

***INTERNATIONAL CYANIDE
MANAGEMENT INSTITUTE***

***Gold Mining Operations
Recertification Summary Audit
Report***

**AngloGold Ashanti Continental
Sadiola Gold Plant
Mali**

14th – 18th April 2019

***For The
International Cyanide Management Code***



Name of Operation: Sadiola Gold Mine
(Société d'Exploitation des Mines d'Or de
Sadiola S.A. (SEMOS-SA)

Name of Operation Owner: AngloGold Ashanti – 41%
IAMGOLD Corporation – 41%
Mali Government – 18%

Name of Operation Operator: AngloGold Ashanti

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Location detail and description of operation

The Sadiola Gold Mine is located in the Kayes region, 80 kilometres from Kayes town in Mali (West Africa).

The mine's gold processing plant uses the conventional plant consisting of crushing, milling, leach adsorption and elution. The elution uses the AARL (Anglo American Research Laboratories) process.

The plant consists of two twin streams capable of processing soft oxide and soft sulphide ores with a limited quantity of hard component. There are two primary mills receiving fresh ore from the ore reception by conveyor belt transportation. The primary mills can run on open or closed circuit. The mills are running in open circuit when the underflow of the primary mill cyclones feeds the regrind mill. However, when the cyclone underflow returns back into the mill, the mill is on closed circuit.

A gravity plant, originally installed December 2008, consists of a screening facility, a falcon concentrator and a Gekko In-Line Leach Reactor unit which is used for intensive cyanidation in the leach reactor. A second falcon concentrator, installed in 2010, is used in conjunction with the first falcon to extract coarse gold, which is fed into the Gekko unit. The pregnant solution from the Gekko unit is pumped to the smelt house for electrowinning and the solids residue is sent back to the regrind mill.



The cyclone overflow passes through linear screens prior to discharging into the pre-oxidation tanks. There are EDR (manufacturer) pumps connected to the pre-oxidation tanks to supply oxygen through injection points on the pipeline. During sulphide ore treatment, it is necessary to add hydrogen peroxide in order to increase the dissolved oxygen concentration to optimise processing.

The lime addition is performed, using an EDR pump in tank 1. The slurry pH is controlled at 10.0 – 10.2, before sodium cyanide addition. The cyanide is added into leach tank 1, but can be added into tanks 2 and 3, when required. There are ten leach tanks on each stream to assure the required residence time. Automatic TAC 1000 cyanide analyzers are in line to control the cyanide concentration and dosing rate as close as possible to the set point. No more cyanide is added downstream to maintain the concentration.

The slurry overflows, by gravity, into adsorption vessels containing activated carbon, except that the first vessels are used as grit catchers. The carbon movement upstream is performed with the carbon transfer pumps installed in each tank. There are eight adsorption tanks in series with gravity flow. The last tanks are used for detoxification of residue slurry prior to pumping to the tailings facility.

A WAD (Weak Acid Dissociable) cyanide analyser is installed at the plant tail for optimization control of the cyanide neutralization process. After detoxification the residue is pumped from the residue tank to the tailings storage facility (TSF) via a steel pipeline. The slurry is cycloned to remove the coarse fractions for TSF impoundment wall building. The fine fractions from the cyclone overflow run down to the pool. The decanted water is pumped to the plant via the return water dam or directly from a barge decant system with four submersible pumps capable of pumping 300 m³/hr each. There are underdrains and elevated filter drains for stability of the wall. Piezometers installed along the starter wall and the ringmain wall (stand pipes and vibrocores) determine the level of water at the wall foundation.

The Loaded carbon is pumped from second adsorption tanks to elution on a daily basis. The carbon is acid washed with hydrochloric acid, neutralized with caustic soda and washed with clean water before elution. The elution consists of heating the carbon, soaking it in hot caustic cyanide solution and rinsing it with hot soft water. The gold-bearing solution is pumped to the smelt house for electro winning and the eluted carbon is regenerated and pumped back to the adsorption circuit. The spent electrolyte is pumped back to the leach circuit after electro winning.



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:

The cyanide Supply and Transport Contract is with Samsung, a Cyanide Code consignor (ICMI recertified on 30 January 2018), who obtains cyanide briquettes from cyanide producers, TaeKwang (ICMI recertified on 19 June 2017) and Tongsoh (ICMI recertified on 23 March 2017). Samsung is also responsible for the transport of the cyanide. The contract requires that Samsung and all its sub-contractors must be certified under the ICMI Cyanide Code.

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:

There is a signed Contract in place for the supply and transportation of sodium cyanide briquettes between Samsung and AngloGold Ashanti Sadiola Gold Mine. The contract specifically covers the responsibilities and requirements for transport, safety, security,

unloading, emergency response (spills prevention and clean-up), route planning and risk assessments, storage, loading and unloading, community liaison, emergency response resource access and availability, training, and communication. Samsung has a Transport Management Plan in place which covers normal, abnormal and emergency situations during cyanide transportation.

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 supply and transport contract requires that the producer/supplier of cyanide must be a signatory to the ICMI Code and the producer supplier and transporter must be ICMI certified. The Samsung Africa supply chain was recertified on 30 January 2018 covering the complete supply chain from the producers in Korea to the site in Mali. Senegal/Mali Transporter, Bollare Africa Logistics SDV Senegal, is certified under the Samsung Africa supply chain and was also recertified as an ICMI transporter on 14 October 2016. Appropriate emergency response plans and capabilities for cyanide management are included in ICMI certifications.

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:

There have been no changes, since the last certification audit, in the offloading, mixing and storage facilities which were designed and built, in accordance with sound and accepted engineering practices, with materials appropriate for use with cyanide and are

located in concrete bunds away from people and surface waters. The cyanide is also stored away from incompatible materials. The site visit confirmed that the tanks are placed on raised solid concrete plinths on steel and concrete supports within a concrete bunded area. The audit reconfirmed the documentation checked during the certification audit.

The control room operator manages the filling of the cyanide mixing tank from the control room during the mixing event. The maximum quantity for filling the mixing tank is 90%. This is controlled using an automatic cut-off valve. High (90%) and High-High (95%) level alarms sounds at the Control room. The control room operator controls the transfer of the mixed cyanide to the storage tank from the control room. The maximum level for the storage tank is set at 95% and this is controlled with an automatic cut-off valve. The level of the storage tank is displayed in the control room with level alarms at High and High-High level.

The solid cyanide is stored in the original packing, which includes plastic liners in a bulk bag inside closed wooden boxes. The boxes are stored in a warehouse with adequate ventilation and protection from rain. The mixing tank is ventilated through the filling chute. The gasses from the cyanide storage tank will escape via a ventilation pipe. The solid cyanide storage area is located within the plant, which is fenced and access is security controlled. The storage area itself is also fenced and access is limited to specific individuals through access control fobs and locks.

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:

The cyanide offloading, sea container de-stuffing and make-up procedures are detailed, spelling out PPE requirements, use of a buddy in the process, and clearly sequenced to prevent spillages and accidental releases during mixing and transfer processes. All valves inside the cyanide mixing and storage area are automatically controlled from the control room.

Sea containers are placed close to the cyanide store to shorten the route to the store and minimise risk of forklift collisions. All forklift operators are appropriately trained to drive forklifts. Incineration of empty boxes, maximum numbers of empty boxes stored in the cyanide store and a security requirement to document boxes incinerated are included in the make-up procedure. The offloading procedure stipulates that full cyanide boxes may not be stacked more than 3 boxes high in the cyanide storage area. This was observed during the site inspection.



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 site has 24 cyanide specific procedures and 126 standard operating procedures in place that cover the operations of the Plant and the TSF (Tailings Storage facility). A corporate Tailings Management Framework document lists commitments, including freeboard and storm events and also includes ICMI Code compliance requirements. A Regional Tailings Management Protocol for AngloGold Ashanti (AGA) West Africa Division is in place. The Mali Sadiola Gold Mine Tailings Audit report by Roger Welff, Senior Manager Geotechnical Engineering Tailings and Heap Leach Management, June 2017 was reviewed. The report covers the detailed Life of Mine deposition, including that the Factor of safety of slopes is 1.3, which is tolerable for an operating TSF. No issues were identified which would prevent the TSF being operated, as designed. All tanks, bunds, pond, impoundments, pipelines, valves and pumps are on the PRAGMA PMS (Planned Maintenance System) and are inspected on a regular basis. Wildlife inspections are carried out daily. The auditors therefore concluded that the operation inspects cyanide facilities on an established frequency sufficient to assure and document that they are functioning within design parameters.

The site uses a water balance model developed using REMIS (Environmental Information Management System Software) and GoldSim (probabilistic water balance software) to predict and respond to changes or upsets in water management. Also used to respond to water balance upsets are emergency procedures covering overflow of the return water dam spillway, overtopping of ponds and impoundments, and the shutdown of the leach section.

Operational inspections include monthly safety officer and management inspections, Cyanide Safety Plant Monthly Inspections, Shift Foreman shiftly inspections and the daily reagent Foreman inspections. Wildlife inspections are carried out daily and are included in the checklists.

The operation has a procedure to identify when changes in a site's processes or operating practices may increase the potential for the release of cyanide and to incorporate the necessary release prevention measures. There were no changes increasing cyanide exposure or release risks in the past three years, as determined by risk assessments.

An electronic PMS called PRAGMA generates inspection scheduling and all cyanide equipment (tanks, secondary containment, pipelines, pumps and valves, ponds and impoundments) on the plant and on the TSF is included in the PRAGMA system. The Plant is designed and equipped with bund walls, sump pumps and all spillages are returned to the process.

There are 19 Gensets located at the plant. Sixteen are used to run the plant, 1 is used to run the mine village and the other 2 are for rotation of maintenance and back-up. Maintenance is done by the Mine for 500 to 12 000 hrs. 24 000 hr maintenance is done by an external vendor. A Genset is available at the TSF to pump water from the TSF to the RWD (Return Water Dam) in the event of a total power outage at the plant in order to prevent too much water being stored on the tailings dam. This Genset is tested on a monthly basis to ensure it is operational when needed.

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:

Sadiola has reached the end of treating its Life of Mine fresh, open pit, reserves. The mill has been treating lower grade oxide stockpile reserves since March 2018. From March 2018 onwards, the feed to the Plant consisted of the low-grade stockpiles from the ROM pads. The feed is marginal mineralised wastes and the feed to the plant is blended for grade control.

Cyanide optimisation testwork is done on a quarterly basis and reports from 2016 to 2018 were sampled. The cyanide usage optimisation report dated 3 February 2016 concluded that the process was running at optimal conditions. The cyanide usage optimisation report dated 30 June 2017, concluded that the process was running at optimal conditions at 0.3 kg/t cyanide consumption. The report dated 15 January 2018, concluded that the process was running at optimal conditions. The report dated 8 June 2018, indicated 0.4 kg/t gave a better recovery. The report dated 5 October 2018, indicated that 0.4 kg/t gave better recovery as in the previous test and the report dated 6 April 2019, indicated that 0.345 kg/t gave the optimal recovery. The testwork indicated varied cyanide consumption on the stockpile material and cyanide consumption is run between 0.3 to 0.4 kg/t. The actual average consumption for 2018 was 0.34kg/t which is in line with the testwork carried out. The bottle roll tests indicate that this is the optimal range and the variability is not significant. Some sulphide areas were identified but this is not milled currently due to high cyanide consumption and lower recovery.



A TAC 1000 cyanide on-line analyser, supported by leach operator titrations, is used for automatic cyanide control. The cyanide control logic includes fuzzy logic algorithms using current and historical information to compute the new addition rates. Variable speed peristaltic pumps are used to vary cyanide feed rates automatically as per control algorithms. The cyanide addition is controlled using ratio control with tonnage and feedback control by the PLC, based on the cyanide analyser results.

The current control strategy is best practice and no further strategies are currently evaluated. If new technology becomes available in future, it may be evaluated.

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:

Sadiola Gold Plant has developed a comprehensive, probabilistic water balance using a contractor. The water balance was developed using Remis (Environmental Information Management System Software) and GoldSim (probabilistic water balance software) and annual updates are undertaken with the plant sending monthly data for a year and then receiving monthly reports for the entire year corresponding to the data sent.

The plant supplies tonnage deposited, target underflow of cyclones, number of cyclones that are operated, running time, utilisation of cyclone, bypass hours, operational utilisation, rainfall data, evaporation factors, ring main wall freeboard, Return Water Dam levels, boreholes levels at the TSF and water quality data, phreatic levels, and piezometer graphs. This data was sampled for June 2017 and March 2019. The rainfall data for 2016 through to 2019 was also reviewed and it was noted that the model uses a stochastic rainfall generator that is calibrated to historical rainfall.

The consultant sends back a Monthly Water Balance Update Report containing probability of spill at the Return Water Dam - 0%, TSF Freeboard (probability of freeboard below minimum levels risk - 0%); 24 hour power failure at the tailings storage facility, and effect of plant upset e.g. reduced density concluded the risk was negligible. The reports were sampled for June 2017 and March 2019.

The operating procedures incorporate inspection and monitoring activities to implement the water balance and prevent overtopping of ponds and impoundments and unplanned discharge of cyanide solutions to the environment. Daily, Weekly and Monthly TSF Inspection Checklists for the Sadiola TSF are completed by the TSF operator. The AGA internal Geotechnical Engineer conducts a quarterly monitoring assessment of the TSF and annual audits by the AGA Geotechnical Engineer: Tailings & Heap Leach Management check issues identified, risk index, recommended mitigation actions, responsible persons and target completion dates.



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:

The Plant compliance point is the cyclone overflow at the deposition point at the TSF. There have been occasional exceedances in the WAD cyanide levels but these have been caused by equipment faults and ore variations.

In 2016, one exceedance of 62 and one of 60 mg/l WAD cyanide was observed. In 2017, four exceedances were observed at 53, 57, 70, and 62 mg/l WAD cyanide. These exceedances were caused by the ore type treated containing more sulphide ore than anticipated. In 2018, exceedances were observed at 63, 66, 75, 60, 53, 54, 58, 60, 55, 54 and 54 mg/l WAD cyanide. The plant was stopped as per procedure to bring Detox back in line. Detox plant failure was the cause of these August 2017 exceedances. The ore type treated containing more sulphide ore, was the cause of the other exceedances. In 2019, two exceedances of 61 and 57 mg/l WAD cyanide were observed, and these were due to the TAC 1000 free cyanide analysers on the two modules becoming faulty. The TSF Pool edge values never exceeded 50 mg/l WAD cyanide for the period from 2016 to March 2019. Maximum values were in 2016 -15 mg/l WAD cyanide, 2017 -11.3 mg/l WAD cyanide, 2018 - 28.2 mg/l WAD cyanide, and in 2019 - 6.3 mg/l WAD cyanide. The Return Water Dam WAD cyanide values were below 5 mg/l. The High WAD cyanide investigation reports for all exceedances from 2016 – 2019 (11 x analyser equipment-related, 1 x laboratory-related and 7 x ore-related) were reviewed. Causes were identified and corrective actions, where possible, were implemented, demonstrating good control and response under abnormal circumstances.

The auditors sampled the TSF inspections for 2017 and 2019, showing that there were no mortalities observed. It was reported in interviews that no cyanide-related wildlife mortalities had been identified over the past three years and furthermore, not since 2002. The auditors are satisfied that the WAD cyanide levels are well controlled and exceedances are not excessive. Thus, there are no additional measures required to restrict access by wildlife to the TSF open waters and beach. Maintaining a WAD cyanide concentration of 50 mg/l, or less, in open water is effective in preventing significant wildlife mortality.

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:

There is no direct or indirect discharge to surface water. Surface water samples from streams sampled during the wet season, when they flow, show all values were below 0.01 ppm WAD cyanide. The nearest river is approximately 56 km from the site.

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 Plant is equipped with extensive bunds and concrete surfaces to prevent seepage from spillages to ground water. The TSF is equipped with under drains and elevated drains and there are cut-off trenches on the western side installed, with the whole TSF surrounded by clean/dirty water separation channels. These measures are to minimise seepage to groundwater. A borehole monitoring program is in place with monthly samples taken and analysed for total cyanide. The legal limits are 1mg/l Free Cyanide and 1mg/l Total Cyanide as cyanide.

The community drinking water boreholes are monitored and compared to the WHO drinking water level of 0.7 mg/l total cyanide. Results for December 2017, June 2018, and February 2019 were reviewed and all values were below the limits of detection of 0.01 mg/l total cyanide.

Upstream borehole data was reviewed and all values were less than limits of detection of 0.01 mg/l Free and total cyanide (Feb 2019). The borehole data downstream of the PCD was also reviewed and all values were less than limits of detection of 0.01 mg/l Free and Total cyanide (June 2017, Feb 2019). Similarly, the borehole data downstream of the TSF showed that all values were less than limits of detection of 0.01 mg/l Free and Total cyanide (February 2019, June 2017).

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:

There has been no change from previous audits. The cyanide storage and make-up area, the leach, CIP, residue, elution and acid wash areas are all equipped with bunds and the plant is designed with sumps and pumps to return all spillage to the process circuit. The secondary containments for the process solution tanks have the capacity to hold a volume greater than that of the largest tank within the containment and any piping draining back to the tank, and with additional capacity for the design storm event. The Cyanide storage and make-up tanks are placed on solid concrete foundations. The cyanide solution transfer lines for the Gekko and elution plants are custom designed, George Fisher pipe-in-pipe systems equipped with leak detection sight glasses. TSF pipelines are maintained by thickness testing and are part of the PMS system maintenance using daily pipe patrol inspections. The new TSF pipeline runs within an earth berm to contain any spillage. Catchment paddocks are placed at low points and the TSF ring main is placed inside the TSF boundaries. All cyanide tanks and pipelines are constructed of mild steel and HDPE. The Cyanide Storage Tank and Cyanide Mixing Tanks are constructed of fibre glass designed in accordance with BS4994:1987.

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:

No changes have been implemented since the previous certification audit and QA/QC evidence remains unchanged.

Quality control and quality assurance documentation or as-built certification for the cyanide facility tank replacement and construction is available and was sighted. The AGA Sadiola Mine Visual Structural Audit by DRA dated February 2015 was reviewed. The report identified various structural issues and made recommendations including a work priority list. The most urgent cyanide-related issue was the maintenance of leach tanks. The Mine embarked on a program to do structural maintenance on the leach tanks. The work was completed in the beginning of 2019, addressing the cyanide-related issues over a 3 year period as per the report recommendations. Following the remedial action taken by the Mine, it is concluded that the issues identified as risks have been remediated and the plant can continue to be operated within established parameters consistent with the Code's Principles and Standards of Practice.

Various TSF Quarterly surveillance inspection reports were sampled and reviewed. The April 2019 report concluded that "...the freeboard was visible all around the TSF with

the exception of the decant edges, the outer walls are being developed towards closure requirements, residue deposition recommendation are made and advised on pool position, under drains were cleaned out, average freeboard is 4.77m...” No stability or freeboard issues were identified.

The October 2017 report concluded that, “...the pool is well managed, a good freeboard is developed around the TSF, deposition is taking place in a cyclic and well controlled manner, lowest freeboard is well within the allowable limit...and an emergency preparedness plan is being developed...” An internal desktop emergency simulation took place.

The annual AGA International Operations Africa - Mali Sadiola Gold Mine Tailings Audit report by Roger Welff, Senior Manager Geotechnical Engineering Tailings and Heap Leach Management, Sept 2018 was reviewed which included risk management, issues, recommendation and mitigating actions. The report did not identify any issues that impacted on the operation of the TSF as per the life of mine and noted the preparation and planning for closure had commenced.

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:

Procedures for environmental monitoring (including sampling and analytical protocols, how and where samples should be taken, cyanide species to be sampled, sample preservation techniques, chain of custody procedures, shipping and a sampling sheet including records of sampling conditions) of surface water and borehole water, developed by competent persons, were sighted and checked. Daily operational bird mortality inspections are in place and TSF inspection reports for the three years since the last certification audit were sampled. Groundwater sampling is conducted on a monthly basis. Surface water sampling is conducted during the rainy season when the streams are flowing. Tailings discharge sampling to the TSF from the cyclone overflow is conducted daily. It is thus concluded that monitoring is conducted at frequencies adequate to characterise 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:

The site has developed a plant decommissioning procedure which includes a broad, timetabled implementation schedule. The procedure was revised in May 2016 and the next revision is scheduled for May 2019.

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:

Cyanide facility decommissioning costs are included in the Sadiola Environmental Liability Statement dated 22 December 2017. The operation reviews and updates the cost estimates every 3 years, or as needed. The revisions were confirmed electronically.

The Malian Government does not require money to be physically put in an account or for financial guarantees to be provided.

A Statement of Financial Strength (including financial information, and ratios and financial test requirements) dated 26 November 2015 prepared by accounting firm, Ernst and Young, for AngloGold Ashanti's Continental Africa Region operations confirming the company's self-financing ability to undertake cyanide decommissioning commitments, prepared by a registered auditor and chartered accountant, was sighted.

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 site has 24 cyanide specific procedures and 126 standard operating procedures in place that cover the operations of the Plant and the TSF (Tailings Storage facility). Nine of the 24 cyanide SOPs were specifically reviewed to check they were able to minimise worker exposure to cyanide through use of PPE, pre-work inspections and other controls and this was confirmed. A corporate, Tailings Management Framework document lists commitments, including freeboard and storm events and also includes ICMI Code compliance requirements. The Mali Sadiola Gold Mine Tailings Audit report by Roger Welff, Senior Manager Geotechnical Engineering Tailings and Heap Leach Management, June 2017 was reviewed. The report covers the detailed Life of Mine deposition, including that the Factor of safety of slopes is 1.3, which is tolerable for an operating TSF. No issues were identified which would prevent the TSF being operated, as designed. All tanks, bunds, pond, impoundments, pipelines, valves and pumps are on the PRAGMA PMS (Planned Maintenance System) and are inspected on a regular basis. Wildlife inspections are carried out daily.

The site uses a water balance model developed using Remis (Environmental Information Management System Software) and GoldSim (probabilistic water balance software) to predict and respond to changes or upsets in water management. Also used to respond to water balance upsets are emergency procedures covering overflow of the return water dam spillway, overtopping of ponds and impoundments, and the shutdown of the leach section.

Operational inspections include monthly safety officer and management inspections, Cyanide Safety Plant Monthly Inspections, Shift Foreman shiftly inspections and the daily reagent Foreman inspections. Wildlife inspections are carried out daily and are included in the checklists.

The operation has a procedure to identify when changes in a site's processes or operating practices may increase the potential for the release of cyanide and to incorporate the necessary release prevention measures. There were no changes increasing cyanide exposure or release risks in the past three years, as determined by risk assessments.

The operation solicits and actively considers worker input in developing and evaluating health and safety procedures. Input is derived from risk assessment sessions which include worker representation. Daily health and safety meetings and monthly Mass Health and Safety meetings are held specifically to obtain worker input on safety and health.

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 operation has determined the appropriate pH for limiting the evolution of HCN gas during mixing and production activities: the pH is controlled at 10.2. The leach feed pumps, and the cyanide dosing pumps are interlocked with the pH so that it shuts down at pH < 9.5. The auditors sighted a procedure, Controlling the leach section, which specified pH parameters, pH being monitored and controlled in Leach Tank 1. In addition, the Sodium Cyanide Make-up Procedure requires the addition of caustic soda to 2%.

PAC 7000 HCN (hydrogen cyanide) personal gas monitors are used when entering a cyanide area. Signs were observed by the auditors showing when a PAC 7000 must be used. Use is also identified within the procedures as to what PPE must be used, including PAC 7000 monitors. The monitors have an alarm at 4.7 ppm and 10 ppm. The first alarm identifies when face masks must be fitted, which are carried by all employees in a rucksack (observed during site inspection) entering a cyanide area. The second alarm identifies when an area must be evacuated. A procedure instructs the use of the Dräger PAC 7000 gas monitor. 52 x PAC 7000 monitors are used on the plant and issued to Plant, Engineering, Procurements, Laboratory and Safety staff. The PAC 7000 register was sighted electronically, indicating calibration expiry dates. The dates change colour automatically to indicate pending calibration requirement. The register also indicates who has been allocated a particular unit and when a unit is taken out of service. “Hotspot” surveys are done monthly and surveys for 2017 and 2019 were sampled and reviewed. The site has identified 38 locations around the plant and 6 around the TSF which are monitored. The site’s Cyanide Champion is trained to calibrate gas monitors six monthly, as per manufacturer’s instructions. The training also covered basic maintenance. His certificate of competence from Dräger (monitor manufacturer) was sighted, dated 22 February 2019, and is valid for two years. Calibration records for a sample of the units, were reviewed to confirm regular calibration as required by the manufacturer.

On-going inspections and checks are also used to monitor and check facilities and emergency response equipment functioning and checklists were sampled in detail in 2017 and 2019. Safety equipment such as safety showers, low pressure eye wash stations, and fire extinguishers are numerous and adequately signposted using both English and French. MSDS are available in English and French. A full-equipped, cyanide emergency trailer is parked near the plant entrance gate and is inspected and maintained by the cyanide champion.

No eating and drinking is allowed on site and this is indicated on signs and trained and reinforced during annual induction of contractors and plant staff. Cyanide pipelines are colour coded, and labelled with appropriate description and directional flow. Accident and incident reporting and investigation procedures, based upon the site safety reporting requirements, were found to be in place and effective. No cyanide related incidents have occurred since 2008.



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:

Fixed and portable radios and cell phones are used for normal and emergency communication. Audible and visual alarms are linked to man down alarms and also alarm in the control room on the SCADA. A dedicated cyanide emergency station is fully equipped to handle cyanide incidents. Cyanide first aid boxes are placed at strategic areas, i.e. the solid cyanide make-up and storage area, top of leach and CIP at both trains, the smelt house, in the emergency trailer, and at the control room.

Antidote kits are all stored in fridges, as per manufacturers recommendations. The kits are replaced through the hospital which obtains them from the AGA South Africa, Johannesburg stores. All antidote kits expire on the same date, simplifying the replacement schedules and deliveries from South Africa.

Running water is available at all cyanide emergency locations. Cyanide Emergency stations were sampled during site inspection and found to be fully equipped as per checklists. Inspection lists for the antidotes, oxygen BA sets, safety showers, oxygen cylinders, and first aid boxes were checked, confirmed for the whole plant, and sampled for 2017 and 2019.

The operation has its own on-site capability to provide first aid and medical assistance to workers exposed to cyanide. Sadiola has an on-site medical facility that will respond to all emergencies, including workers exposed to cyanide. The control room will inform the medical facility of an emergency involving cyanide. The on-site medical facility will send an appropriately equipped ambulance to the plant to recover the patient and take them to the on-site medical facility, 10 minutes from the Plant. There are procedures in place covering Medical Response and Preparedness During a Cyanide Emergency, Medical Evacuation, and Cyanide PPE Checklists. Monthly cyanide checklists for 2016, 2017, 2018 and 2019 were sighted and reviewed. The on-site medical facility has wards, isolation facilities (the isolation facilities are designed to cope with both cyanide and Ebola isolation), full hospital-type resources and is capable of handling overnight cyanide observation requirements.

The facility functions as a hospital, with overnight beds and provides a wide range of medical services. It is able to treat cyanide patients and the medical staff are trained to provide the specialised care and treatment required by cyanide patients.

The current preference is to treat any cyanide patients from the Sadiola mine "in-house" and not send them to local hospitals which do not have the trained staff and resources to treat cyanide patients.



Cyanide emergency drills are conducted periodically to test responses to cyanide emergencies. In the past three years full cycle mandown drills have been conducted, TSF, gassing and spill drills have been conducted, as well as desktop drills. Drill reports were sighted and reviewed and demonstrated that weaknesses were identified and corrective actions implemented.

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:

The site has a cyanide Emergency Preparedness and Response Plan with supporting procedures files. A previous HAZOP was conducted to check various cyanide scenarios for site relevance. Cyanide road transportation in Senegal and Mali is conducted by a ICMI certified transporter who has a separate Bolloré Africa Logistics cyanide emergency plan, “De response D'urgence transport de cyanure”.

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 is involved in the EPP process through training and drills as well as monthly cyanide topics. This was confirmed during the review of cyanide drills; toolbox talks and monthly safety mass meetings.

The communities are not involved in the emergency response plan but are kept informed through a structured dialogue process with surrounding villages. The Sadiola hospital is involved in mock drills to involve them in the EPP process. Local response agencies are not used in cyanide emergencies as they are not equipped or trained to deal with these types of emergencies. The Civil Protection organisation are the only outside responders

that are involved in the emergency planning and response process. The Civil Protection organisation have received specific training with regard to emergency incidents including hazardous chemicals.

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:

The EPP details roles and responsibilities of the plant emergency response team. The on-site team commander is the plant manager or the plant engineer and the explicit authority to commit resources is part of their managerial authority in liaison with the Managing Director.

The procedure describes three levels of incidents with guidelines on action, responsibilities, and relevant authority for each level of incident. The plant and community emergency response teams are identified in the EPP. The emergency equipment inventory was checked and site inspections confirmed availability and readiness. The Plan includes contact references (telephone, cell phone, etc) of internal and external resources for the various scenarios, particularly with detail where external resources and skills might be needed. Periodic drills involving internal and external stakeholders ensure that roles and responsibilities are understood and clearly implemented. No outside responders are used during emergency situations, Communities do not take part in the emergency responses, but are given information on cyanide.

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 Emergency Response Plan includes details for appropriate emergency notification and reporting (internal and external) and the call-out procedure and contact information lists which are updated regularly. Internal and external communication (including the Media) is dealt with in the Plan and is ultimately managed by the Managing Director or his designate.



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 Emergency Response Plan covers clean-up, remediation and a neutralisation methodology. The use of neutralization processes and materials is clearly covered, as is disposal of contaminated materials. There is no scenario where borehole contamination is possible and requiring an alternative drinking water supply to be provided, as drinking water is provided via pipeline from the Senegal river but the mine can provide water via water tanker. The procedure, Handling cyanide spillages, states that sodium hypochlorite, ferrous sulphate and hydrogen peroxide shall not be used to treat cyanide that has been released in to surface water, unless human life is threatened. The water sampling procedure includes provision for the handling of emergency sampling.

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 EPP includes the requirement for review and revision three yearly or after an actual cyanide emergency or a mock drill which identified deficiencies in the plan under the section entitled Plan Maintenance and Change Management. Drills incorporate identification of problems, action and follow up on completion.

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 site personnel are given basic general induction and it includes a section on cyanide awareness covering method of poisoning, effect of cyanide on oxygen in the body, symptoms, PPE, basic emergency response and treatment. Written and oral pre- and post-tests are conducted and the pass mark is 80%. The training matrix specifies required training for all plant employees and includes the requirement for cyanide awareness and cyanide basic first aid. Refresher training is conducted annually for all personnel. Refresher training was checked during interviews and review of the interviewee training records. All records are kept from start of employee's employment for 20 years (local legislation).

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:

All personnel undertaking tasks involving cyanide equipment where solutions and pulp contains more than 0.5ppm WAD cyanide receive training using the standard operating procedures (SOPs). All engineering staff, security, store staff and operational staff in the plant are included in the cyanide first aid training. The training matrix contains the appropriate training elements, for each section. The SOPs are used for training, followed by verbal testing and Planned Task Observations (PTOs). SOP training, once completed, is only repeated if the SOP changes. PTO's are conducted to identify worker specific training deficiencies and facilitate correction and/or counselling and retraining. Each Supervisor does PTOs, according to a schedule, of 4 per month. All records are kept from start of employee's employment for 20 years (local legislation).

The Process Trainer has received training as an Assessor, as a St John's Ambulance trainer, and a "train the trainer" program. He was the first SOP (Standard Operating Procedures) trainer on the plant and developed the procedures.



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:

A special plant emergency response team (PERT) with special training is in place to react to cyanide emergencies. The PERT training matrix includes cyanide awareness, confined space rescue, advanced cyanide first aid, breathing apparatus (SCBA), gas detection equipment, Emergency Response Plan, First aid, and HAZCHEM handling. Currently, all personnel are trained in basic cyanide first aid and response, but they do not take part in the emergency activities.

The medical facility will be contacted by the control room operator who will despatch the ambulance and trained doctor / nurse to the plant. Mock drills are conducted involving all personnel and the Sadiola medical facility is involved in the emergency response plan. No community members are involved in the Emergency Response Plan. The EPP specifies refresher training frequency as bi-annually. The Training Officer is involved in the drills and drills are video-taped and photographed. All records are kept from start of employee's employment for 20 years (local legislation).

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 are two-way dialogue sessions involving both dissemination of information and the answering of questions on cyanide. Quarterly meeting sessions are held with the 8 villages around the Sadiola mine (Sadiola, Farabakouta, Medine, Sirimana, Neteko, Borokone, Tabakot, and Sekokoto). Each village sends 4 people as representatives. The auditors sampled two sets of meeting reports, but noted that all quarterly meetings were conducted.



A meeting with community members (in French) dated 17 July 2017 was attended by 27 members. The objective of the meeting was to raise awareness of cyanide. The meeting covered cyanide training (production transport, storage, handling and usage) and provide refresher training, as necessary. A certificate of attendance was issued to community members who attended. The notes on the meeting included items on environmental incidents involving cyanide (no incidents had occurred). A site visit to the plant and TSF was also conducted. Questions from the community members included rehabilitation of the TSF after mine closure and the cyanide box burning. The attendees were asked questions on the cyanide training to test understanding of the presentation. Indications were of a good understanding of the presentation by all attendees.

A presentation was given to various surrounding villages on 28 May 2018 with 34 attendees and no absentees. The meeting covered communication, life of mine, water issues, wandering animals, traditional miners, and a refresher on knowledge of cyanide. A site visit was subsequently conducted to the TSF on 29 May 2018. No new specific issues were raised.

A health and safety meeting was held with the Minister of Labour on the 10 April 2019. The meeting objective was a safety campaign to assist with more focus on the health and safety of workers by the Government.

The first meeting for 2019 was held on 15 - 16 February 2019. However, the report and minutes were not yet available.

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 are two-way dialogue sessions involving both dissemination of information and the answering of questions on cyanide. Quarterly meeting sessions are held with the 8 villages around the Sadiola mine (Sadiola, Farabakouta, Medine, Sirimana, Neteko, Borokone, Tabakot, and Sekokoto). Each village sends 4 people as representatives. The auditors sampled two sets of meeting reports, but noted that all quarterly meetings were conducted.

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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:

Activities were demonstrated during site visits to the plants and flow sheets were distributed to participants. The participants included current contract or casual workers who were interested to understand more about the process from the point of view to progressing in employment.

A presentation was developed in French and presented to the attendees in the local languages of Bambara and Malinke. A significant number of attendees were not literate. Plant visits are used for communicating how mine activities are conducted. Flow sheets describing the Sadiola operation are handed out, supported by verbal presentation in Bambara, the local language. First aid and emergency shower positions documentation is also handed out to visitors. Information is also disseminated via community members who are given briefing information in the Bambara and Malinke languages and who verbally communicate to illiterate community members. There are very high levels of illiteracy amongst the communities and the only effective and sustainable communication means is verbal using the Bambara and Malinke languages.

An AngloGold Ashanti (AGA) Group wide Workforce Management Reporting System (WMRS) is used as an electronic reporting platform. Safety is covered under Sadiola Incident Reporting and Investigation Procedure SHP 002 rev 6 dated March 2018 which is used for safety incidents. Incidents are classified as Minor, Moderate, High, Major and Extreme when entered into the WMRS system. Environment is covered under the Protocol for Environmental Incident Reporting which is used for environmental incidents. Incidents are loaded in the WMRS and classified as Minor, Moderate, High, Major and Extreme when entered into the WMRS system.



In the Procedure for Developing an Emergency Response Preparedness Plan for Sadiola, Section 15. Emergency Notification of Surrounding Communities, states that the Incident Controller in consultation with the General Manager will instigate incident notification to nominate authorities for surrounding communities via the External Phone list located in the Plant / TSF Emergency Response Plan. The procedure includes a reporting flow diagram including the WMRS reporting requirement. In the same procedure, Section 12. Media Relations, states that Contact with Media / Public Affairs is the responsibility of the Incident Management Team. If required, a Crisis Management Team Leader representative may be sent to site to liaise with relevant agencies should the Managing Director request assistance.

The Managing Director will handle media contact on site and the site personnel are to be advised not to give media interviews, either by telephone or in person or speculate or discuss the incident until a formal investigation has been completed.

Sadiola has not had any cyanide incidents (Health, Safety or Environmental) in the 3 years since certification that required reporting on a public level and thus no reports were made in the AGA annual reports since the last re-certification done in April 2016.

