

SUMMARY AUDIT REPORT

for the September 2012
International Cyanide Management Code Certification Audit



Prepared for:
Golden Star Resources Ltd/
Wassa Operations

Submitted to:
International Cyanide Management Institute
1200 "G" Street NW, Suite 800
Washington, D.C. 20005

FINAL
March 1, 2013



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SUMMARY AUDIT REPORT

Name of Mine: Wassa Mine

Name of Mine Owner: Golden Star (Wassa) Limited

Name of Mine Operator: Golden Star (Wassa) Limited

Name of Responsible Manager: Neale Laffin General Manager

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Location detail and description of operation:

The Golden Star Resources Ltd (GSR) Wassa mine is located in the Mphor Wassa East District, in the Western Region of Ghana. The mine is approximately 80 km north of Cape Coast and 150 km west of the capital, Accra. Wassa Mineral Resources Limited began operation of a small scale gravity circuit in 1988. They later partnered with other companies to form the consortium Satellite Goldfields Limited (SGL). In 1998, after further exploration and security of financing the consortium began operation of the Wassa Mine and processed ore by the heap leach method. The heap leach recovery proved to be low. This and the lull in gold prices forced SGL to stop operations. GSR began negotiations to acquire the mine in late 2001. Current ownership of the Wassa Mine is through a Ghanaian registered company, Golden Star (Wassa) Limited (GSWL).

Since reopening, the Wassa Mine ore is processed through a conventional carbon-in-leach (CIL) circuit. The plant is fed by a combination of newly mined ore and as needed is supplemented by material excavated from the old heap leach pad area. The feed from the grinding mills is dosed with cyanide and pumped through a 900 m long pipeline to a six stage CIL circuit, each stage comprising a 2,500 m³ leach tank. Separation of the mill from the rest of the process plant resulted from the existing infrastructure at the plant site area, with the crushers for the leach pad operation being located some 900 m from the former Adsorption-Desorption-Recovery (ADR) recovery section, where the CIL plant was constructed. The 900 m long pipeline, in which the cyanidated ore slurry is pumped under pressure, serves as a pipe reactor, having the same effect on the process as an additional CIL tank. The pipeline is, therefore, referred to as the Pipe Reactor Feed (PRF).

The design of the Tailings Storage Facility (TSF) is a conventional saddle dam arrangement, with a starter wall at the lower end on a valley, which is gradually being raised as the levels of tailings increases. The TSF as currently designed has a storage capacity of approximately 21 million tonnes, deposited at an average rate of 3.5 million tonnes per annum at a deposition density of about 41%.

The active cyanide facilities at the GSWL operation include:

- Solid cyanide storage facility;
- Cyanide mixing/storage facility located at the mill;
- CIL feed hopper;
- PRF pipeline;
- CIL plant;
- Carbon wash circuit;
- Elution circuit;
- TSF;
- Tailings delivery, distribution, and reclaim water pipelines;
- Process water ponds;
- Cyanide detoxification system; and
- Associated concrete and lined secondary containment structures, process pipes, valves, and pumps .

The approximate location of the Wassa Mine is shown in the following Figure:



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Auditors' Finding

The operation is: in full compliance
 in substantial compliance
 not in compliance

with the *International Cyanide Management Code*.

** The Corrective Action Plan (CAP) to bring the operations noted to be in substantial compliance into full compliance is attached (Attachment A) with this Summary Audit Report. The CAP must be fully implemented within one year of the date of this audit.

GSWL has experienced no significant ICMC compliance issues and has only used ICMC certified cyanide suppliers and transporters since the previous audit.

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Audit Team Leader: John Lambert
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Names and Signatures of Other Auditors

Mark Montoya



Date(s) of Audit: 3 September – 7 September 2012

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

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1. PRODUCTION Encourage responsible cyanide manufacturing by purchasing from manufacturers who 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.

The operation is: in full compliance
 in substantial compliance
 not in compliance...with Standard of Practice 1.1

Discuss the basis for this Finding/Deficiencies Identified:

GSWL continues to purchase sodium cyanide exclusively from Orica Australia Pty Ltd (Orica). The Cyanide Supply Agreement renewed on 1 April 2010 is valid until 31 March 2013. The Agreement requires that the Orica complies with the Code and therefore that Orica's Yarwun Plant be Certified under the Code. The Yarwun facility was recertified to the Code on 17 March 2010.

2. TRANSPORTATION Protect communities and the environment during cyanide transport.

Standards 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.

The operation is: in full compliance
 in substantial compliance
 not in compliance...with Standard of Practice 2.1.

Discuss the basis for the Finding/Deficiencies Identified:

The Supply Agreement states that in respect to storage, handling, packaging and transport of product Orica will be responsible for safety, security, prevention of losses of containment, training of relevant personnel, and emergency response activities up to delivery to the solid cyanide storage area at the Wassa Gold Mine site. Thereafter, GSWL is responsible for cyanide storage, management, as well as personnel training and emergency response.

Orica subcontracts the cyanide transportation and interim storage within Ghana to Barbex Technical Services Ltd., an ICMC certified transporter. The Barbex "Transport

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Management Plan for the Transport of Sodium Cyanide by Road from Barbex Technical Services Tarkwa to Golden Star Resources – Wassa Mine (2011, revised 2012) (BTMP) defines Barbex's roles and responsibilities including security during storage and transportation, vehicle maintenance, driver training and emergency response planning to comply with the ICMC.

The method of cyanide shipment has remained unchanged in the three years since the initial verification audit. Sodium cyanide is shipped to Ghana in 1,100 kg intermediate bulk container (IBC) plywood boxes that are packed within standard metal shipping containers. The shipping containers are placarded at the Yarwun plant in accordance with the International Marine Dangerous Goods (IMDG) Code with UN numbers, the Class 6 dangerous goods class label and the environmental hazard substance label.

Route selection within Ghana is the responsibility of Barbex in consultation with Orica. The trucks are regularly maintained by MBG of Tema, a service/maintenance company contracted by Barbex and drivers have constant radio communication with the Barbex warehouse throughout the route during shipment. Barbex as Orica's agent and transporter in Ghana is responsible for responding to emergencies during transportation of cyanide to the mine site. GSWL is available to offer assistance if requested.

2.2 Require that cyanide transporters implement appropriate emergency response plans and capabilities, and employ adequate measures for cyanide management.

- The operation is:
- in full compliance
 - in substantial compliance
 - not in compliance...with Standard of Practice 2.2.

Discuss the basis for the Finding/Deficiencies Identified:

Orica contracts Toll Resources Group (who contract QR National for the rail portion of the route) to truck and rail cyanide between the Yarwun plant to Port of Brisbane. The Port of Brisbane Intermodal Terminal managed by the Port of Brisbane is used as a transit storage area for containers intended for export. Orica uses Mediterranean Shipping Company (MSC) to ship cyanide between the Port of Brisbane and the Port of Takoradi. Barbex is currently Orica's agent in Ghana and has contractual responsibility for transporting the cyanide from the Port of Takoradi, via storage depot in Tarkwa to the Wassa plant site. The Supply Agreement requires that the Orica complies with the Code and therefore Orica must only use transporters certified under the Code. Review of the ICMI website confirms that all transportation contractors who could potentially be involved in any shipments of cyanide from Orica's Yarwin production facility in Australia to GSR's Wassa site have been certified to the ICMC.

Barbex provides GSWL with transportation documentation for cyanide being shipped between the Barbex/Orica warehouse in Tarkwa and the solid cyanide storage area but does not provide documentation covering shipment between the Orica's process plant in Yarwun and Tarkwa. However, evaluation of the ICMI website indicates that Orica's entire West African supply chain has been certified. Maintenance of chain of custody

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records for each element of the supply chain is addressed as an element of each of the corresponding Code supply chain Summary Audit Reports (SARs), which were examined on the ICMI website and determined to be acceptable. In addition shipping documentation was requested for a specified shipment of cyanide between Yarwun and Tarkwa. The documentation confirms that the origin, route and transporters used for the shipment were the same as those identified in Orica's SARs posted on the ICMI website.

3. HANDLING AND STORAGE: Protect workers and the environment during cyanide handling and storage.

Standards of Practice

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

The operation is: ■ in full compliance
 in substantial compliance
 not in compliance...with Standard of Practice 3.1.

Discuss the basis for this Finding/Deficiencies Identified:

GSWL has not constructed any new or modified any existing cyanide unloading, storage and mixing facilities since the 2009 ICMC verification audit. Prior to and during the 2009 audit, GSWL commissioned qualified persons to perform inspections of the cyanide storage and mixing facilities and certify that their design and construction meet industry standards.

GSWL receives sodium cyanide exclusively as solid briquettes in one-tonne nylon supersacks, packed in polyethylene bags and plywood pallet boxes. The boxes are stored at the solid cyanide storage facility, which consists of a concrete pad surrounded by a locked, chain link fence and covered by a metal roof. The operation has two cyanide mixing/storage facilities, designed by Metallurgical Design and Management (Pty) Ltd., which each consist of a mixing tank and storage tank situated within concrete containment. One facility is located at the mill and the other at the carbon-in-leach (CIL) plant. GSWL uses the facility at the CIL plant only as a backup to the primary facility located at the mill, and has not used it since prior to the 2009 verification audit.

The facilities are located within the secured area of the GSWL process facility, which is surrounded by chain link fence (topped with razor wire) and guarded 24 hours per day by security personnel, allowing authorized entry only. The solid cyanide storage facility remains locked, and an individual, locked, chain link fence surrounds the mixing and storage tanks. The facilities are over 1,500 metres from the nearest habitation and approximately 100 metres from the nearest downgradient surface drainage. The unloading, storage and mixing facilities are open-air (located outside) with adequate ventilation and competent secondary containment. Other reagents are stored separate



from these facilities. Both the mixing tank and storage tank are equipped with automatic level indicators and alarm systems.

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.

The operation is: ■ in full compliance
 in substantial compliance
 not in compliance...with Standard of Practice 3.2.

Discuss the basis for this Finding/Deficiencies Identified:

GSWL has implemented procedures, which address the rinsing, temporary storage and removal of empty cyanide containers and indicated that no procedural changes have occurred since the 2009 ICMC verification audit. These procedures provide sequences for each activity, list required personal protective equipment (PPE) and require that a second person be available to assist and act as a “buddy.” The unloading procedure specifies the transport of only one box at a time, and that boxes are stacked two high. GSWL has also implemented procedures to address cleanup of cyanide spills.

GSWL returns all used cyanide boxes to the supplier for reuse; however, the boxes are temporarily stored on site prior to removal by the transporter. Following offloading of a new cyanide shipment, used boxes stored at the solid cyanide storage facility are loaded into the empty shipping container for removal off site. Immediately following cyanide mixing, the empty boxes used for that particular mixing event are kept within a concrete containment adjacent to the mixing/storage facility bund before being moved to the solid cyanide storage facility or secured shipping containers at the chemical reagent yard.

The audit team physically witnessed a cyanide mixing event on September 5, 2012 and a cyanide unloading event on September 6, 2012. Based on observations made during these mixing and offload events, the auditor determined that GSWL must implement measures to better restrict access during these activities. Additionally, the auditor requested that GSWL retrain its workers on the Cyanide Offloading Procedure regarding the requirement that workers wait the specified amount of time after opening the shipping container containing the cyanide boxes before proceeding with the offload, and on the Cyanide Mixing Procedure regarding proper rinsing of equipment and the containment area following mixing events. Therefore, following this onsite audit, GSWL updated the offload and mixing procedures to include the requirement to install proper barricades and signage during offload and mixing events and provided the requested training records for both procedures. Additionally, GSWL updated the pre-mix safety checklist to include checks for proper blockades and provided completed copies of the checklist over a 30-day period. To demonstrate implementation of the new barricade and signage system, GSWL provided photographs of actual cyanide unloading and mixing events showing the additional blockades and warning signs placed to fully restrict access to the areas.



4. OPERATIONS: Manage cyanide process solutions and waste streams to protect human health and the environment.

Standards 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.

The operation is: in full compliance
 ■ in substantial compliance
 not in compliance...with Standard of Practice 4.1.

Discuss the basis for the Finding/Deficiencies Identified:

GSWL has developed written management and operating plans and procedures for its cyanide facilities. Following the 2009 ICMC verification audit, GSWL installed leak detection systems in the concrete ring-beam foundations at the CIL tanks; and therefore, developed a new procedure for monitoring these systems. During this recertification audit, GSWL indicated that there have been no other substantial changes to operating plans and procedures since the 2009 audit.

Primary cyanide facility changes occurring subsequent to the 2009 audit, include: modifications to the CIL Feed Hopper containment bund; installation of a pipe-in-pipe containment system for the Pipe Reactor Feed (PRF) pipeline where it crosses the roadway at the CIL plant via the overhead gantry; modifications to the CIL tank foundation piezometers; and construction of a concrete sediment catchment basin at the Mill Anti-Pollution Pond (construction was ongoing during this onsite recertification audit). GSWL implements a formal change management procedure to identify when process or operating changes may increase the risk for cyanide releases or exposure and provided documentation evaluating risks associated with changes that have occurred subsequent to the 2009 ICMC audit.

GSWL operating and contingency plans and procedures for its active cyanide facilities cover safe operation of these facilities and incorporate design criteria and regulatory requirements forming the basis of their operation. The Tailings Storage Facility (TSF) design report and operations manual provide the basis and procedures for operating the facility within established parameters and regulatory requirements and includes monitoring, inspection and maintenance, and contingency operating plans for a number of emergency situations. GSWL also implements procedures, which ensure the safe containment of solutions in the process water ponds and maintenance of the water balance model.

GSWL implements comprehensive, appropriately-documented, inspection and preventative maintenance programs. The TSF is inspected on a daily, weekly and quarterly basis. The daily TSF inspections include (amongst other items) tailing beach levels; supernatant pond location, elevation and depth; operation of decant pumps; pipelines; embankment integrity; seepage sumps; water balance; and observations for



wildlife mortalities. Operations personnel conduct routine inspections of process areas (covering tanks, secondary containments, ponds, pipelines, pumps and valves) and document these inspections on a series of checklists. The maintenance department performs routine preventative maintenance inspections of process equipment and outside contractors perform routine thickness testing on the process tanks and the PRF pipeline.

GSWL has onsite diesel-powered generators, which provide emergency power during line outages. GSWL indicated that the total estimated capacity of the active generators is roughly 10,500 kilo-volt amps and that the units generally power one ball mill, the CIL plant, and pumps at the TSF and process water ponds during line outages. The auditor verified that GSWL has consistently implemented its preventative maintenance program for the emergency generators over the period between the 2009 ICMC verification audit and this recertification audit.

During the field inspection conducted during the onsite audit, the auditor observed several issues requiring attention, including: damaged concrete secondary containments at the CIL tanks and the acid wash and elution circuit, and a clogged drainpipe at the CIL tank containment bund. Additionally, areas of the CIL tank containment were full of slurry due to ongoing maintenance at the plant; thus, the auditor could not evaluate the physical integrity of the entire containment structure during this field audit. Please refer to **Corrective Action Request (CAR) GSWL-ICMC-CAR-01** in Attachment A.

The auditor reviewed inspection records over the three-year period between the 2009 ICMC verification audit and this ICMC recertification audit. Although GSWL is conducting comprehensive inspections of its cyanide facilities, the inspection records provided over the period between audits were incomplete with records missing over extended periods. Additionally, the inspection checklists reviewed suggest that personnel performing the inspections are not consistently recording all information, and in some cases, issues identified are not rectified in an expeditious manner. Please refer to **CAR GSWL-ICMC-CAR-02** in Attachment A.

GSWL has implemented a program for inspecting and maintaining its cyanide facilities on a routine basis and these inspections are generally documented in good fashion. Furthermore, GSWL's existing operating and monitoring procedures and resulting water quality history, demonstrate that the Wassa operation's cyanide facilities protect against cyanide exposures and releases to the environment. Therefore, based on this evidence, no immediate or substantial risk to health, safety or the environment is deemed to exist during implementation of **CARs GSWL-ICMC-CAR-01** and **GSWL-ICMC-CAR-02**.

4.2 Introduce management and operating systems to minimize cyanide use, thereby limiting concentrations of cyanide in mill tailings.

The operation is:

- in full compliance
- in substantial compliance
- not in compliance...with Standard of Practice 4.2.

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Discuss the basis for this Finding/Deficiencies Identified:

GSWL processes a blend of oxide and fresh ore, mined from a number of surface pits and intermittently, from inactive heap leach pads. During project feasibility, GSWL conducted metallurgical test work and determined that the mineralized material from the deposit was highly suitable for conventional CIL processing. The initial test work determined the expected cyanide consumption for both oxide and fresh ore.

GSWL uses an automated online cyanide monitor and controller to regulate, and minimize, cyanide addition at the CIL plant. The controller monitors plant parameters and online actual titrated cyanide values to determine the amount of cyanide that should be added to drive the plant toward a desired set point. Additionally, GSWL performs manual titrations at the CIL tails tank every two hours. To optimize recovery and minimize cyanide consumption, the operation attempts to maintain Free cyanide concentrations at the head tank between 100 and 150 milligrams per liter (mg/L). The target concentration at the tails tank is 60 mg/L. During this onsite recertification audit, random samples of electronically compiled log sheet data were reviewed for the period 2009 to date, and concentrations at the head tank were generally within the set point range.

GSWL adds dilution water at the tailings hopper to further lower cyanide concentrations in the tailings stream. If it becomes critical for recovery purposes to keep Free cyanide concentrations at the tails tank above 60 mg/L, then in addition to the tailings hopper dilution water, hydrogen peroxide is added into the tank launder to the tailings screen.

4.3 Implement a comprehensive water management program to protect against unintentional releases.

The operation is: ■ in full compliance
 in substantial compliance
 not in compliance...with Standard of Practice 4.3.

Discuss the basis for the Finding/Deficiencies Identified:

GSWL continues to use its spreadsheet-based water balance model developed in 2007. During this recertification audit, the auditor reviewed the water balance model to verify that it considers current information in a reasonable manner (e.g., current water management plan, facility configuration, etc.).

The primary water management components of the GSWL operation include the TSF, process water ponds, process plant and cyanide detoxification system. The primary gains and losses to the system include precipitation, makeup and TSF reclaim water, evaporation, and seepage. GSWL updates the water balance monthly with actual data and primarily uses the model as a water consumption accounting tool versus as a probabilistic, predictive modeling tool. Nonetheless, it is recognized that the water balance model is used to evaluate conditions for 1 in 10 wet year rainfall and 1 in 10 dry



year rainfall. Additionally, the TSF is managed to provide adequate capacity to contain the rainfall from a 100-year, 24-hour event while providing an additional one metre of freeboard. Therefore, the current model, in combination with the TSF operating procedures, is adequate to manage the GSWL site water balance.

GSWL performs comprehensive inspections of the TSF including individual daily inspections by the operators, shift supervisors, and the tailings supervisor, and quarterly inspections by the design engineer. The intent of the TSF management procedure is to minimize the supernatant pond area and center the pond away from the embankments. GSWL performs routine beach surveys and records water levels daily. Water levels and supernatant pond locations are recorded on the daily inspection sheets. For purposes of the water balance model, GSWL assumes the beach area and supernatant pond area remain constant.

The TSF design engineer conducts quarterly inspections of the facility to ensure that it is operated safely, efficiently, and in accordance with the design intent and generally accepted good practice; and inspection reports reviewed during this audit concluded that the structural integrity of the TSF embankments is generally fine. Additionally, the design engineer independently evaluates the Wassa operational water balance and advises GSWL on the management of the TSF. During this recertification audit, GSWL provided evidence demonstrating that it is recording and providing the information critical to manage the TSF supernatant pond at optimum levels and to ensure that adequate freeboard is maintained.

GSWL has takes necessary routine action to manage excess water and closely monitor the TSF using its water balance model. In its May 2012 report, the design engineer concluded that the structural integrity of the TSF embankments is generally fine. Furthermore, water quality data downgradient of the TSF demonstrate that seepage and indirect discharges have not caused cyanide concentrations in groundwater or surface water to rise above levels protective of the beneficial use. Therefore, based on this evidence and the robust inspection program implemented at the TSF, no immediate or substantial risk to health, safety or the environment is deemed to exist during implementation of this CAR.

The initial water balance model was calibrated using meteorological data collected over a 30-year period from the Tarkwa weather station, which is located approximately 40 kilometres from the site. GSWL currently collects meteorological data at an onsite station located at the mill. These data are collected daily by the environmental department and used to update the water balance model on a monthly basis.

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

The operation is:

- in full compliance
- in substantial compliance
- not in compliance...with Standard of Practice 4.4.

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Discuss the basis for the Finding/Deficiencies Identified:

GSWL does not have any open waters in which WAD cyanide concentrations exceed 50 mg/L and does not implement wildlife deterrent systems. The TSF and the process water ponds are the only facilities where process solutions are open to the environment. Water quality data reviewed for the period August 5, 2009 through July 2, 2012 demonstrate that WAD cyanide concentrations in the TSF supernatant pond and in the process water ponds remained below 50 mg/L. During the same period, WAD cyanide concentrations at the tailings spigot discharges were generally below 50 mg/L with some exceptions, which occurred intermittently over short durations. GSWL addresses these spikes by adjusting peroxide addition at the tailings hopper.

GSWL conducts daily inspections of the TSF and process water ponds. These inspections include monitoring for wildlife mortalities. In August 2011, GSWL environmental personnel began conducting supplemental monthly wildlife inspections at the TSF. Inspection records reviewed during this recertification audit indicate that no wildlife mortalities have occurred. GSWL personnel reiterated that the operation has not had any cyanide-related wildlife mortalities, to date.

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

The operation is: ■ in full compliance
 in substantial compliance
 not in compliance...with Standard of Practice 4.5.

Discuss the basis for the Finding/Deficiencies Identified:

During the wet season, the water balance at the Wassa operation is in a positive state, with the requirement to provide detoxification and discharge to the receiving environment (surface waters). The cyanide detoxification plant consists of a series of ponds utilizing retention time and hydrogen peroxide. The operation may also discharge directly from the Mill Antipollution Pond if both Environmental Protection Agency (EPA) and ICMC water quality criteria are met.

The EPA discharge standards for cyanide, applicable to the GSWL operation (Mining and Minerals Processing Sector), are 0.2 mg/L Free, 0.6 mg/L WAD and 1.0 mg/L Total. The operating procedure for the cyanide detoxification plant currently incorporates the EPA water quality guidelines and the ICMC surface water discharge standard for aquatic life (0.022 mg/L Free cyanide) as the allowable discharge standards. Records reviewed during this recertification audit indicate that the last direct discharge to surface water was from the Mill Antipollution Pond on June 29, 2009. Testing prior to discharge demonstrated that water quality met the ICMI standard for Free cyanide.

The TSF is an unlined facility and the embankments are designed with upstream and downstream toe drains to collect and convey seepage to sumps. GSWL monitors these sumps monthly for cyanide. Monthly water quality data provided over the period 2009

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through June 2012 demonstrate that Free cyanide concentrations in all three sumps were generally below 0.022mg/L. Nonetheless, water from these sumps is not released to surface water.

Water quality data provided for the period January 2009 through June 2012 demonstrate that Free cyanide concentrations at the four downgradient surface water monitoring points were below 0.022 mg/L on all occasions. Additionally, Environmental personnel interviewed during this recertification audit stated that there have been no unplanned releases or indirect discharges, which have resulted in the requirement for remedial action.

4.6 Implement measures designed to manage seepage from cyanide facilities to protect the beneficial uses of ground water.

The operation is: ■ in full compliance
 in substantial compliance
 not in compliance...with Standard of Practice 4.6.

Discuss the basis for the Finding/Deficiencies Identified:

The TSF is an unlined facility and the embankments are designed with upstream and downstream toe drains to collect and convey seepage to sumps. Water collected in seepage sumps is returned to the TSF impoundment or to the process water ponds. The embankments rely on the tailings deposited in the facility for support; therefore, operational procedures call for managing the supernatant pond to keep it a minimum distance of 100 metres from the embankments. Additionally, operational procedures specify that the pond be maintained as small as possible in order to minimize seepage from the facility, maximize the flood absorption capacity of the facility, and maximize the area available for drying and consolidation of the tailings.

The four process water ponds (used to store TSF reclaim water) are double-lined, and two of the ponds have leak detection systems. During the 2009 ICMC verification audit, GSWL indicated that the leak detection systems at the process water ponds were not operational or monitored. During this recertification audit, it was determined that GSWL monitors these systems. Additionally, GSWL monitors surface water on a monthly basis at two points immediately downgradient of the ponds, one of which is an underdrain.

Monitoring bores are installed downstream of the TSF embankments to enable sampling and analysis of the receiving groundwater regime. In total, and on a monthly basis, GSWL samples eight groundwater monitoring wells at four separate locations (each monitoring location has a shallow well and a deep well). GSWL environmental personnel indicated that the downgradient use of groundwater and surface water is primarily agriculture plus domestic (including drinking) at the nearby Kubekro community. Additionally, according to GSWL personnel, the Ghana EPA does not have a regulatory limit for cyanide in groundwater and there is not a designated beneficial use (set by EPA or other regulatory agencies) for groundwater downgradient of the site.

GSWL monitors cyanide at the eight onsite wells against its internally established numerical guideline of 0.022 mg/L Free cyanide. Because two wells at the Kubekro community provide a supply of drinking water, GSWL was required to monitor quality at these wells against the Ghana Standards Board and the Ghana Water Company Limited drinking water guideline for cyanide (0.01 mg/L Free cyanide). This guideline for cyanide applies to any water (surface water or groundwater) that is supplied as drinking water. Monthly groundwater quality data provided for over the period January 2009 through June 2012 demonstrate that WAD cyanide concentrations at all eight onsite monitoring wells were below the detection limit of 0.01 mg/L except on one occasion (i.e., the reported August 2009 WAD and Free cyanide concentrations were 0.34 mg/L and 0.13 mg/L, respectively at well MB-03A, located downgradient of Saddle Dam 4). GSWL periodically monitored the two Kubekro community wells over the period January 2011 through January 2012. All monitoring results over this period demonstrate that WAD and Free cyanide concentrations at these wells were less than the detection limit (<0.001 mg/L); thus, GSWL no longer monitors these wells.

Seepage has not caused cyanide concentrations in groundwater to rise above levels protective of the beneficial use and no remedial activity is currently required.

4.7 Provide spill prevention or containment measures for process tanks and pipelines.

The operation is: ■ in full compliance
 in substantial compliance
 not in compliance...with Standard of Practice 4.7.

Discuss the basis for the Finding/Deficiencies Identified:

GSWL has implemented spill prevention and secondary containment measures for all cyanide mixing, storage and process solution tanks. All tanks have concrete secondary containment, which provides adequate capacity for the largest tanks located within the containments. Sumps with automated pumps return any collected solution and slurry to the process. Additionally, GSWL has implemented written procedures for the removal of precipitation and spillage collected in the secondary containments. Please refer to **CAR GSWL-ICMC-CAR-01** referenced in Section 4.1 above regarding the corrective actions related to the required cleaning and repair of secondary containments.

The cyanide mixing and storage tanks are situated on concrete plinths (ring beams) located within a concrete bund, which provides secondary containment. The design drawings depicting the tank foundations demonstrate that the concrete floor of the bund area extends beneath the tank foundations, creating an impermeable barrier between the tank bottoms and the ground. The CIL feed hopper located at the mill is situated within a concrete bund that is hydraulically linked (via a concrete channel) to the synthetic-lined Antipollution Pond, which provides tertiary containment. At the process plant, six CIL tanks are also situated on concrete plinths (ring beams) located within a concrete bund. Design drawings reviewed during the 2009 ICMC verification audit demonstrate that the foundations do not provide an impermeable barrier between the

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tank bottoms and the ground. Consequently, GSWL installed leak collection and recovery systems within the CIL tank ring foundations to allow for identification of any leakage prior to it entering the environment. The carbon wash and elution circuits are also contained within a concrete bund and the associated process vessels are supported above the concrete bund floors.

GSWL has constructed pipelines with spill prevention and containment measures to collect leaks and prevent releases. Single-walled pipelines are either located within concrete or lined containment or are above ground where they can be visually inspected, and certain pipelines are equipped with pipe-in-pipe systems. To supplement the secondary containment structures, GSWL has implemented procedures to prevent releases to the environment from process solution pipeline leaks or ruptures.

At the mill, where the PRF pipeline leaves the CIL feed hopper bund, a steel gantry supports the rubber-lined steel pipe overhead across the ore crushing area, facilitating visual inspection. Once the PRF leaves the crushing/mill site, the pipeline becomes high-density polyethylene (HDPE) and is contained within a synthetic-lined channel alongside the road between the mill site and the CIL plant. A lined catchment basin with an automatic sump pump is located near the mill (at the low point of the channel). Any slurry collected in this catchment is pumped to the CIL bund containment. If excessive spill inflow or pump failure causes the catchment to reach capacity, the mill feed automatically terminates via an interlock system. Near the CIL plant, the PRF converts back to a rubber-lined steel pipeline at the point where it leaves the synthetic-lined channel and crosses overhead, via a steel gantry, into the CIL bund area. Flange covers are provided along the PRF at high activity work areas and where the pipeline crosses outside of synthetic-lined or concrete secondary containment. Additionally, segments of the PRF pipeline (at higher risk areas) are provided with HDPE or steel pipe sleeves (i.e., pipe-in-pipe containment).

For portions of the tailings delivery, distribution and reclaim water pipelines that present a risk to surface water, the pipelines are within a lined secondary containment channel or located on the inside slope of the TSF embankments. The lined secondary containment channel, provided for the tailings delivery pipeline, drains to the lined process water ponds.

GSWL uses steel, rubber-lined steel, HDPE and polyvinyl chloride (PVC) primary containment pipelines for conveyance of cyanide solutions and slurries. Cyanide mixing, storage and process tanks are steel. These materials are compatible with cyanide and high pH solutions.

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

The operation is:

- in full compliance
- in substantial compliance
- not in compliance...with Standard of Practice 4.8.

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Describe the basis for the Finding/Deficiencies Identified:

New cyanide facilities and modifications to existing cyanide facilities constructed subsequent to the 2009 ICMC verification audit, include:

- Construction of Stage III, Stage IV and Stage V TSF embankment raises;
- Installation of synthetic liner in the Mill Antipollution Pond;
- Modifications to the CIL Feed Hopper containment bund; and
- Installation of the steel pipe sleeve for the PRF pipeline crossing overhead at the CIL plant.

GSWL implemented comprehensive construction quality assurance and quality control (QA/QC) programs for the TSF embankment raises, installation of the liner in the Mill Antipollution Pond and modifications to the CIL Feed Hopper containment bund and installation of the PRF pipe sleeve. These programs were conducted by appropriately qualified personnel. Additionally, during this recertification audit, the auditor obtained copies of QA/QC documentation identified during the 2009 audit for the then active cyanide facilities.

4.9 Implement monitoring programs to evaluate the effects of cyanide use on wildlife, surface and ground water quality.

The operation is: ■ in full compliance
 in substantial compliance
 not in compliance...with Standard of Practice 4.9.

Describe the basis for the Finding/Deficiencies Identified:

GSWL has prepared and implemented written standard procedures for monitoring activities to evaluate the effects of cyanide use on wildlife, surface water and groundwater quality, and indicated that there have been no substantial changes to environmental monitoring plans and procedures since the 2009 ICMC verification audit. The sampling and analytical protocols have been developed by appropriately qualified personnel and incorporate all appropriate requirements including chain of custody procedures and cyanide species to be analyzed.

GSWL monitors for cyanide in direct discharges to surface water at two locations; at the process water ponds where tailings reclaim water is collected, and at the Antipollution Pond near the mill. Additionally, GSWL monitors for cyanide in surface water and groundwater downgradient of the site to ensure indirect discharges are not occurring. Surface water is monitored at four locations downgradient from the detoxification pond system, the process water ponds and the TSF. Additionally, GSWL monitors four seepage sumps at the TSF. GSWL monitors eight onsite groundwater wells and, until January 2012, two groundwater wells located at the Kubekro community. Each onsite monitoring location has a shallow well and a deep well.



Wildlife monitoring is integrated into the daily inspections performed at the TSF. Additionally, in August 2011, GSWL environmental personnel began conducting supplemental, monthly wildlife inspections at the TSF. Inspection records reviewed during this recertification audit indicate that no wildlife mortalities have occurred. GSWL personnel reiterated that the operation has not had any cyanide-related wildlife mortalities, to date.

GSWL conducts monitoring at frequencies adequate to characterize surface water and groundwater quality and wildlife mortalities. The Environmental Monitoring Matrix presents the surface water and groundwater monitoring schedules. Surface water and groundwater monitoring points are sampled for cyanide, at minimum, on a monthly basis. The TSF underdrain sumps are sampled for cyanide monthly. Discharge water quality from the process water ponds and their underdrain system is monitored monthly. Wildlife monitoring at the TSF is conducted daily.

5. DECOMMISSIONING Protect communities and the environment from cyanide through development and implementation of decommissioning plans for cyanide facilities.

Standards of Practice

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

The operation is: in full compliance
 in substantial compliance
 not in compliance...with Standard of Practice 5.1.

Describe the basis for the Finding/Deficiencies Identified:

The original Decommissioning Plan for GSWL, dated December 2004, formed the basis of the initial Reclamation Security Agreement between GSWL and EPA. This Plan with updates and a similar Decommissioning Plan prepared for GSR's Bogoso/Prestea mining operations were subsequently merged into one Closure Plan for GSR's Ghanaian Mining Operations. This Closure Plan is updated annually and contains provisions for decommissioning, rehabilitation and closure of GSWL's operations that include Wassa and the new Benso, Hwini Butre and South Akyempim projects. At Wassa, the Closure Plan addresses all the support facilities for the open pit mine and also the processing plant with its attendant maintenance facilities, process water ponds and the tailings storage facility. Modifications to the Plan were made in 2011 to incorporate the expansion of the TSF footprint due to raises to the embankments and the incorporation of the borrow areas for the raises.

After becoming a signatory to the ICMC, GSWL developed a Cyanide Facility Decommissioning Plan (CFDP) which describes a conceptual schedule and details the activities and sequence in which the cyanide facilities will be decommissioned the costs for decommissioning cyanide facilities from other non-cyanide facility decommissioning activities.

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The Rehabilitation and Closure Plan is reviewed annually in conjunction with annual update of the Asset Retirement Obligation (ARO) estimate. The CFDP is also reviewed annually and updated as applicable.

5.2 Establish an assurance mechanism capable of fully funding cyanide-related decommissioning activities.

The operation is: in full compliance
 in substantial compliance
 not in compliance...with Standard of Practice 5.2.

Describe the basis for this Finding/Deficiencies Identified:

The operation has developed an estimate of the cost to fully fund implementation of cyanide facility decommissioning. The ARO rehabilitation and closure requirements are prepared on a cost spreadsheet that is updated annually to reflect changes in plant, contractor rates and inflation. The costs include an addition of 6% for preliminary and general contractor costs and a 10% contingency.

The costs for decommissioning activities are covered through a Reclamation Security Agreement, dated 27 April 2012, between GSWL and Ghana EPA that is guaranteed through CAL Bank, and a bank (also held by CAL Bank) cash deposit. The guarantee was based on the 2011 ARO assessment and RCP approved by Ghana EPA. The guarantee is substantially higher than the Reclamation Security set for 2010 as it includes additional bonding related to the new Hwini Butre Benso and South Akyempim projects.

6. WORKER SAFETY Protect workers' health and safety from exposure to cyanide.

Standards of Practice

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

The operation is: in full compliance
 in substantial compliance
 not in compliance...with Standard of Practice 6.1.

Describe the basis for the Finding/Deficiencies Identified:

GSWL has standard operating procedures (SOPs) in place that include measures to eliminate, reduce and control cyanide exposure. These are basically unchanged since the verification audit in 2009 and include procedures that address sodium cyanide delivery, unloading, mixing, plant operations, entry into confined spaces and equipment decontamination. The procedures are reviewed and updated as needed when there is a change in process or plant.

Procedures specify the minimum PPE required and provide pre-work instruction including checking equipment and work conditions prior to starting an assignment.

Depending on the task pre-checks include ensuring personnel are trained for the task; monitoring hydrogen cyanide (HCN) gas concentration; inspecting PPE equipment and testing eye-wash and shower operation; ensuring correct positioning of flow valves; and checking the condition of tools and other equipment. Operating procedures also include requirements for Safe Work Permits or Confined Space Entry Permits.

GSWL implements a formal change management procedure to identify when process or operating changes may increase the risk for cyanide releases or exposure and provided documentation evaluating risks associated with changes that have occurred subsequent to the 2009 ICMC audit. The change management procedure requires signed approval by Safety, Environmental, Engineering, Maintenance, Electrical and the Head of the Department originating the change.

Workers are trained to regard safety as a first priority and in addition to being encouraged to freely discuss safety issues with their supervisors; workers may provide input into developing and evaluating health and safety procedures during pre-shift (toolbox) meetings, daily safety talks, and monthly department safety meetings. The safety department provides monthly forums where a safety topic is presented and discussed. Other avenues available include an onsite suggestion box and an online forum or speakers board (www.reportit.net) where workers can post issues in confidence to a third party hotline service.

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

The operation is: in full compliance
 in substantial compliance
 not in compliance...with Standard of Practice 6.2.

Describe the basis for the Finding/Deficiencies Identified:

GSWL has established that process solutions must be maintained at a pH > 10 to prevent the generation of HCN and maximize use of cyanide in the lixiviation process. Operators monitor the pH of each CIL tank every two hours. The results are reported on the daily log sheets. Lime is added to as required to maintain the pH above 10. Review of process plant daily report records for 2010, 2011 and 2012 showed that pH levels in the head tank were, with few exceptions, being maintained between 10.1 and 10.6. To prevent the generation of HCN, a pH > 12 is required during preparation of reagent cyanide solution. The pH measured prior to a mix is entered into a log book. Records are available for the last three years.

GSWL has identified areas where there is a potential for HCN generation and installed fixed HCN monitors which alarm when HCN gas levels exceed 4.7 ppm and 10 ppm. GSWL also continues to monitor HCN levels at different areas of the plant on a weekly schedule to evaluate changes in potential risk. Records of weekly HCN monitoring were available covering the last three years. New HCN monitors were installed in April 2012

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to replace the monitors in use at the time of the verification audit in 2009. These replacement monitors were fitted with visual alarms; however, two of the monitors were not equipped audible alarms. Audible alarms were installed at these two HCN monitors prior to submission of this report. The new fixed HCN monitors were not being calibrated as per manufacturer's recommendations although the monitor readouts were checked against a portable HCN monitor and recalibrated when significant deviation was observed. Subsequent to the audit GSWL set up a contract arrangement with an outside contract to calibrate the fixed monitors as per manufacturer recommendations. Calibration records were provided confirming that the five fixed monitors had been calibrated.

Operating procedures specify the type of PPE needed when undertaking a given task and require the use of personal HCN monitors when working in areas of the plant or on tasks where HCN gas may be present. Workers are trained in the use of portable monitors and use and maintenance of PPE, including full face respirators. GSWL currently has four portable HCN monitors and a multigas monitor that also detects HCN. The monitors are calibrated by NFICO Ghana Ltd, the instrument supplier. Calibration records were available from 2010 to date. It was noted that operators did not have a clean storage environment to protect respirators when not in use. Subsequent to field component of the audit storage bags were provided to protect respirators from dust and cartridges were disconnected and stored separately in a plastic bag to minimize potential contamination from ambient vapours. Procedures require the use of SCBA in situations requiring access to areas where HCN gas concentrations may exceed 40 ppm.

The placement of warning signage was observed to be good and well maintained. As in the 2009 verification audit cyanide warning signs are prominently displayed on fencing surrounding the mix tanks and cyanide storage compound, and along the PRF pipeline corridor. Warning signs are also posted at the mill and CIL cyanide dosing tanks. In addition, the CIL tanks are prominently labeled as such and the plant is well signed to show required PPE. Process lines are well labeled to identify their contents and flow direction. Cyanide pipelines are colour-coded purple and are also labeled to show flow direction. Cyanide warning signs are also posted along the PFR line and at the TSF.

Shower /eyewash stations are installed at strategic locations around the plant in areas where cyanide is used. The location of these stations has not changed since the 2009 verification audit, except for an additional shower/eyewash installed at the cyanide storage compound. The stations are inspected and maintained on a weekly PM schedule and also tested prior to cyanide unloading or mixing operations. The showers are activated by stepping onto a floor grate; however, on two of the stations tested at the time of the field component of the recertification audit, the hydraulic flow valve was sticking impeding activation of the shower. Prior to submission of this report GSWL replaced both stations with new shower/eyewash units. Showers on these units are operated using an overhead pull handle.

All fire extinguishers located in areas where cyanide may be stored or handled are dry-powder non-acid type extinguishers. The extinguishers are inspected monthly by the Fire Brigade and are sent out to a contractor semi-annually for maintenance. Fire extinguisher inspection records were reviewed covering the past three years.



GSWL provides Material Safety Data Sheet (MSDS) training to all new employees as part of General Cyanide training. MSDS for sodium cyanide was observed posted in strategic areas of the plant. Hazard and safety precautions are also provided as pictorial signage showing required PPE prominently posted around the plant. First aid procedures are posted with the "Safety Instructions for Handling Cyanide" and provided in the Sodium Cyanide Emergency Response Plan (CERP).

Procedures for investigating incidents have not changed since the 2009 verification audit. An incident investigation report must be completed within 24 hrs. A team is appointed to investigate the cause of the incident and report to management within a week. Based on the findings of the investigation, a Corrective Action Plan is implemented and tracked to completion. There have been no cyanide incidents related to environmental spills of worker safety since in the three years since the 2009 verification audit.

6.3 Develop and implement emergency response plans and procedures to respond to worker exposure to cyanide.

The operation is: in full compliance
 in substantial compliance
 not in compliance...with Standard of Practice 6.3.

Describe the basis for this Finding/Deficiencies Identified:

Shower /eye-wash units and Life Oxygen Pacs are located at strategic areas of the plant where cyanide is handled. All workers are trained in oxygen resuscitator use as part of first aid training. Since the 2009 verification audit GSWL has stopped stocking amyl-nitrite antidote because of difficulties with obtaining new supplies and has replaced amyl-nitrite with hydroxocobalamin (CyanoKits) as the preferred antidote. The antidote is stored at the Akyempim Clinic located about 5 minutes from the plant. Workers at the plant communicate through use of the Gi-Tronics radio system or portable radio. Workers carry radios when in the tailings area. Supervisors and managers are also provided with cell phones.

Emergency response equipment is inspected monthly. Shower/ eyewash units are checked by maintenance on a weekly schedule and operators check shower operation prior to conducting a critical task such as cyanide mixing.

At the time of the field component of the audit GSWL was in the process of incorporating the CERP in place since the 2009 verification audit into a Consolidated Emergency Response Plan (Consolidated ERP) to provide one document covering all mine operations and ancillary operations. The existing CERP and the draft Consolidated ERP includes standard procedures to be followed in the event of an unplanned release of cyanide. The Consolidated ERP and was approved in November 2012 prior to submission of this report.

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Since the verification audit in 2009, GSWL has contracted Crusader Health Ghana Limited/Medical Services International to provide on-site medical services. The contract specifically includes services for treatment and stabilization of trauma patients including those exposed to cyanide. The clinic, which includes two doctors and six registered nurses, providing service 24 hours, 7 days a week, is located in the Akyempim community about 1.5 km from the plant entrance. The contract dated 2010 expired at the end of August 2012. The contract was extended for three months pending renewal with Crusader or another medical services provider. As an integral part of the Crusader contract patients requiring additional treatment or monitoring would be transported to ABA Hospital in Tarkwa, located about 2 hrs drive from the plant, as Crusader also provided medical services for this hospital. As of August 2012; however, Crusader's contract at ABA Hospital expired and arrangements were subsequently made with other medical providers in Tarkwa, Kumasi or Accra, depending on the situation. International SOS medivac services would be called to provide assistance as needed.

The CERP required that GSWL conduct mock drills at least twice a year to test emergency response procedures. However, in 2009, as discussed further in Section 7.6, GSWL identified inadequacies in their emergency response capability and between 2009 and 2011 made significant changes including acquisition of emergency response equipment, commissioning an emergency response centre, selecting and training a new emergency response team and hiring a full time fire service leader and emergency response coordinator. In 2010 and 2011, during this transition period two mock drills were conducted but poorly executed, substantiating the need for improvement. In 2012 GSWL reinitiated the mock drill program. A mock drill conducted in March 2012 to simulate a solid cyanide spill resulting from an IBC box falling from a shipping container revealed several deficiencies and recommendations were made for further training. The recommended actions were completed and a second mock drill was conducted in November 2012. This drill simulated a solid cyanide spill near a community and cyanide exposure of a community member. The response to this drill showed much improvement over the March 2012 drill. GSWL requires mock drills to be conducted at least twice a year.

7. EMERGENCY RESPONSE Protect communities and the environment through the development of emergency response strategies and capabilities.

Standards of Practice

7.1 Prepare detailed emergency response plans for potential cyanide releases.

- The operation is:
- in full compliance
 - in substantial compliance
 - not in compliance...with Standard of Practice 7.1.

Describe the basis for the Finding/Deficiencies Identified:

At the time of the field component of the audit GSWL was in the process of incorporating the CERP in place since the 2009 verification audit into a Consolidated ERP to provide one document covering all mine operations and ancillary operations. The Consolidated

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ERP was in draft and under review and approval by management at the time of the field component of the audit. The existing CERP and the draft Consolidated ERP provided standard procedures to be followed in the event of an unplanned release of cyanide. These procedures comprise initial response, first aid and emergency response for potential cyanide emergency scenarios that could occur at the site, including solid cyanide spill on land and wet areas; release of HCN gas, spillage of cyanide solution, tailings storage facility failure, tank/pipe rupture; transportation emergency; explosion (fire), ponds/impoundments failure and cyanide poisoning. The Consolidated ERP was finalized and approved in November 2012 prior to submission of this report. The Tailings Storage Facility Operating Manual provides emergency response flow charts for potential failure scenarios including pipeline failure, embankment seepage and sump overflow.

Since the 2009 verification audit, Barbex maintains responsibility for responding to transportation emergencies related to cyanide up to the delivery point where responsibility is transferred to GSWL. The BTMP addresses the physical and chemical form of cyanide, the transportation method and vehicles used, the routing and road conditions, and emergency response procedures. Nevertheless GSWL has agreed to be available to coordinate initial response and provide assistance in the event of a transportation emergency occurring near the mine site and has conducted mock drills involving transportation emergencies and trained communities in appropriate response in the event of a cyanide release.

The CERP used since the 2009 verification audit and the new Consolidated ERP that replaced it in November 2012 set out responsibilities of workers, managers and emergency response personnel. The roles and responsibilities of emergency coordinators have been modified in the new Consolidated ERP to reflect organizational and terminology changes. The roles and responsibilities during an emergency are also provided on duty cards that are distributed to managers and supervisors.

7.2 Involve site personnel and stakeholders in the planning process.

The operation is: in full compliance
 in substantial compliance
 not in compliance...with Standard of Practice 7.2.

Describe the basis for the Finding/Deficiencies Identified:

The CERP was developed with input from key personnel in the safety and ICMC departments. Since early 2011 GSWL has been in the process developing a Consolidated ERP. Development of this plan included input from Safety, recently hired emergency responders, the medical clinic, and GSWL management. Stakeholders and communities have been provided with cyanide awareness training programs that include the role of the community in emergency response. In December 2009 GSWL simulated a mock drill to provide awareness to community leaders on the emergency response procedures in the event of a cyanide spill from a traffic accident. The standing agreement with the Akyempim Police established in 2008 confirming the role of Police

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was reaffirmed in 2012. The agreement with the fire service was not reaffirmed because GSWL has recently enhanced its own fire fighting capability.

GSWL continues to maintain a strong community outreach program which includes educational programs to communities on the hazards, use and nature of cyanide, GSWL's cyanide management practices, and emergency response. These programs are attended by community leaders and government representatives; teachers and students from schools in the catchment area; and local police. The training programs are provided in English and, depending on the audience, Twi (the local language). GSWL has developed a cyanide emergency brochure for communities, that provides emergency response information and an emergency call-in number. In December 2010 GSWL hoisted an open house for community leaders which included discussion in cyanide awareness and emergency response. In addition to these programs Community Relations hosts other forums, such as Quarterly Community Mine Consultative Committee (CMCC) meetings, monthly Community Consultative Team meetings where community have opportunities to discuss concerns and provide input.

Over the period since the initial audit in 2009 Crusader Health Ghana Limited has held the contract to provide medic services to GSWL and operate the Akyempim Clinic. The medical clinic is staffed by a two doctor and six nurses. There is also an ambulance and driver available 24 hrs/7 days a week. The clinic is the repository for the Cyanokit antidote and would be alerted by Security in the event of a cyanide emergency

7.3 Designate appropriate personnel and commit necessary equipment and resources for emergency response.

The operation is: in full compliance
 in substantial compliance
 not in compliance...with Standard of Practice 7.3.

Describe the basis for the Finding/Deficiencies Identified:

The Consolidated ERP designates the Department Manager in the area of the emergency as the Incident Commander. This responsibility was previously assigned to the Loss Control Manager. In his absence the most senior person in the department assumes this role. The roles and responsibilities of each emergency team member are defined in the ERP and on duty cards that are provided to managers and supervisors. The ERP also lists the ERT members. The ERT is commanded by the full time Emergency Response Coordinator in the role of ERT Leader. The General Manager is responsible for providing the resources for emergency response equipment and ERT training. A general list of emergency equipment and location is included in the Consolidated ERP. Until early 2012 emergency equipment inspections were conducted monthly but inspections were not being documented. A formal documented monthly inspection program was recently implemented by the Emergency Response Coordinator.

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7.4 Develop procedures for internal and external emergency notification and reporting.

- The operation is:
- in full compliance
 - in substantial compliance
 - not in compliance...with Standard of Practice 7.4.

Describe the basis for the Finding/Deficiencies Identified:

The CERP provided tables of contact information for GSWL managers and superintendents; Ghana EPA; the Adikanfo Clinic and doctor; hospitals; community representatives; Barbex Technical Services and police and fire services. This information also now tabulated in appendices in the new Consolidated ERP. The responsibilities for communication are presented as a general schematic figure as well as in the specific emergency procedures in the Consolidated ERP.

The Environment and Social Responsibility (ESR) Manager is responsible for contacting the relevant community representatives and media. As the contact information for local community representatives is maintained by the Community Relations of the ESR Department, this contact information is not included in the Consolidated ERP.

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

- The operation is:
- in full compliance
 - in substantial compliance
 - not in compliance...with Standard of Practice 7.5.

Describe the basis for the Finding/Deficiencies Identified:

The CERP provided and the new Consolidated ERP provides specific emergency response procedures for responding to cyanide spills, including a solid cyanide spill on land; a solid cyanide spill into wet lands; and liquid cyanide spill from pipes, tanks and valve failures or leaks. Each specific procedure provides responsibilities and response actions to take including alerting the ERT, spill control, decontamination and clean up and disposal of contaminated soil and liquids. Information on required PPE, tools and equipment, and neutralization methods is also included. GSWL also has specific operating procedures that detail spill clean-up and decontamination. Procedures prohibit the use of chemicals to treat cyanide if there is a potential to affect a surface water body. In situations where there is a potential for water impact the ESR Manager is responsible for arranging water tankers or alternative potable water supply to impacted communities.

Both the former CERP and new Consolidated ERP include instruction to sampling water channels affected by a spill and submitting results to regulatory agencies and local authorities. Soil and groundwater sampling procedures have remained unchanged since the 2009 verification audit. These procedures provide instruction on calibration of field

equipment, sampling and field information, sample identification, quality control, sample preparation and preservation, sample shipment (including chain of custody procedures), analysis of samples, and data management. Guidance on proposed sampling locations and number of samples is also provided but the Environmental Superintendent would supply additional input to the sampling program based on the situation.

7.6 Periodically evaluate response procedures and capabilities and revise them as needed.

The operation is:

- in full compliance
- in substantial compliance
- not in compliance...with Standard of Practice 7.6.

Describe the basis for the Finding/Deficiencies Identified:

The CERP was required to be reviewed at least once a year. In 2009 GSWL recognized a need to restructure the Safety Department and enhance their emergency response capability. GSWL indicated that the ERT in place in 2009 served both the mine and the plant and GSWL decided that a dedicated ERT needed to be developed for the plant to expedite response. Also GSWL had not full time emergency response capability as the ERT then consisted of only voluntary members. Staff turnover and no full time capability presented difficulties in maintaining a trained responsive ERT. Poor responses during a mock drill undertaken in October 2010 and September 2011 substantiated GSWL's need to improve emergency response capability. Reviews of the CERP also revealed the need for additional equipment including gas detectors, ambulance, spill response kits and SCBA.

Between 2009 and 2011 GSWL implemented significant changes to improve emergency response capability including reorganizing the Safety Department, selecting and training employees from various departments in basic first aid, fire fighting and cyanide management to serve as emergency responders; constructing and commissioning a dedicated emergency response centre equipped with a new fire truck, spill response kits, emergency response trailer, and SCBAs; and hiring a fulltime Emergency Response Coordinator and Fire Service Leader to manage and maintain emergency response capability and train the ERT. The emergency response centre operates 24 hours a day with two men on duty each shift. Currently GSWL has twenty three emergency responders serving as core ERT members.

As a result of the inadequacies in the emergency response capability identified by GSWL and the significant changes that have taken place between 2009 and 2011 no cyanide mock drills were undertaken during that time. With the new capability created from the formation of the core ERT, and commissioning of the emergency control centre in 2011, GSWL reinitiated the mock drill program in 2012. A mock drill conducted in March 2012 to simulate a solid cyanide spill resulting from an IBC box falling from a shipping container revealed several deficiencies and recommendations were made for further training. The recommended actions were completed and a second mock drill was conducted in November 2012. This drill simulated a solid cyanide spill near a

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community. The response to this drill showed much improvement over the March 2012 drill.

As with the CERP, the Consolidated ERP has required to be reviewed at least once a year under normal operating procedures; after an mock drill, accident or incident reveals a procedural shortcoming; an wherever a new technology, process, equipment or training methods become available to the mine or there have been physical, structural or layout changes.

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

Standards of Practice

8.1 Train workers to understand the hazards associated with cyanide use.

The operation is: in full compliance
 in substantial compliance
 not in compliance...with Standard of Practice 8.1.

Describe the basis for the Finding/Deficiencies Identified:

All visitors, contractors and new employees entering the site are required to complete Site Induction training on GSWL policies, procedures and site safety. The induction includes cyanide awareness for visitors that enter areas where cyanide may be present. New employees are also required to complete Plant Induction and General Cyanide training before assumption of duty. This training includes recognition of cyanide; hazard of cyanide, safe handling; PPE, symptoms of cyanide exposure and poisoning, and emergency response procedures including first aid in the event of exposure to cyanide.

Cyanide Awareness Refresher training is required to be undertaken by all employees. This is generally completed annually. Training is recorded in a logbook maintained by the trainer as well as on attendance sign-in sheets. This training is also tracked on a trainer tracking matrix developed at the time of the 2009 verification audit. Review of the training records covering the past three years indicates that employees that encounter cyanide have attended refresher training two or three times since the 2009 verification audit.

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

The operation is: in full compliance
 in substantial compliance
 not in compliance...with Standard of Practice 8.2.

Describe the basis for the Finding/Deficiencies Identified:

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Employees that perform cyanide related tasks are required to complete task specific training on the operating procedures related to that task. Line managers are responsible to ensure that workers satisfactorily complete task specific training before permitting workers to perform cyanide related tasks. Training in operating procedures is provided by the Plant Supervisor/ Senior Metallurgical Department Trainer. Emergency response and first aid training is provided by the Safety Department trainers. Training records are maintained through completion of attendance sheets which include the signature of the trainer and attendee. Task training follows specific written operating procedures and is tracked on a training matrix which is updated by the trainer.

Since the 2009 verification audit the Senior Metallurgical Department Trainer continues to conduct all of the cyanide awareness and specific task training at the Plant. Until recently the current HS Superintendent was the primary health & safety trainer. Training is now conducted by experienced trainers in Health and Safety Department and Emergency Response.

Task refresher training is undertaken for critical tasks such as cyanide offloading and mixing, on an annual basis. Other task refresher training is conducted on a periodic basis as warranted based on task observations and procedural changes. In addition to refresher training, the Safety Department delivers safety topics at monthly safety meetings attended by shift workers.

Effectiveness of training and worker competence is evaluated through written exam and task observation. Participants of general cyanide training and refresher training are required to pass a written test to evaluate the effectiveness of the cyanide training. GSWL has a formal task observation program in which supervisors and safety officers are required to conduct a minimum of four task observations per month. Task observation records have been maintained and were reviewed for 2009, 2010, 2011 and 2012. The records report any deficiencies and corrective actions are noted. General cyanide initial and refresher training and task training is recorded in a log book maintained by the Senior Metallurgical Trainer. The log book entries include the training topic, names of attendees and the name of the trainer. Sign-in sheets are also maintained. These sheets provide a record of the training session topic, the date of training, and names of attendees. The trainer tracking matrix includes a record of the employee name, date of training, and topic covered. The test papers of each participant are kept by the trainer. Records are retained throughout an individual's employment

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

The operation is: in full compliance
 in substantial compliance
 not in compliance...with Standard of Practice 8.3.

Describe the basis for the Finding/Deficiencies Identified:

Employees are instructed in procedures to be followed in the event of a cyanide emergency at part of General Cyanide training. This training includes recognition of

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cyanide; safe handling of cyanide; health effects of cyanide; symptoms of cyanide exposure and poisoning, emergency response procedures, and first aid in the event of exposure to cyanide. Employees that perform cyanide related tasks are also required to complete task specific training on the operating procedures related to that task. These procedures include clean-up and decontamination of wet and dry cyanide spills.

The CERP set out minimum training requirements for ERT members. Records show that in 2010 ERT training included Basic Life Support, Advanced Fire Fighting and Spill Control. However, the team at that time comprised only of voluntary members and with staff changes GSWL found it difficult to maintain a functional trained ERT. A mock drill undertaken in October 2010, simulating a car accident, revealed that the emergency response capability was ineffective and therefore GSWL implemented measures to improve capability. These measures included the full time hire in 2011 of two experienced emergency responders in the role of Fire Service Lead and Emergency Coordinator to form and train a capable ERT. A training program was initiated in 2012 and to date the ERT has completed training in cyanide management, road traffic extrication, basic fire fighting, first aid training and SCBA training. Also in 2012 two mock drills were completed to test ERT response to cyanide spills.

GSWL continues to provide cyanide awareness training to community members (opinion leaders, teachers and school children). In December 2009 GSWL simulated a mock drill to provide awareness to community members on the emergency response procedures that would be undertaken if a transportation spill occurred and the roles that the community should take. GSWL has reaffirmed that Akyempim Police will provide assistance in the event of an emergency including those related to cyanide. The clinic retains cyanide antidote in the event of a cyanide exposure and doctors and nurses are available 24/7 in the event of an emergency and arrangements are in place with hospitals in Tarkwa, Kumasi and Accra if a patient requires further treatment or care.

9. DIALOGUE Engage in public consultation and disclosure.

Standards of Practice

9.1 Provide stakeholders the opportunity to communicate issues of concern.

The operation is: in full compliance
 in substantial compliance
 not in compliance...with Standard of

Describe the basis for the Finding/Deficiencies Identified:

GSWL continues to maintain a strong community outreach program through attendance in several scheduled formal meetings. These include quarterly Community Mine Consultative Committee meetings attended by mining companies, community representatives and NGOs, monthly Community Consultative meetings attended by traditional authority and youth leaders, monthly Community Consultation Committee meetings attended by community leaders and representatives. These meetings provide

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a forum between the communities and GSWL to discuss issues, provide information and review progress of any issues or complaints. In addition, GSWL provides cyanide specific training sessions to community representatives and schools. These training forums also provide a venue for communities to discuss issues of concern regarding management of cyanide.

A complaints communication process is in place to address public concerns. The public may contact GSWL by phone, fax letter, email or in person at the administration office or during community meetings. Complaints and enquiries are entered into a database that facilitates tracking communications and the progress of any approved mitigation measures or redress. In the three years since the 2009 audit there have been no cyanide issues or complaints. In the three years since the 2009 verification audit there has been only one complaint that may be considered potentially associated with cyanide. This involved a community member reporting seepage water at one of the TSF saddles. Investigation of the incident; however, confirmed that the water was from a water bowser used to apply water to roads to suppress dust.

9.2 Initiate dialogue describing cyanide management procedures and responsively address identified concerns.

The operation is: in full compliance
 in substantial compliance
 not in compliance...with Standard of Practice 9.2.

Describe the basis for the Finding/Deficiencies Identified:

GSWL continues to maintain a strong community outreach program and interacts with the community on cyanide management practices through provision of community training programs and open houses. Activities include providing annual educational programs to communities on the cyanide hazards, management practices and emergency response. These programs are attended by community leaders and government; teachers and students from schools in the catchment area; and local police. Other initiatives in the last three years have included a simulated mock drill to provide awareness to community leaders on the emergency response; a mine tour organized for school students and teachers that included cyanide management and an open house for community leaders which included discussion in cyanide awareness and emergency response. In addition to these programs Community Relations hosts other forums such as Quarterly Community Mine Consultative Committee (CMCC) meetings, monthly Community Consultative Team meetings where community have opportunities to discuss concerns and provide input.

9.3 Make appropriate operational and environmental information regarding cyanide available to stakeholders.

The operation is: in full compliance
 in substantial compliance
 not in compliance...with Standard of Practice 9.3.

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Describe the basis for the Finding/Deficiencies Identified:

Cyanide awareness training materials provided to communities is generally the same as that used at the time of the 2009 verification audit. Presentations are aided by video and PowerPoint®. Printed copies of the PowerPoint® presentations and copies of the emergency response brochure are handed out to attendees of the sessions. Attendees are instructed to use these materials to help disseminate cyanide awareness and response to others in the community. The training is provided in English and/or Twi (the local language also used in the community) depending on the audience.

Review of incident records from 2009 to date indicate that no cyanide releases, exposure incidents or fatalities have occurred since the initial verification audit was conducted. Although there are no formal incident reporting requirements in Ghana, GSR has developed an incident classification and reporting procedure that defines incidents by severity and has committed to report Level 3 (e.g., lost time injury, tailings spill from a line break), Level 4 (e.g., work related fatality, limited tailings discharge or ground/surface water pollution) and Level 5 (e.g., multiple fatality, contamination of potable water, major tailings dam failure) incidents to the appropriate government authorities. This incident reporting process would include reporting on the types of cyanide release and exposure incidents. In addition GSR would also report incidents relating to cyanide to ICMI.

Outside of the established lines of communication with local communities and notifying government authorities GSR has also committed to publicly report on its environmental and safety performance. Information on cyanide related releases or exposures would be made publically available through the Annual Sustainability Report that GSR prepares and posts on its web site, www.gsr.com. GSR is a signatory to UN Global Compact and reports environmental performance through this initiative.

