

February 2010

INTERNATIONAL CYANIDE MANAGEMENT CODE PRODUCTION CERTIFICATION AUDIT

Anhui Anqing Shuguang Chemical Co Ltd Production Facility Summary Audit Report

Submitted to:

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REPORT

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Audit Report

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SUMMARY AUDIT REPORT FOR SODIUM CYANIDE PRODUCTION FACILITY

Name of Facility: Shuguang Cyanide Production Facility

Name of Facility Owner: Anhui Anging Shuguang Chemical Co. Ltd

Name of Company Board Representative: Yu Yongfa, Chairman

Name of Facility Operator: Anhui Anging Shuguang Chemical Co. Ltd

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LOCATION DETAIL AND DESCRIPTION OF OPERATION:

Shuguang (founded in April 1994) is a large enterprise manufacturing high-purity solid sodium cyanide for gold mining use in the People's Republic of China. Shuguang has a production capacity of 50,000 tonnes per annum, and services both domestic Chinese and export markets in South America and Asia. Shuguang's "Qingyi" branded industrial sodium cyanide accounts for approximately 30% of the cyanide product sold in the domestic market, and almost 90% of China's exports of sodium cyanide. According to Shuguang, this is largely attributed to the high quality of their product.

Shuguang makes consistent statements of its commitment to stable and safe production of cyanide, and to date no safety or environmental incidents of significance have been reported. The company has been awarded credits as "National Advanced Chemical Enterprise of Protecting Environment" and "National Example Enterprise of Occupational Health".

The Production Facility is located adjacent to the acrylonitrile unit of the Anqing Branch of China Petroleum and Chemical Corporation (AQPCC).

AQPCC manufactures hydrocyanic acid as a by-product of its process for the manufacture of acrylonitrile. Hydrocyanic acid is delivered to Shuguang by pipeline from AQPCC's storage directly into Shuguang's process for the manufacture of solid sodium cyanide. Shuguang also upgrades sodium cyanide manufactured elsewhere by Anqing New Shuguang Fine Chemical Co Ltd for miscellaneous industrial purposes to meet the requirements of the gold mining market.

Shuguang also has the capability to manufacture potassium cyanide by substituting potassium hydroxide for sodium hydroxide as a raw material in the production process. At the time of the certification audit this capability was not in use.





SUMMARY AUDIT REPORT AUDITORS FINDINGS

AUDITORSTINDIN	100	
The Shuguang Cyanide Pro	oduction Facility is:	
	in substantial compliance with	The International Cyanide Management Code
	not in compliance with	3000
Audit Company:	Golder Associates	
Audit Team Leader:	Mark Latham,	
	IEMA(19411), CPEng, M	IEAust(322667), FIChemE (176745)
Email:	mlatham@golder.com.au	<u>I</u>

Names and Signatures of Auditors:

Name	Position	Signature	Date
Mark Latham	Lead Auditor and Production Technical Specialist	Marketan	5 February 2010

Dates of Audit:

The Certification Audit was undertaken over four days (10 man-days) between 9 and 12 November 2009.

I attest that I meet the criteria for knowledge, experience and conflict of interest for Code Verification Audit Team Leader, established by the International Cyanide Management Institute and that all members of the audit team meet the applicable criteria established by the International Cyanide Management Institute for Code Verification Auditors. Translation services during the audit were provided by bilingual Chinese and English-speaking staff of Golder Associates Consulting Limited; Ms Suzy Huang (Environmental Scientist) and Mr Roderick Yun (Environmental Health & Safety Consultant).

I attest that this Summary Audit Report accurately describes the findings of the verification audit. I further attest that the verification audit was conducted in a professional manner in accordance with the International Cyanide Management Code's *Production Verification Protocol* and using standard and accepted practices for health, safety and environmental audits.

Shuguang Cyanide Production Facility	Maria	5 February 2010	
Name of Facility	Signature of Lead Auditor	Date	





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PRINCIPLE 1 – OPERATIONS:

Design, construct and operate cyanide production facilities to prevent release of cyanide

Production Practice 1.1:	Design and construct cyanide proc sound, accepted engineering pract assurance procedures.	
	oxtimes in full compliance with	
The operation is	in substantial compliance with	Production Practice 1.1
	not in compliance with	

Summarise the basis for this Finding/Deficiencies Identified:

The operation is in FULL COMPLIANCE with Standard of Practice 1.1 requiring an operation design and construct cyanide production facilities consistent with sound, accepted engineering practices and quality control/quality assurance procedures.

Quality assurance and quality control practices were applied to the initial plant construction in 1995 and to the major expansion completed in 2007. The construction works undertaken have adopted established standards for materials of construction using materials such as HDPE-lined mild carbon steel and stainless steels (grades 304 and 316) recognised for their compatibility with cyanide. Shuguang has also made appropriate investigations to support its use of such materials as epoxy and neoprene rubber. Whilst the plant is operated by a significant workforce, it is also extensively instrumented with indicators, alarms and interlocks connected to a centrally-located distributed control system to help manage processing risks including releases and exposures. The chemical reactors are instrumented for early identification of conditions that could lead to cyanide releases, and there is an emergency shutdown system to stop the reaction if a hydrogen cyanide release is detected. Electric power supply is duplicated so that a backup supply can be activated if the primary power feeder fails. Level indicators and alarms are installed on tanks to manage the risk of overfilling. Cyanide is managed on concrete surface to ensure that cyanide spills or cyanide-contaminated water generated when responding to a hydrogen cyanide release cannot seep into the soil. Cyanide secondary containments are sized to contain at least 110% of the volume of the largest tank within the bund and concrete structures are epoxy-lined to ensure impermeability is maintained. The risks of releases from cyanide process pipelines are managed by a combination of measures including fixed HCN detectors, valve guards and preventive maintenance.

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Production Practice 1.2:	Develop and implement plans and procedures to operate cyanic production facilities in a manner that prevents accidental releas	
	oxtimes in full compliance with	
The operation is	in substantial compliance with	Production Practice 1.2
	not in compliance with	

Summarise the basis for this Finding/Deficiencies Identified:

The operation is in FULL COMPLIANCE with Standard of Practice 1.2 requiring that develop and implement plans and procedures to operate cyanide production facilities in a manner that prevents accidental releases.

The Production Facility has an extensive system of procedures, instructions and checklists (including signage reinforcing operating requirements) which support the management of the integrity of processing equipment and its operation in a manner aimed at avoiding cyanide releases and exposures. The procedures deal comprehensively with both normal and abnormal operating conditions. The Production Facility applies effective procedures to control the modification of the plant and operating instructions; and the evaluation of proposed modifications takes account of potential impacts on the environment; health and safety and has been applied to the 186 modifications undertaken since production began in 1996. An annual plan of preventive maintenance activities is prepared for each year, and includes the intervals to be adopted for inspections, protective activities and calibrations of instruments monitoring such parameters as hydrogen cyanide concentrations, pressures, flows and levels. The process plant is extensively instrumented to support the activities of its large workforce. Some instruments display locally whilst others are monitored and interpreted in the central control room. Under normal operating conditions there is no discharge of cyanidecontaminated water to the environment, with on-line monitoring of cyanide concentrations in effluent and stormwater discharges being used to initiate corrective actions when criteria are exceeded. Procedures are in place to ensure the avoidance of cyanide-contaminated waste and to treat cyanide-contaminated waste where this is generated (e.g. used packaging, used personal protective equipment); the Production Facility employs a licensed facility and accredited technology to decontaminate its solid wastes. The cyanide warehouse is designed to provide good ventilation (using both mechanical and natural ventilation) whilst also protecting the packaged product from moisture through the use of wooden pallets and to ensure drums are kept elevated. Humidity within the warehouse is monitored using a hygrometer. The site is subject to high integrity security arrangements by means of effective fencing and numerous security cameras. Procedures are in place to ensure cyanide is packaged as required by the political jurisdictions through which the load will pass. Packages may be labelled in Chinese, English and Russian as appropriate.

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Production Practice 1.3:	Inspect cyanide production facilities to ensure their integrity and prevent accidental releases.	
	$oxed{\boxtimes}$ in full compliance with	
The operation is	in substantial compliance with	Production Practice 1.3
	not in compliance with	
Summarise the basis for this	Finding/Deficiencies Identified:	

The Production Facility is in FULL COMPLIANCE with Standard of Practice 1.3 requiring it to inspect cyanide production facilities to ensure their integrity and prevent accidental releases.

Inspections of the integrity of tanks, pumps, pipes, valves and bunds are undertaken as part of the operation's preventive maintenance program. The frequencies of preventive maintenance activities are reviewed annually. Inspections for leaks and housekeeping are undertaken as part of operational monitoring of the plant, which includes two-hourly inspections in each department by multidiscipline teams of at least five people. Operational monitoring is also undertaken using the extensive instrumentation. The plant displayed a high standard of housekeeping during the audit. Records are maintained of the various inspections, with inspections recorded on hardcopy checklists, and corrective actions (repairs) are recorded in the Maintenance Records. These documents are retained in hardcopies and managed by the relevant departments.

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PRINCIPLE 2 – WORKER SAFETY:

Protect workers' health and safety from	rom exposure to cyanide
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	and safety from exposure to cya	
Production Practice 2.1:	Develop and implement procedures to exposure to cyanide.	protect plant personnel from
	igtimes in full compliance with	
The operation is	in substantial compliance with	Production Practice 2.1
	not in compliance with	
Summarise the basis for this	Finding/Deficiencies Identified:	
•	ILL COMPLIANCE with Standard of Practi ures to protect plant personnel from expos	
through finished product packar Production Facility implements potential impacts on worker heat through application of this proceduction Facility solicits work both team meetings and a suggenot just the health and safety as used to confirm that worker expression of the concemaintained, tested and calibrate instrument department. Areas dust have been identified and ulocations. An occupational hyginexposure are within a broadly dequipment (PPE) requirements for the use of defined PPE are are reminded of the requirement. Jobs are designed so that tasks Radios are in place to ensure the Shuguang's staff doctors assess tasks prior to commencing empace of the staff and the staff doctors assess tasks prior to commencing empace of the staff doctors.	worker safety during normal plant operations ging and shipping, maintenance, non-rout a procedure to review proposed process alth and safety, and has incorporated necessalth and serious system; Employees have the opposite of procedures. Both fixed and personaure to hydrogen cyanide is below the activitien of dust in the working areas. The ed according to the manufacturers' specificand activities where workers may be expensed to establish personal protective equipment erview is conducted annually. The analysis of the area applied to entry by persons to the area set out in the standard operating procedurates by the signage erected extensively are set out in the standard operating procedurates by the signage erected extensively are set on the health of employees to determine the ployment and during their employment (three changes policy is applied for employmen	ine and emergency situations. The and operational changes for their essary worker protection measures since start-up in 1996. The Ith and safety procedures through ortunity to comment on any issue, onal hydrogen cyanide monitors are idopted limits. Daily sampling is monitoring equipment is ideations and records are kept by the osed to HCN gas or solid cyanide oment requirements and monitoring reas involving risks of cyanide and line. Defined personal protective as within the red line. Requirements res, training materials and workers and the plant. Idertaken by at least four workers for assistance if there is an incident ough an Annual Health
enter areas identified as posing cyanide contamination. The Pro	change policy is applied for employees, or cyanide exposure risk and there is strict oduction Facility prohibits personnel from sometical for cyanide exposure and clear was a second control of the cont	control of clothing with possible smoking, eating, drinking, and using
Shuguang Cyanide Production Facility	Marke	<u>5 February 2010</u>

Signature of Lead Auditor

Date



Name of Facility





Production Practice 2.2:	Develop and implement plans and procedures for rapid and effective response to cyanide exposure.	
	oxtimes in full compliance with	
The operation is	in substantial compliance with	Production Practice 2.2
	not in compliance with	
Summarise the basis for thi	is Finding/Deficiencies Identified:	

The Production Facility is in FULL COMPLIANCE with Standard of Practice 2.2 requiring an operation develop and implement plans and procedures for rapid and effective response to cyanide exposure.

The Production Facility has developed specific written emergency response plans (including an Emergency Response Knowledge Card issued to all workers) that include rapid and effective response to cyanide exposure. Showers, eye wash stations and dry chemical fire extinguishers are located strategically throughout the Production Facility where they are maintained and inspected on a regular basis. An oxygen cylinder and oxygen inhalators, cyanide antidote kits and fixed wireless radios are available for use in emergency situations and procedures are in place to regularly test and maintain the first aid and emergency response equipment. Material Safety Data Sheets and first aid procedures related to cyanide are available in Chinese at the First Aid Station and the EHS Department from where they are readily available to workers. The First Aid Station is staffed 24 h per day by at least one doctor and one nurse. In addition, the Production Facility has an agreement with Anqing Yicheng Hospital to support its health professionals in cases of acute poisoning and has investigated its capability to provide that support. Equipment and piping containing cyanide is clearly identified to alert workers of their contents and to show direction of flow where applicable. Mock emergency drills are conducted at least four times per year to test response procedures and at least one will include dealing with a cyanide exposure scenario to promote learning from the drills. Shuguang has an Incident Management Procedure to investigate and evaluate incidents including cyanide exposure, and to undertake corrective actions.

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PRINCIPLE 3 – MONITORING:

Conduct environmental monitoring to confirm that planned or unplanned releases of cyanide do not result in adverse impacts

Production Practice 3.1:	Conduct environmental monitoring to confirm that planned or unplanned releases of cyanide do not result in adverse impacts.	
	$oxed{\boxtimes}$ in full compliance with	
The operation is	in substantial compliance with	Production Practice 3.1
	not in compliance with	

Summarise the basis for this Finding/Deficiencies Identified:

The Production Facility is in FULL COMPLIANCE with Standard of Practice 3.1 requiring an operation conduct environmental monitoring to confirm that planned or unplanned releases of cyanide do not result in adverse impacts.

There is no direct discharge to surface water under normal operating conditions, nor is there any indirect discharge of contaminated groundwater to surface water. No groundwater contamination has been identified at the site to date. Water discharges ultimately destined for disposal to the Yangtze River are monitored at the boundary of the Production Facility. This allows responsibility for any issues to be clearly differentiated from those that could originate from the adjoining site that also handles hydrogen cyanide.

Atmospheric emissions are limited by controls including a cyclone dust removal, water and alkaline scrubbers, and local exhaust ventilation. Ten on-line HCN meters are also installed for monitoring purposes.

Groundwater monitoring is conducted twice monthly on two bores located upstream and downstream of the manufacturing area within the site and on-line monitors provide continual monitoring of emissions to air and water to ensure there is no delay in detecting abnormal conditions.

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PRINCIPLE 4 – TRAINING:

Train workers and emergency response personnel to manage cyanide in a safe and environmentally protective manner

Production Practice 4.1:	Train employees to operate the plant in a manner that minimises the potential for cyanide exposures and releases.	
	$oxed{\boxtimes}$ in full compliance with	
The operation is	in substantial compliance with	Production Practice 4.1
	not in compliance with	
Summarise the basis for this Finding/Deficiencies Identified:		

The Production Facility is in FULL COMPLIANCE with Standard of Practice 4.1 requiring an operation train employees to operate the plant in a manner that minimises the potential for cyanide exposures and releases.

The training program delivers information to ensure that individuals understand the hazards and basic principles of working safely with cyanide through a range of training programs delivered at company, department, shift and individual job skills levels. Refresher training in cyanide awareness is provided in modules distributed over an annual cycle. Foundation training in personal protective equipment is provided mainly through department and shift level training although trainees learn about the specific requirements of when, how and where as part of their job skill training. The techniques for dealing with health and safety risks associated with normal, abnormal and emergency operating conditions are addressed through job skill training, and with supporting information provided through departmental and shift training. Training covers the risks of cyanide release and exposure as well as important characteristics of the process equipment used. The training elements for each of fourteen jobs are identified and documented in a training matrix. Training is delivered to trainees by trainers assigned to them. Trainers are technically qualified and selected for their demonstrated interests and skills in communication. Competency is assessed by written examinations and observations to confirm demonstrations of practical skill on the job. Defined milestones must be achieved before trainees can work as fully qualified workers (a minimum of two buddies per working party) in cyanide areas.

The Production Facility assesses the training effectiveness by conducting examinations on employees on various training modules and by undertaking an annual assessment of skills within each department.

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Production Practice 4.2:	Train employees to respond to cyanide exposures and releases.	
	oxtimes in full compliance with	
The operation is	in substantial compliance with	Production Practice 4.2
	not in compliance with	
Summarise the basis for thi	s Finding/Deficiencies Identified:	
	ULL COMPLIANCE with Practice 4.2 requises and releases requiring an operation train of	
exposures and releases. Emergency response training is covered in company, department and shift training modules and specifically includes the procedures for employees to notify the supervisor immediately when a cyanide release is discovered. The training also covers specific responses to different types of personal exposure including clothing contamination, eye splashes and the other pathways. Emergency drills have been conducted on four occasions in 2009 for each shift crew with one scenario in July devoted to poisoning. These drills were evaluated by observers who were not participating directly in the drill. Improvements to the training program were identified and implemented. Training records are maintained in department/shift training files and (in summary) on the individual training register kept in the HR Department.		

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PRINCIPLE 5 - EMERGENCY RESPONSE:

Protect communities and the environment through the development of emergency response strategies and capabilities

Production Practice 5.1:	Prepare detailed emergency response plans for potential cyanide releases.	
	$oxed{\boxtimes}$ in full compliance with	
The operation is	in substantial compliance with	Production Practice 5.1
	not in compliance with	

Summarise the basis for this Finding/Deficiencies Identified:

The Production Facility is in FULL COMPLIANCE with Standard of Practice 5.1 requiring the operation prepare detailed emergency response plans for potential cyanide releases.

The site has developed written documents that constitute an Emergency Response Plan to address potential releases of cyanide that may occur on-site or may otherwise require response. The Plan contains procedural information specifying actions to be conducted, decisions to be made and details of persons responsible to make decisions and undertake the actions.

A detailed Emergency Response Scenarios document has been developed as a component of the Emergency Response Plan, which identifies seventeen types of emergencies and of which nine are related to cyanide release.

The Emergency Response Plan documents describe specific response actions considered appropriate for the identified potential emergency situations (such as decisions to evacuate employees and communities) and use of cyanide antidotes. Generic responses for isolating releases at source are covered in the Plan whilst the Scenarios cover detailed responses to contain released material and limit the spread of material that cannot be contained. Procedures require that emergencies are investigated as incidents to determine the underlying causes and corrective actions required to prevent recurrence.

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Production Practice 5.2:	Involve site personnel and stakeholde	ers in the planning process.
	oxtimes in full compliance with	
The operation is	in substantial compliance with	Production Practice 5.2
	not in compliance with	
Summarise the basis for this	Finding/Deficiencies Identified:	
	JLL COMPLIANCE with Standard of Practice cholders in the planning process.	ice 5.2 requiring an operation
Shuguang has involved its workforce and external stakeholders in the emergency response planning process. External stakeholders involved have included Wuli Village, the neighbouring facility of the Anqing Branch of China Petroleum and Chemical Corporation (AQPCC), the AQPCC Fire Brigade, Anqing Work Safety Bureau, Anqing Environment Protection Bureau, and Anqing Yicheng Hospital. Each has been provided with a copy of the Emergency Response Plan and have formally acknowledged their awareness of the plan.		
	agreement with the neighbouring commuractions to be taken if evacuation is required	
An agreement has been established with the Anqing Yicheng Hospital to provide support to Shuguang's on- site health professionals in the event of acute poisoning.		
Anqing Work Safety Bureau and Anqing Environment Protection Bureau attended the most recent emergency drill conducted in November 2009.		

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Production Practice 5.3:	Designate appropriate personnel and commit necessary equipment and resources for emergency response.	
	oxtimes in full compliance with	
The operation is	in substantial compliance with	Production Practice 5.3
	not in compliance with	
Cummariae the basis for thi	a Finding/Deficionaica Identified	

Summarise the basis for this Finding/Deficiencies Identified:

The Production Facility is in FULL COMPLIANCE with Standard of Practice 5.3 requiring the operation designate appropriate personnel and commit necessary equipment and resources for emergency response.

The Emergency Plan designates the General Manager as primary and the Vice General Manager as alternate emergency response commander in chief with explicit authority to commit the resources necessary to implement the Emergency Response Plan.

The Emergency Plan identifies the Emergency Response Teams and the training required to put the Emergency Response Plan into effect.

The Emergency Plan includes call-out procedures and contact information for the command team members and clearly specifies the duties for all Emergency Response Team members (consistent with the roles assigned to them on a departmental basis).

A list of emergency response equipment is included with the Emergency Plan. A procedure is in place to inspect emergency response equipment and assure its availability as required in the Emergency Plan. The outside responders who may be directly involved in responding to an emergency (AQPCC Fire Brigade and Anqing Yicheng Hospital) have acknowledged their awareness of the Emergency Response Plan. AQPCC Fire Brigade is involved in drills on a case-by-case basis. They were most recently involved in a drill in June 2009. The Production Facility considers that Anqing Yicheng Hospital does not need to be involved in drills. Anqing Work Safety Bureau and Anqing Environment Protection Bureau may attend emergencies to carry out their regulatory role. Their representatives have acknowledged awareness of the Emergency Response Plan and attended a drill conducted in November 2009.

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Production Practice 5.4:	Develop procedures for internal and external emergency notification and reporting.	
	☑ in full compliance with	
The operation is	in substantial compliance with	Production Practice 5.4
	not in compliance with	
Summarise the basis for this Finding/Deficiencies Identified:		

The Production Facility is in FULL COMPLIANCE with Standard of Practice 5.4 requiring an operation develop procedures for internal and external emergency notification and reporting.

The Emergency Response Plan contains clear flow charts describing the call out procedures and contact information for management, internal responders, outside responders and medical facilities.

Based on a review of potential releases from the Production Facility and the distances involved, Wuli Village has been identified as the only residential community potentially affected by an emergency. Procedures and contact information for notifying Wuli Village are clearly described in the Plan. The neighbouring chemical manufacturing facility of AQPCC is also identified as potentially affected by an emergency.

The Emergency Response Plan notes that specific government agencies and designated media contacts are to be notified if the impact of an emergency extends outside the Production Facility and that the General Manager (as Emergency Commander) must approve the information to be disclosed.

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Production Practice 5.5:	Incorporate into response plans and remediation measures monitoring elements that account for the additional hazards of using cyanide treatment chemicals.	
	$oxed{\boxtimes}$ in full compliance with	
The operation is	in substantial compliance with	Production Practice 5.5
	not in compliance with	
Summarise the basis for th	is Finding/Deficiencies Identified:	

The Production Facility is in FULL COMPLIANCE with Standard of Practice 5.5 requiring an operation incorporate into response plans and remediation measures monitoring elements that account for the additional hazards of using cyanide treatment chemicals.

The Emergency Response Plan describes specific, appropriate remediation measures including the recovery of released cyanide solutions and solids, and the handling of soils or other contaminated media for treatment in the Production Facility's licensed cyanide decontamination plant. The Production Facility does not dispose of cyanide-contaminated debris. If necessary, the waste water treatment plant would be used to treat contaminated groundwater. An alternate water supply is not required for emergency scenarios identified for the Production Facility.

The Emergency Plan prohibits the use of chemicals such as sodium hypochlorite, ferrous sulfate and hydrogen peroxide to treat cyanide released into surface water. However, the release of cyanide into surface water is not considered a credible scenario.

The plan addresses arrangements for environmental monitoring of air, soil and groundwater to identify the extent and effects of any release, including sampling methodologies, parameters for analysis and reference criteria.

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Production Practice 5.6:	Periodically evaluate response procedures and capabilities and revise them as needed.	
	$oxed{\boxtimes}$ in full compliance with	
The operation is	in substantial compliance with	Production Practice 5.6
	not in compliance with	
Summarise the basis for this	Finding/Deficiencies Identified:	
	LL COMPLIANCE with Standard of Praction procedures and capabilities and revise the	
9 , .	n is required to be evaluated at least annu- e actual implementation of the Emergency	
Four drills were conducted in 2009; February, July, September and November. The drills conducted in 2009 did not identify the need to update the Emergency Response Plan itself, but decisions were made to deliver elements of the emergency response training materials more widely within the organisation.		

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Signature of Lead Auditor

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Report Signature Page

GOLDER ASSOCIATES CONSULTING LIMITED

Mark Latham
ICMI Lead Auditor & Production Technical Specialist

AML/PDM/im

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 $c: \label{localization} c: \$



APPENDIX A

Limitations



LIMITATIONS

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