



October 2016

INTERNATIONAL CYANIDE MANAGEMENT CODE RECERTIFICATION AUDIT

Gold Fields Australia Pty Ltd – St Ives Gold Mine Recertification Audit – Summary Audit Report

Submitted to:

International Cyanide
Management Institute (ICMI)
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UNITED STATES OF AMERICA

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REPORT

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Table of Contents

SUMMARY AUDIT REPORT	1
For Operational Gold Mines	1
Location Detail and Description of Operation	1
Auditors Findings	3
Name and Signatures of Other Auditors.....	3
Dates of Audit.....	3
PRINCIPLE 1 – PRODUCTION	4
Standard of Practice 1.1.....	4
PRINCIPLE 2 – TRANSPORTATION	5
Standard of Practice 2.1.....	5
Standard of Practice 2.2.....	5
PRINCIPLE 3 – HANDLING AND STORAGE	6
Standard of Practice 3.1.....	6
Standard of Practice 3.2.....	7
PRINCIPLE 4 – OPERATIONS	8
Standard of Practice 4.1.....	8
Standard of Practice 4.2.....	13
Standard of Practice 4.3.....	14
Standard of Practice 4.4.....	17
Standard of Practice 4.5.....	18
Standard of Practice 4.6.....	18
Standard of Practice 4.7.....	19
Standard of Practice 4.8.....	22
Standard of Practice 4.9.....	23
PRINCIPLE 5 – DECOMMISSIONING	25
Standard of Practice 5.1.....	25
Standard of Practice 5.2.....	26
PRINCIPLE 6 – WORKER SAFETY	27
Standard of Practice 6.1.....	27
Standard of Practice 6.2.....	28



ST IVES GOLD MINE – ICMC RECERTIFICATION AUDIT SUMMARY AUDIT REPORT

Standard of Practice 6.3.....	30
PRINCIPLE 7 – EMERGENCY RESPONSE	32
Standard of Practice 7.1.....	32
Standard of Practice 7.2.....	34
Standard of Practice 7.3.....	35
Standard of Practice 7.4.....	36
Standard of Practice 7.5.....	36
Standard of Practice 7.6.....	37
PRINCIPLE 8 – TRAINING	39
Standard of Practice 8.1.....	39
Standard of Practice 8.2.....	40
Standard of Practice 8.3.....	41
PRINCIPLE 9 – DIALOGUE	43
Standard of Practice 9.1.....	43
Standard of Practice 9.2.....	44
Standard of Practice 9.3.....	44
IMPORTANT INFORMATION.....	46
APPENDICES	
APPENDIX A	
Important Information	



SUMMARY AUDIT REPORT For Operational Gold Mines

Name of Mine: St Ives Gold Mine
Name of Mine Owner: Gold Fields Australia Pty Ltd
Name of Mine Operator: Gold Fields Australia Pty Ltd
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Location Detail and Description of Operation

Gold Fields Australia Pty Ltd

Gold Fields operates four mines in Australia – Agnew/Lawlers, St Ives Gold Mine (SIGM), Darlot and Granny Smith, all located in the Eastern Goldfields Region of Western Australia. Gold Fields have been operating in Australia for over a decade since acquiring the St Ives and Agnew gold mines in 2001. In October 2013 Gold Fields expanded its presence in Australia through the acquisition of the Granny Smith, Lawlers and Darlot gold mines from Barrick (Australia Pacific) Limited (Barrick).

St Ives Gold Mine


Located near Lake Lefroy in the gold-producing Eastern Goldfields region of Western Australia, SIGM is around 80 km south of Kalgoorlie and 630 km east of Perth. Acquired from WMC Resources in 2001, this mine produces over 450 000 ounces per annum.

The mine is located on the Norseman-Wiluna Greenstone Belt, which forms part of the Yilgarn Craton in Western Australia. It is a mineralised granite-greenstone terrain with deposits of gold and nickel.

SIGM has produced in excess of 10.5 million ounces of gold, with the first gold mining commencing in the mid-1980s. Featuring both underground and surface mining, SAG Mill and CIP technology, the site supports over 1000 staff and contractors. The site comprises a Heap Leach facility and associated processing plant and a conventional CIP processing plant (Lefroy Mill).

SIGM operates mainly on a residential basis, with employees either living in Kambalda or in Kalgoorlie.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date




ST IVES GOLD MINE – ICMC RECERTIFICATION AUDIT SUMMARY AUDIT REPORT

Existing facilities at SIGM include:

- 4.8 million tonnes per annum (Mtpa) Lefroy Processing Facility. The Lefroy Mill consists of:
 - 1 x Primary Gyratory Crusher and associated conveyors.
 - Coarse Ore Stockpile and associated feeders and conveyors.
 - 1 x Gyratory Secondary Crusher and associated conveyors.
 - 1 x 36 ft SAG Mill and associated hoppers and pumps and cyclones.
 - 2 x Primary Falcons and associated pipework, screens and chutes.
 - 2 x Inline Pressure Jigs and associated pipework.
 - 1 x Intensive Leach Reactor and associated vessels, pumps and services + 2 x Electrowinning Cells.
 - 1 x Vertical helical screw fine grinding mill and associated hoppers and pumps and cyclones.
 - 5 x 3400 m³ Leach tanks with associated services, instruments and 30% sodium cyanide solution addition.
 - 6 x 200 m³ carbon adsorption tanks with associated services.
 - 1 x Tailings Thickener.
 - 1 x AARL Elution Circuit + 4 x Electrowinning Cells.
 - Reagent, air and water services including 3 x lined water ponds, PSA Oxygen generation, Liquid Oxygen Storage, Hydrochloric Acid Storage, Caustic Storage, Floc Storage and mixing, and 2 x 165 m³ 30% sodium cyanide solution tanks.
- 2.5 Mtpa capacity Heap Leach operation (crushing and stacking closed at end of 2012).
- Heap leach irrigation and Wet Plant (closed May 2016).
- Underground mines.
- Open pit operations and associated Waste Rock Dumps (WRDs) Mines several above ground paddock style Tailing Storage Facilities (TSF) and in pit TSFs.
- TSF1 mined as paste material for underground backfill.
- 2 underground paste fill preparation plants, although only 1 operational.
- A number of Low Grade Stockpiles.

Within the mining area, SIGM also has a number of other facilities under its control including the decommissioned original mill area, TSF1 and TSF 2, old workings, as well as control over surface leases covering the Beta Hunt site.

St Ives Gold Mine
Name of Facility


Signature of Lead Auditor

18 October 2016
Date



ST IVES GOLD MINE – ICMC RECERTIFICATION AUDIT SUMMARY AUDIT REPORT

Auditors Findings

The Gold Fields SIGM is:

in full compliance with

in substantial compliance with

not in compliance with

**The International
Cyanide Management
Code**

A number of cyanide incidents (not releases) were noted as occurring during the audit period. Details are provided within this report.

Audit Company: Golder Associates

Audit Team Leader: Ed Clerk, Exemplar Global (105995)

Email: eclerk@golder.com.au

Name and Signatures of Other Auditors

Name	Position	Signature	Date
Ed Clerk	Lead Auditor and Technical Specialist		18 October 2016
Mike Woods	Auditor		18 October 2016

Dates of Audit

The Recertification Audit evidence was examined over three (3) days between 22 and 24 March 2016.

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.

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 *Gold Mining Operations Verification Protocol* and using standard and accepted practices for health, safety and environmental audits.

St Ives Gold Mine
Name of Facility

Signature of Lead Auditor

18 October 2016
Date



PRINCIPLE 1 – PRODUCTION

Encourage Responsible Cyanide Manufacturing by Purchasing from Manufacturers that Operate in a Safe and Environmentally Protective Manner

Standard of Practice 1.1: Purchase cyanide from manufacturers employing appropriate practices and procedures to limit exposure of their workforce to cyanide, and to prevent releases of cyanide to the environment.

in full compliance with

The operation is

in substantial compliance with

Standard of Practice 1.1

not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:


SIGM is in FULL COMPLIANCE with Standard of Practice 1.1, requiring the operation purchase cyanide from manufacturers employing appropriate practices and procedures to limit exposure of their workforce to cyanide and to prevent releases of cyanide to the environment.

Australian Gold Reagents (AGR) has been contracted by SIGM to supply cyanide to supply and deliver cyanide to SIGM under a Sodium Cyanide Solution Supply Agreement (Supply Agreement).

The text of the Supply Agreement does not require that the cyanide be produced at a facility that has been certified as being in compliance with the Code. Despite this, AGR is an ICMC certified cyanide producer. AGR was conditionally recertified with the ICMC subject to the implementation of a Corrective Action Plan on 13 March 2013. All items in the Corrective Action Plan were closed out on 19 June 2014 as reported on the ICMI website.

SIGM does not purchase cyanide from an independent distributor.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



PRINCIPLE 2 – TRANSPORTATION

Protect Communities and the Environment during Cyanide Transport

Standard of Practice 2.1: Establish clear lines of responsibility for safety, security, release prevention, training and emergency response in written agreements with producers, distributors and transporters.

in full compliance with

The operation is

in substantial compliance with

Standard of Practice 2.1

not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

SIGM is in FULL COMPLIANCE with Standard of Practice 2.1, requiring that clear lines of responsibility are established for safety, security, release prevention, training and emergency response in written agreements with producers, distributors and transporters.

AGR has been contracted by SIGM to manufacture and deliver cyanide to SIGM under a (Supply Agreement). The text of the Supply Agreement does not designate specific responsibilities required under this Standard of Practice. Nor does the contract specify that the designated responsibilities extend to any subcontractors used by the producer, distributor, transporter or the operation for transportation-related activities.

AGR is a certified consignor under the Code and its West Australian Supply Chain, which includes deliveries to the SIGM operation, was re-certified against the Code on 13 June 2013.

Standard of Practice 2.2: Require that cyanide transporters implement appropriate emergency response plans and capabilities and employ adequate measures for cyanide management.

in full compliance with

The operation is

in substantial compliance with

Standard of Practice 2.2

not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:


SIGM is in FULL COMPLIANCE with Standard of Practice 2.2, requiring that cyanide transporters implement appropriate emergency response plans and capabilities and employ adequate measures for cyanide management.

SIGM purchases its cyanide from AGR under a Supply Agreement.

The Supply Agreement does not specifically require that AGR be certified under the Code. Despite this, AGR is a certified consignor under the Code and its West Australian Supply Chain, which includes deliveries to the SIGM operation, was re-certified against the Code on 13 June 2013.

The operation has chain of custody records identifying all elements of the supply chain (producer, transporter(s) and recipient) that handle the cyanide brought to its site. The records conform to the elements of AGR's West Australian Supply Chain.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



PRINCIPLE 3 – HANDLING AND STORAGE

Design and Construct Unloading, Storage and Mixing Facilities Consistent with Sound, Accepted Engineering Practices, Quality Control/Quality Assurance Procedures, Spill Prevention and Spill Containment Measures

Standard of Practice 3.1: Design and construct unloading, storage and mixing facilities consistent with sound, accepted engineering practices, quality control/quality assurance procedures, spill prevention and spill containment measures.

in full compliance with

The operation is

in substantial compliance with

Standard of Practice 3.1

not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

SIGM is in FULL COMPLIANCE with Standard of Practice 3.1, requiring that cyanide handling and storage facilities are designed and constructed consistent with sound, accepted engineering practices, Quality Control/Quality Assurance (QC/QA) procedures, spill prevention and spill containment measures.

The Lefroy and Heap Leach facilities for unloading, storing and mixing cyanide have been designed and constructed in accordance with cyanide producers' guidelines, applicable jurisdictional rules and sound and accepted engineering practices.

The Heap Leach liquid unloading and storage facility was designed by AGR and constructed by Roche Mining. Engineering specification were assessed and referenced during the previous Recertification Audit Report. Engineering specifications and construction records for the Lefroy liquid unloading and storage facility were assessed and referenced during the previous Recertification Audit Report.

AGR undertakes annual inspections of both facilities. Recommendations from the inspections are entered into INX InControl for follow up and tracking.

Unloading and storage areas for liquid cyanide are located away from people and surface waters. The location of the facilities at the Heap Leach and Lefroy plants were risk assessed which concluded that the risks to people and surface waters could be successfully managed through the hierarchy of controls using existing site processes.


The liquid cyanide is unloaded at both facilities on concrete pads that drain to the respective cyanide storage tank bund and sumps capable of containing and recovering spillages.

Both unloading and storage facilities have methods to prevent the overfilling of cyanide storage tanks. At the Heap Leach and Lefroy unloading and storage facilities, tanks are equipped with both manual gauges and ultrasonic level measurement devices. Level indicators are cross checked for accuracy. Manual levels are checked as part of the unloading procedure and level instrumentation is sent electronically to the control room and via telemetry to the supplier to enable appropriate scheduling of deliveries.

High level and high-high level alarms are set and alarms are activated on the PLC (programmable logic controller) in the Mill Control Room.

Storage tanks at both facilities are located on concrete surfaces that can prevent seepage to the subsurface. The Lefroy storage tanks and the Heap Leach storage tank are located on a concrete plinths with slots designed to transfer leaks to the plinth perimeter.

St Ives Gold Mine
Name of Facility


Signature of Lead Auditor

18 October 2016
Date



**ST IVES GOLD MINE – ICMC RECERTIFICATION AUDIT
SUMMARY AUDIT REPORT**

Secondary containments for cyanide storage and mixing tanks are constructed of materials that provide a competent barrier to leakage. The Lefroy storage tank containment area is constructed on concrete and the Heap Leach storage tank containment area is constructed of steel and concrete.

The cyanide is stored in closed tanks with adequate ventilation. The facilities are located within restricted areas of the operation where personnel movements are restricted to trained individuals as per the Cyanide Storage Compound Access procedure. No incompatible materials are stored within the cyanide storage area. Solid cyanide is not stored on site.

Standard of Practice 3.2: Operate unloading, storage and mixing facilities using inspections, preventive maintenance and contingency plans to prevent or contain releases and control and respond to worker exposures.

in full compliance with

The operation is in substantial compliance with **Standard of Practice 3.2**

not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:


SIGM is in FULL COMPLIANCE with Handling and Storage Practice 3.2 requiring that cyanide handling and storage facilities are operated using inspections, preventive maintenance and contingency plans to prevent or contain releases and control and respond to worker exposures.

Liquid cyanide is delivered to the site by AGR in isotainers. The isotainers are removed from site at the completion of the unloading process. They are not removed from the truck. Connection points are also rinsed before and after disconnection.

Procedures are in place that detail the operational valve sequences necessary to transfer liquid cyanide from the isotainer to the storage tank. Spills are cleaned up as necessary in accordance with procedures.

A sentry that has been trained in the requirements of the procedure and he is present at all times during the mixing of cyanide and during safety and level check activities. The procedure details both the mixing operator and the sentry roles.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



PRINCIPLE 4 – OPERATIONS

Manage Cyanide Process Solutions and Waste Streams to Protect Human Health and the Environment

Standard of Practice 4.1: Implement management and operating systems designed to protect human health and the environment including contingency planning and inspection and preventive maintenance procedures.

in full compliance with

The operation is

in substantial compliance with

Standard of Practice 4.1

not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

SIGM is in NON COMPLIANCE with Standard of Practice 4.1 requiring that the operation introduce management and operating systems designed to protect human health and the environment including contingency planning and inspection and preventative maintenance procedures.

SIGM has developed and implemented written management and operating plans and procedures. The procedures cover cyanide facilities including unloading and storage facilities, Heap Leach, process plants, tailings impoundments, and cyanide treatment and disposal systems.

The operation has also developed overarching plans addressing the management of cyanide facilities, including:

- Tailings Management Plan
- Cyanide Emergency Response Plan (CERP)
- SIGM – Emergency and Crisis Management Plan
- Draft Cyanide Management Plan.

SIGM has certified environmental (ISO14001) and safety (AS18001) systems.

The operation’s plans and procedures identify the assumptions and parameters on which the facility design was based and any applicable regulatory requirements as necessary to prevent or control cyanide releases and exposures consistent with applicable requirements.


The overarching Tailings Management Plan also details the operational objectives which includes assumptions and parameters on which the facility design was based and any applicable regulatory requirements.

The Draft Cyanide Management Plan is an overarching plan that summarises the requirements for ICMC compliance including assumptions and parameters on which the facility design was based and any applicable regulatory requirements.

Operating parameters and regulatory requirements are outlined in training documents and plans. The Lefroy Mill Operating Specifications outlines the set points for operating requirements.

The operation has plans and procedures that describe the standard practices necessary for the safe and environmentally sound operation of the facility including the specific measures needed for compliance with the Code, such as inspections and preventative maintenance activities.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



ST IVES GOLD MINE – ICMC RECERTIFICATION AUDIT SUMMARY AUDIT REPORT

Key procedures, Management Plans, training manuals and operator log sheets outline the specific measures for Code compliance.

All process (including the TSF) pumps, pipes, valves and tanks are registered within SAP. Specific maintenance tasks and associated frequencies have been assigned for each item.

SIGM has a procedure to identify when changes in site processes or operating practices may increase the potential for the release of cyanide and to incorporate the necessary release prevention measures.

Management of Change assessments were not completed for all the changes identified, specifically the modifications to the Heap Leach. Of the reports provided, none were completed in their entirety, particularly the signoff confirming that the plant and process register has been updated the modification report completed and filed.

Upon becoming aware of the deficiency, SIGM reviewed the sequence of events leading to the deficiency to identify immediate causes, contributing factors and organisational factors. The review concluded that insufficient identification and management of changes is considered to be the core issue. In this case SIGM considered the following to be underlying causes of the failure:

- Inadequate change management process implemented.
- Objective and scope of changes not clearly defined.
- Inadequate risk versus benefit assessment of changes.
- Inadequate tollgate mechanism or monitoring of the impacts of change over time.


SIGM is considered to be Non-Compliant with this Standard of Practice as it cannot demonstrate that it is able to identify when changes in a site's processes or operating practices may increase the potential for the release of cyanide and to incorporate the necessary release prevention measures.

The operation has developed procedures and plans that outline contingencies for situations when inspections and monitoring identify a deviation from design or standard operating procedures.

The operation has developed a CERP that addresses potential accidental releases of cyanide, including:

- Cyanide Related Injury
- Catastrophic Release of HCN gas > 50 ppm
- Transportation Accidents
- Fires Involving Cyanide
- Liquid NaCN Spill Outside Bunding

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



The Tailings Management Plan includes information on the following:

- Over Topping of Water Storage Dams
- Tailings and Return Water Line Systems
- Tailings Storage Embankment Failure
- Fauna death on or near the TSFs.
- Uncontrolled release of tailings slurry or return water and the cause (pipe break, overtopping, pump malfunction, automatic switch malfunction or operator error).
- Impact from seepage (vegetation distress, soil contamination, water quality changes).
- Defects impacting on the integrity of the tailings storage facility such as the embankments, decant, return water dams, bunds, etc.
- Changes in water quality that exceed prescribed conditions of licence criteria.
- Increases in production tonnages above Notice of Intention levels

The Process Plant Operational Manual includes information on the following:

- Tank overflow from the CIP Tanks
- Lack of cyanide discharge at the dosing points to the Leach Tanks (possibly indicative of a leak)
- Low pH in Leach Tanks (indicative of risk of HCN gas release)
- High HCN gas concentrations above Leach Tanks and CIP Tanks
- The Mine Closure Plan includes information on temporary cessation of operations.


The operating procedures also contain contingency planning information on:

- Critical slurry pump failures.
- Minor cyanide spill clean-up.
- Elevated WAD cyanide levels
- Power outages
- Significant rainfall events

The operation does not consistently inspect cyanide facilities on an established frequency sufficient to assure and document that they are functioning within design parameters.

Daily inspections by Process Technicians and the Shift Supervisors' are undertaken in the normal course of operations. These inspections focus on checking for cyanide solution leaks rather than checking the integrity of equipment.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



ST IVES GOLD MINE – ICMC RECERTIFICATION AUDIT SUMMARY AUDIT REPORT

Monthly EHS Inspections using checklists are conducted at the Lefroy and Heap Leach Plants. The inspections include thorough examination of pipelines across all areas for leaks. These cover the following areas:

- Crusher
- Reagents area
- Grinding area
- Leach and pump cell area
- Elution
- Maintenance workshops
- TSF
- Gravity circuit
- Crib and control room
- Heap Leach and Wet Plant
- Contractor Management.

TSFs are inspected three times per day. The TSFs are also inspected annually by a third party to ensure that the facilities and all adjacent pipelines exist and are managed to the requirements of the site and industry standards.

The Mechanical Team conduct inspections as part of an established preventative maintenance programme. These are managed through SAP CMMS software.


AGR attends site on an annual basis to conduct engineering compliance audits on the cyanide unloading facilities. Actions are entered into INX InControl for follow up and tracking.

A review of operational checks and inspections indicated that they were generally well documented for the Lefroy facility, however, they appear to be inconsistently signed off by the supervisor as being complete and identified actions assessed and entered into INX InControl.

Limited records are available confirming that operational inspections occurred at the Heap Leach during the audit period. Weekly documented checks were largely discontinued for the audit period and the EHS inspection processes deteriorated resulting in a lack of current information on the substandard condition of the facility being filtered through the organisation to relevant managers.

SIGM is considered to be Non-Compliant with this Standard of Practice as does not consistently inspect cyanide facilities on an established frequency sufficient to assure and document that they are functioning within design parameters.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



ST IVES GOLD MINE – ICMC RECERTIFICATION AUDIT SUMMARY AUDIT REPORT

SIGM inspects the following at unloading, storage, mixing and process areas:

a) *Tanks holding cyanide solutions for structural integrity and signs of corrosion and leakage.*

Tanks are inspected during operator rounds and as part of the EHS inspection process. Both of these inspection will identify excessive corrosion or leakage but not structural integrity.

Maintenance staff inspected tanks on a 12 week, 48 week, 52 week, or 20 month (CIL only) schedule. Inspections address internal coatings and steel thickness.

Extensive corrosion was observed at the Heap Leach Wet Plant and the annual external corrosion inspection had not occurred since 2012. Limited EHS and operator records are available for the Heap Leach Wet Plant.

b) *Secondary containments for their integrity, the presence of fluids and their available capacity, and to ensure that any drains are closed and, if necessary, locked, to prevent accidental releases to the environment.*

Secondary containments are inspected during operator rounds and as part of the EHS inspection process. Maintenance staff inspect the containments every 12 months. Limited records are available for the Heap Leach Wet Plant.

c) *Leak detection and collection systems at leach pads and ponds, as required in the design documents.*

- Leak detection beneath the CIL tanks is conducted quarterly.
- Leaks at the TSF are monitored via the leak and seepage detection and collection systems, as required in the design documents.
- No records were available for the inspection of leak detection points beneath the Heap Leach liner or associated ponds (Event Pond, Storm Pond 1 and Storm Pond 2).

d) *Pipelines, pumps and valves for deterioration and leakage.*


Inspections of tails pipelines, decant return lines, containment ponds and pipeline trenches are conducted three times per day by the process operators. Maintenance staff conduct visual inspections of tails pipelines every 12 weeks. Thermography tests are conducted on critical steel lines and impingement boxes within the plant that are rubber lined. The TSFs are inspected annually by a third party to ensure that the facilities and all adjacent pipelines exist and are managed to the requirements of the site and industry standards.

Limited records were available for the Heap Leach Facility.

e) *Ponds and impoundments for the parameters identified in their design documents as critical to their containment of cyanide and solutions and maintenance of the water balance, such as available freeboard and integrity of surface water diversions.*

- Liner integrity at the TSF decant ponds is included as part of the process operator checks.
- Eight hourly operational inspections are conducted on a daily basis. The checks assess tailings discharge management, water levels and pumping requirements.
- Remote monitoring of pond levels and flows is conducted via the telemetry system to the manned control room.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



Inspections are documented, including the date of the inspection, the name of the inspector, and any observed deficiencies. The nature and date of corrective actions are also documented and records are maintained. Where deficiencies are identified, details of the deficiency and corrective actions are generally noted.

Records are retained digitally and in some cases as hard copy.

Preventive maintenance programs are partly implemented and activities partly documented to ensure that equipment and devices function as necessary for safe cyanide management.

Preventative maintenance scheduling and record keeping for most items of plant are maintained and recorded in SAP CMMS software. Preventative maintenance schedules are based on manufacturer recommendations and are supplemented with operator experience. Items may be scheduled for maintenance outside of the schedule program based on inspection findings.

The status of programmed maintenance activities is tracked in SAP CMMS software from issuing the work order to signoff and completion of the task.

Limited records are available for the Heap Leach Wet Plant.

The operation does have necessary emergency power resources to operate pumps and other equipment to prevent unintentional releases and exposures in the event its primary source of power is interrupted.

SIGM has power supplied from the State electricity network. In the event of a power failure the plant fails in a safe mode with the exception of the thickener which must have its valve manually closed. Last chance ponds at the Heap Leach and Lefroy provide additional safeguards in the event of an unintentional release during power failures.

Procedures have been established for the restart of critical equipment and the plant to prevent unintentional releases.

Standard of Practice 4.2: Introduce management and operating systems to minimise cyanide use, thereby limiting concentrations of cyanide in mill tailings.

in full compliance with

The operation is in substantial compliance with **Standard of Practice 4.2**

not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:


SIGM is in FULL COMPLIANCE with Standard of Practice 4.2 requiring that the operation introduce management and operating systems to minimise cyanide use, thereby limiting concentrations of cyanide in mill tailings.

Testing programmes are in place to determine the optimum rate of cyanide addition to achieve both metallurgical requirements and satisfy Code requirements of reducing cyanide concentration in TSFs.

SIGM has a future ore test work programme that involves diagnostic leach testing to determine cyanide and grinding requirements. Test work was completed for all different ore types during the feasibility study.

The operation has evaluated various control strategies for cyanide additions.

St Ives Gold Mine
Name of Facility


Signature of Lead Auditor

18 October 2016
Date



ST IVES GOLD MINE – ICMC RECERTIFICATION AUDIT SUMMARY AUDIT REPORT

The ore is blended and the cyanide rate is set to achieve a set point of 95 ppm free cyanide in the last tank. Cyanide addition rates are adjusted to ensure the set point in the last tank is achieved.

Bottle roll tests are conducted twice weekly to check for optimal cyanide dosing.

The operation has implemented a strategy to control its cyanide addition.

The operation uses two TAC units to manage the cyanide addition within the leaching circuit with sample points drawing from Tank 1 and 2 (front unit) and sample point in Tank 5 (back unit). The cyanide dosing is controlled using a MANTA Cyanide Cube. This system achieves the Tank 5 set point by monitoring and controlling cyanide addition in Tank 1 and 2.

The addition of the Manta Cyanide Cube control loop has dropped cyanide consumption by 25%.

This Standard of Practice is not applicable to the Heap leach Facility as the facility is not associated with a mill or tailings facility.

Standard of Practice 4.3: Implement a comprehensive water management program to protect against unintentional releases.

in full compliance with

The operation is **in substantial compliance with Standard of Practice 4.3**

not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

SIGM is in SUBSTANTIAL COMPLIANCE with Standard of Practice 4.3, requiring the operation to implement a comprehensive water management program to protect against unintentional releases.

A probabilistic water balance (PWB) to prevent unintentional releases to the environment has not been used during the Audit period.


Since the 2013 recertification, the software used to generate the PWB was not updated and was not useable, and had not been updated since the 2013 recertification.

Upon becoming aware of the deficiency, SIGM initiated a process to develop a new PWB to model changes to the water balance since the last audit, as well as to maintain compliance with the Cyanide Code. Discussions with the Metallurgist and ICMC Champion on the deficiency identified the timeline for development of the PWB has been protracted and resulted in a functional model in Q1 2016.

The PWB runs in GoldSIM, and satisfies both future planning requirements and Cyanide Code Compliance by showing that there is always excess capacity at the TSFs to handle a 1 in 100 year storm. SIGM has developed a procedure to ensure that this PWB is run each quarter.

For the Heap Leach, a consultant was also engaged to develop a probabilistic water storage model to assess Heap Leach water storage capacities and the ability for the facility to contain likely future rainfall sequences including a 1 in 100 year, 72 hr rainfall storm event. The model developed showed sufficient water storage capacity is provided in the existing site water storage facilities to prevent releases to the environment. The model results are considered sufficient to demonstrate enough water storage capacity is available on site to protect against unintentional releases without the need to develop a full PWB in accordance with the ICMC.

St Ives Gold Mine
Name of Facility


Signature of Lead Auditor

18 October 2016
Date



ST IVES GOLD MINE – ICMC RECERTIFICATION AUDIT SUMMARY AUDIT REPORT

The Auditor accepts that there was sufficient capacity to manage site water at both the Lefroy and Heap Leach areas during the audit period. The site is subject to incident rainfall only and not upstream runoff from catchment areas. The processing plant and TSF are managed in such a way as to maintain a significant buffer volume to contain the precipitation associated with a worst case scenario rainfall event. In making this determination, the Auditor notes that the intent of this Standard of Practice is:

“...to protect against unintentional releases”.

Despite the sufficient capacity available to prevent unintentional release, SIGM has committed to maintaining the PWB for the Lefroy Plant as a planning tool for operational purposes and to ensure sufficient capacity is maintained in the TSFs.


SIGM is considered to be Substantially Compliant with this Standard of Practice as the operation committed to maintaining a PWB and will require to maintain a PWB for the Lefroy site for business planning purposes to maintain sufficient TSF storage capacity for business planning and ICMC compliance purposes.

In making this determination it was noted that:

- SIGM had shown a good faith effort to comply by:
 - Decommissioning the Heap leach.
 - Implementing a Code compliance programme that included self-assessments and third party assessments.
 - The operation consistently worked over an extended timeframe to update and implement a PWB for the site once the deficiency was identified.
 - The deficiency in not maintaining a PWB did not directly result in incidents during the Recertification Audit period due to the available storage and management techniques, including:
 - Available capacity for 1 in 100 year, 72 hr rainfall storm event in Heap Leach ponds and TSFs.
 - Environmental licence requirement to maintain 300 mm freeboard in TSFs
 - 8 hourly TSF Inspections.
 - Remote monitoring of pond levels and flows via the telemetry system to the manned control room.
 - SIG-PRO-WI085 – Preparing for Significant Rainfall Events. This procedure ensures that when rain event is forecast, ponds are pumped out to low levels in advance, and TSFs are collared in order to allow for excess water storage.
 - Development of temporary water balancing spreadsheets on an ad-hoc basis during this time when there was any concern about the water balance changing.
- The deficiency is readily correctable within one year
- The deficiency does not represent an immediate risk to personnel or the environment as SIGM made substantial supplementary efforts to maintain control and prevent overtopping of ponds and impoundments (i.e. TSF) during the Recertification Audit period.

This determination was assessed and supported by an independent Code Auditor.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



ST IVES GOLD MINE – ICMC RECERTIFICATION AUDIT SUMMARY AUDIT REPORT

The operation has not consistently implemented a PWB during the recertification period. SIGM has calculated that the operation had the ability to manage design storm events at Lefroy and Heap Leach without unintentional releases. The new PWB developed for the site considers:

- The rates at which solutions are applied to tailings that are deposited into TSFs.
- A design storm duration and storm return interval that provides a sufficient degree of probability that overtopping of the pond or impoundment can be prevented during the operational life of the facility.
- The quality of existing precipitation and evaporation data in representing actual site conditions.
- The amount of precipitation entering a pond or impoundment resulting from surface runoff from the upgradient watershed, including adjustments as necessary to account for differences in elevation and for infiltration of the runoff into the ground.
- Solution losses in addition to evaporation, such as the capacity of decant, drainage and recycling systems, allowable seepage to the subsurface, and allowable discharges to surface water.
- The effects of potential power outages or pump and other equipment failures on the drain down from a leach pad or the emergency removal of water from a facility.

The operating procedures do incorporate inspection and monitoring activities to prevent overtopping of ponds and impoundments and unplanned discharge of cyanide solutions to the environment. SIGM conducts checks of the decant and seepage and overall free board levels, including:


- Engaging a third-party to undertake an annual review of the TSFs on site.
- 8 hourly TSF Inspections.
- Remote monitoring of pond levels and flows via the telemetry system to the manned control room.
- SIG-PRO-WI085 – Preparing for Significant Rainfall Events. This procedure ensures that when rain event is forecast, ponds are pumped out to low levels in advance, and TSFs are collared in order to allow for excess water storage.
- Running the PWB on a quarterly basis.

Ponds and impoundments are designed and operated with adequate freeboard above the maximum design storage capacity determined to be necessary from water balance calculations.

SIGM's Environmental Licence requires the operation maintain a total freeboard of 0.3 m or be sufficient to retain a 1:100 year, 1:72 hr event for TSFs and ponds containing cyanide solutions.

- SIGM utilises Kambalda precipitation data and maintains 1 in 100 year, 72 hour rainfall calculations for its TSFs and ponds as required in its Environmental Licence. The revised PWB has been developed using local meteorological data.

St Ives Gold Mine
Name of Facility


Signature of Lead Auditor

18 October 2016
Date



ST IVES GOLD MINE – ICMC RECERTIFICATION AUDIT SUMMARY AUDIT REPORT

Standard of Practice 4.4: Implement measures to protect birds, other wildlife and livestock from adverse effects of cyanide process solutions

in full compliance with

The operation is

in substantial compliance with

Standard of Practice 4.4

not in compliance with

SIGM is in NON COMPLIANCE with Standard of Practice 4.4 requiring an operation implement measures to protect birds, other wildlife and livestock from adverse effects of cyanide process solutions.

The operation has not implemented measures to restrict access by wildlife and livestock to all open waters where WAD cyanide exceeds 50 mg/L.

Initial ICMC Certification and Recertification was achieved with tailings discharge exceeding 50 mg/L WAD cyanide concentration with the peer-reviewed and accepted protective mechanism of tailings hypersalinity (>50 000 mg/L TDS). The study that determined the protective mechanism (MERIWA 398 (M398)) recommended tailings operating parameters based on chemistry concentrations measured during the study. These subsequently became conditional for compliance with the Standard of Practice 4.4 and are presented in Table 1.

Table 1: Operating parameters for SIGM from M398

Parameter	Target Maximum WAD Cyanide 95 th Percentile (mg/L)	Target WAD Cyanide 80 th Percentile (mg/L) (operate under on 80% of days)	Target Minimum TDS (mg/L)	Target Maximum Copper (mg/L)
Spigot	132	112	50 000	46
Supernatant	65	N/A	50 000	44

During the audit period the WAD cyanide and copper concentrations at the spigot and within the supernatant were found to be largely within the prescribed operating parameters, but salinity was found to be deficient. The salinity, required to be above 50 000 mg/L TDS was found to be generally less than this up to August 2015 and at times to February 2016.

The requirement for daily sampling was also not being complied with during much of the audit period with sampling conducted only during week days and when the mill was operational.


A site inspection of the Heap Leach identified that pregnant solution (>50 mg/L WAD cyanide) returning from the Heap Leach was being discharged directly into perimeter drains and flowing to the netted containment pond. The M398 protective mechanisms established for TSFs and cannot be applied to the Heap Leach.

In June 2016, the Metallurgist and ICMC Champion conducted an investigation to identify root causes and focus on preventing a reoccurrence of the issue.

SIGM cannot demonstrate that cyanide concentration in all open waters does not exceed 50 mg/L WAD cyanide.

Maintaining a WAD cyanide concentration of 50 mg/L or less in open water is effective in preventing significant wildlife mortality at SIGM. Daily wildlife observations are conducted recording the presence or absence of wildlife mortality. Completed records from the Audit period demonstrate that no cyanide related wildlife mortalities have been observed at the operation.

St Ives Gold Mine
Name of Facility


Signature of Lead Auditor

18 October 2016
Date



The operation does not consistently apply leach solutions in a manner designed to avoid significant ponding on the heap surface. It does limit overspray of solution off the heap liner. The solution irrigated onto the Heap Leach is >50 mg/L WAD. An inspection of the facility during the audit identified significant ponding. Interviews confirmed that this was not an isolated event. The operation has not implemented a formalised check on ponding and a standard had not been established to inform operators what constitute acceptable levels of ponding and what was considered significant.

Since the audit, SIGM has decommissioned the Heap Leach.

SIGM is considered to be Non-Compliant with this Standard of Practice as it cannot demonstrate that it consistently complied with the MERIWA requirements and it cannot demonstrate it restricted access by wildlife to open waters where WAD cyanide exceeds 50 mg/L at the Heap Leach.

Standard of Practice 4.5: Implement measures to protect fish and wildlife from direct or indirect discharges of cyanide process solutions to surface water.

in full compliance with

The operation is in substantial compliance with **Standard of Practice 4.5**

not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

Standard of Practice 4.5, requiring the operation implement measures to protect fish and wildlife from direct or indirect discharges of cyanide process solutions to surface water, is NOT APPLICABLE to SIGM.

The operation does not have a direct or indirect discharge from the process plant, TSF or Heap Leach to surface water.

The operation does discharge mine dewatering to Lake Lefroy in accordance with its Environmental Licence which requires the operation to maintain the pH of the discharge between 6.0 and 8.0. Cyanide is not required to be monitored. As the mine is a non-cyanide facility this standard of practice is not applicable.

Standard of Practice 4.6: Implement measures designed to manage seepage from cyanide facilities to protect the beneficial uses of groundwater.

in full compliance with

The operation is in substantial compliance with **Standard of Practice 4.6**

not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:


SIGM is in FULL COMPLIANCE with Standard of Practice 4.6 requiring the implementation of measures designed to manage seepage from cyanide facilities to protect the beneficial uses of groundwater.

The operation implements water management measures to manage seepage to protect the beneficial use of groundwater beneath and immediately downgradient of the operation.

Two TSFs (TSF 3 and 4) and a Heap Leach were operational at SIGM during the audit period. The TSFs have been constructed to standard comprising compacted clay materials around the decant tower and a combination of toe drains, seepage trenches, recovery bores around the perimeters of each facility.

Monitoring bores are installed at nominated points around all TSFs and the Heap Leach.

St Ives Gold Mine
Name of Facility


Signature of Lead Auditor

18 October 2016
Date



**ST IVES GOLD MINE – ICMC RECERTIFICATION AUDIT
SUMMARY AUDIT REPORT**

The process water, decant and Heap Leach ponds are lined with either underline detection or monitoring bores situated downgradient.

SIGM is licensed by the Department of Environment Regulation (DER) requiring groundwater WAD CN levels to be <0.5 ppm in bores specified on the licence.

The Department of Water (DoW) has licenced the operation to take water for the beneficial uses of mine dewatering, mineral processing and for use as a wildlife protective mechanism as required (refer to 4.4.1). The DoW licence authorises the operation to discharge to salt lakes. No cyanide is present within the discharge.

WAD cyanide concentrations in groundwater at compliance points below or downgradient of the facility are below levels that are protective of identified beneficial uses of groundwater. A review of groundwater quality monitoring data for bores monitored, including licenced bores, indicated WAD cyanide levels were <0.5 mg/L at all sampling points during the audit period.

The operation uses a paste fill process which comprises of a combination of reclaimed solid tailings, cement powder and reclaimed underground water which is produced on a batch process when required.

Reclaimed tailings from TSF 1 are used in the paste process and tested for WAD cyanide concentrations. Test results indicate that the tailings used within the paste plant had WAD cyanide concentrations of <0.5 mg/kg with the exception of 17 results in 2014, which noted the WAD cyanide concentration as being <5 mg/kg. The Occupational Hygienist advised that the apparent increase was related to a change in detection limit rather than an increase in WAD cyanide levels.

The paste plant is not considered a cyanide facility as the WAD cyanide concentrations used in the paste plant (prior to dilution with aggregate, cement and water) are likely to be <0.5 mg/L based on the sample results.

The low levels of calculated WAD cyanide concentration means there is minimal risk to worker health.

Seepage from the operation has not caused cyanide concentrations of groundwater to rise above levels protective of beneficial use.

Standard of Practice 4.7: Provide spill prevention or containment measures for process tanks and pipelines.

in full compliance with

The operation is **in substantial compliance with Standard of Practice 4.7**


not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

SIGM is in SUBSTANTIAL COMPLIANCE with Standard of Practice 4.7 requiring that the operation implement measures designed to manage seepage from cyanide facilities to protect the beneficial uses of groundwater.

Spill containment measures are provided for all cyanide unloading and storage tanks. Spill prevention or containment measures are not provided for all cyanide process solution tanks.

St Ives Gold Mine
Name of Facility


Signature of Lead Auditor

18 October 2016
Date



Pump cell tanks are placed on solid concrete foundation within a bund area. The operation does have solution tanks installed on ring beams:

- Five CIL tanks
- One process water tank.
- Three Heap Leach tanks

CIL Tanks

The CIL process tanks were observed to have leak detection installed within the ring beam but no evidence to show how the installed design would detect leaks. The basis for design for this system to confidently detect leaks was not provided. The current system comprises short pipes that extend 0.08 m into the oil sand layer underlying the tanks. The tanks are approximately 16 m in diameter.

Process Water Tank

The process water tank does not have a leak detection system installed. The tank is emptied and inspected on a 12 weekly cycle.

Heap Leach Tanks

Two cyanide solution tanks at the Heap Leach facility do not have a leak detection system installed. Since the audit, SIGM has decommissioned the Heap Leach and associate tanks.

SIGM engaged a consultant to assess the basis of design for the existing leak detection and provide recommendations to adjust the current system (if required) to meet the requirements of the Code.


The study recommended that SIGM installs two additional leak detection pipes into the oil sand layer beneath each CIL tank, extending to a target depth of 3-5 m, to augment the existing leak detection system. Similarly, it was recommended at least two leak detection pipes are installed into the oil sand layer beneath the Process Water Tank to a target length of 2-4 m to meet the requirements of the Code.

SIGM is considered to be Substantially Compliant with this Standard of Practice as the operation had not installed spill prevention measures for its solution tanks on ring beam foundations.

In making this determination it was noted that:

- SIGM had shown a good faith effort to comply by:
 - Installing a system that the operation believed was compliant and had passed previous ICMC Certification and Recertification Audits.
 - Diligently monitoring the deficient system installed on the CIL tanks.
 - The operation was aware that the three tanks at the Heap leach and the Process Water tank were on ring beam foundations but were not aware of the monitoring requirements. SIGM had undertaken ICMC gap analysis work and previous audits where these issues were not identified.
 - Upon becoming aware of the lack of leak detection at the Heap Leach (amongst other issues), the operation decommissioned the facility.
 - The lack of maintaining a leak detection system was offset to some degree by a preventative maintenance programme on the tanks.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



ST IVES GOLD MINE – ICMC RECERTIFICATION AUDIT SUMMARY AUDIT REPORT

- SIGM has rapidly responded to the deficiency once it was identified and is in the process of retrofitting the existing system and installing a new system on the process water tank.
- The deficiency is readily correctable within one year
- The deficiency does not represent an immediate risk to personnel or the environment as there are no identified ecological beneficial uses of groundwater beneath the identified tanks and the cyanide solution concentration is relatively low, particularly in the case of the process water tank.

This determination was assessed and supported by an independent Code Auditor.

Secondary containments for cyanide unloading, storage, mixing and process tanks are sized to hold a volume greater than that of the largest tank within the containment and any piping draining back to the tank, and with additional capacity for the design storm event.

Containments considered in isolation do not have sufficient capacity to hold 110% of the largest tank. The operation has established connections between compatible containments to combine capacities. The connections made between various containments and the presence of the Last Chance Pond for additional catchment of any spillage from the Thickener or Pump Cell bunds, allow SIGM to be sure that 110% of the largest vessel in each bund group can be effectively contained.

Procedures have been developed to prevent discharge to the environment of cyanide solution or cyanide-contaminated waters that are collected in the secondary containment areas. Secondary containment areas (excluding the Last Chance Pond) have sumps and pumps to transfer spillage to nominated tanks and compatible containments within the processing plant. The pumps are controlled manually or automatically.

The process tanks are situated within a concrete bund that is sufficient for minor releases. The Last Change Pond, an earthen pond at the rear of the plant, down gradient from the Thickener, Leach and Pump Cell bunds has been constructed and extended to provide adequate capacity to contain the contents of the largest vessel in the plant, the Thickener.

The Last Change Pond is not used for routine operational purposes and a procedure is in place to manage emergency flows to the last chance pond.


Spill prevention and containment measures are provided for cyanide solution pipelines within the processing area to collect leaks and prevent releases to the environment. Procedures are written for TSF inspections, which include all pipelines, ponds, pumps and seepage control. Inspections are conducted by Process Operators every 8 hours. Inspection sheets are completed.

All process solution pipes within the plant are above secondary containment or located in pipe in pipe draining to an existing containment. All TSF pipelines are located within an earth trench. The trench is equipped with emergency sumps at low points along the delivery route to the TSFs. All TSF pipelines are included within the SAP planned maintenance systems.

Areas where cyanide pipelines present a risk to surface water have been evaluated for special protection needs. The location of the facilities at the Heap Leach and Lefroy plants were risk assessed. The outcome of the assessment identified the risk to surface water as “moderate” indicating that the risks to people and surface waters could be successfully managed through the hierarchy of controls with existing site processes.

Cyanide tanks and pipelines are constructed of materials compatible with cyanide and high pH conditions. Interviews and site observations noted that tanks, pumps, pipe work and fittings are constructed of carbon steel which is suitable for storage and transmission of cyanide solution.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



**ST IVES GOLD MINE – ICMC RECERTIFICATION AUDIT
SUMMARY AUDIT REPORT**

Standard of Practice 4.8: Implement quality control/quality assurance procedures to confirm that cyanide facilities are constructed according to accepted engineering standards and specifications.

in full compliance with

The operation is

in substantial compliance with

Standard of Practice 4.8

not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

SIGM is in FULL COMPLIANCE with Standard of Practice 4.8 requiring that operations implement quality control and quality assurance programmes (QC/QA) to confirm that cyanide facilities are constructed according to accepted engineering standards and specifications.

QC/QA have been implemented during construction of cyanide facilities referenced during the last Certification Audit as well as new cyanide facilities constructed since this period.

New cyanide facilities observed during the Recertification Audit Period were:


- New lift on TSF3
- New lift on TSF4
- Modifications to the Heap Leach :
 - The repositioning of 1.5 million tonnes of material on the Heap Leach and recommissioning of sections of irrigation.
 - The reduction and changes in personnel
 - Reduction in maintenance and inspection regimes.
 - New berms created to control drainage and installation of new drainage works and piping
 - Irrigation manifold relocated to top of Heap Leach
 - Combined two solution return lines into a single line.
 - Reduced staffing and changes to inspection/maintenance frequencies.
- New manifold for cyanide distribution
- New oxygen distribution
- New line for hypersaline injection
- New WAD analyser

Construction reports for the TSF raises are available and annual operating audits confirm that TSFs are being operated in accordance with design.

No construction reports were available for modifications conducted on the Heap Leach. Compliance for this facility was addressed through 4.8.5.

QC/QA documentation was also available for the other cyanide facility modifications through the management of change process.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



**ST IVES GOLD MINE – ICMC RECERTIFICATION AUDIT
SUMMARY AUDIT REPORT**

QC/QA programs have addressed the suitability of materials and adequacy of soil compaction for earthworks such as tank foundations and earthen liners, the installation of synthetic membrane liners used in ponds and leach pads and for construction of cyanide storage and process tanks. Records cover cyanide facilities referenced during the last Certification Audit as well as new cyanide facilities constructed since this period, specifically the:

- New lift on TSF3
- New lift on TSF4

QC/QA records have been retained for all cyanide facilities constructed during the Recertification period. Records cover cyanide facilities referenced during the last Certification Audit as well as new cyanide facilities constructed since this period.

Appropriately qualified personnel reviewed cyanide facility construction and provided documentation that the facility has been built as proposed and approved. Records cover cyanide facilities referenced during the last Certification Audit as well as new cyanide facilities constructed since this period.

Appropriately qualified people have signed the TSF construction reports along with annual operating audits.

SIGM requires the participation of and approval by suitably qualified personnel from relevant department(s) for projects initiated through the management of change process. These approved changes are managed and signed off by appropriately qualified people confirming that works have been built as proposed.

Evidence was not made available to enable a complete finding to be made for modifications to the Heap Leach. Where there is no available quality control and quality assurance documentation or as-built certification for cyanide facility construction, the Auditor Guidance allows for an appropriately qualified person to inspect those elements of the facility involving cyanide and issue a report concluding that its continued operation within established parameters will protect against cyanide exposures and releases.

A suitably qualified consultant was engaged in May 2016 to provide an engineering review of the Heap Leach confirming its design and operating practices are safe for continued use. The engineering review determined from a stability and containment perspective that the Heap Leach is fit to continue functioning as currently operated. This determination was assessed and supported by an independent Code Auditor.

Since the audit, SIGM has decommissioned the Heap Leach.

Standard of Practice 4.9: Implement monitoring programs to evaluate the effects of cyanide use on wildlife, surface and groundwater quality.

in full compliance with

The operation is

in substantial compliance with

Standard of Practice 4.9


not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

SIGM is in FULL COMPLIANCE with Standard of Practice 4.9 requiring that operations implement monitoring programs to evaluate the effects of cyanide use on wildlife, surface and groundwater quality.

The operation has developed written standard procedures for monitoring activities. These have been developed by appropriately qualified personnel. All environmental water quality sampling procedures used at SIGM have been approved by the Environmental Supervisor or Manager who are degree qualified and have an appropriate level of experience.

St Ives Gold Mine
Name of Facility


Signature of Lead Auditor

18 October 2016
Date



ST IVES GOLD MINE – ICMC RECERTIFICATION AUDIT SUMMARY AUDIT REPORT

The Cyanide Management Plan is written by a consultant and signed off by the Metallurgist and ICMC Champion who is degree qualified and has an appropriate level of experience.

Procedures do specify how and where samples should be taken, sample preservation techniques, chain of custody procedures, shipping instructions, and cyanide species to be analysed for most situations.

Systems are in place to ensure that sampling conditions (e.g. weather, livestock/wildlife activity, anthropogenic influences etc.), and procedures are documented in writing. A review of the field sampling sheets for the Recertification Audit Period confirmed that the recording of situations or occurrences out of the ordinary was being undertaken during water sampling.

The Wildlife Observation Logsheet requires the recording of weather conditions. There is also a space for general comments regarding the monitoring. A review of data sheets for the Recertification Audit Period indicates that conditions are generally being recorded during wildlife observations.

The operation does not have a direct or indirect discharge from the process plant, TSF or Heap Leach to surface water.

A series of groundwater monitoring bores are located around the site and the operation also monitors process ponds and impoundments with the potential to contain cyanide.


The operation does inspect for and record wildlife mortalities related to contact with and ingestion of cyanide solutions for most cyanide solution ponds.

At each active TSF, Process Department personnel undertake 20 minute observations on a daily basis, preferably within three hours of sunrise. Should a wildlife death be recorded, a second observation should be performed during the afternoon.

Monitoring is conducted at frequencies adequate to characterise the medium being monitored and to identify changes in a timely manner.

Groundwater and surface water monitoring is undertaken on a variety of frequencies depending on the parameters measured.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



PRINCIPLE 5 – DECOMMISSIONING

Protect Communities and the Environment from Cyanide through Development and Implementation of Decommissioning Plans for Cyanide Facilities

Standard of Practice 5.1: Plan and implement procedures for effective decommissioning of cyanide facilities to protect human health, wildlife and livestock.

in full compliance with

The operation is in substantial compliance with **Standard of Practice 5.1**

not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:


SIGM is in FULL COMPLIANCE with Standard of Practice 5.1 requiring operations plan and implement procedures for effective decommissioning of cyanide facilities to protect human health, wildlife and livestock.

The operation has developed written procedure to decommission cyanide facilities at the cessation of operations. SIGM has recently updated its cyanide demolition and decommissioning procedures and plans with an updated Decommissioning Report and an updated Decontamination and Decommissioning Plan. These plans link to the mines overall Mine Closure Plan and closure cost estimate.

SIGM's Decontamination and Decommissioning Plan includes an implementation schedule for decommissioning activities. The Decontamination and Decommissioning Plan provides details on tasks commencing two years out from closure as part of planning for closure and decontamination tasks from closure

SIGM reviews its decommissioning procedures for cyanide facilities during the life of the operation and revise them as needed. The Decontamination and Decommissioning Plan provides for a three yearly review and the updated decommissioning plan was initially written in 2015 with 4 revisions undertaken at the time of the audit with the final version issued in January 2016.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



**ST IVES GOLD MINE – ICMC RECERTIFICATION AUDIT
SUMMARY AUDIT REPORT**

Standard of Practice 5.2: Establish an assurance mechanism capable of fully funding cyanide related decommissioning activities.

in full compliance with

The operation is

in substantial compliance with

Standard of Practice 5.2

not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

SIGM is in FULL COMPLIANCE with Standard of Practice 5.2 requiring that the operation establish an assurance mechanism capable of fully funding cyanide related decommissioning activities.


The operation has developed written procedure to decommission cyanide facilities at the cessation of operations. St Ives has recently updated cyanide demolition and decommissioning procedures and plans with an updated demolition report and an updated decontamination and decommissioning plan. These plans link to the mines overall Mine Closure Plan and closure cost estimate.

SIGM's Decontamination and Decommissioning Plan does include an implementation schedule for decommissioning activities. Section 11 of the plan provides details on tasks commencing two years out from closure as part of planning for closure and decontamination tasks from closure.

SIGM does review its decommissioning procedures for cyanide facilities during the life of the operation and revise them as needed. The Decontamination and Decommissioning Plan provides for a three yearly review and the updated decommissioning plan was initially written in 2015 with 4 revisions undertaken at the time of the audit with the final version issues in January 2016.

SIGM has established a financial mechanism approved by the applicable jurisdiction to cover the estimated costs for cyanide-related decommissioning activities as identified in its decommissioning and closure strategy. The Government of Western Australia introduced the Mining Rehabilitation Fund (MRF) on 1 July 2013. The MRF provides a pooled fund levied according to the environmental disturbance existing on a tenement at the annual reporting date. SIGM complies with the MRF requirements.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



PRINCIPLE 6 – WORKER SAFETY

Protect Workers’ Health and Safety from Exposure to Cyanide

Standard of Practice 6.1: Identify potential cyanide exposure scenarios and take measures as necessary to eliminate, reduce and control them.

in full compliance with

The operation is

in substantial compliance with

Standard of Practice 6.1

not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

SIGM is in NON COMPLIANCE with Standard of Practice 6.1 requiring an operation to identify potential cyanide exposure scenarios and take measures as necessary to eliminate, reduce and control them.

SIGM has developed procedures describing how cyanide-related tasks such as unloading, mixing, plant operations, entry into confined spaces, and equipment decontamination prior to maintenance should be conducted to minimise worker exposure.

The operation has a set of operating procedures for cyanide related tasks and activities. The operating procedures address cyanide related hazards and provide a hazard assessment of each step in the procedure and the PPE that is required. The procedures are also a component of operator training and competency and include a competency assessment sheet. The formalised training program ensures process and maintenance personnel are trained and assessed in these procedures.

To supplement the procedures and training, there is signage to remind personnel of rules and PPE for cyanide related tasks.

SIGM has a permit to work system that covers isolations and entry into confined spaces. Confined space entry requires the completion of a risk assessment, evacuation plan and atmospheric testing. Confined spaces can only be entered by those personnel trained and authorised to do so.

For maintenance activities the processing operators isolate and drain the lines, before handing over to maintenance personnel


The procedures address the use of PPE and the operation has a pre-work inspection process. The Field Level Risk Assessment (FLRA) is used by workers to assess the workplace before each task in addition to the work instructions and PPE requirements for the task. The task procedures detail the PPE necessary for the tasks. The site inspection confirmed that workers were using PPE and conducting pre-work inspections.

As noted in Standard of Practice 4.1, the Management of Change Procedure is operational at site to identify when changes in the site's processes or engineering modifications may increase the potential for the release of cyanide and to incorporate the necessary release prevention measures.

A number of significant changes occurred during the audit period (the changes were both voluntary and involuntary) that resulted in in non-compliance with the Code. The lack of a management of change process at the Heap Leach appears to be a contributing factor to the following identified deficiencies (discussed in previous sections):

- Cyanide bearing solution >50 mg/L WAD cyanide in the drainage system for the Heap Leach that was accessible to wildlife.

St Ives Gold Mine
Name of Facility


Signature of Lead Auditor

18 October 2016
Date



- The condition of infrastructure on and around the Heap Leach allowing the leakage of cyanide solution indicating a lack of inspections and maintenance of these pipelines and netting.
- Excessive ponding of irrigated cyanide solution on the Heap Leach.
- A lack of compliance with SIGM's operating procedures and parameters.

Upon becoming aware of the deficiency, SIGM reviewed the sequence of events leading to the deficiency to identify immediate causes, contributing factors and organisational factors. The review concluded that insufficient identification and management of changes is considered to be the core issue. In this case SIGM considered the following to be underlying causes of the failure:

- Inadequate change management process implemented
- Objective and scope of changes not clearly defined.
- Inadequate risk versus benefit assessment of changes.
- Inadequate tollgate mechanism or monitoring of the impacts of change over time.

SIGM has a number of tools and systems that could be used to address some these aspects however, at this time, these do not appear to have been fully implemented within the area of the operation responsible. A Scope Change procedure under the OHS management system was identified as a potential suitable system to address the identified organisational factors.

The operation does solicit and actively consider worker input in developing and evaluating health and safety procedures. Workers have a number of forums (for example the daily processing meetings) where feedback can be provided on health and safety procedures.

The mill operators and maintenance works closely together with the processing operators and maintenance workers when developing or revising procedures. The monthly Safety Representatives Meeting is a key forum for the consultation and dissemination of health and safety related information and provides the mechanism for escalation of health and safety issues including safety procedures.

Standard of Practice 6.2: Operate and monitor cyanide facilities to protect worker health and safety and periodically evaluate the effectiveness of health and safety measures.

in full compliance with

The operation is

in substantial compliance with

Standard of Practice 6.2

not in compliance with


Summarise the basis for this Finding/Deficiencies Identified:

SIGM is in FULL COMPLIANCE with Standard of Practice 6.2 requiring an operation operates and monitors cyanide facilities to protect worker health and safety and periodically evaluates the effectiveness of health and safety measures.

SIGM is in FULL COMPLIANCE with Standard of Practice 6.2 requiring an operation operates and monitors cyanide facilities to protect worker health and safety and periodically evaluates the effectiveness of health and safety measures.

SIGM has determined the appropriate pH for limiting the evolution of HCN gas during mixing and production activities. Test work at Lefroy Mill on optimising pH resulted in increasing the pH from 9.4 and 9.6 to 10.0, which has also resulted in lower cyanide consumption. The heap leach facility was operated at a pH of 10.0.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



ST IVES GOLD MINE – ICMC RECERTIFICATION AUDIT SUMMARY AUDIT REPORT

SIGM does use personal monitoring devices to confirm that controls are adequate to limit worker exposure to hydrogen cyanide gas and sodium, calcium or potassium cyanide dust to 10 parts per million on an instantaneous basis and 4.7 parts per million continuously over an 8-hour period, as cyanide.

SIGM has a fleet of approximately 155 Honeywell Monotox personal monitors that are calibrated on a 6 monthly basis. SIGM has an on-site occupational hygienist that reviews worker exposure and confirmed that there have been no exceedances of the 10 ppm and 4.7 ppm TWA levels.

SIGM has identified areas and activities where workers may be exposed to cyanide in excess of 10 parts per million on an instantaneous basis and 4.7 parts per million continuously over an 8-hour period and require use of personal protective equipment in these areas or when performing these activities.

SIGM has previously completed a hot spot survey of the operation and identified areas of the plant where higher HCN levels could be experienced and requires the use of monitors in the these areas. Procedures detail the PPE that needs to be worn for specific tasks including respiratory protection. The PPE is covered in the induction and cyanide awareness training packages.

Hydrogen cyanide monitoring equipment is maintained, tested and calibrated as directed by the manufacturer, and records are retained for at least one year. The site utilises both fixed and personal HCN monitors.

HCN monitors are allocated to individuals and they are responsible for bump testing and calibrating the units using the on-site docking station. If faults are identified the unit is placed out of service. As part of the bump testing regime, the docking station on site calibrates them on a 6 monthly schedule in accordance with manufacturer's recommendations.

Warning signs have been placed where cyanide is used, advising workers that cyanide is present, and that smoking, open flames and eating and drinking are not allowed, and that, if necessary, suitable PPE must be worn.

Showers, low-pressure eyewash stations and dry powder or non-acidic sodium bicarbonate fire extinguishers located at strategic locations throughout the operation.

SIGM completes monthly inspections on a rotational basis including inspections on showers, eyewash stations and fire extinguishers. Safety shower are connected to a ring main with a potable water supply.

The operation has identified unloading, storage, mixing and process tanks and piping containing cyanide to alert workers of their contents.


All concentrated cyanide lines are painted lilac, labelled "Cyanide" and have an arrow indicating the direction of flow. All tanks containing reagent strength cyanide are labelled as containing cyanide.

Safety Data Sheets (SDS), first aid procedures and informational materials on cyanide safety were available in the language of the workforce (English) in areas where cyanide is managed.

SDS' and first aid instructions (included within the SDS) are posted at the cyanide unloading area, at the entry points to the cyanide storage facilities. The operation has a Chemwatch database, which each worker has access to through the intranet that provides SDS.

Procedures are in place and being implemented to investigate and evaluate cyanide exposure incidents to determine if the operations programmes and procedures to protect worker health and safety, and to respond to cyanide exposures, are adequate or need revising.

St Ives Gold Mine
Name of Facility


Signature of Lead Auditor

18 October 2016
Date



**ST IVES GOLD MINE – ICMC RECERTIFICATION AUDIT
SUMMARY AUDIT REPORT**

The operation has a tiered incident reporting and investigation process that involves the assessment of the actual and potential outcome to govern the level of investigation. An incident that presents serious injury or had the potential to result in serious injury receives a more detailed investigation.

There have been no cyanide exposure incidents requiring medical treatment at SIGM during the audit period.

Standard of Practice 6.3: Develop and implement emergency response plans and procedures to respond to worker exposure to cyanide.

in full compliance with

The operation is in substantial compliance with **Standard of Practice 6.3**

not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

SIGM is in FULL COMPLIANCE with Standard of Practice 6.3 requiring an operation develop and implement emergency response plans and procedures to respond to worker exposure to cyanide.

The operation has the necessary equipment to respond in the event of a worker’s exposure to cyanide. SIGM has a medical clinic on site and the clinic is manned during day time operations by a paramedic, who is also on call at night. Emergency Services Officers (ESOs) and selected Emergency Response Team (ERT) members are also trained to certificate IV levels for first aid response.

The antidotes are stored at less than 25°C, as per manufacturer specifications.

On-site communication equipment consists of:

- Fixed and mobile phones
- VHF and CB radios
- Alarm system

Safety showers and oxy-socks are located strategically throughout the plant area for quick access in the event of an emergency. SIGM conducts inspections of its first aid equipment regularly to ensure that it is available when needed and materials such as cyanide antidotes are stored and/or tested as directed by their manufacturer and replaced on a schedule to ensure that they will be effective when needed.


The operation has established weekly inspection process for first aid equipment in the clinic and ambulance, and has implemented a tagging system to identify and maintain the integrity of equipment for use in an emergency. Cyanokits batch 201404-02 Exp 11/2017 were inspected and found to be stored correctly.

The operation has clinical guidelines that describe the assessment of cyanide exposure and administration of first aid including cyanide antidote, if needed. The cyanide awareness presentation provided basic information on the provision of medical oxygen. SIGM also has a procedure that details the use of Oxygen Soft Packs

The operation has an ambulance that can be used to transport exposed individuals to Kalgoorlie Regional Hospital by road. There are also two airstrips in proximity of the mine to provide air evacuation to Perth.

SIGM has made formalised arrangements with local hospitals to treat patients for cyanide exposure. The closest capable hospital is Kalgoorlie Regional Hospital that would also provide this service for other gold mines in the region. Alternatively, patients can be medevac’d to Perth via one of two service providers.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date




ST IVES GOLD MINE – ICMC RECERTIFICATION AUDIT SUMMARY AUDIT REPORT

SIGM has run cyanide specific mock drills periodically which have included worker exposure to cyanide scenarios. Mock Drill Reports are completed post exercise to evaluate what went well and what could be improved.

In addition to the mock drills the emergency response team complete regular training including practical aspects for hazardous materials response and first aid for chemical incidents.

SIGM has recently developed a Site Emergency Debrief procedure as part of process improvements that clarifies the process for conducting the debrief session, its scope, recommendations and actions.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



PRINCIPLE 7 – EMERGENCY RESPONSE

Protect Communities and the Environment through the Development of Emergency Response Strategies and Capabilities

Standard of Practice 7.1: Prepare detailed emergency response plans for potential cyanide releases.

in full compliance with

The operation is

in substantial compliance with

Standard of Practice 7.1

not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

SIGM is in FULL COMPLIANCE with Standard 7.1 requiring an operation prepare detailed emergency response plans for potential cyanide releases.

The operation has developed Emergency Response Plans to address potential accidental releases of cyanide. The operation has a tiered emergency response structure with an overarching Site Crisis Management Plan that provides the framework for managing emergencies at the site.

Supporting plans include:

- Cyanide Emergency Response Plan (CERP)
- Lefroy Processing Area Emergency Response Plan
- Health Watch Clinics – Clinical Practice Guidelines, Undated
- Health Watch Clinics –First Aid Treatment if Hydrogen Cyanide Exposure, January 2015
- SIG-ESD-GU016 HAZMAT Response Guide.


Scenarios are provided in the form of Pre-Incident Plans (PIPs) within the Cyanide Emergency Response Plan. SIGM has developed an emergency services risk register that includes assessment of cyanide transport, unloading, storage and decontamination

The primary documents detailing response actions are CERP and Tailings Management Plan.

The CERP includes information on:

- Roles and Responsibilities
- Incident Response
- Entry Protocols
- Plausible Scenarios
- First Aid
- Decontamination and Neutralisation.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



The Tailings Management Plan includes information on the following:

- Over Topping of Water Storage Dams
- Tailings and Return Water Line Systems
- Tailings Storage Embankment Failure
- Fauna death on or near the TSFs.
- Uncontrolled release of tailings slurry or return water and the cause (pipe break, overtopping, pump malfunction, automatic switch malfunction or operator error).
- Impact from seepage (vegetation distress, soil contamination, water quality changes).
- Defects impacting on the integrity of the tailings storage facility such as the embankments, decant, return water dams, bunds etc.
- Changes in water quality that exceed prescribed conditions of licence criteria.
- Increases in production tonnages above Notice of Intention levels.

The cyanide supplier, AGR, is contractually responsible for emergency response until the cyanide has been transferred into the storage tanks at St Ives. As such, AGR has a Transport Management Plan (TMP) that details response actions in the event of an emergency. The TMP considers:


- Transport routes
- Physical and chemical properties of the cyanide
- Method of transport
- Design of the vehicle.

The CERP contains Pre-Incident Plan 3 that covers response to transport related incidents on site.

The emergency response documentation does describe specific response actions (as appropriate for the anticipated emergency situations) such as clearing site personnel from the area of exposure, use of cyanide antidotes and first aid measures.

There are no communities within the vicinity of the site that would require response actions. Evacuation of site personnel is covered under the Lefroy Processing Area Emergency Plan and covered in the induction training provide to all personnel working or visiting the site.]

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



Standard of Practice 7.2: Involve site personnel and stakeholders in the planning process.

in full compliance with

The operation is

in substantial compliance with

Standard of Practice 7.2

not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

SIGM is in FULL COMPLIANCE with Standard of Practice 7.2, requiring an operation involve site personnel and stakeholders in the planning process.

The operation has involved its workforce and stakeholders in the cyanide emergency response planning process. There are no communities within proximity of the SIGM that could be impacted by a plausible on-site cyanide emergency. The CERP was revised in 2014 and recently SIGM has conducted a site wide emergency services risk assessment in 2016 that includes cyanide incidents and updated the CERP. Emergency Services Personnel and Operations personnel were involved in the review. The workforce is also engaged with through the mock drills and debrief process.

Whilst there is no communities that would be impacted by an on-site incident SIGM participates in the local emergency management committee, which is involved in managing a range of emergencies including hazardous materials incidents. SIGM has engaged with AGR in relation to transport of cyanide and with Kalgoorlie Regional Hospital for assistance in treatment of cyanide exposure. Given the distance of the site from Kalgoorlie, it is unlikely that the hospital will be actively involved in response.

The operation has made potentially affected communities aware of the nature of their risks associated with accidental cyanide releases.


The workforce at SIGM is considered to be the main group at risk from an on-site cyanide emergency as there are no downstream or nearby communities or residential camps. The operation has developed and implemented a Cyanide Awareness Training package as part of the site induction program, which is compulsory for all persons accessing cyanide areas on site. The training covers the nature of the risks associated with accidental cyanide releases and what action to take in the event of an emergency.

SIGM participates in the local emergency management committee which does consider transport incidents from hazardous materials.

The operation has involved local response agencies such as outside responders and medical facilities in the cyanide emergency planning and response process. Due to the location of SIGM mine site external response to an on-site incident is not anticipated. The CERP does detail mutual aid agreement with the Department of Fire & Emergency Services (DFES) and the Kambalda Volunteer Fire & Rescue Services. The training and procedures used by the on-site emergency response team for hazard materials response align with DFES to enable unified response should it be necessary.

The operation has engaged in consultation or communication with stakeholders to keep the ERP current. As noted, the operation has conducted a number of mock drills and has recently revisited a site wide emergency services risk assessment that included cyanide related incidents. The processing and emergency response teams were involved in the review and consideration of site specific constraints.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



**ST IVES GOLD MINE – ICMC RECERTIFICATION AUDIT
SUMMARY AUDIT REPORT**

Standard of Practice 7.3: Designate appropriate personnel and commit necessary equipment and resources for emergency response.

in full compliance with

The operation is in substantial compliance with **Standard of Practice 7.3**

not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

SIGM is in FULL COMPLIANCE with Standard of Practice 7.3 requiring an operation designate appropriate personnel and commit necessary equipment and resources for emergency response.

Section 4.0 of Cyanide Emergency Response Plan (CERP) does detail roles and responsibilities and provides that the Processing Supervisor assumes the role of On Scene Commander and the Area Manager assumes role of Incident Commander. The Emergency Services Coordinator and Emergency Response Team will respond to the incident and assist in implementing the plan.

At SIGM the ERT is the combat team when there is an emergency situation. This team is a volunteer team from employees at the mine that receive emergency response training including HAZMAT response. SIGM maintains an Emergency Personnel Roster that lists contact information for all ERT members. Dedicated emergency services officers provide initial assessment and coordination of response.

The CERP does require appropriate training for emergency responders. SIGM provides various theoretical and practical training to the ERT to enable response. The team member needs to demonstrate competence in hazardous materials response training, first aid, self-contained breathing apparatus prior to being allowed to respond to cyanide incidents. A review of training records confirmed that SIGM have sufficient capacity of trained personnel to form the strike teams detailed in the CERP.


Section 5.1 of the CERP provides that Initial emergency notification is received by the Security Gatehouse, by phone on extension 45 (08 9088 1845) or radio UHF Channel 2 and there is a procedure and contact details for escalation.

The CERP does specify the duties and responsibilities of coordinators and team members. The CERP specifies duties for the following roles:

- On Scene Commander
- Incident Controller
- Incident Management Team Leader
- Emergency Services Coordinator
- Emergency Response Team Captain
- Paramedic

The PIPs detail the emergency response equipment deemed necessary for each scenario including personal protective equipment and SIGM does have procedures to inspect emergency response equipment to ensure its availability. A review of completed checklists and inspection of equipment confirmed that equipment is inspected, available and in condition ready for use.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



**ST IVES GOLD MINE – ICMC RECERTIFICATION AUDIT
SUMMARY AUDIT REPORT**

The CERP does describe the role of outside responders and medical facilities, although external response is not anticipated for on-site cyanide related incidents. SIGM has mutual aid agreements in place. There are no potentially affected communities in proximity to the site.

The operation has made outside entities included in the ERP aware of their involvement and has included them as necessary in mock drills or implementation exercises. As noted external response is not anticipated for on-site cyanide related emergencies. SIGM has mutual aid agreements in place with the DFES and the Kambalda Volunteer Fire & Rescue Services. The training and procedures used by the on-site emergency response team for hazard materials response align with DFES to enable unified response should it be necessary.

Standard of Practice 7.4: Develop procedures for internal and external emergency notification and reporting.

in full compliance with

The operation is in substantial compliance with **Standard of Practice 7.4**

not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

SIGM is in FULL COMPLIANCE with Standard of Practice 7.4 requiring the development of procedures for internal and external emergency notification and reporting.

SIGM emergency documentation includes procedures and contact information for notifying management, regulatory agencies, outside response providers and medical facilities of the cyanide emergency.

The Emergency and Crisis Management Plan details the appropriate emergency notification and reporting (internal and external) and the call-out procedure and contact information lists, which are updated regularly.

The Lefroy Processing Area Emergency Plan provides the contact details for initiating and escalating an emergency including internal contacts, supplier and contractors that are likely to be involved. Contract details for processing, safety, environment and AGR are contained within the plan. SIGM emergency response documentation does includes procedures and contact information for communication with the media. SIGM have a process for communicating with the Media including stakeholder assessments, log sheets, contact information and Question and Answer sheet development.

There are no potentially affected communities in proximity of the site that could be impacted by an on-site cyanide incident.

Standard of Practice 7.5: Incorporate in response plans and remediation measures monitoring elements that account for the additional hazards of using cyanide treatment chemicals.

in full compliance with


The operation is in substantial compliance with **Standard of Practice 7.5**

not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

SIGM is in FULL COMPLIANCE with Standard of Practice 7.5, requiring an operation develop procedures for internal and external emergency notification and reporting.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



The SIGM emergency documentation describes specific remediation measures as appropriate for the likely cyanide release scenarios, such as:

- Recovery or neutralisation of solutions or solids.
- Decontamination of soils or other contaminated media.
- Management and/or disposal of spill clean-up debris.
- Provision of an alternate drinking water supply.

Alternative drinking water supply is not applicable to SIGM as there is no local potable supply. Water in the vicinity of SIGM is hypersaline.

The CERP does prohibit the use of chemicals such as sodium hypochlorite, ferrous sulfate and hydrogen peroxide to treat cyanide that has been released into surface water.

The CERP states:

This plan subscribes to the recommendations of the International Cyanide Management Code in that no chemicals are to be added to a flowing waterway in the event of a cyanide spill as these may only exacerbate the situation with their own toxicity characteristics.

The emergency documentation does address the potential need for environmental monitoring to identify the extent and effects of a cyanide release, and include sampling methods, parameters and, where practical, possible sampling locations.

The CERP provides details on the general sampling requirements to assess if the neutralisation process has been successful and this is supported by the Cyanide Spill Ground Decontamination procedure and Tailings Management Plan.

Standard of Practice 7.6: Periodically evaluate response procedures and capabilities and revise them as needed.

in full compliance with

The operation is

in substantial compliance with

Standard of Practice 7.6

not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:


SIGM is in FULL COMPLIANCE with Standard of Practice 7.6 requiring an operation periodically evaluate response procedures and capabilities and revise them as needed.

SIGM does review and evaluate the cyanide related elements of its ERP on a regular basis. The CERP was revised in 2014 and recently SIGM has conducted a site wide emergency services risk assessment in 2016 that includes cyanide incidents and updated the CERP. Emergency Services Personnel and Operations personnel were involved in the review. The workforce is also engaged with through the mock drills and debrief process.

SIGM has run cyanide specific mock drills periodically which have included worker exposure to cyanide scenarios. Drill Reports are completed post exercise to evaluate what went well and what could be improved. Environmental spills (on site) have been recorded and used in evaluation processes.

In addition to the mock drills the emergency response team complete regular training including practical aspects for hazardous materials response and first aid for chemical incidents.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



ST IVES GOLD MINE – ICMC RECERTIFICATION AUDIT SUMMARY AUDIT REPORT


SIGM has recently developed a Site Emergency Debrief procedure as part of process improvements that clarifies the process for conducting the debrief session, its scope, recommendations and actions. Provisions are in place to evaluate and revise the ERP after any cyanide related emergency.

Section 9.1 of the CERP provides that each exercise shall require a thorough debrief of participants with recommendations for any training, procedure or equipment changes documented. The documentation of each exercise, debrief notes and recommendations shall be kept by the Emergency Response Superintendent, The Processing Department is responsible for the entry of all Cyanide related incidents and debriefs into INX.

The flow chart in section 5.1 provides that an incident investigation and CERP is completed once incident response has been completed. There have been no incidents at SIGM during the audit period that have required implementation of the CERP.

The CERP was revised in 2014 and recently SIGM has conducted a site wide emergency services risk assessment in 2016 that includes cyanide incidents and updated the CERP.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



PRINCIPLE 8 – TRAINING

Train Workers and Emergency Response Personnel to Manage Cyanide in a Safe and Environmentally Protective Manner

Standard of Practice 8.1: Train workers to understand the hazards associated with cyanide use.

in full compliance with

The operation is in substantial compliance with **Standard of Practice 8.1**

not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

SIGM is in FULL COMPLIANCE with Standard of Practice 8.1 requiring an operation train workers to understand the hazards associated with cyanide use.

The operation does train all personnel who may encounter cyanide in cyanide hazard recognition.

SIGM has a tiered induction process. Prior to commencing work employees and contractors have to complete a General Lease Induction and then a Processing Department Induction prior to undertaking work at the Lefroy Mill and/or Heap Leach facility. The processing area induction contains information on the properties and hazards of cyanide and controls implemented on site.

Personnel working permanently in the mill or Heap Leach complete a Cyanide Awareness Training package based on AGR program that provides additional detail on cyanide hazards. All visitors must be escorted at all times by an inducted person and are not permitted to undertake work.


The Processing Induction package includes a knowledge assessment by the participant that is marked and signed off by a person deemed competent in assessing.

The Processing Induction training is refreshed every two years for permanent staff and every 12 months for contractors.

Interviews with personnel and a review of training records confirmed that training is provided. Cyanide hazard recognition refresher training is provided periodically. The Processing Induction (SIG-PRO-TRN001) is completed every two years. Cyanide Awareness training (based on AGR Cyanide Management) is completed every 12 months for permanent workers. A review of training records and interviews with site personnel confirmed that periodic training is provided.

The operation does retain cyanide training records. SIGM uses Sharepoint to record training attendance and training records.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



Standard of Practice 8.2: Train appropriate personnel to operate the facility according to systems and procedures that protect human health, the community and the environment.

in full compliance with

The operation is

in substantial compliance with

Standard of Practice 8.2

not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

SIGM is in FULL COMPLIANCE with Standard of Practice 8.2 requiring an operation train appropriate personnel to operate the facility according to systems and procedures that protect human health, the community and the environment.

SIGM does train workers to perform their normal production tasks, including unloading, mixing, production and maintenance, with minimum risk to worker health and safety and in a manner that prevents unplanned cyanide releases.

SIGM has a tiered induction process that employees and contractors complete before being allowed to work. The general lease induction covers general safety requirements including process to control isolations, entry into confined spaces and risk assessment tools used by SIGM. The processing area induction provides further information on hazards and controls applicable to the Lefroy Mill and Heap Leach areas. Permanent staff also complete a cyanide awareness training package prior to entering the work place.


Once these requirements have been completed the worker is teamed with an experienced operator who trains them on task specific procedures. The new employee is provided with self-paced training manual for the area that they are working and need to demonstrate that they can safely complete the task before being allowed to work independently. The shift supervisor is responsible for the training of their crew.

Work Instructions are in place for most normal production tasks, including unloading, mixing, production and maintenance. All Work Instructions which involve work where a worker may encounter Cyanide hazards exist when performing the task and the controls necessary to prevent exposure. All new workers are required to work under a Buddy System (SIG-PRO-PR109) for a minimum of one week or until the Supervisor is satisfied that the worker can perform the tasks safely.

The training elements necessary for each job involving cyanide management are identified in training materials.

SIGM have developed modules for each individual area of the plant that are provided to employees and used for self-paced learning. The training manuals are supported by task specific procedures and these are used to train personnel on the specific task. A SharePoint portal “Lefroy Mill Operations” has been created so that all training elements associated with specific job areas can be accessed easily. The Work Instructions are the fundamental basis for Process Technicians who are required to carry out routine Cyanide related tasks. Rotation through functional areas occurs on an as needs basis using the Buddy System facilitated by the shift Supervisor.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



**ST IVES GOLD MINE – ICMC RECERTIFICATION AUDIT
SUMMARY AUDIT REPORT**

SIGM uses a Buddy System for training and the procedure (SIG-PRO-PR109) notes that the person who is selected to be buddied with the new employee must have the following before leading any new employee:

- Have been part of the shift team at SIGM for a minimum of 12 months.
- Have completed training in JHA's, Level 1 Isolations and where required Cyanide Awareness.
- Be nominated by the supervisor

Employees are trained prior to working with cyanide. As noted in 8.1 workers completed a tiered induction process that includes information on cyanide prior to being allowed to undertake work. The Processing Induction (SIG-PRO-TRN001) contains information on risk management and cyanide. Additional AGR Cyanide Management training is completed by personnel who will be working on shift within Processing Production or Maintenance areas for more than two weeks.

Refresher training on cyanide management has been provided to employees that work with cyanide.

The Processing Induction (SIG-PRO-TRN001) is completed every two years. Cyanide Awareness training (based on AGR Cyanide Management) is completed every 12 months for permanent workers.

The tiered induction process includes knowledge assessments as participants complete modules. Once these have been successfully completed the worker is teamed with an experienced buddy who trains and observes the worker complete specific tasks.

There is a Monthly EHS Inspection requirement for six task observations to be conducted each month; this is a documented process with the records being stored within INX's Monthly EHS Inspections. The Processing & Maintenance Departments also have a monthly target of 50 TOPS (Task Observation Process for Supervisors) to be completed these will include cyanide related tasks.

Records are retained throughout an individual's employment documenting the training they receive. The records do include the names of the employee and the trainer, the date of training, the topics covered, and if the employee demonstrated an understanding of the training materials.

Standard of Practice 8.3: Train appropriate workers and personnel to respond to worker exposures and environmental releases of cyanide.

in full compliance with

The operation is in substantial compliance with **Standard of Practice 8.3**

not in compliance with


Summarise the basis for this Finding/Deficiencies Identified:

SIGM is in FULL COMPLIANCE with Standard of Practice 8.3 requiring an operation train appropriate workers and personnel to respond to worker exposures and environmental releases of cyanide.

Cyanide unloading, mixing, production and maintenance personnel trained in the procedures to be followed if cyanide is released.

Response to incidents and emergency situations is covered in the induction process that all employees must complete. Cyanide specific response actions aspects are covered in processing area induction and additional information is presented in the Cyanide Awareness Training material and via task specific procedures. SIGM has procedures for mill evacuation that includes response to cyanide releases and specific procedures for HCN gas and respiratory protection

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



ST IVES GOLD MINE – ICMC RECERTIFICATION AUDIT SUMMARY AUDIT REPORT

Site cyanide response personnel are trained in decontamination and first aid procedures. SIGM has dedicated emergency services officers and a volunteer emergency response team that provide response in the event of an emergency.

The ERT complete industry recognised training in the form of Certificate III in Mine Response and Rescue which includes responding to hazardous materials incidents. The ERT complete theory and practical training on the various response disciplines on a rotational basis.

The ERT are trained in first aid and there is an on-site paramedic with higher level first aid training.

Processing and maintenance personnel are instructed in the response actions in the event of a cyanide incident through the induction process and cyanide awareness training package.

The ERT conduct regular training drills and HAZMAT forms a significant part of the training and cyanide scenarios have been specifically included in these drills. Members of the ERT are trained in the use of breathing apparatus, fire response equipment, chemical response and decontamination.

The on-site paramedics have been trained in the cyanide treatment and have access to 24 hours emergency doctor advisory service to enable administration of medication. Due to the location of the mine, assistance with external responders is not anticipated for plausible on-site cyanide incidents. Notwithstanding, SIGM has mutual aid agreements in place with the DFES and the Kambalda Volunteer Fire & Rescue Services. The training and procedures used by the on-site emergency response team for hazard materials response align with DFES to enable unified response should it be necessary.


The ERT conduct regular training drills and HAZMAT forms a significant part of the training and cyanide scenarios have been specifically included in these drills. Members of the ERT are trained in the use of breathing apparatus, fire response equipment, chemical response and decontamination.

SIGM has conducted mock exercises that have involved evacuation of the mill and worker exposure to cyanide. Environmental spills (on site) have been recorded and used in evaluation processes.

In addition to the larger scale mock emergency drills the ERT conduct drills on a regular basis. This training is aimed at establishing and maintaining the skills of the responders and a large component of this training is responses to chemical emergencies and the use of equipment. Cyanide emergency drills are evaluated from a training perspective to determine if personnel have the knowledge and skills required for effective response. Training procedures are revised if deficiencies are identified.

Records are retained throughout an individual's employment documenting the training they receive. A review of ERT training records confirmed the records include the names of the employee and the trainer, the date of training, the topics covered, and if the employee demonstrated an understanding of the training materials.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



PRINCIPLE 9 – DIALOGUE

Engage in Public Consultation and Disclosure

Standard of Practice 9.1: Provide stakeholders the opportunity to communicate issues of concern.

in full compliance with

The operation is

in substantial compliance with

Standard of Practice 9.1

not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

SIGM is in FULL COMPLIANCE with Standard of Practice 9.1 requiring an operation provide stakeholders the opportunity to communicate issues of concern.

The operation does provide the opportunity for stakeholders to communicate issues of concern regarding the management of cyanide.

SIGM is in a regional location in Western Australia and the workforce either drives in and out or lives at company camp in nearby Kambalda. The site is located approximately 20 km south-east of the nearest community, Kambalda.

At a corporate level, Gold Fields develops an Annual Report. The 2014 issue states that the Gold Fields Australia operations comply with the requirements of the International Cyanide Management Code (ICMC) and that the SIGM operation is certified as fully compliant to the ICMC. The 2012 and 2013 issues both provide a link to the ICMI website and the 2012 issue incorporates a ‘Promoting environmental stewardship’ section which states:


“...cyanide represents the most potentially hazardous input material, meaning we place particular emphasis on its management. All our eligible operations have full certification under the International Cyanide Management Code (ICMC). This certification extends to our transport providers.”

The Gold Fields website provides information for contacting regional offices including Gold Fields Australia located in West Perth. There is also a contacts page that provides an avenue for stakeholders to communicate concerns or request information.

At an operational level, all employees, contractors and visitors are required to attend a Site Induction, prior to working on the site. The induction notes that cyanide is used on the site and promotes questions on the issue. Opportunity is provided during the presentation to answer questions from the participants.

SIGM also utilise an intranet site throughout the operation where operational procedures are maintained.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



**ST IVES GOLD MINE – ICMC RECERTIFICATION AUDIT
SUMMARY AUDIT REPORT**

Standard of Practice 9.2: Initiate dialogue describing cyanide management procedures and responsively address identified concerns.

in full compliance with

The operation is in substantial compliance with **Standard of Practice 9.2**

not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

SIGM is in FULL COMPLIANCE with Standard of Practice 9.2 requiring operations initiate dialogue describing cyanide management procedures and responsively address identified concerns.

SIGM has created opportunities for the operation to interact with stakeholders and provide them with information regarding cyanide management practices and procedures.

At an operational level, SIGM has developed opportunities to communicate to internal and external stakeholders. These mechanisms include those discussed in 9.1.1:

- Site Inductions
- Cyanide Awareness Training
- SIGM intranet site
- Cyanide Information Poster.

At a corporate level, Gold Fields has developed opportunities to communicate to internal and external stakeholders. These mechanisms include those discussed in 9.1.1:

- Gold Fields website
- Gold Fields Annual Report.

SIGM also participate in the local emergency management committee which include representation from the local government and the State Government Department of Fire and Emergency Services.

SIGM have an annual program were family and members of the community can visit the site and tour the facility. This includes the mill and an open question and answer process.

Standard of Practice 9.3: Make appropriate operational and environmental information regarding cyanide available to stakeholders.

in full compliance with


The operation is in substantial compliance with **Standard of Practice 9.3**

not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

SIGM is in FULL COMPLIANCE with Standard of Practice 9.3 requiring an operation make appropriate operational and environmental information regarding cyanide available to stakeholders.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



ST IVES GOLD MINE – ICMC RECERTIFICATION AUDIT SUMMARY AUDIT REPORT

SIGM has written descriptions of how their activities are conducted and how cyanide is managed. SIGM has developed a large poster that provides an overview of the Lefroy Mill circuit, what cyanide is, why it is used, what are the risks and what SIGM is doing to manage those risk. The Poster includes contact details for the mine.

SIGM can provide information in a verbal form through the annual site tour program. However as standard of education and literacy in the area is reasonable written information via website or poster is the primary method of providing information.

There is also opportunity to seek information verbally through the complaints hot line or via contacting the operation through the publicly advertised telephone numbers. SIGM is required to submit an Annual Environmental Report (AER) to the DER and DMP on an annual basis. The AER details all environmental incidents that occurred on site during the reporting period. Cyanide releases, including tailings spills are reported in the AER and this was confirmed in a review of the document. Permission from SIGM was not required to access the AER. The public can access the AER through the Freedom of Information Act 1992 (FOI Act).


Releases (environmental and exposures) that cause applicable limits for cyanide to be exceeded are advised to regulatory authorities as required by the safety and environment incident reporting and investigation procedure. The environmental releases are also reported within the AER.

All mining operations within Western Australia are required to report serious occurrences and mining injuries (including cyanide exposures) to DMP on designated forms. The Mining Injury Report Form requires information to be recorded concerning the nature of the injury, part of the body injured and incident details.

The Occurrence Report form lists up to 14 categories that require the form to be completed and submitted to DMP, including poisoning or exposures to toxic gas or fumes, and serious or potentially serious injury (including fatality).

The Resources Safety Incident Database managed by DMP was reviewed, but the information contained was in a form such that the operation and or company could not be identified. However, such information can be obtained by the public through FOI Act via the FOI Application for access to documents DMP Resources Safety form.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor


18 October 2016
Date



IMPORTANT INFORMATION

Your attention is drawn to the document titled – “Important Information Relating to this Report”, which is included in Appendix A of this report. The statements presented in that document are intended to inform a reader of the report about its proper use. There are important limitations as to who can use the report and how it can be used. It is important that a reader of the report understands and has realistic expectations about those matters. The Important Information document does not alter the obligations Golder Associates has under the contract between it and its client.

St Ives Gold Mine
Name of Facility



Signature of Lead Auditor

18 October 2016
Date



Report Signature Page

GOLDER ASSOCIATES PTY LTD

A handwritten signature in black ink, appearing to read 'E. Clerk', written over a light blue horizontal line.

Ed Clerk
ICMI Lead Auditor/Technical Specialist

LS/EWC/hsl

A.B.N. 64 006 107 857

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APPENDIX A

Important Information



IMPORTANT INFORMATION RELATING TO THIS REPORT

The document (“Report”) to which this page is attached and which this page forms a part of, has been issued by Golder Associates Pty Ltd (“Golder”) subject to the important limitations and other qualifications set out below.

This Report constitutes or is part of services (“Services”) provided by Golder to its client (“Client”) under and subject to a contract between Golder and its Client (“Contract”). The contents of this page are not intended to and do not alter Golder’s obligations (including any limits on those obligations) to its Client under the Contract.

This Report is provided for use solely by Golder’s Client and persons acting on the Client’s behalf, such as its professional advisers. Golder is responsible only to its Client for this Report. Golder has no responsibility to any other person who relies or makes decisions based upon this Report or who makes any other use of this Report. Golder accepts no responsibility for any loss or damage suffered by any person other than its Client as a result of any reliance upon any part of this Report, decisions made based upon this Report or any other use of it.

This Report has been prepared in the context of the circumstances and purposes referred to in, or derived from, the Contract and Golder accepts no responsibility for use of the Report, in whole or in part, in any other context or circumstance or for any other purpose.

The scope of Golder’s Services and the period of time they relate to are determined by the Contract and are subject to restrictions and limitations set out in the Contract. If a service or other work is not expressly referred to in this Report, do not assume that it has been provided or performed. If a matter is not addressed in this Report, do not assume that any determination has been made by Golder in regards to it.

At any location relevant to the Services conditions may exist which were not detected by Golder, in particular due to the specific scope of the investigation Golder has been engaged to undertake. Conditions can only be verified at the exact location of any tests undertaken. Variations in conditions may occur between tested locations and there may be conditions which have not been revealed by the investigation and which have not therefore been taken into account in this Report.

Golder accepts no responsibility for and makes no representation as to the accuracy or completeness of the information provided to it by or on behalf of the Client or sourced from any third party. Golder has assumed that such information is correct unless otherwise stated and no responsibility is accepted by Golder for incomplete or inaccurate data supplied by its Client or any other person for whom Golder is not responsible. Golder has not taken account of matters that may have existed when the Report was prepared but which were only later disclosed to Golder.

Having regard to the matters referred to in the previous paragraphs on this page in particular, carrying out the Services has allowed Golder to form no more than an opinion as to the actual conditions at any relevant location. That opinion is necessarily constrained by the extent of the information collected by Golder or otherwise made available to Golder. Further, the passage of time may affect the accuracy, applicability or usefulness of the opinions, assessments or other information in this Report. This Report is based upon the information and other circumstances that existed and were known to Golder when the Services were performed and this Report was prepared. Golder has not considered the effect of any possible future developments including physical changes to any relevant location or changes to any laws or regulations relevant to such location.

Where permitted by the Contract, Golder may have retained subconsultants affiliated with Golder to provide some or all of the Services. However, it is Golder which remains solely responsible for the Services and there is no legal recourse against any of Golder’s affiliated companies or the employees, officers or directors of any of them.

By date, or revision, the Report supersedes any prior report or other document issued by Golder dealing with any matter that is addressed in the Report.

Any uncertainty as to the extent to which this Report can be used or relied upon in any respect should be referred to Golder for clarification.

At Golder Associates we strive to be the most respected global group of companies specialising in ground engineering and environmental services. Employee owned since our formation in 1960, we have created a unique culture with pride in ownership, resulting in long-term organisational stability. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees now operating from offices located throughout Africa, Asia, Australasia, Europe, North America and South America.

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