

***INTERNATIONAL CYANIDE
MANAGEMENT INSTITUTE***

Gold Mining Operations

Summary Recertification Audit Report

***Newmont Golden Ridge Ltd.
Akyem Gold Mine
Ghana***

29^h January – 2nd February 2018



Name of Operation: Akyem Gold Mine

Name of Operation Owner: Newmont Ghana Gold Limited

Name of Operation Operator: Newmont Golden Ridge Limited

Name of Responsible Manager: Joep Coenen, General Manager

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Location detail and description of operation:

The Akyem Gold Mine (NGRL) is a major mining operation owned and operated by the Newmont Gold Corporation. Akyem is a green-field, open-pit gold mining operation located within the Eastern Region of Ghana and 120 kilometres northwest of the capital city of Accra.

The mine currently operates one large open pit. Mining is conducted using large scale conventional hard rock drill and blast open pit methodology. Run of Mine (ROM) ore is trucked from the pits using CAT 785 DT's and is then crushed using a gyratory crusher with the crushed product being conveyed via a 1.8km overland conveyor to the live stockpile.

The process plant consists of a large conventional SAG and Ball Mill configuration with an annual production rate of >8mt. The rest of the Process Plant consists of a carbon-in-leach circuit with cyanidation followed by elution and refining for gold doré recovery.

Tailings remaining after completion of the processing and precious metals recovery are conveyed by pipeline to a counter-current decantation (CCD) plant where the tailings are rinsed with decant return water to reduce WAD cyanide concentrations to less than 50ppm WAD cyanide prior to final disposal. After the CCD circuit, the tailings are transferred in HDPE pipelines placed in a lined tailings trench, to an engineered, lined tailings storage facility (TSF) for permanent disposal.



Tailings water is recovered from a decant pond, and recycled back to the process facilities for re-use. The entire process and tailings facilities are designed as a zero-discharge operation.

Sodium cyanide is supplied to the mine by Orica from its Yarwun manufacturing plant in Queensland, Australia. Cyanide is transported to the Akyem site using the state-of-the-art cyanide sparge process. This new methodology makes use of purpose-built sparge isotainers and provides a safer, secure and more efficient operation than the older, more conventional, cyanide delivery methods.

Sparging is a closed circuit mixing process that passes pH-adjusted water from a mixing tank through the isotainer in a continuous circuit until the required concentration of liquid cyanide is achieved. On completion of the sparging process, the liquid cyanide is transferred from the mixing tank to a dedicated storage tank, ready for delivery by pipeline to the process plant. All pipelines used for the transfer of cyanide to the process plant or within the process plant are either double-piped or installed above containment facilities to prevent leaks or spills to the surrounding surface.

The cyanide mixing facility at Akyem is specifically designed to handle the bulk sparging operations.



Auditor's Findings

This operation is

in full compliance

in substantial compliance

not in compliance

with the International Cyanide Management Code.

This operation has not experienced compliance problems during the previous three year audit cycle.

Audit Company: Eagle Environmental

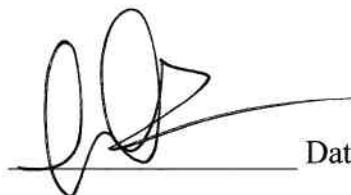
Audit Team Leader: Arend Hoogervorst

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Names and Signatures of Other Auditors:

Name : Dawid M. L Viljoen

Signature



Date: 5/6/2018

Dates of Audit: 29th January – 2nd February 2018

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

Akyem Gold Mine

Facility

Signature of Lead Auditor

Date



11/6/2018

Akyem Mine
2018

Signature of Lead Auditor

4th June

Auditor's Findings

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.

X in full compliance with

The operation is in substantial compliance with **Standard of Practice 1.1**

 not in compliance with

Basis for this Finding/Deficiencies Identified:

There is a Sodium Cyanide Supply Agreement between Orica and Newmont Akyem Mine commencing 1 January 2015 and expiring 31 December 2019. Orica's Yarwun facility, which supplies the sodium cyanide, was fully recertified as a producer on 22nd February 2017. The Orica cyanide bag to bulk facility in Tarkwa, Ghana, is operated by Barbex Technical Services on behalf of Orica and is classified as a production facility. The facility was recertified on 9th April 2018. Solid briquette cyanide is purchased directly from the producer, Orica, and the shipped sea containers from Orica are unloaded at Tarkwa. The briquettes are repacked in isotainers in the Orica cyanide bag-to-bulk facility and dispatched to Akyem for sparging on site.

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.

X in full compliance with

The operation is in substantial compliance with **Standard of Practice 2.1**

 not in compliance with



Basis for this Finding/Deficiencies Identified:

The Sodium Cyanide Supply (and Transport) Agreement between producer, Orica, and Newmont Akyem commenced on 1st January 2015 and expires on 31st December 2019. The contract covers labelling, the responsibilities and requirements for transport, packaging, safety, security, unloading, emergency response (spills prevention and clean-up), route evaluation and assessments, training, community liaison, emergency response resource access and availability. Responsibilities are clearly delineated between Akyem and Orica.

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

X in full compliance with

The operation is in substantial compliance with Standard of Practice 2.2

 not in compliance with

Basis for this Finding/Deficiencies Identified:

The Contract requires that the seller shall comply with the ICMI Code production and transportation principles and standards of practice as published and amended from time to time by ICMI. Chain of custody documentation was sighted by the auditors. It is reported that the Orica Australia Supply Chain was audited in November 2017 and result publication by ICMI is awaited. The Orica West Africa Supply chain from Brisbane to Tema and Takoradi, Ghana, was certified on 3 April 2018. Stellar Logistics, an ICMI transporter was certified as fully compliant on 14th April 2015 and is due for a recertification audit at the end of March 2018.

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

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.

X in full compliance with

The operation is in substantial compliance with **Standard of Practice 3.1**

 not in compliance with



Basis for this Finding/Deficiencies Identified:

No solid cyanide is stored on site as a sparge process is used to transport solid cyanide to the site and to make up liquid cyanide. The cyanide offloading sparging and storage facility was designed and constructed by a professional engineering and design company. Design and construction has been completed to conform to cyanide producer specifications for a reagent area and which also complies with the engineering practices required in Ghana. This was audited and the drawings sampled and checked during the previous certification audit. There have been no design or construction changes since the previous audit. The facilities are located away from people and surface waters. An Orica audit report dated 20 Sept 2017 included inspection of the sparge and box mixing facilities at the client mine site. Item 11 included a leak on the storage tank (this had already been identified by the Mine inspection and planned maintenance system). The report contains an action summary including responsible person and due date for action. The tank repairs have been completed. The audit site inspection confirmed that all concrete surfaces were competent and crack-free and the sparge isotainer parking area slopes towards the cyanide sparge and storage bund to drain any spillage into the bund. Level elements, low and high level alarms, and interlocks to automatic valves and pump motors are indicated for both the cyanide sparging and the cyanide storage tanks in the Cyanide Sparging Control Philosophy document. The operation is fully automated as per the make-up procedure. There are no incompatible materials near the cyanide storage areas and the cyanide tanks only share the bund with the caustic tank. The bund area is constructed of concrete, no cracks were observed and the bund was empty. The cyanide sparging and storage tanks are installed within a security area of the plant with full access control. The plant is situated inside the greater mine security area with access control gates.

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.

X in full compliance with

- The operation is**
- in substantial compliance with **Standard of Practice 3.2**
 - not in compliance with

Basis for this Finding/Deficiencies Identified:

No solid cyanide is received directly from the supplier in boxes. Cyanide is delivered in a dedicated isotainer by truck and cyanide sparging takes place on site next to the cyanide sparging and storage section, with the isotainer being returned to the bag-to-bulk facility. The sparging procedure is detailed, spelling out personal protective equipment (PPE) requirements, and clearly sequenced to prevent and manage spillages and accidental releases and clean the area, tanks and hoses. Members of the Mine Emergency Response

Team are present during the sparging operation and provide for emergency response in case of any health or environmental emergencies arising from the sparging operation.

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 utilizing contingency planning and inspection and preventive maintenance procedures.

X in full compliance with

The operation is in substantial compliance with **Standard of Practice 4.1**

 not in compliance with

Basis for this Finding/Deficiencies Identified:

The Standard Task Procedure inventory contains 84 process and 29 maintenance procedures, with 55 cyanide specific procedures. The Tailings Storage Facility (TSF) operating parameters (freeboard, design storm event and WAD cyanide concentrations) are contained in the Tailings Storage Facility Operating And Monitoring Guidelines, and the Akyem Revised Tailings Management Plan. Shiftly, daily, weekly, and monthly and quarterly inspections are conducted by Operations, Maintenance and TSF staff.

The major operation risk for an unintentional release is the overtopping of the plant Events Pond into the adjacent storm water diversion trench which leads to the raw water pond containing aquatic life. The Events Pond is operated at minimum level to accommodate the design parameters and to prevent overtopping. Alarms will sound at different levels and the plant is stopped when the pond reaches 52% of capacity.

A SAP Planned Maintenance System (PMS) is in place and has been functioning since the commissioning of the plant in September 2013. The SAP PMS was reviewed electronically and planned inspections, breakdowns, records and histories of tanks, secondary containments, leak detection systems, pumps, pipelines and valves were sampled over the period since the previous certification audit and found to be effective. The frequencies of the inspections (PM and operational) are deemed sufficient to assure and document that the cyanide facilities are functioning within design parameters.

An emergency power system is in place with priority emergency units listed in the CITECT control system. The critical units to prevent overtopping of the events pond include the events pond pumps and the residue pumps and it was confirmed that these were included in the logic system prioritising the emergency power distribution. The events pond is equipped with two submersible pumps, as well as a standby unit in the maintenance department stores. There are 7 standby diesel generators in place and are maintained as per the SAP PMS system. It was confirmed in the SAP system that there are weekly manual start-up, and monthly standby load shedding, procedures and

fortnightly separator inspections. Contract maintenance is done by equipment manufacturer.

The plant has a change management procedure covering health, safety and environment in place. A de-silting of the process water pond Management of Change (MOC) exercise was sighted and the document was signed off by the Safety, Health Coordinator, the Health Safety and Loss Prevention Manager, and the Senior Environmental Coordinator. The plant will be stopped at a level of 52% in the events pond and will only restart if the safe operating level is restored to prevent potential overtopping. The plant is stopped for planned and breakdown maintenance using the standard stop/start procedures on the CITECT control system.

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

X in full compliance with

- The operation is**
- in substantial compliance **with Standard of Practice 4.2**
 - not in compliance with
 - not subject to

Basis for this Finding/Deficiencies Identified:

The ore sources that will be treated in the Akyem mill includes an Oxide ore (consisting of Oxide Mafic and Oxide Greywacke ores), followed by a deeper Primary ore body (consisting of primary Mafic and primary Greywacke ores). Newmont undertook a comprehensive program of ore characterisation tests on drill hole composites of the different ore bodies. The tests included variability tests, cyanide optimisation tests and process optimisation tests. The latest report, Akyem Project 2009 Oxide & Primary Ore Leach Tests Interim Report, covered tests on four primary composites and seven oxide composites. The sample locations are known and can thus be used to predict the cyanide consumption of the ore type. Samples from the oxide ore chemical analyses all showed higher copper, nickel and zinc values, all of the metals that would form WAD cyanide complexes and will impact on WAD cyanide values in the tailings, as well as having an increased cyanide consumption in the leach.

The current ore mix is constant but the higher cyanide consumed by the deeper ore body is anticipated. Tuesday meetings are held with the Mining staff and the Geologists to determine the planned production for the next week. A procedure, Cyanide Control and Optimization Strategy, is in place and was reviewed. Section 4 details responsibilities and accountabilities, including requiring the Geologist to provide drill core samples of the pits; the General Foreman to monitor cyanide addition in the CIL, and the Production Superintendent is to implement recommendations by the Chief Metallurgist. The procedure under section 4 requires internal and external test work, including bottle roll



tests to determine ore variability of the feed and optimal cyanide concentrations in the leach.

Electronic records of weekly bottle roll results were sighted for 2014, 2015, 2017. The results indicate that 180 ppm sodium cyanide in the leach CIL 1 is the optimum dosing rate. The Design concentration, as sodium cyanide, was 230 ppm and the current set point is 180 ppm as sodium cyanide. Elution cyanide consumption was reduced from 1400 litres to 450 litres in the caustic cyanide make up.

The report, “External Optimisation Test Work: Akyem Mine to Mill Metallurgical Report”, dated February 2016, undertaken by Newmont Metallurgical Services, Denver, was sighted. It includes Mineralogy, and ore characterisation tests, The tests were done on ore representing ore that will be processed from 2017 to 2019. Some elevated Copper values were found that could impact on cyanide consumption. The results will be considered in future planning. The plant has been in operation since Sept 2013 and is currently optimising the automatic control system. The current system configuration is working well, but equipment availability is being investigated and improved reliability is looked at. An OCM 5000 on- line cyanide analyser is used to control an automatic dosing valve to tank CIL 1 or 2. Manual titrations are used to check the on-line analyser results and if the difference is more than 10 ppm, action is taken. Cyanide can be controlled manually in case the on line unit is down for maintenance or repairs.

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

X in full compliance with

- The operation is** in substantial compliance with **Standard of Practice 4.3**
- not in compliance with

Basis for this Finding/Deficiencies Identified:

The Mine uses a mine-wide GoldSim probabilistic water balance model which includes the TSF, Process Plant, Water Storage Dam, Sediment Control Structures 1, 2, 3, and 5, Waste dumps, Pits, Potable water and Impacted Pond. The model is updated to 8 November 2017 and the latest Water Balance Model report was reviewed. The Events Pond design was done using the 1:100 year, 24 hour rainfall event of 235mm, as per Ghanaian EPA requirements. The Events Pond probabilistic water balance was updated in June 2016 using the 1:100 year, 24 hr rainfall event of 235mm.

The GoldSim model includes slurry flow rates and densities are measured using mass flow meters on-line. The model includes variation in rainfall events and the TSF is operated using a 1:100 year 24 hour storm event of 235mm. The models used historic rainfall data from the Obuasi weather station from 1981-2003, and the latest climate data from the site’s current weather station and TSF rainfall gauge. Site precipitation data is used to update the Water Balance model. With regard to other solutions losses, no discharge to surface water takes place; the TSF and the events pond are double lined with HDPE. TSF daily, weekly and monthly inspections and quarterly reviews are conducted.

The TSF freeboard is operated at more than design levels and is monitored during daily, weekly and monthly inspections. Current freeboard is 5.1m, as per survey data.

The events pond is equipped with two sets of level monitors and alarms in the CITECT in the control room, as per the Events Pond Procedure. CCTV cameras are used to monitor the plant pond levels. The design freeboard of the events pond is specified in the Events Pond standard operating procedure which states that the Event Pond must be operated to be kept empty at all times.

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

X in full compliance with

The operation is in substantial compliance with **Standard of Practice 4.4**
 not in compliance with

Basis for this Finding/Deficiencies Identified:

During the original certification audit, it was assumed that the plant process pond might contain values higher than 50 mg/l WAD cyanide and it was therefore covered with bird balls to restrict access by wildlife and livestock. The Process water pond is situated inside the process plant fence. The plant embarked on a cyanide optimisation program after commissioning, resulting in a decrease in cyanide addition from 230 ppm design to 180 ppm sodium cyanide. This resulted in lower WAD cyanide delivered to the CCD cyanide recovery circuit and a lower TSF decant value returned as washing solution to the CCD circuit. This, in turn, resulted in the CCD 1 thickener overflow feeding the process water pond, WAD cyanide reduced to less than 50 mg/l, making the practice to cover the pond with bird balls unnecessary. The bird balls were removed subsequently for pond maintenance purposes.

The WAD cyanide results from daily samples (daily average) from the feed to the process water pond were reviewed since removal of the bird balls and are as follows:

2014 and 2015: The pond was covered with bird balls because it was assumed that the values were above 50mg/l WAD cyanide

2016: Average WAD cyanide was 26.62, with the highest value at 50.9, and the number of exceedances: 2

2017/8: Average WAD cyanide 30.3, with the highest value at 65.96, and number of exceedances: 12.

Investigations indicated that the exceedances were as a result of upsets and maintenance of the CCD thickeners which led to running one stage from the normal operation of two stages, with a lower washing efficiency and thus higher WAD cyanide feed to the process water pond from the overflow of the final CCD thickener.

The TSF compliance point is sampled twice per shift manually with the sample taken from the delivery line valve at the TSF T- junction. Data was reviewed for the three year period since the previous certification and the results were as follows:-

2014: Maximum value was 49 mg/l WAD cyanide.



2015: Maximum value was 39 mg/l WAD cyanide.

2016: Maximum value was 39 mg/l WAD cyanide.

2017: Maximum value was 39 mg/l WAD cyanide.

Thus, the WAD cyanide values over the recertification period never exceeded 50 mg/l WAD cyanide.

The decant water values were reported as follows:

2014: Maximum value was 4.11 mg/l WAD cyanide.

2015: Maximum value was 1.17 mg/l WAD cyanide.

2016: Maximum value was 4.88 mg/l WAD cyanide.

2017: Maximum value was 4.8 mg/l WAD cyanide.

Thus, the WAD cyanide values over the period since certification never exceeded 4.88 mg/l WAD cyanide.

As a result of the review of the daily WAD cyanide samples being less than 50 mg/l WAD cyanide, the need for measures to restrict access by wildlife and livestock to the process water pond proved unnecessary.

No cyanide-related bird mortalities have been observed or reported at the TSF since certification, thus confirming that maintaining the WAD cyanide below 50 mg/l is effective in preventing wildlife mortalities. This was further confirmed during the sampling of the daily TSF inspection checklists for 2015 and 2017.

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

X in full compliance with

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

not in compliance with

Basis for this Finding/Deficiencies Identified:

Following site inspections and interviews, it was confirmed that no direct discharge to surface water takes place. The nearest river is the Mamang river, approximately 5 km away from the TSF. Samples are taken up-stream and downstream of the river and all were found to be below limits of detection for WAD cyanide of 0.003mg/l since the previous certification.

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

X in full compliance with

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

not in compliance with

Basis for this Finding/Deficiencies Identified

The TSF is equipped with under drains returning TSF seepage to the process water circuit. Monitor wells are placed below and around the TSF, boreholes are sampled for groundwater cyanide contents, and finger drains are installed to dewater the TSF walls. The TSF is fully lined with a HDPE synthetic liner. Secondary under drains are installed under the synthetic liner.

The Process water ponds and events ponds are fully lined to prevent seepage. Leak detection and recovery systems are installed on the Process Water and Event Ponds, and the pond liners and leak detection systems are inspected as part of the operational inspections. The process plant is equipped with concrete bunds and spill ways to prevent seepage. It was confirmed during the site inspection that no change has occurred since the certification audit.

The potential beneficial uses for groundwater include drinking water and the Ghana Water Authority standards for ground water cyanide levels of 0.07 mg/l free cyanide are used. Borehole samples up and down stream of the TSF (9 shallow and 9 deep boreholes) were reviewed for the 3 years since the previous certification and all values were less than limits of detection of 0.003 mg/l WAD cyanide. A few values at 0.004 mg/l were seen, but all values were less than the GWA standard of 0.07 mg/l free cyanide.

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

X in full compliance with

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

 not in compliance with

Basis for this Finding/Deficiencies Identified:

All tanks are placed on ring beams equipped with an impermeable HDPE liner underneath the oil impregnated sand on top to bed the tank base. All cyanide solution containing tanks are placed inside competent concrete bunds which, ultimately, drain to the events pond. Reagent strength cyanide storage tanks are placed in a concrete bund. All secondary containments are sized to hold a volume greater than that of the largest tank within the containment and any piping draining back to the tank, with additional capacity for the design storm event. The plant is designed with sump pumps in all the secondary containments returning any spillage back to the process.

The reagent strength cyanide lines, as well as the sparge area bund sump pump line, are above containment areas or are equipped with a pipe-in-pipe secondary containment where they cross open soil. The whole TSF pipeline is installed inside a HDPE-lined trench draining back, either to the events pond in the plant or the TSF. All cyanide tanks and pipelines are constructed of materials that are compatible with cyanide and high pH conditions, i.e. mild steel, stainless steel and HDPE (High Density Polyethylene).



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.

X in full compliance with

- The operation is** in substantial compliance with **Standard of Practice 4.8**
- not in compliance with

Basis for this Finding/Deficiencies Identified:

The site QA/QC system and documentation was audited in detail during the certification audit. Lycopodium, the design and construction company gave the following commitment:

“...Throughout the entire construction phase, all contractors will follow the Lycopodium comprehensive QA/QC process. QA/QC documentation will be signed off by qualified personnel, and turnover packages will be provided to Newmont upon hand over of facilities which will contain all QA/QC records for the entire project...” This was fully checked and confirmed in the QA/QC data room.

With regard to the Cell 2/3 raise construction, the Golders 2015 Annual Audit report commenting on the construction, stated, “The construction of the TSF stage 2/3 raise was in progress during the Q1 audit visit and was completed in May 2015. Knights Piésold Consulting (KP) was responsible for the design of the TSF stage 2/3 raise and was also responsible for the construction quality assurance and quality control (QA/QC). KP provided a Site Engineer to carry out site management, field engineering, earthworks, liner installation and material selection required to comply with the Drawings and Technical Specification, which formed part of the construction documents provided by KP. Testing was conducted by the contractor, PW Group Ltd., and M&S Engineering (HDPE contractor) and the records were submitted to KP, who summarised the results in a construction completion report upon completion of the project...”

The 2016 TSF Cell one construction QA/QC records were reviewed electronically and included HDPE liner tests (destructive tests, trial weld samples and panel deployment logs) and civil tests (moisture field tests, field density tests, and laboratory particle size distribution and Atterberg limits).

There were no changes or additions to the cyanide facilities in the plant area.

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

X in full compliance with

- The operation is** in substantial compliance with **Standard of Practice 4.9**
- not in compliance with



Basis for this Finding/Deficiencies Identified:

Groundwater and surface water sampling procedures and TSF monitoring procedures were noted to be in place. Sampling and analytical protocols were developed by the Environmental Department under their manager, an M.Sc. Geological Engineering (hydrogeological options) graduate and the plant monitoring procedure was developed by a qualified metallurgical superintendent. Sampling points are identified on a sampling map and in a procedure. The procedures include how and where samples should be taken, reference to field sampling sheets, sample preservation techniques, chain of custody procedures and which cyanide species are to be analysed. Boreholes are placed and sampled upstream and downstream of the plant. Boreholes and surface waters are sampled monthly and daily wildlife mortality inspections take place. Wildlife inspections form part of the daily checklist of the TSF operator and the Environmental Department. No cyanide-related wildlife mortalities have been recorded since the plant was commissioned. Sample frequency is deemed adequate to characterize the medium being monitored and to identify changes in a timely manner.

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.

X in full compliance with

The operation is in substantial compliance with **Standard of Practice 5.1**
 not in compliance with

Basis for this Finding/Deficiencies Identified:

A reclamation and closure plan, which includes cyanide decommissioning procedures, is in place. A conceptual decommissioning schedule is included in the plan and covers all process components from Mill to the TSF. Review is required every 3 years.

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

X in full compliance with

The operation is in substantial compliance with **Standard of Practice 5.2**
 not in compliance with



Basis for this Finding/Deficiencies Identified:

The closure costs include costs covering the individual sections in the circuit under headings including Reagents, Leaching, screening Thickening and tails disposal, CCD cyanide recovery circuit and Elution and carbon regeneration. The total provision for items is US\$ 1,28m. Newmont generates closures cost estimates internally, applicable to the use of third party contractors. The closure cost estimate is reviewed annually. The closure costs are covered by a reclamation bond with GCB Bank, Accra, guaranteed to the Ghana Environmental Protection Agency (EPA), first issued in September 2016, and annually renewable unless otherwise notified. There is also an Ecobank Bank Guarantee, with the beneficiary being the Ghana EPA, the initial date being 14 September 2016 and annual automatic renewal, unless otherwise notified.

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 or control them.

X in full compliance with

The operation is in substantial compliance with **Standard of Practice 6.1**

 not in compliance with

Basis for this Finding/Deficiencies Identified:

The Standard Task Procedure inventory contains 84 process and 29 maintenance procedures, with 55 cyanide specific procedures. The Tailings Storage Facility (TSF) operating parameters (freeboard, design storm event and WAD cyanide concentrations) are contained in the Tailings Storage Facility Operating And Monitoring Guidelines, and the Akyem Revised Tailings Management Plan. Shiftly, daily, weekly, and monthly and quarterly inspections are conducted by Operations, Maintenance and TSF staff. All procedures include the requirements for PPE, hazard classification and pre-work inspection requirements. The TSF operating procedures were revised to reflect the changes required by the new lifts. The TSF staff were given update training in the new procedures.

Procedures, when revised, are circulated for comment to the operations. Daily and shiftly toolbox meetings are used for worker input into safety related issues. Worker input is also obtained through their involvement in risk assessments. Process operations pre-safety talks are also used for safety related dialogue.

A change management procedure, "Risk Opportunity and Change Management", is in place and requires the sign-off by the Health and Safety Manager and the Environmental Manager. A change management example covering the de-silting of the process water pond was sighted and reviewed.



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.

X in full compliance with

The operation is in substantial compliance with **Standard of Practice 6.2**

 not in compliance with

Basis for this Finding/Deficiencies Identified:

The cyanide sparging control document requires that the pH of the solution used for cyanide sparging is at least 12, adjusted by the addition of sodium hydroxide from the sodium hydroxide mixing and storage tank by running the caustic metering pump for 2 minutes. This requirement is to minimise the generation of hydrogen cyanide (HCN) gas during sparging.

The pH in the leach is controlled at 10.6. A weekly Akyem control parameters form is issued to the control room to set CITECT operating parameters settings, including the CIL pH min 10.5, max 10.8, with set point 10.6.

Ten fixed HCN gas monitors are installed at the sparging area, milling area, cyclones, the CIL (2), carbon screen, acid wash column, CCD feed hopper area, CCD 1, and the tails tank (2). There are 13 Personal HCN gas monitors (a further two are out of service) in use which are issued to individuals where required. The Emergency Response Team (ERT) uses two HCN gas monitors with one in for calibration.

A baseline gas survey was undertaken, areas and activities were identified and fixed HCN gas monitors were installed, with personal monitors used during activities where workers may be exposed to cyanide gas in excess of 10 ppm on an instantaneous basis. This includes: during cyanide sparging operations, confined space entry, and working on cyanide equipment. Fixed monitors are maintained as per the PMS SAP schedules with personal monitors being calibrated monthly on site and serviced and calibrated annually by the manufacturer. The Akyem Mine has trained and certificated staff to do the on-site calibrations. The calibration records register was reviewed and sampled.

On-going inspections and checks are also used to monitor and check facilities and emergency response equipment functioning and checklists. Safety equipment such as safety showers, low pressure eye wash stations, and fire extinguishers are numerous, adequately signposted and regularly inspected. Adequate warning signs, advising workers that cyanide was present and that smoking, open flame and eating and drinking are not allowed, were noted. Induction training includes the information that all slurries and process solutions on the plant may contain cyanide.

Reagent strength cyanide pipes are labelled as "cyanide" with flow direction indicated on the pipes. Plant cyanide solution pipes are labelled process water and process slurry with flow direction indicated. Process tanks are all labelled.

MSDSs (Material Safety Data Sheets) were sighted at the cyanide sparging area, the control room and the CIL laboratory and an MSDS is included in the sparging

procedures. English is the working language for the site as well as the official national language and used in operational documentation. Any cyanide incidents are investigated using the Mines standard Accident / Incident reporting procedure and forms. A no loss time incident investigation report using the Mine electronic on line system, Cintellate, was sighted and reviewed. Formal employee interviews (see Appendix 2) were used to check awareness and sensitivity to health and safety measures and the response from employees and contractors alike, was found to be appropriate and acceptable.

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

X in full compliance with

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

 not in compliance with

Basis for this Finding/Deficiencies Identified:

The mine has water and oxygen available at the Sparge section, CIL Laboratory and the Process Control room. (ERT is on standby on site during sparging operations.) Resuscitator sets are available at the ERT room just outside of the plant. The primary mode of communication used is radios.

Four Cyanokit (Hydroxocobalamine) antidote kits are available at the Mine Clinic in the pharmacy room. The available cyanide antidote kits kept in the clinic were inspected and found to be current, and stored in the pharmacy at a consistent 22°C via the air-conditioning system (manufacturers recommendation is storage not above 25°C). The pharmacist is responsible for the timeous replacement of the antidote. Pharmacy records for Hydroxocobalamine acquisition and replacement for 2015, 2016 and 2017 were sighted.

First aid equipment on the plant is inspected by the Clinic Paramedic. The mine has a fully trained Emergency Response Team and a clinic to respond to cyanide emergencies. The ISOS (medical service provider, International SOS) clinic is equipped to handle cyanide patients and is on the camp site close to the process plant. The clinic is staffed by two Medical Doctors and a Paramedic with a nurse and a pharmacist available on 24 hour call. The ISOS Protocol covers the cyanide emergency medical response. The ISOS local on-site clinic provides for primary response and is staffed with qualified and cyanide trained Doctors and Paramedics, and has cyanide emergency equipment and expertise in the treatment of cyanide emergencies. The protocol makes provision for Evacuation to a Tertiary Hospital. "...Due to the availability of expertise and equipment; the regular training undertaken and the availability of antidote; patients should be managed locally as far as possible. The site Chief Medical Officer in consultation with the Regional Medical Director will make the decision on evacuation to a higher centre. All evacuated patients will be accompanied by a trained medical staff (member)." The protocol further requires that a medical bag accompany the patient which includes the cyanide treatment protocol, cyanide antidote and cyanide PPE. The Komfo Anokye Teaching Hospital, a part of

Kwame Nkrumah University of Science and Technology, is prepared to accept cyanide patients from Akyem to its ICU.

Cyanide mandown and spill drills have been conducted on site and reports including observations, an activity log, photographs and recommendations were sighted.

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.

X in full compliance with

- The operation is**
- in substantial compliance with **Standard of Practice 7.1**
 - not in compliance with

Basis for this Finding/Deficiencies Identified:

There is a mine-wide Akyem Emergency Response Plan (ERP) in place, which covers the mine, process plant and TSF. The plan covers the full range of cyanide emergency scenarios likely to be experienced on site, including the control of releases at their source as well as release containment, assessment, mitigation and the prevention of future releases. The scenarios are based upon a cyanide risk assessment conducted in 2016. The Orica cyanide supply and transport contract refers to transport emergencies and the Stellar Logistics (an ICMI certified transporter), emergency plan for the transportation of sodium cyanide was reviewed.

The ERP covers general evacuation, and process site personnel evacuation. Clearing potentially affected communities from the area of exposure is covered under the Community Notification and Evacuation Procedure. Use of cyanide antidotes and first aid measures for cyanide exposure are covered in the Plan and in the ISOS SOS Ghana Cyanide Management Protocol technical document. All incidents are investigated as per the Akyem incident reporting/ incident investigation procedure.

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

X in full compliance with

- The operation is**
- in substantial compliance with **Standard of Practice 7.2**
 - not in compliance with



Basis for this Finding/Deficiencies Identified:

The workforce was not involved in the development of the EMP as this plan was developed by specialists for the dedicated Emergency Response Team. They are, however, involved in mock drills and exercises where input is gathered through worker response.

The surrounding communities are not directly involved in the EMP but are given presentations on cyanide awareness and cyanide emergencies. The Ghana national fire service regional commanders conducted a familiarisation visit and reviewed the ERP in October 2017. Newmont staff were involved in the validation team for the district disaster management plan for the Birem North District Assembly dated November 2012. Drills are used to involve clinic, ERT, ambulance and paramedic staff in the planning and review processes.

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

X in full compliance with

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

 not in compliance with

Basis for this Finding/Deficiencies Identified:

A dedicated, full time, Emergency Response Team (ERT) is in place and available. The Team has clear duties, roles and responsibilities which are included in the EMP. Appropriate training is defined and described in the Plan, as are contact details. The Akyem emergency profile (inventory) lists emergency equipment and the dedicated fulltime ERT Captain is responsible for equipment inspections. Inspection checklists for the fire truck, ambulance, and clinic were sampled for 2015 and 2017. Drills involving relevant stakeholders ensure that roles and responsibilities are understood and clearly implemented.

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

X in full compliance with

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

 not in compliance with

Basis for this Finding/Deficiencies Identified:

The National Disaster Management Organisation (NADMO) is the designated control authority for all emergency events. When an emergency situation emerges on site, which

can be managed effectively by site personnel, it is expected that control is exercised by the General Manager or his designate. The Akyem ERP covers notification requirements to site personnel, the regulatory agencies, management and the media. The community evacuation procedure covers community and media communication. The Rapid Response Checklist includes a rapid respond checklist for the community relations advisor.

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

X in full compliance with

The operation is in substantial compliance with **Standard of Practice 7.5**
 not in compliance with

Basis for this Finding/Deficiencies Identified:

The ERP and supporting procedures refer to spill response and cyanide neutralisation, including solutions, soils, and disposal of spill clean-up debris, and neutralization of cyanide bearing solution slurry using ferrous sulphate. It also refers to recovery and disposal of spillages as appropriate to the site-specific identified scenarios. Alternate water supply is covered in the ERP, as needed. The procedure, Neutralization of Cyanide Bearing Solution slurry using Ferrous Sulphate, covers the prohibition of use of treatment chemicals being released into surface water. An Emergency sampling procedure is in place and linked to the sampling point plans.

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

X in full compliance with

The operation is in substantial compliance with **Standard of Practice 7.6**
 not in compliance with

Basis for this Finding/Deficiencies Identified:

The Plan is required to be reviewed every four years, or in the event of a major change as a result of a drill or occurrence.

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.



X in full compliance with

- The operation is** in substantial compliance with **Standard of Practice 8.1**
- not in compliance with

Basis for this Finding/Deficiencies Identified:

All personnel that may encounter cyanide receive the Akyem process safety / security induction training, as well as the cyanide training module. This includes plant employees, security staff, contractors and TSF staff. The training includes all requirements in terms of cyanide hazard recognition using cyanide producer-developed cyanide awareness training. Refresher training is done annually according to a schedule. Training records are kept both in the training matrix and as hard copies. The records are kept for the employee's work period from start of employment of the individual to current date and at least 10 years after his/her departure.

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.

X in full compliance with

- The operation is** in substantial compliance with **Standard of Practice 8.2**
- not in compliance with

Basis for this Finding/Deficiencies Identified:

A STP (Standard Task Procedure) tracker matrix system is in place and training includes all production tasks from crushing to TSF and is used in parallel to the SAP system database. All the STPs include the required PPE, pre-work inspections, and preparations. The matrix contains the names and task training required for the production staff for each job as per the above matrix, thus covering the training elements.

After receiving induction and cyanide awareness training, the employee receives the STP theoretical training in the training centre. The employee is then sent on to the plant and receives on the job training by his supervisor for the specific section. A job assessment is done after 3 months by the Trainer and the employee's Supervisor. The employee is not allowed to work unsupervised during this period. Following successful competency assessment, the employee is then allowed to work unsupervised doing the task as per the STP the employee was trained for.

STP Assessments are done following the theoretical training at the Learning and Development Department. On-the-job training is evaluated by the Supervisors doing PTO's (Planned Task Observations) and the trainer from the Learning and Development Department doing STP Assessments.



Two PTO's are done per month by the Supervisors. During the review of the interviewees training records, it was confirmed that the operation evaluates the effectiveness of cyanide training

The Trainer is a qualified workplace Trainer and Assessor and has a degree in Metallurgy. Training records are kept electronically in the training matrix and as hard copies. Records will be kept for at least 10 years after the employee leaves the workplace.

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

X in full compliance with

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

not in compliance with

Basis for this Finding/Deficiencies Identified:

Employees are trained during the induction, refresher and cyanide awareness training in the procedures to follow during cyanide releases. Refresher training is undertaken annually. The Mine uses a dedicated emergency response team and the plant personnel are trained in raising the alarm. The Emergency Response Team (ERT) is trained in the procedures to follow when cyanide is released. At least Five ERT members are available on each shift. The emergency response training calendars for 2015, 2017, 2018 were sighted which included: cyanide awareness, confined space rescue, cyanide first aid, containing leaks, HAZMAT scene control, decontamination, protection and decontamination, ventilation procedures, donning and doffing, SCBA inspection, Oxygen administration to patient, and handling decontaminated victims.

Drills are used to train plant staff, the ERT and clinic staff in the emergency response plan. Annual induction and refresher training includes cyanide awareness / cyanide producer training, and the ERT receives ongoing practical and theory training. Evidence of emergency cyanide drills was sighted. The process training officer is involved in all cyanide related drills. The ERT captain maintains all ERT training records and other records are kept at L & D (Learning and Development) and recorded in the SAP training database.

9. DIALOGUE: Engage in public consultation and disclosure.

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

X in full compliance with

The operation is in substantial compliance with **Standard of Practice 9.1**



not in compliance with

Basis for this Finding/Deficiencies Identified:

Dialogue meetings or “one-on-one’s” are two-way dialogue sessions involving both dissemination of information and the answering of questions on cyanide. Identification of Communities: Mapped Communities as well as Communities along the transport route from Akyem to Nkawkaw were identified. Site Key Communities were identified: Adausena, Afosu, Hweakwae, Mamanso, New Abirem, Ntronang, Old Abirem, Adjenua, and Amanfrom. The villages along the route of the cyanide transport from Abepotia to Bedaneagya have also been identified. Other groups identified are Religious Leaders, Executives of youth groups of the communities, schools (headmasters and social studies teachers), women's groups, soccer team leaders, community announcers, social responsibility forum, and sustainable development committees. Mapped communities are reviewed annually and given cyanide refresher sessions annually.

Presentations were given to the identified Communities before the commissioning of the mine (Aug 2013) to prepare the members for the coming events and specifically information on cyanide and its transportation management plan. Communication consists of PowerPoint presentations, and pictures. An explanation in Twi (a local language) is used for illiterate people.

Communication is ongoing with the community along the main road and the catchment areas. This includes how the mine handles cyanide. Quarterly engagement includes cyanide. Records and minutes of meetings are kept. Questions include the distance cyanide gas can travel, which is a safety concern and is difficult to quantify.

The following meeting reports, minutes and attendance registers were sighted:-

- Chiefs and Community Heads, Date: 1st June, 2016 including Cyanide Safety Awareness in the agenda.
- Concern Youth Association Executives, Date: 20th May, 2016 including Cyanide safety awareness in the agenda.
- Assembly and Unit Committee Members, Date: 20th May, 2016 including Cyanide Safety Awareness in the agenda.

The 2016 presentation including cyanide bulk transport safety measures and pictures was sighted and reviewed.

Presentation material on cyanide transportation, including transport and sparging using isotainers was sighted and reviewed. Attendance registers of various transportation related meetings conducted during 19th to 26th January 2018 including community members were reviewed. The notes on the meetings include questions and answers / responses given, as well as pictures of the meetings. 12 meetings were conducted covering all villages along the cyanide transport route within 40 km of the site, and with an estimated 136 attendees.

Group Mine Tours are conducted covering various interested groups, identified stakeholders and ad hoc requests received.

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



X in full compliance with

- The operation is**
- in substantial compliance with **Standard of Practice 9.2**
 - not in compliance with

Basis for this Finding/Deficiencies Identified:

Dialogue meetings or “one-on-one’s” are two-way dialogue sessions involving both dissemination of information and the answering of questions on cyanide. Identification of Communities: Mapped Communities as well as Communities along the transport route from Akyem to Nkawkaw were identified. Site Key Communities were identified: Ahausena, Afosu, Hweakwae, Mamanso, New Abirem, Ntronang, Old Abirem, Adjenua, and Amanfrom. The villages along the route of the cyanide transport from Abepotia to Bedaneagya have also been identified. Other groups identified are Religious Leaders, Executives of youth groups of the communities, schools (headmasters and social studies teachers), women's groups, soccer team leaders, community announcers, social responsibility forum, and sustainable development committees. Mapped communities are reviewed annually and given cyanide refresher sessions annually.

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Group Mine Tours are conducted covering various interested groups, identified stakeholders and ad hoc requests received.



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

X in full compliance with

The operation is in substantial compliance with **Standard of Practice 9.3**
 not in compliance with

Basis for this Finding/Deficiencies Identified:

Copies of PowerPoint presentations are made available, on request, during meetings, along with laminated pictures.

Verbal presentations in Twi, using key speaking points from English material, are used for communication with illiterate community members. Approximately 60% of the local communities are illiterate. Presentations include the use of enlarged colour pictures and posters to reinforce speaking points.

Newmont globally reports specifically on the Cyanide Code on their global website annually.

The 2016 Newmont web section including cyanide at: <http://sustainabilityreport.newmont.com/2016/environmental-stewardship/cyanide-management> was sighted. The report includes reference to cyanide case studies, cyanide management performance in 2016 (11 out of 13 Operations are compliant with 2 scheduling initial certification process), 1 level 3 event and no level 4 cyanide related events were reported.

Newmont cyanide incidents are classified as follows on a severity scale of 1 to 5 and Newmont considers:

- level 1 and 2 events to be relatively minor
- level 3 to 5 events to be more significant

There was only one level 3 event in 2016: A spill of approximately 4 000 gallons of low concentration cyanide solution outside of containment at the Twin Creeks Operation in Nevada. The solution did not leave the property and there was no threat to human health, communities or wildlife. There were no incidents or releases experienced at the Akyem Operation.

The 2015 Newmont web section, including cyanide, at: <http://sustainabilityreport.newmont.com/2015/environmental-stewardship/cyanide-management#!performance> was reviewed:- 10 out of 11 Newmont Operations were certified as compliant with the Cyanide Code; Newmont Nevada operation experienced two level 3 incidents and one level 4 incident; and there were no incidents or releases experienced at the Akyem Operation.

The 2014 Newmont web section at:- <http://sustainabilityreport.newmont.com/2014/environmental/environmental-data.php#sthash.9xOgEWZv.dpuf> also contained information on cyanide at Newmont operations globally.

