTAINABILITY CHECKLIST FOR THE PROPOSED SOLID SODIUM CYANIDE PLANT UPGRADE

Question	Proposal
Does the proposal deplete non-renewable resources significantly?	No
Does the proposal deplete assimilative capacity significantly?	No
Does the proposal use natural resources responsibly?	Yes
Does the proposal satisfactorily restore any disturbed land?	No
Does the proposal follow the waste hierarchy and manage satisfactorily any waste produced?	Yes
Does the proposal incorporate best practice in water and energy efficiency?	Yes
Does the proposal make good use of best practice to prevent pollution?	Yes
Does the proposal increase use of non-renewable transport fuels?	Yes
Does the proposal use energy efficient technologies?	Yes
Does the proposal result in net improvements in biodiversity?	No
Does the proposal increase greenhouse gas emissions?	Yes
Does the proposal involve acceptable levels of risk?	Yes
Does the proposal have a secure foundation of scientific understanding of its impacts?	Yes
Does the proposal minimise the ecological footprint?	Yes
Does the proposal avoid or minimise adverse impacts and promote beneficial impacts on the surrounding community?	Yes
Does the proposal produce sustainable net economic benefits?	Yes
Does the proposal produce sustainable net social benefits?	Yes
Does the proposal add to heritage protection and provide a sense of place?	No
Does the proposal produce net environmental benefits?	No
Does the proposal contribute to a more equitable and just society?	Yes
Does the proposal interact positively with other likely developments?	Yes
Does the proposal provide new opportunities (social, economic or environmental)?	Yes

Checklist sourced from EPA (2004a).

Table 1 is provided to show that the issue of sustainability has been considered, and attempts have been made to address key issues. It is noted that justification is not provided for the above responses.

In summary, the main sustainability benefits arising from this proposal are:

- The proposed upgrade will see greater use made of the project area and more efficient use of the existing infrastructure, and will avoid the need to establish additional facilities elsewhere with the resultant environmental benefits.

- The proposal will produce sustainable net economic benefits, for the State in both the short and long term.

- AGR and CSBP have existing environmental management procedures in place, which will ensure the proposed upgrade will be managed in accordance with community and regulatory expectations.

1.6 AGR & CSBP Environmental Management System and Environmental Management Programs

CSBP and AGR have in place an Environmental Monitoring and Management Program which details procedures for the management and monitoring of the Solid Sodium Cyanide Facility, to protect the environment in the event of an incident. The Environmental Monitoring and Management Program will include but not be restricted to:

- Water (Surface and Waste) Management Plan;
- Solid Waste Management Plan;
- Noise Management Plan (when required);
- Preliminary Decommissioning Plan;
- Transport Management Plan; and
- All monitoring and management procedures for the cyanide business.

The Environmental Monitoring and Management Program is reviewed, every three years or as required by the Document Management System.

Further information on each of the above Plans is provided below.

The *Water (Surface and Waste) Management Plan* details procedures for the management of water discharge from the site, to protect marine flora and fauna and groundwater. This plan includes but is not limited to:

- management of contaminated stormwater;
- management of liquid spills and washdown water;
- liquid waste storage requirements;
- process and storage area sealing and bunding requirements;
- requirements for monitoring/testing prior to disposal;
- discharge requirements including:
  - concentration of cyanide and copper each to be less than 1 part per million (ppm); and
  - emission of nitrogen to be no greater than 14kg/day on monthly average.
- contingency/emergency procedures; and
- reporting requirements.

The *Solid Waste Management Plan* details procedures for the management of solid waste disposal from the site, to minimise potential contamination to the receiving environment. This plan includes but is not limited to:

- recyclable wastes will be removed by an approved contractor;
- general refuse (domestic and industrial solid waste) will be disposed of at an appropriate landfill;
- solid waste storage requirements; and
- reporting requirements.

AGR will, within 6 months after the review of the *Environmental Protection (Noise) Regulations 1997* has been completed prepare a *Noise Management Plan* to ensure compliance with prescribed standards and to minimise where practicable noise impacts. The Noise Management Plan will include a detailed description of:

- the acoustical model of the plant;
- best practicable measures to minimise noise emissions;
- operating procedures to be adopted for particular activities to minimise noise impacts;
- the noise monitoring program; and
- the complaint management procedure.

AGR will also prepare a *Preliminary Decommissioning Plan* within six months of the date of the publication of Ministerial Statement 668 (11 November 2004), to provide a framework to ensure that the plant site is left in an environmentally acceptable condition. The *Preliminary Decommissioning Plan* will address:

- conceptual plans for the removal or, if appropriate retention, of the plant and infrastructure;
- a conceptual rehabilitation plan for all undisturbed areas and a description of a process to agree on the end land use(s) with all stakeholders;
- a conceptual plan for the care and maintenance phase; and
- management of noxious materials to avoid the creation of contaminated areas.

At least twelve months prior to the anticipated date of decommissioning, or at a time agreed with the Environmental Protection Authority, the proponent shall prepare a *Final Decommissioning Plan* designed to ensure that the site is left in an environmentally acceptable condition. The *Decommissioning Plan* will address:

- removal or, if appropriate retention of the plant and infrastructure in consultation with relevant stakeholders;
- rehabilitation of all disturbed areas to a standard suitable for the agreed new land use(s); and
- identification of contaminated areas, including provision of evidence of notification and proposed management measures to relevant statutory authorities.

The *Transport Management Plan* (TMP) details procedures for the management of the transport of sodium cyanide briquettes and solution, to protect the environment in the event of an incident with advice from the Department of Industry and Resources (DoIR). This plan includes but is not limited to:

- Procedure for Transport Emergency Response for both sodium cyanide briquettes and solution.
- Procedure for obtaining the DoIR authorisation for changes to the approved (as outlined in submission) sodium cyanide transport routes.
- Process for liaison with Local Government Authorities, relevant government departments, State emergency authorities and the local emergency management advisory committees before transport commences along approved transport routes, to address local and specific issues, including setting up emergency plans and training programs.
- Procedure for reviewing the approved transport routes and updating the transport risk assessment based on updates to Dangerous Goods Transport Routes, changes to facilities adjoining the route and a review of traffic data as required or otherwise three yearly.
- Specifications for the use of Intermediate Bulk Containers that meet the International Marine and Dangerous Goods (IMDG) Code for the transport of solid sodium cyanide.
- Procedures for sea container inspections.
- Procedure in the event of a Port disruption.
- Procedure for communications with the transport operations base as each vehicle carrying sodium cyanide solution travels along a transport route to a mine and until that vehicle logs off.
- Procedure for maintenance of a log for vehicles carrying sodium cyanide solution, which includes time of departure from the Kwinana area. The general goal is to clear the metropolitan area before significant traffic build-up occurs.
- Location and description of the most effective and suitable neutralising agents used to treat any spilled sodium cyanide.
- Procedure for internal and external audits of all aspects of the TMP.
- Procedure for annual emergency exercises in association with Fire and Emergency Services Authority (FESA).
- Procedure for incident follow-up.
- Procedure for review and update of TMP every two years.

AGR will also, with the advice of the DoIR, continue to maintain a Safety Report as described under the *National Standard for the Control of Major Hazard Facilities* [NOHSC:1014(2002)], as required by the facility's Dangerous Goods Licence or other relevant legislation, to provide the framework to ensure that the facility emergency response is appropriate to respond to all scenarios.

AGR will continue to be represented in Kwinana Industries Mutual Aid and Kwinana Industries Public Safety (through CSBP) and maintain emergency response capabilities in accord with the Safety Report and approved TMP to ensure that the facility's fire protection and fire-fighting capability is appropriate to respond to all emergency and fire scenarios with the advice of the Department of Industry and Resources.

2. PROJECT JUSTIFICATION AND EVALUATION OF ALTERNATIVES

2.1 Project Justification

Sodium cyanide is an essential reagent for gold production where it is used to extract gold from gold bearing ore using the carbon-in-leach and carbon-in-pulp processes, with 98 per cent of Australia's gold production dependent on it.

AGR operates two liquid sodium cyanide plants in Kwinana (Figure 2) which together are approved and licenced under the *Environmental Protection Act 1986* to produce 70,000 tonnes per annum (tpa) pure (100%) sodium cyanide. The sodium cyanide solution is comprised of approximately 70% water and for distances greater than approximately 1000km, it is generally more cost effective to transport solid sodium cyanide.

In 2002 AGR commissioned a plant to convert sodium cyanide solution to solid sodium cyanide to utilise the spare capacity of the two liquids plants. The solid sodium cyanide briquettes are sold overseas or interstate, or for use at remote sites within Western Australia. The nominal design production capacity of the solid sodium cyanide plant is 25,000 tpa, however it is now believed that through debottlenecking and installation of new plant equipment the production capacity can be increased to 45,000 tpa.

The proposed increase in the production capacity of solid sodium cyanide is driven by opportunities for increased sales overseas, particularly to new mining projects. The export market for sodium cyanide is based solely on the solid form of the product and, if AGR is to increase its presence in the international market, it must increase the production of solid sodium cyanide.

2.2 Alternative Options Considered

At the pre-feasibility stage for the current proposal, AGR considered a number of options including:

- establishment of new production facilities overseas;
- establishment of new production facilities elsewhere in Western Australia; and
- expanding the existing Sodium Cyanide Manufacturing Facility at the CSBP Kwinana Industrial Complex.

AGR studies to date demonstrate that the option of debottlenecking and upgrading the existing operations at the Kwinana industrial complex is the most economical and flexible solution with the lowest environmental impact.

The existing Sodium Cyanide Manufacturing Facility at Kwinana delivers the greatest production flexibility and utilisation of existing internal and external resources established for the wider AGR operations in WA.

The option for establishing a new facility elsewhere in Western Australia or overseas is not economically viable due to the following factors:

- Significantly higher establishment costs.
- Greater delays associated with development and construction of the project.
- Duplication of facilities that already exist at Kwinana.
- Overall higher resultant environmental impacts associated with land acquisition and clearing.
- Duplication of organisational overheads required to operate a remote site.
- Organisational difficulties associated with remote sites, including the retention of trained technical personnel.
- Higher operating costs and duplication of critical spare requirements.
- Reduced synergies between the two operating units impacting on the flexibility of switching product mixes to meet customer demands during peak seasons.

AGR therefore determined that it should seek approval for the upgrade of the existing Kwinana solid sodium cyanide plant as described in this proposal.

3. LEGISLATIVE FRAMEWORK

3.1 Previous Approvals under the Environmental Protection Act 1987

As this proposal is an upgrade of an existing facility, it is relevant to describe the previous environmental approvals.

Bulletin 274 (April 1987)

Joint partners – CSBP and Farmers Ltd, Coogee Chemicals Pty Ltd and the Australian Industry Development Corporation proposed to construct and operate a 15,000 tpa sodium cyanide plant at Kwinana and transport the sodium cyanide as a 30% solution by road to the gold mines in the State.

The EPA (1987a) concluded that the individual risk levels fell within the Authority's published guidelines and therefore the risk associated with the sodium cyanide plant was acceptable. However, the EPA recommended that the proposal as put forward in the PER (Kinhill Stearns, 1986) not be approved on the grounds that the transportation by road of sodium cyanide in solution through the EPA's defined area of concern (within 50km of the GPO plus designated surface and groundwater catchment areas) was environmentally unacceptable. The EPA made a number of recommendations should the Government decide that the project should proceed.

Bulletin 284 (July 1987)

AGR submitted a detailed Notice of Intent (Kinhill, 1987) which proposed to transport sodium cyanide solution in tank containers (ISO-tainers) by rail from the proposed plant site at Kwinana to rail terminals in the proximity of mine sites which would be using the product. At the rail terminals the ISO-tainers would be lifted onto road vehicles for delivery to the mine sites.

The EPA (1987b) concluded that it was environmentally acceptable to transport sodium cyanide solution by rail through the defined area of concern, to rail terminals which are close as practicable to the intended markets, subject to the implementation of the proponent commitments and the recommendation made in Bulletin 284.

Bulletin 387 (May 1989)

AGR proposed to construct a duplicate liquid sodium cyanide plant at Kwinana to permit a total production of 30,000 tpa. The sodium cyanide would be transported to the gold mines using existing rail/road routes.

The EPA(1989) concluded that the proposal as described in the PER (Kinhill Stearns, 1986) was environmentally acceptable subject to the EPA's recommendations in Bulletin 387 and the management commitments made by the proponent, the assumptions made in the risk assessment and in responses raised during the assessment. The EPA also made a number of recommendations with respect to risk management (including safety reviews during the life of the plant), maintenance of process equipment, instrumentation and alarm systems, revision of site emergency plans, revision of wastewater and solid waste management plans submission of

decommissioning plans and the installation of remotely operated fast action safety valves in the ammonia pipeline to isolate plants.

Bulletin 427 (February 1990)

AGR proposed to expand its existing liquid sodium cyanide plant at Kwinana to increase its annual production from 15,000 tpa to 40,000 tpa. The expansion would be achieved by doubling the number of reactors and optimising the capacity of major plant items by removing engineering obstacles (debottlenecking).

The EPA (1990a) concluded that the proposal to debottleneck the existing plant and previously approved expansion from a total capacity of 30,000 tpa to 40,000 tpa was environmentally acceptable and recommended that the proposal could proceed subject to the same conditions contained in Ministerial Statement 073 which approved the expansion of the plant production to 30,000 tpa.

Bulletin 450 (November 1990)

The Minister for the Environment requested the EPA to inquire into and report on a Change to Condition 5 of the Ministerial Statement which relates to the timing of the debottlenecking of the existing plant (Stage 1) and the approved but not yet built duplicate plant (Stage 2).

The EPA's view (EPA, 1990b) was that it was environmentally acceptable to debottleneck stage 1 of the AGR sodium cyanide plant, without further constraint associated with the key emergency response provisions of the Kwinana Integrated Emergency Management System being in place.

Bulletin 727 (December 1993)

AGR requested changes to Conditions 1 and 5 of the amended Statement of 15 March 1991 (Statement 129). Condition 1 restricts the original plant and duplicate plant (not yet built) from each producing more than 20,000 tpa of sodium cyanide. AGR proposed to debottleneck both plants so that each can produce up to 35,000 tpa. The second change relates to Condition 5 which restricts the duplicate plant (Stage 2) from being debottlenecked until the key emergency response provisions of the Kwinana Integrated Emergency Management System were in place.

The EPA (1993) considered the debottlenecking of the original plant and duplicate (not yet built) sodium cyanide plant to allow each to produce up to 35,000 tpa was environmentally acceptable on the basis of the risk study and given that the main generator of risk (the ammonia feed pipe) was to be re-engineered in a manner which would lower the risk. The EPA considered that coordination of emergency response for risk was an issue for Government and not individual industries and therefore recommended that Condition 5 is deleted. The EPA also recommended that the standard implementation and compliance auditing conditions be included in the conditions for the proposal.

Bulletin 772 (March 1995)

AGR sought an amendment to the Environmental Conditions to transport 30% solution by road from Kwinana as detailed in the PER. AGR stated that rail is the preferred option and road is only to be used when necessary.

The EPA (1995) considered that the proponent had adequately addressed the issues associated with the transport of sodium cyanide solution along the proposed routes and that the proposal was acceptable on environmental grounds. The proponent had established an acceptable sodium cyanide handling and transport management system based on best industry practices. Before the commencement of transport of sodium cyanide solution along the proposed routes the proponent should consult with relevant government authorities to ensure all specific requirements were fulfilled in the transport and emergency response procedures.

Bulletin 1028 (September 2001)

AGR submitted a proposal (ATA Environmental, 2001) to construct a downstream processing plant that was capable of producing 25,000 tpa of solid sodium cyanide for export overseas, interstate or to remote sites within Western Australia.

The EPA (2001) considered that the proponent had demonstrated that the addition of the solid sodium cyanide plant to AGR's existing operation could be managed in an environmentally acceptable manner subject to the supplementary commitments made by the proponent, which will need to be incorporated into the existing Ministerial Statement 347.

Bulletin 1047 (April 2002)

AGR submitted a proposal (AGR, 2002) to transport solid sodium cyanide from its operations at Kwinana to the North Fremantle Port Wharf for export. The proposal sought approval to transport solid sodium cyanide on existing transport routes for sodium cyanide solution within Western Australia.

The EPA (2002a) concluded that the proposal by AGR could be managed to meet the EPA's objectives for public and environmental risk. The EPA was satisfied with AGR's commitments to:

- update its Transport Management Plan;
- review the Fremantle Port's Marine Safety and Environmental Management Plan;
- audit the stevedore's operations; and
- verify control measures and assumptions identified in the risk assessment.

The EPA also considered the transportation of solid sodium cyanide on routes approved for sodium cyanide solution to be acceptable since the Department of Minerals and Petroleum Resources (now DoIR) had no objection and advised that it

considered the risk to the community to be no greater than would be posed by the transport of sodium cyanide solution.

All of the above proposals were essentially approved as proposed by the Minister for Environment of the day except where as indicated the EPA did not support the proposal.

Bulletin 1132 (May 2004)

Since 1987, the Sodium Cyanide Manufacturing Facility and product transport has been the subject of numerous proposals, changes of proposal and assessments. This resulted in a complex set of eight Ministerial Statements as described in the previous sections.

AGR, pursuant to Ministerial Statement 579, submitted a requested under Section 46 of the *Environmental Protection Act 1986* to conduct a review of its commitments included in the existing Ministerial Statements pertaining to the manufacture, storage, and transport of sodium cyanide briquettes and solution.

The purpose of the review was to simplify the Ministerial conditions/commitments relating to AGR operations by, clarifying their intent, removing obsolete or confusing aspects, updating outdated wording and where possible incorporating recent standard conditions. The outcome of the review is a single consolidated list of clear, relevant and workable commitments incorporated into one Ministerial Statement which supersedes the eight existing Ministerial Statements.

The EPA (2004b) concluded that the proposed amendments to the Ministerial conditions will not compromise the EPA's objectives for the relevant environmental factors.

Ministerial Statement 668, replacing all previous Ministerial Statements, was signed by the Minister for Environment on 11th November 2004 and came into effect on the 25th November 2004.

3.2 Other Relevant Legislation

The existing Solid Sodium Cyanide Facility is subject to a range of licences and regulations applying to industry in Western Australia. In addition to gaining environmental approval from the Minister for the Environment, the proponent is required to comply with other legislation. A summary of the key relevant legislation, regulations or local laws is listed below (all of which are Western Australian state laws, except where otherwise noted).

- *Aboriginal Heritage Act 1980;*
- *Agriculture and Related Resources Protection Act 1976;*
- *Australian Heritage Commission Act 1975;*
- *Conservation and Land Management Act 1984;*
- *Contaminated Sites Act 2003;*

- *Dangerous Goods Safety Act 2004 (and regulations)(*is likely to be proclaimed in mid 2005)*;*
- *Environmental Protection Act 1986 as amended (and relevant Regulations);*
- *Environmental Protection and Biodiversity Conservation Act (1999), (Commonwealth) (and Regulations);*
- *Explosives and Dangerous Goods Act 1961* (eventually will be repealed and replaced by the *Dangerous Goods Safety Act and Regulations);*
- *Health Act 1911;*
- *Kwinana Environmental Protection (Atmospheric Waste) Policy 1992*
- *Local Government Act 1995;*
- *Main Roads Act 1930;*
- *Occupational Health and Safety Act 1984 (and Regulations);*
- *Rights in Water and Irrigation Act 1914;*
- *Town Planning and Development Act 1928;*
- *Water and Rivers Commission Act 1995;*
- *Wildlife Conservation Act 1950;* and
- *Port Authorities Act 1999.*

3.3 Approvals Required

The following Commonwealth, State Government or Local Authority approvals are required for this proposal:

- Department of Environment (DoE) – Works Approval and Licence amendment.
- EPA – Ministerial Approval pursuant to s.45 of the *Environmental Protection Act 1986.*
- DoIR - Assessment of the dangerous goods and licence amendments, public risks and hazard aspects of the proposal.
- DoIR – Update of Facility Safety Case.
- Town of Kwinana – Development Approval.
- Department of Planning and Infrastructure - Development Approval (potentially).

3.4 Major Hazard Facilities in Western Australia

3.4.1 Legislative Regulation of Major Hazard Facilities in WA

The AGR Sodium Cyanide Manufacturing Facility is one of 28 Major Hazard Facilities currently operating in WA.

Major Hazard Facilities are facilities such as oil refineries, chemical plants and large fuel and chemical storage sites where large quantities of dangerous goods are stored, handled or processed.

Major Hazard Facilities in WA are currently regulated by the:

- *Explosives and Dangerous Goods Act 1961.* The new *Dangerous Goods Safety Act 2004* was given Royal Assent on 10 Jun 2004 and proclamation is expected by mid 2005. The purpose of this new Act is to replace the outdated *Explosives and Dangerous Goods Act 1961*. It amalgamates the provisions of the *Explosives and Dangerous Goods Act 1961* and the *Dangerous Goods (Transport) Act 1998* to create a single consolidated *Dangerous Goods Safety Act*. The Act primarily relates to the safe storage, handling and transport of dangerous goods for related purposes. The *Dangerous Goods Safety (Major Hazard Facilities) Regulations 2003 and Dangerous Goods Safety (Storage and Handling) Regulations 2003* (incorporating the National Standard for the Storage and Handling of Workplace Dangerous Goods) are currently being drafted and are also expected to come into force by mid 2005.

- *Explosives and Dangerous Goods (Dangerous Goods Handling and Storage) Regulations 1992.*

The DoIR administers the *Explosives and Dangerous Goods Act 1961* and associated regulations.

The Safety Assessment Section (SAS), one of five sections within the Technical Services Branch of the Safety, Health and Environment Division (SHED) of the DoIR oversees the implementation of the *National Standard for the Control of Major Hazard Facilities* [NOHSC:1014(2002)], which is currently administratively applied under Section 45C of the *Explosives and Dangerous Goods Act 1961* (WA).

3.4.2 Application to the AGR Sodium Cyanide Manufacturing Facility

Section 6 of the *Control of Major Hazard Facilities National Standard,* which addresses hazard identification, risk assessment and risk control, requires AGR to carry out, document and continually update a systematic risk assessment which as far as practicable:

- identifies all hazards and all events which may lead to a major accident;

- identifies the type, likelihood and consequence of major accidents that may occur; and

- assesses the risks posed by those hazards and events.

Section 6 also requires AGR to maintain a documented Safety Management System for its Sodium Cyanide Manufacturing Facility, which incorporates details from the risk assessment and other relevant information. The AGR Safety Management System details actions to:

- eliminate or minimise hazards at the facility;

- implement technical measures to limit the consequence of a major accident; and

- protect people property and the built and natural environment from the effects of a major accident by establishing emergency plans and procedures.

Section 7 of the *Control of Major Hazard Facilities National Standard, w*hich addresses Safety Reports, requires AGR to provide to the DoIR a Safety Case. AGR's *Sodium Cyanide Manufacture Facility Safety Report* (AGR, 2004) contains the following:

- The nature and scale of use of the hazardous materials by AGR.
- The type, relative likelihood and consequence of major accidents that might occur.
- Details of the AGR "Safety Management System" which includes the procedures for:
  - the safe operation of the facility including the control of serious deviations that could lead to a major accident and emergency procedures at the site; and
  - the means to ensure that the procedures for the safe operation of the facility are properly designed, constructed, tested, operated, inspected, and maintained.
- Justification as to the adequacy of the measures taken to ensure the safe operation of the facility.

AGR's Safety Report is revised, updated, amended and provided to the DoIR as follows:

- Prior to any modification, which may significantly alter the risk associated with the facility.
- When developments in technical knowledge or in the assessment of hazards and risks make this appropriate.
- At least every five years.
- When requested by the DoIR.

The Safety, Health and Environment Division of the DoIR has the responsibility of monitoring the ongoing implementation of AGR's Safety Report through audit, inspection and regular meetings with AGR personnel. AGR's safety report meets the intent of the *National Standard for the Control of Major Hazard Facilities* and has been acknowledged by the DoIR.

Section 9 of the *Control of Major Hazard Facilities National Standard*, which addresses emergency planning, requires AGR to:

- ensure that all persons on-site have appropriate training in the implementation of the emergency plans;

- in consultation with emergency services, formulate and agree to an off-site emergency plan for action outside the facility;

- ensure that an on-site emergency plan for action inside the facility is established and maintained in conjunction with emergency services; and

- consult with the community, including other closely related facilities, during the preparation of off-site emergency plans, where appropriate.

Section 9 also requires AGR to update the on-site and off-site emergency plans and the information provided to emergency services:

- in conjunction with the updating of the safety report;
- when a major incident, near miss or an effectiveness test the need to do so; or
- at the specific request of the relevant public authority.

AGR's participation in the emergency response planning within the Kwinana area and consequently compliance to the emergency planning requirements of the *Control of Major Hazard Facilities National Standard* is discussed in more detail in Sections 3.4.3 and 3.4.4.

3.4.3 Kwinana Industries Mutual Aid (KIMA)

CSBP, appointed by AGR as the operator and sales agent responsible for the day to day activities of the Kwinana Sodium Cyanide Joint Venture, is a full member of Kwinana Industries Mutual Aid (KIMA).

Established in 1990, KIMA ensures that adjacent sites receive early warning of an emergency that may impact upon their site. Prior to 1990, the Kwinana Integrated Emergency Management System undertook a similar role to that of KIMA.

KIMA, administered by the Kwinana Industries Council (KIC), is a voluntary working group of technical specialists from within Kwinana industries who share emergency response expertise, manpower, and resources in case of a major emergency. KIMA members meet regularly and are directly involved in the maintenance and continual improvement of the KIMA Plan and Resource Manual.

Full members of KIMA are those companies which are subject to the *Explosives and Dangerous Goods (Dangerous Goods Handling and Storage) Regulations 1992* and operate a Major Hazard Facility (MHF) under the National Standard for Major Hazard Facilities and therefore require a Safety Report. The member companies also meet in a policy/liaison forum as the Kwinana Industries Public Safety Group (KIPS), which in turn hosts a public forum called KIPS Liaison Group (see Section 3.4.4).

Other full members of KIMA are:

- BP Refinery (Kwinana) Pty Ltd

- Fremantle Port Authority (not an MHF, but a KIMA member as a result of the interactions with MHF's)
- Nufarm Coogee Pty Ltd - Chlor Alkali Plant
- Tiwest Joint Venture
- Wesfarmers LPG Pty Ltd
- WMC Kwinana Nickel Refinery

All incidents within a site are attended to initially by the Member Company concerned, using in-house expertise and emergency response equipment available at or near the site. All Member Companies hold sufficient equipment and have trained emergency response personnel to cope with foreseeable incidents that may occur on their site. The KIMA Plan is activated when the management of an incident is beyond the capability of the Member Company concerned or when the incident will affect other industries.

Key Elements of the KIMA Plan

Emergency Assistance Agreement

All KIMA members have signed an agreement, which commits them to maintain their own emergency response capability and to provide assistance to other companies if required.

Inter-industry Radio Communications and Training

A regularly tested emergency-radio-communication system linking Kwinana Industries has been established specifically for use by KIMA Member Companies, and associated companies.

Emergency Access Routes and Signage

Clearly sign-posted emergency access routes link KIMA Member Companies to provide easy access during emergencies.

KIMA Resource Manual

Each KIMA Member Company has copies of the KIMA Resource Manual. This manual provides information on how KIMA works and has details of the emergency response equipment owned by each company.

3.4.4 Kwinana Industries Public Safety Group (KIPS)

In 1991, a number of major Kwinana industries, including CSBP, formed a mutual aid group to provide a forum, which was focussed on joint industry emergency response and public safety.

In 2002, this structure provided the basis for the establishment of the Kwinana Industries Public Safety group (KIPS) with the aim of providing a similar cooperative approach on issues relating to community and employee safety and the environment.

KIPS was set up through the Kwinana Industries Council in conjunction with a range of key stakeholders including:

- Fire and Emergency Services Authority (FESA);
- WA Police Service;
- State Government regulatory authorities;
- Local Councils; and
- Community representatives.

KIPS was designed to address the need for a cooperative and effective approach to managing public safety in the Kwinana Industrial Area, as well as providing a mechanism for companies to meet their own obligations under the requirements of both the WA Occupational Safety and Health Act and the requirements of the National Standard for Major Hazard Facilities.

The Structure of KIPS

The structure of KIPS included establishing a special public communication group called the Kwinana Public Safety Liaison Group (KIPSLG). This group comprises representatives from all key stakeholders, including other local community groups.

The program provides structured links to existing safety control programs currently used within industries as well as external emergency services. Some of the internal risk reduction systems already used by many Kwinana Industries include:

- HAZOPS (Hazard Operability Studies);
- Kwinana Industries Mutual Aid (KIMA);
- PCCOPS (Community Telephone Alerting System) (currently under review in March 2005 by the WA Police Service);
- Safety Management Plans (SMPs);
- Emergency response Plans; and
- Kwinana Industries Council Community Information Services (KICCIS).

These existing systems are both recognised and integral to the operation of KIPS and allow effective integration with State Emergency Services and Westplan HAZMAT.

From November 2003, CSBP provides the Chair for this group.

Kwinana Industries Public Safety Liaison Group Meetings

Regular meetings are held at least once every 3 months to review the operation and effectiveness of public safety initiatives in the Kwinana Industrial Area and to discuss opportunities for further development and improvement.

4. PROPOSAL DESCRIPTION

4.1 Existing Solid Sodium Cyanide Plant

The location of the existing solid sodium cyanide plant is shown in Figure 2.

The Sodium Cyanide Manufacturing Facility is a prescribed premise within schedule 1 of the *Environmental Protection Regulations.* The facility is therefore licenced under Part V of the *Environmental Protection Act 1986* and subject to the conditions contained within that licence. A copy of the current facility licence is provided in Appendix 1.

A consolidation of the key characteristics of the AGR operation to date is presented in Table 2.

TABLE 2
CONSOLIDATION OF KEY CHARACTERISTICS FOR THE AGR SOLID SODIUM CYANIDE FACILITY AND TRANSPORT OF SODIUM CYANIDE BY ROAD AND RAIL

Characteristic	Description
General	
Location	Kwinana Beach Road – Kwinana South east corner of the CSBP Kwinana Industrial Complex and west of Coogee Chemicals – Kwinana Industrial Area.
Disturbance Areas	
Plant areas	Approx 4ha
Total area disturbed	4.3ha
Solid Sodium Cyanide Plant[1].	
Plant Commissioned	2002
Plant Facilities	Two batch evaporators, vacuum pump incorporating a scrubber, condensate tank, slurry tank, centrifuge, spin flash dryer incorporating scrubber system, powder screw and compacting machine.
Process Description	The solids plant receives a continuous feed of sodium cyanide solution produced at the liquid sodium cyanide plants which will be directed to one of two batch evaporation units. Following concentration by evaporation, the sodium cyanide crystals are centrifuged, dried and compressed into briquettes. The briquettes are then packaged and transported.
Production Capacity	25,000 tpa
Inputs	Up to 21 tonnes per hour of 30% sodium cyanide solution.
Outputs	Up to 3.2 tonnes per hour of briquettes containing >97% sodium cyanide.
Storage	The store has a maximum capacity of 7140 tonnes solid sodium cyanide. Solid sodium cyanide will be stored in intermediate bulk containers packed into sea containers or a warehouse. Small quantities may be stored in ISO-tainers (equipped to allow injection of water to dissolve the sodium cyanide at the mine site).
Atmospheric Emissions	Ammonia, hydrogen cyanide and sodium cyanide particulates.

Characteristic	Description
Liquid Effluent Discharges	10 m^3/hour wastewater, containing up to 14 kg/day of nitrogen. All liquid effluent is treated and then pumped to CSBP's effluent pond and CSBP have committed to ensuring that all emissions comply with the relevant site *Environmental Protection Act* licence criteria and a total CSBP nitrogen emission no higher than discharges of the period ending June 30th 2001.
Transport[1].	
Solid Sodium Cyanide	By road from plant to: • Fremantle Port North Wharf for export; • Kwinana container rail terminal for freight to Kalgoorlie; • then road transport for supply to remote sites in WA; and • Kewdale container rail terminal for supply to sites through-out Australia. The *Dangerous Goods (Transport) (Road and Rail) Regulations 1999*, Australian Dangerous Goods Code and recommendations of the Department of Industry and Resources Guidance Note T117 "Recommendations for Route Selection for the Transport of Dangerous Goods in the Perth Metropolitan Area" are adhered to at all times for transport and packaging.

[1.] Assessed by EPA.

The solid sodium cyanide plant converts sodium cyanide solution from the liquid sodium cyanide plants into solid briquettes for export overseas or interstate, or for use at remote sites within Western Australia.

The solid sodium cyanide plant is located adjacent to the existing liquid sodium cyanide plant. The solid sodium cyanide plant receives a continuous feed of sodium cyanide solution by pipeline from the storage tanks or either of the liquids plants. This feed is directed to one of two batch evaporation units. Following evaporation the concentrated sodium cyanide liquor is centrifuged to separate the solid crystals, which are then dried and compressed into briquettes.

The solid sodium cyanide plant is designed to have a nominal capacity to produce 25,000 tpa of solid sodium cyanide product. The plant is designed as a single train with the exception of the evaporation section, which comprises two parallel trains.

The site is licenced by the DoIR to store up to 1600 tonnes of solid sodium cyanide in intermediate bulk containers (IBCs) in a purpose-built warehouse, and 5540 tonnes IBC's in sea containers awaiting dispatch. IBCs are one cubic metre plastic lined wooden boxes used to package the material for storage and transport.

The briquettes are packaged in IBCs and placed into conventional shipping containers or in special ISO-tainers for transport. The majority of solid product is transported within Western Australia by road and interstate by rail.

The only solid wastes that the plant produces are used membranes from the reverse osmosis plant used to treat the process condensate, boxes and miscellaneous items such as used personal protective equipment. These solid wastes are disposed of in accordance with established AGR procedures and Western Australian laws.

Wastewater from the solids plant contains low levels of cyanide and ammonia (the ammonia originates from the sodium cyanide solution process). Wastewater is treated in a number of steps as follows:

- ammonia stripping which drives off the ammonia and some free cyanide which is directed to the liquid sodium cyanide plant incinerator and destroyed; and
- reverse osmosis for removal of sodium cyanide. The sodium cyanide concentrate is recycled to the solids plant and the permeate is directed to the cyanide destruction unit or recycled to the solids plant.

Wastewater (with a cyanide level less than 1 ppm and copper level no higher than 1 ppm) is currently discharged to the CSBP wastewater effluent management system. Once the CSBP connection to Kwinana Water Reclamation Plant (KWRP) has been commissioned, it is intended that the wastewater will be directed for disposal to the Sepia Depression Ocean Outlet Landline. (These emissions were included in the formal environmental assessment of this ocean disposal which was approved).

Gaseous emissions from the plant are combined and vented to the atmosphere through a single scrubber stack. The major contaminants are ammonia, hydrogen cyanide and sodium cyanide particulate. Control equipment including a two stage wet scrubber with demisters are incorporated to ensure that air emissions comply with the *Environmental Protection Act* licence requirements.

The Sodium Cyanide Manufacturing Facility currently complies with the *Environmental Projection (Noise) Regulations 1997* or subsequent Ministerial Approvals, with one exception. AGR retains the commitment in the current Ministerial conditions which commit to complying with the revised noise regulations within six months of their release. If the proposed amendments to the noise regulations are approved AGR will fully comply. If the proposed amendments are not progressed then a detailed study of the plant will be conducted to progress with additional modifications to reduce noise and ensure compliance.

In the interim, AGR has undertaken a number of projects to continuously improve noise levels including:

- Implementation of a variety of noise attenuation measures as described in Section 6.4.3.
- Consideration of noise in the purchasing of new equipment and plant upgrades.
- Commenced implementation of a trial to reduce noise from the Sodium Cyanide Manufacturing Facility by replacing fan blades in the cooling towers with new fibreglass blades.
- Commissioning of Herring Storer Acoustics to prepare a report detailing what other actions may be taken to reduce noise levels.
- Regular participation in the KIC environmental planning committee meetings, which discuss noise issues for the KIA.

- Contributed to the cumulative noise study undertaken by KIC.

4.2 Proposed Changes to Solid Sodium Cyanide Plant

The increase of the solid sodium cyanide production capacity will occur progressively over a number of years in response to market demand. No change is required to the approved production capacity of sodium cyanide solution as a result of this proposal.

A schematic process flow chart for the solid sodium cyanide plant is included as Figure 4. The solid sodium cyanide manufacturing process will not change as a result of this proposal, however where possible equipment upgrades will be made that improve performance.

Table 3 summarises the proposed changes to equipment required to achieve increased production capacity.

TABLE 3
PROCESS UPGRADE SUMMARY

Item	Equipment	Current Estimated Capability	Debottlenecking Options to Achieve 30 000tpa	Debottlenecking Options to Achieve 45 000tpa
Evaporation	2 off Evaporators	3.5 tph	Bleed in solution during evaporation; and upgrade slurry pumping system.	Additional evaporator, or increase size of existing units.
Separation	Ferrum Centrifuge	3.5 tph	N/A	A larger centrifuge.
Dehydration	Spin Flash Dryer	3 to 3.5 tph	Increase inlet air temp/flow, and replace 2nd cyclone.	A larger dryer.
Packaging	Packaging plant	10 tph	Either work 2 shifts, or fill ISO-tainers.	N/A
Waste Water Treatment	RO unit & waste water treatment tanks	2.5 tph	Install more membranes, and increase pump capacity.	Additional RO units.
Treatment of off-gases	Venturi & Packed Bed Scrubbers	3.5 tph	N/A	Redesign the off-gas system.
Cooling Water	Cooling Tower	2.5 tph	Minor improvements eg increasing pump size would enable throughput of 3.5 tph.	Additional cooling tower cells.
Solids Storage	Warehouse	1,600 tonnes in warehouse	Increase warehouse size to maintain 1 month's production.	Further increase size of solid storage warehouse to enable more storage of product inside the shed. An increase in the total amount of solid sodium cyanide stored is not required.

All the upgraded equipment will be located within the existing solid sodium cyanide plant with the exception of the addition of two cooling tower cells. Accordingly, there will be no additional land acquisition or disturbance required and no resultant impact any existing natural flora or fauna habitats.

The majority of the increased production will be packaged in sea containers and trucked (or railroad when feasible) to Fremantle for export via the port.

It is not envisaged that any modifications will be required to the packaging plant as these have sufficient capacity to handle the increased throughput with only extended shifts being required.

Table 4 provides a summary of project key characteristics following the proposed expansion.

TABLE 4
KEY CHARACTERISTICS FOR THE PROPOSED SOLID SODIUM CYANIDE PLANT UPGRADE COMPARED WITH EXISTING PLANT

Characteristic	Existing Facility	Description of Upgraded Facility
Location	Kwinana Beach Road – Kwinana Kwinana Industrial Area.	No change.
CSBP Kwinana Industrial Complex area	138ha	No change.
Sodium cyanide plant area	4.3ha	No change.
Land use	Solid sodium cyanide plant	No change.
Project life	30 years	No change.
Plant operating hours	Continuous	No change.
Plant facilities	Two batch evaporators, vacuum pump incorporating a scrubber, condensate tank, slurry tank, centrifuge, spin flash dryer incorporating scrubber system, powder screw and compacting machine.	Minor upgrades or replacements of existing equipment.
Production	25,000 tpa nominal.	Debottleneck existing – 30,000 tpa nominal. Upgrade existing – 45,000 tpa nominal.
Process Description	• The solids plant receives a continuous feed of sodium cyanide solution produced at the liquid sodium cyanide plants which will be directed to one of two batch evaporation units. • Following concentration by evaporation, the sodium cyanide crystals are centrifuged, dried and compressed into briquettes. • The briquettes are then packaged and transported.	No change.
Inputs	Up to 21 tonnes per hour of 30% sodium cyanide solution.	Up to 33.5 tonnes per hour of 30% sodium cyanide solution.
Outputs	Up to 3.2 tonnes per hour of briquettes containing >97% sodium cyanide.	Up to 5.1 tonnes per hour of briquettes containing >97% sodium cyanide.
Gaseous Emissions	Ammonia, hydrogen cyanide and sodium cyanide particulates (estimated in Table 5).	Ammonia, hydrogen cyanide and sodium cyanide particulates (estimated in Table 5).
Liquid Effluent Discharges	10 m^3/hour wastewater, containing up to 14kg/day of nitrogen (to CSBP effluent system).	16 m^3/hour wastewater, containing up to 19 kg/day of nitrogen (to CSBP Effluent system).

TABLE 4 cont.

Characteristic	Existing Facility	Description of Upgraded Facility
Noise	Noise emissions from the Sodium Cyanide Manufacturing Facility currently comply with the *Environmental Protection (Noise) Regulations 1997* or subsequent Ministerial approvals, with one exception. With all plants operating the total noise level at the boundary of Coogee Chemicals (most sensitive premises) currently does not comply with the noise regulations. Measured noise levels range from 61 to 65.5 dB(A) along the boundary, the highest noise levels being associated with noise emissions from the AGR cooling towers. On most occasions the existing noise emissions fail to comply with the Regulation industrial receiver 'assigned level' of 65 L_{A10} because the noise emission is 'tonal' in characteristic and attracts a +5 adjustment to the measured level. It is noted that were the Regulation 'assigned levels' to be changed in accordance with the recommendations of the "Noise Regulations Review: Outcomes of the Working Group Programme, June 2000", or the proposed regulation changes as currently being proposed by the Department of Environment, then the existing noise levels at the Coogee Chemicals boundary would be in compliance with the Regulations. AGR is committed to complying with the current Ministerial condition which outlines the commitment to complying with the revised noise regulations within six months of their release.	Within *Environmental Protection (Noise) Regulations, 1997* or subsequent Ministerial approvals.

4.3 Process Descriptions

Figure 4 shows a simple schematic diagram of the process involved in the manufacture of solid sodium cyanide briquettes. The plant is designed to produce 25,000 tpa of solid sodium cyanide product at an average production rate of 60 tonnes per day and 2.5 tonnes per hour for 330 days each year. The solids plant has been designed to produce solid cyanide briquettes from a 30% sodium cyanide solution.

The consecutive steps in the process are:

- Transfer of sodium cyanide solution from the liquid plants or existing storage.
- Evaporation under vacuum to produce 60% sodium cyanide slurry.
- Separation by centrifuge.
- Dehydration by spin flash dryer.
- Compaction.
- Packaging of solid briquettes into ISO-tainers or intermediate bulk containers (IBCs).
- Recovery of ammonia and cyanide from the water driven off in the evaporators.
- Treatment of the off gases is provided by a venturi and packed gas scrubber to remove sodium cyanide dust and hydrogen cyanide.

Feedstock for the sodium cyanide solids plant is provided from No.1 sodium cyanide plant or No. 2 Sodium Cyanide Plant supplemented by sodium cyanide solution pumped from No. 3 sodium cyanide storage tank. Both supplies flow to the sodium cyanide solution feed tank.

Sodium cyanide solution is transferred to one of two evaporators. Evaporation is carried out employing a batch process under a vacuum, using low-pressure steam from the sodium cyanide plants reactor system.

Evaporated water is condensed and purified by ammonia stripping, reverse osmosis and waste water treatment plant, before being used as make up water to the sodium cyanide plants cooling water towers. The water may also be pumped directly to the ponds prior to discharge directly to Cockburn Sound or via the Sepia Depression ocean outfall line (from March 2005 approximately).

On completion of the evaporation cycle, the evaporated sodium cyanide solution is dropped into the slurry tank. The slurry tank is fitted with an agitator to ensure any crystals formed are kept in suspension. This vessel has a small retention time because of the potential for crystal accumulation and subsequent blockage. The tank has enough capacity to handle two evaporator batches and forms the interface between batching and continuous operation for the solids sodium cyanide plant production train.

Slurry is pumped from the slurry tank to the centrifuge. The centrifuge separates the sodium cyanide crystals from the slurry. The filtrate (mother liquor) from the centrifuge can have a sodium cyanide concentration of up to 43%. The filtrate is directed to the filtrate tank where it is blended back to a 30% sodium cyanide solution with diluted sodium cyanide supplies from the packed bed and variable throat venturi scrubber. In addition, rainwater from the plant sump and tank bund sump is also used to dilute the sodium cyanide solution. The filtrate tank is equipped with an agitator to ensure that any crystals that are formed are kept in suspension. The agitator provides mixing of the filtrate.

The product from the filtrate tank can be sent to No.1 or No.2 sodium cyanide storage tanks or to the Off Spec Solution Tank.

The sodium cyanide cake from the centrifuge passes to the spin flash dryer where the moisture is liberated by hot air heated by high-pressure and low-pressure steam and an electric heater. Moisture is drawn through the dryer by an induced draft fan. The dried sodium cyanide powder is picked up in the gas stream and lifted to the top of the structure where the powder is recovered from the gas stream by two cyclones arranged in series. The gas then passes through a venturi scrubber and a packed bed scrubber where any sodium cyanide dust or hydrogen cyanide is removed before the gases are discharged to atmosphere via a common stack.

The dried sodium cyanide powder is collected in two dryer cyclones and the powder hopper. Sodium cyanide powder is fed by gravity to the compacting machine where the powder is compressed between two sets of rolls to form tear shaped pillows approximately 34mm by 32mm by 15mm and weighting about 15 grams.

After screening the briquettes can be sent to fill ISO-tainers for transport to mine sites around Australia (not currently in use) or the briquettes may be sent to the briquette hopper that provides feed surge capacity for the packaging plant where the briquettes are loaded into 1-tonne intermediate bulk containers. The intermediate bulk containers are stored under cover on site and loaded into sea containers for transport within Australia or overseas.

The entire solid sodium cyanide plant operates under a vacuum so that any sodium cyanide dust from the spin flash dryer and solids handling section of the plant is removed in the venturi and packed bed scrubbers. The section of the plant that handles sodium cyanide solution also operates under a vacuum – this section operates at a slightly lower vacuum than that of the dry section of the plant. This ensures that the gases join the effluent gas stream from the venturi scrubber where any hydrogen cyanide is removed by reaction with caustic in the packed bed scrubber. An induced draught fan provides the vacuum for the sodium cyanide solids plant with the treated gases being expelled to the atmosphere via a common stack.

4.4 Inputs and Outputs

The major materials flows and emissions for the sodium cyanide solids plant at its current production capacity of 25,000 tpa and future nominal production capacities of 30,000 tpa and 45,000 tpa are summarised in Table 5. These flows should be regarded as estimates only as they may vary due to changes in ambient conditions and plant operating practice.

TABLE 5
SOLID SODIUM CYANIDE PLANT
ESTIMATED MAJOR MATERIALS FLOWS AND EMISSIONS

	Units	25,000 tpa	30,000 tpa	45,000 tpa	Comments
Inputs					
Sodium Cyanide liquid (30% solution)	kg/h	20,833	25,000	31,250	Pro rata
Electricity	kW	1,625	1,842	1,900	
Outputs					
Sodium cyanide solid	kg/h	3,125	3,750	5,625	
	t/d	75	90	135	Typical operating range
Environmental Discharges (Solids Plant)					
To Atmosphere (scrubber stack)					
Total Airflow	kg/h	12,488	13,223	19,843	
Ammonia	g/s	0.60	0.7	1.2	
	kg/d	51.8	62.21	93.31	
Total cyanide (hydrogen cyanide and particulates)	g/s	0.3	0.36	0.58	0.3g/s is actual current average for total cyanide.
	kg/d	26	31	50	
Sodium cyanide particulates	mg/m^3	2.3	2.76	3	Specification for scrubber is $50mg/m^3$ but is performing better than this design.
Overall Emissions to Atmosphere					
Total Annual Ammonia (atmospheric)					
No 1 SCP	kg/y	10,000	10,000	10,000	
No 2 SCP	kg/y	10,000	10,000	10,000	
Solids plant	kg/y	18,144	21,773	27,216	350 days/year
Total	kg/y	38,144	41,773	47,216	
Total Annual Hydrogen Cyanide					
No 1 SCP	kg/y	15,791	15,791	15,791	
No 2 SCP	kg/y	15,791	15,791	15,791	
Solids plant	kg/y	9,072	10,886	16,330	350 days/year
Total	kg/y	40,654	42,468	47,912	
Wastewater					
Volume	m^3/hr	10	12	16	
Total Nitrogen	kg/d	12	14	19	Daily loads to Cockburn Sound will be no higher than they were in licence period to 30th June 2001. CSBP's pilot nutrient stripping wetland will assist with nitrogen management.
Cyanide	ppm	<1	<1	<1	

4.5 Sodium Cyanide Storage

The site is licenced by the DoIR to store up to 1600 tonnes of solid sodium cyanide in intermediate bulk containers (IBCs) in a purpose-built warehouse, and 5540 tonnes IBC's in sea containers awaiting despatch.

At this stage it is not envisaged that it will be necessary to increase the amount of solid product stored in Kwinana as a result of this proposal from the existing capacity of 7140 tonnes. Should a decision be made to increase the storage capacity above the approved amount, then any necessary dangerous goods approvals will be obtained following a detailed analysis of risks and hazards including a review of the Quantitative Risk Assessment (QRA).

4.6 Waste Management

4.6.1 Liquid

The existing wastewater treatment system has sufficient capacity to treat the additional wastewater that will be generated as a result of this proposal. The established and proven site procedures described below will continue to be used and improved as discussed.

Wastewater from various points in the solids facility is held in a stripper feed tank before being pumped to an ammonia stripper. The ammonia stripper is a column that has a steam heated reboiler in the base and this provides sufficient energy to drive off the ammonia and some free cyanide, which is directed to the existing incinerator on either of the liquid sodium cyanide plants where it is destroyed. Some water is also associated with the gases directed to the incinerator (as steam).

The stripped liquor is treated in a reverse osmosis unit specially configured for this application. In this unit, 85% of the feed stream is produced as a low cyanide concentration and the remainder, containing the majority of the sodium cyanide at a concentration of approximately 2.5% sodium cyanide, is recycled to the solids plant scrubbers as makeup liquor.

Currently, water passing through the membranes is then pumped to the cyanide destruction plant located near SCP1. The destruction plant uses hydrogen peroxide, sulphuric acid and copper sulphate to reduce the cyanide concentration to < 1ppm.

As part of a continual improvement review process, AGR is currently undertaking a modification design review to remove the use of copper and hydrogen peroxide and instead utilise chlorine and sodium hypochlorite to destroy cyanide. It is not proposed to change the cyanide or copper discharge limits.

This chlorine based system will be used to destroy cyanide in the reverse osmosis permeate. The advantages of the use of a chlorine based treatment system (using sodium hypochlorite) includes the familiarity of the operators in using this chemical, the removal of copper from the wastewater discharge and the removal of the need for

steam as the treatment can occur at ambient temperatures. The additional storage of sodium hypochlorite will be managed through AGR's dangerous goods licence.

Wastewater leaving the treatment plant is then discharged to CSBP's containment ponds via a batch tank system. Each batch tank is filled then manually sampled and analysed for copper, pH and cyanide prior to discharge to ensure compliance with *Environmental Protection Act* licence conditions. The discharge also has an on-line pH and cyanide analyser. Both the analysers alarm to the control room and automatically prevent discharge if the pH or cyanide concentrations exceed a trigger value.

In accordance with Condition 2 and Proponent Commitment 3 of Ministerial Statement No. 668 CSBP has implemented and developed a stormwater management plan and a wastewater and solid waste management plan for the Sodium Cyanide Manufacturing Facility in addition to an Environmental Management Plan. These plans will be progressively updated to reflect changes to the solids plant prior to any upgrade occurring.

The wastewater flows from the plant are summarised in Figure 5, which also describes, schematically, the CSBP effluent management system. At the discharge point from the solids plant wastewater treatment system, before discharge to the CSBP effluent system, the cyanide and copper concentrations will be no higher than 1ppm.

In order to reduce the amount of groundwater abstracted for use in the process, a separate proposal has been submitted to the DoE and approved to implement a trial to reuse treated water in the cooling towers of the sodium cyanide liquids plant. This will commence shortly and will reduce the use of groundwater in the process if successful.

The Kwinana Water Reclamation Plant (KWRP) has been commissioned, and it is intended that the wastewater will be directed for disposal to the Sepia Depression Ocean Outlet Landline (through CSBP's system) potentially from March 2005.

4.6.2 Solids

As with the existing solids plant, the only solid industrial wastes that the plant produces are used membranes from the reverse osmosis plant used to treat the process condensate, boxes and miscellaneous items such as used personal protective equipment. These solid wastes are disposed of in accordance with established site procedures.

As part of AGR's philosophy of continual improvement, AGR have recently obtained approval from the DoIR to use plastic-lined bulka bags. AGR previously used a bulka bag with a separate plastic liner. The use of the lined bulka bag minimises the generation of excess plastic and reduces the amount of manual handling required during packaging of the solid sodium cyanide.

Domestic type solid waste will be disposed of in the approved manner and to the satisfaction of the regulatory authorities. Waste oils and other commercial and

industrial wastes will be managed through existing waste disposal systems maintained by AGR.

As noted above, the existing wastewater and solid waste management plans for the Sodium Cyanide Manufacturing Facility will be updated to reflect any changes arising from this proposal.

4.6.3 Gaseous Emissions

Figure 6 is a schematic diagram of the atmospheric emissions management system.

During normal operation at design capacity, the gaseous emissions listed in Table 5 are directly vented to the atmosphere from the scrubber stack. As a result of this proposal, gas flows will increase and the scrubbers will be modified if required to ensure compliance with emission limits is achieved at all times.

The only other gaseous discharge will be minor fugitive emissions arising from the venting of vessels prior to maintenance activities. This is a necessary safety requirement prior to undertaking work on pipelines and vessels containing process gases. These will be controlled in accordance with industry standard procedures to minimise the volume of gases emitted and any potential environmental impact. It is not anticipated that the current proposal will significantly impact on such discharges.

4.7 Hours of Operation

The solid sodium cyanide plant is planned to operate continuously except for planned maintenance shutdowns. It is estimated that the plant will operate for approximately 350 days per year. This does not represent a change from the existing operation hours for the current facility.

5. ENVIRONMENTAL SETTING

This section provides a description of the environmental setting relating to the proposal. Only those physical, ecological and social systems that have the potential to be affected in either a positive or negative manner have been described.

5.1 Land Use and Zoning

The Sodium Cyanide Manufacturing Facility is located within the CSBP Kwinana Industrial Complex, and comprises an area of 4.3ha. The entire CSBP Kwinana Industrial Complex encompasses an area of 138ha.

The land on which the Sodium Cyanide Manufacturing Facility is sited is zoned 'Industrial' under the Town of Kwinana Town Planning Scheme No. 2 and the Metropolitan Regional Scheme, and is surrounded by 'Industrial' zoned land to the north, south and east, with Cockburn Sound to the west.

The land does not require rezoning before the proposal can be implemented.

The nearest major residential areas to the CSBP Kwinana Industrial Complex are Medina and Calista, located approximately three kilometres inland to the east. The town centre of Kwinana is screened from the industrial strip on the coastal plain by a ridge of well-vegetated dunes. Other nearby residential areas includes Orelia, Parmelia, Leda and North Rockingham.

The existing major industrial operations in the vicinity of the CSBP Kwinana Industrial Complex are listed below (Figure 3):

- Air Liquide (air separation plant);
- Alcoa World Alumina (alumina refinery);
- Australian Fused Materials (industrial fused minerals);
- BP Petroleum Refinery (oil refining) (*Major Hazard Facility*);
- Brambles WA (sulphur import, materials export);
- BOC (industrial gas production);
- Coogee Chemicals Pty Ltd (chemical manufacture and storage) (*Major Hazard Facility*);
- CBH (Grain terminal);
- CIBA Speciality Chemicals (chemical manufacture) (*Major Hazard Facility*);
- Cockburn/Swan Cement (cement manufacture);
- Fremantle Port Bulk Terminal;
- HIsmelt iron manufacturing plant, currently being commissioned (February 2005);
- Kwinana Power Cogeneration Plant (formerly Mission Energy);
- Nufarm Coogee (chlorine manufacture) (*Major Hazard Facility*);
- Nufarm Ltd. (agricultural chemicals and pesticides manufacture and packaging);
- Summit Fertilisers (fertiliser manufacture and import);
- Super-fert (fertiliser manufacture and import).
- Terminals West (bulk fuel depot) (*Major Hazard Facility*);
- Tiwest Joint Venture (titanium dioxide manufacture) (*Major Hazard Facility*);

- TYCO Water (pipe manufacturing);
- United Farmers Cooperative (fertiliser manufacture and import);
- Western Power (power station);
- Wesfarmers LPG Pty Ltd (LPG extraction) (*Major Hazard Facility*);
- Wesfarmers Kleenheat Gas (LPG) (*Major Hazard Facility*); and
- WMC Resources (nickel refining).

The KIA was established by the Western Australian Government in the early 1950s to serve as a strategic industrial area for the Perth Metropolitan Region and has subsequently been developed as the State's most significant heavy industrial area.

Consequently, the KIA has been the subject of many strategic planning studies over the years with the aim of ensuring suitable industrial development is facilitated. A buffer zone has been established around the KIA to accommodate risk, noise and air emissions.

The most significant regional planning document currently affecting the KIA and surrounding areas is the Fremantle Rockingham Industrial Area Regional Strategy (FRIARS) (WAPC, 2000). The FRIARS was prepared to provide a statutory means to safeguard the future of the KIA and provide strategic land use planning for the Fremantle-Rockingham region for the next 20 – 25 years.

The *Hope Valley Wattleup Redevelopment Act 2000,* which is being implemented as the Hope Valley Wattleup Redevelopment Project, provides the legal framework for the implementation of the major recommendations of the FRIARS. Following the introduction of the *Hope Valley Wattleup Redevelopment Act 2000*, LandCorp commenced purchasing properties in the Hope Valley and Wattleup townsites as part of its role in planning, developing and promoting the land within the project area.

5.2 Landscape

The existing Sodium Cyanide Manufacturing Facility is located within the CSBP Kwinana Industrial Complex (Figure 2), with the BP Petroleum refinery to the north, and a railway corridor to the east (Figure 3). While the generally flat landform retains little of its original vegetation, much of the eye-level visual impact of the CSBP Kwinana Industrial Complex has been ameliorated by extensive screen planting, particularly west of the railway reserve along the former CSBP evaporation pond bunds (Kinhill Stearns, 1986).

The CSBP Kwinana Industrial Complex is well screened from Patterson Road and, to a lesser extent, from Kwinana Beach Road. Due to the scale of industrial surroundings and the 'tunnel vision' effect of Patterson Road caused by generally uninterrupted traffic flow and established verge and median screen planting, the perception of visibility of the site is minimal. The CSBP Kwinana Industrial Complex is visible from Kwinana Beach.

The CSBP Kwinana Industrial Complex is not visible from residential areas with the exception of the prilling plant tower and columns in the ammonia and nitric acid plants and the sodium cyanide solids plant tower.

5.3 Climate

The climate of Kwinana, as for the entire Perth Metropolitan Area, is characterised by a Mediterranean climate with mild wet winters and hot dry summers.

A summary of the meteorological data relevant to the CSBP Kwinana Industrial Complex is presented in Table 6.

TABLE 6
SUMMARY OF THE METEOROLOGICAL DATA

Period	Mean daily temperature (°C)[a]		Mean relative humidity (%)[a]		Mean Rainfall [a]		Mean daily evaporation (mm)[b]	Highest recorded wind gust (km/h) [a]
	Minimum	Maximum	9am	3pm	Amount (mm)	No. of rain days		
Jan	18.7	29	53	55	10.8	2.1	8.5	
Feb	19.2	29.4	53	54	15.4	2.4	8.0	
Mar	17.8	27.6	56	54	16.9	3.7	6.2	
Apr	15.6	24.3	63	59	42.2	7.8	4.0	
May	13.2	21.1	69	62	105.7	13.2	2.3	
Jun	11.7	18.7	74	66	162.1	17.5	1.8	
Jul	10.6	17.6	74	66	158.3	18.9	1.8	
Aug	10.5	17.9	71	65	107	16.3	2.3	63
Sep	11.3	19.2	68	63	68.4	13.1	3.2	
Oct	12.6	21.3	61	60	41.4	9.1	4.7	
Nov	14.9	24.0	56	58	23.8	6	6.5	
Dec	17	26.8	53	56	8.2	2.9	7.9	
Annual	14.4	23.0	63	60	760.2	113	4.7	63

Source:
a Bureau of Meteorology Station 009064 Kwinana BP Refinery (1955-2004).
b Bureau of Meteorology Station 009194 Medina Research Centre (1983-2004).

The mean daily minimum temperature measured at Kwinana BP Refinery ranges from 10.5°C in August to 19.2°C in February. The mean daily maximum temperature ranges from 17.6°C in July to 29.4°C in February.

The month of February has the lowest mean relative humidity measured at Kwinana BP Refinery, which is 53% at 9am and 54% at 3pm. The months of June and July have the highest mean relative humidity, both of which are 74% at 9am and 66% at 3pm.

The average annual rainfall measured at Kwinana BP Refinery is 760.2mm. Eighty percent of total rainfall falls between May and September.

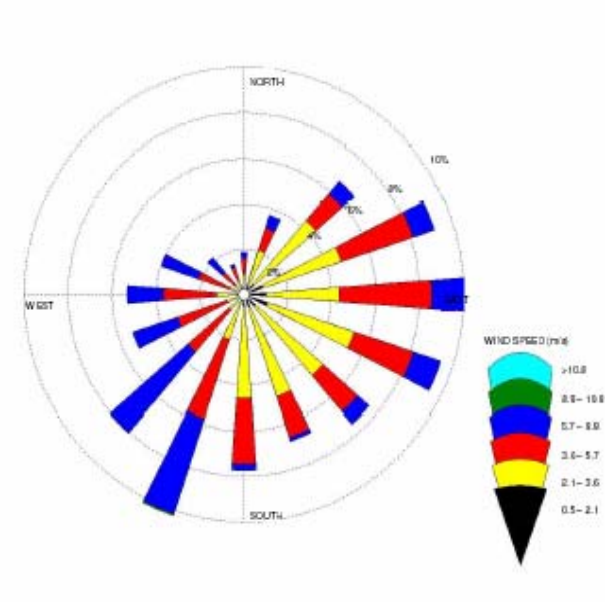
Mean daily evaporation measured at the Medina research station ranges from a minimum of 1.8mm in June and July, to a maximum of 8.5mm in January. The total annual evaporation is approximately 1730mm, which exceeds annual rainfall by approximately 970mm.

Winds in the Kwinana region result from both large-scale (synoptic) winds associated with low and high-pressure systems, and local thermally influenced winds. Typically, strong offshore breezes occur during the daytime followed by corresponding onshore breezes as the land cools during the evening. This sea breeze/land breeze cycle is typical of coastal environments (Sinclair Knight Merz, 2002a).

Synoptic winds in the Kwinana region are generally from the east. During spring and summer, the easterly winds are disrupted by the sea breeze from the south west and south south west, which is generally an afternoon weather phenomenon (Sinclair Knight Merz, 2002a).

Summer winds tend to be quite persistent, and 50% of winds have speeds of 5 ms^{-1} to 9ms^{-1}. Winds during winter are typically from westerly through northerly directions. Winter winds are typically more variable with occasional periods of calm and strong storm winds, and 50% of winds having speeds of 2ms^{-1} to 7ms^{-1} (D.A. Lord & Associates, 2001, p12).

The annual wind roses based on data from the Hope Valley Meteorological Station (1980) is shown below (source Sinclair Knight Merz (2002a)):



Air quality is discussed in Section 6.2.

5.4 Vegetation and Fauna

No remnant vegetation remains in the vicinity of the CSBP Kwinana Industrial Complex. The predominant vegetation species in the plant area are mixed *Eucalyptus* planted by CSBP as part of the landscaping works for its Kwinana site. Small pockets of remnant vegetation are restricted to the margins of the site boundary (Kinhill Stearns, 1986).

Due to the clearing of vegetation on the site for previous developments, there are no faunal habitats for native species other than those areas that have been established as landscaped areas around the site.

5.5 Landforms and Soils

The site is located towards the northern end of the Becher-Rockingham beach ridge plain. It straddles the boundary between the Quindalup soil unit, which consists of beach ridges and unconsolidated calcareous sand, and the Cottesloe soil unit, which consists of shallow, yellow-brown sands and exposed limestone (Kinhill Stearns, 1986).

5.6 Geology and Hydrogeology

The CSBP Kwinana Industrial Complex is located in the Coastal Belt subdivision of the Swan Coastal Plain in the Quindalup Dunes, which is a relic foredune plain of the Holocene period (Davidson, 1995; Gozzard, 1983). The geological profile of the site is typical of the coastal deposits found in the area and consists of Safety Bay Sand (recent) unconformably overlying Tamala Limestone, and the Leederville Formation (Pinjar Member) (Davidson, 1995).

The Safety Bay Sand comprises a thick layer (up to 20m) of calcareous sand. The calcareous sand is described by Gozzard (1983) as white medium-grained, rounded quartz and shell debris, well sorted and of eolian origin.

A geotechnical investigation at the HIsmelt site located approximately 3km to the north of the AGR facility (Figure 3) indicated that the Safety Bay Sand overlies a layer of up to 2m of silty clay and clayey sand (Dames & Moore, 1990a). The clay layer is discontinuous and pinches out towards the west.

The Tamala Limestone comprises various proportions of quartz sand, fine to medium grained shell fragments and minor clayey lenses (Davidson, 1995). The Tamala Limestone comprises an upper layer of pale yellow medium to coarse grained sand that has decomposed from the deeper limestone, which in turn is pale yellow/brown variably cemented fine to coarse grained limesand with shell debris (calcarenite) (D.A. Lord & Associates, 2001).

The Leederville Formation consists predominantly of discontinuous, interbedded sandstones, siltstones and shales with individual sandstone beds (Davidson, 1995). The sandstones are weakly consolidated, grey, fine to very coarse grained, poorly sorted, subangular to subrounded and commonly silty. The siltstones and shakes are dark grey to black, typically micaceous, thinly laminated with fine-grained sandstone.

The Safety Bay Sand and the Tamala Limestone Formations contain unconfined aquifers (Dames & Moore, 1990b) that are considered to form a single (superficial) aquifer system at a regional level. The superficial aquifer is located within the Jandakot Mound division. However, detailed investigations indicate that the flow

paths within the KIA are more complex and that the aquifers can be separated on the basis of hydrostatic head and natural groundwater quality (Barnes & Whincup, 1981).

The direction of groundwater flow is generally to the north west under a hydraulic gradient of approximately 1 in 2500 (Dames & Moore, 1990b).

Fresh groundwater overlies the saline marine water in the aquifer. As groundwater flowing from the Jandakot Mound approaches the coast at Cockburn Sound it is forced over the dense saline wedge and then discharges into the shallow near shore zone (D.A. Lord & Associates, 2001). This salt water/groundwater interface occurs along the coast and can in places extend almost 1km inland.

Groundwater flow through the Tamala Limestone is highly variable and ranges between 200 and 2000m per year (Davidson, 1995). Groundwater flow through the Safety Bay Sand is significantly slower at around 20m per year (D.A. Lord, 2001).

The Tamala Limestone is the most productive and widely used aquifer in the Kwinana area with permeability's in the order of 500 to 1500m/day. The Safety Bay Sands are unconsolidated and well compacted with a permeability in the order of 10 to 20m/day (Barnes & Whincup, 1981).

The Superficial Aquifer is underlain by two major confined aquifers: The Leederville Formation and the deeper Yarragadee Formation.

The Leederville Formation aquifer consists of interbedded sandstone, siltstone and shale units. The sand beds are frequently silty and groundwater quality is generally brackish, although local areas of fresh water do occur. Groundwater enters the Leederville Formation from downward leakage through the superficial formations on the edge of the Jandakot groundwater mound and moves westward to discharge at sea (Sinclair Knight Merz, 2002a).

The Yarragadee Formation is separated from the Leederville Formation aquifer by the South Perth Shale, a confining layer, and is a multi-layered aquifer consisting of interbedded sandstone, siltstone and shale. The aquifer contains a large resource of brackish water (Sinclair Knight Merz, 2002a).

5.7 Surface Hydrology and Wetlands

CSBP has constructed a pilot wetland on land leased from the BP Refinery. The wetland covers approximately 1ha (10,000m^2), varies in depth between one and two metres and is lined with heavy-duty black plastic. The wetland is planted with sedges and incorporates a number of processes aimed at reducing the level of nitrogen in the CSBP effluent stream.

The performance of the wetland will be evaluated after two years of operation, and CSBP will decide whether to proceed with up to four cells, covering more than 6ha.

5.8 Marine Environment

The CSBP Kwinana Industrial Complex is located immediately adjacent to Cockburn Sound. Cockburn Sound is 16km long and 9km wide, with a 17m to 22m deep central basin (D.A. Lord & Associates, 2001, p1). Garden Island extends along almost the entire western side of the Sound, providing shelter from ocean swells. Shallow waters are located at the southern and northern entrances to the Sound. The depth of Cockburn Sound and its degree of shelter from ocean swell make it is also the most intensively used marine embayment in Western Australia.

In response to increasing pressures on the Sound, the Western Australian Government established the Cockburn Sound Management Council (CSMC) in August 2000 to coordinate environmental planning and management of Cockburn Sound and its catchment. At the same time as the CSMC was formed, the EPA commenced drafting the *(Draft) Environmental Protection (Cockburn Sound) Policy 2002*. The Policy outlines the environmental values, objectives and criteria for managing Cockburn Sound, and requires the preparation of an Environmental Management Plan by the Cockburn Sound Management Council. The Minister for the Environment approved an interim Environmental Management Plan for Cockburn Sound and its Catchment in December 2002.

In January 2005, the Western Australian Government released the *State Environmental (Cockburn Sound) Policy 2005* (a revision of the *Revised Draft Environmental Protection (Cockburn Sound) Policy 2002)* and associated documents including:

- *Environmental Quality Criteria Reference Document For Cockburn Sound (2003 - 2004)*, (EPA, 2005a);
- *Manual of Standard Operating Procedures for Environmental Monitoring against the Cockburn Sound Environmental Quality Criteria (2004)* (EPA, 2005b); and
- *Environmental Management Plan for Cockburn Sound and its Catchment* (Cockburn Sound Management Council, 2005).

The Environmental Management Plan builds on the previous studies including the *Cockburn Sound Environmental Study* (Department of Conservation and Environment, 1979), the *Southern Metropolitan Coastal Waters Study* (Department of Environmental Protection, 1996) and, a compilation of the most recent work, the *State of Cockburn Sound* report (D.A. Lord & Associates, 2001). Much of the background information in the Plan is drawn directly from the *State of Cockburn Sound* report (D.A. Lord & Associates, 2001).

Sections 5.8.1 to 5.8.3 provide a brief overview of the environmental setting of Cockburn Sound, as described in the *Southern Metropolitan Coastal Water Study* (SMCWS) (Department of Environmental Protection, 1996) and *The State of Cockburn Sound: a Pressure-State-Response Report* (D.A. Lord & Associates, 2001). Where relevant, Sections 5.8.1 to 5.8.3 also include more recent information obtained from the *Environmental Management Plan for Cockburn Sound and its Catchment*

(Cockburn Sound Management Council, 2005), which is based on the national approach to water quality management outlined in the ANZECC/ARMCANZ (2001a) *National Water Quality Management Strategy*.

5.8.1 Water Movement

As a result of the protected nature of the Sound, the three main processes that control its hydrodynamics are:

- wind;
- horizontal pressure gradients due to wind, tides, waves, atmospheric pressure and continental shelf waves (which create differences in water pressure due to differences in water level); and
- horizontal pressure gradients due to buoyancy effect (differences in water density).

Based on the relative importance of wind and pressure gradients in determining circulation patterns and flushing, the three distinct hydrodynamic regimes have been identified in Cockburn Sound: 'summer', 'autumn' and 'winter-spring' (Department of Environmental Protection, 1996).

The key characteristics of the three seasons are as follows (D.A. Lord & Associates, 2001):

- **"Summer**. During summer, winds are the most important factor controlling the hydrodynamics. Circulation is wind-driven and the waters within both the Sound and adjacent waters are vertically well mixed and therefore well oxygenated due to a combination of wind mixing during the day (due to sea breezes) and surface cooling of the water column at night (cooler surface waters sink towards the seabed, enhancing vertical mixing).
- **Autumn**. During autumn the wind subsides and pressure gradients determine the circulation. The waters in the Sound are of a greater density (cooler and saltier) compared to adjacent waters due to evaporation that has occurred during the summer and rapid cooling during autumn. The gradient between the denser waters of Cockburn Sound and the lighter adjacent water controls the flushing of Cockburn Sound to the greatest extent. Stratification within the Sound becomes apparent due to movement of lighter water into the Sound, and as noted previously, extended periods of calm may result in oxygen depletion of bottom waters.
- **Winter-spring.** In this 'season' the circulation is primarily driven by pressure gradients, punctuated by periods of wind-driven circulation due to storm activity. The waters within the Cockburn Sound become progressively lighter than waters further offshore due to the relative lowering of salinity. Salinity is lowered within Cockburn Sound due to freshwater inflow, particularly from rivers. The relatively rapid response of the shallow waters of Cockburn Sound to heating (compared to offshore waters) as spring progresses also contributes to

the relative decrease in density. Denser water moves into the lower depths of Cockburn Sound during calm periods (wind speeds typically less than 5m/s), and stratification persists until broken down by the passage of winter low pressure systems about every 7-10 days".

5.8.2 Water Quality

The water quality at eight monitoring sites within Cockburn Sound has been monitored during 'summer' (December to March) since 1977 (D.A. Lord & Associates, 2001).

Average water temperature in Cockburn Sound varies from about 16^{o}C in winter to 24^{o}C in summer (±2-3^{o}C in the shallows, depending on the time of year). Water salinity in Cockburn Sound varies slightly from that of the open ocean (which is about 35 parts per thousand (ppt)), typically reaching 36ppt in autumn and declining to about 34ppt in winter (D.A. Lord & Associates, 2001).

The waters of Cockburn Sound are generally well oxygenated, although if calm weather persists for more than a week the deep waters at the southern end of the Sound may become low in oxygen (D.A. Lord & Associates, 2001).

The following overview of historical information on water quality in Cockburn Sound has been excerpted from *The State of Cockburn Sound: A Pressure-State-Response Report* (D.A. Lord & Associates, 2001, pp v-vi):

> *"Studies in the late 1970s found that industrial discharge into Cockburn Sound had caused widespread contamination of sediments and biota, poor water quality and widespread loss of seagrass on the eastern margin of the Sound. The loss of seagrass was attributed to light starvation due, in turn, to shading caused by nutrient-stimulated growth of epiphytes (algae that grow on seagrass leaves) and phytoplankton (microscopic algae in the water). The two main sources of nutrients were pipeline discharges: the KNC/CSBP outfall, and the Water Authority's Woodman Point wastewater treatment plant outfall.*
>
> *In the early 1990s, the Southern Metropolitan Coastal Water Study (SMCWS) found that seagrass dieback had slowed considerably, but nutrient-related water quality was only slightly better than in the late 1970s. Contaminated groundwater had replaced industrial discharge as the main nitrogen input to the Sound, and came mainly from two short areas of coastline: the southern part of the Kwinana Industrial Area; and in the Jervoise Bay Northern Harbour. Industrial discharge of metals and organic contaminants (eg. pesticides and petroleum products) had decreased substantially, as had contamination of sediments and biota. The introduction of foreign marine organisms via shipping activities (ballast discharge, hull fouling) was also raised as a concern.*
>
> *Work undertaken since the early 1990s has found no further deterioration of the health of surviving seagrass meadows, and no significant losses related to water quality. Overall water quality has improved slightly since the early*

1990s, apart from in the Jervoise Bay Northern Harbour. Nutrient inputs from human activities have declined from an estimated 2000 tonnes/year in 1978 to about 300 tonnes/year in 2000, about 70% of which is from groundwater. The three main areas from which nutrient-rich groundwater is coming are: the southern part of the Kwinana Industrial Area (74 tonnes/year); the Jervoise Bay Northern Harbour (66 tonnes/year); and rural areas (46 tonnes/year).

Estimated amounts of metals and oil discharged by industry have continued to decrease due to improved waste treatment practices, and are presently about one sixth to one thousandth of those discharged in 1978, depending on the contaminant in question. A 1999 sediment survey found that contaminant levels (including arsenic and mercury) were well below environmental guidelines, apart from TBT in some areas…A survey in 1999 also confirmed the presence of two acknowledged foreign marine pests in the Sound: the European fan worm Sabella cf. Spallanzanii, and the Asian date mussel Musculista senhousia. These two pests are prolific growers and can out compete native species, affecting biodiversity, but this does not seem to be occurring in Cockburn Sound.

Nutrient-related water quality remains one of the two main environmental concerns in Cockburn Sound, and there have been concerted efforts by industry to reduce nitrogen inputs from groundwater. WMC's Kwinana Nickel Refinery has reduced nitrogen discharges from about 500 tonnes/year in 1990 to 8 tonnes/year; there has been a 14% improvement at the Wesfarmers CSBP site in the four years to 2000, and inputs to the Jervoise Bay Northern Harbour are expected to decrease from 66 tonnes/year to 26 tonnes/year within a year.

Nutrient-related water quality has been monitored by means of summer surveys of chlorophyll levels (an accepted measure of phytoplankton growth) since 1977. There have been large decreases in nitrogen inputs to the Sound during summer, but this has not been matched by a similar decrease in chlorophyll levels. Up to 1990, the largest nutrient input to Sound was a 'point' source (the KNC/CSBP outfall) that was clearly related to overall chlorophyll levels in the Sound. Now chlorophyll levels are mainly determined by sediment nutrient cycling and diffuse nutrient inputs (groundwater), and the relationship between nutrient inputs from human activities and chlorophyll levels is less direct. With the present level of understanding, it is not possible to predict to what extent further reductions in diffuse nutrient inputs from human activities will reduce overall chlorophyll levels in the Sound, and available data indicate any response is likely to be slow. Further reductions in diffuse nutrient inputs should, however, result in localised improvements in water quality.

The other main environmental concern in Cockburn Sound is TBT contamination, and a number of management measures address this. The WA State Government has banned the use of TBT on vessels less than 25m long, and restricted its use to low-leaching paints on boats over 25m. The Royal Australian Navy ahs banned TBT use on ships less than 40m in length,

and is replacing TBT on larger warships with a copper based paint. The Fremantle Port Authority has banned 'in water' hull cleaning when ships are at berth (believed to be a major contributor of TBT to sediments). Insofar as international shipping is concerned, the International Maritime Organisation has recently announced that it will ban application of TBT to ship's hulls form January 2003. These measures are expected to produce significant decreases in TBT contamination due to shipping movements. The high levels of TBT in Cockburn Sound sediments at present appear to be more related to shipping maintenance areas than shipping movements, and forthcoming bans on the use of TBT should reduce inputs from these areas too".

As indicated previously, the Western Australian Government released the *State Environmental (Cockburn Sound) Policy 2005* and associated documents including an *Environmental Management Plan for Cockburn Sound and its Catchment* (Cockburn Sound Management Council, 2005) in January 2005.

The *Environmental Management Plan* (Cockburn Sound Management Council, 2005, p9) indicates that the environmental quality criteria for Cockburn Sound will be compared against the current data available for the Sound, with the results of the comparison simplified and summarised in the form of 'report cards' to allow managers and the community to clearly see the areas where a management response is required. It should be noted that the 'report card' assessment is very general by nature, relating to the whole of Cockburn Sound. It provides a broad assessment of the scale of the problems and the overall management response.

Report cards for areas afforded a high level of protection (the broader area of Cockburn Sound) and a moderate level of protection (the eastern foreshore) are included as Tables 4a and 4b respectively in the *Environmental Management Plan* (Cockburn Sound Management Council, 2005).

In relation to toxicants in water (metals and metalloids, non-metallic inorganic compounds, organics, pesticides, herbicides and fungicides, surfactants, hydrocarbons and miscellaneous/others), the following comment was made for both high and moderate level of protection areas (Cockburn Sound Management Council, 2005):

- For the range of water toxicants monitored to date (April 2003), levels are either below the guidelines or below normal laboratory detection limits. These parameters were not intended to be sampled on an annual basis.

Further information on water quality is presented in Section 6.5.3.

5.8.3 Sediment Quality

Shallower areas experience more wave and current action (which causes the finer particles to become suspended and swept away) and so have sandy sediments (D.A. Lord & Associates, 2001).

Deeper areas of Cockburn Sound accumulate fine organic particles (eg. dead plankton, faecal material), and so sediments tend to be fine and silty and are naturally more organically enriched than shallower areas (D.A. Lord & Associates, 2001).

The proportion of fine particles (the silt and clay fraction) influences the amount of naturally present metals: the more silt and clay, the higher the metal levels. The original source of a sediment (eg. calcium carbonate from marine organisms versus material eroded from the land) also has a strong influence on natural levels of metals as calcium carbonate generally has lower levels of metals than sediments eroded from the mainland (D.A. Lord & Associates, 2001).

Sediments also contain metals and other contaminants from anthropogenic sources. It is often difficult to determine what impact the presence of contaminants from natural and man-made sources have on the marine environment, as it is dependent on a variety of factors such as the bioavailability (which is influenced by factors such as the amount of organic matter, silt and clay) of the contaminant and the sensitivity of the receptor.

In the 1976-79 Cockburn Sound Environmental Study (Department of Conservation and Environment, 1979), widespread contamination of sediments was found. A subsequent study undertaken as part of the SMCWS in 1994 found that contaminant levels had decreased significantly since the late 1970s due to large reductions in wastewater discharges from industry. Metal levels found in 1994 were generally below the Department of Environment draft sediment quality guidelines, with the exception of arsenic and mercury in some localised areas near industries or harbours. Very high levels of tributyltin (a highly toxic ingredient in antifoulant paints commonly used on large commercial vessels) were also found throughout Cockburn Sound, particularly near shipping facilities. Organic contaminants (eg. pesticides, petroleum hydrocarbons, polychlorinated biphenyls) were present at very low levels in 1994, and were not considered cause for concern. Organic matter and nitrogen in the sediments of the deep basin at the southern end of Cockburn Sound were higher in 1978 than in 1994, presumably due to the greater phytoplankton production (D.A. Lord & Associates, 2001).

A number of SMCWS sites were re-sampled in 1999 using the same sampling techniques and analytical methods (D.A. Lord & Associates, 2000). Although low concentrations close to or below the limit of detection make it difficult to compare the results of the 1994 and 1999 studies, it was concluded that arsenic concentrations (and all other metals) in Cockburn Sound sites were well below the national 'Interim Sediment Quality Guidelines' (ISQCs) for the protection of marine ecosystems and TBT contamination was less than indicated by 1994 results (D.A. Lord & Associates, 2001).

More recently, the report cards for areas afforded a high level of protection (the broader area of Cockburn Sound) and a moderate level of protection (the eastern foreshore) in the *Environmental Management Plan* (Cockburn Sound Management Council, 2005) contained the following comments in relation to toxicants in sediments (metals and metalloids, organometallics (e.g. TBT) and organics) for each level of protection area:

- **High:** Additional sampling for TBT required. For the range of sediment toxicants monitored to date (April 2003), levels are either below the guidelines or below normal laboratory detection limits. Sampling did not occur this sample period.

- **Moderate:** TBT met the guideline in the general moderate protection area. Key areas surrounding the harbours and the Kwinana Bulk Jetty exceeded their guideline. The resample trigger was exceeded in Jervoise Bay North Harbour. TBT levels are increasing in the harbours and no data is available for Careening Bay (naval waters). For the range of sediment toxicants monitored, levels are generally below guidelines or below normal laboratory detection limits. Cadmium levels at the Kwinana Bulk Jetty triggered an investigation in 2003. Further testing in September 2003 did not require re-sampling but were still of concern. Current levels (April 2004) are below guidelines.

5.9 Aboriginal and European Heritage

A search of the Register of Aboriginal Sites held by the Department of Indigenous Affairs indicates that no previously recorded Aboriginal sites are listed as being located within or overlapping the CSBP Kwinana Industrial Complex.

Sinclair Knight Merz (2002a) reported that McDonald, Hale and Associates undertook a heritage survey of the KIA in 1993 did not discover any archaeological sites. The ethnographic survey involved five Aboriginal consultants and a number of meetings with a local Aboriginal community organization and identified two ethnographic sites, a campsite and a mythological site (a spring), in the vicinity of James Point in the undeveloped coastal fringe of the 1993 study area. Neither of these sites would be impacted upon directly by the CSBP Kwinana Industrial Complex.

A search of the Register of Heritage Places maintained by the Heritage Council of WA and the Register of the National Estate maintained by the Heritage Commission of Australia did not identify any sites of interest within the vicinity of the CSBP Kwinana Industrial Complex.

5.10 Social Environment

The nearest major residential areas to the CSBP Kwinana Industrial Complex are Medina and Calista, located approximately three kilometres inland to the east. The town centre of Kwinana is screened from the industrial strip on the coastal plain by a ridge of well-vegetated dunes. Other nearby residential areas includes Orelia, Parmelia, Leda and North Rockingham.

As noted previously, the CSBP Kwinana Industrial Complex is located within the KIA which was established by the Western Australian Government to serve as a strategic industrial area for the Perth Metropolitan Region. Consequently, the KIA has been the subject of many strategic planning studies over the years with the aim of ensuring suitable industrial development is facilitated. A buffer zone has been established around the KIA to accommodate risk, noise and air emissions (Figure 7).

CSBP and Coogee Chemicals are full members of the Kwinana Industries Council (KIC). The KIC was founded in 1991 to:

- promote a positive image of Kwinana industries;
- work towards the long-term viability of Kwinana industry;
- coordinate a range of intra-industry activities including water quality, air quality, monitoring and emergency management;
- highlight the contribution Kwinana industry makes to community; and
- liaise effectively with local communities, government and government agencies.

In 2002, the KIC and Chamber of Commerce and Industry of WA investigated the potential economic and social benefits of the KIA as reported in *Kwinana Industrial Area Economic Impact Study – an Example of Industry Interaction* (Sinclair Knight Merz, 2002b). The study showed that the Kwinana industries contribute a wide range of economic and social benefits to the local community, WA and Australia. Kwinana industries provide direct and indirect employment, services and social initiatives and support for local community issues, with 70% of employees of the KIA living locally.

The major industry members of the KIC initiated the Kwinana Industries Education Partnership (KIEP) in 1993, which was officially launched in 1995. The KIEP is a formal agreement between members of the KIC and local senior high schools to work together to develop mutually beneficial long-term relationships in order to achieve excellence in education that broadens the learning experiences of students. The KIEP program has increased upper school retention rates from 68% to 82% since 1995, and the industry actively supports more than 800 apprenticeships and traineeships.

KIC also actively supports community consultation programs, such as the Communities and Industries Forum.

In addition, CSBP is a sponsor of the:

- Curtin University's Centre of Excellence in Cleaner Production;
- University of Western Australia (Albany Campus) Sustainability Fund; and
- Numerous community-based programs around the KIA.

6. ASSESSMENT AND MANAGEMENT OF ENVIRONMENTAL FACTORS

6.1 Summary of Relevant Environmental Factors

The potential environmental factors related to the proposed solid sodium cyanide plant upgrade are considered to be:

Emissions Management

- Air Quality - Gaseous and Particulate Emissions.
- Greenhouse Gas Emissions.
- Noise.
- Liquid Wastes/Surface Water Discharges.

Social Surroundings

- Risk.
- Transport.

No direct impact to the biophysical environment encompassing flora, vegetation and fauna communities is envisaged given that the proposed expansion will be located entirely within the existing solid sodium cyanide plant, with the exception of the addition of two new cooling tower cells (see Figure 2).

A detailed discussion about the existing environment, potential impacts and management strategies for each environmental factor is provided in Sections 6.2 to 6.7. A summary of the potential environmental impacts and management strategies is provided in Section 6.8.

In Sections 6.2 to 6.7 most of the "Environmental Objectives" have been derived from the Environmental Protection Authority *Guide to EIA Environmental Factors and Objectives* (EPA, 2002b). Where objectives for environmental factors have not been published by the EPA, AGR has presented its own objective to ensure the relevant environmental factor is adequately addressed, and an acceptable environmental outcome is achieved.

6.2 Air Quality - Gaseous and Particulate Emissions

6.2.1 Environmental Objective

Ensure that emissions do not adversely affect the environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards (EPA, 2002b).

6.2.2 Applicable Standards, Guidelines or Procedures

Selected ambient air quality and occupational health and safety guideline levels for ammonia, hydrogen cyanide and sodium cyanide particulate are presented in Table 7.

TABLE 7
AMBIENT AIR QUALITY AND OCCUPATION HEALTH AND SAFETY GUIDELINES

Compound	Guideline Type	Reference	Concentration ($\mu g/m^3$)
Ammonia (NH_3)	Ambient Air Quality (1 hour averaging time)	OEHHA[1] (California)	3,200
	Ambient Air Quality (annual average)	USEPA[2] (United States)	100
Cyanide[3]	Ambient Air Quality (1 hour averaging time)	OEHHA[3] (California)	340
	Ambient Air Quality (annual average)	OEHHA (California)	9
Particulates[4] $PM_{2.5}$	Ambient Air Quality (24 hr)	NEPM[5] (Australia)	25

Notes
1. OEHHA (2003).
2. USEPA (2004).
3. All cyanide guideline levels presented in Table 7 are for hydrogen cyanide. Ambient air quality criteria are not available for sodium cyanide, but occupational health criteria for sodium cyanide are less strict than for hydrogen cyanide. This indicates that sodium cyanide has a lower toxicity than hydrogen cyanide. Therefore, the use of the hydrogen cyanide guideline levels for the total cyanide emitted is conservative.
4. The NEPM PM_{10} criterion has not been included as an ambient guideline level as there is no information on particle size distribution for the AGR particulate emissions. It has therefore been assumed that all particles are $PM_{2.5}$ or less (the most conservative approach). The NEPM PM_{10} criterion (24-hr average concentration) is $50ug/m^3$, so all emissions complying with the $PM_{2.5}$ criterion will also comply with the PM_{10} criterion.
5. National Environmental Protection Council (1998).

OEHHA is the Californian Office of Environmental Health Hazard Assessment. The OEHHA criteria were also selected as they are recognized as being conservative, with guideline values generally lower than other organizations such as the United States Environmental Protection Authority (USEPA) or World Health Organisation (WHO). As the OEHHA sets values for a range of parameters not included in other sets of guidelines it is commonly used as a reference source.

Also, there are few guideline values for hydrogen cyanide ambient air quality (there are no hydrogen cyanide guideline values provided by USEPA or WHO, for example), and so for the sake of uniformity, the OEHHA guideline value was also used for ammonia.

NEPM criteria are available for a small number of key contaminants, including $PM_{2.5}$. They have been ratified by all Australian states, and are the first guideline to be considered in such assessments.

6.2.3 Existing Environment

Figure 6 is a schematic diagram of the atmospheric emissions management system.

The main compounds emitted from the sodium cyanide solids plant are:

- Ammonia; and

- Cyanides (CN), comprising hydrogen cyanide gas (HCN) and sodium cyanide particulates (NaCN).

Emissions data for the existing solid sodium cyanide plant is included in Table 8.

The nearest sensitive residential premises are located approximately 3km to the east of the site in Medina and Calista.

6.2.4 Methodology

The air dispersion modelling was completed using the Industrial Source Complex Short Term Version 3 with Plume Rise Model Enhancement (ISC3 Prime). ISC3 Prime is one of the United States Environment Protection Agency's (USEPA) recommended air dispersion models and is used extensively for regulatory assessments of industrial sources.

ISC3 Prime is a conventional Gaussian plume dispersion model that includes enhanced treatment of the effects of buildings on plume dispersion. Since there are a number of buildings and structures in the vicinity of the cyanide plants, ISC3 Prime was considered to be the most appropriate model to use in this study. The ISC3 Prime model does not consider effects of coastal fumigation; however this is not expected to be significant in this instance due to the relatively low stack heights.

Modelling was completed in accordance with the *Air Quality and Air Pollution Modelling Guidance Notes* (Department of Environmental Protection, 2000a). An ISC configuration file is included in Appendix 2 to allow the DoE AQMB to audit the modelling process.

6.2.5 Assessment

ENVIRON were commissioned to undertake air dispersion modelling to assess the air quality impacts associated with the upgrade. The following information has been excerpted from the air modeling report, which is included in full as Appendix 2.

The air dispersion model included the cumulative impact of emissions from the two liquid sodium cyanide plants, which are located in close proximity to the solids plant.

The following scenarios were modelled:

- current normal operation of the solids plant in isolation (25,000 tpa);
- upgraded operation of the solids plant in isolation (45,000 tpa);
- current operation of the solids plant (25,000 tpa) and both liquid plants; and
- upgraded operation of the solids plant (45,000 tpa) and both liquid plants.

Emissions from the liquid plants are significantly higher during start-up than during normal operation (see Table 8). This occurs approximately fifteen times a year (total for both plants) and is managed under Condition A4 of the *Environmental Protection Act* licence (see Appendix 1), which specifies the meteorological conditions (wind speed and direction) under which start-up may occur. Note that the arc restrictions (wind direction) and wind speeds specified in Condition A4(a) have been amended

following negotiations with the Department of Environment and the revised arc restrictions and wind speeds will be included in the next licence due to commence late March 2005.

For each of the above scenarios, the air dispersion model was used to predict the maximum 1-hour and annual average ground level concentrations in the vicinity of the plants. The stack parameters and emission rate data used are presented in Table 8.

The emissions data presented in Table 8 reflect the current *Environmental Protection Act* licence limits rather than actual emission rates, which are lower than the licence limits. The upgraded emissions data reflect emission rates as predicted by AGR. These are considered worst case emissions for both the current and upgrade scenarios.

TABLE 8
STACK PARAMETERS AND EMISSIONS DATA[1]

Stack	Height (m)	Exit Diameter (m)	Exit Temp (Kelvin)	Exit Velocity (m/s)	Ammonia Emission (g/s)[2]	Cyanide Emission (g/s)[2,3]	Total particulates (g/s)
Solids Plant (current)	39	0.5	313	12.1	0.6	0.58	0.005
Solids Plant (upgraded)	39	0.5	313	21.7	1.2-1.5[5]	0.58	0.007
Liquid Plant 1 Normal Operation	30.4	1.2	473	17.7	0.438	-	-
Liquid Plant 2 Normal Operation	30	1.1	423	15.8	0.367	-	-
Liquid Plant 1 or 2 Start-up	27	0.5	363	16.8	179	59.8	-

Notes:
1. Data provided to ENVIRON by AGR via emails of 16 August 2001 and 11 October 2004.
2. Current emissions data, and predictions of emissions data following the upgrade, were made by AGR and forwarded to ENVIRON via email on 6 December 2004.
3. The reported cyanide emission comprises both hydrogen cyanide gas and sodium cyanide particulate.
4. The reported particulate emission is composed mostly of sodium cyanide particles of unknown size distribution.
5. The reported ammonia emission rate of 1.2g/s following the upgrade is expected to be achieved for the majority of the time however short peaks of 1.5g/s may be possible. Both emissions scenarios have been modeled.

The predicted maximum 1 hour average ground level concentrations (GLC) and the highest predicted annual average ground level concentration for the four scenarios is presented in Table 9.

The results presented in Table 9 indicate that if ammonia and cyanide are emitted at current or proposed licence limit emission rates, the resultant ground level concentrations would be significantly lower than relevant ambient air quality criteria.

TABLE 9
AIR DISPERSION MODEL RESULTS

Scenario	Maximum Predicted 1 Hour Average Ground Level Concentrations				Highest Predicted Annual Average Ground Level Concentration			
	Ammonia		Cyanide		Ammonia		Cyanide	
	Max GLC	% of guideline[1]	Max GLC	% of guideline[1]	Max GLC	% of guideline[1]	Max GLC	% of guideline[1]
Current Solids Plant in Isolation	62	2	60	18	0.7	1	0.7	8
Upgraded Solids Plant in Isolation	124	4	60	18	1.5	2	0.7	8
Current Solids Plant and Both Liquid Plants	62	2	60	18	1.0	1	0.7	8
Upgraded Solids Plant and Both Liquid Plants	124	4	60	18	1.7	2	0.7	8

Notes:
1. The guideline level referred to in Table 9 is the relevant ambient air guideline from Table 7.

The following contour plots are presented in Appendix 2:

- maximum predicted 1 hr average ammonia ground level concentrations during concurrent operation of the solids plant (at current and proposed licence limit levels) and both liquid plants;
- predicted annual average ammonia ground level concentrations during concurrent operation of the solids plant (at current and proposed licence limit levels) and both liquid plants; and
- maximum predicted 1 hr and annual average cyanide (hydrogen cyanide and sodium cyanide) ground level concentrations during concurrent operation of solids plant and both liquid plants.

The contour plots indicate that the highest maximum GLC for the 1 hour average ammonia and cyanide, and annual average cyanide, are predicted to occur within 10m of the stack, due to building wake effects. The location of the highest annual average ammonia is located approximately 200m east and 400m north of the stack.

Contribution of Increased Ammonia Emissions

The current *Environmental Protection Act* licence for the sodium cyanide solids plant has a target level of 0.6g/s for ammonia. However, AGR expects that this emission rate may be difficult to achieve following the upgrade, and proposes an ammonia concentration of 1.2g/s with occasional measurements of up to of 1.5g/s.

The modelling predicts that increasing the emission rate of ammonia from 0.6g/s to 1.2g/s will increase the 1 hour average ground level concentrations. The maximum 1 hour average ground level concentration 500m from the plant is predicted to rise from approximately 18µg/m^3 to approximately 40µg/m^3 (1.2g/s emission rate) or 50µg/m^3 (1.5g/s emission rate). The highest annual average ground level concentration 500m from the plant is predicted to rise from approximately 0.9µg/m^3 to approximately 1 µg/m^3 (1.2g/s emission rate) or 1.5µg/m^3 (1.5g/s emission rate). The predicted ground

level ammonia concentrations associated with the upgrade are well below published ambient air quality and occupational health exposure levels (refer Table 7).

CSBP Limited has commissioned Environ to conduct a preliminary atmospheric emissions screening assessment of Kwinana industries (ENVIRON, 2005). In the study, National Pollutant Inventory records were examined to identify those industries that emit ammonia to the atmosphere, and air dispersion modelling was undertaken to assess long-term cumulative impacts of emissions at selected community receptor locations. The study provides the most useful information to date regarding the cumulative impacts of ammonia emissions in Kwinana, as ambient monitoring for the chemical is not required under any industry licence and is not included as a parameter in the Department of Environment's ambient monitoring program.

The study concluded that the dominant contributor source of ammonia emissions in Kwinana is an industrial premise located south of the AGR site. The study predicted that the highest ground level ammonia concentration at any of the receptor locations is at Kwinana Beach, and that the ground level concentration at this location is approximately half the USEPA annual ambient air quality standard.

The solids plant upgrade is predicted to result in modest increases in the relative contribution to ground level impacts. However, given that the current contribution of the plant is small compared to neighbouring industrial sites, and that the cumulative impact of ammonia emissions from all sources within the Kwinana industrial strip is predicted to be within guideline criteria, the increases associated with the upgrade are not expected to be significant in a regional context.

Contribution of Increased Cyanide Emissions

The solids plant produces solid sodium cyanide briquettes from a 30% sodium cyanide solution through a process which includes evaporation, dehydration and compaction. The entire solid sodium cyanide plant operates under a vacuum so that any sodium cyanide dust from the spin flash dryer and solids handling section of the plant is removed. Treatment of the off gases is provided by a venturi and packed gas scrubber to remove sodium cyanide dust and hydrogen cyanide. From these scrubbers low level concentrations of hydrogen cyanide (gaseous) and particulates of sodium cyanide are emitted to the atmosphere.

The current *Environmental Protection Act* licence limit for total cyanide (gaseous and particulate) is 0.58g/s. Current monitoring results from stack tests conducted on a monthly basis are below licence limits (average concentration is 0.35g/s). The air emission modelling conducted utilised the licence limit of 0.58g/s total cyanide for both the current and upgraded scenarios as a conservative case. The licence limit represents the worst case scenario at the current production rate of 25,000tpa. Process improvements on the scrubbers will be undertaken to ensure the concentration of total cyanide remains at or below 0.58g/s at a production rate of 45,000tpa. National Pollutant Inventory (NPI) records indicate AGR is the single source of cyanide air emissions from static sources in Kwinana/Rockingham.

The air emission modelling indicates that a concentration of 0.58g/s (total cyanide) results in a maximum ground level concentration of 0.7$\mu g/m^3$ (annual average). This

is 8% of the relevant ambient air guideline of 9µg/m^3 (annual) as outlined by the OEHHA (this maximum GLC occurs within 400m of the plant well away from sensitive receptors).

Particulates are sampled, collected on a filter and measured as part of monthly stack testing commitments. The results of particulates on average are 0.3mg/m^3 however the worst reading of 2.3mg/m^3 was utilized for the air emission modelling. The modelling conducted assumed all particles to be $PM_{2.5}$ (i.e. they are diameter 2.5 micron of smaller). AGR has not conducted particle size distribution tests as results of stack tests indicate the concentration of particulates to be very low. This assumption provides a conservative estimate of impacts since the health risk of particulates tends to decrease with increasing particle size. An increase to 3mg/m^3 was predicted for the upgraded production rate of 45,000tpa. The air emission modelling predicted that the maximum 24 hour average ground level concentration for the upgraded scenario is 0.6µg/m^3, which is less than the 3% of the NEPM standard for $PM_{2.5}$ (this maximum GLC occurs within 400m of the plant well away from sensitive receptors).

6.2.6 Management

During normal operation, the gaseous emissions are directly vented to the atmosphere from the scrubber stack. The stack is tested on a monthly basis for emissions of ammonia and total cyanide (including gaseous and particulates) in accordance with AGR's *Environmental Protection Act* licence.

The ammonia emissions from the sodium cyanide solids plant will increase as a result of the upgrade yet remain well below published ambient air quality and occupational health exposures levels. Emissions of ammonia are predicted to generally be 1.2g/s or lower with occasional excursions between 1.2g/s and 1.5g/s. The modelling report assumes an ammonia emission of 1.5g/s as the worst possible case (this worst case will be approached rarely during operation). As with the existing plant, the ammonia emissions will be treated through a chilled water scrubber which is situated after the vacuum pumps. AGR believes that this system is capable of ensuring that the emissions from the stack remain at or below 1.2g/s. As a consequence of the predicted ammonia emissions for the upgrade exceeding the current *Environmental Protection Act* licence limit, it is proposed to seek a revision of the ammonia atmospheric emission limits.

The emissions of total cyanide for the upgraded production rate of 45,000 tpa will increase to 0.58g/s, which is the current *Environmental Protection Act* licence limit. Particulate emissions are well below NEPM standards. Emissions of total cyanide will be managed through improvements in the scrubbing system. The maximum ground level concentration of total cyanide (particulates and gaseous remains) is significantly lower than relevant air quality criteria. Stack testing will continue on a monthly basis or as outlined in the *Environmental Protection Act* licence.

The only other gaseous discharge will be minor fugitive emissions arising from the venting of vessels prior to maintenance activities. This is a necessary safety requirement prior to undertaking work on pipelines and vessels containing process gases. These will be controlled in accordance with industry standard procedures to

minimise the volume of gases emitted and any potential environmental impact. It is not anticipated that the current proposal will significantly impact on such discharges.

6.2.7 Comments on Relevance of Factor

Based on the modelled prediction of ground level concentrations of gaseous emissions, it is considered that the increase in gaseous emissions is minor and manageable.

6.3 Greenhouse Gas Emissions

6.3.1 Environmental Objective

To minimise emissions to levels as low as practicable on an on-going basis and consider offsets to further reduce cumulative emissions (EPA, 2002b).

6.3.2 Applicable Standards, Guidelines or Procedures

The EPA's position with respect to greenhouse gas issues is detailed in *Guidance for the Assessment of Environmental Factors, Statement No. 12: Minimising Greenhouse Gas Emissions* (2002c).

As part of the Commonwealth's efforts to control greenhouse gas emissions the Greenhouse Challenge program has been developed. The Greenhouse Challenge Program is a key element of the National Greenhouse Response Strategy and is derived from the Greenhouse 21C program. It is a cooperative agreements program for industry and government to work together in meeting Australia's obligations under the Framework Convention on Climate Change.

CSBP (including AGR operations) has been a signatory to the Greenhouse Challenge Program since 1997.

6.3.3 Existing Environment

Greenhouse gas emissions are mainly from power consumption, natural gas consumption, direct carbon dioxide (CO_2) from incinerators and natural gas purifiers and nitrous oxide (N_2O) emissions.

The liquid sodium cyanide production process involves exothermic reactions which generate heat. This heat is converted to steam and used to produce electricity. The Sodium Cyanide Manufacturing Facility is in fact a nett power generator.
Natural gas is utilised in the plant as a raw feed as well as a fuel for incineration of waste gases. Incoming natural gas is passed through a CO_2 Absorber containing 30-50%w/w methyldiethanolamine (MDEA). The CO_2 rich MDEA is then transferred to the CO_2 stripper where the CO_2 is driven out of the MDEA by heat. The MDEA is continuously re-circulated to remove CO_2 from the natural gas intake.

CO_2 emissions from the Gas Purification Plant are monitored monthly. Emissions for 2003/04 ranged between 118 and 178 tonnes CO_2/month.

The purified natural gas is mixed with air and ammonia before entering the hydrogen cyanide reactor where the proportionately mixed gases pass over heated (~1050^{O}C) platinum-rhodium gauzes to produce hydrogen cyanide gas.

The hydrogen cyanide gas then enters the lower section of the main stage of the absorber tower. The sodium cyanide solution is produced when circulating sodium cyanide solution with excess sodium hydroxide comes into contact with the hydrogen cyanide gas in the packed beds. As previously mentioned, CO_2 is removed from feed gas as excessive amounts of CO_2 results in the generation of sodium carbonate by-product, reducing available sodium hydroxide for the production of sodium cyanide.

The gas leaving the top of the absorber tower flows to the suction blowers and is transferred to the John Zinc or Maxitherm incinerator where natural gas is used to incinerate waste gases. The waste gases consisting of carbon monoxide (CO), CO_2 and small concentrations of hydrogen cyanide are discharged to atmosphere. The incinerator also incinerates sludge from items of the process plant such as the ammonia vaporiser and separator.

Direct CO_2 emissions from the incinerators are monitored monthly. Average CO_2 emissions from the John Zinc and Maxitherm Incinerators servicing the liquid sodium cyanide plants were 2,025 and 859 tonnes CO_2/month in 2003/04 respectively.

Waste gases from the production process are combusted in incinerators to produce steam which is converted to electrical power in turbine alternators. Staged air combustion and Selective Catalytic Reduction (SCR) are used on the incinerators for SCP 1 and SCP 2 respectively. The combustion process produces oxides of nitrogen (NO_x) and nitrous oxide (N_2O). The latter gas N_2O has a global warming potential 310 times that of CO_2 (using the 100 year timeline recommended by the EPA).

N_2O emissions discharged to the atmosphere from the liquid sodium cyanide plant incinerators are tested monthly. In 2003/04, monthly emissions from the liquid sodium cyanide plants ranged from 0.03 tonnes to 13 tonnes of N_2O. The variation in monthly N_2O emissions is due to the plant production rate and the different technologies used (staged combustion versus SCR Technology) to reduce NO_x emissions. Table 10 shows that N_2O emissions for the current approved production rate equate to approximately 40,692 tonnes of CO_2 discharged to atmosphere.

The calculated greenhouse gas emissions from the Sodium Cyanide Manufacturing Facility for the current production scenario (70,000tpa liquid sodium cyanide and 25,000tpa solid sodium cyanide) and following the proposed upgrade (70,000tpa liquid sodium cyanide and 45,000tpa solid sodium cyanide) are provided in Table 10 (next page).

The data indicates that under the current approved production capacity, the Sodium Cyanide Manufacturing Facility emits 201,074 tonnes of carbon dioxide equivalent (CO_2-e) per year. Of this, the solids plant contributes 9,146 tonnes of CO_2-e per year or 5% of the total emissions from the Sodium Cyanide Manufacturing Facility.

6.3.4 Assessment

Table 10 demonstrates that the only expected change in greenhouse emissions from the facility following the proposed upgrade relate to an increase in power consumed by the solids plant. In 2003/04, the calculated energy consumption rate for the solids plant was 1.18GJ/tonne of solids produced or 0.366 tonnes CO_2-e/tonne of solids produced. Based on an expected throughput of 45,000 of solids, the total greenhouse emissions from the upgraded solids plant will be approximately 16,464 tonnes CO_2-e per annum or 0.366 tonnes CO_2-e/tonne of solids produced.

Accordingly, under the expanded scenario, it is anticipated that greenhouse emissions from the Sodium Cyanide Manufacturing Facility will increase by 3.6% compared to current approved operations. The solids plant contribution to the facility greenhouse gas emissions will increase from 5% to 8%. The solids plant emissions will constitute approximately 1.2% of the total greenhouse gas emissions inventory for CSBP business units. CSBP emissions as a whole will increase by approximately 0.5%. It is evident that the solids plant expansion presents a minimal impact on the greenhouse inventory for the CSBP business as a whole.

TABLE 10
CALCULATED ANNUAL GREENHOUSE GAS EMISSIONS

	PRODUCTION		POWER CONSUMPTION			GAS		CO_2 STACK EMISSIONS			N_2O	SUB-TOTAL	TOTAL SCP
	Tonnes		Tonnes CO_2-e			Tonnes CO_2-e		Tonnes CO_2-e			Tonnes CO_2-e	Tonnes CO_2-e	Tonnes CO_2-e
	Liquids	Solids	Generated	Consumed	Nett	Feed	Fuel	Liquids	Solids	Generated	Consumed	Nett	Feed
CURRENT APPROVED SCENARIO													
SCP1	35,000		-24,994	12,154	-12,840			24,774			2,556	14,490	
SCP2	35,000		-29,154	15,797	-13,357				29,172		38,135	53,950	
SCP1 + SCP2	70,000		-54,148	27,951	-26,197	107,948	12,847	24,774	29,172	2,692	40,692	191,928	
SOLIDS		25,000		9,146	9,146							9,146	
SCP Total		**25,000**	**-54,148**	**37,097**	**-17,051**	**107,948**	**12,847**	**24,774**	**29,172**	**2,692**	**40,692**		**201,074**
UPGRADE SCENARIO													
SCP1	35,000		-24,994	12,154	-12,840			24,774			2,556	14,490	
SCP2	35,000		-29,154	15,797	-13,357				29,172		38,135	53,950	
SCP1 + SCP2	70,000	-	-54,148	27,951	-26,197	107,948	12,847	24,774	29,172	2,692	40,692	191,928	
SOLIDS		45,000		16,463	16,463							16,463	
SCP Total	**70,000**	**45,000**	**-54,148**	**44,414**	**- 9,734**	**107,948**	**12,847**	**24,774**	**29,172**	**2,692**	**40,692**		**208,391**

Notes: SCP1 is the liquid sodium cyanide plant No. 1.
SCP2 is the liquid sodium cyanide plant No. 2.
SOLIDS is the solid sodium cyanide plant.

6.3.5 Management

Notwithstanding the fact that the upgrade is considered to present an insignificant change to our total greenhouse emissions inventory, AGR and CSBP will continue to implement greenhouse abatement initiatives.

A key component in determining the focus of the abatement initiatives has been to refine emissions monitoring and reporting methodologies in consultation with the Australian Greenhouse Office (AGO). As signatories to the Greenhouse Challenge Program, CSBP report annual emissions to the AGO and have engaged an independent auditor who is certified by the AGO to audit the content of CSBP's reports, as well as the systems used to generate the greenhouse data.

In monitoring the greenhouse performance of each of the CSBP units, activities have been broken down into two major components, specifically chemical manufacture and distribution, and fertiliser manufacture and distribution. Separate Key Performance Indicator's (KPI's) have been utilised to assess ongoing performance of all of the manufacturing arms. Within these, KPI's have been developed to measure performance against energy usage (gigajoule (GJ) consumed per tonne product generated) and greenhouse gas emissions respectively (tonnes CO_2-e emitted per tonne product generated).

As previously indicated, the respective KPI's for the sodium cyanide solids plant for 2003/04 were:

- Energy KPI: 1.18 GJ/tonne of solids produced; and
- Greenhouse gas KPI: 0.366 tonnes CO_2-e/tonne of solids produced.

Following the proposed upgrade of the solid sodium cyanide plant, the performance of the solids plant will continue to comply with these performance indicators.

The regular (monthly) monitoring of N_2O from the Sodium Cyanide Manufacturing Facility incinerators has allowed more accurate quantification of N_2O emissions. Applicable findings will be adopted in the Sodium Cyanide Manufacturing Facility where practicable.

N_2O emissions from the Sodium Cyanide Manufacturing Facility incinerator will continue to be monitored.

CSBP has already implemented improvements within the Sodium Cyanide Manufacturing Facility in relation to ammonia conversion efficiencies in reactors. In addition, the optimization of the Gas Purification Plant in 2002/03 to remove CO_2 from feed gas has led to improvements in the overall plant performance. As previously indicated, the Gas Purification Plant prevents excessive amounts of CO_2 entering the feed gas stream which would result in the generation of sodium carbonate by-product and reduce available sodium hydroxide for the production of sodium cyanide in the absorber. An indirect benefit of this is a reduction in energy consumption and associated greenhouse emissions generated elsewhere in the production of sodium hydroxide.

In 2003/04, CSBP implemented a revised method for managing both purchased and self generated electricity at Kwinana. This provides greater incentives for individual plants and facilities to maximise the efficiency of electricity use, and benefit from energy saving actions, particularly in relation to off peak electricity use.

6.3.6 Comments on Relevance of Factor

Given the relatively minor increase in greenhouse emissions as a result of the solids plant expansion, and the proposed management measures and commitments to further reduce greenhouse emissions from CSBP facilities as a whole, it is considered that impacts from anticipated greenhouse emissions are minor and manageable.

6.4 Noise

6.4.1 Environmental Objective

To protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring that noise levels meet the *Environmental Protection (Noise) Regulations 1997 (As Amended)* for residential receptors, and to reduce noise emissions to as low as reasonably practicable.

6.4.2 Applicable Standards, Guidelines or Procedures

Environmental noise is governed by the *Environmental Protection (Noise) Regulations 1997*. These regulations stipulate maximum allowable external noise levels determined by the calculation of an influencing factor that is then added to the base levels shown in Table 11 below. The influencing factor is calculated for the usage of land within the two circles, having a radius 100m and 450m from the premises of concern.

TABLE 11
BASELINE ASSIGNED OUTDOOR NOISE LEVEL

Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		$L_{A\ 10}$	$L_{A\ 1}$	$L_{A\ max}$
Residential	0700 - 1900 hours Monday to Saturday	45	55	65
	0900 - 1900 hours Sunday and Public Holidays	40	50	65
	1900 - 2200 hours all days	40	50	55
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays	35	45	55
Commercial premises	All hours	60	75	80
Industrial and utility premises	All hours	65	80	90

The above levels are conditional on no characteristics existing in the noise of concern, such as tonality, modulation or impulsiveness. If such characteristics exist then any measured level is adjusted according to Table 12.

TABLE 12
ADJUSTMENTS TO MEASURED NOISE LEVELS

Where tonality is present	Where modulation is present	Where impulsiveness is present
+5 dB(A)	+5 dB(A)	+10 dB(A)

Note: these adjustments are cumulative to a maximum of 15 dB.

With respect to residential receivers the night period is the most critical time for noise propagation. The most significant 'assigned level' acoustic parameter is the L_{A10} noise level. At most of the residential receiver locations the influencing factor will be greater than zero, and hence the 'assigned level' will be greater than 35 L_{A10}. The noise emissions from the CSBP Kwinana Industrial Complex are not expected to be tonal in characteristic at distances exceeding 2000m, and particularly where the CSBP contribution to the noise received is at least 5 dB(A) less than measured at the location. Where the cumulative effects of a number of industries impact on a residential receiver (as is the case in Kwinana), any single industry that makes a contribution to the measured noise level that is 5dB(A) (or more) less than the measures level is deemed not to contribute significantly to the measured noise level. The implication of this when assessing the emissions from the Sodium Cyanide Manufacturing Facility is that if they are less than 30 L_{A10} in residential areas then they are likely to comply with the Regulations at all times.

At present Industrial receiver 'assigned levels' are 65 L_{A10}, with adjustment of +5 to the measured / predicted level if the noise is tonal in characteristic.

The Department of Environment (DoE) is in the process of a 'Regulation Review' (Department of Environmental Protection, 2000b), and industrial noise 'assigned levels' are one area where a change is likely to occur. The most recent discussion with the DoE has revealed that a proposal to increase the Industrial Receiver 'assigned level' from 65 L_{A10} to 70 L_{A10} is being pursued, with the adjustments for noise characteristic not being applicable. Where an industrial premise has offices or other noise affected areas then the level would remain at 65 L_{A10}, but the noise characteristic adjustments would not be applicable. A timeframe for regulation drafting and public review is not well defined but potentially could be concluded by the end of 2005. Provided the expected Regulation review is concluded in accordance with the DoE proposal, the 'assigned level' at the Industrial boundary(s) adjacent to the CSBP Kwinana Industrial Complex would be 70 L_{A10}.

6.4.3 Existing Environment

Noise emissions from the plant currently comply with the *Environmental Protection (Noise) Regulations 1997* or subsequent Ministerial approvals, with one exception.

With all plants operating the total noise level at the boundary of Coogee Chemicals (most sensitive premises) currently does not comply with the noise regulations. Measured noise levels range from 61 to 65.5 dB(A) along the boundary, the highest noise levels being associated with noise emissions from the AGR cooling towers.

The existing noise emissions fail to comply with the Regulation industrial receiver 'assigned level' of 65 L_{A10} largely because the noise emission is 'tonal' in characteristic and attracts a +5 adjustment to the measured level.

It is noted that if the Regulation 'assigned levels' are changed in accordance with the recommendations of the *Noise Regulations Review: Outcomes of the Working Group Programme* (Department of Environmental Protection, 2000b), or the proposed regulation changes as currently being proposed by the Department of Environment, then the existing noise levels at the Coogee Chemicals boundary would be in compliance with the Regulations.

The nearest non industrial noise sensitive premises is located approximately 3km east of the site at Medina. Noise emissions for the existing solids plant are well within the Regulation 'assigned level' for residential premises under 'worst case' night weather conditions. AGR retains the commitment in the current Ministerial conditions which commit to complying with the revised noise regulations within six months of their release. If the proposed amendments to the noise regulations are approved AGR will fully comply. If the proposed amendments are not progressed then a detailed study of the plant will be conducted to progress with additional modifications to reduce noise and ensure compliance.

AGR has been active in reducing environmental noise emissions over the preceding five years. Significant noise control measures and upgrades (in approximate chronological order) have included in the following acoustic history summary.

Prior to 2000

- Attenuation of blower room ventilation fan openings. Acoustic lagging of knock-out-pot pipe-work to reduce noise emissions.

September 2000

- Design and construction of solids plant in Sodium Cyanide area. The design was reviewed for environmental noise compliance prior to construction, and was deemed to be a relatively low noise emission plant.

January 2002

- Update of sound power data for the 2003 KIC review (based on ENM acoustic modelling) which predicted an overall level for the CSBP Kwinana Industrial Complex of 123 Lwa. The KIC model was not re-calculated and the updated sound power levels provided by CSBP were not reflected in the reported numbers in the review report. The predicted noise level from this model at Medina residences was 33.7 LA10 under DoE 'Draft 8' night conditions using ENM.

Early 2004

- Sodium Cyanide Plant control system modified so that the start-up fan (used to ventilate standby plant vessels) switched off when Plants No.1 and No.2 in

concurrent operation. The start-up fan is located at the top of the SCP structure and being an elevated noise source can make a (small) contribution to the noise emissions to residential areas.

November 2004

- Upgrade of CSBP/AGR acoustic model for proposed Nitric Acid Plant duplication, including measurement of Nitric Acid discharge stack radiation following attenuator maintenance upgrade. The measurement showed a 12 dB(A) reduction in radiated noise emission. The acoustic model used to model noise emissions at the CSBP Kwinana Industrial Complex was converted from ENM to SoundPlan to permit more detailed acoustic modelling close to plant and take advantage of better graphical outputs and reporting capabilities. Sound power of AGR Sodium Cyanide Plant is 125.1 Lwa. The updated model predicted the noise level at Medina residences would be 30.8 LA10 under adverse night wind / inversion conditions.

- Acoustic modelling of proposed Nitric Acid Plant duplication, new Prill plant and upgrade of AGR Sodium Cyanide Plant No.2 (additional blower inside blower room). The predicted AGR Sodium Cyanide Plant site sound power of 123.5 Lwa. Predicted noise level at Medina residences is 31.0 LA10 under adverse night wind / inversion conditions.

Noise emissions from the AGR Sodium Cyanide Plant site have been systematically reduced over the past five years. The attenuation measures have been focused on the high sound power noise sources and include significant noise sources which were elevated relative to the surrounding topography and buildings.

6.4.4 Methodology

Herring Storer Acoustics were commissioned to develop an acoustic model to predict noise emission from the proposed upgrade of the AGR Solids Plant at CSBP Kwinana Industrial Complex. The model also includes the cumulative effect of other proposed upgrades on site, namely a new nitric acid and Prill plant.

Noise modelling was undertaken in accordance with the proposed scope of works provided in the Scoping Document (ATA Environmental, 2004).

Prediction of the noise level propagation to surrounding areas was undertaken using the computer program SoundPlan 5.6. This program incorporates various parameters including source sound power levels, ground topography and atmospheric conditions in determining propagation of noise from the site. The CSBP Kwinana Industrial Complex acoustic model was upgraded from a 2002 model utilizing the ENM noise modelling software.

Measurements were be conducted around key plant items to re-develop aspects of the model to reflect a greater interest in localised noise levels and to incorporate the changes in noise emissions of the plant which have occurred over the last few years. Major reductions in noise emissions have occurred as a result of attenuator

maintenance for the existing nitric acid stack, as well as a program of engineering controls on minor noise sources such as steam vents.

Using recognised algorithms (Concawe) the program calculates the sound levels at distances from the source resulting in noise levels at receiver locations.

Single point calculations were carried out to rank the contribution of each source at a particular location, namely the nearest boundary of Coogee Chemicals, and residential locations in Medina, Calista, Leda, Hillman and North Rockingham.

6.4.5 Assessment – Residential Receptors

The objective of this study is to predict the noise level emissions from the operating plant and assess the noise level at the nearest residential premises in accordance with the *Environmental Protection (Noise) Regulations 1997*. The following information has been excerpted from the acoustic modeling report, which is included as Appendix 3.

Predicted noise levels from the single point calculations for 'worst case' night-time conditions of 3m/s wind from source to receiver with temperature inversion are summarised in Table 13.

TABLE 13
RESULTS OF SINGLE POINT CALCULATIONS OPERATIONAL NOISE AT RESIDENTIAL PREMISES

Location	Existing L_{A10}	Upgrade L_{A10}
Medina Residence	30.8	31.0
Calista Residence	29.4	29.5
Leda Residence	26	26.4
Hillman Residence	22.2	22.0
North Rockingham (near CBH)	24.9	25.4
East Rockingham (coast)	19.5	20.1

The single point calculations and the corresponding noise contour plots (Appendix 3) show that the noise emissions from the CSBP Kwinana Industrial Complex are generally below 30 L_{A10}, with a nominal 0.1 to 0.2 dB increase as a consequence of all the proposed upgrades at CSBP.

The exceptions are at the nearest residential location (Medina) where the predicted level is up to 31 L_{A10} from the CSBP operations under adverse wind conditions at night, with a temperature inversion.

The contribution of the proposed upgrades at the AGR plant is not significant with respect to the predicted noise levels at Medina. The predicted noise level of 30.9 L_{A10} at Medina is made up of the noise contributors summarised in Table 14.

From the information presented in Table 14 it is evident that the proposed AGR upgrade is not a significant contributor to the noise received at the Medina residential area.

TABLE 14
CONTRIBUTORS TO PREDICTED NOISE LEVELS AT MEDINA

CSBP Noise Contributor	Noise Level Contribution at Medina
CSBP Existing Main Plant	25.6
CSBP Nitric Acid Upgrade	15.4
SCP Existing Plant	29.3
SCP Proposed Upgrade	4.3
TOTAL	**31.0**

The 2001 Kwinana Industries Council (KIC) noise study and Kwinana acoustic model (SVT Engineering Consultants, 2001) predicted noise levels at residential receiver locations under a range of weather conditions. A summary of the predicted and measured noise levels from the KIC report, together with the current predicted CSBP noise emissions are shown in Table 15 for comparison purposes. The significant noise reductions achieved at the CSBP Kwinana Industrial Complex since the original study are reflected in the much lower predicted noise levels at the residential receiver locations. For the purposes of this assessment the CSBP and AGR noise emissions have been combined, as per the KIC study.

TABLE 15
COMPARISON OF OPERATIONAL NOISE AT RESIDENTIAL PREMISES

Residential Receiver Location	Wind Direction / Speed Inversion Lapse Rate	KIC Overall Level 2001	KIC CSBP Contribution 2001	CSBP Upgrade Contribution 2005
Calista (predicted)	W 3 2	43.5	38.9	29.5
Calista (KIC measured)	W 2 0	36	-	-
Medina (predicted)	NW 3 2	48.0	38.0	31.0
Medina (KIC measured)	NW 2 0	44	-	-

Source: SVT (2001)

The figures in Table 15 show that has been a reduction in predicted noise level at Calista due to CSBP operations from 38.9 to 29.5 L_{A10}. At a level of 29.5 L_{A10} the CSBP Kwinana Industrial Complex noise emissions are not technically classified as 'significantly contributing' and comply with the Regulation 'assigned level' of 35 L_{A10} at Calista residences. The contributing source ranking from the KIC report changes from 1st ranked contributor to 4th ranked contributor (assuming other industry noise emissions are unchanged).

For Medina the figures show that has been a reduction in predicted noise level due to CSBP operations from 38.0 to 31.0 L_{A10}. At a level of 31.0 L_{A10} the CSBP Kwinana Industrial Complex noise emissions are technically classified as 'significantly contributing' to the Regulation 'assigned level' of 35 L_{A10} at Medina residences. However at 31.0 L_{A10}, the noise contribution from CSBP would be more than 5 dB(A) less than the overall noise level (based on KIC measured/predicted levels) and unlikely to be audible. The contributing source ranking for CSBP from the KIC report

changes from 1st ranked contributor to 5th ranked contributor (assuming other industry noise emissions are unchanged).

The reductions in noise received at residential locations over recent years (since the 2001 KIC acoustic modelling and report) are due to noise control measures implemented by AGR and CSBP.

The proposed AGR upgrades are not expected to have any adverse impact on the noise received at residential locations such as Medina.

6.4.6 Assessment – Industrial Receptors

In the process of upgrading the acoustic model of the existing CSBP Kwinana Industrial Complex, boundary noise levels were measured near the AGR Sodium Cyanide Manufacturing Facility at the adjacent boundary of the nearest Industrial Premises, being Coogee Chemicals. Measured noise levels ranged from 61 to 65.5 dB(A) along the boundary, the highest noise levels being associated with noise emissions from the AGR cooling towers.

The existing noise emissions fail to comply with the Regulation industrial receiver 'assigned level' of 65 L_{A10} only because the noise emission is 'tonal' in characteristic and attracts a +5 adjustment to the measured level. It is noted that were the Regulation 'assigned levels' to be changed in accordance with the recommendations of the *Noise Regulations Review: Outcomes of the Working Group Programme* (Department of Environmental Protection, 2000b), or the proposed regulation changes as currently being proposed by the Department of Environment, then the existing noise levels at the Coogee Chemicals boundary would be in compliance with the Regulations.

The acoustic model under 'worst case' daytime conditions of wind towards Coogee Chemicals at 4 m/s have slightly higher predicted noise levels than measured (due to the wind effect on propagation of noise).

The proposed upgrade of the solids plant is essentially a debottlenecking process, with the majority of the upgrade plant being contained within an enclosed building. The current noise levels inside this building are less than 85 dB(A), and are not expected to increase significantly.

The predicted noise levels from the upgrade at the Coogee Chemicals nearest boundary under 'worst case' daytime wind conditions are summarised in Table 16.

TABLE 16
PREDICTED NOISE LEVELS FROM THE UPGRADE AT THE COOGEE CHEMICALS NEAREST BOUNDARY

Location	Existing, L_{A10}	Upgrade, L_{A10}
Opposite Cooling Tower No.1	65.4	65.9
Opposite Cooing Tower No.2 (2 cell addition)	65.4	66.1

The predicted noise levels with the addition of two cooling tower cells show an increase of up to 0.7 dB(A) at the Coogee Chemicals boundary. The noise level of 66 L_{A10} is (1 + 5 adjustment =) 6 dB in excess of the current Regulation 'assigned level'. However, the predicted level of 66 L_{A10} would be well within the proposed Regulation Review 'assigned level' of 70 L_{A10} (no noise characteristic applicable).

6.4.7 Management

Noise emissions for the proposed solids plant upgrade comply with the *Environmental Protection (Noise) Regulations 1997* requirements at the nearest residential receiver locations. The predicted noise levels at the nearest industrial premises (Coogee Chemicals) currently exceeds the Regulation 'assigned level' of 65 L_{A10} by virtue of tonal noise characteristics. In the event that the *Environmental Protection (Noise) Regulations 1997* are amended it is expected that the noise level at the industrial premises will then comply with the Regulations.

AGR retains the commitment in the current Ministerial conditions which commit to complying with the revised noise regulations within six months of their release. If the proposed amendments to the noise regulations are approved AGR will fully comply. If the proposed amendments are not progressed then a detailed study of the plant will be conducted to progress with additional modifications to reduce noise and ensure compliance.

In the interim, AGR has undertaken a number of projects to continuously improve noise levels including:

- Implementation of a variety of noise attenuation measures as described in Section 6.4.3.
- Consideration of noise in the purchasing of new equipment and plant upgrades.
- Implementation of a trial to reduce noise from the Sodium Cyanide Manufacturing Facility by replacing fan blades in the cooling towers with new fibreglass blades. This trial has commenced with results expected in June 2005.
- Commissioning of Herring Storer Acoustics to prepare a report detailing what other actions may be taken to reduce noise levels.
- Regular participation in the KIC environmental planning committee meetings, which discuss noise issues for the KIA.
- Contributed to the cumulative noise study undertaken by KIC.

6.4.8 Comments on Relevance of Factor

The upgrade will result in only a minor increase in noise levels at residential and industrial recurrence. Subject to the changes proposed for industrial noise in the *Environmental Protection (Noise) Regulations 1997*, the upgraded facility will fully comply with the EPA objective for noise.

6.5 Liquid Wastes/Surface Water Discharges

6.5.1 Environmental Objective

To ensure that surface water is managed to prevent discharge of contaminated water from site or to groundwater.

To maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance, are protected (EPA, 2002b).

6.5.2 Applicable Standards, Guidelines or Procedures

Surface water discharges shall be managed in accordance with Conditions contained in Environmental Protection Licence 6110/7.

Management of water related issues on site such that surface waters comply with the *National water quality management strategy: Australian water quality guidelines for fresh and marine waters Revised Guideline No 4*. (ANZECC & ARMCANZ, 2001a), *Australian Guidelines for Water Quality Monitoring and Reporting (Guideline No 7)* (ANZECC & ARMCANZ 2001b) and the *Draft Environmental Protection (Cockburn Sound) Policy* (EPA, 2002d).

6.5.3 Existing Environment

There are no permanent natural surface water bodies on the site. The main environmentally sensitive water body within close proximity to the site is Cockburn Sound. Treated wastewater is directed from the CSBP Kwinana Industrial Complex to Cockburn Sound via a submarine pipeline. The Kwinana Water Reclamation Plant (KWRP) has been commissioned, and it is intended that the wastewater will be directed for disposal to the Sepia Depression Ocean Outlet Landline potentially from March 2005 when the appropriate contracts are in place.

In accordance with Condition 2 and Proponent Commitment 3 of Ministerial Statement No. 668, CSBP has implemented and developed a stormwater management plan and a wastewater and solid waste management plan for the Sodium Cyanide Manufacturing Facility. These plans will be progressively updated to reflect changes to the solids plant prior to any upgrade occurring.

Figure 5 is a schematic diagram of the AGR effluent stream, and its interaction with the CSBP effluent stream.

Wastewater from various points in the solids facility is held in a stripper feed tank before being pumped to an ammonia stripper. The ammonia stripper is a column that has a steam heated reboiler in the base and this provides sufficient energy to drive off the ammonia and some free cyanide, which is directed to the existing incinerator on either of the liquid sodium cyanide plants where it is destroyed. Some water is also associated with the gases directed to the incinerator (as steam).

The stripped liquor is treated in a reverse osmosis (RO) unit. In this unit, most of the feed stream is produced as a low cyanide concentration and the remainder, containing the majority of the sodium cyanide at a concentration of approximately 25ppm sodium cyanide, is recycled to the solids plant scrubbers as makeup liquor.

Currently, water passing through the membranes is then pumped to the cyanide destruction plant located near SCP1. The destruction plant uses hydrogen peroxide, sulphuric acid and copper sulphate to reduce the cyanide concentration to < 1ppm.

As part of a continual improvement review process, AGR is currently undertaking a modification design review to remove the use of copper and hydrogen peroxide and instead utilise sodium hypochlorite and chlorine to destroy cyanide. The concentration of cyanide of 1ppm will still be met. The concentration of copper will decrease in the effluent stream as copper sulphate usage is reduced.

This chlorine based system will be used to destroy cyanide in rainwater and potentially also in the reverse osmosis permeate. The advantages of the use of a chlorine based treatment system (using sodium hypochlorite and chlorine) includes the familiarity of the operators in using this chemical, the removal copper in the wastewater discharge and the removal of the need for steam as the treatment can occur at ambient temperatures. The additional storage of sodium hypochlorite will be managed through AGR's dangerous goods licence.

Wastewater leaving the treatment plant is then discharged to CSBP's containment ponds via a batch tank system. Each batch tank is filled then manually sampled and analysed for copper, pH and cyanide to ensure compliance with *Environmental Protection Act* licence conditions prior to discharge to CSBP's containment ponds, or in the future to the cooling towers.

CSBP has approval from the DoE to trial the reuse of the treated water in the cooling towers of the sodium cyanide liquids plant. This will commence shortly and will reduce the use of groundwater in the process if successful.

Discharges of Nitrogen

AGR discharges to the CSBP containment pond system typically have average nitrogen concentrations of approximately 3.34kg/day, however in recent months the nitrogen load has increased from the plant (26kg/day) due to a problem with a heat exchanger. This has been investigated and will be redesigned and repaired in April 2005. After the heat exchanger has been repaired the nitrogen discharges will return to the approximate daily average of 3.34kg.

During the environmental approvals process for the construction of the sodium cyanide solids plant, CSBP made a commitment to ensure that the average daily nitrogen discharges (calculated once per month over a rolling three month period) from the CSBP Kwinana Industrial Complex to Cockburn Sound will be no higher from the end of 2002 than they were in the 2001 *Environmental Protection Act* licence period. The highest daily three month rolling average nitrogen discharge during the 2001 licence period was 137kg of nitrogen.

Since this time, CSBP's nitrogen discharges have been below 137kg/day (three month rolling average) in 38 of the 42 monthly calculations. The four exceedances emanated from two separate instances, one of which affected the three month rolling average for a three month period (i.e. three of the exceedances came from this instance), and were generally due to management of stormwater during the winter months and process upsets. However, despite these exceedances, the average daily emission during the period January 2001 to December 2004 has been 116kg, well below the CSBP commitment of 137kg/day (three monthly rolling average).

CSBP remains focused on reducing nitrogen discharges. This includes continued monitoring and analysis of wastewater discharges across site, the construction of a pilot nutrient stripping wetland, reuse of wastewater within and between the processing plants across the CSBP Kwinana Industrial Complex, a commitment to the Kwinana Water Reclamation Plant and the discharge of wastewater to the Sepia Depression Ocean Outfall.

Discharges of Copper and Cyanide

The *State Environmental (Cockburn Sound) Policy 2005 (*Government of Western Australia, 2005) indicates that CSBP's discharge point into Cockburn Sound is designated as a Low Ecological Protection Area. In particular, the CSBP Low Protection Area is defined as the marine water area within a horizontal distance of 9m (to the inshore direction from the diffuser) and 16 m (to the offshore direction from the diffuser), and extending 12.5m beyond each end of the diffuser.

The *State Environmental (Cockburn Sound) Policy 2005* (Government of Western Australia, 2005) also establishes environmental quality criteria (EQC) to protect the environmental values and meet the environmental quality objectives established under the policy. The EQC are contained in the *Environmental Quality Criteria Reference Document for Cockburn Sound (2003-2004)* (EPA, 2005a) (as amended and published from time to time by the EPA following public consultation).

The *Environmental Protection Act* licence limits for wastewater discharges from the CSBP site to Cockburn Sound have been determined based on the EQC contained in EPA (2005a). A summary of the licence limits and typical copper and cyanide discharge concentrations are provided in Table 18. Note, EQC for nitrogen were not specified in EPA (2005a).

TABLE 18
COMPARISON OF WASTEWATER COPPER AND CYANIDE DISCHARGES CONCENTRATIONS FROM CSBP TO RELEVANT WATER QUALITY CRITERIA

	Copper	Free Cyanide
Estimated Discharge Concentrations		
Typical Concentrations (mg/L)[a] in CSBP pipeline	<0.001-0.019	<0.01
Dilution Factor[b] from CSBP diffuser	0.005	0.005
Estimated Maximum Concentration discharged to Cockburn Sound (mg/L)	0.000095	<0.00005
Assessment Criteria		
Environmental Protection Act Licence Limits		
Daily Concentration Limit (mg/L)		
For 98% of time rolling 365 days	0.285	0.1
For 2% of time rolling 365 days	0.485	0.1
Monthly Average Daily Load Limit (kg/day)	0.240	-
Target Load (Guideline) (kg/day)	0.032	-
EWQ for protecting the marine ecosystem from the effects of toxicants in marine waters and sediment pore waters		
High protection (mg/L)	0.0013 [c]	0.004 [c]
Moderate protection (mg/L)	0.003 [d]	0.007 [d]
Low protection(mg/L)	-	-
Initial Management Triggers for High Protection and Moderate Protection areas		
High protection (mg/L)	0.003 [d]	0.007 [d]
Moderate protection (mg/L)	0.008 [e]	0.014 [e]
Low protection (mg/L)	-	-

Notes:
a Based on monthly monitoring results for January 2002 to December 2004.
b The *Environmental Protection Act* licence allows for a dilution factor of 1:200, which is based on studies by Kellog, Brown & Root (2004) which estimate dilution rates of between 1:270 and 1:914 depending on a combination of different factors.
c Equal to the 95% Level of protection (% species), Marine waters (ANZECC & ARMCANZ, 2001a).
d Equal to the 90% Level of protection (% species), Marine waters (ANZECC & ARMCANZ, 2001a).
e Equal to the 80% Level of protection (% species), Marine waters (ANZECC & ARMCANZ, 2001a).

6.5.4 Assessment

The plant design means that virtually all wastewater produced in the solids plant is treated and recycled in the process.

At the discharge point from the solids plant wastewater treatment system, before discharge to the CSBP effluent system, the cyanide will be less than 1ppm, and copper will be no higher than 1ppm.

As a result of the permeate from the reverse osmosis plant being directed to the site effluent system, a load of up to 19kg/day of nitrogen will be directed to the CSBP Kwinana Industrial Complex marine outfall. This additional load can be accommodated without breaching the discharge limit for nitrogen in CSBP's site *Environmental Protection Act* licence, and CSBP maintains its commitment that average daily nitrogen loads to Cockburn Sound will be no higher from the end of

2002 than they were in the licence period June 30th 2001. CSBP's nitrogen discharges have been below 137kg/day (three month rolling average) in 38 of the 42 most recent monthly calculations, with the exceedances generally due to management of stormwater during the winter months and process upsets.

The Kwinana Water Reclamation Plant (KWRP) was commissioned in October 2004. CSBP will begin accepting treated water from this facility for use potentially in March 2005. It is intended that wastewater collected in CSBP containment ponds including the wastewater from the AGR sodium cyanide solids plant will be directed for disposal to the Sepia Depression Ocean Outlet Landline after the approvals process that the Water Corporation is currently undertaking is finalised. This is currently expected to occur in late March 2005.

6.5.5 Management

AGR has an existing stormwater management plan and a wastewater and solid waste management plan for the Sodium Cyanide Manufacturing Facility. These plans will be updated should approval be granted.

CSBP/AGR have an active program aimed at reducing the current load of nitrogen and other contaminants discharged through the marine outfall and this will continue. As part of a continual improvement process, CSBP and AGR review their processes and ensure wastewater streams are reused where possible, and emphasise the importance of good housekeeping to minimise spillage. CSBP also commissioned a pilot nutrient stripping wetland in June 2004 which will further reduce nutrients into Cockburn Sound. CSBP maintains its commitment that daily nitrogen loads to Cockburn Sound will be no higher from the end of 2002 than they were in the *Environmental Protection Act* licence period June 30th 2001. Despite CSBP's intention to divert its wastewater to the Sepia Depression ocean outfall line (from March 2005 approximately) instead of directly into Cockburn Sound, CSBP remains committed to achieving this target.

Despite the robust nature of the site surface water management system, CSBP recognises there is always a potential for accidental releases of process fluids or effluents that could lead to a discharge of contaminants in the form of liquid sodium cyanide or hydrocarbons. Accordingly, there is a comprehensive monitoring system in place and an Emergency Response Plan and management procedures have been developed to address a range of potential incidents such as spills, fire, transport accidents etc that could result in the release of pollutants to surface waters and Cockburn Sound. Additionally, CSBP is committed to the Kwinana Industries Mutual Aid agreement including various local industries within the Kwinana industrial estate, established to provide a combined industry response to emergency situations.

6.5.6 Comments on Relevance of Factor

The current proposal is not expected to significantly alter the overall performance of CSBP/ AGR's facility with respect to discharge of surface water and liquid wastes, and the EPA's objective can be met.

6.6 Risk

6.6.1 Environmental Objective

To ensure that risk from the proposal is as low as reasonably achievable and complies with acceptable standards and EPA criteria including *Guidance for the Assessment of Environmental Factors No. 2: Risk Assessment and Management: Offsite Individual Risk from Hazardous Industrial Plant* (EPA, 2000).

6.6.2 Applicable Standards, Guidelines or Procedures

The EPA stipulates acceptable risks to which individuals in Western Australia can be subjected. To meet these criteria, proponents must ensure that risk is as low as reasonably achievable and complies with the requirements in EPA *Guidance for the Assessment of Environmental Factors No. 2: Risk Assessment and Management: Offsite Individual Risk from Hazardous Industrial Plant* (EPA, 2000).

In summary, the applicable criteria are based on 'industrial facilities' requiring that the chance (likelihood or probability) per year of a fatality as a result to exposure to site activities will not exceed fifty-in-a-million per year (50×10^{-6}/year) as defined in the EPA Guidance. The assumptions underpinning these standards are very conservative, and protective of public safety.

In relation to residential areas, the risk of a development to residents shall not exceed one in one million years (1×10^{-6}/year) per year.

Sensitive premises such as hospitals or aged persons accommodation has a higher degree of protection, being one half in one million year (0.5×10^{-6}/year) per year.

6.6.3 Existing Environment

In 2001, Det Norske Veritas (DNV) prepared an As-Designed Quantitative Risk Assessment (QRA) for the proposed solid sodium cyanide plant based on a production rate of 20,000 tpa (DNV, 2001). Undertaking a conservative "systematic break" approach the risk to off-site populations was found to tolerable in accordance with current guidelines (EPA, 2000).

Upon completion of construction of the solid sodium cyanide plant, an update to the QRA (DNV, 2002) was undertaken to determine how final design changes impacted the risk to off-site populations. The final design was found to have the same or lower levels of risk and thus new quantitative results were not generated as the risks were already tolerable.

Particularly interesting is that the driving force for risks impacting offsite populations in DNV (2001) was no longer valid. The original design used ammonia in the refrigeration unit and it was the ammonia releases from the refrigeration unit driving the risk profile for the solid sodium cyanide plant in DNV (2001). The design changed prior to construction and the solid sodium cyanide plant used a different refrigeration unit that utilised Refrigerant 22 (R22), which is non-toxic and non-flammable, thus not posing a risk to off-site populations.

6.6.4 Assessment

QEST Consulting were commissioned by AGR to review the existing risk model for the Sodium Cyanide Manufacturing Facility and to determine whether the proposed upgrade to the solid sodium cyanide plant would pose undue risk to population outside the facility boundary.

A copy of the response from QEST Consulting is included as Appendix 4.

QEST Consulting concluded that the proposed upgrade to the solid sodium cyanide plant will not alter the current situation where risk levels are tolerable, particularly when considering the following points:

- The proposed changes for the upgrade do not alter the original conclusions about the process being stable and non-volatile, resulting in tolerable risk to off-site populations.

- The environmental monitoring provides an excellent barrier for preventing releases that pose an adverse risk to persons (due to concentrations of environmental concern being well below those that pose an acute risk to human health).

6.6.5 Management

Safety features are already incorporated into the existing plant will be incorporated into any new facilities. All plant operators and maintenance employees based in the Sodium Cyanide Manufacturing Facility 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 upgraded facilities will incorporate at least two tiers of personnel technically qualified to manage hazardous chemical operations.

Prior to commissioning of any substantial changes to the plant, the operating manual and procedures covering all process work, including start-up, and shut-down, plant testing, maintenance, inspection and emergency action will be updated. The potential hazards identified will be reviewed and appropriate contingency measures incorporated into existing on-site and off-site emergency procedures for the Kwinana works.

A fire protection system is incorporated into the solid sodium cyanide plant in accordance with the requirements of the plant design and the Western Australian Fire & Emergency Services Authority (FESA). Emergency Response Team (ERT) personnel will be trained in the appropriate fire-fighting and emergency response techniques.

CSBP maintains a close working relationship with the FESA and has a service agreement. FESA provides backup to AGR and CSBP personnel in emergency response situations and regularly visits the CSBP and AGR sites for training and familiarisation purposes. This practice will be extended to the upgraded solids plant when it is operational.

On-site emergency facilities at CSBP's Kwinana works will continue to include a dedicated emergency response vehicle, fire tender and a patient transfer vehicle at all times, and an occupational health nurse during normal working hours. The emergency response vehicles and resources will be available to service any off-site incident involving the transport of sodium cyanide.

6.6.6 Comments on Relevance of Factor

The current proposal is not expected to significantly alter the overall performance of CSBP/AGR's facility with respect to risk, and the EPA's objective will be met.

6.7 Transport

6.7.1 Environmental Objectives

Ensure that transportation and storage of fuels/chemicals complies with the Australian Dangerous Goods Code so as to ensure that risk is as low as reasonably achievable.

Ensure that roads are maintained and road traffic managed to meet an adequate standard of level of service and safety.

Ensure the requirements of Main Roads of Western Australia are met.

6.7.2 Applicable Standards, Guidelines or Procedures

The transport of solid sodium cyanide is subject to requirements of the following:

- *Dangerous Goods Regulations 1992*;
- *Dangerous Goods (Transport) Act 1998;*
- *Dangerous Goods (Transport Act) (Road and Rail) Regulations 1999*; and
- Specifications for Intermediate Bulk Containers for the Transport of Dangerous Goods by Road and Rail (Supplement 2 to the Australian Dangerous Goods Code - Federal Office of Road Safety) AS/NZS 4452:1997 - The Storage and Handling of Toxic Substances.

6.7.3 Existing Environment

AGR has a *Transport Management Plan* (TMP) that details procedures for the management of the transport of solid and sodium cyanide solution, to protect the environment in the event of an incident with advice from the Department of Industry and Resources. This plan includes but is not limited to:

- A procedure for Transport Emergency Response for both sodium cyanide briquettes and solution.

- A procedure for obtaining Department of Resources and Industry authorisation for changes to the approved (as outlined in submission) sodium cyanide transport routes.

- A process for liaison with Local Government Authorities, relevant government departments, State emergency authorities and the local emergency management advisory committees before transport commences along approved transport routes, to address local and specific issues, including setting up emergency plans and training programs.

- A procedure for reviewing the approved transport routes and updating the transport risk assessment, based on updates to Dangerous Goods Transport Routes, changes to facilities adjoining the route and a review of traffic data as required or otherwise three yearly.

- Specifications for the use of Intermediate Bulk Containers that meet the IMDG Code for the transport of solid sodium cyanide.

- Procedures for sea container inspections.

- A procedure in the event of Port disruption.

- A procedure for communications with the transport operations base as each vehicle travels along a transport route to a mine and until that vehicle logs off.

- A procedure for maintenance of a log, which includes time of departure from the Kwinana area, the general goal is to clear the metropolitan area before significant traffic build-up occurs.

- The location and description of the most effective and suitable neutralising agents used to treat any spilled sodium cyanide.

- A procedure for internal and external audits of all aspects of the TMP.

- A procedure for annual emergency exercises in association with FESA.

- A procedure for incident follow-up.

- A procedure for review and update of TMP every two years.

6.7.4 Assessment

Hazards to the public range from direct (collision) to indirect (road damage from heavy vehicle use). Professional drivers in licenced and well-maintained trucks will undertake road transport.

It is anticipated that the majority of solid product will be transported via road from Kwinana, other than a small quantity that may be railed interstate or possibly to the Eastern Goldfields. The specific routes to be used have been finalised and for export via the Port of Fremantle, vehicles will follow main roads from the Kwinana site to

the North Fremantle container terminal, i.e. Kwinana Beach Road, Patterson Road, Rockingham Road, Stock Road, Leach Highway, Stirling Highway, Tydeman Road, Napier Road, and Port of Fremantle. It was recently acknowledged by the Minister for Environment that the required review of transport options is due in August 2005 (correspondence dated 3rd December 2004).

There are approximately 700 road traffic movements per (usual business) day from the CSBP Kwinana Industrial Complex at present. The potential ongoing traffic increase resulting from this proposal is likely to be 500 loads per annum (1-2 per day), which is insignificant in the context of current traffic movements on Kwinana Beach Road and Paterson Road.

6.7.5 Comments on Relevance of Factor

The increase on the number of road movements is not regarded as significant and can be managed within the framework of the current Transport Management Plan.

6.8 Summary of Potential Environmental Impacts and Management Strategies

A summary of the potential environmental impacts and management strategies is provided in Table 19.

TABLE 19
SUMMARY OF RELEVANT ENVIRONMENTAL FACTORS RELATING TO PROPOSED SOLID SODIUM CYANIDE PLANT UPGRADE

Environmental Factor	EPA Objective	Existing Environment	Potential Environmental Impacts/ Proposal Characteristics	Proposed Mitigation and Management Strategies	Predicted Outcome
Pollution Management					
Air Quality - Gaseous and Particulate Emissions	Ensure that emissions do not adversely affect the environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards (EPA, 2002b).	Figure 6 is a schematic diagram of the atmospheric emissions management system. The following compounds are emitted from the sodium cyanide solids plant in significant quantities: • Ammonia; and • Cyanides (CN), comprising hydrogen cyanide gas (HCN) and sodium cyanide particulates (NaCN). Emissions data for the existing solid sodium cyanide plant is included in Table 8. The nearest sensitive residential premises are located approximately 3km to the east of the site in Medina and Calista.	The results presented in Table 9 indicate that if ammonia and cyanide are emitted at current or proposed licence limit emission rates, the resultant ground level concentrations would be significantly lower than relevant ambient air quality criteria. The current *Environmental Protection Act* licence for the solid sodium cyanide plant has a target level of 0.6 g/s for ammonia. However, AGR expects that this emission rate may be difficult to achieve following the upgrade, and proposes a new target level of 1.2g/s for the majority of the time however concentrations of 1.5g/s may be possible. The modelling predicts that increasing the emission rate of ammonia from 0.6g/s to 1.2g/s – 1.5g/s will increase the 1 hour average ground level concentrations, with maximum 1 hour average ground level concentrations 500m from the plant rising from approximately 18µg/m^3 to approximately 40µg/m^3 or 50 µg/m^3 (1.5g/s). The highest annual average ground level concentration 500m from the plant is predicted to rise from approximately 0.9µg/m^3 to approximately 1 µg/m^3 (1.2g/s) or 1.5µg/m^3 (1.5g/s) The predicted ground level concentrations associated with the upgrade are well below published ambient air quality and occupational health exposures levels. The emissions of total cyanide for the upgraded production rate of 45,000tpa will increase to 0.58g/s, which is the current *Environmental Protection Act* licence limit. Emissions of total cyanide will be managed through improvements in the scrubbing system. The maximum ground level concentration of total cyanide (particulates and gaseous remains) significantly lower than relevant air quality criteria. Stack testing will continue on a monthly basis or as outlined in the *Environmental Protection Act* licence.	During normal operation at design capacity, the gaseous emissions are directly vented to the atmosphere from the scrubber stack. The ammonia emissions from the sodium cyanide solids plant will increase as a result of the upgrade yet remain well below published ambient air quality and occupational health exposures levels. Emissions of ammonia are predicted to generally be 1.2g/s or lower with occasional excursions between 1.2g/s and 1.5g/s. The modelling report assumes an ammonia emission of 1.5g/s as the worst possible case (this worst case will be approached rarely during operation). As with the existing plant, the ammonia emissions will be treated through a chilled water scrubber which is situated after the vacuum pumps. AGR believes that this system is capable of ensuring that the emissions from the stack remain at or below 1.2g/s. As a consequence of the predicted ammonia emissions for the upgrade exceeding the current *Environmental Protection Act* licence limit, it is proposed to seek a revision of the ammonia atmospheric emission limits. The predicted ground level ammonia concentrations associated with the upgrade are well below published ambient air quality and occupational health exposure levels. The emissions of total cyanide for the upgraded production rate of 45,000 tpa will increase to 0.58g/s, which is the current *Environmental Protection Act* licence limit. Particulate emissions are well below NEPM standards. Emissions of total cyanide will be managed through improvements in the scrubbing system. The maximum ground level concentration of total cyanide (particulates and gaseous remains) is significantly lower than relevant air quality criteria. Stack testing will continue on a monthly basis or as outlined in the *Environmental Protection Act* licence. The only other gaseous discharge will be minor fugitive emissions arising from the venting of vessels prior to maintenance activities. This is a necessary safety requirement prior to undertaking work on pipelines and vessels containing process gases. These will be controlled in accordance with industry standard procedures to minimise the volume of gases emitted and any potential environmental impact. It is not anticipated that the current proposal will significantly impact on such discharges.	Based on the modelled prediction of ground level concentrations of gaseous emissions, it is considered that the increase in gaseous emissions is minor. It is therefore concluded that the EPA's objective will be met.

Environmental Factor	EPA Objective	Existing Environment	Potential Environmental Impacts/ Proposal Characteristics	Proposed Mitigation and Management Strategies	Predicted Outcome
Greenhouse Gas (GHG) Emissions	To minimise emissions to levels as low as practicable on an on-going basis and consider offsets to further reduce cumulative emissions (EPA, 2002b).	Greenhouse gas emissions are mainly from power consumption, natural gas consumption, direct carbon dioxide (CO_2) from incinerators and natural gas purifiers and nitrous oxide (N_2O) emissions. The liquid sodium cyanide production process involves exothermic reactions which generate heat. This heat is converted to steam and use to produce electricity. The Sodium Cyanide Manufacturing Facility is in fact a nett power generator producing an average of 150 kWh of power per tonne of product generated. The calculated greenhouse gas emissions from the Sodium Cyanide Manufacturing Facility for the current production scenario (70,000 tpa liquid sodium cyanide and 25,000 tpa solid sodium cyanide) and following the proposed upgrade (70,000 tpa liquid sodium cyanide and 45,000 tpa solid sodium cyanide) are provided in Table 10. The data indicates that under the current approved production capacity, the Sodium Cyanide Manufacturing Facility emits 198,172 tonnes of carbon dioxide equivalent (CO_2-e) per year. Of this, the solids plant contributes 9,146 tonnes of CO_2-e per year or 5% of the total emissions from the Sodium Cyanide Manufacturing Facility.	Table 10 demonstrates that the only expected change in greenhouse emissions from the facility following the proposed upgrade relate to an increase in power consumed by the solids plant. In 2003/04, the calculated energy consumption rate for the solids plant was 1.18GJ/tonne of solids produced or 0.366 tonnes CO_2-e/tonne of solids produced. Based on an expected throughput of 45,000 tonnes per annum of solids, the total greenhouse emissions from the upgraded solids plant will be approximately 16,464 tonnes CO_2-e per annum 0.366 tonnes CO_2-e/tonne of solids produced. Accordingly, under the expanded scenario, it is anticipated that greenhouse emissions from the Sodium Cyanide Manufacturing Facility will increase by 3.6% compared to current approved operations. The solids plant contribution to the facility greenhouse gas emissions will increase from 5% to 8%. The solids plant emissions will constitute approximately 1.2% of the total greenhouse gas emissions inventory for CSBP business units. CSBP emissions as a whole will increase by approximately 0.5%. On this basis the solids plant expansion presents a minimal impact on the greenhouse inventory for the CSBP business as a whole.	Notwithstanding the fact that the upgrade is considered to present an insignificant change to CSBP/AGR's total greenhouse emissions inventory, AGR and CSBP will continue to implement greenhouse abatement initiatives. A key component in determining the focus of the abatement initiatives has been to refine emissions monitoring and reporting methodologies in consultation with the Australian Greenhouse Office (AGO). As signatories to the Greenhouse Challenge Program, CSBP report annual emissions to the AGO and have engaged an independent auditor who is certified by the AGO to audit the content of CSBP's reports, as well as the systems used to generate the greenhouse data. In monitoring the greenhouse performance of each of the CSBP units, Key Performance Indicator's (KPI's) have been utilised to assess ongoing performance of all of the manufacturing arms. If the proposed upgrade of the solid sodium cyanide plant is implemented, it is anticipated that the performance of the solids plant will still meet the relevant KPI's.	Given the relatively minor increase in greenhouse emissions as a result of the solids plant expansion, and the proposed management measures and commitments to further reduce greenhouse emissions from CSBP facilities as a whole, it is considered that impacts from anticipated greenhouse emissions are minor and manageable.

Environmental Factor	EPA Objective	Existing Environment	Potential Environmental Impacts/ Proposal Characteristics	Proposed Mitigation and Management Strategies	Predicted Outcome
Noise	To protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring that noise levels meet the *Environmental Protection (Noise) Regulations 1997 (As Amended)* for residential receptors, and to reduce noise emissions to as low as reasonably practicable.	A review of the significant noise control measures and upgrades undertaken at the CSBP Industrial Complex over the last five years is presented in Section 6.4.3. Noise emissions from the plant currently comply with the *Environmental Protection (Noise) Regulations 1997* or subsequent Ministerial approvals, with one exception. With all plants operating the total noise level at the boundary of Coogee Chemicals (most sensitive premises) currently does not comply with the noise regulations. Measured noise levels range from 61 – 65.5 dB(A) along the boundary, the highest noise levels being associated with noise emissions from the AGR cooling towers. The existing noise emissions fail to comply with the Regulation industrial receiver 'assigned level' of 65 L_{A10} only because the noise emission is 'tonal' in characteristic and attracts a +5 adjustment to the measured level. It is noted that were the Regulation 'assigned levels' to be changed in accordance with the recommendations of the "Noise Regulations Review: Outcomes of the Working Group Programme, June 2000", or the proposed regulation changes as currently being proposed by the Department of Environment, then the existing noise levels at the Coogee Chemicals boundary would be in compliance with the Regulations. The nearest non industrial noise sensitive premises is located approximately 3km east of the site at Medina. Noise emissions for the existing solids plant are well within the Regulation 'assigned level' for residential premises under 'worst case' night weather conditions. AGR retains the commitment in the current Ministerial conditions which commit to complying with the revised noise regulations within six months of their release.	Noise emissions for the proposed solids plant upgrade comply with the *Environmental Protection (Noise) Regulations 1997* requirements at the nearest residential receiver locations. The acoustic modelling shows that the predicted noise emissions from the CSBP Kwinana Industrial Complex (existing with proposed upgrades) are well within the 'assigned level' for residential premises under 'worst case' night weather conditions. The predicted noise levels at the nearest industrial premises (Coogee Chemicals) currently exceeds the Regulation 'assigned level' of 65 L_{A10} by virtue of tonal noise characteristics. The predicted noise emissions are expected to increase by up to 0.7 dB(A) at the Coogee Chemicals boundary. Both existing and predicted noise emissions are expected to comply with the proposed Regulation Review level of 70 L_{A10} (no characteristic adjustment required) criteria being pursued by the Department of Environment. In the event that the *Environmental Protection (Noise) Regulations 1997* are changed it is expected that the noise level at the industrial premises will then comply with the Regulations.	Noise emissions for the proposed solids plant upgrade comply with the *Environmental Protection (Noise) Regulations 1997* requirements at the nearest residential receiver locations. The predicted noise levels at the nearest industrial premises (Coogee Chemicals) currently exceeds the Regulation 'assigned level' of 65 L_{A10} by virtue of tonal noise characteristics. In the event that the *Environmental Protection (Noise) Regulations 1997* are amended it is expected that the noise level at the industrial premises will then comply with the Regulations. AGR retains the commitment in the current Ministerial conditions which commit to complying with the revised noise regulations within six months of their release. If the proposed amendments to the noise regulations are approved AGR will fully comply. If the proposed amendments are not progressed then a detailed study of the plant will be conducted to progress with additional modifications to reduce noise and ensure compliance. In the interim, AGR has undertaken a number of projects to continuously improve noise levels including: • Implementation of a variety of noise attenuation measures as described in Section 6.4.3. • Consideration of noise in the purchasing of new equipment and plant upgrades. • Implementation of a trial to reduce noise from the Sodium Cyanide Manufacturing Facility by replacing fan blades in the cooling towers with new fibreglass blades. This trial has commenced with results expected in June 2005. • Commissioning of Herring Storer Acoustics to prepare a report detailing what other actions may be taken to reduce noise levels. • Regular participation in the KIC environmental planning committee meetings, which discuss noise issues for the KIA. • Contributed to the cumulative noise study undertaken by KIC.	The upgrade will result in only a minor increase in noise levels at residential and industrial recurrence. Subject to the changes proposed for industrial noise in the *Environmental (Work) Regulations 1997*, the upgraded facility will fully comply with the EPA objective for noise.

Environmental Factor	EPA Objective	Existing Environment	Potential Environmental Impacts/ Proposal Characteristics	Proposed Mitigation and Management Strategies	Predicted Outcome
Liquid Wastes/ Surface Water Discharges	To ensure that surface water is managed to prevent discharge of contaminated water from site or to groundwater. To maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance, are protected (EPA, 2002b).	There are no permanent natural surface water bodies on the site. The main environmentally sensitive water body within close proximity to the site is Cockburn Sound. Treated wastewater is directed from the CSBP Kwinana Industrial Complex to Cockburn Sound via a submarine pipeline. Figure 5 is a schematic diagram of the AGR effluent stream, and its interaction with the CSBP effluent stream. As part of a continual improvement review process, AGR is currently undertaking a modification design review to remove the use of copper and hydrogen peroxide and instead utilise sodium hypochlorite and chlorine to destroy cyanide. The concentration of cyanide of 1ppm will still be met. The concentration of copper will decrease in the effluent stream as copper sulphate usage is reduced. This chlorine based system will be used to destroy cyanide in rainwater and potentially also in the reverse osmosis permeate. The advantages of the use of a chlorine based treatment system (using sodium hypochlorite) includes the familiarity of the operators in using this chemical, the removal copper in the wastewater discharge and the removal of the need for steam as the treatment can occur at ambient temperatures. The additional storage of sodium hypochlorite will be managed through AGR's dangerous goods licence.	The plant design means that virtually all wastewater produced in the solids plant is treated and recycled in the process. At the discharge point from the solids plant wastewater treatment system, before discharge to the CSBP effluent system, the cyanide will be no higher than 1ppm, and copper will be no higher than 1ppm. As a result of the permeate from the reverse osmosis plant being directed to the site effluent system, a load of up to 19kg/day of nitrogen will be directed to the CSBP Kwinana Industrial Complex marine outfall. This additional load can be accommodated without breaching the discharge limit for nitrogen in CSBP's site *Environmental Protection Act* licence, and CSBP maintains its commitment that average daily nitrogen loads to Cockburn Sound will be no higher from the end of 2002 than they were in the licence period June 30th 2001. This commitment has been met on all but four occasions since January 2001, with the exceedances generally due to management of stormwater during the winter months and process upsets. The Kwinana Water Reclamation Plant (KWRP) was commissioned in October 2004. CSBP will begin accepting treated water from this facility for use potentially in March 2005. It is intended that wastewater collected in CSBP containment ponds including the wastewater from the AGR sodium cyanide solids plant will be directed for disposal to the Sepia Depression Ocean Outlet Landline after the approvals process that the Water Corporation is currently undertaking is finalised. This is currently expected to occur in late March 2005.	CSBP/AGR has an existing stormwater management plan and a wastewater and solid waste management plan for the Sodium Cyanide Manufacturing Facility. These plans will be updated should approval be granted. CSBP/AGR have an active program aimed at reducing the current load of nitrogen and other contaminants discharged through the marine outfall and this will continue. As part of a continual improvement process, CSBP and AGR review their processes and ensure wastewater streams are reused where possible, and emphasise the importance of good housekeeping to minimise spillage. CSBP also commissioned a pilot nutrient stripping wetland in June 2004 which will further reduce nutrients into Cockburn Sound. Despite the robust nature of the site surface water management system, CSBP recognises there is always a potential for accidental releases of process fluids or effluents that could lead to a discharge of contaminants in the form of liquid sodium cyanide or hydrocarbons. Accordingly, an Emergency Response Plan and management procedures have been developed to address a range of potential incidents such as spills, fire, transport accidents etc that could result in the release of pollutants to surface waters and Cockburn Sound. Additionally, CSBP is committed to the Kwinana Industries Mutual Aid agreement including various local industries within the Kwinana industrial estate, established to provide a combined industry response to emergency situations.	The current proposal is not expected to significantly alter the overall performance of CSBP/ AGR's facility with respect to discharge of surface water and liquid wastes, and the EPA's objective will be met.
Social Surrounds					

Environmental Factor	EPA Objective	Existing Environment	Potential Environmental Impacts/ Proposal Characteristics	Proposed Mitigation and Management Strategies	Predicted Outcome
Risk	To ensure that risk from the proposal is as low as reasonably achievable and complies with acceptable standards and EPA criteria including Guidelines and Criteria for EIA No. 2, Guidance for Risk Assessment and Management: Offsite Individual Risk from Hazardous Industrial Plant (EPA, 2000).	In 2001, Det Norske Veritas (DNV) prepared an As-Designed Quantitative Risk Assessment (QRA) for the proposed solid sodium cyanide plant based on a production rate of 20,000 tpa (DNV, 2001). Undertaking a conservative "systematic break" approach the risk to off-site populations was found to tolerable in accordance with current guidelines (EPA, 2000). Upon completion of construction of the solid sodium cyanide plant, an update to the QRA (DNV, 2002) was undertaken to determine how final design changes impacted the risk to off-site populations. The final design was found to have the same or lower levels of risk and thus new quantitative results were not generated as the risks were already tolerable. Particularly interesting is the driving force for risks impacting offsite populations in DNV (2001) were no longer valid. The original design used ammonia in the refrigeration unit and it was the ammonia releases from the refrigeration unit driving the risk profile for the solid sodium cyanide plant in DNV (2001). The design changed prior to construction and the solid sodium cyanide plant used a different refrigeration unit that utilised Refrigerant 22 (R22), which is non-toxic and non-flammable, thus not posing a risk to off-site populations.	QEST Consulting were commissioned by AGR to review the existing risk model for the Sodium Cyanide Manufacturing Facility and to determine whether the proposed upgrade to the solid sodium cyanide plant would pose undue risk to population outside the facility boundary. A copy of the response from QEST Consulting is included as Appendix 4. QEST Consulting concluded that the proposed upgrade to the solid sodium cyanide plant will not change the current situation where off-site risk levels are tolerable, particularly when considering the following points: • The proposed changes for the upgrade do not alter the original conclusions about the process being stable and non-volatile, resulting in tolerable risk to off-site populations. • The environmental monitoring provides an excellent barrier for preventing releases that pose an adverse risk to persons (due to concentrations of environmental concern being well below those that pose an acute risk to human health).	Safety features are already incorporated into the existing plant will be incorporated into any new facilities. All plant operators and maintenance employees based in the sodium cyanide plant 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 upgraded facilities will incorporate at least two tiers of personnel technically qualified to manage hazardous chemical operations. CSBP/AGR maintains a close working relationship with the Fire & Emergency Services Authority (FESA) and has a service agreement. FESA provides backup to AGR and CSBP personnel in emergency response situations and regularly visits the CSBP and AGR sites for training and familiarisation purposes. This practice will be extended to the upgraded solids plant when it is operational. On-site emergency facilities at CSBP's Kwinana industrial complex will continue to include a dedicated emergency response vehicle, fire tender and a patient transfer vehicle at all times, and an occupational health nurse during normal working hours. The emergency response vehicles and resources will be available to service any off-site incident involving the transport of sodium cyanide.	The current proposal is not expected to significantly alter the overall performance of CSBP/ AGR's facility with respect to risk, and the EPA's objective will be met.
Transport	Ensure that transportation and storage of fuels/chemicals complies with the Australian Dangerous Goods Code so as to ensure that risk is as low as reasonably achievable. Ensure that roads are maintained and road traffic managed to meet an adequate standard of level of service and safety. Ensure the requirements of Main Roads of Western Australia are met.	AGR has a *Transport Management Plan* (TMP) that details procedures for the management of the transport of solid and sodium cyanide solution, to protect the environment in the event of an incident with advice from the Department of Industry and Resources. The specific routes to be used for export via the Port of Fremantle comprise Kwinana Beach Road, Patterson Road, Rockingham Road, Stock Road, Leach Highway, Stirling Highway, Tydeman Road, Napier Road, Port of Fremantle.	Hazards to the public range from direct (collision) to indirect (road damage from heavy vehicle use). It is anticipated that the majority of solid product will be transported via road from Kwinana, other than a small quantity that may be railed interstate or possibly to the Eastern Goldfields. The specific routes to be used for export via the Port of Fremantle, vehicles will follow main roads from the Kwinana site to the North Fremantle container terminal, i.e. Kwinana Beach Road, Patterson Road, Rockingham Road, Stock Road, Leach Highway, Stirling Highway, Tydeman Road, Napier Road, and Port of Fremantle. It was recently acknowledged by the Minister for Environment that the review of transport options is due in August 2005 (correspondence dated 3rd December 2004). There are approximately 700 road traffic movements per (usual business) day from the CSBP Kwinana Industrial Complex at present. The potential ongoing traffic increase resulting from this proposal is likely to be 500 loads per annum (1-2 per day), which is insignificant in the context of current traffic movements on Kwinana Beach Road and Paterson Road.	The transport of solid sodium cyanide will comply with the requirements of the following: • *Dangerous Goods Regulations 1992*; • *Dangerous Goods (Transport) Act 1998;* • *Dangerous Goods (Transport Act) (Road and Rail) Regulations 1999*; • Specifications for Intermediate Bulk Containers for the Transport of Dangerous Goods by Road and Rail (Supplement 2 to the Australian Dangerous Goods Code - Federal Office of Road Safety) AS/NZS 4452:1997 - The Storage and Handling of Toxic Substances; and Only Professional drivers in licenced and well-maintained trucks will undertake road transport. AGR, as a matter of course, provides customers receiving shipments of sodium cyanide with advice on correct handling, storage and usage procedures. This situation will continue and any documentation will be updated to reflect the requirements for safely handling, storing and using solid sodium cyanide. It was recently acknowledged by the Minister for Environment that the review of transport options is due in August 2005 (correspondence dated 3rd December 2004)	The increase in truck movement is relatively minor and can be managed under the Framework of the existing Transport Management Plan. The EPA's objective will be met.

7. STAKEHOLDER CONSULTATION

Given the nature and scale of the proposed expansion, AGR was cognisant of the need to adequately inform and consult with key stakeholders as part of development of the proposal.

Initial consultations have involved a briefing of the need and scope of the proposed expansion, in order to trigger discussion of key factors that require addressing in as part of the project assessment.

In July and August 2004, AGR commenced consultation with the Town of Kwinana, the Environmental Protection Authority and key staff from the Department of Industry and Resources.

The proposal was also presented to the following public forums:

- Kwinana Communities & Industries Forum (KCIF) on 5 October 2004.
- A Stakeholder Forum held at CSBP's premises on 17 November 2004.

A copy of the presentation made to the KCIF, attendance list (individual names removed for privacy reasons) and summary of the comments raised are included in Appendix 5. The comments raised were all related to site security, and did not refer directly to the proposed upgrade.

A copy of the presentation made at the Stakeholder Forum, the invitation list, a summary of the comments raised during the presentation and the response is included in Appendix 6.

Individual briefings have also been held with Local Government Authorities (Town of Kwinana, City of Rockingham), neighbouring industries, regulatory agencies (DoE, WA Planning Commission, DoIR), and local public interest groups.

8. SUMMARY OF ENVIRONMENTAL MANAGEMENT COMMITMENTS, STRATEGIES AND PROCEDURES

It is considered that the existing commitments are adequate to manage any environmental impacts associated with the proposed upgrade of the solid sodium cyanide plant. The existing commitments are summarised in Table 20.

TABLE 20
PROPOSED SOLID SODIUM CYANIDE PLANT UPGRADE
ENVIRONMENTAL MANAGEMENT COMMITMENTS, STRATEGIES AND PROCEDURES

NO	TOPIC	ACTION	OBJECTIVE/S	TIMING	ADVICE
Manufacture and Storage of Sodium Cyanide					
1	Environmental Management	Continue to implement the Environmental Monitoring and Management Program, which details procedures for the management and monitoring of the solid and liquid sodium cyanide manufacturing facility. The Environmental Monitoring and Management Program will include but not be restricted to: 1. Water (Surface and Waste) Management Plan (see commitment 3); 2. Solid Waste Management Plan (see commitment 5); 3. Noise Management Plan (when required) (see commitment 7); 4. Transport Management Plan (see commitment 15); and 5. All monitoring and management procedures for the cyanide business.	To protect the environment in the event of an incident.	Implemented and ongoing.	DoE/EPA
2	Environmental Management	Continue to review the Environmental Monitoring and Management Program as described in commitment 1.	To protect the environment in the event of an incident.	At intervals not exceeding 3 years.	

NO	TOPIC	ACTION	OBJECTIVE/S	TIMING	ADVICE
3	Water Management	Continue to implement the Water (Surface and Waste) Management Plan, which details procedures for the management of water discharge from the site. This plan includes the following: 1. Management of contaminated stormwater; 2. Management of liquid spills and washdown water; 3. Liquid waste storage requirements; 4. Process and storage area sealing and bunding requirements; 5. Requirements for monitoring/testing prior to disposal; 6. Discharge requirements including concentration of cyanide and copper each to be less than 1 ppm; and emission of nitrogen to be no greater than 19 kg/day on monthly average; 7. Contingency/emergency procedures; and 8. Reporting requirements.	To protect marine flora and fauna and groundwater.	Implemented and ongoing.	
4	Water Management	Continue to review the Water (Surface and Waste) Management Plan as described in commitment 3.	To protect marine flora and fauna and groundwater.	At intervals not exceeding 3 years.	
5	Solid Waste Management	Continue to implement the Solid Waste Management Plan, which details procedures for the management of solid waste disposal from the site. This plan will include but not be limited to: 1. Recyclable wastes will be removed by an approved contractor; 2. General refuse (domestic and industrial solid waste) will be disposed of at an appropriate landfill; 3. Solid waste storage requirements; and 4. Reporting and review requirements.	To ensure that waste is relocated to the correct locations to minimise potential contamination to the receiving environment	Implemented and ongoing.	DoE
6	Solid Waste Management	Continue to review the Solid Waste Management Plan described in commitment 5.	To ensure that waste is relocated to the correct locations to minimise potential contamination to the receiving environment.	At intervals not exceeding 3 years.	

NO	TOPIC	ACTION	OBJECTIVE/S	TIMING	ADVICE
7	Noise Management	Develop a Noise Reduction Plan for the site. This Plan will be comprehensive and will specify the measures and the timeframe for implementation of the measures. This Plan will also include: 1. The acoustical model of the plant; 2. Best practicable measures to minimise noise emissions; 3. Operating procedures to be adopted for particular activities to minimise noise impacts; 4. The noise monitoring program; and 5. The complaint management procedure.	To achieve compliance with *Environmental Protection (Noise) Regulations 1997* or to reduce noise emissions to as low as reasonable practicable.	Within 6 months after the review of the *Environmental Protection (Noise) Regulations 1997* has been completed and the new Regulations are made publicly available.	Town of Kwinana/ DoE
8	Noise Management	Implement the Noise Management Plan referred to in commitment 7 if required. (See commitment 7 – "Timing").	To ensure compliance with prescribed standards and minimise where practicable noise impacts.	As soon as the Noise Management Plan is approved by the EPA.	
9	Facility Emergency Response	Be represented in KIMA and KIPS and maintain emergency response capabilities in accord with the Safety Report and approved Transport Management Plan.	To ensure that the emergency response and fire-fighting capability is appropriate to respond to all emergency and fire scenarios.	Implemented and ongoing.	DoIR

NO	TOPIC	ACTION	OBJECTIVE/S	TIMING	ADVICE
Transport of Sodium Cyanide					
10	Transport Management Plan	Have in place a Transport Management Plan, which details procedures for the management of the transport of solid and liquid sodium cyanide. This Plan will include: 1. Procedure for Transport Emergency Response for both liquid and solid sodium cyanide; 2. Procedure for obtaining DoIR authorisation for changes to the approved (as outlined in submission) sodium cyanide transport routes; 3. Process for liaison with Local Government Authorities, relevant government departments, State emergency authorities and the local emergency management advisory committees before transport commences along approved transport routes, to address local and specific issues, including setting up emergency plans and training programs; 4. Procedure for reviewing the approved transport routes and updating the transport risk assessment based on updates to Dangerous Goods Transport Routes, changes to facilities adjoining the route and a review of traffic data as required or otherwise three yearly; 5. Specifications for the use of Intermediate Bulk Containers that meet the IMDG Code for the transport of solid sodium cyanide; 6. Procedures for sea container inspections; 7. Procedure for Port disruption; 8. Procedure for communications with the transport operations base as each vehicle travels along a transport route to a mine and until that vehicle logs off; 9. Procedure for maintenance of a log, which includes time of departure from the Kwinana area, and a general goal, will be to clear the metropolitan area before significant traffic build-ups occur. 10. Location and description of the most effective and suitable neutralising agents used to treat any spilled sodium cyanide; 11. Procedure for external and internal audits of all aspects of the TMP; 12. Procedure for annual emergency exercises in association with FESA; 13. Procedure for incident follow-up; and 14. Procedure for review and update of TMP every two years or when required.	To protect the environment in the event of an incident.	Implemented and ongoing.	DoIR/EPA

NO	TOPIC	ACTION	OBJECTIVE/S	TIMING	ADVICE
11	Transport Management Plan	Continue to review Transport Management Plan described in commitment 10 above.		Two yearly.	DoIR
12	Solids Export Emergency Response	Audit the Stevedore's operations, Safety Management System and Emergency Response Plans for handling of solid sodium cyanide.	To verify that: • control measures and assumptions identified in the QRA are provided and/or implemented • the Port operations are compliant with Dangerous Goods in Ports Regulations with respect to solid sodium cyanide and • drainage from the solid sodium cyanide laydown area is contained and emergency response is adequate.	At intervals not exceeding two years (from November 2002).	DoIR and Fremantle Port Authority
13	Transport Options	Review other transport options, including road/rail viability and risk assessment.	To ensure the most effective transport mode is used and public safety is protected.	Within three years from 31 August 2002.	DoIR City of Fremantle

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10. GLOSSARY

10.1 Abbreviations

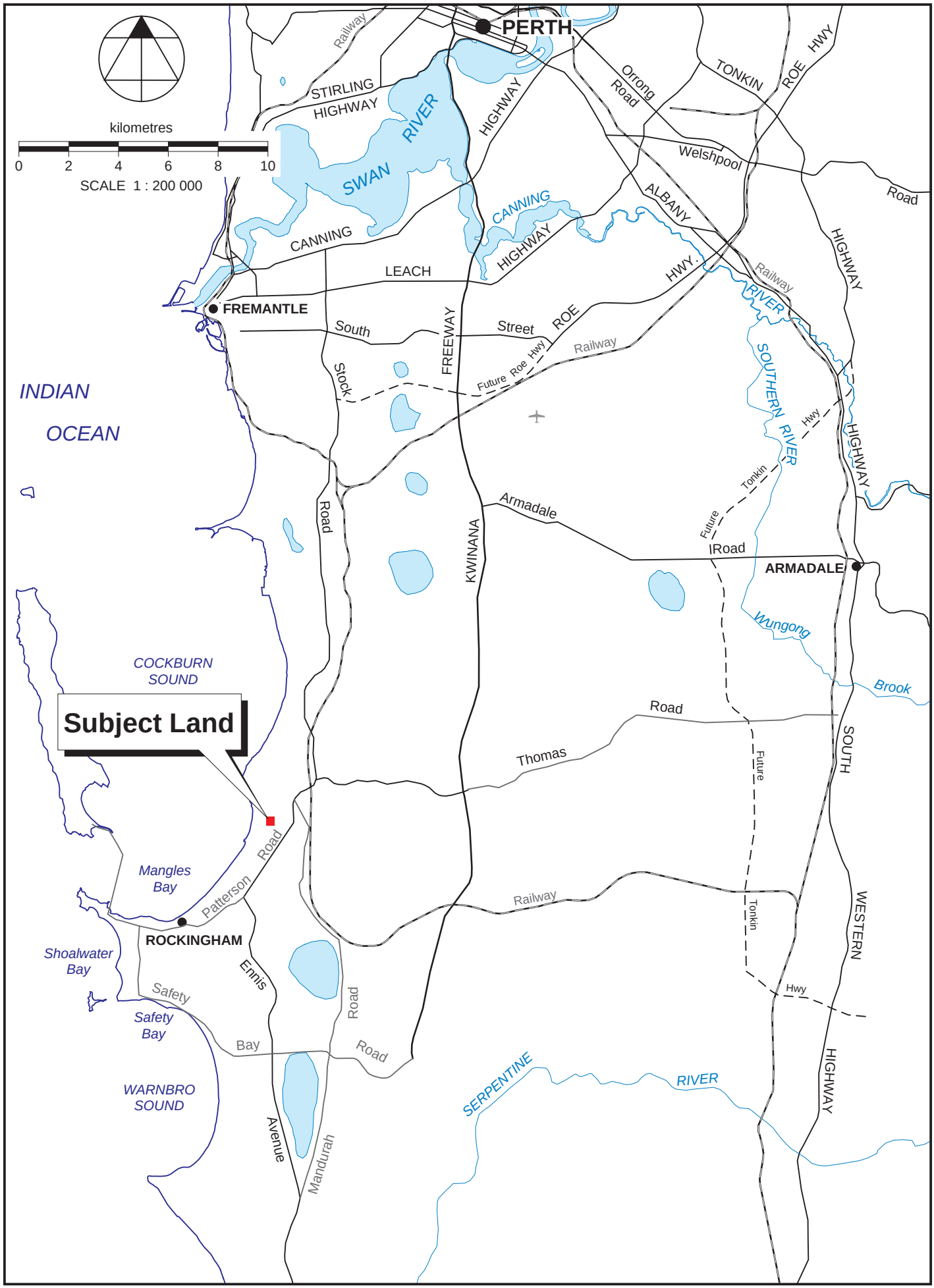
AGO	Australian Greenhouse Office
AGR	Australian Gold Reagents
ANZECC	Australian and New Zealand Environment and Conservation Council
ARMCANZ	Agricultural and Resource Management Council of Australia and New Zealand
CO_2	Carbon dioxide
CSBP	CSBP Limited
DNV	Det Norske Veritas
DoE	Department of Environment
DoIR	Department of Industry and Resources
EPA	Environmental Protection Authority
ERT	Emergency Response Team
FESA	Fire and Emergency Services Authority
GLC	Ground Level Concentrations
HCN	Hydrogen Cyanide
IBC	Intermediate Bulk Containers
IMDG	International Marine and Dangerous Goods
KCIF	Kwinana Communities & Industries Forum
KIA	Kwinana Industrial Area
KIC	Kwinana Industries Council
KIEP	Kwinana Industries Education Partnership
KIMA	Kwinana Industries Mutual Aid
KIPS	Kwinana Industries Public Safety
KWRP	Kwinana Water Reclamation Plant
KWRP	Kwinana Water Reclamation Plant
L_{A1}	A $L_{A\ 1}$ level is an A-weighted noise level which is exceeded for 1% of the representative assessment period. (An A-weighted noise level has been filtered in such a way as to represent the way in which the human ear perceives sound. As the human ear is not very sensitive in the lower frequencies these frequencies are weighted more than the higher frequencies. An A-weighted sound pressure level is described by the symbol dB(A)).
L_{A10}	A $L_{A\ 10}$ level is an A-weighted noise level which is exceeded for 10% of the representative assessment period. A $L_{A\ 10}$ level is considered to represent the *"intrusive"* noise level.
L_{AMAX}	A $L_{A\ max}$ level is the maximum A-weighted noise level during the representative assessment period.
MDEA	Methyldiethanolamine
NaCN	Sodium cyanide
NH_3	Ammonia
N_2O	Nitrous oxide
NO	Nitric oxide
NO_2	Nitrogen dioxide
OEHHA	Office of Environmental Health Hazard Assessment

PCB	Polychlorinated Biphenyl
PER	Public Environmental Review
QRA	Qualitative Risk Assessment
SMCWS	Southern Metropolitan Coastal Water Study
TBT	Tributyl tin
TMP	Transport Management Plan
USEPA	United States Environmental Protection Authority
WHO	World Health Organisation

10.2 Units

°C	degrees Celsius (Centigrade)
d	day
dB	decibels
dB(A)	decibels (A-weighted)
g	grams
GJ	gigajoule
g/m^3	grams per cubic metre
g/Nm^3	grams per normal cubic metre
g/s	grams per second
ha	hectares
kg	kilograms
kg/d	kilograms per day
kg/h	kilograms per hour
kg/y	kilogram per year
km	kilometres
km/h	kilometres per hour
kW	kilowatts
kWh	kilowatts hours
m	metres
m/day	metres per day
m/s	metres per second
m2	square metres
m3	cubic metres
m3/h	cubic metres per hour
m3/s	cubic metres per second
mg	milligrams
mg/m^3	milligrams per cubic metre
mg/Nm^3	milligrams per normalised cubic metre
mm	millimetres
Nm^3	normalised cubic metres (measured at 0°C and 101.3kPa)
Nm^3/h	normalised cubic metres per hour
ppm	parts per million
s	seconds
t	tonnes
tpa	tonnes per annum
$\mu g/m^3$	micrograms per cubic metre
y	year

FIGURES



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PROPOSED SOLID SODIUM CYANIDE PLANT UPGRADE
PUBLIC ENVIRONMENTAL REVIEW

REGIONAL LOCATION

FIGURE 1

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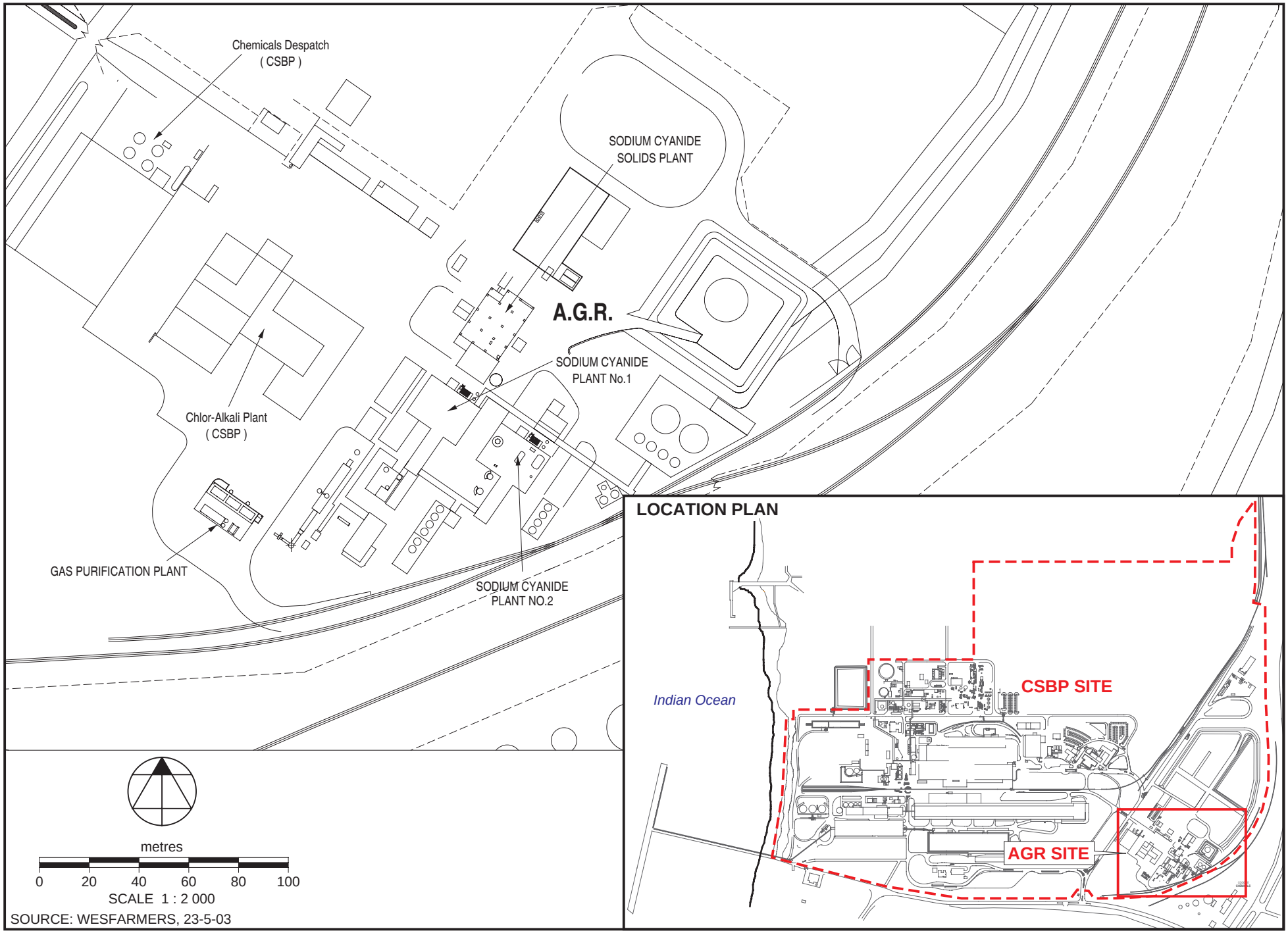
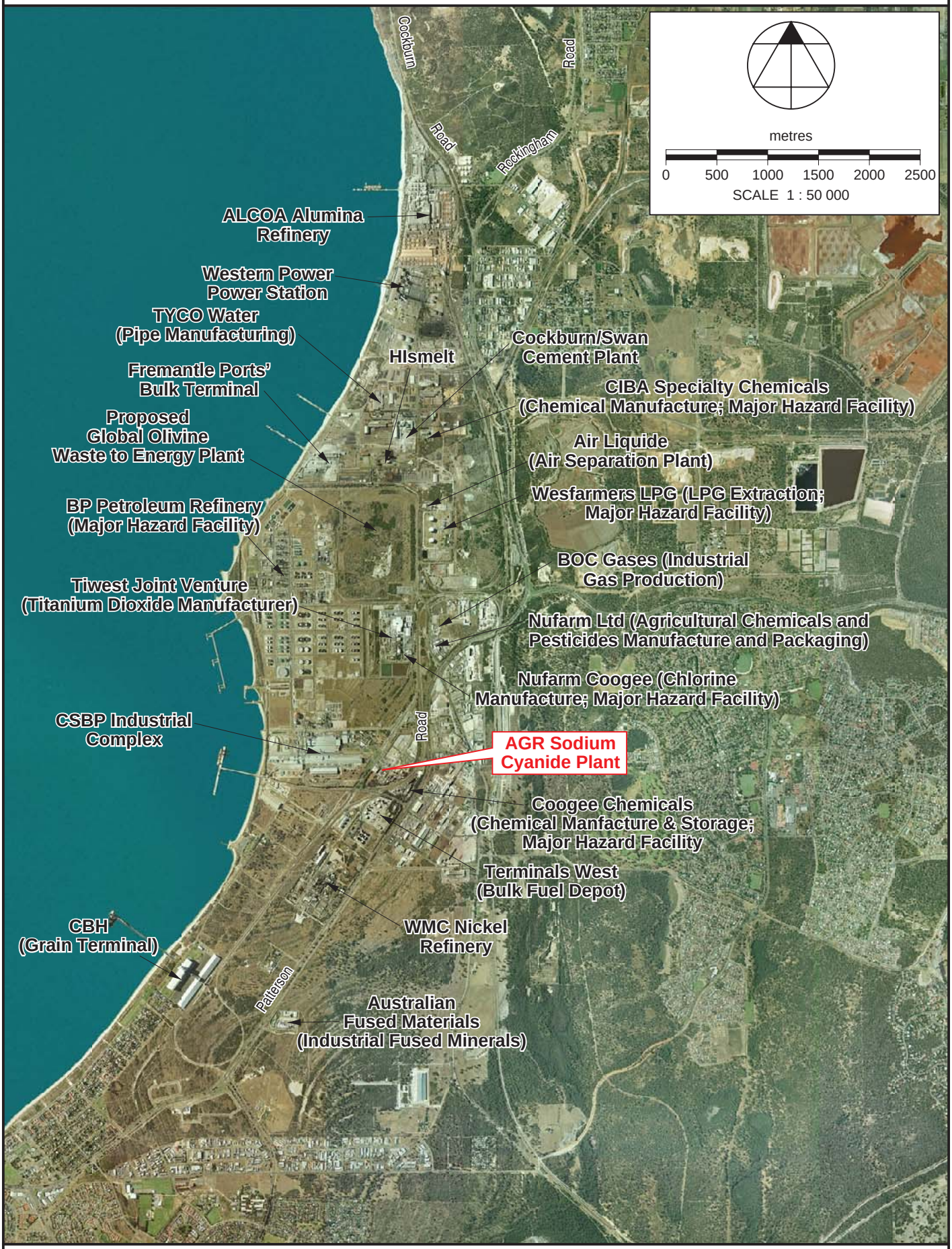


PROPOSED SOLID SODIUM CYANIDE PLANT UPGRADE
PUBLIC ENVIRONMENTAL REVIEW

SITE LAYOUT

FIGURE 2



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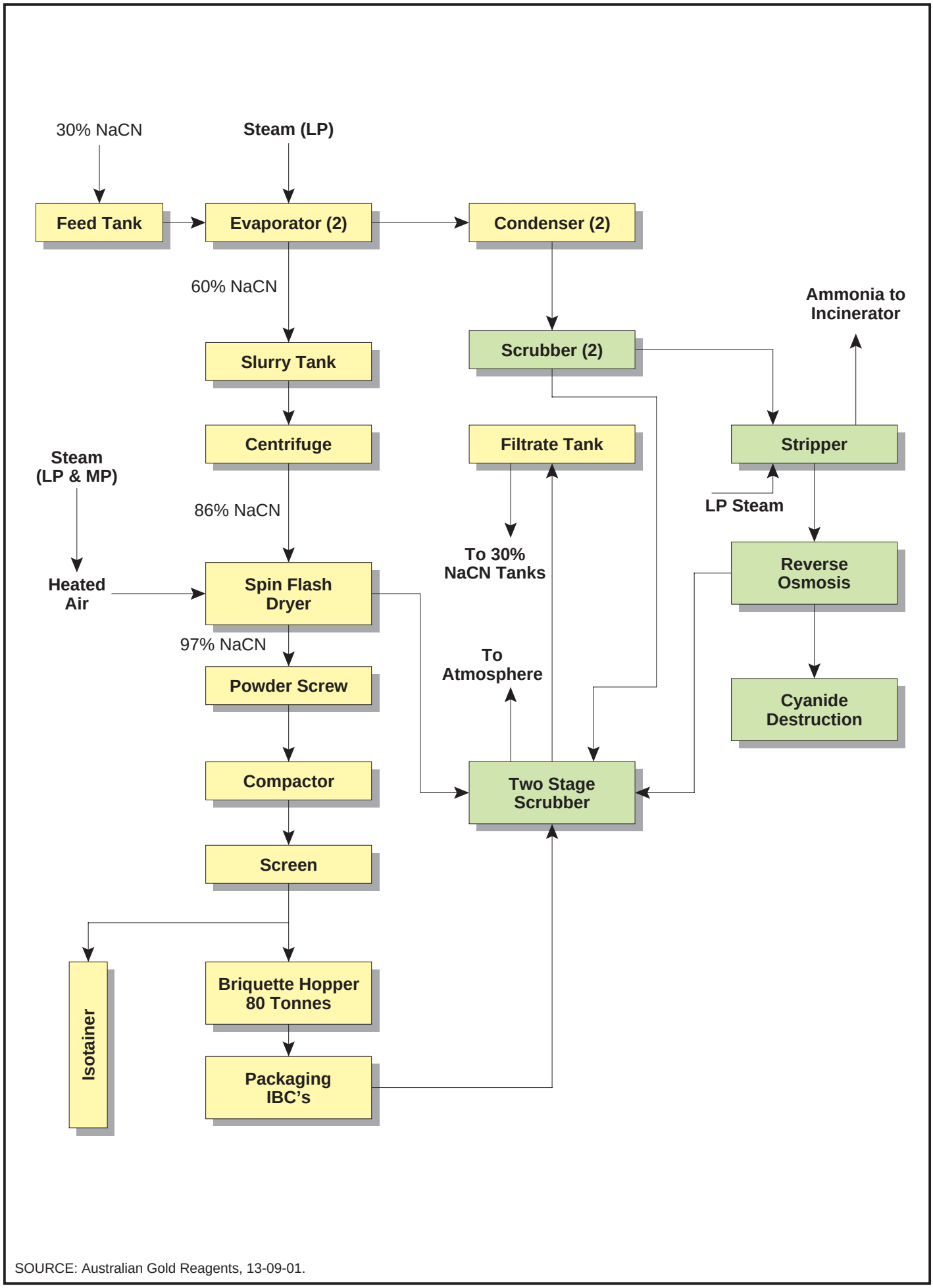
PROPOSED SOLID SODIUM CYANIDE PLANT UPGRADE
PUBLIC ENVIRONMENTAL REVIEW

LOCATION WITH RESPECT TO THE KWINANA INDUSTRIAL AREA

FIGURE 3



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PROPOSED SOLID SODIUM CYANIDE PLANT UPGRADE
PUBLIC ENVIRONMENTAL REVIEW

PROCESS FLOW CHART

FIGURE 4

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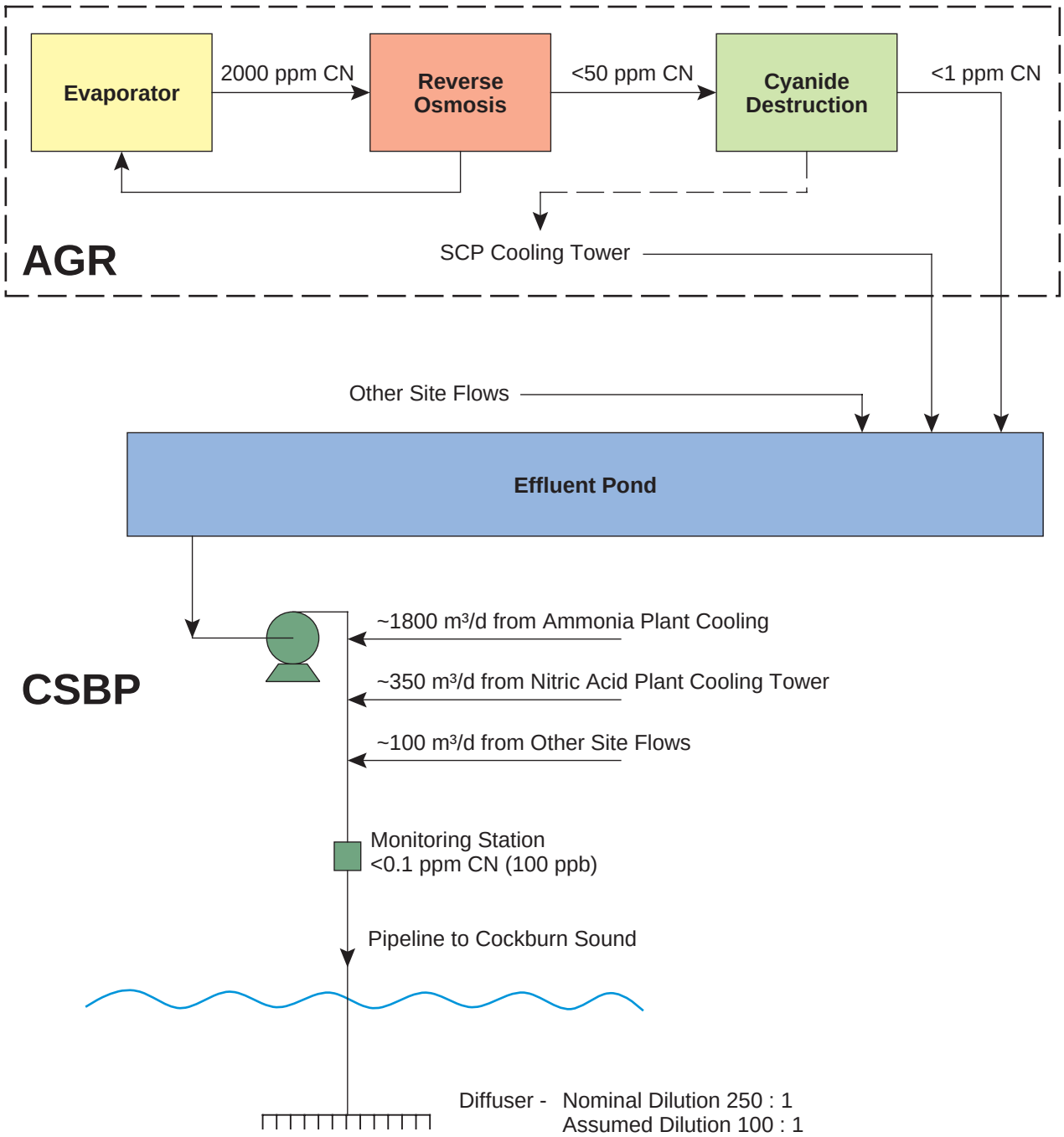

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PROPOSED SOLID SODIUM CYANIDE PLANT UPGRADE
PUBLIC ENVIRONMENTAL REVIEW
WASTEWATER TREATMENT
FIGURE 5

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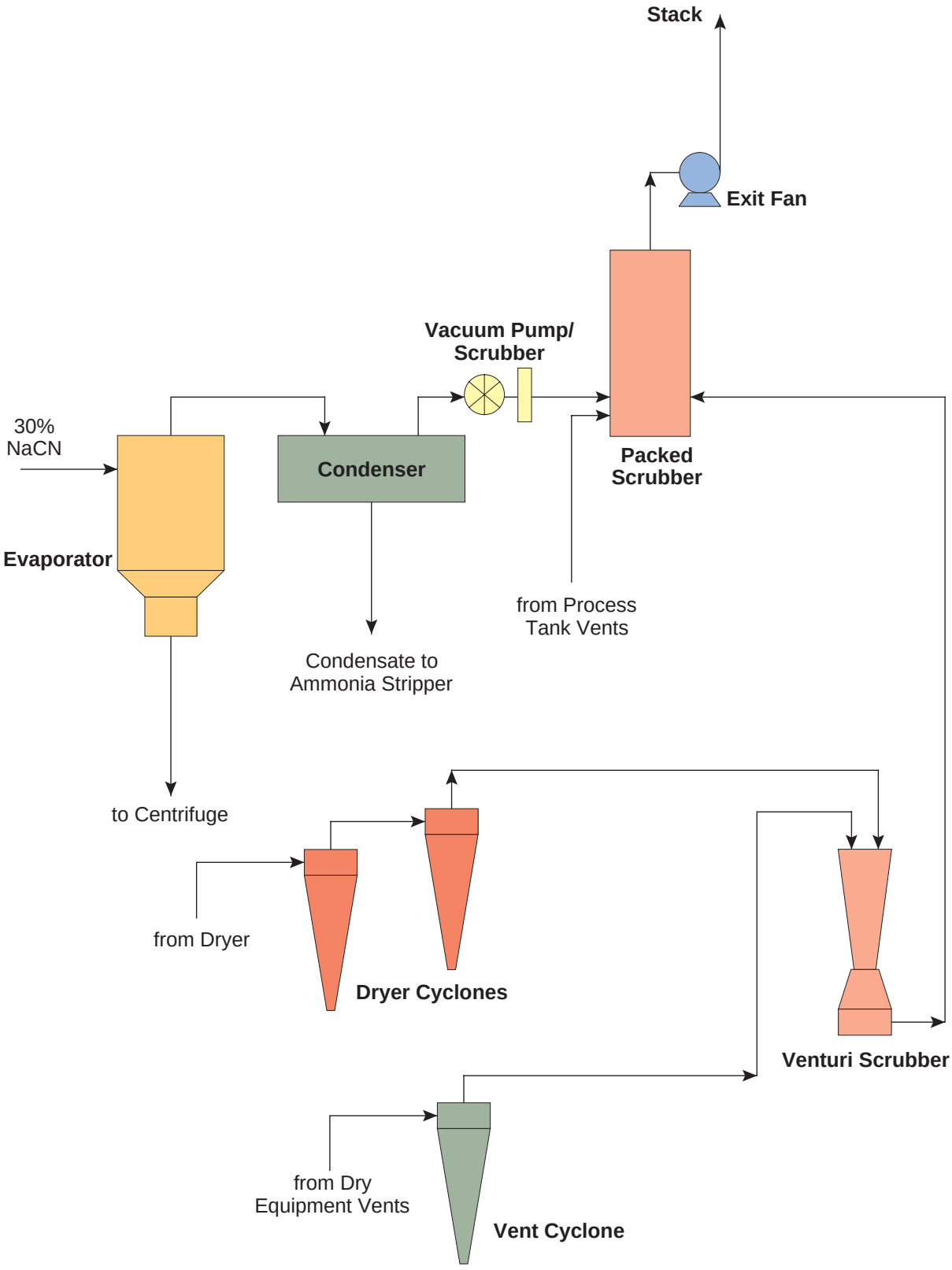

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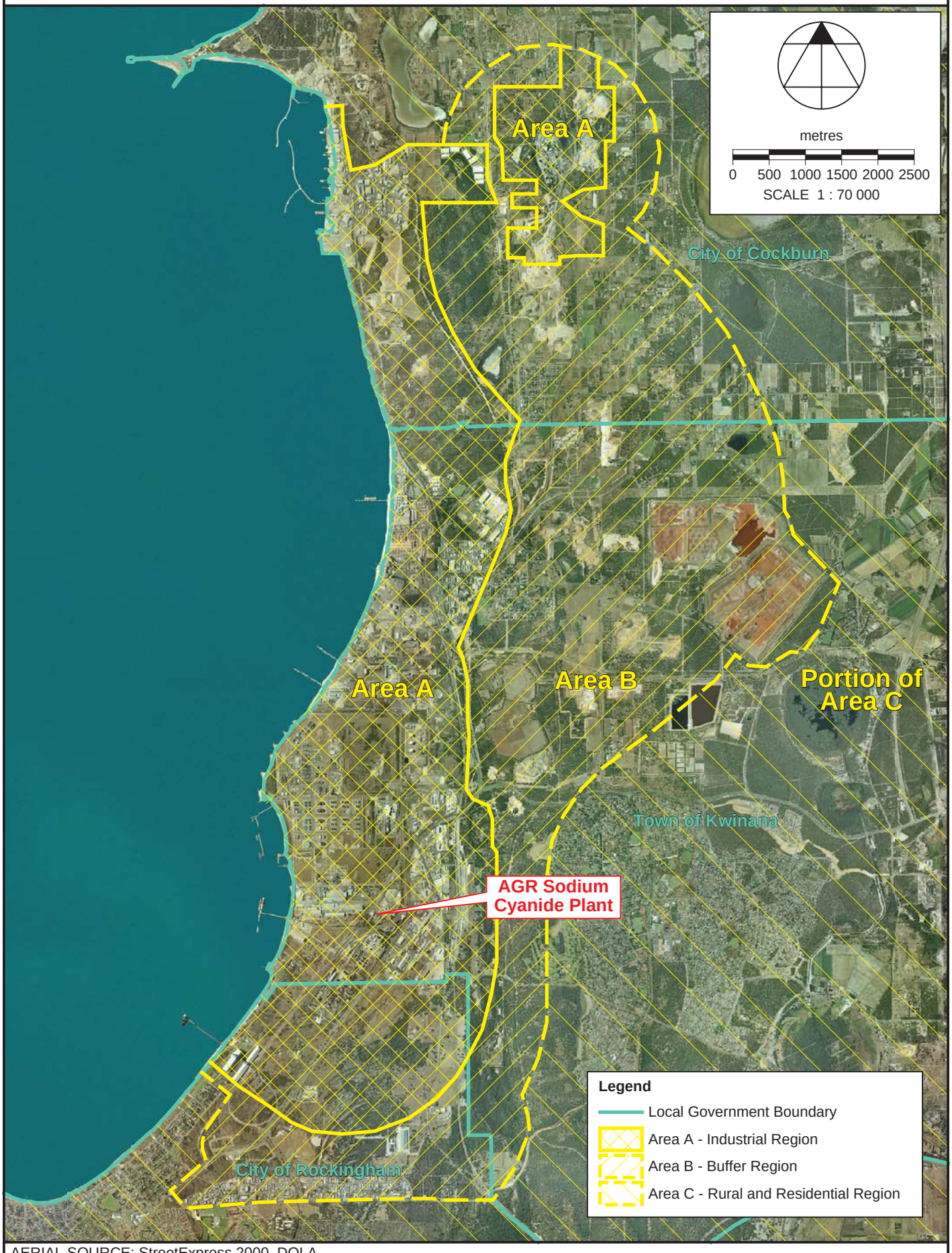
PROPOSED SOLID SODIUM CYANIDE PLANT UPGRADE
PUBLIC ENVIRONMENTAL REVIEW

ATMOSPHERIC EMISSIONS

FIGURE 6



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BUFFER ZONES SOURCE: EPA, 1999.

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PROPOSED SOLID SODIUM CYANIDE PLANT UPGRADE
PUBLIC ENVIRONMENTAL REVIEW

KWINANA INDUSTRIAL AREA BUFFER ZONE

FIGURE 7

APPENDICES

APPENDIX 1

ENVIRONMENTAL PROTECTION ACT LICENCE

WESTERN AUSTRALIA

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Environmental Protection Act 1986

LICENCE NUMBER: 6110/7 **FILE NUMBER: L138/90**

PREAMBLE

The following statements in this Preamble either reflect important sections of the Environmental Protection Act 1986 or provide relevant background information for the licensee. They should not be regarded as conditions of licence.

Applicability
This licence is issued to Australian Gold Reagents Pty Ltd for the operation of the Kwinana Sodium Cyanide Plant located at Kwinana Beach Road, Kwinana Beach 6167 which is a prescribed premises within Schedule 1 of the *Environmental Protection Regulations*, and includes but is not necessarily limited to, the following operations:

- sodium cyanide dissolving plant;
- two Sodium Cyanide Manufacturing plants
- downstream Sodium Cyanide Solids Plant.

The two Liquid Manufacturing plants and the Sodium Cyanide Solids Plant is prescribed within Schedule 1 of the *Environmental Protection Regulations 1987* as outlined in Table 1;

Table 1: Categories under which Australian Gold Reagents Pty Ltd premises are prescribed.

Category Number	*Category name*	*Description*
31	Chemical Manufacturing. 100 tonnes or more per year	Premises (other than Cat 32) on which chemical products are manufactured by a chemical process

Nominal Rated Throughput
The nominal rated throughput of the premises covered by this Licence is in accordance with the following:

- Sodium cyanide dissolving plant: Rated at 10 tonnes per hour of solid 100% sodium cyanide.
- Two Liquid Sodium Cyanide Manufacturing Plants: Each plant is rated at 35,000 tonnes per annum expressed as 100% by weight sodium cyanide which is equivalent to a combined actual production of 256,600 tonnes per annum of 30% by weight of sodium cyanide solution.
- A Sodium Cyanide Solids plant to processes the output from the Liquid Sodium Cyanide Plants to produce up to 25,000 tonnes per annum of sodium cyanide briquettes.

Any significant increase (greater than 10% per cent) above the nominal rated throughput listed shall not occur unless the licensee has been granted prior approval in writing from the Director under the provisions of the *Environmental Protection Act 1986*.

Calibration
Condition A3(a) of this licence requires the licensee to ensure that all equipment required to measure compliance with the licence condition is calibrated in accordance with the manufacturer's requirements or an appropriate Australian or International (ISO) Standard. Where there is no clear understanding of the requirements for calibration, or a discrepancy

exists in the interpretation of the requirements, the licensee should immediately bring these issues to the attention of the Director, Pollution Prevention Division. They will then be discussed with a view to reaching a satisfactory resolution.

Approved atmospheric emission points

The Australian Gold Reagents Pty Ltd premises has been assessed and approved in accordance with Part IV of the Environmental Protection Act (1986), the discharge of process gases from the premises to the environment through the discharge points listed in table 2.

TABLE 2: Approved atmospheric discharge points

Discharge Point	Discharge Point abbreviation	Stack Height above ground level (m)	Density (1) (kg/m^3)	Volume(1) (m^3/s)	Temp(1) (^oC)
John Zink Incinerator Stack	Y3705	30.4	0.74	20.0	177 (250-260)
Maxitherm Incinerator Stack	E301	30	0.77	15	150
No 1 plant Start Up Stack	K101	27	0.86	3.3	90
No 1 plant Shut Down Stack	A201	27	0.86	6.4	52
No 2 plant Start Up Stack	K1001	27	0.86	3.3	90
No 2 plant Shut Down Stack	A2001	27	0.86	6.4	52
Sodium Cyanide Solids Plant Stack	Y0381	39	1.1	2.9	40

(1) Estimate only, based on high throughput as at May 1994 sodium cyanide plant capacity.

Approved discharge of process gaseous wastes can only occur from the discharge points detailed in Table 2, and in the following ways:

(i) under normal operation, through one or more of the following:
- *John Zink* incinerator stack,
- *Maxitherm* incinerator stack, or
- Sodium Cyanide Solids stack;

(ii) during start-up, through the start-up and/or shut down stacks;
(iii) during a shut-down, through the shut down stack; and
(iv) in the event of one of the incinerators being shut down when the plant is producing sodium cyanide, through the associated shut-down stack.

Other legal requirements

The licensee should be aware that these conditions do not exempt the Premises/Licensee from other statutory obligations under the *Environmental Protection Act 1986,* or any other Acts. This includes the licensee's obligations under the:
- *Environmental Protection Regulations 1987* (as amended); and
- *Environmental Protection (Noise) Regulations 1997*.

Where there is conflict between the conditions set in this licence and any Act or Regulations, the latter takes precedence.

Approvals provided under Part IV of the Environmental Protection Act (1986)

The Australian Gold Reagents Pty Ltd premises has been subject to formal assessment by the EPA for the initial proposal and subsequent changes to the facility. The EPA's reports and recommendations regarding these assessments are contained in Bulletins 427, 450, 727 and 1028. Although all of the Ministerial Statements issued for the proposal still have legal standing, in practical terms some statements have been superseded because the conditions and commitments in earlier statements also appear in more recent statements. Other statements were issued, in accordance with Section 46 of the Environmental Protection Act, to change some of the conditions appearing in earlier statements. The statements which have been issued for the project are listed below with appropriate comment.

Statement 6, 15Oct87: Proposed NaCN plant at Kwinana and transport of NaCN by Rail. This is the original statement approving a total manufacture of 15,000 tpa and rail transport of 30% NaCN solution from Kwinana .

Statement 73, 24Aug89: NaCN plant extensions. This statement approved a duplication of the existing plant to permit a total production limit to 30,000 tpa; that is 15,000 tpa for the existing plant and 15,000 tpa NaCN for the proposed plant.

Statement 99, 1Jun90: NaCN (liquid) plant extension to 40,000 tpa (de-bottlenecking). This statement approved the increase in production to a total of 40,000 tpa from Stage 1 and Stage 2 production facilities; that is 20,000 tpa for the existing plant and 20,000 tpa for the proposed plant.

Statement 129, 15Mar91: Section 46 to alter Condition 5 of Statement 99. This statement approved a change to Condition 5 which would allow the de-bottlenecking of the existing Stage 1 plant to permit a production of 20,000 tpa.

Statement 347, 17 March 94: Section 46 to alter Conditions 1 and 5 of Statement 99. Provides for the de-bottlenecking of both plants to enable each to produce 35,000 tpa of NaCN; that is, a total production of 70,000 tpa when the duplicate plant is completed.

Statement 384, 12 May 1995: Section 46 to replace the transportation requirements of previous statements. This statement replaced all previous conditions and commitments which relate to the transport of NaCN, replacing a rail only transport option from Kwinana to a combined road/rail option.

Statement 579, 6Dec01: Approving a downstream plant for converting liquid NaCN manufactured in the two liquid sodium cyanide plants to solid briquettes. Wastewater recovered from the process of concentrating sodium cyanide to solid form is treated and discharged to the CSBP wastewater tertiary containment system. Wastewater discharged from the solids plant is required to be monitored in addition to the discharges to Cockburn Sound under Licence No. 6107 issued to Wesfarmers CSBP Ltd.

Statement 602, 2Aug02: Transport options for solid sodium cyanide.

Non-Standard Operations
The licensee should inform the DEP Kwinana Regional Office, at least 24 hours prior to the commencement of any planned non-standard operation which may have the potential to cause pollution.

Emergency, Accident or Malfunction
The licensee should inform the DEP Kwinana Regional Office as soon as practicably possible following the identification of any discharge of waste which has occurred as a result of an emergency, accident or malfunction, or extreme weather conditions, otherwise than in accordance with any condition of this Licence and has caused or is likely to cause pollution.

General Requirements
The following statements paraphrase sections of the *Environmental Protection Act 1986* and are included for the information of the licensee.

- The licensee should take all reasonable and practicable measures to prevent pollution of the environment.
- The licensee shall take all reasonable and practicable measures to prevent or minimise the emission of odours from the premises.

Gaseous Emission Testing
For practical operational purposes and the efficacy of obtaining reliable gaseous emissions test results seven consecutive operating days should have occurred before a monthly emissions test is necessary. When an equipment failure occurs such that a gaseous emissions test can not be preformed then the director should be notified and an alternative time agreed for the tetsing.

Alteration to Premises
Prior to making any significant alterations to the premises which may affect the air, water or noise emissions from the premises the Licensee must submit a proposal to the Director accompanied by supporting information and plans which allow the environmental impact of that change to be assessed.

CONDITIONS OF LICENCE

DEFINITIONS

In these conditions of licence, unless inconsistent with the text or subject matter:

"advise" and "notify" means notification in written form to the DEP Kwinana Branch, and may be transmitted by facsimile;

"annually" means once each calendar year;

"approval" means approval in writing from time to time;

"approved" means approved in writing from time to time;

"Inspector" means a person appointed as an Inspector under Section 88 of the *Environmental Protection Act 1986*;

"DEP" means Department of Environmental Protection;

"DEP Kwinana Branch" for the purpose of correspondence means-

Manager, Kwinana Branch
Department of Environmental Protection
PO Box 454 Telephone: 9419 5500
KWINANA 6167 Facsimile: 9419 5897

Or other email agreed by a delegated officer.

"Director" means Director, Pollution Prevention Division or other delegated officer of the Department of Environmental Protection for and on behalf of the Chief Executive Officer as delegated under Section 20 of the *Environmental Protection Act 1986*;

"Director" for the purpose of correspondence means-
Director, Pollution Prevention Division
Department of Environmental Protection
PO Box K 822 Telephone: 9222 7000
PERTH WA 6842 Facsimile: 9222 7099

"g/s" means grams per second;

"g/m^3" means grams per cubic metre, expressed as dry at 0 degrees Celsius and 1.0 atmosphere pressure (101.325 kilopascals);

"kg/day" means kilograms per day;

"licensee" means Australian Gold Reagents PTY LTD;

"licensed premises" means the manufacturing site of the operations undertaken by Australian Gold Reagents PTY LTD at the premises located at Kwinana Beach Road, Kwinana;

"m/s" means metres per second at exit temperature and pressure;

"m^3/s" means cubic metres per second at exit temperature and pressure;

"mg/l" means milligrams per litre;

"NOx" means the combination of nitric oxide and nitrogen dioxide, and expressed as nitrogen dioxide; and

"NOx concentration" means the total combined concentration of nitric oxide and nitrogen dioxide, expressed as nitrogen dioxide, dry, at 0 degrees Celsius and 1.0 atmosphere pressure (101.325 kilopascals).

"ppm" means parts per million on a volume basis;

"3-monthly reporting period" means a 3 calendar month period considered to commence on 1 January, 1 April, 1 July and 1 October each year.

"Annual reporting period " means a 12-calendar month period, considered to commence on 1 July each year.

"CN^-"means cyanide ion.

All other terms take their meaning from the Environmental Protection Act 1986.

GENERAL CONDITIONS

PERSONS IN CHARGE TO HAVE ACCESS TO CONDITIONS

The licensee shall take the following measures for the purpose of minimising the likelihood of pollution occurring as a result of any activity conducted or proposed to be conducted in any part of the Premises:

G1(a) The licensee shall ensure that any person left in charge of the premises is aware of these Conditions of Licence and has access at all times to this Licence or copies thereof.

G1(b) The licensee shall ensure that any person who performs tasks on the Premises is informed of all of the Conditions in this Licence that relate to the tasks which that person is performing.

EXCEEDANCE REPORTS

The licensee shall provide the results of monitoring for the purpose of supplying the Director with information relating to the characteristics, volume and effects of the waste being or to be discharged/emitted from the premises.

G2(a) The licensee shall provide an exceedance report to the Director where any monitoring results are in excess of the limits specified in any condition of this licence within seven working days of that exceedance becoming known. The exceedance report shall contain:

(i) the amount by which the limit was exceeded, supported by relevant monitoring data;

(ii) reasons for the pollutant levels being in excess of the limits; and
(iii) an outline of corrective action taken by the licensee to ensure that pollutant levels are maintained below the limits, where applicable.

Where additional investigation may be required, the report may be submitted at a later time, than the required 7 working days, at the discretion of the Director.

G2(b) A summary of exceedances shall be included in the annual report in accordance with condition G4

3-MONTHLY REPORTING

The licensee shall provide the results of monitoring for the purpose of supplying the Director with information relating to the characteristics, volume and effects of the waste being or to be discharged/emitted from the premises.

G3 The licensee shall provide to the DEP Kwinana Branch, within 28 days of the completion of each 3-monthly reporting period (or a later date approved by the Director), monitoring results as required by condition A3(b) and W1(c).

ANNUAL REPORTING

The licensee shall provide the results of monitoring for the purpose of supplying the Director with information relating to the characteristics, volume and effects of the waste being or to be discharged/emitted from the premises.

G4 The licensee shall provide to the DEP Kwinana Branch an annual monitoring report containing the monitoring data, or other collected data, required by Conditions G2(b), G5(b), A2(c) and A3(a) The report shall contain data collected over the 12-month reporting period and shall be provided, no later than 42 days after the last day of the 12-month reporting period to which the data relates, or at a later date approved by the Director.

SODIUM CYANIDE PROCESS PLANTS - LICENSED THROUGHPUT

The licensee shall take the following measures for the purpose of minimising the likelihood of pollution occurring as a result of any activity conducted or proposed to be conducted in any part of the Premises:

G5(a) The licensee shall ensure that the quantity of liquid sodium cyanide produced from each liquid cyanide processing plant does not exceed 35,000 tonnes of sodium cyanide per year (expressed as 100% sodium cyanide).

G5(b) The report required by G4 shall include a statement of the total production of sodium cyanide for the two previous 6-month reporting periods, expressed as 100% sodium cyanide.

SOLID SODIUM CYANIDE DISSOLVING PLANT - LICENSED THROUGHPUT

The licensee shall take the following measures for the purpose of minimising the likelihood of pollution occurring as a result of any activity conducted or proposed to be conducted in any part of the Premises:

G6 The licensee shall ensure that the nominal rated throughput of the solid sodium cyanide dissolving plant does not exceed 10 tonnes per hour of (solid) 100% sodium cyanide.

SOLID SODIUM CYANIDE DISSOLVING PLANT - SOLID WASTE DISPOSAL

The licensee shall take the following measures for the purpose of minimising the likelihood of pollution occurring as a result of any activity conducted or proposed to be conducted in any part of the Premises:

G7 The licensee shall ensure that solid wastes from the solid sodium cyanide dissolving plant (including packaging from solid sodium cyanide which is not recycled) is disposed of off-site in a manner approved by the Director.

AIR POLLUTION CONTROL CONDITIONS

STACK EMISSION LIMITS

The licensee shall provide the results of monitoring for the purpose of supplying the Director with information relating to the characteristics, volume and effects of waste being or to be discharged from the premises into the environment.

A1(a) Start-up Emission Limits

The licensee shall ensure that gases emitted from the start-up stacks at all times comply with the emission limits specified below:

(i) Total Cyanide 15 g/m^3 (expressed as HCN)
(ii) Nitrogen Oxides 310 g/m^3 (total nitrogen oxides reported as NO_2)
(iii) Ammonia 22 g/m^3

A1(b) Shut-down Emission Limits

The licensee shall ensure that gases emitted from the shut-down stacks at all times comply with the emission limits specified below:

(i) Total Cyanide 0.1 g/m^3 (expressed as HCN)
(ii) Nitrogen Oxides 1.0 g/m^3 (total nitrogen oxides reported as NO_2)
(iii) Ammonia 22 g/m^3

A1(c) Operation Emission Limits

The licensee shall ensure that under plant operating conditions, that stack emission comply with the emission limits specified in the table below:

Table 3: Atmospheric emission limits

Parameter	*John Zink Incinerator Stack*	*Maxitherm* Incinerator Stack (1)	*Solids Plant Stack*	*Total allowable emissions*
Nitrogen Oxides (total nitrogen oxides reported as NO_2) for equal to or more than 99% of the operating time of the NaCN solution plant over the previous consecutive 12 months.	5 g/s	5 g/s	-	10 g/s
Nitrogen Oxides (total nitrogen oxides reported as NO_2) for equal to or less than 1% of the operating time of the NaCN solution plant over the previous consecutive 12 months	12 g/s	12 g/s	-	-
Ammonia	0.34 g/s	0.32 g/s	0.33 g/s	0.66 g/s(2)
Total Cyanide (expressed as HCN)	0.53 g/s	0.51 g/s	0.58 g/s	1.04 g/s(2)

Note (1): Except within 60 minutes of the waste gas being introduced to the *Maxitherm* incinerator.

Note (2): Total emissions for the Solids Plant and Liquids Plants will not exceed the licence limits that were set prior to 2001 for the .Liquids Plants,

NOx MONITORING SYSTEM

The licensee shall provide the results of monitoring for the purpose of supplying the Director with information relating to the characteristics, volume and effects of waste being or to be discharged from the premises into the environment.

A2(a) The licensee shall maintain the *John Zink* NOx monitor on the *John Zink* incinerator and the *Maxitherm* NOx monitor on the *Maxitherm* incinerator to provide reliable and accurate measurement of the exit emissions from the sodium cyanide manufacturing plants. All equipment covered by this licence condition shall be calibrated in accordance with the manufacturer's requirements or an appropriate Australian or International (ISO) Standard.

A2(b) The licensee shall maintain each monitoring system, described in part (a) of this condition, to provide reliable and accurate data for:

(i) greater than 90 percent of the operating time of each sodium cyanide solution plant in every calendar month period; and

(ii) greater than 95 percent of the operating time of each sodium cyanide solution plant in any 12 consecutive calendar months.

A2(c) The licensee shall ensure that the NOx monitoring systems described in part (a) of this condition are measured directly, or otherwise estimate in a manner approved by the Director, the following quantities:

(i) NOx concentration in g/m^3 on a continuous basis;

(ii) NOx mass emission rate in g/s for comparison to limits;

(iii) total volume emission rate of waste gases in m^3/s; and

(iv) density of the waste gases in kg/m^3.

Where the above values shall be expressed as half hourly averages.

PARAMETERS TO BE MEASURED WHEN MONITORING WASTE GAS DISCHARGES

The licensee shall provide the results of monitoring for the purpose of supplying the Director with information relating to the characteristics, volume and effects of waste being or to be discharged from the premises into the environment.

A3(a) The licensee shall ensure that the following parameters are measured (or calculated where appropriate) annually when determining the quantity of wastes discharged from the *John Zink* and *Maxitherm* incinerators and the Sodium Cyanide Solids Plant stack:

(i) density at exit temperature;
(ii) moisture content;
(iii) total volume flow rate at exit temperature; and
(iv) exit temperature.

A3(b) The licensee shall take monthly grab samples from the *John Zink* and *Maxitherm* incinerator and the Sodium Cyanide Solids Plant stacks to determine

(i) Particulate concentration (Solids Plant only);
(ii) HCN gaseous concentration (all three);
(iii) Ammonia concentration (all three stacks).

PLANT START-UP RESTRICTIONS

The licensee shall take the following measures for the purpose of minimising the likelihood of pollution occurring as a result of any activity conducted or proposed to be conducted in any part of the Premises

A4(a) Liquid Sodium Cyanide Plant start ups shall only be initiated according to either of the following conditions:

(i) when the wind direction originates from 50˚ - 170˚, the wind speed is at least 2 m/s and subject to an assessment of meteorological information available from the Bureau of Meteorology that indicates favourable meteorological conditions are likely to prevail for the duration of the start up; or
(ii) following submission of a written request for a start up, which includes a start-up strategy, to the Director and subject to the specific written conditions issued by the Director, to the licensee, for a given startup.

A4(b) The licensee shall ensure that the DEP Kwinana Branch is notified 30 minutes prior to start up of either plant.

A4(c) Where a startup has been completed, subject to Condition A4(a)(ii), the licensee shall provide a written report to the DEP Kwinana Branch, within 24 hours of the start up, providing compliance information with the conditions of start up and start-up strategy.

INCINERATOR - REQUIREMENT TO REPORT FAILURE

The licensee shall take the following measures for the purpose of minimising the likelihood of pollution occurring as a result of any activity conducted or proposed to be conducted in any part of the Premises

A5 The licensee shall notify the DEP Kwinana Branch of any incinerator shut-down, for more than 2 hours duration, while the associated sodium cyanide plant is operating and producing sodium cyanide. Notification shall occur within 2 hours and 15 minutes of the incinerator being shut down.

STACK SAMPLING PORTS, PLATFORMS ACCESS WAYS

The licensee shall take the following measures for the purpose of minimising the likelihood of pollution occurring as a result of any activity conducted or proposed to be conducted in any part of the Premises

A6 The licensee shall maintain all stack sampling ports, platforms and access ways on the *Maxitherm* and *John Zink* incinerator stacks and the Sodium Cyanide Solids Plant stack to the requirements of the Director.

SOLID SODIUM CYANIDE DISSOLVING PLANT
WET SCRUBBER DUST COLLECTION SYSTEM

The licensee shall take the following measures for the purpose of minimising the likelihood of pollution occurring as a result of any activity conducted or proposed to be conducted in any part of the Premises

A7 The licensee shall maintain and operate the wet scrubber dust collection such that it collects any fugitive dust particles or fumes from the dissolving tank, where dust or fumes may be emitted to the atmosphere.

SOLID SODIUM CYANIDE DISSOLVING PLANT
RE-USE OF WET SCRUBBER LIQUORS

The licensee shall take the following measures for the purpose of minimising the likelihood of pollution occurring as a result of any activity conducted or proposed to be conducted in any part of the Premises

A8 The licensee shall ensure that all wet scrubber liquors are either directed back into the solid sodium cyanide dissolving tank or be directed to the wastewater treatment plant.

WATER POLLUTION CONTROL CONDITIONS

LIMITS

The licensee shall take the following measures for the purpose of minimising the likelihood of pollution occurring as a result of any activity conducted or proposed to be conducted in any part of the Premises

W1(a) The licensee shall store all treated wastewater, generated by the Sodium Cyanide Solids Plant, in a holding tank for the purpose of testing prior to its release to Wesfarmers CSBP tertiary containment system.

W1(b) The licensee shall not discharge wastewater from the solids plant or from the holding tank required by part (a) of this condition until tests have been conducted to determine the concentration of:
(i) CN^-, where the concentration has been determined to be less than 1mg/L
(ii) pH to be not less than 5 nor greater than 9.5

W1(c) The licensee shall ensure that wastewater held for testing, as required by part (a) of this condition, that does not conform to the schedule identified by part (a) of this condition, shall be re-directed to the cyanide plant wastewater treatment plant for further treatment for removal of CN- and/or pH adjustment.

W1(d) The licensee shall ensure that the concentration of Copper, CN^-, ammonia as total nitrogen, and the pH of the wastewater discharged is determined on a daily basis and a log of these determinations shall be maintained. This log shall be supplied to the Director in accordance with condition G2 of this licence.

BUNDING AND SEALING OF PROCESS AND STORAGE AREAS

The licensee shall take the following measures for the purpose of minimising the likelihood of pollution occurring as a result of any activity conducted or proposed to be conducted in any part of the Premises:

This condition pertains to secondary containment of environmentally hazardous liquids and is designed to protect the environment from the harmful effects of a failure in a storage tank, process vessel or interconnecting pipeline carrying environmentally hazardous chemicals.

W2(a) The Licensee shall store environmentally hazardous chemicals including fuel, oil or other hydrocarbons (where the total volume of each substance stored on the premises exceeds 250 litres) within low permeability (10^{-9} metres per second or less) bunded compound designed to contain not less than 110% of the volume of the largest storage vessel or inter-connected system, and at least 25% of the total volume of substances stored in the compound.

W2(b) The compound described in part (a) of this conditions shall:
(i) be graded or include a sump to allow recovery of liquid;

(ii) be chemically resistant to the substances stored;
(iii) include valves, pumps and meters associated with transfer operations wherever practical. Otherwise the equipment shall be adequately protected (eg. Bollards) and contained in an area designed to permit recovery of spilled chemicals;
(iv) be designed such that jetting from any storage vessel or fitting will be captured within the bunded area [see for example Australian Standard 1940-1993 Section 5.9.3 (g)];
(v) be controlled such that the capacity of the bund is properly maintained (eg. regular inspection and pumping of trapped uncontaminated rainwater).

W2(c) The Licensee shall immediately recover, or remove and dispose of, liquid resulting from spills or leaks of chemicals including fuel, oil or other hydrocarbons, whether inside or outside the low permeability compound.

SEVERANCE

It is the intent of these licence conditions that they shall operate so that, if a condition or a part of a condition is beyond my power to impose, or is otherwise *ultra vires* or invalid, that condition or part of a condition shall be severed and the remainder of these conditions shall nevertheless be valid to the extent that they are within my power to impose and are not otherwise *ultra vires* or invalid.

.....

Officer Delegated Under Section 20
Of the Environmental Protection Act 1986

Date of issue: Monday, 24 March 2003

APPENDIX 2

RESULTS OF AIR MODELLING

ENVIRON

Memorandum

To: Australian Gold Reagents via ATA Environmental

From: ENVIRON
Date: 4 April 2005

SUBJECT Air Dispersion Modelling Assessment of Sodium Cyanide Solids Plant Upgrade

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Introduction

Australian Gold Reagents (AGR) is currently seeking approval to upgrade its sodium cyanide solids plant. The upgrade includes the installation of improved pollution control equipment to enable a throughput increase from 25,000 to 45,000 tonnes per annum.

ENVIRON has been requested by ATA Environmental, on behalf of AGR, to undertake air dispersion modelling to assess the air quality impacts associated with the upgrade.

Air Dispersion Model

The air dispersion modelling has been completed using the Industrial Source Complex Short Term Version 3 with Plume Rise Model Enhancement (ISC3 Prime). ISC3 Prime is one of the United States Environment Protection Agency's (USEPA) recommended air dispersion models and is used extensively for regulatory assessments of industrial sources.

ISC3 Prime is a conventional Gaussian plume dispersion model that includes enhanced treatment of the effects of buildings on plume dispersion. Since there are a number of buildings and structures in the vicinity of the cyanide plants, ISC3 Prime was considered to be the most appropriate model to use in this study. The ISC3 Prime model does not consider effects of coastal fumigation, however this is not expected to be significant in this instance due to the relatively low stack heights.

A sample of one of the ISC3 Prime configuration files is included as Attachment A.

Meteorological Data

The air dispersion modelling was undertaken using a meteorological data set created from meteorological measurements collected in Hope Valley for the 1980 calendar year.

Model Setup and Emissions Information

The following compounds are emitted from the sodium cyanide solids plant in significant quantities, and were considered in this study:

- Ammonia (NH_3); and
- Cyanides (CN), comprising hydrogen cyanide gas (HCN) and sodium cyanide particulates (NaCN).

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159 Adelaide Terrace
East Perth WA 6004

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Two sodium cyanide liquid plants are located in close proximity to the solids plant, and the cumulative impact of emissions from the three plants was also considered. The following scenarios were modelled:

- Current normal operation of solids plant in isolation (25,000 t/a);
- Upgraded operation of solids plant in isolation (45,000 t/a);
- Current operation of solids plant (25,000 t/a) and both liquid plants; and
- Upgraded operation of solids (45,000 t/a) and both liquid plants.

Emissions from the liquid plants are significantly higher during start-up than during normal operation (see Table 1). Liquid plant start-up conditions were not considered in this study because specific regulatory mechanisms are in place to manage this.

For each of the above scenarios, the ISC3 Prime air dispersion model was used to predict the maximum 1-hour and annual average ground level concentrations in the vicinity of the plants. Modelling was performed over a 5 km x 5 km grid domain, with grid spacings of 100 m.

Since there are no proposed changes to the two adjacent liquid cyanide plants, and no structures will be constructed that could modify the air dispersion characteristics, data provided to ENVIRON for use in previous studies was also used in the present study of the emissions. These were supplemented with additional information regarding current and predicted emissions data for the solids plant following the upgrade. The stack parameters and emission rate data used are presented in Table 1.

Table 1
Stack Parameters and Emissions Data[1]

Stack	Height (m)	Exit Diameter (m)	Exit Temp (K)	Exit Velocity (m/s)	NH_3 Emission (g/s)[2]	CN Emission (g/s)[2,3]	Total Particulates (g/s)[4]
Solids Plant (current)	39	0.5	313	12.1	0.6	0.58	0.005
Solids Plant (upgraded)	39	0.5	313	21.7	1.2- 1.5[5]	0.58	0.007
Liquid Plant 1 Normal Operation	30.4	1.2	473	17.7	0.438	-	-
Liquid Plant 2 Normal Operation	30	1.1	423	15.8	0.367	-	-
Liquid Plant 1 or 2 Start-up (not modelled)	27	0.5	363	16.8	179	59.8	-

Notes
1. Data provided to ENVIRON by AGR via emails of 16 August 2001 and 11 October 2004.
2. Current emissions data, and predictions of emissions data following the upgrade, were made by AGR and forwarded to ENVIRON via email on 8 December 2004
3. The reported CN emission comprises both hydrogen cyanide gas and sodium cyanide particulate.
4. The reported particulate emission is composed mostly of sodium cyanide particles of unknown size distribution.
5. The reported NH_3 emission rate of 1.2 g/s following the upgrade is expected to be achieved for the majority of the time, however short peaks of up to 1.5 g/s may be possible. Both emissions scenarios have been modelled.

The current emissions data presented in Table 1 reflect the current Department of Environment licence limits rather than actual emission rates, which are lower than these values. The upgrade emissions data reflect emission rates following the upgrade as predicted by AGR. These are considered worst case emissions for both the current and upgrade scenarios.

Ambient Air Quality and Occupational Health and Safety Criteria

Selected ambient air quality and occupational health and safety guideline levels for ammonia, hydrogen cyanide and particulates are presented in Table 2.

Table 2
Ambient Air Quality Criteria

Compound	Averaging Time	Reference	Concentration (µg/m^3 unless stated)
NH_3	1 hr	OEHHA[1] (California)	3,200
	Annual	USEPA[2] (United States)	100
CN[3]	1 hr	OEHHA (California)	340
	Annual	OEHHA (California)	9
Particulates $PM_{2.5}$	24 hr	NEPM[4] (Australia)	25

Notes
1. OEHHA (2003)
2. USEPA (2004)
3. All CN guideline levels presented in Table 2 are for HCN. Ambient air quality criteria are not available for NaCN, but occupational health criteria for NaCN are less strict than for HCN. This indicates that NaCN has a lower toxicity than HCN. Therefore, the use of the HCN guideline levels for the total CN emitted is conservative.
4. NEPC (1998)

Modelling Results – NH_3 and CN

For NH_3 and CN, the predicted maximum 1 hour average ground level concentrations for the four scenarios is presented in Table 3. The highest predicted annual average ground level concentration for the four scenarios is presented in Table 4.

Table 3
Model Results: Maximum Predicted 1 Hour Average Ground Level Concentrations (µg/m^3)

	NH_3		CN	
	Max GLC (µg/m^3)	% of guideline[1]	Max GLC (µg/m^3)	% of guideline[1]
Current Solids Plant in Isolation	62	2	60	18
Upgraded Solids Plant in Isolation (1.2 g/s NH_3 emission)	124	4	60	18
Upgraded Solids Plant in Isolation (1.5 g/s NH_3 emission)	155	5	60	18
Current Solids Plant and Both Liquid Plants	62	2	60	18
Upgraded Solids Plant and Both Liquid Plants (1.2 g/s NH_3 emission)	124	4	60	18
Upgraded Solids Plant and Both Liquid Plants (1.5 g/s NH_3 emission)	155	5	60	18

Notes
1. The guideline level referred to in Table 3 is the relevant ambient air guideline from Table 2.

Table 4
Model Results: Highest Predicted Annual Average Ground Level Concentration (µg/m^3)

	NH_3		CN	
	Max GLC (µg/m^3)	% of guideline[1]	Max GLC (µg/m^3)	% of guideline[1]
Current Solids Plant in Isolation	0.7	1	0.7	8
Upgraded Solids Plant in Isolation (1.2 g/s NH_3 emission)	1.5	2	0.7	8
Upgraded Solids Plant in Isolation (1.5 g/s NH_3 emission)	2.1	2	0.7	8
Current Solids Plant and Both Liquid Plants	1.0	1	0.7	8
Upgraded Solids Plant and Both Liquid Plants (1.2 g/s NH_3 emission)	1.7	2	0.7	8
Upgraded Solids Plant and Both Liquid Plants (1.5 g/s NH_3 emission)	1.9	2	0.7	8

Notes
1. The guideline level referred to in Table 4 is the relevant ambient air guideline from Table 2.

The results presented in Tables 3 and 4 indicate that if NH_3 and CN are emitted at either the current limits, or at the proposed emission rates, resultant ground level concentrations would be significantly lower than relevant ambient air quality criteria.

The following contour plots are presented:

- Maximum predicted 1 hr average NH_3 ground level concentrations during concurrent operation of solids plant (at current licence limit and upgrade levels) and both liquid plants (Figure 1);
- Predicted annual average NH_3 ground level concentrations during concurrent operation of solids plant (at current licence limit and upgrade levels) and both liquid plants (Figure 2); and
- Maximum predicted 1 hr and annual average CN ground level concentrations during concurrent operation of solids plant and both liquid plants (Figure 3).

Modeling Results - Particulates

No data have been supplied to ENVIRON regarding particle size distribution in the stack emissions. Therefore, it has been assumed that all particles are $PM_{2.5}$ (i.e. they are diameter 2.5 micron or smaller). This provides a conservative estimate of impacts, since the health risk of particulates tends to decrease with increasing particle sizes.

The predicted maximum 24-hr average ground level concentrations for the upgrade scenario is predicted to be 0.6 $\mu g/m^3$, which is less than 3% of the NEPM standard for $PM_{2.5}$. Given the likelihood that many of the particles emitted are larger than $PM_{2.5}$, and that this standard is therefore likely to be overly conservative, it can be concluded that the modest increase in particulate emissions is unlikely to be significant.

Contribution of Increased Ammonia Emissions to Cumulative Impacts

The current Department of Environment licence for the cyanide solids plant stipulates an ammonia emission limit of 0.6 g/s. However, Australian Gold Reagents expects that this emission rate may be difficult to achieve following the upgrade, and proposes and ammonia emission limit of 1.2 g/s.

The modelling predicts that increasing the emission rate of ammonia from 0.6 g/s to 1.2 g/s will have a significant effect on 1 hour average ground level concentrations, with maximum 1 hour average ground level concentrations 500 m from the plant rising from approximately 18 $\mu g/m^3$ to approximately 40 $\mu g/m^3$ (1.2 g/s emission rate) or 50 $\mu g/m^3$ (1.5 g/s emission rate). The highest annual average ground level concentration 500 m from the plant is predicted to rise from approximately 0.9 $\mu g/m^3$ to approximately 1 $\mu g/m^3$ (1.2 g/s emission rate) or 1.5 $\mu g/m^3$ (1.5 g/s emission rate). The predicted ground level concentrations associated with the upgrade are well below published ambient air quality and occupational health exposures levels.

CSBP Limited has commissioned ENVIRON to conduct a preliminary atmospheric emissions screening assessment of Kwinana industries (ENVIRON 2005). In the study, National Pollutant Inventory (NPI) records were examined to identify those industries that emit ammonia to the atmosphere, and air dispersion modelling was undertaken to assess long-term cumulative impacts of emissions at selected community receptor locations. The study provides the most useful information to date regarding the cumulative impacts of ammonia emissions in Kwinana, as ambient monitoring for the chemical is not required under any industry licence and is not included as a parameter in the Department of Environment's ambient monitoring program.

The study concluded that the dominant contributor source of ammonia emissions in Kwinana is an industrial premises located immediately south of the AGR site. The study predicted that the highest ground level ammonia concentration at any of the receptor locations is at Kwinana Beach, and that the ground level concentration at this location is approximately half the USEPA ambient air quality standard.

The solids plant upgrade is predicted to lead to modest increases in CSBP ammonia emissions, and to the relative contribution to ground level impacts. However, given that the current contribution of the plant is small compared to a neighbouring industrial site, and that the cumulative impact of ammonia emissions from all sources within the Kwinana industrial strip is predicted to be within guideline criteria, the increases associated with the upgrade are not expected to be significant in a regional context.

Summary of Conclusions

Modelling has been undertaken to predict ground level concentrations of NH_3, CN and particulates generated from current licence limit emissions, and at proposed upgrade emission levels.

Maximum ground level concentrations for all pollutants are predicted to be below both ambient air quality criteria when the solids and liquid plants are operating normally. This is predicted to be the case under both the current and proposed solids plant upgrade operating scenarios.

References

ENVIRON (2005) *Kwinana Industry Screening Assessment from NPI Data: Ammonia and Oxides of Nitrogen Emissions*. Report for CSBP Limited, 4 April 2005.

NEPC (1998) *National Environmental Protection (Ambient Air Quality) Measure*, National Environmental Protection Council, 1998, taking into account amendments up to Variation 2003.

OEHHA (2000) *All Acute Reference Exposure Levels Adopted by the OEHHA as of May 2000*. Office of Environmental Health Hazard Assessment, Sacremento, 2000

OEHHA (2003) *All Chronic Reference Exposure Levels Adopted by the OEHHA as of August 2000*. Office of Environmental Health Hazard Assessment, Sacremento, 2003

USEPA (2004) *Integrated Risk Information System*. Downloadable database, October 4 2004 version.

* * * *

I trust this memorandum presents sufficient information for your current purposes. Should you have any queries please do not hesitate to contact us.

Brian Bell
Principal

FIGURES

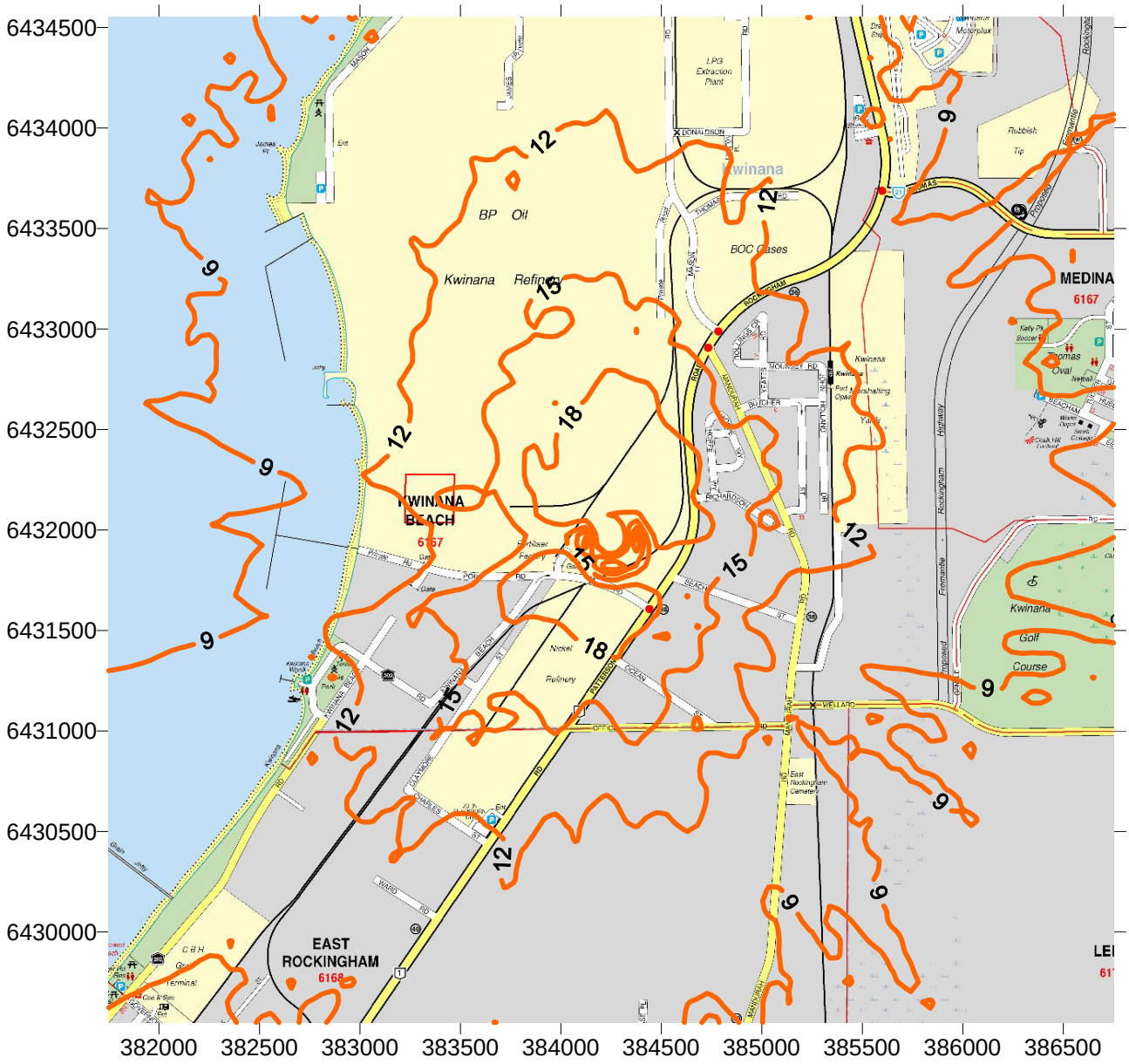

Figure 1

Maximum Predicted 1 Hr Average NH_3 Ground Level Concentrations ($\mu g/m^3$)

0.6 g/s NH_3 Emission from Solids Plant

Client: AGR	ENVIRON	
Project: Solids Plant Upgrade	Drawn: GDA	Date: 20 Dec 04

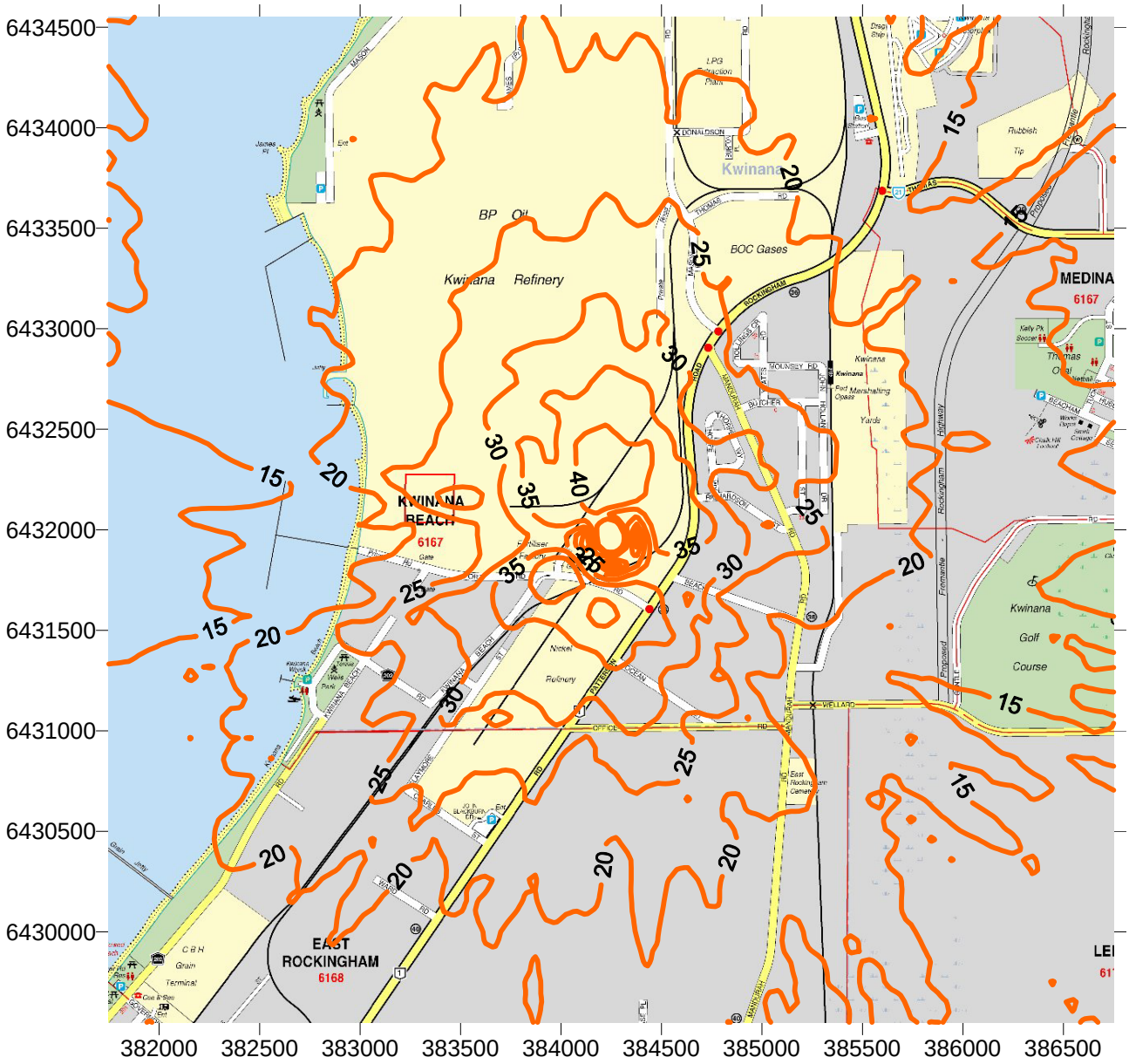

Figure 2

Maximum Predicted 1 Hr Average NH_3 Ground Level Concentrations ($\mu g/m^3$)

1.2 g/s NH_3 Emission from Solids Plant

Client: AGR	ENVIRON	
Project: Solids Plant Upgrade	Drawn: GDA	Date: 20 Dec 04

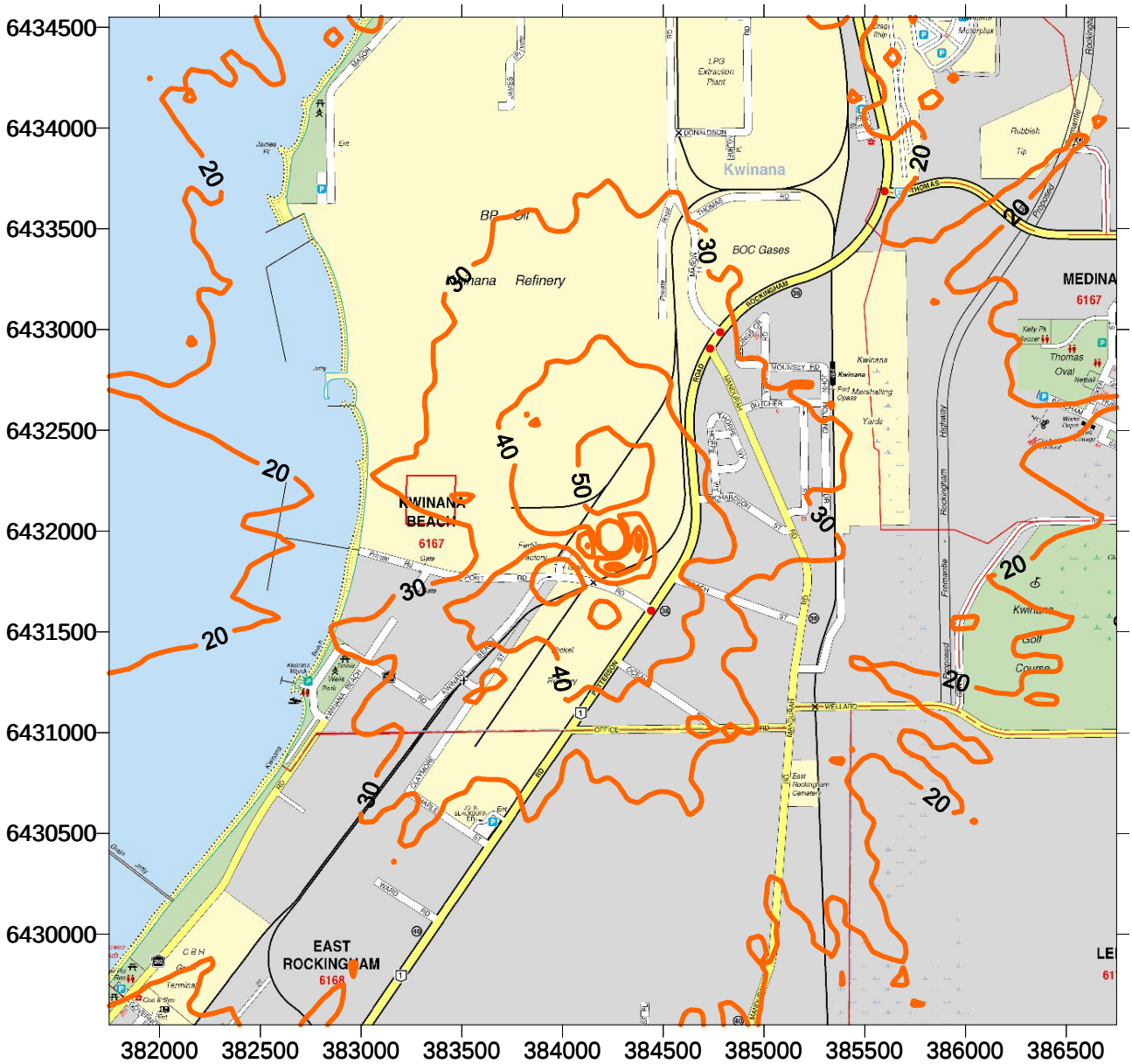

Figure 3

Maximum Predicted 1 Hr Average NH_3 Ground Level Concentrations ($\mu g/m^3$)

1.5 g/s NH_3 Emission from Solids Plant

Client: AGR	ENVIRON	
Project: Solids Plant Upgrade	Drawn: GDA	Date: 20 Dec 04

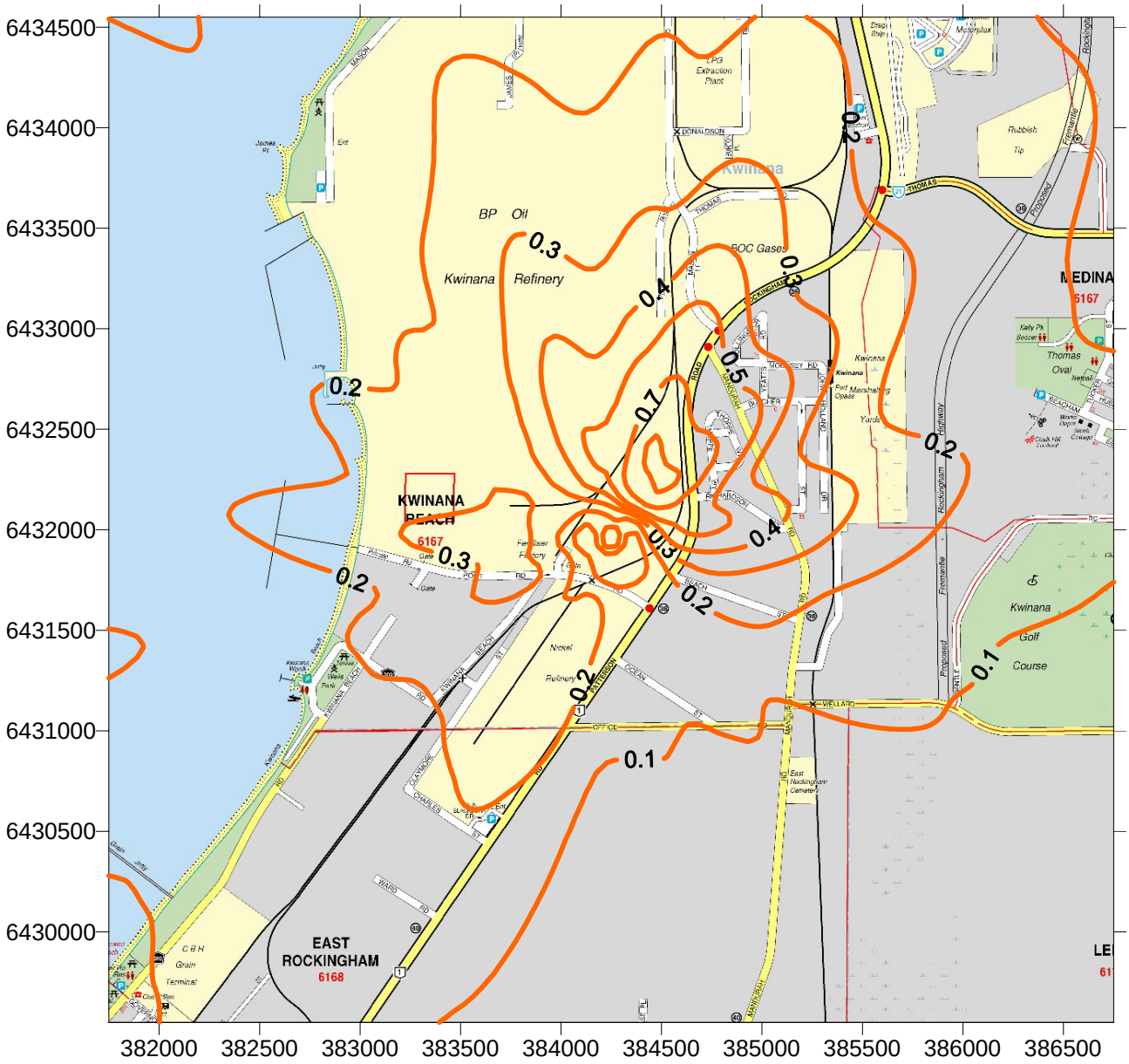

Figure 4

Predicted Annual Average NH_3 Ground Level Concentrations (µg/m^3)

0.6 g/s NH_3 Emission from Solids Plant

Client: AGR	ENVIRON	
Project: Solids Plant Upgrade	Drawn: GDA	Date: 20 Dec 04

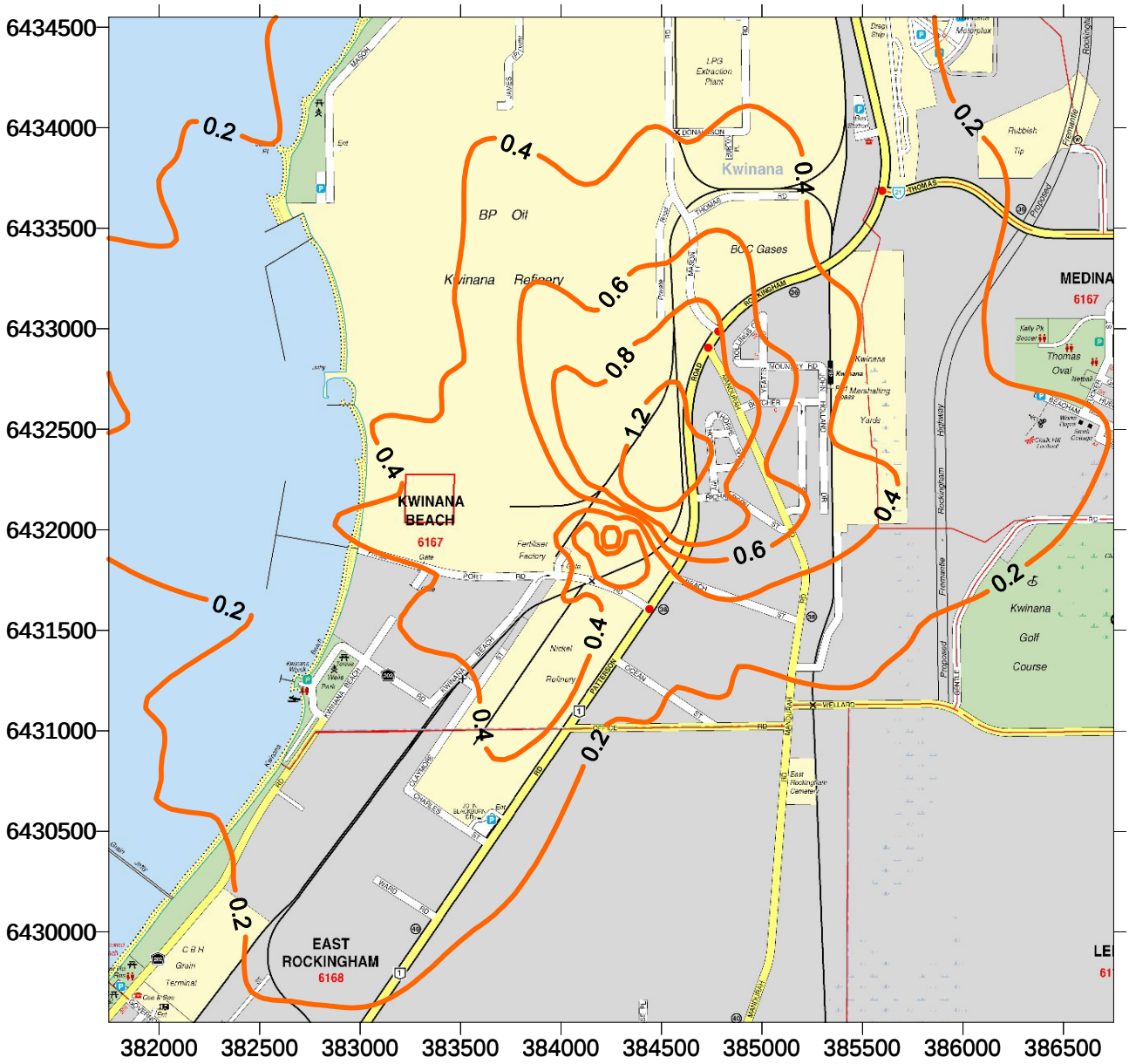

Figure 5

Predicted Annual Average NH_3 Ground Level Concentrations (µg/m^3)

1.2 g/s NH_3 Emission from Solids Plant

Client: AGR	ENVIRON	
Project: Solids Plant Upgrade	Drawn: GDA	Date: 20 Dec 04

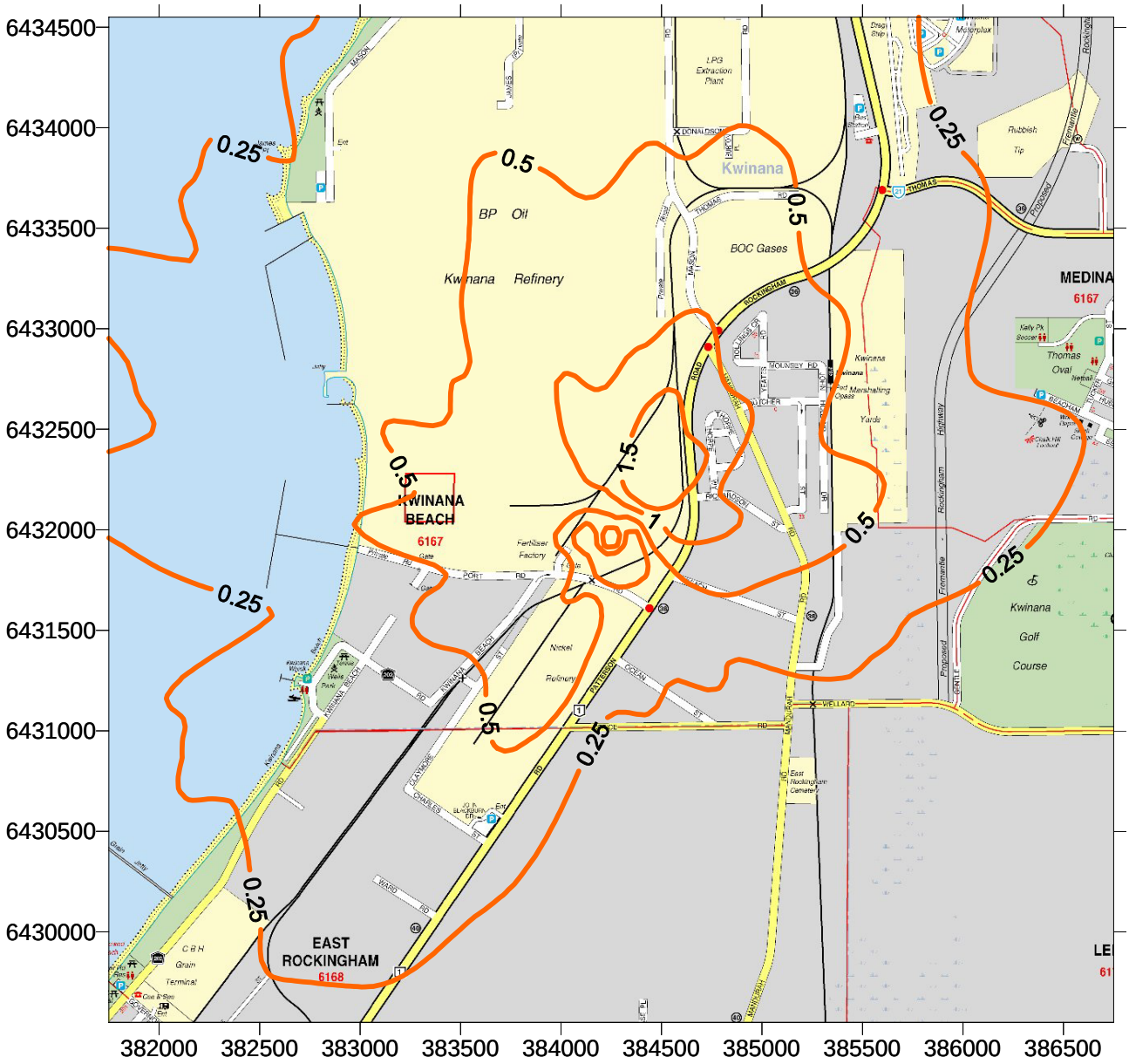

Figure 6

Predicted Annual Average NH_3 Ground Level Concentrations (µg/m^3)

1.5 g/s NH_3 Emission from Solids Plant

Client: AGR	ENVIRON	
Project: Solids Plant Upgrade	Drawn: GDA	Date: 20 Dec 04

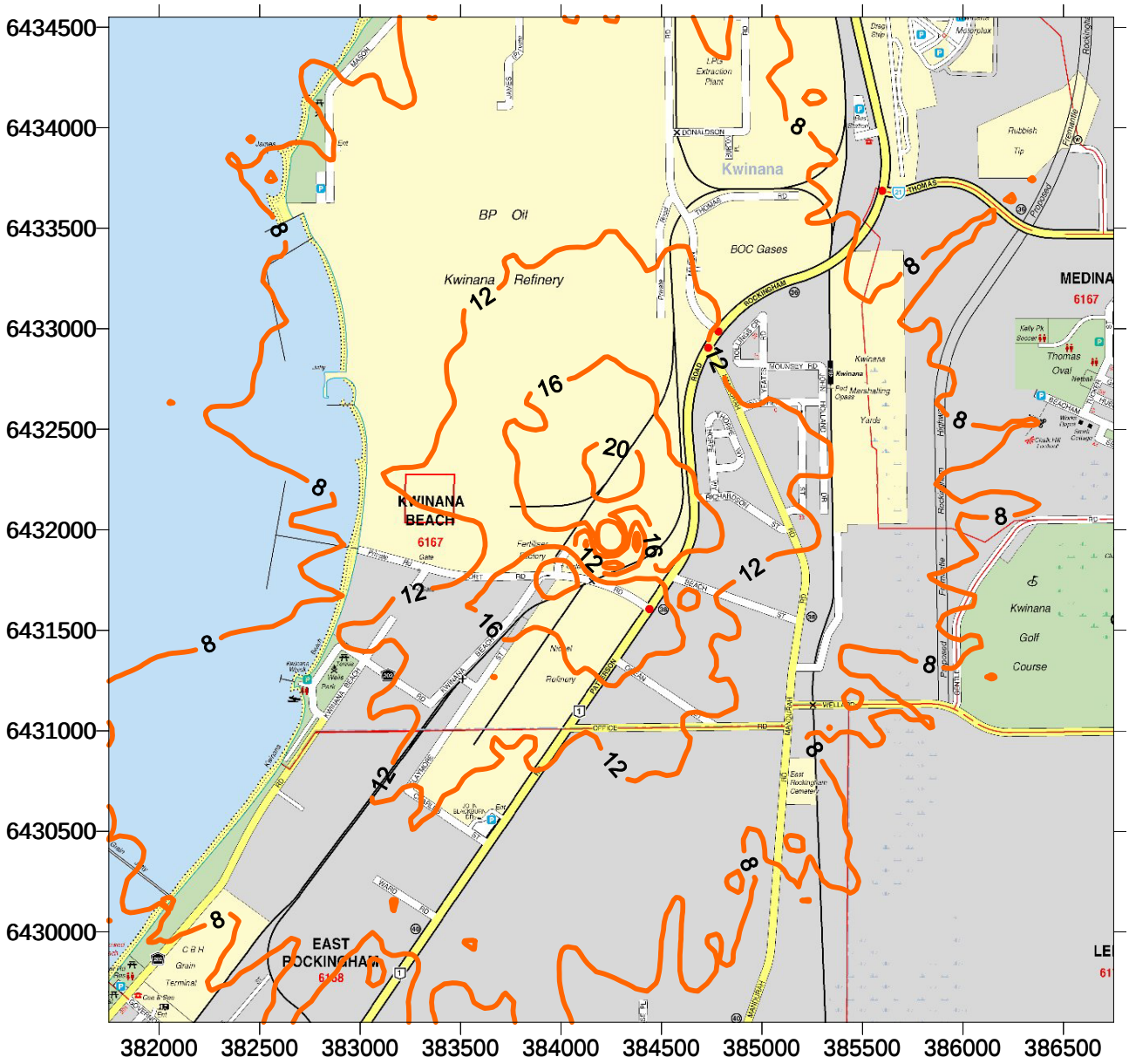

Figure 7

Maximum Predicted 1 Hr Average CN Ground Level Concentrations (µg/m^3)

Proposed CN Emission Post-Upgrade

Client: AGR	ENVIRON	
Project: Solids Plant Upgrade	Drawn: GDA	Date: 20 Dec 04

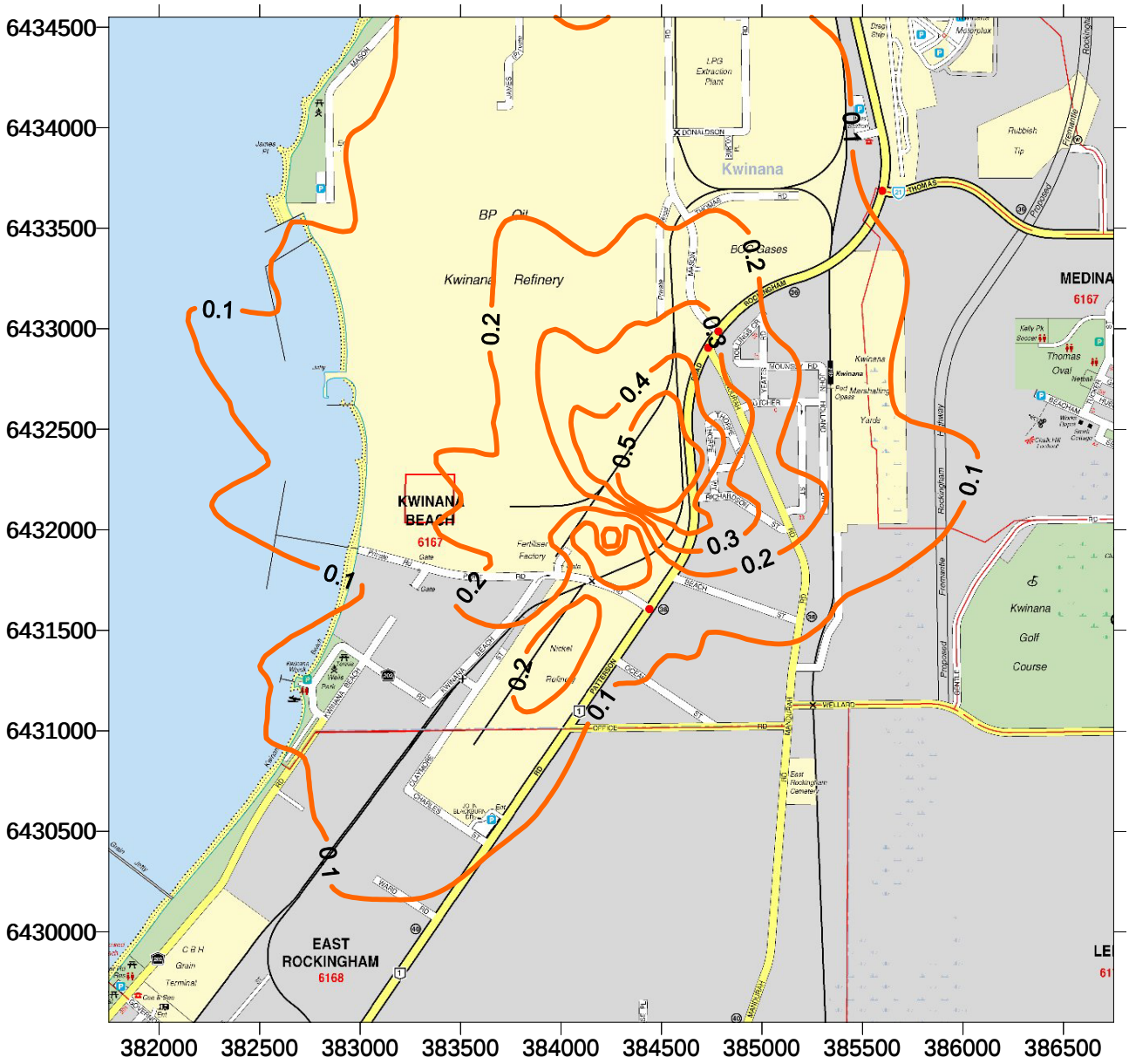

Figure 8

Predicted Annual Average CN Ground Level Concentrations (µg/m^3)

Proposed CN Emission Post-Upgrade

Client: AGR	ENVIRON	
Project: Solids Plant Upgrade	Drawn: GDA	Date: 20 Dec 04

ATTACHMENT A

Sample ISC3 Prime Configuration File

```
**
****************************************
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** ISC-PRIME Input Produced by:
** ISC-AERMOD View Ver. 4.6.2
** Lakes Environmental Software Inc.
** Date: 27/10/2004
** File: C:\ISCView4\Clients\CSBP\Solids Plant Upgrade\NH3upg.PIN
**
****************************************
**
**
****************************************
** ISC-PRIME Control Pathway
****************************************
**
**
CO STARTING
  TITLEONE C:\ISCView4\Clients\CSBP\Solids Plant Upgrade\NH3upg.isc
  MODELOPT DFAULT CONC NOCMPL  RURAL
  AVERTIME 1 24 PERIOD
  POLLUTID NH3
  TERRHGTS FLAT
  RUNORNOT RUN
CO FINISHED
**
****************************************
** ISC-PRIME Source Pathway
****************************************
**
**
SO STARTING
** Source Location **
** Source ID - Type - X Coord. - Y Coord. **
  LOCATION LIQ1 POINT 384256.000 6431837.000
** DESCRSRC Liquid Plant 1 Stack
  LOCATION LIQ2 POINT 384201.000 6431849.000
** DESCRSRC Liquid Plant 2 Stack
  LOCATION SOPL POINT 384256.000 6431939.000
** DESCRSRC Solids Plant Stack
  LOCATION L1ST POINT 384250.000 6431900.000
** DESCRSRC Liquid 1 Plant Start Up
  LOCATION L2ST POINT 384277.000 6431881.000
** DESCRSRC Liquid Plant 2 Startup Stack
** Source Parameters **
  SRCPARAM LIQ1 0.438 30.400 473.000 17.68000 1.200
  SRCPARAM LIQ2 0.367 30.000 423.000 15.78000 1.100
  SRCPARAM SOPL 0.17 39.000 313.000 21.70000 0.500
  SRCPARAM L1ST 178.8 27.000 363.000 16.81000 0.500
  SRCPARAM L2ST 178.8 27.000 363.000 16.81000 0.500
** Building Downwash **
```

BUILDHGT LIQ1 0.00 0.00 0.00 0.00 0.00 14.00
BUILDHGT LIQ1 14.00 14.00 14.00 14.00 14.00 14.00
BUILDHGT LIQ1 14.00 14.00 0.00 0.00 0.00 0.00
BUILDHGT LIQ1 0.00 0.00 0.00 0.00 0.00 14.00
BUILDHGT LIQ1 14.00 14.00 14.00 14.00 14.00 14.00
BUILDHGT LIQ1 14.00 14.00 0.00 0.00 0.00 0.00
BUILDHGT LIQ2 14.00 14.00 14.00 14.00 14.00 14.00
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YBADJ   L2ST 0.00 0.00 0.00 0.00 0.00 0.00
SRCGROUP NORMAL SOPL LIQ2 LIQ1
SRCGROUP STARTUP SOPL L2ST L1ST
SRCGROUP SOLIDS SOPL
```

```
SO FINISHED
**
****************************************
** ISC-PRIME Receptor Pathway
****************************************
**
**
RE STARTING
  GRIDCART UCART1 STA
              XYINC 381750.00 51 100.00 6429550.00 51 100.00
  GRIDCART UCART1 END
RE FINISHED
**
****************************************
** ISC-PRIME Meteorology Pathway
****************************************
**
**
ME STARTING
  INPUTFIL ws_GT_2.met
  ANEMHGHT 10 METERS
  SURFDATA 1 1980
  UAIRDATA 1 1980
ME FINISHED
**
****************************************
** ISC-PRIME Output Pathway
****************************************
**
**
OU STARTING
  RECTABLE ALLAVE FIRST
  RECTABLE 1 FIRST
  RECTABLE 24 FIRST
** Auto-Generated Plotfiles
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  PLOTFILE 24 NORMAL 1ST NH3UPG.PR\24H1G001.PLT
  PLOTFILE PERIOD NORMAL NH3UPG.PR\PE00G001.PLT
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  PLOTFILE 1 SOLIDS 1ST NH3UPG.PR\01H1G003.PLT
  PLOTFILE 24 SOLIDS 1ST NH3UPG.PR\24H1G003.PLT
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OU FINISHED
```

APPENDIX 3

RESULTS OF NOISE MODELLING

Rochdale Holdings Pty Ltd A.B.N. 85 009 049 067 trading as:
HERRING STORER ACOUSTICS
Suite 34, 11 Preston Street, Como, W.A. 6152
P.O. Box 219, Como, W.A. 6952

Telephone: (08) 9367 6200
Facsimile: (08) 9474 2579
Email: hsa@hsacoustics.com.au

CSBP WESFARMERS KWINANA

AGR PROPOSED UPGRADE 2004

NOISE EMISSION STUDY

BY

HERRING STORER ACOUSTICS

NOVEMBER 2004

OUR REFERENCE: 3921-2-04188-2

CONTENTS

APPENDICES

1.0 INTRODUCTION

CSBP Kwinana commissioned Herring Storer Acoustics to develop an acoustic model to predict noise emission from the proposed upgrade of the AGR Solids Plant at CSBP Kwinana. The upgrade also includes the cumulative effect of other proposed upgrades on site, namely a new nitric acid and prill plant.

The objective of this study is to predict the noise level emissions from the operating plant and assess the noise level at the nearest residential premises in accordance with the Environmental Protection (Noise) Regulations 1997.

2.0 SUMMARY

Noise level propagation to the surrounding noise sensitive areas has been modelled for plant operation noise and assessed against the Environmental Protection (Noise) Regulations 1997. The sound power levels used in the predictive modelling were based on measurements of existing plant and calculation of the likely sound power increases due to the solids plant upgrade.

The assessment has assumed that noise emissions from the whole of CSBP/AGR plant operation will be tonal.

The noise emissions have been calculated using the computer program SoundPlan 5.6 with parameters in accordance with the Department of Environmental Protection document “EPA Draft Guidance for Assessment of Environmental Factors No. 8 - Environmental Noise” (refer Methodology section for details).

Noise emissions for the proposed AGR SCP / Solids Plant upgrade comply with the Regulation requirements at the nearest residential receiver locations. The acoustic modelling shows that the predicted noise emissions from the CSBP/AGR site (existing with proposed upgrades) are well within the Regulation ‘assigned level’ for residential premises under ‘worst case’ night weather conditions.

The proposed AGR upgrades are not expected to have any adverse impact on the noise received at residential locations such as Medina.

The predicted noise levels at the nearest industrial premises (Coogee Chemicals) currently exceeds the Regulation ‘assigned level’ of 65 LA10 by virtue of tonal noise characteristics. The predicted noise emissions are expected to increase up to 0.7 dB(A) at the Coogee Chemicals boundary. Both existing and predicted noise emissions are expected to comply with the proposed Regulation Review level of 70 L_{A10} (no characteristic adjustment required) criteria being persued by the DEP. In the event that the Regulations are changed it is expected that the noise level at the industrial premises will then comply with the Regulations.

3.0 METHODOLOGY

Prediction of the noise level propagation to surrounding areas was achieved utilising the computer program SoundPlan 5.6. This program incorporates various parameters including source sound power levels, ground topography and atmospheric conditions in determining propagation of noise from the site. The CSBP Kwinana acoustic model was upgraded from a 2002 model utilizing the ENM noise modelling software.

Measurements were conducted around key plant items to re-develop aspects of the model to reflect a greater interest in localized noise levels and to incorporate the changes in noise emissions of the plant which have occurred over the last few years. Major reductions in noise emissions have occurred as a result of attenuator maintenance for the existing Nitric Acid stack, as well as a program of engineering controls on minor noise sources such as steam vents.

Using recognised algorithms (Concawe) the program calculates the sound levels at distances from the source resulting in noise levels at receiver locations.

Single point calculations were carried out to rank the contribution of each source at a particular location, namely the nearest boundary of Coogee Chemicals, and residential locations in Medina, Calista, Leda, Hillman and North Rockingham.

The major noise source upgrade for the AGR plant is the addition of two cooling tower cells, bringing the number of cooling tower cells near the Sodium Cyanide Plant from 12 to 14. There are a number of items in the solids plant to have a performance or size increase, the majority of these items being contained within the enclosed section of the solids plant. These items are all relatively quiet noise sources and not expected to make a significant contribution to plant noise emissions.

A separate project to upgrade the SCP No.1 unit from one blower to two is expected to result in no significant increase in noise emissions. The proposed new blower is significantly quieter than the existing units, and with some additional noise control to existing blower noise sources, the blower upgrade should not result in any increase in noise emissions. It is noted that the proposed blower is to be located within an existing ventilated masonry building.

4.0 REGULATORY CRITERIA

The criteria used is in accordance with the Environmental Protection (Noise) Regulations 1997 (as amended). These regulations stipulate maximum allowable external noise levels determined by the calculation of an influencing factor which is then added to the base levels shown below. The influencing factor is calculated for the usage of land within the two circles, having a radii of 100m and 450m from the premises of concern.

TABLE 1 - BASELINE ASSIGNED OUTDOOR NOISE LEVEL

Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Residential	0700 - 1900 hours Monday to Saturday	45	55	65
	0900 - 1900 hours Sunday and Public Holidays	40	50	65
	1900 - 2200 hours all days	40	50	55
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays	35	45	55
Commercial premises	All hours	60	75	80
Industrial and utility premises	All hours	65	80	90

The above levels are conditional on no annoying characteristics existing in the noise of concern, such as tonality, amplitude modulation or impulsiveness. If such characteristic exist then any measured level is adjusted according to Table 2 below.

TABLE 2 - ADJUSTMENTS TO MEASURED LEVELS

Where **tonality** is present	Where **modulation** is present	Where **impulsiveness** is present
+5 dB(A)	+5 dB(A)	+10 dB(A)

Note: These adjustments are cumulative to a maximum of 15 dB

With respect to residential receivers the night period is the most critical time for noise propagation. The most significant 'assigned level' acoustic parameter is the L_{A10} noise level. At most of the residential receiver locations the influencing factor will be greater than zero, and hence the 'assigned level' will be greater than 35 L_{A10}. We note that the noise emissions from CSBP are not expected to be tonal in characteristic as distances exceeding 2000m, and particularly where the CSBP contribution to the noise received is at least 5 dB(A) less than measured at the location. Due to the cumulative effects of noise from a number of industries, the noise contribution from CSBP is required to be 5 dB less than the 'assigned level' (significantly contributing), hence noise emissions which are less than 30 L_{A10} at receiver locations are likely to comply with the Regulations at all times.

At present Industrial receiver 'assigned levels' are 65 L_{A10}, with adjustment of +5 to the measured / predicted level if the noise is tonal in characteristic.

The DEP is in the process of a 'Regulation Review' (refer: Noise Regulations Review: Outcomes of the Working Group Programme, June 2000), and industrial noise 'assigned levels' are one area where a change is likely to occur. The most recent discussion with the DEP has revealed that a proposal to increase the Industrial Receiver 'assigned level' from 65 L_{A10} to 70 L_{A10} is being pursued, with the adjustments for noise characteristic not being applicable. Where an industrial premises has offices or other noise affected areas then the level would remain at 65 L_{A10}, but the noise characteristic adjustments would not be applicable. A timeframe for regulation drafting and public review is not well defined but potentially concluded by the end of 2005. We note that should the expected Regulation review be concluded in accordance with the DEP proposal, the 'assigned level' at the Industrial boundary(s) adjacent CSBP Kwinana would be 70 L_{A10}.

5.0 PREDICTED NOISE LEVELS AT RESIDENTIAL PREMISES

Predicted noise levels from the single point calculations are summarised below in Table 3 'worst case' night-time conditions of 3 m/s wind from source to receiver with temperature inversion.

TABLE 3 - RESULTS OF SINGLE POINT CALCULATIONS OPERATIONAL NOISE AT RESIDENTIAL PREMISES

Location	Existing L_{A10}	Upgrade L_{A10}
Medina Residence	30.8	31.0
Calista Residence	29.4	29.5
Leda Residence	26	26.4
Hillman Residence	22.2	22.0
North Rockingham (near CBH)	24.9	25.4
East Rockingham (coast)	19.5	20.1

Note: t – tonal noise

The single point calculations and the corresponding noise contour plots (Appendix A) show that the noise emissions from CSBP are generally below 30 L_{A10}, with a nominal 0.1 – 0.2 dB increase as a consequence of all the proposed upgrades at CSBP. The exceptions are at the nearest residential location (Medina) where the predicted level is up to 31 L_{A10} from the CSBP operations under adverse wind conditions at night, with a temperature inversion. The contribution of the proposed upgrades at the AGR plant are not significant with respect to the predicted noise levels at Medina. The predicted noise level of 31.0 L_{A10} at Medina is made up of the following noise contributors.

CSBP Noise Contributor	Noise Level Contribution at Medina
CSBP Existing Main Plant	25.6
CSBP Nitric Acid Upgrade	15.4
AGR SCP Existing Plant	29.3
AGR SCP Proposed Upgrade	4.3
TOTAL	**31.0**

It is evident that the proposed AGR upgrade is not a significant contributor to the noise received at the Medina residential area.

The 2001 KIC noise study and Kwinana acoustic model predicted noise levels at residential receiver locations under a range of weather conditions. A summary of the predicted and measured noise levels from the KIC report, together with the current predicted CSBP noise emissions are shown for comparison purposes. The significant noise reductions achieved at CSBP since the original study are reflected in the much lower predicted noise levels at the residential receiver locations. For the purposes of this assessment the CSBP and AGR noise emissions have been combined, as per the KIC study.

TABLE 4 – COMPARISON OF OPERATIONAL NOISE AT RESIDENTIAL PREMISES

Residential Receiver Location	Wind Direction / Speed Inversion Lapse Rate	KIC Overall Level 2001	KIC CSBP Contribution 2001	CSBP Upgrade Contribution 2005
Calista (predicted)	W 3 2	43.5	38.9	29.5
Calista (KIC measured)	W 2 0	36		
Medina (predicted)	NW 3 2	48.0	38.0	31.0
Medina (KIC measured)	NW 2 0	44		

The above figures show that has been a reduction in predicted noise level at Calista due to CSBP operations from 38.9 to 29.5 L_{A10}. At a level of 29.5 L_{A10} the CSBP noise emissions are not technically classified as 'significantly contributing' and comply with the Regulation 'assigned level' of 35 L_{A10} at Calista residences. The contributing source ranking from the KIC report changes from 1st ranked contributor to 4th ranked contributor (assuming other industry noise emissions are unchanged).

For Medina the figures show that has been a reduction in predicted noise level due to CSBP operations from 38.0 to 31.0 L_{A10}. At a level of 31.0 L_{A10} the CSBP noise emissions are technically classified as 'significantly contributing' to the Regulation 'assigned level' of 35 L_{A10} at Medina residences. However at 31.0 L_{A10}, the noise contribution from CSBP would be more than 5 dB(A) less than the overall noise level (based on KIC measured / predicted levels) and unlikely to be audible. The contributing source ranking from the KIC report changes from 1st ranked contributor to 5th ranked contributor (assuming other industry noise emissions are unchanged).

The reductions in noise received at residential locations over recent years (since the 2001 KIC acoustic modelling and report) are due to noise control measures implemented by CSBP.

The proposed AGR upgrades are not expected to have any adverse impact on the noise received at residential locations such as Medina.

6.0 PREDICTED NOISE LEVELS AT INDUSTRIAL RECEIVERS

6.1 MEASURED NOISE LEVELS OF EXISTING OPERATIONS

In the process of upgrading the acoustic model of the existing CSBP operations, boundary noise levels were measured near the AGR Sodium Cyanide Plant. Measurements were made at the adjacent boundary of the nearest Industrial Premises, being Coogee Chemicals. Measured noise levels ranged from 61 – 65.5 dB(A) along the boundary, the highest noise levels being associated with noise emissions from the AGR cooling towers.

The existing noise emissions fail to comply with the Regulation industrial receiver 'assigned level' of 65 L_{A10} only because the noise emission is 'tonal' in characteristic and attracts a +5 adjustment to the measured level. It is noted that were the Regulation 'assigned levels' to be changed in accordance with the recommendations of the "Noise Regulations Review: Outcomes of the Working Group Programme, June 2000", or the proposed regulation changes as currently being proposed by DEP, then the existing noise levels at the Coogee Chemicals boundary would be in compliance with the Regulations.

The acoustic model under 'worst case' daytime conditions of wind towards Coogee Chemicals at 4 m/s have slightly higher predicted noise levels than measured (due to the wind effect on propagation of noise).

6.2 PREDICTED NOISE LEVELS OF PROPOSED UPGRADE

The proposed upgrade is relatively minor, being the addition of two cooling tower cells to an existing 4 cell cooling tower. However, the cooling tower is close to the AGR boundary and therefore there will be a localized increase in noise levels near the cooling tower.

The proposed addition of a blower to the SCP No.2 plant, to be contained within the existing masonry building is not expected to result in a significant increase in noise emissions from the plant. Being enclosed, the blower noise emissions will be well contained. We have been advised that the proposed new blower will be approximately 10 dB quieter than the existing unit (the two will operate together), and therefore the net increase in noise emissions will be less than 1 dB. However, in the process of installing the new blower additional noise control is proposed to some existing pipework which currently radiates sound outside the enclosure, and this is expected to offset any potential increase in pipe radiated noise that may occur with the addition of a second blower.

The proposed upgrade of the solids plant is essentially a de-bottlenecking process, with the majority of the upgrade plant being contained within an enclosed building. The current noise levels inside this building are less than 85 dB(A), and are not expected to increase significantly.

The predicted noise levels from the upgrade at the Coogee Chemicals nearest boundary under 'worst case' daytime wind conditions are:

Location	Existing, L_{A10}	Upgrade, L_{A10}
Opposite Cooling Tower No.1	65.4	65.9
Opposite Cooing Tower No.2 (2 cell addition)	65.4	66.1

The predicted noise levels with the addition of two cooling tower cells show an increase of up to 0.7 dB(A) at the Coogee Chemicals boundary. The noise level of 66 L_{A10} is (1 + 5 adjustment =) 6 dB in excess of the current Regulation 'assigned level'. However, the predicted level of 66 L_{A10} would be well within the proposed Regulation Review 'assigned level' of 70 L_{A10} (no noise characteristic applicable).

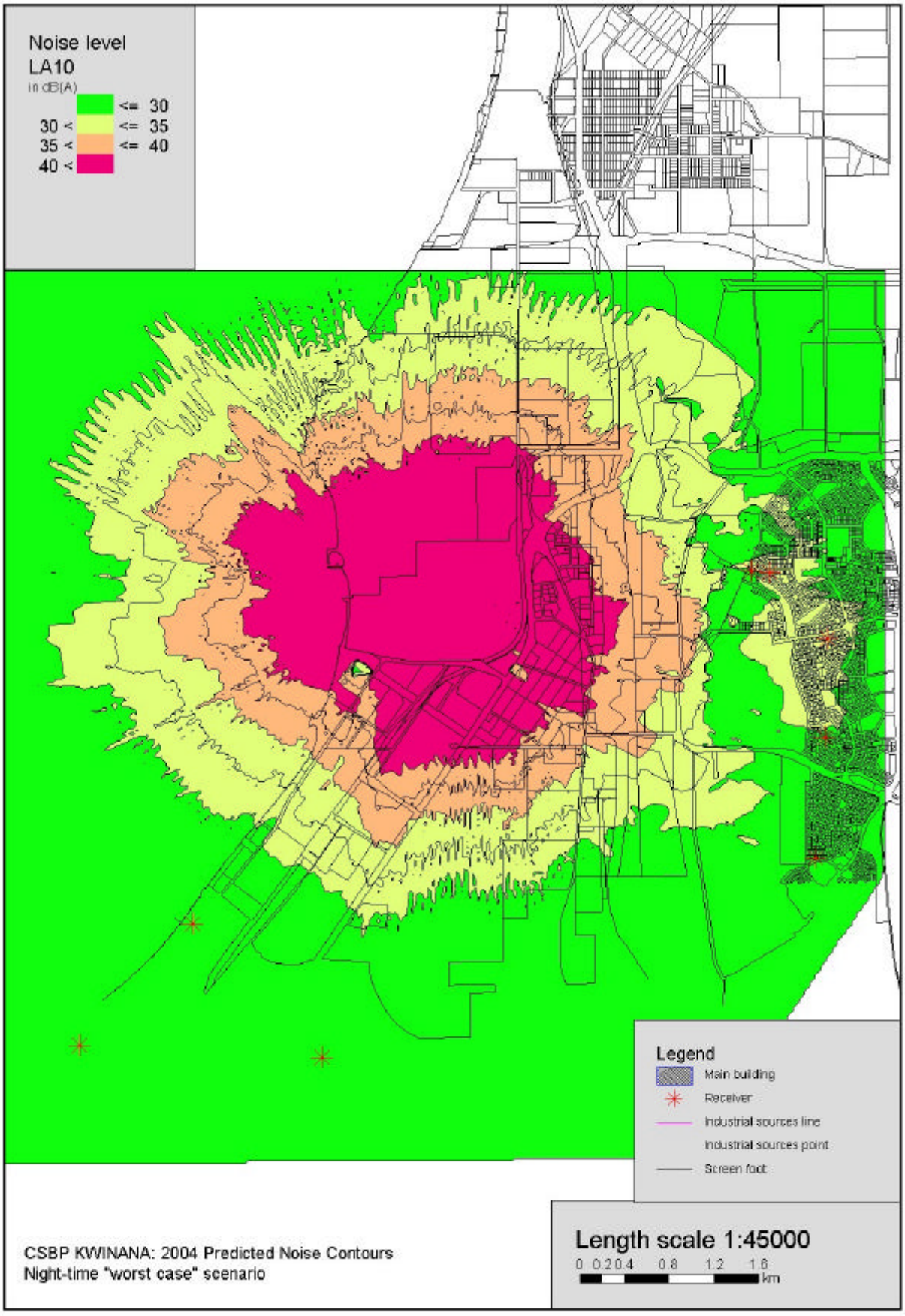
For: **HERRING STORER ACOUSTICS**

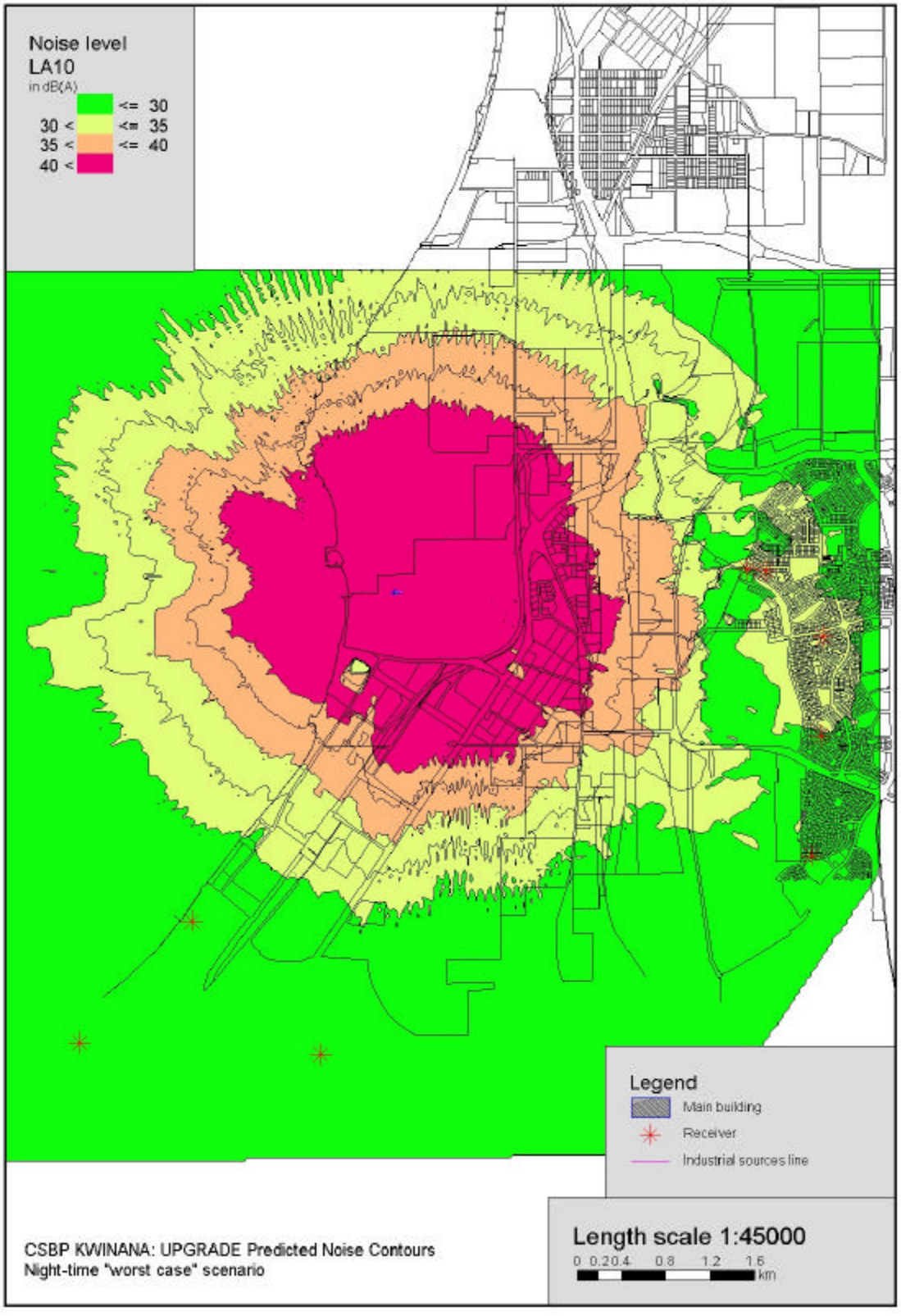
Paul Drew

16 November 2004

APPENDIX A

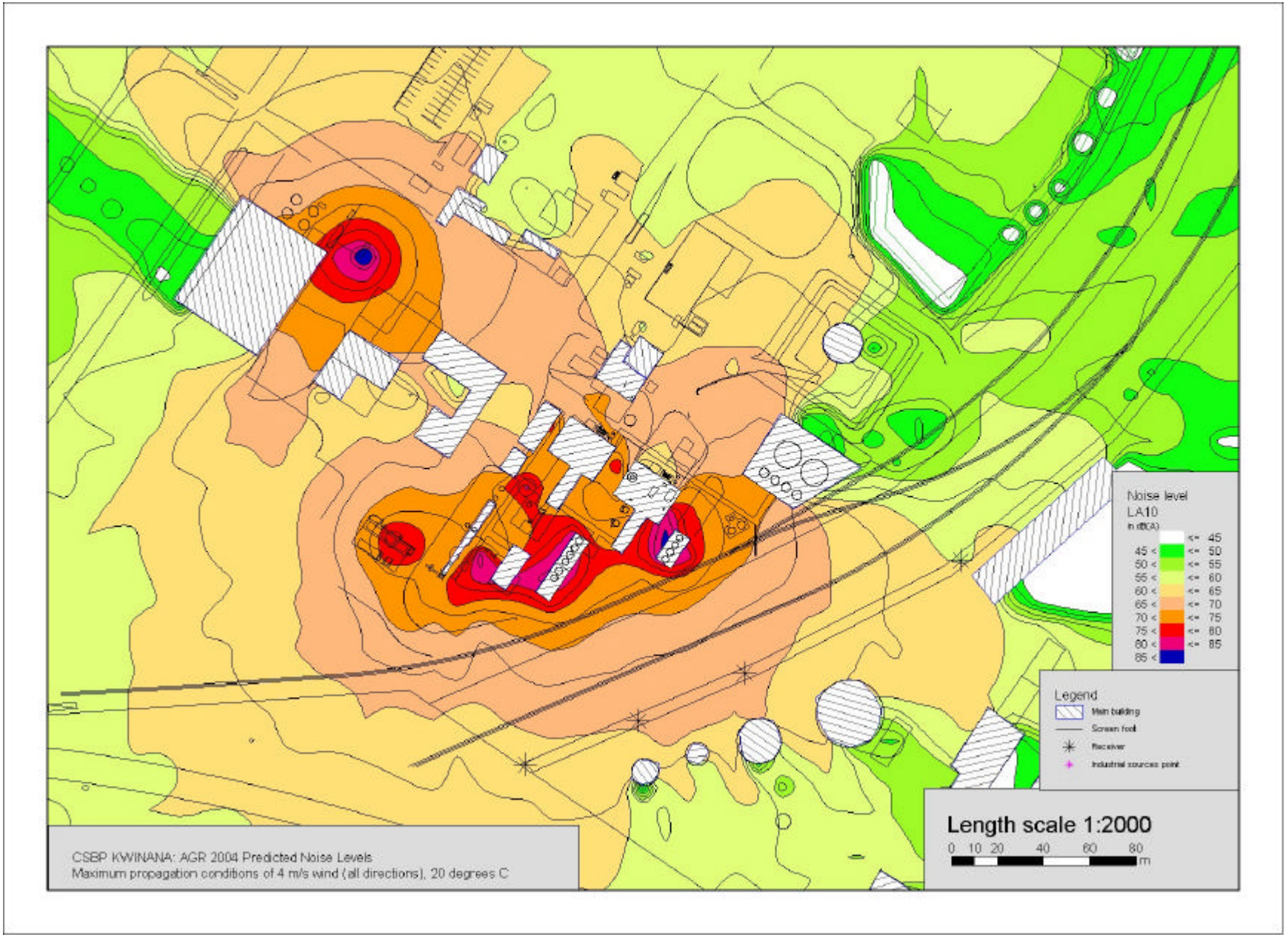
FAR-FIELD NOISE CONTOURS

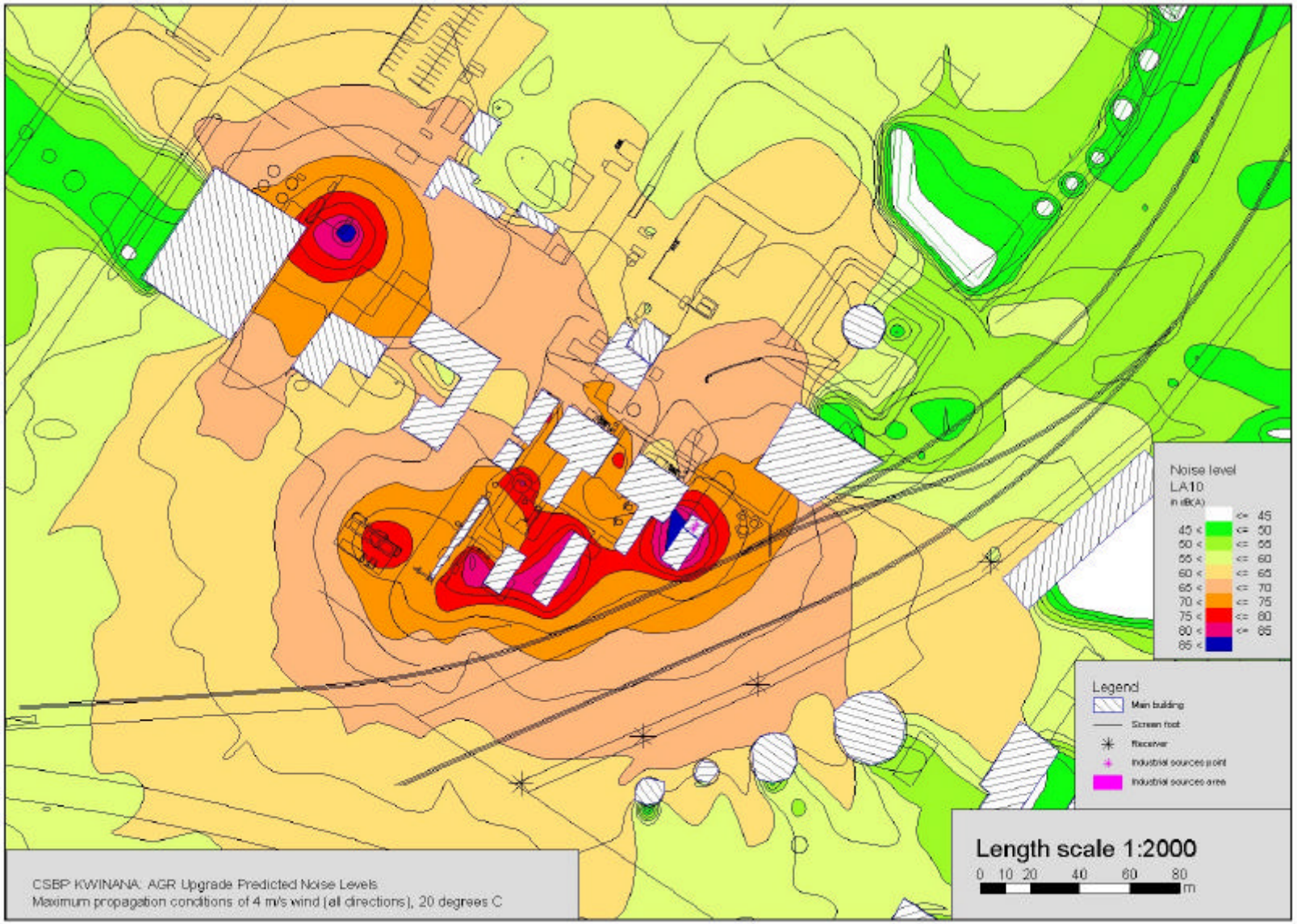

Noise level
LA10
in dB(A)
<= 30
30 < <= 35
35 < <= 40
40 <
Legend
Main building
Receiver
Industrial sources line
Industrial sources point
Screen foot
Length scale 1:45000
0 0.2 0.4 0.8 1.2 1.6
km
CSBP KWINANA: 2004 Predicted Noise Contours
Night-time "worst case" scenario


Noise level
LA10
in dB(A)
<= 30
30 < <= 35
35 < <= 40
40 <
Legend
Main building
Receiver
Industrial sources line
Length scale 1:45000
0 0.20.4 0.8 1.2 1.6
km
CSBP KWINANA: UPGRADE Predicted Noise Contours
Night-time "worst case" scenario

APPENDIX B

NEAR-FIELD NOISE CONTOURS AGR PLANT


Noise level
LA10
in dB(A)
<= 45
45 < <= 50
50 < <= 55
55 < <= 60
60 < <= 65
65 < <= 70
70 < <= 75
75 < <= 80
80 < <= 85
85 <
Legend
Main building
Screen foot
Receiver
Industrial sources point
Length scale 1:2000
0 10 20 40 60 80
m
CSBP KWINANA: AGR 2004 Predicted Noise Levels
Maximum propagation conditions of 4 m/s wind (all directions), 20 degrees C


Noise level
LA10
in dB(A)
<= 45
45 < <= 50
50 < <= 55
55 < <= 60
60 < <= 65
65 < <= 70
70 < <= 75
75 < <= 80
80 < <= 85
85 <
Legend
Main building
Screen root
Receiver
Industrial sources point
Industrial sources area
Length scale 1:2000
0 10 20 40 60 80
m
CSBP KWINANA: AGR Upgrade Predicted Noise Levels
Maximum propagation conditions of 4 m/s wind (all directions), 20 degrees C

APPENDIX 4

CORRESPONDENCE FROM QEST CONSULTING

QEST CONSULTING

Level 2, 172 St Georges Tce
Perth, WA, 6000

CSBP Limited
PO Box 345
Kwinana WA 6966

October 5, 2004

Attention: Laurinda Shaw

Our Ref. no: CSB18P/L001/JM/nrh

Subject: Solid Sodium Cyanide Plant Expansion and Impact on Safety to Off-Site Population

Dear Laurinda,

This letter has been drafted in response to CSBP Ltd. having sought assurance from QEST Consulting that changes to Sodium Cyanide Plant #3 (SCP #3) will not pose undue risk to population outside the facility boundary. Quantitative Risk Assessments (QRAs) have previously demonstrated that the risk profile associated with SCP #3 is tolerable when measured against the prescribed framework of criteria here in Western Australia.

QEST Consulting conclude that the expansion of SCP #3 will not impact the safety of off-site populations in an adverse manner. This judgement is made after the review and revision of the QRA model for SCP #3 and supported by the additional safety considerations outlined below.

History of QRAs for SCP #3

DNV prepared a QRA for SCP #3 during the design phase (DNV, 2001). Undertaking a conservative "systematic break" approach the risk to off-site populations was found to tolerable in accordance with current guidelines (EPA, 2000).

Upon completion of construction of SCP #3 an update to the QRA (DNV, 2002) was undertaken to determine how final design changes impacted the risk to off-site populations. The final design was found to have the same or lower levels of risk and thus new quantitative results were not generated as the risks were already tolerable. Particularly interesting is the driving force for risks impacting off-site populations in DNV, 2001 were no longer valid. The original design used Ammonia (NH_3) in the refrigeration unit and it was the NH_3 releases from the refrigeration unit driving the risk profile for SCP #3 in DNV, 2001. By construction the design was changed and SCP #3 used a different refrigeration unit that utilised Refrigerant 22 (R22), which is non-toxic and non-flammable, thus not posing a risk to off-site populations.

Risk Framework

The existing QRAs use the Environmental Protection Agency's criteria for risk to off-site populations (EPA, 2000). This criteria typically uses individual risk contours to visually demonstration compliance and when discussing results at a given location, the risk is Location Specific Individual Risk (LSIR).

SCP #3 was found to be within the criteria by two orders of magnitude (DNV, 2001), with the risk of NH_3 being used in the refrigeration unit as the driving risk factor which never eventuated.

The risks at the nearest boundary to SCP #3 (South Eastern) are found to be from three other systems:

1. NH_3 distribution pipeline releases (75% of the LSIR).
2. NH_3 releases from within the Sodium Cyanide Solution Plants (16% of the LSIR).
3. Leaks from the Chlor-Alkali Plant, primarily chlorine (9% of the LSIR).

Supporting Safety Considerations

There are additional factors which are not covered within the risk modelling for the QRA that provide confidence in the conclusions reached within the SCP #3 risk model, namely:

1. Much of the solution in the process is under vacuum, a local (on-site) hazard would result if a leak occurred. The most likely outcome if leak occurs is a process upset due to air ingress. As the solution and vapour in this process are non-flammable this would not result in an explosion.
2. Liquid in the process are of low volatility (do not readily vapourise). If released these liquids present a hazards to those who are in contact with them, although this will remain on site due to bunding and drainage.
3. Much of the process is solid Sodium Cyanide (NaCN) which is stable and does not present a hazard at a distance.
4. NaCN and NH_3 present in aqueous streams are at extremely low levels (on the order of parts per million) and are do not represent an acute threat at these concentrations.
5. Dust from the scrubber could pose a health risk if ingested in large quantities. However, for this to occur the dust would have to be released to the atmosphere, travel off-site in massive quantities and be ingested by a person. This is not considered a credible scenario because the process is controlled to environmental criteria which involve concentrations of dust much lower than that required to pose a health risk.

Conclusion

The expansion of SCP #3 will not change the tolerable levels that exist due to the current configuration of SCP #3, particularly when considering the following points:

- The changes for the expansion do not alter the original conclusions about the process being stable and non-volatile, resulting in tolerable risk to off-site populations.
- The environmental monitoring provides an excellent barrier for preventing releases that pose an adverse risk to persons (due to concentrations of environmental concern being well below those that pose an acute risk to human health).

For Qest Consulting,

Nick Hardy

Key References

DNV, 2001: As-Designed Quantitative Risk Assessment of AGR's Solid Sodium Cyanide Plant, DNV, Rev 3, 2001

DNV, 2002: Solid Sodium Cyanide Plant Quantitative Risk Assessment Review, DNV, Rev 0, 2002

DNV/QEST, 2003: Quantitative Risk Assessment of Miscellaneous Pipelines, DNV/QEST, Rev 3, 2003

DNV/QEST, 2004a: Quantitative Risk Assessment of the Sodium Cyanide Plant, DNV/QEST, Rev 1, 2004

DNV/QEST, 2004b: Quantitative Risk Assessment of the Chlor-Alkali Plant, DNV/QEST, Rev 4, 2004

EPA, 2000: Guidance for Risk Assessment and Management: Off-site individual risk from Hazardous Industrial Plant, EPA(WA), 2000

APPENDIX 5

KCIF STAKEHOLDER MEETING INFORMATION

APPENDIX 5
KCIF STAKEHOLDER MEETING INFORMATION

Date : 5th October 2004
Time : 5:30pm – 7:30pm
Venue : Reception Room, City of Rockingham Council Offices, Civic Boulevard, Rockingham, WA 6168

Attendees: Please note names deleted for privacy reasons

NAME	REPRESENTING
	ERS
	Rockingham Community
	Rockingham Community
	Community
	KPA
	KWG
	CORKE
	CORKE
	Community
	HIsmelt
	Landcorp
	DoE
	Rockingham Community
	Tiwest
	CSBP
	CSBP
	CSBP
	Cockburn Buffer Zone Resident
	Cockburn Buffer Zone Resident
	Kwinana RESIDENT
	FESA
	Nufarm Coogee
	Department of Health
	Town of Kwinana
	Weekend Courier
	PRIVATE
	ENV Australia
	DOIR
	DoE
	Australian Gold Reagents
	Alcoa
	HIsmelt
	Community
	Community
	CWA Kwinana Branch
	Alcoa
	Tiwest
	Sustainable Consulting
	WPC
	CSBP
	CSBP
	KIC

Andy Byk, Australian Gold Reagents, gave a short presentation on the proposed expansion of the Solid Cyanide Facility (see attached).

The following questions and answers on the presentation were noted.
Please note names removed for privacy reasons.

I am concerned about the security of the Cyanide Plant. I visited CSBP recently, and drove straight through the main gates. No one was on duty, even half an hour later when we passed the gates again. They did have security at the next lot of gates to the rest of the plant, but there was none to the Cyanide Plant.	Andy Byk This is one of the things I have been hearing. I cannot comment on your recent experience, however, the Chemicals East Complex (where the Cyanide is) has two gates to pass through, the main security gates and a second gate. There are two levels of security.
Do you mean when you go through the main gate and turn right – there is security there?	Andy Byk There is another gate you have to go through. It is not a manned gate but is normally closed and you have to swipe an access card to get through. Cameron Schuster There is closed access to the Chemicals East Complex but there is no restriction to get to Reception. You cannot turn right, as there is another fence and a locked gate to the Chemicals East Complex.
How often does a fence stop anyone that is intent on getting in when there is nobody there?	Cameron Schuster Fences do not stop anybody, but you cannot drive a truck over it and load it up. The fact the fence has been breached will bring attention. People do not work 24 hours. While the warehouse is open staff attend to the security of the Chemicals complex. The whole issue is the security and the level of threat – which is continually under review. The level of protection is only going up. If you are asking if the Sodium Cyanide is secure from access by a truck, the answer is yes.
What are you doing to stop someone going over the fence and planting something on the wall – sabotage?	Andy Byk That is the process of the security company. We have major experience with FESA etc, and the question of security is being developed.

APPENDIX 6

AGR STAKEHOLDER MEETING INFORMATION

APPENDIX 6
AGR STAKEHOLDER MEETING INFORMATION

Date : Wednesday 17 November 2004
Time : 5.30pm to 7.30pm (approx.)
Venue : Theatrette, CSBP Limited
Kwinana Beach Road, Kwinana (meet at our Main Reception Office)

Invitation List: Please note names removed for privacy reasons

First Name	Surname	Position	Company Name
			Millar Road Landfill
			Kwinana Progress Association
			Kwinana Watchdog Group
			Fire & Rescue Service of WA
			Fremantle Port Authority
		Manager, Port Safety & Env	Fremantle Port Authority
		Port Safety & Env Officer	Fremantle Ports
			Hope Valley Progress Association
		Refinery Manager	Alcoa World Alumina Australia
		Env, Health & Safety Manager	Alcoa World Alumina Australia
		General Manager- Engineering & Operations	Hismelt Corp. Pty Ltd
		Operations Manager	Metropolitan Cranes - Brambles WA
			Nalco Australia
		Project Supervisor	Nufarm Coogee Pty Ltd
		Manufacturing Manager	Nufarm Ltd
		Manager	Sulphur Road
			Bridging the Gap Kwinana
			Probus Club of Kwinana
		Business Relations Coordinator	WMC Resources
		GM Operations	CSBP Limited
		Environmental Adviser	CSBP Limited
			CSBP Limited
		Field Engineering Superintendent	CSBP Limited
		Environmental Adviser	CSBP Limited
		Human Resources Manager	CSBP Limited
		Maintenance Superintendent	CSBP Limited
		GM Chemicals Business	CSBP Limited
		Snr Process Engineer	CSBP Limited
		Laboratory	CSBP Limited
			CSBP Limited
		Manager Amm/An Production	CSBP Limited
		Process Engineer	CSBP Limited
			CSBP Limited
			CSBP Limited
			CSBP Limited
		Env & Manufacturing Sup Manager	CSBP Limited
		Environmental Adviser	CSBP Limited
		Environmental Adviser	CSBP Limited
		Snr Process Engineer	CSBP Limited

First Name	Surname	Position	Company Name
		Manager Project Engineering	CSBP Limited
		Chief Financial Officer	CSBP Limited
			CSBP Limited
		Project Engineering Process	CSBP Limited
			Department of Environment
			Alcoa World Alumina Australia
		Manager	Australian Gold Reagents Pty Ltd
		Site Manager	Aventix Crop Science Pty Ltd
			BHP Biliton
		HSEQ Coordinator	Coogee Chemicals Pty Ltd
			Hismelt
			CSBP Limited
		Operations Manager	Wesfarmers LPG
		Safety & Training Supervisor	Wesfarmers LPG
		Env Coordinator	WMC Resources
		Production Engineer	BOC Gases
		Water Treatment Division	CIBA Specialty Chemicals
		Pipe Plant Manager	Tyco Water
		General Manager	WMC Resources
		Group Leader-Safety & Health	Tiwest Joint Venture
		Quality Health Safety & Env Manager	Coogee Chemicals Pty Ltd
		Central Ward	Town of Kwinana
		West (Industrial) Ward	Town of Kwinana
		Economic Development Officer	Town of Kwinana
		Deputy Mayor and Central Ward Rep	Town of Kwinana
		Central Ward	Town of Kwinana
			Town of Kwinana
		Environment Officer	Town of Kwinana
		East Ward	Town of Kwinana
		Central Ward	Town of Kwinana
		His Worship the Mayor	Town of Kwinana
		Manager Planning Services	Town of Kwinana
		Chief Executive Officer	Town of Kwinana
		Central Ward	Town of Kwinana
		Central Ward	Town of Kwinana
		0	Town of Kwinana
		MLA	
		Community Relations	Nufarm Ltd
		HR Officer	Coogee Chemicals Pty Ltd
		Regional Manager	United KG
		HSEQ Officer	Coogee Chemicals Pty Ltd
		Administrative Officer	Western Power
		Environmental Officer	Western Power
		Operations Manager	Kwinana Power Station
			Kwinana Power Station
		Administrative Officer	Western Power
		A/Safety Manager	Alstom Power
		Librarian	Kwinana Industries Council
		Production Manager	Thermal Ceramics Aust
			Patrick Terminals
			Carlton Contracting Kwinana Pty Ltd
			Carlton Contracting Kwinana Pty Ltd

First Name	Surname	Position	Company Name
		Plant Manager	Edison Mission Operations
		Retail Outlet	Kitchen & Catering Supplies
		Plant Manager	Nufarm Coogee Pty Ltd
		Plant Superintendent	Nufarm Coogee Pty Ltd
		Group Editor	Sound Telegraph
			Terminals West
		President	South Coast Regional Chambers of Commerce
		Public Relations Officer	BP Refinery (Kwinana) Pty Ltd
		Managing Director	Coogee Chemicals Pty Ltd
			Rockingham Regional Environmental Centre
		Environmental Graduate Trainee	BP Refinery (Kwinana) Pty Ltd
		Business Growth Leader	BP Refinery (Kwinana) Pty Ltd
		Business Development Analyst/Executive Assistant	BP Refinery (Kwinana) Pty Ltd
		Env Manager	BP Refinery (Kwinana) Pty Ltd
			Coogee Chemicals Pty Ltd
			Coogee Chemicals Pty Ltd
		General Manager	Australian Fused Materials
		Executive Assistant	Kwinana Industries Council
		Director	Kwinana Industries Council
		Operations Manager	Millennium Performance Chemicals
		Site Manager	Ondeo-Nalco Australia Pty Ltd
		WA Manager	One Steel Market Mills
		Refinery Manager	BP Refinery (Kwinana) Pty Ltd
			BP Oil
		Safety, Health, Quality & Systems Manager	BP Refinery (Kwinana) Pty Ltd
		(Safety Bay Ward)	City of Rockingham
		Chief Executive Officer	City of Rockingham
		His Worship the Mayor (Rockingham Ward)	City of Rockingham
		(Baldivis Ward)	City of Rockingham
		Director - Community Development	City of Rockingham
		(Coastal Ward)	City of Rockingham
			Rockingham City Council
		Editor	Sound Telegraph Newspaper
			Murdoch University
		ALP - Brand	Federal Government
			City of Rockingham
		Editor	Weekend Courier Community Newspaper
			Sustainable Consulting
			Casuarina/Wellar Progress Association

AGR PROPOSED SOLID SODIUM CYANIDE PLANT UPGRADE
STAKEHOLDER FORUM - 17 NOVEMBER 2004
QUESTIONS AND RESPONSES

Topic	Answered By	Response
How clean is the water from the evaporators? Where does it go to?	Mike Rodriguez	The water contains some ammonia and sodium cyanide. Wastewater from various points in the solids facility is held in a stripper feed tank before being pumped to an ammonia stripper. The ammonia stripper is a column that has a steam heated reboiler in the base and this drives off the ammonia and some free cyanide, which is directed to the existing incinerator on either of the sodium cyanide solution production plants where it is destroyed. Some water is also associated with the gases directed to the incinerator as steam. The stripped liquor is treated in a reverse osmosis (RO) unit. In this unit, most of the feed stream is produced as a low cyanide concentration and the remainder, containing the majority of the sodium cyanide at a concentration of approximately 25ppm sodium cyanide, is recycled to the solids plant scrubbers as makeup liquor. Water passing through the membranes is then pumped to the cyanide destruction plant located near SCP1. The destruction plant uses hydrogen peroxide, sulphuric acid and copper sulphate to reduce the cyanide concentration to < 1ppm. Typically, the concentration sis much lower than 1ppm. Wastewater leaving the cyanide destruction plant is then discharged to CSBP's containment ponds via a batch tank system.
What is the proportion of liquid NaCN to solid NaCN?	Mike Rodriguez	2 tonne of liquid NaCN are used to produce 1 tonne solid NaCN, with 1 tonne of liquid NaCN (from the centrifuge) returned to the liquid storage.
Prior to 1988, how much solid NaCN was imported?	Cameron Schuster	Not sure exactly, thousands of tones? 5 figures It was imported via Fremantle Inner Harbour and from the eastern states The amount to be produced if the upgrade proceeds would be lower than prior to 1988.
Will there be any changes to the storage of bricketters at Patrick's?	Cameron Schuster (later)	There is only one Ministerial Statement for storage of goods at Patrick's, and that is for the AGR NaCN. The NaCN is transported via truck to the holding (storage) facility where it is stored for up to five days in accordance with its Dangerous Goods licence. Note, the standard holding period is 2 days, however this can be increased to five days subject to a risk assessment being undertaken, which is what AGR did. It is possible to load directly onto a ship from the truck provided the loading is completed within two hours. This is under review and may be increased to 12 hours. We don't anticipate that the storage area at Patrick's will increase, however the way it is stacked may change.
The mode of transport to Patrick's (road)		AGR would be happy to use rail if feasible. AGR made a commitment to review the mode of transport, with the first review (which included City of Fremantle, Fremantle Port Authority and the EPA) concluding that there had been no change (i.e. road is still the preferred option). The next review is due in August 2005.

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What will be the main changes to the scrubbers?	Mike Rodriguez	There are two scrubbers. One is a venture scrubber to remove dust, and one is a packed bed scrubber to remove HCN. These will probably be made bigger.
Why is the treated wastewater discharged to Cockburn Sound and not SDOOL?	Laurinda Shaw	This will be answered by the next slide (No. 11, Water – Future).
	Cameron Schuster (later)	On 28th October the Minister for the Environment approved the Water Corporation water reclamation plant. CSBP should be connected the week commencing the 7th December (could be one week later). Once the connection is in place, CSBP can take water from KWRP and direct wastewater out via SDOOL. The *Environmental Protection Act* licence includes both Cockburn Sound and SDOOL, with the same conditions for both. CSBP will use SDOOL when available. There may several (three?) times per year (e.g. heavy rains) when water will be directed to Cockburn Sound.
What are the risks with transporting solid NaCN? For e.g., if it was dropped into the sea and came into contact with salt water, or if it came into contact with an acid or alkali	Mike Rodriguez	Solid NaCN is very soluble so it would dissolve on contact with water (if for e.g. it was dropped into the sea). If it becomes damp, it will give off HCN. If it comes into contact with an acid, it will give off HCN. If it comes into contact with an alkali, it could potentially dissolve (alkali would suppress HCN formation).
What are the particulate ratios? PM_{10}, $PM_{2.5}$	Laurinda Shaw	Gaseous emissions go through a filter that captures all particulates to 0.3 micrograms or bigger. Concentration on the particulates is approximately 0.3mg/m3 Particulates on the filter are measured. The impingers are also measured for cyanide and ammonia .Will provide more detail in the PER.
With all the landscaping done by CSBP, it is difficult to see the windsock so the public don't know which direction to go to get upwind in the event of an accident. Could you put up another windsock?	Cameron Schuster	CSBP will take that on board. Could possibly put another windsock on top of the solid NaCN plant.
Is NaCN heavier or lighter than air?	Mike Rodriguez	NaCN is heavier than air. The gas it emits, HCN, is lighter than air.
We were originally told the KIF Air Toxics Study would include $PM_{2.5}$ and NO_x. We are now told by DOIR that they will not be included. Will AGR commit to $PM_{2.5}$ monitoring?	Cameron Schuster	I can't answer on behalf of AGR. We don't have any information on particle sizes for the solid NaCN plant particulates. CSBP as a member of KIC pushed to get $PM_{2.5}$ and NO_x included in the Air Toxics Study, and believed it achieved a good outcome as the budget of the Air Toxics Study was increased and particulates and NO_x were identified as issues in the draft report. If $PM_{2.5}$ and NO_x are no longer to be included in the Air Toxics Study, KIC will continue to lobby for their inclusion.
It is understood that Alcoa will be taking CO_2 from CSBP. Will that be sourced from the NaCN plant?	Cameron Schuster	No, it will come from the ammonia plant. Ammonia plants are one of the few industrial plants that produce pure CO_2.

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Noise	Cameron Schuster	It is a commitment and a licence condition that the NaCN plant complies with the noise regulations. It the Section 46 consolidation of commitments and conditions, the two commitments from the construction of the solids NaCN plant were kept. They related to transport and noise. I understand that the regulations are currently being drafted for another round of consultation.
Has the timing in your noise commitment changed? It originally said 6 months, but now it says 6 months after the new Regulations are in place.	Cameron Schuster	No, the wording has always been the same, i.e. Within 6 months after the review of the *Environmental Protection (Noise) Regulations 1997* has been completed and the new Regulations are made publicly available. If the Minister decides not to proceed with the new noise regulations, then the site will comply with the existing regulations no matter how much it costs. AGR are replacing most of the blades in the cooling tower with new fiberglass blades, which should reduce overall noise and the tonality component.
Industry in the area is working to reduce noise emissions. Western Mining was very close to its Industry-Industry level and has done some work; BP has also done some work.		No response required.
Expressed concern over potential risk due to variations in box (sea container) sizes at wharf.	Cameron Schuster & Others	The link assemblage is standard around the world, although box dimensions may vary. Noted.