AUSTRALIAN GOLD REAGENTS PTY LTD

SODIUM CYANIDE MANUFACTURING FACILITY, KWINANA

MINISTERIAL STATEMENT 700 PERFORMANCE REVIEW

NOVEMBER 2013 – OCTOBER 2018

NOVEMBER 2018

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SUMMARY

This performance review has been prepared to comply with Commitment 4-2 of Ministerial Statement 700 (MS 700). This report reviews environmental management at Australian Gold Reagents Limited (AGR) sodium cyanide manufacturing facility at Kwinana from November 2013 to October 2018.

Post de-bottlenecking the solids plant capacity in 2013 no further work has been initiated other than studies and pre-feasibility work.

	Solids plant
FY	Tonnes
12/13	27337
13/14	29600
14/15	30650
15/16	41268
16/17	38601
17/18	39369

Table 1: production volumes from solids plant

Changes to the key project characteristics were approved by the Chairman of the Environmental Protection Authority on 4 November 2014 to remove reference to the storage capacity of liquid sodium cyanide, the storage area for liquid sodium cyanide and atmospheric emissions of ammonia and hydrogen cyanide and sodium cyanide (combined).

Currently the business is exploring opportunities to upgrade the solution plants to 100,000 tpa and solids plant to 60,000 tpa. A Section 45C amendment request was submitted to the EPA Services Division of DWER on 27 September 2018.

Monitoring results over the period have been provided to the Department of Water and Environmental Regulation (DWER) in accordance with *Environmental Protection Act 1986* licence obligations. Discharges to air and water have been within the range that modelling indicates will result in no exceedance of ambient standards. Waste water and atmospheric emission monitoring results were within licence limits for the 5 year period. Target exceedances throughout the 5 year period have been highlighted in this report. Detailed incident investigation reports and the implemented corrective and preventative measures were sent to DWER at the time of the incident.

AGR will continue to meet and where possible improve on environmental targets and continue to investigate technologies that may be applicable to the existing sodium cyanide manufacturing facility to improve environmental outcomes.

1. INTRODUCTION

1.1 Project Overview

Australian Gold Reagents Pty Ltd (AGR) is owned by CSBP Limited (75%) and Coogee Chemicals Limited (25%). As a joint venture between these two companies, AGR was formed to manufacture and distribute sodium cyanide.

AGR currently operates two liquid sodium cyanide plants and a downstream solid sodium cyanide processing plant, which are collectively referred to as the Sodium Cyanide Manufacturing Facility (SCMF).

The SCMF is located within the CSBP Kwinana Industrial Complex in the Kwinana Industrial Area. The AGR facility is licensed under Part V of the *Environmental Protection Act 1986* and subject to the conditions contained within that licence (EP Act licence). A copy of the current facility licence is provided in Appendix 3.

Following approval and implementation of capital projects to lift solution capacity to 85,000 tonnes per annum and solids to 45,000 tonnes per annum the business has seen significant positivity in the local solution market from gold producers who have re-commissioned plants or built new gold processing facilities in the gold fields.

This sentiment has increased the local solution offtake and reduced our international export of sodium cyanide. Current five to ten year forecasts show that there may be a shift from solution supply locally to CSBP selling more solids product internationally.

1.2 Project Location

AGR leases 4.3ha of land for the SCMF within the CSBP Kwinana Industrial Complex (KIC) in the Kwinana Industrial Area, approximately 40km south of Perth, Western Australia (Figures 1 and 2). The entire CSBP Industrial Complex encompasses an area of 138ha, with BP Kwinana to the north and a railway corridor to the east.

1.3 The Proponent

The proponent for the SCMF is:

Australian Gold Reagents Pty Ltd
Kwinana Beach Road
Kwinana WA 6167

The key contact is:

Stephanie Felstead
Environmental Superintendent
CSBP Limited
Tel: 08 9411 8821
E-mail: stephanie.felstead@csbp.com.au

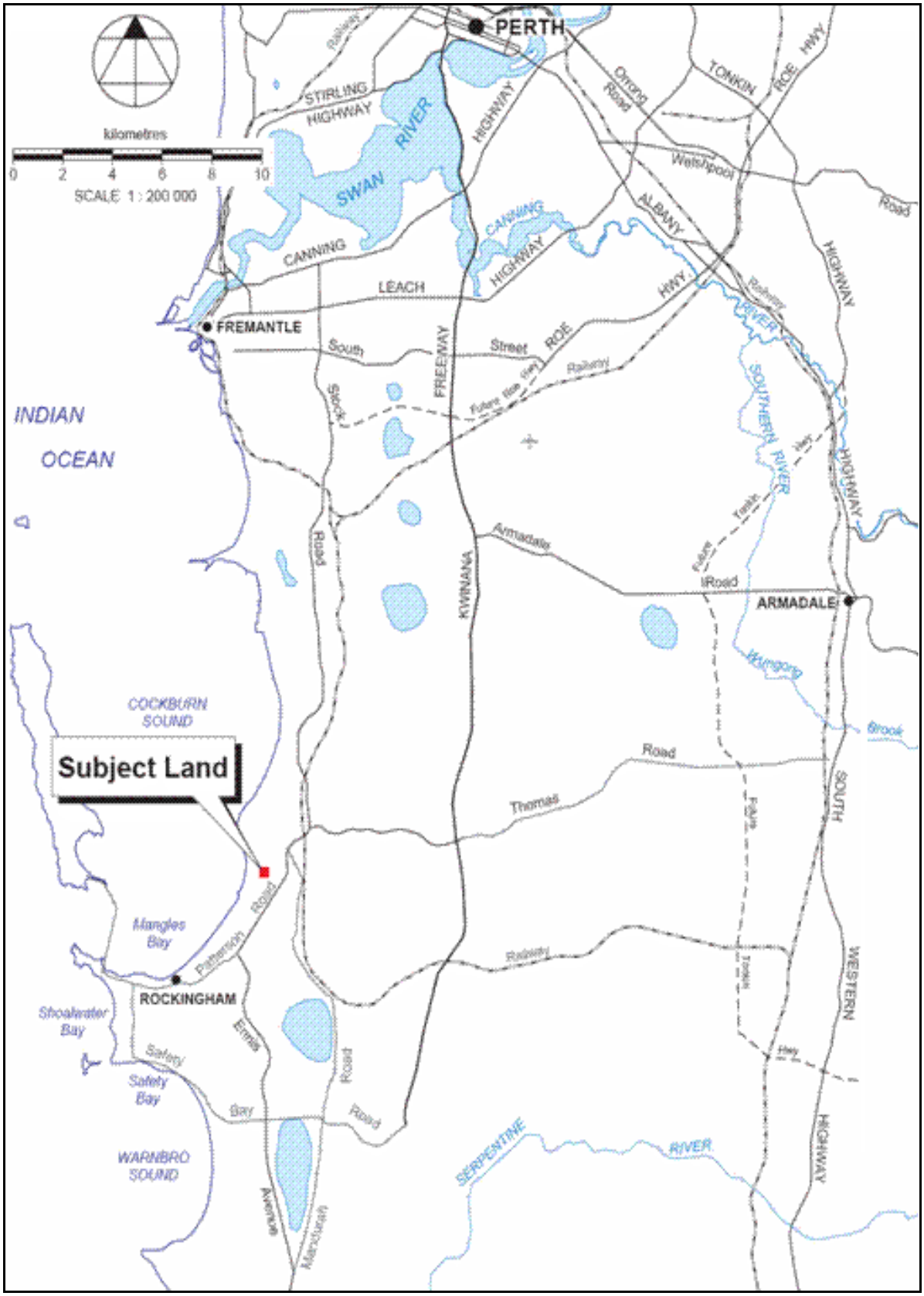

Figure 1 Regional Location of CSBP Kwinana Industrial Complex

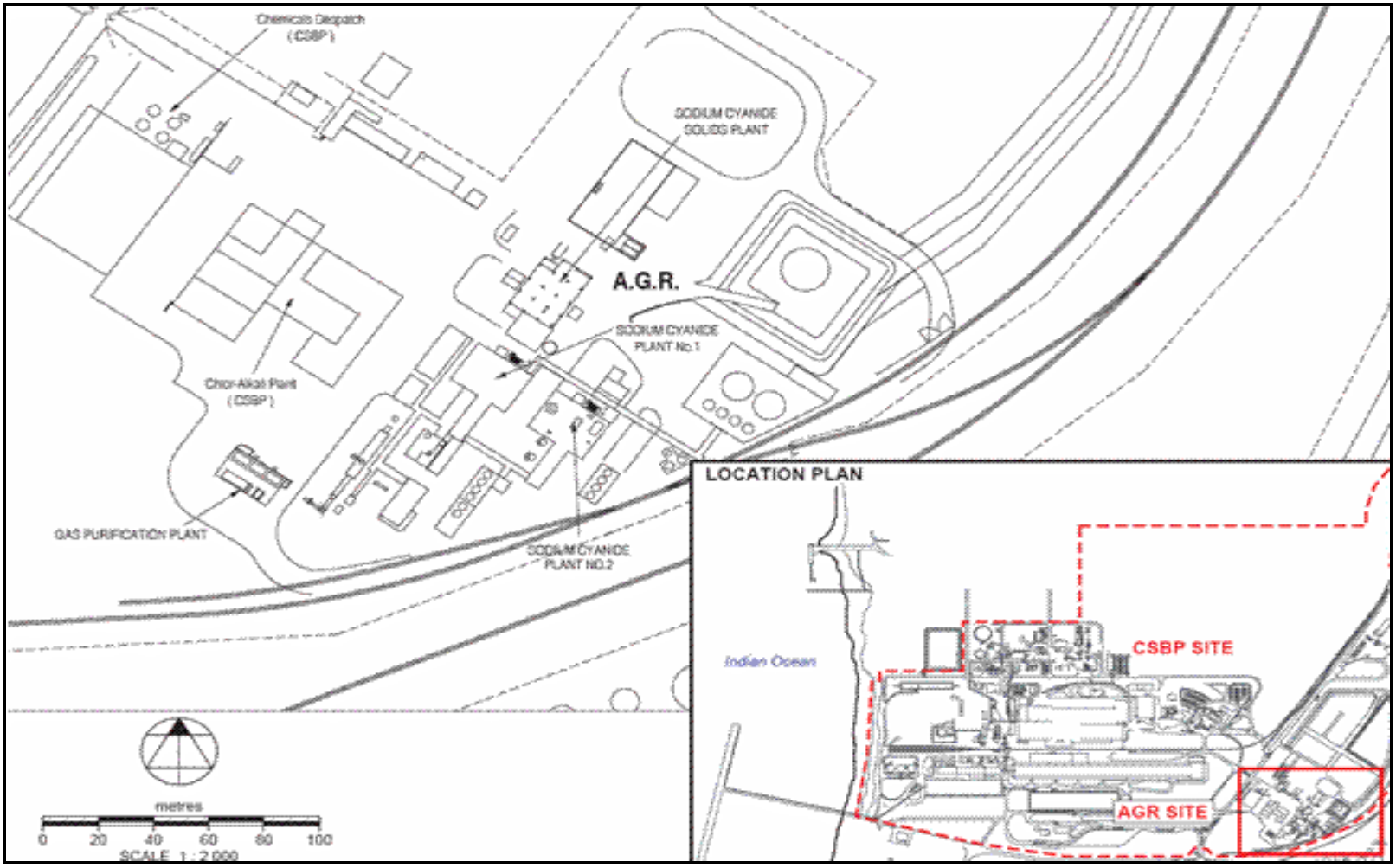

Figure 2 CSBP Kwinana Site Layout

1.4 Purpose of this Document

This Performance Review (PR) has been prepared to satisfy Ministerial Condition 4-2 of Statement 700 for the period Nov 2013 to October 2018. The PR is required to address:

1. The major environmental issues associated with implementing the project; the environmental objectives for those issues; the methodologies used to achieve these; and the key indicators of environmental performance measured against those objectives.
2. The level of progress in the achievement of sound environmental performance, including industry benchmarking, and the use of best practicable measures available.
3. Significant improvements gained in environmental management, including the use of external peer reviews.
4. Stakeholder and community consultation about environmental performance and the outcomes of that consultation, including a report of any on-going concerns being expressed.
5. The proposed environmental objectives over the next five years including improvements in technology and management processes.

1.5 Management Commitments

AGR is committed to ensuring that the existing project and any future expansion is undertaken in a manner that minimises impacts on the surrounding biophysical and social environments.

AGR has made a series of management commitments intended to meet EPA objectives for the identified environmental factors over the next 5 years. These are summarised in Table 3 in Section 6.

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. The Environmental Monitoring and Management Program includes, but is not limited to:

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

The Environmental Monitoring and Management Program is routinely reviewed as required by the Document Management System.

2. LEGISLATIVE FRAMEWORK

2.1 Ministerial Approval under the Environmental Protection Act 1986

AGR released a Public Environmental Review (PER) in 2005, proposing to increase its existing solid sodium cyanide production capacity through debottlenecking and installation of new equipment. The increase in the production capacity of solid sodium cyanide was driven by opportunities for increased sales in overseas markets.

Ministerial Statement 700 was signed by the Minister for Environment and came into effect on 22 November 2005.

A change to the key project characteristics was approved by the Minister on 4 February 2013 to increase liquids production from 70,000 to 85,000 tpa and make de-bottlenecking adjustments to the solids plant to achieve the approved 45,000 tpa production capacity.

A subsequent change to the key project characteristics was approved by the Minister on 4 November 2014 to remove the storage capacity and storage area of liquid sodium cyanide and atmospheric emissions of ammonia and hydrogen cyanide and sodium cyanide (combined).

3. PROJECT DESCRIPTION

3.1 Key Characteristics

A summary of the key characteristics of the SCMF and the current status of the facility is presented in Table 1.

Table 1 Key Characteristics for the AGR Sodium Cyanide Manufacturing Facility and Current Status of the Facility

Characteristic	Existing Facility	Description of Upgraded Facility
General		
Location	Kwinana Beach Road, Kwinana South east corner of the CSBP site and west of Coogee Chemicals – Kwinana Industrial Area	Kwinana Beach Road, Kwinana South east corner of the CSBP site and west of Coogee Chemicals – Kwinana Industrial Area
Disturbance Areas		
Plant Areas	Approximately 4 ha	Approximately 4 ha
Total area disturbed	4.3 ha	4.3 ha
Liquid Sodium Cyanide Plants		
Plant Facilities (x2)	Gas reactor, cooler, absorber, distillation column and incinerator.	Gas reactor, cooler, absorber, distillation column and incinerator.
Production Capacity (Plants 1 & 2 combined)	Capacity to produce a combined total of 70,000 tpa sodium cyanide (expressed as 100% sodium cyanide).	Capacity to produce a combined total of 85,000 tpa sodium cyanide (expressed as 100% sodium cyanide).
Storage – liquid sodium cyanide	• Steel tanks with total capacity of 5,500 m3 (2,000 t of 100% sodium cyanide) onsite. • Up to 140 t in isotainers in transit.	**Removed as storage of liquid sodium cyanide is regulated under the Dangerous Goods Safety Act 2004, administered by the Department of Mines and Petroleum.**
Gaseous Emissions	• Tail gases from the incinerator; • Discharge gases from the start-up blower; and • Discharge gases from the incinerator shutdown stack.	• Tail gases from the incinerator; • Discharge gases from the start-up blower; and • Discharge gases from the incinerator shutdown stack.
Solid Sodium Cyanide Plant		
Plant Facilities	• Two or three batch evaporators, vacuum pump incorporating a scrubber, condensate tank, slurry tank, centrifuge, spin flash dryer incorporating scrubber system, powder hopper and compacting machine.	Two or three batch evaporators, vacuum pump incorporating a scrubber, condensate tank, slurry tank, two centrifuges, spin flash dryer incorporating scrubber system, two powder screws and two compacting machines.
Production capacity	Nominal 45,000tpa	Nominal 45,000tpa
Inputs	30% sodium cyanide solution	30 to 38% sodium cyanide solution
Outputs	Briquettes containing >97% sodium cyanide.	Briquettes containing >97% sodium cyanide.
Storage	• Area designed to store a maximum of 7140 tonnes solid sodium cyanide. Solid sodium cyanide will be stored in IBC's packed into sea containers or a warehouse.	**Removed as storage of liquid sodium cyanide is regulated under the Dangerous Goods Safety Act 2004, administered by the Department of Mines and Petroleum.**

	• Small quantities may be stored in isotainers (equipped to allow injection of water to dissolve the sodium cyanide at the mine site).	
Gaseous Emissions	• Ammonia to a maximum 1.5 grams per second. • Hydrogen cyanide and sodium cyanide (combined) to a maximum 0.58 grams per second.	**Removed as managed under the conditions of Licence issued under Part V of the Environmental Protection Act 1986 (EP Act).**
Transport		
Liquid Sodium Cyanide	By road and rail. 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.	By road and rail. *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.
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3.2 Equipment Changes

No additional equipment has been installed on the solids plant since debottlenecking.

3.3 Hours of Operation

The plant operates for approximately 350 days per year in an around-the-clock operation.

3.4 Process Description

3.4.1 Liquids Plants

Two liquid sodium cyanide plants (SCP1 & SCP2) produce a 30% liquid sodium cyanide solution. Purified natural gas (CH_4) is mixed with air and ammonia (NH_3) before entering the hydrogen cyanide reactors to produce hydrogen cyanide (HCN) gas. The reactor gases are directed to the absorber where the hydrogen cyanide is absorbed into sodium hydroxide (caustic or NaOH) solution to form sodium cyanide solution.

Sodium cyanide solution is then directed to storage tanks and the waste gases leaving the top of the absorber tower flow to the suction blowers to be transferred to the incinerator where natural gas is used to incinerate the waste gases.

The liquid sodium cyanide process is designed with two stage absorption to ensure complete reaction of the hydrogen cyanide with caustic soda. Plant operations are optimised via recycling of any cyanide rich gases for complete reaction. The sodium cyanide production process is sealed by design and maintained under suction by the blowers that direct waste gas to the incinerators to minimise the risk of fugitive emissions.
The waste gases discharged from the incinerator stack consist of carbon monoxide, carbon dioxide, ammonia and oxides of nitrogen (NO_x).

3.4.2 Solids Plant

The solid sodium cyanide plant produces solid sodium cyanide briquettes from a 30% sodium cyanide solution through a process which includes evaporation, dehydration and compaction.
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 isotainers 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 gas scrubber to remove sodium cyanide particulate and hydrogen cyanide gas.

The solid sodium cyanide plant operates under vacuum to prevent fugitive emissions of sodium cyanide dust and/or hydrogen cyanide gas from the spin flash dryer and solids handling section of the plant.

3.5 Waste Management

3.5.1 Liquid Waste

Wastewater from various points in the solid sodium cyanide facility is recycled within the production process whenever possible. Water that must leave the 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 extract 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 (the permeate) is produced as a low cyanide concentration and the remainder (the reject), 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.

Permeate is pumped to the wastewater treatment plant located near SCP1. Hydrogen peroxide, sulphuric acid and copper sulphate are used to reduce the cyanide concentration to less than 1ppm.

Treated wastewater 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 EP Act licence conditions and internal targets.

In accordance with Proponent Commitments 3 & 5 of Ministerial Statement No. 700 CSBP has developed and implemented a Water (Surface and Waste) Management Plan and a Solid Waste Management Plan for the SCMF as a whole. These plans are regularly reviewed and updated to reflect changes to the solids plant and other processes and activities on site.

3.5.2 Solid Waste

The only solid industrial wastes that the SCMF 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.

Domestic type solid waste is disposed of in the approved manner. Waste oils and other commercial and industrial wastes are managed through existing waste disposal systems maintained by CSBP.

3.5.3 Gaseous Emissions

Gaseous emissions are vented to the atmosphere from the incinerator stacks (liquids plant) and a scrubber stack (solids plant).

The only other gaseous discharges are minor fugitive emissions arising from the venting of vessels prior to maintenance activities or via plant malfunction. Venting vessels prior to undertaking maintenance is a necessary safety requirement when working on pipelines and vessels containing process gases. These are controlled in accordance with industry standard procedures to minimise the volume of gases emitted and any potential environmental impact.

4 ASSESSMENT AND MANAGEMENT OF ENVIRONMENTAL FACTORS

4.1 Summary of Relevant Environmental Factors

The relevant environmental factors related to the SCMF are:

Emissions Management

- Atmospheric emissions of ammonia and cyanides (Air Quality);
- Noise (Social Surroundings); and
- Wastewater (Marine Environmental Quality).

The process upgrades have created no additional impact to the biophysical environment encompassing flora, vegetation and fauna communities, as the expansion is located entirely within the existing AGR sodium cyanide business area.
A detailed discussion about the environmental objectives, key indicators and management strategies for each environmental factor is provided in Sections 4.2 to 4.4.

4.2 Air Quality

4.2.1 Environmental Objective

To maintain air quality and minimise emissions so that environmental values are protected.

4.2.2 Applicable Standards

The applicable licensed air emissions from the EP Act Licence for the SCMF are shown in Table 2.

Table 2 Environmental Protection Act Licence 6110 Stack Monitoring Requirements

Parameter	Licensed Emissions g/s				
	SCP1 & 2 Incinerators		Solids Plant		Annual average total for all stacks
	Limit	Target	Limit	Target	Limit
NOx equal to or more than 95% operating time over the previous 12 months	5.0	<4.5	n/a	n/a	n/a
NOx equal to or less than 5% of operating time over the previous 12 months	12.0	5.0	n/a	n/a	n/a
Ammonia	n/a	0.60	n/a	1.5	n/a
Total Cyanide	0.58	0.35	0.58	0.35	1.0

4.2.3 Emissions to Air

Gaseous emissions has previously been removed from the Key Characteristics Table as it is regulated under Part V of the EP Act 1986, however, the air emission data for ammonia, cyanide and NOx are discussed below.

Ammonia Emissions

Monitoring results for ammonia emissions from solids plant stack and the two liquids plant stacks are presented in Figures 3-5.

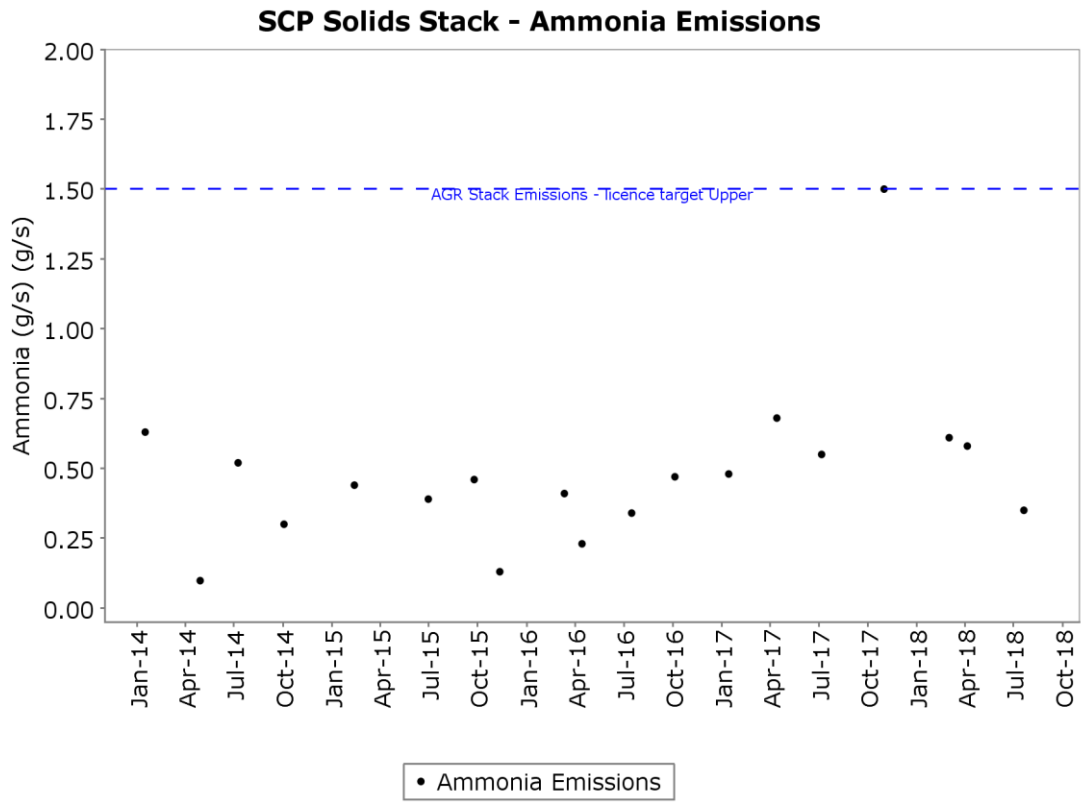


Figure 3 Solid Sodium Cyanide Stack Ammonia Emissions

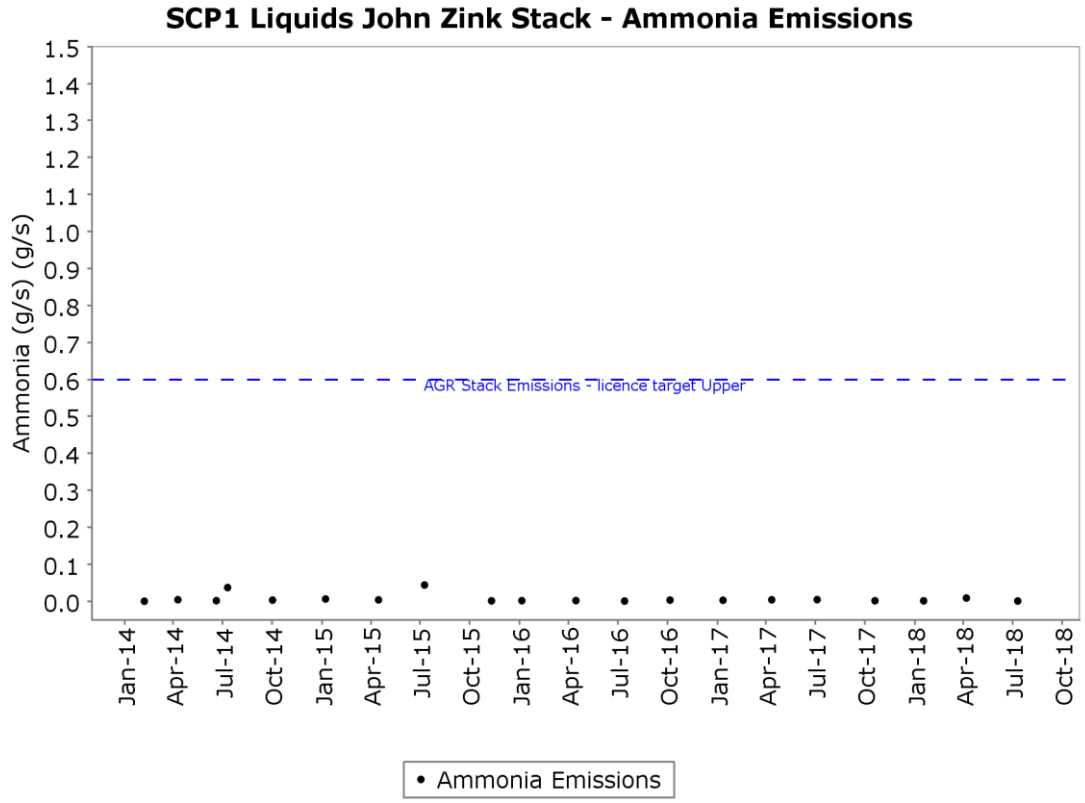


Figure 4 SCP1 John Zink Stack Ammonia Emissions

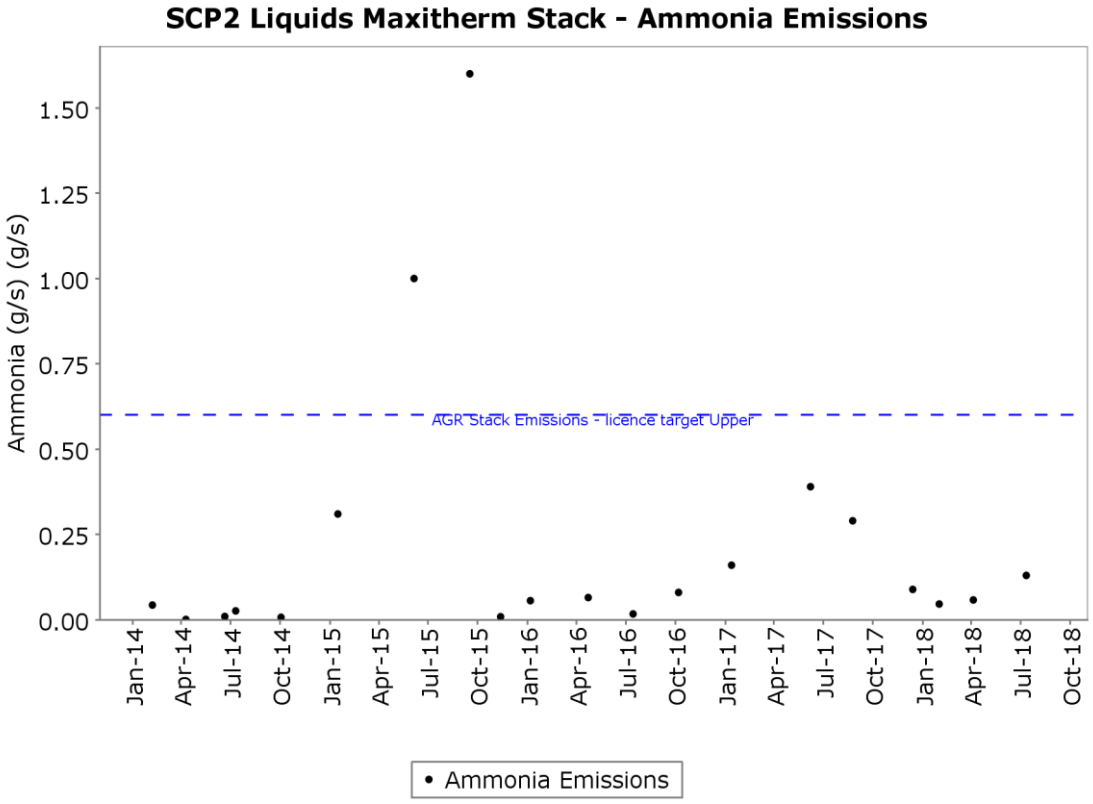


Figure 5 SCP2 Maxitherm Stack Ammonia Emissions

Ammonia emissions from the SCP2 Liquids Maxitherm stack on 5 June 2015 were 1.0 g/s and on 16 September 2015 were 1.6 g/s. DWER was advised of these licence target exceedances and AGR commenced an investigation to determine the cause.

The investigation identified one of the AGR gas supplier's (Kleenheat) had a major failure on 23 November 2014 and as a result, AGR was required to run on ATCO gas for more than a month. The ATCO gas differs from gas supplied by Kleenheat in that it contains mercaptans which may have contributed to deterioration of the Selective Catalytic Reduction (SCR) catalyst.

Plant trips at AGR in February and March 2015 may have also contributed to deterioration in the SCR catalyst. A significant step change in ammonia use in the process was noticed after a shutdown and restart period. The ammonia is used to control the NOx decomposition reaction. An increase in ammonia usage is evidence of a decrease in the SCR catalyst's activity. The catalyst was replaced in the October 2015 shutdown.

Cyanide Emissions

Monitoring results for cyanide emissions from the solid sodium cyanide stack are presented in Figure 6. Monitoring results for cyanide emissions from the liquid sodium cyanide stacks are presented in Figure 7 and Figure **8**.

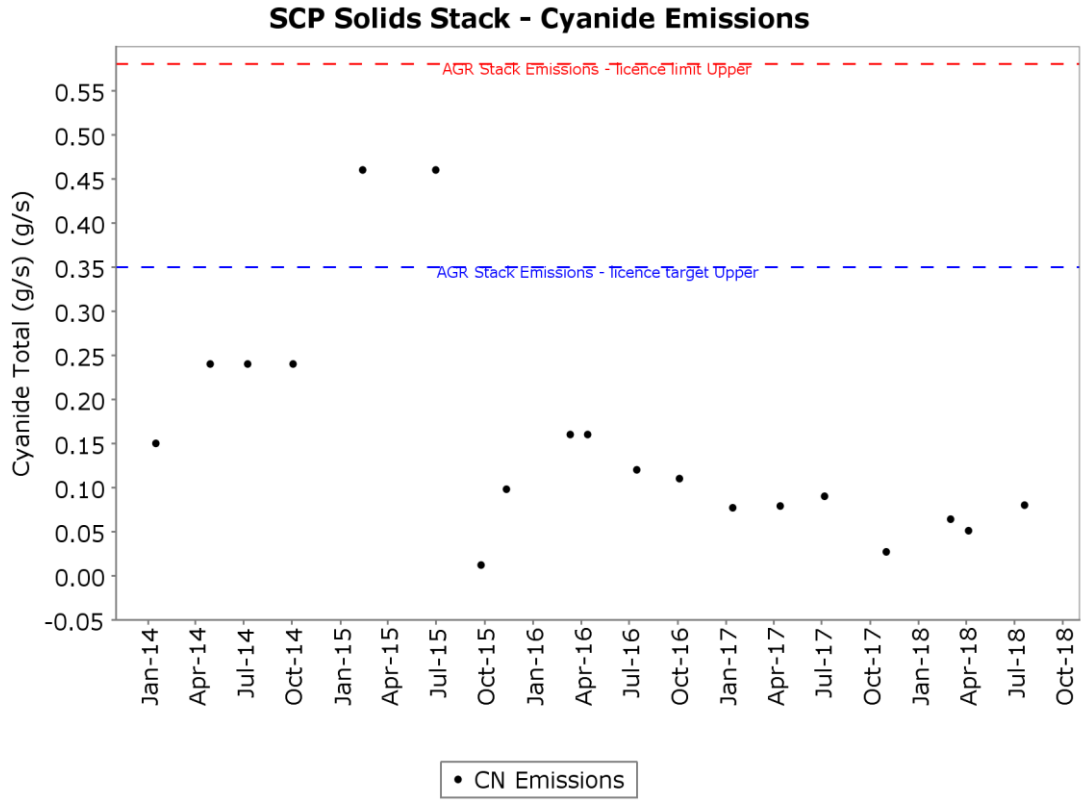


Figure 6 Solid Sodium Cyanide Stack Cyanide Emissions

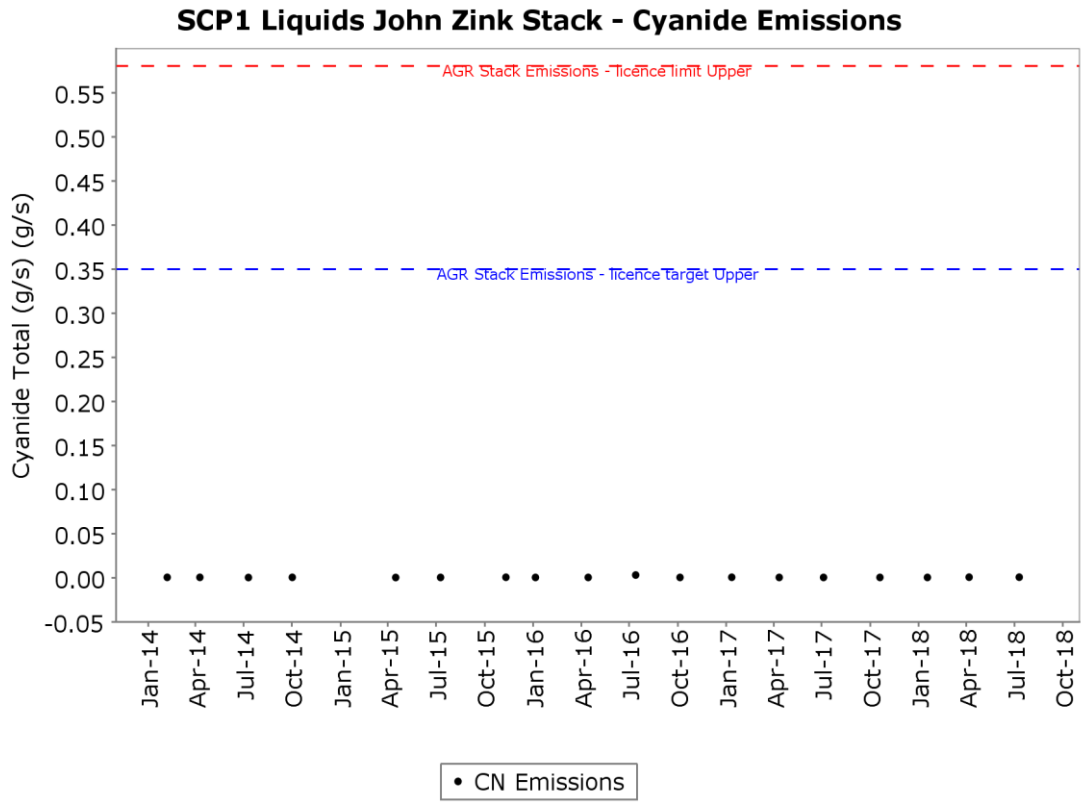


Figure 7 SCP1 John Zink Stack Cyanide Emissions

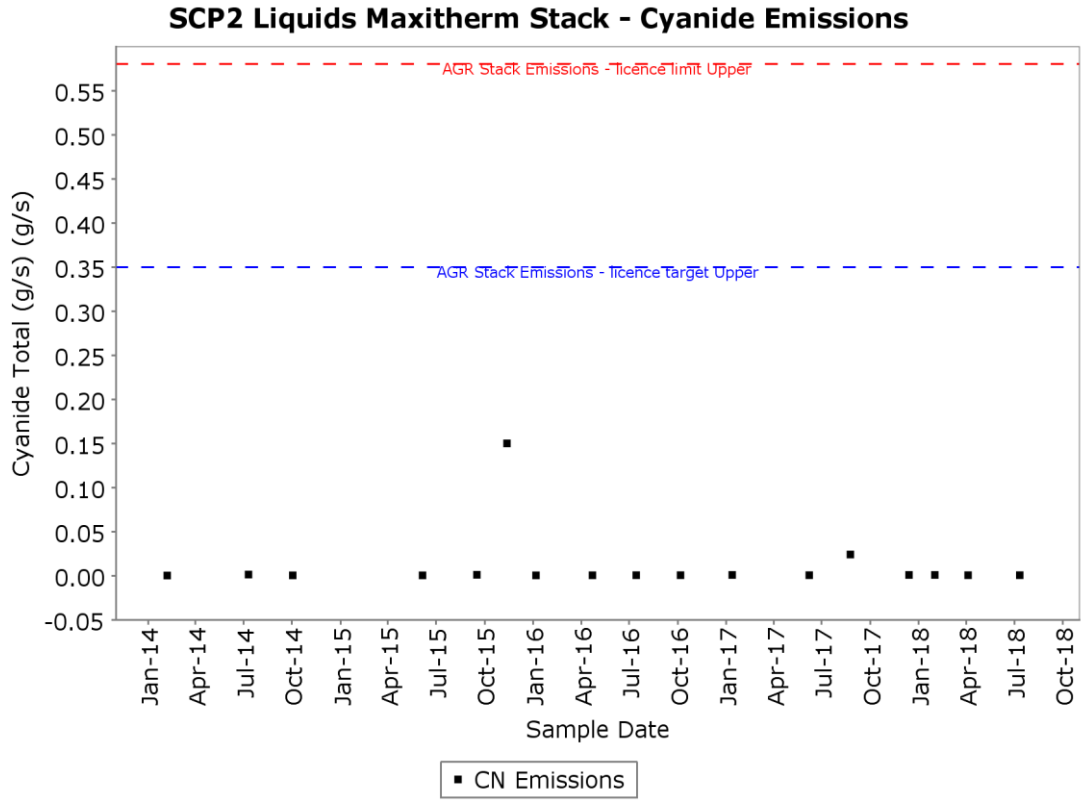


Figure 8 SCP2 Maxitherm Stack Cyanide Emissions

Solids plant stack tests on 12 February 2015 and 30 June 2015 reported higher than anticipated levels of hydrogen cyanide gas at 0.46g/s total cyanide. The results were below the EP Act licence limit of 0.58 g/s but above the licence target of 0.35 g/s and therefore communicated to the DWER in accordance with licence obligations.

In both incidents all relevant operating parameters were checked and compared with previous stack testing times for correlation between results. All parameters checked 12 February 2015 were consistent with the exception of the following:

- There was variation in the chilled water circulation flow but this was not considered significant.
- The induced draft fan speed was higher which may have contributed to an increase in the fumes discharging from the stack.
- The gas flow rate was higher which may have been caused by the packed bed scrubber packing distribution, and/or spray nozzle distribution. Inspection identified that the packed bed scrubber packing was intact, however the spray nozzle distribution did not completely cover the column.

Investigations concluded that the incomplete spray nozzle distribution may have been a contributing factor in the elevated total cyanide stack test result.

All relevant operating parameters on 30 June 2005 were checked and compared with previous stack testing times for correlation between results. All parameters checked were consistent with the exception of the following:

- The pressure drop and controller output on the venturi scrubber throat was lower. This may have contributed to reduced particulate scrubbing efficiency.
- The venturi scrubber bleed density was higher, bleed flow and make-up flow was lower and the venturi scrubber make up water cyanide concentration was higher. This may have contributed to reduced scrubbing efficiency due to saturation of scrubbing liquor which could lead to re-entrainment of cyanide.
- The packed bed scrubber make up water temperature was higher, gas exit temperature from the venturi scrubber to the packed bed scrubber was higher, the vacuum on the ID fan inlet was higher and the packed bed scrubber makeup pH was lower. Low pressure, high temperature and low pH conditions reduce cyanide solubility in water which could contribute to increasing likelihood of slippage.

Investigations concluded that there were some parameters in the venturi scrubber and packed bed scrubber which may have contributed to the elevated total cyanide stack test result and required some adjustment. All stack test results have been below the licence target since then.

NOx Emissions

Monitoring results for NOx emissions from the liquid sodium cyanide stacks are presented in Figure 10.

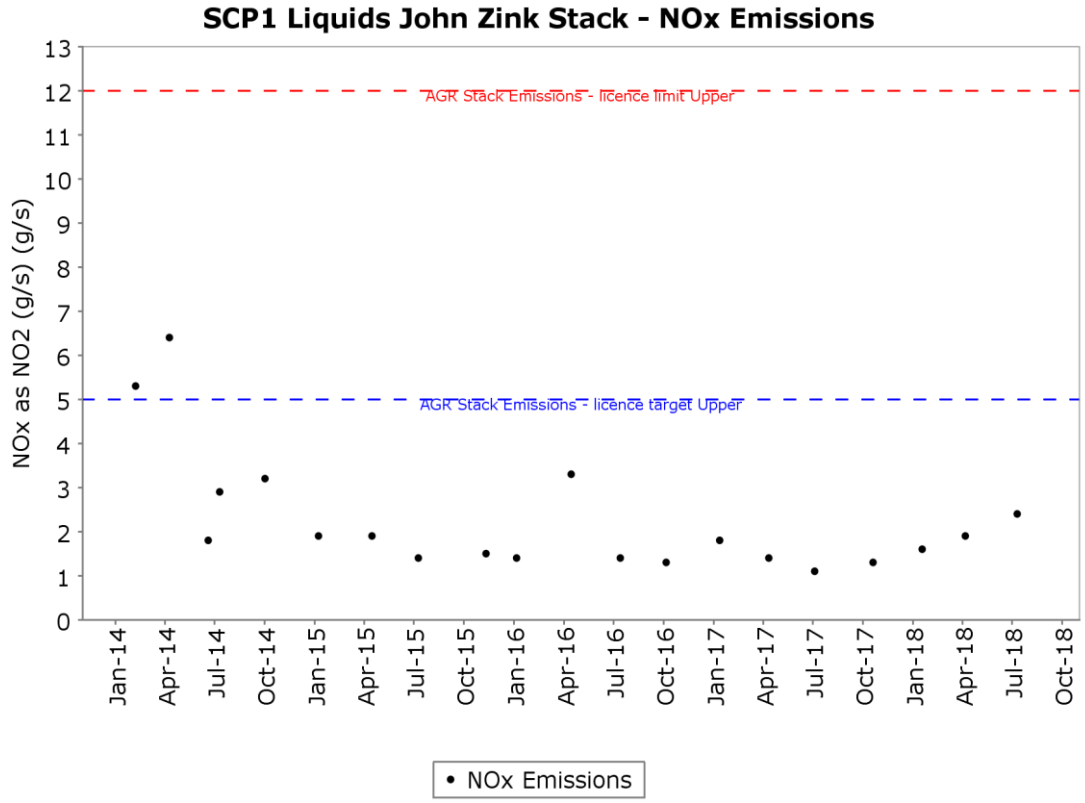


Figure 9 SCP1 John Zink Stack NOx Emissions

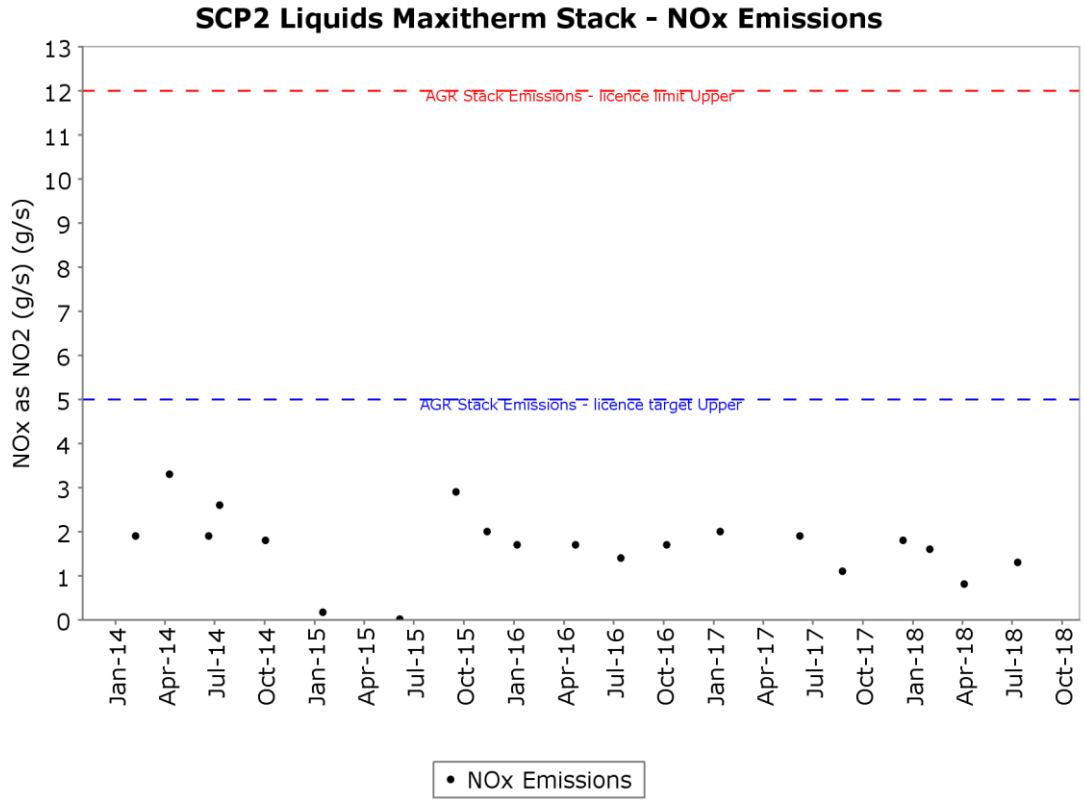


Figure 10 SCP2 Maxitherm Stack NOx Emissions

The current EP Act licence limit for NOx for SCP1 and SCP2 for 95% or more operating time is 5.0 g/s and a target of <4.5 g/s. Limits for 5% of operating time is 12.0 g/s and a target of 5.0 g/s.

All monitoring results from regular stack tests for both liquids stacks are below licence limits/ targets. There is no licence limit or target for this parameter for the solids plant stack.

4.2.4 Management

During normal operation, the gaseous emissions are vented to the atmosphere from the plant stacks. Stacks are tested for emissions for licence parameters in accordance with AGR's EP Act licence. Internal targets have been set which trigger an investigation into cause prior to licence targets being reached.

4.3 Marine Environmental Quality

4.3.1 Environmental Objective

To maintain the quality of water, sediment and biota so that environmental values are protected.

4.3.2 Applicable Standards, Guidelines or Procedures

Wastewater discharges shall be managed in accordance with conditions contained in EP Act Licence 6110.

4.3.3 Discharges

All wastewater from the sodium cyanide business is directed to the CSBP Kwinana containment pond. This wastewater is processed via nutrient stripping wetlands for treatment prior to being pumped offsite to CSBP Kwinana *Environmental Protection Act 1986* licence L6107/1967 discharge point, the Sepia Depression Ocean Outlet Landline (SDOOL) operated by the Water Corporation. During periods of high rainfall, containment pond storage capacity and maximum pump rates to the wetlands and SDOOL may be exceeded and wastewater may be discharged to Cockburn Sound via the two alternative licensed discharge points – the emergency beach outfall and/or the submarine pipeline.

In accordance with Condition 2 and Proponent Commitment 3 of Ministerial Statement No. 700, CSBP have in place a water (surface and waste) management plan for the SCMF.

Wastewater from various points in the solid sodium cyanide facility is recycled within the process whenever possible. Water that must leave the 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 extract 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, 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.

Wastewater leaving the treatment plant is discharged to CSBP's containment ponds via a batch tank system. Each batch tank is filled and then manually sampled and analysed to ensure compliance with EP Act licence conditions prior to discharge to CSBP's containment pond. The SCMF on-line boundary waste water analyser tests the effluent and storm water every 8 minutes against licence criteria for pH and cyanide and if outside of acceptable values automatically stops pumping to prevent the wastewater being discharged to the CSBP containment pond.

Liquid effluent discharges has previously been removed from the Key Characteristics Table as discharge water quality is regulated under Part V of the EP Act 1986, however, the discharge data for nitrogen, copper and cyanide are discussed below.

Discharges of Nitrogen, Copper and Cyanide

Proponent commitment 3 – Water Management – states that there be a Water Management Plan which includes discharge requirements including concentration of cyanide and copper to be less than 1 ppm and nitrogen to be no greater than 19 kg/day on a monthly average. Figure 11 below shows the monthly average nitrogen (kg/day) discharges from AGR to the CSBP containment pond.
Elevated nitrogen in June to August 2017 was due to process problems in the evaporator. When the CN is reduced to CNO during the destruction process ammonia is also produced. Elevated Nitrogen load in 2018 is due to the inefficient operation of the ammonia stripper.

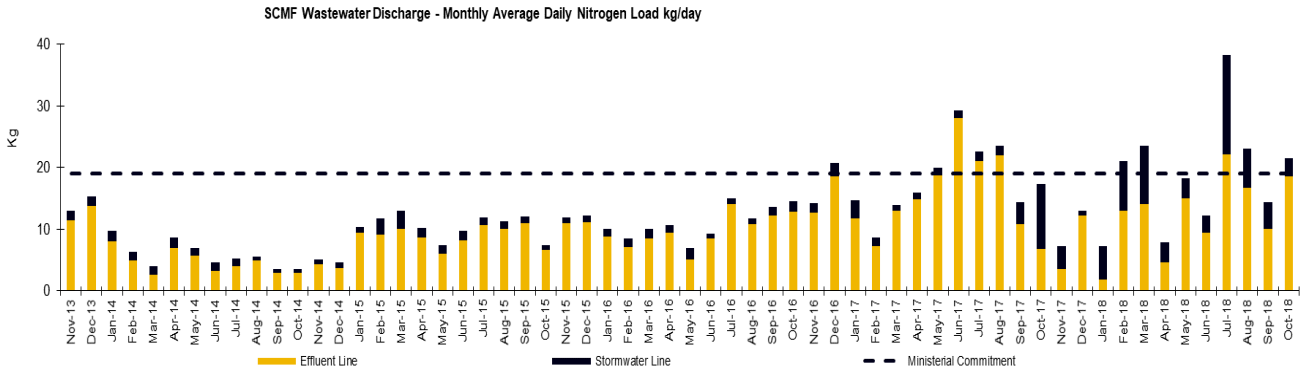


Figure 11 Ammonia nitrogen kg/day in treated wastewater discharges to CSBP

Copper in the effluent is reviewed daily by the process engineer and adjustments are made by the Process Technicians. There is an operational procedure for the operation of the copper sulphate make up and addition to ensure complete destruction of cyanide whilst minimising copper load in effluent. This has resulted in low copper concentrations in the treated effluent whilst ensuring effective destruction of cyanide prior to discharge to the CSBP containment pond.

Figure 12 below shows that the monthly average concentration of copper in treated effluent has been below 1ppm throughout the reporting period.

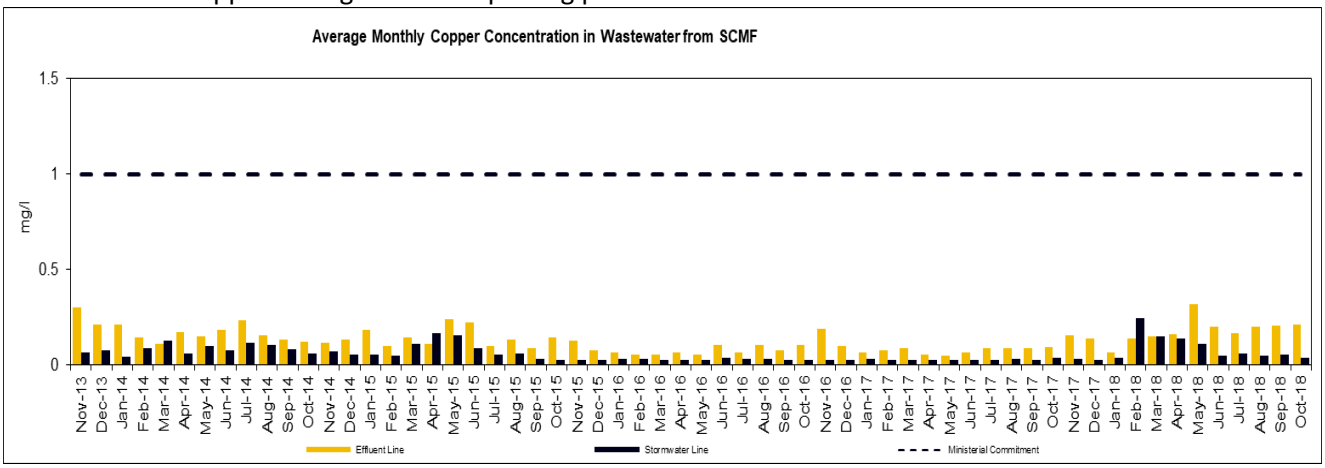


Figure 12 Copper concentration in treated wastewater discharges to CSBP

Figure 13 below shows that the monthly average concentration of cyanide in treated effluent has consistently been below 1ppm.

Stormwater and cooling tower blowdown is also discharged from AGR to the CSBP containment pond via a second pipeline, known as the Surface Water line. This wastewater is from sources that are normally not contaminated with copper or cyanide.

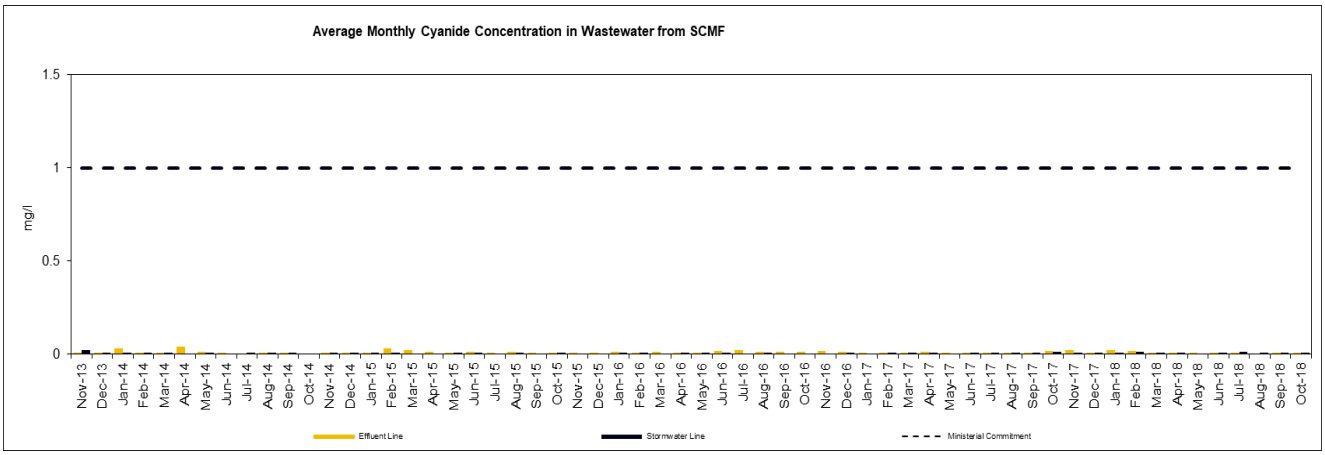


Figure 13 Cyanide concentration in treated wastewater discharges to CSBP

4.3.4 Management

AGR has a stormwater management plan and a wastewater and solid waste management plan for the SCMF.

CSBP has an active program aimed at reducing the load of nitrogen and other contaminants discharged via the licensed discharge points. As part of a continual improvement process, processes are periodically reviewed to ensure wastewater streams are reused where possible. The importance of good housekeeping is emphasized, to minimise the potential for contaminant inputs into the wastewater management system. Wastewater is treated in the

nutrient stripping wetlands prior to discharge. Internal targets have been set which trigger an investigation, prior to reaching concentrations in proponent commitments.

The comprehensive and robust nature of the wastewater management system enables CSBP to detect and manage incidents involving process fluids or effluents that could lead to an unacceptable discharge of contaminants. This includes the Emergency Response Plan and management procedures that have been developed to address a range of potential incidents such as spills, fire and transport accidents that could result in the release of contaminants to ground water and the marine environment. 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.

4.4 Social Surroundings

4.4.1 Environmental Objective

To protect social surroundings from significant harm.

4.4.2 Applicable Standards, Guidelines or Procedures

Environmental Protection (Noise) Regulations 1997 (as amended)

4.4.3 Industrial Receptors

Boundary noise surveys along the nearest premises to the Sodium Cyanide Manufacturing Facility (SCMF)(Coogee Chemicals boundary) in February 2016 confirmed the noise emission from the SCMF when operating at full capacity comply with the requirements of the *Environmental Protection (Noise) Regulations 1997 (as amended).*

4.4.4 Residential Receptors

Directional Noise Monitoring (BarnOwl) has been undertaken at Chalk Hill in the Medina residential area by Herring Storer Acoustics on a number of occasions to verify modelled noise impacts from the CSBP industrial complex, including the solid sodium cyanide facility. Most recent BarnOwl measurements in 2010 found that the contribution of noise emission from CSBP was in the order of 23-30 dB(A) and therefore consistent with the CSBP predicted noise emissions based on the CSBP SoundPlan acoustic model. The assessment concluded that noise from CSBP premises was not significant at Medina, the overall noise level complied with the regulation 'assigned level' at night and that the noise control implemented at the SCMF appeared to have been effective.

4.4.5 Management

An Environmental Noise Management Plan (ENMP) has been prepared which describes the way in which CSBP Kwinana achieves compliance with the *Environmental Protection (Noise) Regulations 1997 (as amended).* The ENMP takes into account near and far field noise measurements undertaken to assist in the preparation and assessment of acoustic modelling.

NOISE MONITORING PROGRAM

The CSBP Kwinana Industrial Complex acoustic model is updated when new works are planned that may impact environmental noise emissions. The model outputs are then used to guide design and construction to achieve on-going compliance with the *Environmental Protection (Noise) Regulations 1997 (as amended).*
When new works are completed and fully commissioned, noise measurements are undertaken to verify compliance with the regulations and compare actual results against the model predictions. If appropriate, the noise model may be further updated using the latest data. If changes occur to existing plant or process that are assessed to potentially impact compliance with the nearfield and/or farfield regulations, noise monitoring is commissioned to assess the level of impact. If noise attenuation measures are warranted, advice will be sought from the acoustic consultant to identify the most appropriate actions.

5 STAKEHOLDER CONSULTATION

AGR participates in an extensive technical exchange with Cyanco focused on safer operation of the solids plant. The result of the exchange to date has been the identification and implementation of specific improvements to the processing plant that enable a higher quality briquette to be made resulting in substantially less dust and the subsequent improvement in safety.

As a signatory to the International Cyanide Management Institute , AGR is exposed to experienced cyanide plant auditors who are able to pass on best practices from other locations. AGR has benefited from this over the years with auditing conducted every 3 years.

We also host visits and tours for a range of government, industry and community stakeholders in WA. These tours provide stakeholders with a first-hand experience of our business, and help demonstrate our commitment to open and transparent business practices.

CSBP is a member of the Kwinana Industries Council (KIC) and is represented on the Community and Industries Forum (CIF). The CIF is the primary forum for members of the KIC to consult with the local community and other stakeholders.

CSBP continues to engage with stakeholders on a regular basis through a number of forums to provide opportunities to discuss all relevant issues. These include:

- Participation in Kwinana Industries Council (KIC) activities including representation on a number of committees.
- Regular representation at Kwinana Communities & Industries Forum (CIF) meetings, which are held every 3 months.
- Public availability of relevant reports and documents via the company website (www.csbp.com.au), local libraries and Government Authorities (e.g. Department of Environment Regulation, Town of Kwinana).

CSBP is committed to consulting with all stakeholders on matters relevant to the Kwinana Sodium Cyanide Manufacturing Facility. Consultation occurs in a number ways both formally and informally including provision of information and contact details on the company website http://www.agrcyanide.com.

6 ENVIRONMENTAL MANAGEMENT OBJECTIVES FOR THE PERIOD 2019 TO 2023

Table 3 Sodium Cyanide Plant Upgrade Environmental Management Objectives for the Period 2019 to 2023

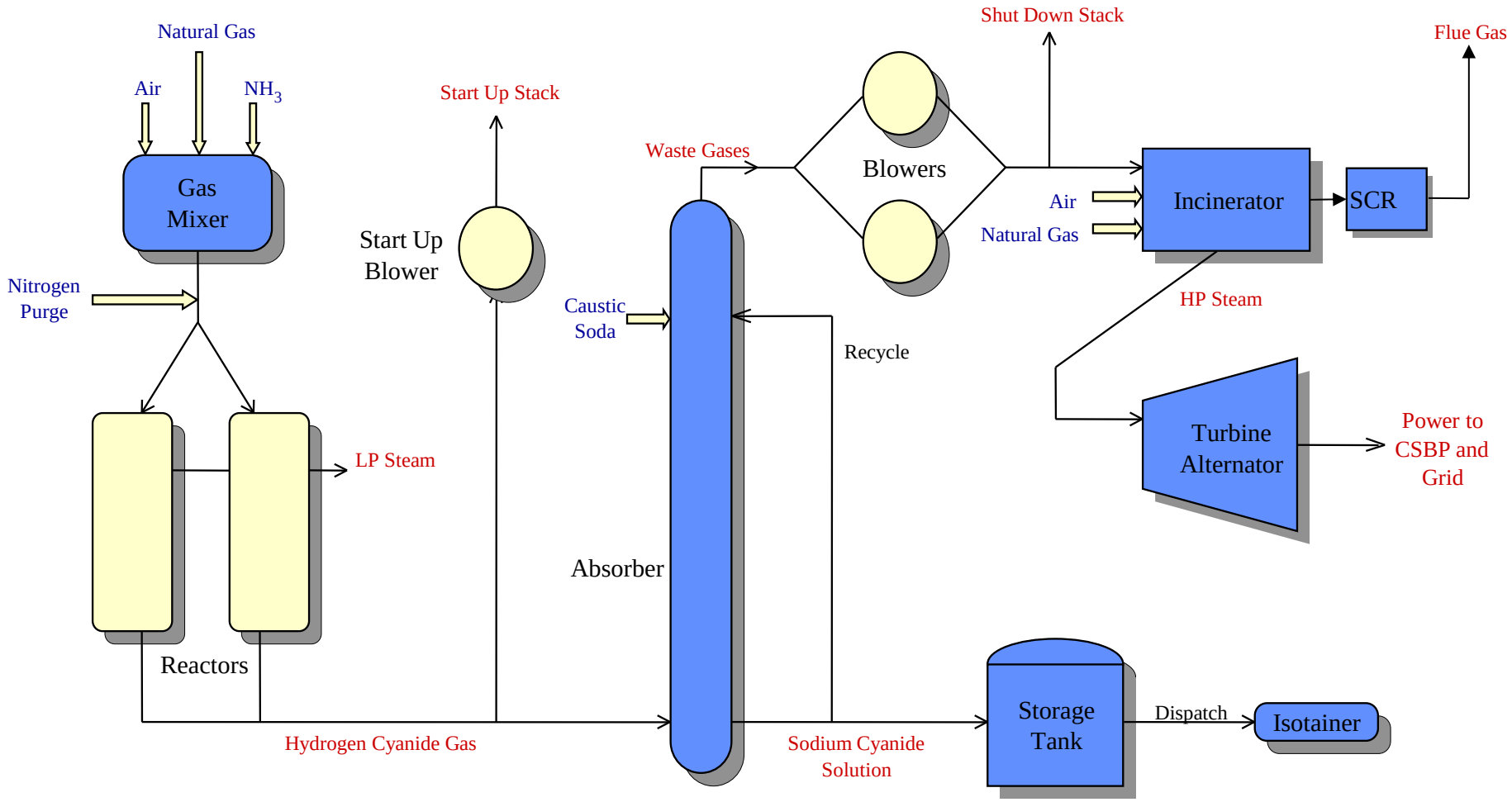
NO	TOPIC	ACTION	OBJECTIVE/S	TIMING
1	Environmental Management	Continue to implement the Environmental Monitoring and Management Program, which details procedures for the management and monitoring of the solid and liquid sodium cyanide manufacturing facility.	To protect the environment.	Implemented and ongoing.
2	Environmental Management	Continue to review the Environmental Monitoring and Management Program as described in Commitment 1.	To protect the environment.	At intervals not exceeding 3 years.
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. Set internal targets which trigger investigations prior to proponent commitments, licence target or limits being reached.	To protect marine flora and fauna and groundwater.	Ongoing.
4	Water Management	Review and implement options to improve wastewater quality, which may include: • Optimising or redesigning the ammonia stripper in the Solids plant to reduce the ammonia-nitrogen load in wastewater discharged to the CSBP containment pond. Options to upgrade the vessel are part of feasibility study. • Upgrading the reverse osmosis plant to reduce the cyanide load on the waste water treatment system by increasing cyanide recovery. • Switching cyanide destruction from peroxide and copper to sodium hypochlorite to eliminate copper and further reduce ammonia. Seek opportunities to utilise recycled or recovered water for: • Cooling Towers	To protect marine flora and fauna and groundwater.	Ongoing.

NO	TOPIC	ACTION	OBJECTIVE/S	TIMING
		• Process		
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. Recycle solid sodium cyanide that cannot be despatched to customers and appropriately dispose of the associated packaging.	To ensure that waste is managed effectively and appropriately to minimise potential contamination to the receiving environment	Implemented and ongoing.
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.
7	Atmospheric Emissions	Set internal targets which trigger investigations prior to proponent commitments, licence target or limits being reached. N2O analyser has been installed. Improved ammonia conversion from an average of 62% to 65%. Natural gas reduction on John Zink (220 m3/hr to 70 m3/hr) and Maxitherm (170 m3/hr to 120 m3/hr). Gauze changes reduced from 4 per annum to 2-3 on average.	To reduce carbon emissions and energy usage.	Implemented and ongoing.
8	Noise Management	Continue to implement the Noise Management Plan for the site. Boundary noise monitoring in February 2016 confirmed compliance with the Environmental Protection (Noise) Regulations 1997 (as amended) when plants were operating at full capacity following the debottlenecking project undertaken in 2014.	To achieve compliance with the Environmental Protection (Noise) Regulations 1997 (as amended)	Implemented and ongoing.
9	Facility Emergency Response	Continue to 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.
10	Transport Management	Continue to have in place a Transport Management Plan, which details procedures for the management of the	To protect the environment in the event of an incident.	Implemented and ongoing.

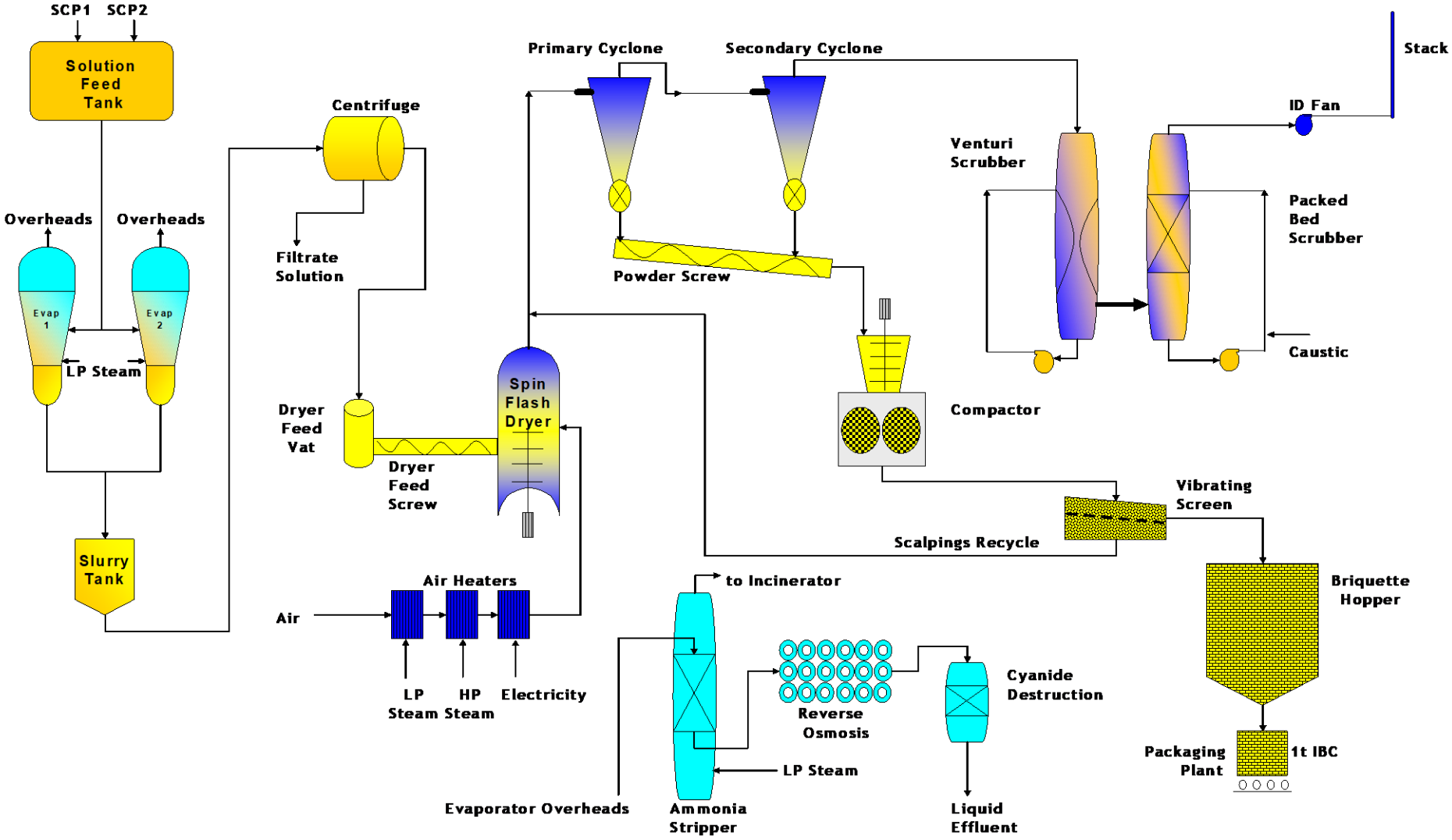
NO	TOPIC	ACTION	OBJECTIVE/S	TIMING
	Plan	transport of solid and liquid sodium cyanide.		
11	Transport Management Plan	Continue to review Transport Management Plan described in commitment 10 above.	To ensure that the most effective transport mode is used and public safety is protected. To protect the environment in the event of an incident.	Biennially (every two years).
12	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.	At intervals not exceeding three years. Next review due 2020.
13	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 • 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. Next audit due 2019.

APPENDIX 1: LIQUID SODIUM CYANIDE PROCESS FLOW DIAGRAM

$$CH_4 + 1.5O_2 + NH_3 = HCN + 3H_2O + Heat$$



APPENDIX 2: SOLID SODIUM CYANIDE PROCESS FLOW DIAGRAM


SCP1
SCP2
Solution Feed Tank
Overheads
Overheads
Evap 1
Evap 2
LP Steam
Slurry Tank
Centrifuge
Filtrate Solution
Primary Cyclone
Secondary Cyclone
Powder Screw
Stack
ID Fan
Venturi Scrubber
Packed Bed Scrubber
Caustic
Compactor
Dryer Feed Vat
Dryer Feed Screw
Spin Flash Dryer
Vibrating Screen
Scalpings Recycle
Air Heaters
Air
LP Steam
HP Steam
Electricity
to Incinerator
Evaporator Overheads
Ammonia Stripper
LP Steam
Reverse Osmosis
Cyanide Destruction
Liquid Effluent
Briquette Hopper
Packaging Plant
1t IBC

APPENDIX 3: AGR ENVIRONMENTAL PROTECTION ACT LICENCE: L6110/1990/13