

***INTERNATIONAL CYANIDE  
MANAGEMENT INSTITUTE***

***Cyanide Code Compliance Audit  
Gold Mining Operations***

***Recertification Summary Audit Report***

***AngloGold Ashanti Continental  
Sadiola Gold Plant  
Mali***

***6<sup>th</sup> – 10<sup>th</sup> November 2012***



Name of Operation: Sadiola Gold Mine

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

Name of Operation Operator: AngloGold Ashanti

Name of Responsible Manager: Mr Adama Coulibaly, Plant Manager

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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). Gold processing uses the conventional plant consisting of crushing, milling, leach adsorption and elution. The elution uses AARL process. The plant consists of two twin streams capable to process soft oxide and soft sulphide with a limited amount of hard component.

**1. Ore reception section**

Two semi-mobile jaw crushers installed at the ROMPAD to feed directly each stream surge bin with crushed ore below 200 mm can supply 80% of the plant need in ore tons per hour. Trucks supply the remaining 20% of the required tons of ore which passes through a 900 mm from grizzly bars on top of the bins. All plant feed ore is loaded into the surge bins below which are apron feeders feeding mineral sizers at a variable speed that allow controlling of the feed rate. The ore fractions prior to milling are reduced to 100% passing 300 mm size from a maximum feed fraction size of 900 mm from grizzly bars on top of the bins. Each stream is capable to deliver a maximum of 400 tons per hour (tph) of ore.

**2. Milling section operation**

There are two primary mills receiving fresh ore from the ore reception by conveyor belt transportation. The primary mills can run on open or close circuit. The mills are running in open circuit when the underflow of the primary mill cyclones feeds the regrind mill. But when the cyclone underflow returns back into

the mill, thus the mill is on close circuit. The ore is milled to obtain a product with a density of 1.45 to 1.50 containing minimum 45 % of 75 microns. The mill product is diluted in the discharge sump to reach the required cyclone feed density between 1.35 and 1.40 depending on the ore type. The hydro cyclones (Krebs cyclones) classify the slurry to get an overflow with minimum 80% of fractions minus 75 microns. The throughput averages 315 tph in open circuit and 270 tph in close circuit per primary mill. The viscosity modifier is added into the mills when the slurry viscosity is above 80 kpa.s<sup>-1</sup>. A gravity plant installed since December 2008 consists of a screening facility, a falcon concentrator and a Gekko unit 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 prior to the leaching section. A dewatering circuit has been added to the gravity plant in 2012 to dewater the tail of both falcons (dewatering circuit consists of a tank receiving the tail of the falcons and a set of 3 pumps to enable pumping the tail slurry to two separate cyclone clusters for dewatering). The pregnant solution is pumped to electrowinning in the smelt house and the solids residue back to the regrind mill.

### 3. Leaching section

The cyclone overflow passes through linear screens prior to discharging into the preoxidation tanks. There are EDR pumps connected to the preoxidation tanks to supply oxygen through injection points on the pipeline. During sulphide ore treatment it is necessary to add some hydrogen peroxide in order to increase the dissolved oxygen concentration to the right level and maintain it. The preoxidation tank overflows into the surge tank where the lead nitrate is added at a rate of 300 g/t during sulphide treatment. No lead is added when processing oxide ore. The lime addition is performed in tank 1. An EDR pump is fitted to that tank as well. The slurry pH is controlled at 10.0 – 10.2 before sodium cyanide addition. The cyanide is added into the leach tank 2 at a concentration between 450 and 500 ppm for sulphide and 180 to 200 ppm for oxide. There are ten leach tanks on each stream with a capacity of 1350 m<sup>3</sup> to assure the required residence time. Automatic 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.

### 4. Adsorption section

The slurry overflows by gravity into adsorption vessels containing activated carbon except the first vessels used as grit catchers. The interstage NKM screens retain the carbon in the tanks. The carbon movement upstream is performed with the carbon transfer pumps installed in each tank. There are height adsorption tanks in series with gravity flow. The last tanks are used for detoxification of residue slurry prior to pumping to the slimes dam. The cyanide level in adsorption tank 5 is determined by the in line cyanide analyzer and the results are used to predict the quantity of reagents required for an effective residue cyanide destruction. A WAD (Weak Acid Dissociable) cyanide analyzer is installed at the plant tail for optimization control of the cyanide neutralization process. The unit takes a sample every 30 minutes on each stream and measures the WAD cyanide level. EDR pumps are installed at the detoxification CIP tanks in order to supply dissolved oxygen required for cyanide neutralization.

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Hydrogen peroxide 70% strength, sodium metabisulphite with solution RD from 1050 to 1070, and copper sulphate are dosed in last CIP tank for the detoxification.

#### **5. Residue section**

A manual sample is taken every hour at the common residue line and sent to the chemical laboratory for free cyanide and WAD cyanide analysis. There are 6 pumps on each residue stream connected to the main residue line. After adsorption the slurry flows into linear screens for catching eventual coarse carbon leaving the circuit when the NKM screens are passing.

#### **6. Tailing storage facility**

After detoxification the residue is pumped from the residue tank to the slimes dam via a steel pipeline 500 mm inside diameter. The flow pumped per hour varies between 1200 to 1400 m<sup>3</sup>/hr with a pressure of 10 to 12 bars. The slurry is cycloned to remove the coarse fractions for impoundment wall building. The fine fractions from 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 decants system with four submersible pumps capable of pumping 300 m<sup>3</sup>/hr each. There are underdrains and elevated filter drains for stability of the wall. Piezometers installed along the starter wall and vibrocores allow determining the level of water at the wall foundation.

#### **7. Elution and regeneration**

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 (1.5 % cyanide and 3% caustic), and rinse with hot soft water. The gold bearing solution is pumped to electro winning in the smelt house and the eluted carbon is regenerated at 700°C and pumped back to adsorption circuit to the tank 6 or 7.



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*Auditor's Finding*

**This operation is**

**X 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

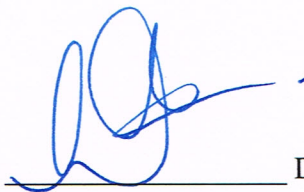
Audit Team Leader: Arend Hoogervorst

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Names and Signatures of Other Auditors:

Name : Dawid M. L Viljoen

Signature



Date: 14/3/2013


Dates of Audit: 6<sup>th</sup> – 10<sup>th</sup> November 2012

I attest that I meet the criteria for knowledge, experience and conflict of interest for Code Verification Audit Team Leader, established by the International Cyanide Management Institute and that all members of the audit team meet the applicable criteria established by the International Cyanide Management Institute for Code Verification Auditors.

I attest that this 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.

Sadiola Gold Plant

Facility

  
Signature of Lead Auditor

14/3/2013  
Date

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Sadiola Gold Plant

  
Signature of Lead Auditor

13<sup>th</sup> February 2013

***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 Supply and Transport Contract was originally with Australian Gold Reagents (AGR) and was Code compliant. From 15 May 2011, it was changed to Samsung, a Cyanide Code consignor, who obtains cyanide briquettes from cyanide producers, TaeKwang (ICMI certified on 18 March 2011) and Tongsoh (ICMI certified on 7 March 2011). Samsung is also responsible for the transport of the cyanide. The contract requires that Samsung must be certified by the ICMI Cyanide Code and all sub-contractors must also be certified under the 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 for supply and transportation of sodium cyanide briquettes between Samsung and AngloGold Ashanti Sadiola Gold Mine, in place. 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, community liaison, emergency response resource access and availability, training, and communication. There is also a Samsung 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 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 West Africa supply chain was certified on 12 July 2011 covering the complete supply chain from the producers in Korea to the site in Mali. SAM IK Logistics, (certified in compliance with the Cyanide Code on December 16, 2010) transports cyanide from the Tongshuh production plant to the Port of Pusan and Seyang Logistics (certified in compliance with the Cyanide Code on January 6, 2011) transports cyanide from the Taekwang production plant to the Ports of Pusan and New Pusan. Transporter, Bollare Africa Logistics SDV Senegal, is certified under the Samsung West Africa supply chain.

**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:*

The offloading, mixing and storage facilities 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 area was inspected by a Professional Civil Engineer who issued a fit for purpose report after completion of corrective actions. The audit reconfirmed the documentation checked during the certification audit. The cyanide is also stored away from incompatible materials.

Current solution mixing and storage tanks at the leach are equipped with level indicators. The mixing tank level is interlocked with water valves and the storage tank is equipped with high and low level audible alarms, alarming at 80% high level. The interlocked transfer pump stops at 80%. The secondary containment is constructed of concrete with joints sealed. Cyanide is stored in the original boxes in a roofed store with an open front area and open side entrances equipped with fencing and gates which allow for free movement of air. The cyanide mixing tank is open on top and the cyanide make-up tank is equipped with a central vent pipe. The store is within a security area with access control.

*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 mixing 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. 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. There is a specific procedure for the incineration of wooden boxes, plastic bags and polypropylene bulk bags.

**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*



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*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 28 cyanide specific procedures, 10 engineering procedures with the cyanide specific procedures taking preference when working with cyanide equipment and there are 135 plant cyanide equipment operating procedures in place. A corporate Tailings Management Framework lists commitments (including freeboard) and includes ICMI Code requirements. A Regional Tailings Management Code of Practice West Africa Division is in place. The Mine Tailings Facility Audit for 2012 reports that the TSF is in good condition with no visible signs of instability. Residue pipeline lengths and valves are numbered and thickness testing completed. All tanks, bunds, pond, impoundments, pipelines, valves and pumps are on the PRAGMA PMS system and are inspected on a regular basis. Wildlife inspections are carried out daily. A GoldSim probabilistic water balance evaluates the monthly water balance and determines management responses under normal, abnormal and emergency conditions. The plant is stopped immediately when the WAD cyanide level increases above 80ppm or exceeding 50ppm for three consecutive samples. The plant will also be stopped if the water level of the pool exceeds a predetermined level and all other action taken is not effective in reducing the pool to safe levels. Operational inspections include monthly safety officer and management inspections, Shift Foreman shiftly inspections and the daily reagent Foreman inspections. The Plant is designed and equipped with bund walls, sump pumps and all spillages are returned to the process. The mine generates its own power and has spare capacity generators available. An emergency generator is available on the TSF to run 1 decant pump to remove water from the pool. Mobile diesel pumps are available to pump water from the return water dam to the settling dam in case of power outages. The TSF is designed to contain the 1 in 100 year storm in the pool, preventing overfilling of the settling dam and the return water dam.

*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

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☐ not subject to

*Basis for this Finding/Deficiencies Identified:*

A gravity circuit was installed, based on previous test programs and indications are that less cyanide has been used since the installation of the circuit. Leach profiles are taken weekly and evaluated for correct terminal cyanide concentration. Two stage cyanide addition is also being considered to reduce cyanide consumption. Ore characterisation test reports evaluate gravity recoverable gold and cyanide requirements for optimal gold recovery on different pit samples. The ore types are classified in oxide, transition and sulphide zones with each zone characterised. Ore types are based on the life of mine plan. All oxide ores display similar mineralogy and metallurgical performance. However, one pit is different with sulphides. Diagnostic leaches are conducted by the on-site laboratory to assist with optimisation.

On-line cyanide analysis with automatic cyanide addition control, backed up with WAD analyses on the tailings streams, were evaluated. Fuzzy logic techniques to fine tune cyanide addition and concentrations in the leach were also considered. Differential addition rates, when mineralogy varies, are used.

A TAC 2000 cyanide on-line analyser, supported by leach operator titrations, is used for automatic cyanide control. The cyanide control logic includes fuzzy logic algorithm using current and historical information to compute the new addition rates. Variable speed mono-pumps are used to vary cyanide feed rates automatically as per control algorithms. A WAD 1000 WAD analyser is used after detoxification on the residue. Cyanide control level set points are varied according to the feed ore mineral composition: for sulphides, 450ppm and oxides, to 180ppm (reduced from 200ppm before commissioning of the gravity circuit). Cyanide set point changes are communicated to the operators using the control book.

*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:*

There is a comprehensive, GoldSim, computerised probabilistic water balance model in place. The design storm event is included in the stochastic calibration of the rainfall used in the model and nearby Kenieba historic data was used to estimate the 1:50 and 1:100 storm events. The evaporation data used was taken from measured evaporation at nearby Kayes, as well as from measured monthly data from the mine operations. No problems were identified running the GoldSim scenarios of power outages on the plant and TSF. Sufficient capacity exists in the plant emergency dam to accommodate any run-off and rainfall during power outages. The model includes the effect of preceding rainfall to

calculate run off and infiltration into the ground and daily time steps are used to take account of preceding rainfall. The model differentiates between scenarios within the different seasons with August being the highest risk period.

*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 Sadiola gold plant is equipped with on-line WAD cyanide measuring capacity (WAD 1000 WAD analyser) and there are Cyanide detoxification systems in place on the end of each CIP section, with control being based on the on-line WAD analyser results and hourly manual samples analysed by the laboratory for WAD cyanide. WAD cyanide values are taken at the first open water in the beach area, closest to where cycloning takes place, and there have been no indications of exceedances above 50ppm WAD cyanide occurring. Bird scaring measures include the use of air cannons, the "Eagle Eye" system, and traditional hunters scaring off any birds around the TSF. No cyanide related bird mortalities have occurred since 2002, indicating effective management. The antipollution dam WAD results since certification show no results exceeding 50 ppm WAD cyanide.

*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 total cyanide.

*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**

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

☐ not in compliance with

*Basis for this Finding/Deficiencies Identified*

The site applies measures to reduce seepage to groundwater. 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. A borehole monitoring program is in place with monthly samples taken and analysed for WAD cyanide. No beneficial uses are defined either by legislation or actual users for ground water down gradient of the site. The jurisdiction has established a numerical standard for cyanide in ground water as total cyanide to be less than 0.7ppm, Reviewed borehole data upstream and downstream and all values are below limits of detection except for 7 values with the highest being 0.624 ppm total cyanide which is less than the legal standard of 0.7ppm.

*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:*

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 were replaced with custom designed, George Fisher pipe-in-pipe systems equipped with leak detection sight glasses. The new pipeline from the Gekko pregnant solution tank to the smelt house is placed above the concrete slab, surrounded by bund walls as secondary containment. The pipe is constructed out of mild steel pipe-in-pipe design with transparent sight glass leak detectors fitted. The TSF pipes route is equipped with trenches, berms and paddocks to contain down flow leakages. Pipe patrols are done daily by operations and maintenance includes pipe thickness measurement and replacement if thickness is less than 75% of original thickness. 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.



*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 plant added an Intensive Leach Reactor (ILR) to leach concentrates using high cyanide leach conditions. The ILR design documentation used AngloGold Ashanti material specifications for the cyanide equipment design, and the AngloGold Ashanti Cyanide Code guidelines on construction of cyanide facilities. The high strength cyanide lines were replaced with double pipe-within-a-pipe George Fisher lines. The quality control records were sighted as were the sign-offs by competent persons such as professional engineers, and engineering superintendents. The Sadiola Mine Visual Structural Report April 2009 identified items requiring attention and included a priority table. The report proposed a follow up audit in 3 years with work being scheduled on an on-going basis. Progress on this work was observed.

On the TSF, Residue pipeline lengths and valves are numbered and thickness testing is undertaken and all pipelines, valves and pumps are on the PRAGMA PMS system. Daily 24 hour operational and maintenance pipe patrol inspections are conducted looking for leaks and monthly survey data is sent to specialist consultants for conformance evaluation and reports, includes freeboard, deposition rate, cyclone performance, phreatic levels, WAD Cyanide in boreholes, rainfall and storm events, drain flows and return water. Quarterly reviews are conducted and analysed by specialist consultants and the AngloGold Ashanti professional Geotechnical Engineer. Reports concluding the overall dam operations and management is sound, with no critical issues being sighted from both internal and external audits.

*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 sample preservation and chain of custody procedures and the sample sheet) of surface water and borehole water, developed

by competent persons, were sighted and checked. The site Environmental Management Plan includes cyanide sampling categorisation, cyanide species monitored and frequency of measurements. Daily operational bird mortality inspections are in place and TSF inspection reports for 2010 and 2012 were sampled. Sample frequencies are deemed adequate by auditors to characterise the medium monitored.

**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 a plant decommissioning procedure which includes an implementation schedule. The procedure is reviewed every two 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:*

Cyanide facility decommissioning costs are included in the Sadiola mine closure liability estimate 2011 signed by the Closure Project Manager, the Technical Service Manager, the Managing Director and the Finance Manager and the costs are updated annually. The current scenario is self-insurance and thus, to provide for the rehabilitation fund before declaring dividend, there is an accrual system with funding maintained in the operation's bank account. The amounts required are confirmed annually and signed off as above.





**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 28 cyanide specific procedures, 10 engineering procedures with the cyanide specific procedures taking preference when working with cyanide equipment and there are 135 plant cyanide equipment operating procedures in place. Each procedure states the required PPE for the task at hand, including the requirement for pre-work inspections. Pictogram signs are in place to indicate what PPE must be worn. An illiteracy issue exists in the lower levels of the workforce and is addressed by the use of pictures and explanations of the jobs in the local language, Bambara.

A corporate Tailings Management Framework lists commitments (including freeboard) and includes ICMI Code requirements. A Regional Tailings Management Code of Practice West Africa Division is in place. The Mine Tailings Facility Audit for 2012 reports that the TSF is in good condition with no visible signs of instability. A GoldSim probabilistic water balance evaluates the monthly water balance and determines management responses under normal, abnormal and emergency conditions. The plant is stopped immediately when the WAD cyanide level increases above 80ppm or exceeding 50ppm for three consecutive samples. The plant will also be stopped if the water level of the pool exceeds a predetermined level and all other action taken is not effective in reducing the pool to safe levels. Operational inspections include monthly safety officer and management inspections, Shift Foreman shiftly inspections and the daily reagent Foreman inspections. The Plant is designed and equipped with bund walls, sump pumps and all spillages are returned to the process. The TSF is designed to contain the 1 in 100 year storm in the pool, preventing overfilling of the settling dam and the return water dam.

A change management procedure covering health, safety and environment is in place and operational and examples of major and minor change management exercises indicated that the process is used effectively.

OHSAS (Occupation Health and Safety Assessment Series) risk assessment sessions include worker representation and use is made of a translator for French speaking personnel. Daily safety meetings and weekly communication meetings are held specifically obtaining worker input on safety and health. Input is also gathered from pre-shift safety talks and safety representatives' meetings. Interviews with personnel confirmed that safety issues are communicated through the toolbox meetings and weekly meetings.



*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 pH in the process is controlled primarily at 10.2. The leach feed pumps and the cyanide dosing pumps are interlocked with the pH monitors to shut down at pH of less than 9.5. A pH procedure is in place to control the leach section, specifying pH parameters. There are 9 fixed HCN gas monitor Polytrons used on-site, together with 82 handheld PAC 7000 and 2 Exam 5000 personal HCN gas monitors. Personnel entering risk areas are issued with gas mask units and gas monitors. Polytrons as well as PAC 7000 units measure and record continuous exposure and are set to alarm at 10ppm instantaneous and 4.7ppm over an 8 hour period. Hotspot surveys are done monthly and surveys for 2010 and 2012 were reviewed. The site's Cyanide Champion is trained to calibrate gas monitors 6 monthly, as per manufacturer's instructions. Calibration records for a sample of the units, were reviewed to confirm regular calibration as required by the manufacturer. Calibration is on a 6 monthly check via the PRAGMA system. On-going inspections and checks are also used to monitor and check facilities and emergency response equipment functioning and checklists covering three years since certification were sampled. 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.

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.

*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. Safety showers are equipped with local alarms with the man down buttons located next to the shower. Antidote kits are all stored in fridges, as per manufacturers recommendations. Antidote replacement is managed between the Doctor at the clinic (orders) and distributed by the cyanide champion. Running water is available at all cyanide emergency locations. All emergency stations were checked during site inspection. 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 the three years since certification.

An on-site emergency team is in place, providing first stage cyanide emergency treatment. The medical clinic at Sadiola village is equipped to handle cyanide emergencies. Four doctors and one professional nurse, and one paramedic are trained to handle cyanide emergencies and are based at the clinic. A procedure includes transport to local clinic, where medical support by medical doctors is available. The clinic doctor will decide whether to CASAVAC the patient to a suitable medical facility in Bamako or nearby Kayes Hospital. The site will send a doctor, equipped with antidote, gas monitor and cyanide PPE for hospital staff, and trained in cyanide first aid will accompany a CASAVAC to hospital. There are no laboratory facilities in Mali that can undertake blood tests for cyanide. On hospitalisation, blood will to be sent to France for testing. Cyanide equipment is regularly checked and tested and mock drills are held regularly on site. Man down drills are used to assure that emergency teams and the medical facility are competent and equipped to handle emergencies.

**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 an Emergency Preparedness and Response Plan with supporting procedures files and Master files of this Plan are placed at strategic positions in the operation. A Procedural HAZOP study was conducted on emergency scenarios for Sadiola Gold Plant and responses in the Plan are based upon this study.

*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 involved in the ERP plan development through various Risk Assessments and toolbox meetings. The plant provides the opportunity for three monthly cyanide awareness and emergency training for the village cyanide committee, which has included a plant visit (minutes are kept of training). The representatives in the committee are the main contacts for communicating any cyanide emergencies to the village. The Sadiola clinic is involved in mock drills to involve them in the ERP process. Local response agencies are not to be used in cyanide emergencies as they are not equipped or trained to deal with these types of emergencies.

*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 ERP details roles and responsibilities of the emergency response team. The on-site team commander role is taken on by the plant manager or the plant engineer, based on availability, 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 ERP. 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.

*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. Treatment chemicals use is prohibited in cyanide procedures. Emergency sampling is covered in procedures.

*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**



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☐ not in compliance with

*Basis for this Finding/Deficiencies Identified:*

The ERP includes the requirement for review and revision on an annual basis 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 induction and basic cyanide training. The training matrix specifies required training for all plant employees and includes the requirement for cyanide awareness and cyanide basic first aid. Contractors go through a cyanide awareness program. Refresher training is conducted 6 monthly for all personnel. Written and oral pre- and post- tests are conducted. Refresher training was checked during interviews and review of the interviewee training records. Records are retained for 40 years as per the AngloGold Ashanti corporate standard.

*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 are included in the training program. The SOPs are used for training, followed by verbal testing and Planned Task Observations.



Illiterate personnel are tested verbally and checked in the field using PTOs. Deficiencies are addressed through re training. Each Supervisor does PTOs, according to a schedule, of 4 per month. Records are retained for 40 years as per the AngloGold Ashanti corporate standard.

*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 emergency response team with special training is in place to react to cyanide emergencies. Currently, all plant personnel are trained in cyanide first aid and response and every shift worker can react to an incident. First response is done by the trained plant emergency team personnel in the area of the man down / spillage incident. The clinic 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. Twelve of the ERT members were trained at the Sasol Emergency Response Academy and this course was replaced by the Training Academy in National Incident Command System and Rescue and Advance Fire Fighting Training by ATA International. The Sadiola clinic is involved in the emergency response plan. The appropriate community members are included in the plan and currently used in terms of their communication role. The ERP specifies refresher training frequency as bi-annually. The Training Officer is involved in the drills and drills are videotaped and photographed. The Training Manager is also present at selected drills. Records are retained for 40 years as per the AngloGold Ashanti corporate standard.

**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. The following villages are included in Sadiola dialogue: Sékokoto, Sirimana, Farabakouta, Sadiola, Borokoné, Nétéko, and Tabakoto

A representative stakeholder group consisting of 2 men and 2 women from each of the 8 villages is in place. Village representatives change periodically. The function of this group is as a general liaison with the Mine and notes on a meeting of 12 to 14 January 2012 were sighted.

The Fixed Cyanide Committee (to aid in Villager awareness) for the 8 villages is in place (2 representatives per village). A note on a meeting and a list of members of the cyanide committee of 23 Sept 2011 detailing information, questions, requests and reaction from the attendees, was sighted. A cyanide presentation was given during the meeting and the meeting was followed by a site visit. Three monthly cyanide awareness and emergency training is in place for the cyanide committee, which also includes a plant visit. The representatives are the main contacts for communicating any cyanide emergencies to the village and the mine is in telephonic communication with key members of the committee.

*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. The following villages are included in Sadiola dialogue: Sékokoto, Sirimana, Farabakouta, Sadiola, Borokoné, Nétéko, and Tabakoto

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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:*

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 position 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.

A communication protocol is in place using incident levels 1 to 3 : **Level 1:** is contained or controlled within a specific area (plant TSF or bund). The incident is dealt with within the locality. **Level 2:** capacity to spread or may have influence on neighbouring activities or enlarge and may require internal / external emergency resources. The incident or emergency is dealt with by the emergency preparedness plan. **Level 3:** significant in size and requires external support. The incident characteristics are dealt with by the Sadiola crisis management team. The Managing Director initiates all reporting to external bodies and interested parties in conjunction with the Social Development Manager. Local authorities and the local community mayor are informed, followed by the second level of government, Sous prefet, Governor in Kayes, then the DME (Direction des Mines et de l'Energie) and the National Director of Geology. In the event of cyanide releases or exposures, this information would be made available to the public. AGA Corporate requirements indicate that level 2 and 3 incidents are reported in the annual report. The 2011 AGA sustainability report, which is publically available, contains information on cyanide and the ICMI.

