

# ORICA TARKWA BOX TO SPARGE RECERTIFICATION SUMMARY AUDIT REPORT

**Orica Box to Sparge Facility, Tarkwa**

Prepared for: Orica Ghana Ltd

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## 1 SUMMARY AUDIT REPORT FOR GOLD MINING OPERATIONS

<b>Name of Cyanide User Facility:</b>	Orica Box to Sparge Facility, Tarkwa
<b>Name of Cyanide User Facility Owner:</b>	Orica Ghana Limited
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## 2 LOCATION AND DESCRIPTION OF OPERATION

Orica is an Australian-owned, publicly listed company with global operations. Orica is managed as discrete business units that produce a wide variety of products and services. The Mining Chemicals unit is based in Australia and exports products to Asia, Africa and the Americas, as well as supplying the local Australian industry. This unit's main product is sodium cyanide, which is manufactured at Orica's Yarwun facility in Queensland, Australia.

Orica's Yarwun facility, which is located approximately eight kilometres by road from Gladstone, Queensland, commenced operations in 1989 and is engaged in the manufacture of cyanide (both solid and liquid forms), ammonium nitrate, nitric acid, chlorine, sodium hydroxide, sodium hypochlorite, hydrochloric acid and expanded polystyrene balls. The cyanide production facility at Yarwun was certified by the International Cyanide Management Institute (ICMI) as first being compliant with the Code on 28 November 2006 with the latest recertification on 17 September 2020.

Cyanide manufactured at Yarwun is repackaged at the Transfer Facility in Ghana.

Barbex was established in 1990 as a logistical support company. In 1997, Barbex constructed a warehouse complex (1200 m<sup>2</sup>) on the Teberebe Goldfields property near Tarkwa in the Western Region of Ghana. Barbex manage the Transfer Facility on behalf of Orica.

The Transfer Facility is used to transfer cyanide briquettes (or "cyanoids") contained within boxes to a sparge isotainer. The cyanide briquettes are manufactured at Orica's Yarwun Cyanide Facility in Queensland, Australia and transported to Ghana.

The Transfer Facility is comprised of the following areas and activities.

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The cyanide Box to Sparge Transfer Facility adjoining the eastern section of Barbex's Warehouse A. This Transfer Facility includes a dedicated intermediate bulk container (IBC) storage area, a staging area where the IBCs to be transferred are marshalled before the transfer operation begins, a sparge tank filling area, hoppers, and a hopper loading bay.

Warehousing activities:

- Warehouse A (IBC storage) – The eastern end of this warehouse is connected to the Transfer Facility IBC storage area.
- Warehouse B (IBC Storage) – Connected to the southern side of Warehouse A.
- Warehouse C (waste bag temporary storage area and IBC Storage) – Located to the south of Warehouse B.

A covered, secured breezeway storage area between Warehouse B and C. Cladding has been installed at the eastern entrance and plastic drapes across the access way to prevent stormwater ingress.

Waste management activities:

- The waste management annex at the rear of Warehouse A, B and C is used for dismantling IBCs and the temporary storage of waste bags. The area contains a decontamination area (wash tubs, sumps, press etc.) that is now decommissioned and waste bag strapping facility.
- Annex between Warehouse B and C.
- Incinerator for disposal of waste bags and IBCs (decommissioned).

The Facility is located on land occupied by Barbex Technical Services Limited (Barbex) at AngloGold Ashanti's Tarkwa Gold Mine. Barbex operates the Transfer Facility under a Service Agreement with Orica and for the purposes of the Code, certain facilities owned by Barbex are also subject to this audit. The land occupied by Barbex is referred to in this report as the Site. The Box to Sparge Bulk Cyanide Transfer Facility (Transfer Facility) was first certified as being fully compliant with the Code on 8 March 2011.

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## **SUMMARY AUDIT REPORT**

### **AUDITORS FINDINGS**

in full compliance with **The International Cyanide Management Code**

Orica Box to Sparge is:  in substantial compliance with **The International Cyanide Management Code**

not in compliance with **The International Cyanide Management Code**

**Audit Company:** SLR Consulting (Africa) (Pty) Ltd

**Audit Team Leader:** Ed Perry, Lead Auditor

**Email:** ed.perry@slrconsulting.com

### **COMPLIANCE STATEMENT**

The Orica Box to Sparge Facility, Tarkwa, Ghana has not experienced any cyanide incidents since the previous recertification audit.

### **NAME OF OTHER AUDITORS**

Dawie Viljoen (ICMI pre-certified Production Technical Specialist).

### **DATES OF AUDIT**

The Re-certification Audit was undertaken between 15 February 2021 and 17 February 2021.

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 (ICMI) and that all members of the audit team meet the applicable criteria established by the International Cyanide Management Code (ICMC) for the 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 Cyanide Production and using standard and accepted practices for health, safety and environmental audits.

The "International Cyanide Management Code For The Manufacture, Transport, And Use Of Cyanide In The Production Of Gold and Silver" (the Code) was developed by a multi-stakeholder Steering Committee under the guidance of the United Nations Environmental Program (UNEP) and the then, International Council on Metals and the Environment.

The Code is a voluntary industry programme for gold and silver mining companies, and companies involved with the production and transport of cyanide to gold and silver mining companies; it focuses exclusively on the safe management of cyanide. Companies that adopt the Code must have their operations, which manufacture cyanide, transport cyanide or use cyanide to recover gold and silver, audited by an independent third party to determine the status of the Code's implementation. Those operations that meet the Code's requirements can

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be certified and are able to use a unique trademark symbol, which identifies the company as a certified operation. Audit results are made public to inform stakeholders of the status of cyanide management practices at the certified operation.

The objective of the Code is to improve the management of cyanide used in gold and silver mining and assist in the protection of human health and the reduction of environmental impacts (refer to [www.cyanidecode.org](http://www.cyanidecode.org)). The Code is managed by the ICMI.

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## PRINCIPLE 1 – OPERATIONS

### **DESIGN, CONSTRUCT AND OPERATE CYANIDE PRODUCTION FACILITIES TO PREVENT RELEASE OF CYANIDE**

**Standard of Practice 1.1: Design and construct cyanide production facilities consistent with sound, accepted engineering practices and quality control/quality assurance procedures.**

in full compliance with

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

not in compliance with

#### **Summarise the basis for this Finding/Deficiencies Identified:**

The operation is in full compliance with Standard of Practice 1.1; design and construct cyanide production facilities consistent with sound, accepted engineering practices and quality control/quality assurance procedures.

Quality control and quality assurance programs have been implemented during construction of cyanide production and storage facilities. Quality control and quality assurance (QA/QC) programs for the design of Transfer Facility were addressed during the March 2014 Certification Audit. There have been no changes to the facility since the previous recertification Audit. The facility was last inspected in February 2021 by Obed Mensah (PE GLIE). The operation has completed the recommended repairs transpiring from the February 2021 structural inspection.

The materials used for construction of cyanide production facilities appear to be compatible with the reagents used and the processes employed.

It was noted that stainless steel is used for process equipment that comes into contact with cyanide during box to bulk transfer operations. The cyanide solution pump and associated hoses and pipework, are fabricated from a range of materials including polyvinyl chloride, mild steel and rubber, all of which have been confirmed to be compatible with the reagents used and processes employed. The area around where the solid cyanide is transferred is sealed with concrete.

The lowest point of the concrete sealed system is a sump in the pad that acts as a secondary containment for the isotainer during transfer operations.

Floors used for key areas (transfer area, waste area and forklift transport route) are covered with concrete with an epoxy sealed surface.

There is a backup generator (100 kilovolt amps). The generator is of sufficient capacity to power the entire facility. The electrician manually starts the generator in the event of a power failure. In the event of a power failure the following occur. The plant remains in a safe situation. The hoist used to move bags remains in place regardless of location or load at the time. A reserve supply of compressed air remains under pressure in a receiver vessel. This enables the air filters on the transfer hoppers to continue to function correctly. If the air compressor fails for reasons other than loss of power supply, there is provision to introduce an alternative source of compressed air to enable loading of an isotainer to be completed. The hydraulic systems that control the movement of the hopper assembly is configured so that on power failure the transfer hoppers will “stay put” which is a failsafe mode for the Transfer Facility. The transfer hoppers are interlocked with the hopper air extraction systems to ensure that extraction system is working when the hoppers are in use. The transfer hoppers

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are aligned directly to the isotainer during transfer. This provides good visibility from the manned loading platform of any issues that may develop during filling.

Cyanide is managed on a concrete surface that can minimise seepage to the subsurface. All cyanide storage, transfers and the handling of waste packaging occurs in roofed warehouses on concrete floors. Epoxy coating has been applied to the surface of the concrete in the Transfer Area, Waste Storage Area and the traffic ways in the warehouse used by the forklift trucks

Methods to prevent the overfilling of cyanide process and storage vessels are used at the Transfer Facility. The delivery checklist used at customer gold mines prescribes and requires checks to verify that liquid has been drained from the isotainer before it leaves the mine. Any liquid remaining in the isotainer is drained into an IBC and subsequently allowed to dry before it is filled with solid cyanide. Filling is controlled on the basis that an isotainer can contain eighteen Orica boxes of solid cyanide equalling 20.4 tonnes. The isotainer has the capacity to hold 23 tonnes. The operators loading the solid cyanide through the hoppers undertake a visual check to check that the briquettes are settling correctly within the isotainer confirming that there is sufficient capacity for further boxes of solid cyanide.

There are no storage tanks at the facility as the operation is for the loading of solid cyanide into isotainers. The isotainer is on the back of a lorry that is reversed into position under the hoppers prior to filling. The secondary containment for the isotainer during the filling is the loading bay area (Level 1 of the facility). it is sealed with concrete on the surface and sides in order to contain any solid cyanide spilled during the filling operation.

The only cyanide solution pipeline is when residual liquid within the isotainer is drained into an IBC. This process is undertaken with the Loading Bay area that will contain any spills.

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**Standard of Practice 1.2: Develop and implement plans and procedures to operate cyanide production facilities in a manner that prevents accidental releases.**

in full compliance with

The operation is  in substantial compliance with **Standard of Practice 1.2**

not in compliance with

**Summarise the basis for this Finding/Deficiencies Identified:**

The operation is in full compliance with Standard of Practice 1.2; to develop and implement plans and procedures to operate cyanide production facilities in a manner that prevents accidental releases. The facility also has procedures for contingencies during upsets in its activities that may result in cyanide exposures or releases, which include the following.

The Orica Mining Chemical Systems Ghana transfer Facility, rev 11, Feb 2021 is one of the main documents used that describes the standard practices necessary for the facilities safe and environmentally sound operation. This includes the following sections: Safety; Start up of Box to Sparge Facility; Normal Operation of Box to Sparge Facility; Shutdown; Abnormal Operating Instructions; Waste Management; Job Procedures; and Troubleshooting Guide.

In addition, there is the Barbex Technical Services Ltd Management Policies and Standard Operating Procedures. This contains 22 management policies, 24 standard operating procedures, and 5 environmental procedures.

The procedures include MP-SOP-008 Job Safety and Environmental Risk Assessment, rev 7, 20 February 2019.

The facility has a procedure to identify when site operating practices have or will be changed from those on which the initial design and operating practices were predicated.

The Orica Field Services Book included the procedure for change management for the Box to Sparge Facility. This required the Alteration Authorities form to be completed. This has been replaced by the Orica Group Procedure, Safety, Health and Environmental System (SHES) Management of Change, 22 February 2018.

This includes the following: Management of change system; SHES acceptance and completion; and Temporary and emergency change .

Preventive maintenance programs are implemented and activities documented for equipment and devices necessary for cyanide production and handling

Barbex undertakes weekly and fortnightly checks. The weekly inspections include; Transfer Hoppers, Hoist, personal protective equipment (PPE), Compressor. The Fortnightly inspection includes Hydraulics, Safety Showers, Sump Pump, Electrical , and Extractors Fans.

A planned maintenance system is operated by Orica Active Tracker. This is comprised of an excel spreadsheet listing the equipment and the frequency of checks. The spreadsheet also shows the priority for the different actions.

The nature of the operation is such that process instrumentation does not play a critical role in managing the risk of potential exposures and releases and so there are no instruments required to be calibrated according to manufacturer's recommendations. Personal and fixed cyanide monitors are calibrated as required by the manufacturer's recommendations.

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Procedures are in place and being implemented to prevent unauthorized/unregulated discharge to the environment of any cyanide solution or cyanide-contaminated water that is collected in a secondary containment area.

The cyanide warehouses are enclosed, and stormwater is prevented from coming into contact with cyanide product or packaging including waste packaging. Stormwater within external Sumps is managed in accordance with EP-SOP-004 Disposal of Uncontaminated Liquid Waste. This procedure requires Barbex to test the water quality within the Sumps to confirm the weak acid dissociable (WAD) cyanide is less than 0.5 mg/L and the free Cyanide is less than 0.022mg/L before the stormwater is discharged to the environment. If the testing shows that the levels are exceeded the solution is kept in the sump and treated in accordance with EP-SOP-004 Disposal of Contaminated Liquid Waste, prior to disposal as the adjacent mines tailings storage facility (TSF).

The facility has environmentally sound procedures for disposal of cyanide or cyanide contaminated solids.

The facility handles solid cyanide and therefore does not dispose of cyanide. Solid waste contaminated with cyanide includes the packaging boxed and bags the solid cyanide is received in, PPE, and filters for the hopper extraction system. The site has arranged with Vehrad Transport and Haulage to dispose of this cyanide contaminated waste within their Environmental Protection Agency (EPA) approved incineration facility. Vehrad are an ICMC certified transporter and cyanide producer (sparge facility). A trailer from Vehrad arrives regularly to site to transport the waste back to the incinerator in Tema. Use of this disposal method has been in effect since January 2014.

Cyanide is stored with adequate ventilation to prevent the build-up of hydrogen cyanide gas. The solid cyanide is received in the boxes it was packaged in by the producer. These boxes are stored in naturally ventilated warehouses with a ventilation gap between the top of the walls and the roof. The warehouses are roofed with solid sides and a concrete floor to prevent contact with moisture.

Cyanide is stored in a secure area where public access is prohibited. Sparge isotainers are sealed and transported to customers once they have been loaded. The Transfer Facility is located within the Barbex facility. The Barbex site is fenced along four boundaries. All fences are fitted with razor wire. On two sides the facility is bounded by AngloGold Ashanti Iduapriem Mine, the fence is constructed of masonry. The other two boundaries (northern and eastern) which adjoin other AngloGold Ashanti tenants are predominantly cyclone wire mesh. Three security guards are present throughout the day and night shift periods. The site also has closed circuit television (CCTV).

Procedural arrangements are in place to allow cyanide supplied by Orica and third parties in Ghana to be packaged as required by the political jurisdictions through which loads will pass. Orica monitors international legislation applicable to its supply of cyanide throughout the world. All of the isotainers are currently transported within Ghana. Orica has determined that there is no specific legislation covering the transport of dangerous goods in Ghana at this time. However, Ghana is a signatory to the International Maritime Dangerous Goods Code, which establishes a reasonable expectation that dangerous goods transported within Ghana will be transported to international standards or higher. Before filling isotainers at Tarkwa, the isotainers are checked to ensure that placards are displayed on both the rear and the side of the vessel.

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**Standard of Practice 1.3: Inspect cyanide production facilities to ensure their integrity and prevent accidental releases.**

in full compliance with

The operation is  in substantial compliance with **Standard of Practice 1.3**

not in compliance with

**Summarise the basis for this Finding/Deficiencies Identified:**

The operation is in full compliance with Standard of Practice 1.3; to inspect cyanide production facilities to ensure their integrity and prevent accidental releases.

The facility conducts routine inspections to prevent accidental releases to the environment.

Barbex undertakes weekly and fortnightly checks. The weekly inspections include; Transfer Hoppers, Hoist, PPE, Compressor. The Fortnightly inspection includes Hydraulics, Safety Showers, Sump Pump, Electrical , and Extractors Fans.

A planned maintenance system is operated by Orica Active Tracker. This is comprised of an excel spreadsheet listing the equipment and the frequency of checks. The spreadsheet also shows the priority for the different actions. The maintenance is undertaken once a job ticket/ clearance has been produced. the tracker also includes breakdown maintenance items. The planned maintenance is undertaken on a monthly, quarterly, half yearly and yearly basis.

There are no tanks holding cyanide solution. The only secondary containment is the loading bay area and that is for spilled solid cyanide that is cleaned up immediately and is undercover. There is no cyanide solution so no pipelines, pumps, or valves.

Inspection frequencies are sufficient to assure that equipment is functioning within design parameters. Checklists are used for documenting inspections that occur batch-wise, weekly and fortnightly. There are no obvious deficiencies in the distribution of actions throughout these lists. Based on conditions observed during the audit, there is no evidence to suggest that inspections should be carried out more frequently than is currently the case.

Inspections are documented. The documentation (internal inspection checklists) identifies specific items observed and includes the date of the inspection, the name of the inspector, and observed deficiencies. The inspections undertaken as part of the Orica Activity Tracker are recorded electronically on an excel spreadsheet. They are also recorded through a job card/ clearance system.

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## PRINCIPLE 2 – WORKER SAFETY

### **PROTECT WORKERS' HEALTH AND SAFETY FROM EXPOSURE TO CYANIDE**

**Standard of Practice 2.1: Develop and implement procedures to protect plant personnel from exposure to cyanide.**

in full compliance with

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

not in compliance with

#### **Summarise the basis for this Finding/Deficiencies Identified:**

The operation is in full compliance with Standard of Practice 2.1; to develop and implement procedures to protect plant personnel from exposure to cyanide.

The facility has procedures that minimise worker exposure during normal plant operations, non-routine and emergency operations, and maintenance related activities. These are included in the following:

Orica Mining Chemical Systems Ghana transfer Facility, rev 11, Feb 2021; and

Barbex Technical Services Ltd Management Policies and Standard Operating Procedures.

The procedures include MP-SOP-008 Job Safety and Environmental Risk Assessment, rev 7, 20 February 2019.

The Orica procedures for the normal operation of the facility from receipt of raw materials through finished product packaging and shipping includes: Start up of Box to Sparge Transfer; Normal operation of Box to Sparge Transfer Facility; and Waste Management.

Orica procedures for non-routine operations includes: Abnormal operating instructions.

Orica Emergency Response Guide - Sodium Cyanide rev 10, Sept 2019 contains responses to a cyanide emergencies/ incidents including specific Emergency Response Guides.

Barbex Technical Services Ltd, Sodium Cyanide Emergency Response Plan, Rev 22, 15 November 2020. This contains Activation, Response Task, Resources, Preparedness, Toxicity First Aid, Medical Treatment, and Maintenance Related Activities.

The facility implements procedures to review proposed process and operational changes and modifications for their potential impacts on worker health and safety, and incorporate the necessary worker protection measures.

The Orica Field Services Book included the procedure for change management for the Box to Sparge Facility. This required the Alteration Authorities form to be completed. This has been replaced by the Orica Group Procedure, SHES Management of Change, 22 February 2018.

This includes the following: Management of change system; SHES acceptance and completion; and Temporary and emergency change .

Appendix 1 includes examples of the types of change covered by the group procedure. The procedure requires a change register to be completed, which includes the following: identification, description, timing, ownership, summary, workflow comments, analysis checklists.

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Orica through Barbex solicits and considers worker input in developing and evaluating health and safety procedures. Monthly Safety, Health and Environment (SHE) Meetings are used to obtain input regarding its health and safety procedures. Employee input during these meetings is used in developing and evaluating the Facility's procedures. The Orica representative attends the Monthly SHE Meetings and then escalation of issues follows the line management structure. The Monthly SHE Report provides a summary of meeting and weekly activities.

Personal hydrogen cyanide (HCN) monitors (Draeger) are available and used in designated areas. HCN Monitors are required when entering a blue operational areas, which includes the Box to Sparge Facility and the waste storage area. The devices are set to alarm at 4.7 ppm and 10 ppm. The facility requires that one individual in a team wear a personal HCN monitor when working at Level 1 (sump level), Level 2 (staging area) or the waste storage area. Individuals working at Level 3 (bag splitting area) must wear one HCN monitor each.

In addition, there is a fixed monitor on Level 2 of the Sparge facility at the level of the top of the isotainer when being loaded. If monitoring results suggest HCN levels are greater than the alarm level of 4.7 ppm the employees must be cautious and monitor the readings. If levels continue to increase up to 10 ppm then work must cease. If the work is required to continue full PPE must be worn including a full face mask with gas canister. If the levels reach 20 ppm the area must be fully evacuated.

The operation also has ambient monitoring undertaken by the Minerals Commission and uses this to assess time weighted averages (TWA) for worker exposure approximately twice a year. The results for this for 31 March 2017 were observed. The guideline value is 10 ppm, the results for the waste storage area showed a maximum result of 0.02 ppm with a TWA of <0.01 ppm. The results for the Warehouse showed a maximum of 0.3 ppm with a TWA of 0.04 ppm. The results for the Box to Sparge Facility shows a maximum of 0.5 ppm with a TWA of 0.03 ppm. This was the last time that the Minerals Commission undertook testing. A third party was appointed to undertake annual testing.

Hydrogen cyanide monitoring equipment is maintained, tested and calibrated in accordance with manufacturer's requirements. The monitors were observed to be stored, used and maintained in an effective manner during the site visit.

Orica has identified areas and activities where workers may be exposed to HCN gas or sodium cyanide dust and requires the use of personal protective equipment, as necessary, in these areas when these activities are being performed.

The operation requires HCN monitors to be used in areas designated as blue areas where PPE level 2 is required, at least one member of the team must wear a monitor. This includes the box to sparge facility and the waste management area.

The operators on Level 3 of the Box to Sparge facility adjacent to the hoppers loading the isotainers are required to wear the following : blue overalls, Air Powered Respiratory Protective Equipment (RPE) system with ABEK1 cartridges, PVC gauntlets, wellington boots, and an HCN detector each.

Orica has provisions to ensure that a buddy system is used, or workers can otherwise notify or communicate with other personnel for assistance, help or aid where deemed necessary.

The Orica Mining Chemical Systems Ghana Transfer Facility, Rev 10, April 2020, Section 5.2.5 Transfer Supervisors Inspection Responsibility states that they "must act as a buddy together with the security personnel present during the operation." The role of the buddy is defined in Section 1.0 Definitions.

Medical Examination Policy BTS\_L\_HRPOL 002 states that an offer of employment will be made "subject to a candidate passing a medical examination by a registered medical practitioner appointed by the company". It

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also states that existing employees shall undergo medical examination at least once a year. Employees who are exiting the firm shall undergo medical checks 1 week prior to their exit date.

The Barbex Employee Guide, Section 3.4.1 Medical Examination and Prevention states "The commencement and continuation of employment is conditional on the employee satisfying the pre-employment and annual medical examination requirements and being found fit for work".

The facility has a clothing change policy or procedure for employees, contractors and visitors to areas with the potential for cyanide contamination of clothing; MP-SOP-020 Clothing Change Policy Rev 5, 1 October 2020.

Warning signs are posted advising workers that cyanide is present and the necessary personal protective equipment that must be worn. Signage is placed at strategic locations around the facilities including the front entrance to the site, and entrance to the blue areas. Warning signs indicate that cyanide is present and that smoking, eating, naked flames, and drinking is prohibited. The type of PPE required to be worn is also posted.

Personnel are prohibited from smoking, eating and drinking, and having open flames within the Transfer Facility. Signage is displayed at the main gate and at the access point to the site office to communicate these prohibitions. Additional signs are displayed at the entrance to the Box to Sparge Facility building. These messages are reinforced in the Site Induction and in the Orica Cyanide Safety Training materials. During the Site visit these prohibitions were seen to be strictly adhered to.

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**Standard of Practice 2.2: Develop and implement plans and procedures for rapid and effective response to cyanide exposure.**

in full compliance with

The operation is  in substantial compliance with **Standard of Practice 2.2**

not in compliance with

**Summarise the basis for this Finding/Deficiencies Identified:**

The operation is in full compliance with Standard of Practice 2.2; to develop and implement plans and procedures for rapid and effective response to cyanide exposure.

The facility developed specific written emergency response plans or procedures to respond to cyanide exposures.

Orica Emergency Response Guide - Sodium Cyanide rev 10, Sept 2019

Contains response to a cyanide emergency/ incident including specific Emergency Response Guides as follows: Dry Sodium cyanide Spill - Inside Buildings / Storage Facility; Dry Sodium Cyanide Spill -Outside Buildings/ Storage Facility; Dry Sodium Cyanide Spill - Inside a Shipping Container; Shipping Container Decontamination; Handling Wet Sodium Cyanide; Sodium Cyanide Spill to Waterway; Response to a Fire in the Vicinity of Stored Cyanide; Roll over of a Shipping Container.

Appendix 3 - Orica Response to a reported cyanide incident

Barbex Technical Services Ltd, Sodium Cyanide Emergency Response Plan Rev 22, 15 November 2020. This contains Plan Activation, Response Task, Resources, Preparedness, Toxicity First Aid and Medical Treatment.

Emergency showers and low pressure eye washes are located throughout the site including one on each of the three levels of the box to sparge facility. They are maintained on a regular basis as part of the fortnightly inspection. Non-acidic fire extinguishers are located throughout the site including at the box to Sparge facility. The Barbex Tarkwa Facility Weekly Inspections/ Maintenance checklist includes that safety showers are functional and have good pressure and that fire extinguishers are placed at all the warehouses, office, blending plant, waste storage area, and maintenance area. The safety showers have a dedicated water tank with two pumps to ensure the correct pressure one pump is operational and the second pump is a backup.

The fire extinguishers are serviced on a regular basis. It was observed that they were last serviced in Dec 2020 with the next service due May 2021.

The operation has medical oxygen and resuscitator available at the administration office and at the Transfer Area. Water is available throughout the facility and in the Box to Sparge Facility through the safety shower system. The antidote is stored at the Sam Jonah Medical facility which is located less than 10 minutes from the site and who have staff trained to administer the antidote. The antidote available at the Sam Jonah medical facility ( the clinic for AngloGold Ashanti Iduapriem gold mine adjacent to the site) is Cyanokit containing Hydroxocobalamin. The clinic stores the antidote as directed by its manufacturer and inspects the antidote on a schedule that ensure it will be effective when used.

The site is small enough that verbal communication can be used, in addition there are emergency buttons for raising the alarm at strategic locations including the Box to Sparge Facility.

The Barbex Tarkwa Facility Weekly Inspection / Maintenance Checklist includes checking the contents of the first aid kit, the contents of the emergency response container, and that the oxygen pressure is higher than

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1000 psi. This confirms that the equipment is available and assures they are effective if they need to be used. There is a monthly checklist for the contents of the Emergency Response Container and the Emergency Responders bags.

The antidote is stored at the Sam Jonah Medical facility which is located less than 10 minutes from the site and who have staff trained to administer the antidote.

The materials safety data sheet (MSDS) for solid cyanide was observed posted at various locations around the site including the storage warehouses and the box to sparge facility. The MSDS states that the product may contain a dye / colouring agent. The MSDS for Carmosine the red colourant added to the solid cyanide is available on site, it is classed as non-hazardous.

The first aid procedure is communicated to all site personnel during induction. Chapter 7 of the Barbex Sodium Cyanide Emergency Response Plan Rev 22 15 November 2020 states the guidelines for first aid treatment. The Emergency Response Team has additional certificated first aid training every 3 years.

The only containers containing cyanide are two, one cubic metre intermediate bulk containers (IBC) are used to store potential cyanide solution in the loading bay. The solution results from cleaning activities and draining any residual liquid from the isotainer and are labelled to indicate that they contain cyanide.

The facility has a decontamination policy or procedure for employees, contractors and visitors leaving areas with the potential for skin exposure to cyanide - MP-SOP-020 Clothing Change Policy Rev 5, 1 October 2020.

This stipulates that personnel working within designated blue areas i.e. the waste management area and the box to sparge facility need to wear blue coveralls and are required to change out of the overalls at the end of the day and for their meal break. Supervisors visiting the area are required to wear a blue overcoat which is removed once they have left the area. There are designate locations for changing and storing blue clothing required for these areas. The overall are washed on a daily basis.

The Transfer Facility has its own on-site capability to provide first aid, but not medical assistance to workers exposed to cyanide. All Transfer Facility personnel are trained in the First Aid procedure including the administration of oxygen as part of annual emergency response training. In the event that medical treatment is required, the casualty would be transported to obtain qualified medical treatment at the Sam Jonah medical facility on the AngloGold Ashanti Iduapriem Gold Mine adjacent to the site. The Sam Jonah Medical Facility has an ambulance for the transportation of patients. It was observed that Appendix 1 of the Barbex Emergency Response Plan contains an Emergency Contact List which includes the contact no for the Sam Jonah Clinic.

The facility has developed procedures to transport exposed workers to locally available qualified off site medical facilities. Section 4.4.7 Transport of Exposed Workers or Victims, of the Barbex Sodium cyanide Emergency Response Plan details the procedures to be followed in the event of transporting exposed workers to locally available qualified off site medical facilities. The procedure states that "the response coordinator or Emergency Response Team (ERT) Leader will immediately organise urgent ambulance transfer to the nearest medical facility. Barbex utilises the Sam Jonah Hospital for medical emergencies."

In the event that medical treatment is required, the response coordinator makes telephone contact with the Sam Jonah medical facility to raise the alert. Meanwhile, oxygen administration is continued whilst the affected person is transported to the medical facility. The Sam Jonah medical facility provides the ambulance services and have 2 equipped ambulances for this requirement.

The Transfer Facility has alerted two local hospitals (Sam Jonah Hospital and Tarkwa Municipal Hospital) of the potential need to treat patients for cyanide exposure, and the operation is confident that the medical facility has adequate, qualified staff, equipment and expertise to respond to cyanide exposures. Barbex has

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established a relationship with the hospitals to provide routine medical support, including medical assessment of employees.

Mock emergency drills are conducted periodically to test response procedures for various exposure scenarios, and lessons learned from the drills are incorporated into response planning. The following mock drills were conducted; 26 November 2020 for spillage of solid cyanide within the Transfer Facility; 18 February 2020 for a fire in the loading bay of the quicklime facility; 22 October 2019 for being splashed with sodium cyanide solution; 27 May 2019 for a fall; 23 Nov 2018 for high HCN levels in the Transfer Facility.

It is stated in Barbex Technical Services Ltd, Sodium Cyanide Emergency Response Plan, rev 22, 15 Nov 2020 that mock drills will be undertaken twice a year. This includes cyanide and non-cyanide scenarios.

Procedures are in place to investigate and evaluate cyanide exposure incidents to determine if the Transfer Facility's programmes and procedures, to protect worker health and safety and to respond to cyanide exposures, are adequate or need to be revised. The Site has a formalised incident reporting procedure MP-SOP-009 Incident Management Rev 7, 19 Sept 2019. Incidents in the Transfer Facility are reported to Orica as well as to Barbex management. In the first instance a Incident Flash Notification is sent to Orica which triggers the start of the investigation and corrective action system Enablon operated by Orica. A full report is then produced by Barbex which is loaded on to the Enablon system generating actions and prompts ensuring the actions are closed out.

There have been no cyanide exposures since the last recertification audit.

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## PRINCIPLE 3 – MONITORING

### ENSURE THAT PROCESS CONTROLS ARE PROTECTIVE OF THE ENVIRONMENT

**Standard of Practice 3.1:** Conduct environmental monitoring to confirm that planned or unplanned releases of cyanide do not result in adverse impacts.

in full compliance with

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

not in compliance with

#### Summarise the basis for this Finding/Deficiencies Identified:

The operation is in full compliance with Standard of Practice 3.1; to conduct environmental monitoring to confirm that planned or unplanned releases of cyanide do not result in adverse impacts.

The cyanide warehouses are enclosed and stormwater is prevented from coming into contact with cyanide product or packaging including waste packaging. Stormwater within external Sumps is managed in accordance with EP-SOP-004 Disposal of Uncontaminated Liquid Waste. This procedure requires Barbex to test the water quality within the Sumps to confirm the WAD cyanide is less than 0.5 mg/L and the free cyanide is less than 0.022mg/L before the stormwater is discharged to the environment.

If the testing shows that the levels are exceeded the solution is kept in the sump and treated in accordance with EP-SOP-004 Disposal of Contaminated Liquid Waste, Rev 8, 20 February 2020 , prior to disposal as the adjacent mines TSF.

The Site does not have an indirect discharge to surface water.

WAD cyanide concentrations (or other species of cyanide for which there is a numerical standard established by the applicable jurisdiction) in groundwater at compliance points are below or down gradient of the facility at or below levels that are protective of identified beneficial uses of the groundwater.

The closest groundwater extraction to the Transfer Facility is determined to be dewatering of the AngloGold Ashanti Iduapriem Mine Pit for the beneficial use of mining and/or processing purposes. Ghanaian EPA cyanide levels guidelines for effluent water are 0.2 ppm free CN and 0.6 ppm WAD CN, and 1.0 mg/l total cyanide. If the groundwater is used for drinking water this will be some distance from the site. The Ghanaian standard for drinking water is 0.07 ppm free cyanide. There are three boreholes on site that monitor the groundwater MBOH1, MBOH2, and MBOH3.

All of the results were less than 0.005 mg/l free cyanide and WAD cyanide which is acceptable for the drinking water standard of 0.07 ppm free cyanide.

Seepage from the facility has not caused the cyanide concentration of the groundwater to exceed that necessary to protect its beneficial use.

The facility does not have emission of hydrogen cyanide gas. The health of workers are therefore protected. The closest community is approximately 5 km from the facility.

The Box to Sparge Facility is involved with the transfer of solid cyanide from boxes arriving to site in shipping containers into isotainers. The opportunity for the production of HCN gas is limited given the protection given to the solid cyanide from coming into contact with moisture. The cyanide hoppers used for the filling of the

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isotainers have extraction fans and filters to move air away from operators and capture cyanide dust from the air stream before the air is discharged to the atmosphere high on the side of the building. The Ghana EPA does not provide numerical limits for atmospheric emissions of cyanide. The exposure limits adopted for hydrogen cyanide at the Transfer Facility are based on the standards applicable to sodium cyanide as published on the Orica Safety Data Sheet. Those limits are 4.7 ppm over an eight hour period and 10 ppm peak limitation. The Orica Safety Data Sheet is based on the Australian National Occupational Health and Safety Commission where Orica's headquarters is based.

The facility monitors for cyanide in discharges to surface water and in surface and groundwater upgradient and down gradient of the site as detailed above.

Monitoring is conducted at frequencies adequate to characterise the medium being monitored, the monitoring of surface water and groundwater is carried out monthly. Barbex tests the water quality within the Sumps to confirm the WAD Cyanide is less than 0.5 mg/L and the free Cyanide is less than 0.022mg/L before the stormwater is discharged to the environment. The monitoring results indicate consistent trends in both media. Health and safety monitoring for cyanide in air is undertaken through the use of personal monitors. The personal detectors are used daily for the duration that a worker is handling cyanide.

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## PRINCIPLE 4 – TRAINING

### **TRAIN WORKERS AND EMERGENCY RESPONSE PERSONNEL TO MANAGE CYANIDE IN A SAFE AND ENVIRONMENTALLY PROTECTIVE MANNER**

**Standard of Practice 4.1: Train employees to operate the plant in a manner that minimizes the potential for cyanide exposures and releases.**

in full compliance with

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

not in compliance with

#### **Summarise the basis for this Finding/Deficiencies Identified:**

The operation is in full compliance with Standard of Practice 4.1; to train employees to operate the plant in a manner that minimizes the potential for cyanide exposures and releases

The Transfer Facility trains workers to understand the hazards of cyanide and refresher training is periodically conducted. The Cyanide Safety Awareness Presentation is provided to all staff as part of their induction and on a yearly basis as a refresher after that. This includes the necessary first aid to be undertaken in the case of an exposure and the PPE that must be worn. The purpose of the training course is to:

Illustrate the properties and potentially hazardous nature of cyanide; and

Demonstrate the appropriate precautions and safe handling techniques to minimise the possibility of an incident occurring.

This was shown as mandatory on the training matrix i.e. a person cannot start work without having undergone this training. Additional training includes Emergency Response, Box to Sparge operation, and Spill Clean up.

The facility trains workers in the use of personal protective equipment and when and where this equipment is required. The primary training provided on PPE is through the induction process (including induction and cyanide awareness training) and through site signage, showing what PPE needs to be worn in which areas. The operation has some materials and conducts training of personnel in the use of PPE through toolbox style presentations. Employees also go through a worker evaluation where experienced employees review their activities.

Workers are trained to perform their normal production tasks with minimum risk to worker health and safety and in a manner that prevents unplanned cyanide releases. The materials used for Sodium Cyanide Box to Sparge Training are comprehensive. They include photographs of key equipment (PPE, Sparge isotainer, flange guards, Transfer Facility hatch access point, transfer hopper and chute, crane hoist including bag lifter and bag splitter) and steps involved in its use Toolbox sessions are also used to train staff on specific issues identified as needing raised awareness or requiring refreshing.

Barbex in consultation with Orica personnel have developed a training matrix to manage the training requirements for all employees. This shows the training required for each position, whether it is mandatory (must be completed prior to starting work), required (must be completed but this can be done after starting work), or optional and the frequency it is required. Another matrix shows the training that has been undertaken for each person, and the date it was undertaken.

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Personnel at the operation have been trained by suitably qualified personnel. The initial training of operators was undertaken by Orica at the time of establishing the operation in a train the trainer forum. If there are any changes to the Box to Sparge Facility e.g. use of stationary HCN Monitor, Orica undertakes the initial training. Subsequent training on the subject is then undertaken by the Barbex Safety Health and Environment (SH&E) Coordinator and Barbex SH&E Officer (Dennis Akakpo) . The operation utilises external trainers for certified first aid training (St Johns), undertaken every 3 years for the Emergency Response Team. The qualifications were observed for the SH&E Officer.

The Cyanide Safety Awareness Presentation is provided to all staff as part of their induction and on a yearly basis as a refresher after that. This includes the necessary first aid to be undertaken in the case of an exposure and the PPE that must be worn. The purpose of the training course is to: illustrate the properties and potentially hazardous nature of cyanide; and demonstrate the appropriate precautions and safe handling techniques to minimise the possibility of an incident occurring. This was shown as mandatory on the training matrix i.e. a person cannot start work without having undergone this training.

Workers are trained to perform their normal production tasks with minimum risk to worker health and safety and in a manner that prevents unplanned cyanide releases prior to working with cyanide.

The facility evaluates the effectiveness of cyanide training by testing. The evaluations are conducted in English, which is the official language of Ghana. In addition to formalised training, the operation also undertakes informal workplace observations and more formalised audits where deviations from procedures are identified and corrected. An initial evaluation is undertaken by the relevant supervisor with further evaluation by the Safety, Health and Environment Coordinator.

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**Standard of Practice 4.2: Train employees to respond to cyanide exposures and releases.**

in full compliance with

The operation is

in substantial compliance with

**Standard of Practice 4.2**

not in compliance with

**Summarise the basis for this Finding/Deficiencies Identified:**

The operation is in full compliance with Standard of Practice 4.2; to train employees to respond to cyanide exposures and releases.

Emergency Response training is required for all site personnel as shown by the training matrix and is provided as part of the annual refresher on Cyanide Awareness Training. This includes procedure to follow in the event of a cyanide release.

The site has an ERT comprised of 5 people. Section 6.2. of the Barbex - Sodium Cyanide Emergency Response Plan states that the ERT will be given the following training: Fire/ Fire Extinguishers / Emergency Evacuation; Emergency Response; First Aid (certified every 3 years); Sodium Cyanide Awareness; MSDS Training; Incident Management; and PPE Training. This is undertaken annually with the exception of the First Aid training, which is undertaken every 3 years.

The facility trains workers to respond to worker exposure to cyanide and routine drills are used to test and improve their response skills. The main component of training for workers is the Cyanide Awareness Training package that provides information on response actions. Workers are involved in mock drill exercises. The operation has an emergency response team and has completed mock emergency drills and completed training. The team has completed first aid training and training on the updated emergency response plan.

Emergency drills are evaluated from a training aspect to determine if personnel have the knowledge and skills required for effective response, and training procedures are revised if deficiencies are identified.

It is stated in Barbex Technical Services Ltd, Sodium Cyanide Emergency Response Plan, Rev 22, 15 November 2020 that mock drills will be undertaken twice a year. The report on the drill includes the following: The Scenario; Participants; Drill Synopsis; What Went Wrong; What Went Right; Actions Recommendations and Issues; Evaluations; Photos.

The ERT takes the lead with the mock drills. The SHE Manager takes part in the mock drill as an observer and will feed any deficiencies back into the training that he provides.

Confirmation of training attendance/participation records are retained throughout an individual's employment documenting the training they have received, including the names of the employee and the trainer, the date of training, the topics covered. The records indicate whether an employee demonstrated an understanding of the training materials. This is done either through a question and answer sheet or through the trainer's observations after verbalising the questions. Each worker also carries a passport detailing the training undertaken.

The facility evaluates the effectiveness of cyanide training by testing. The evaluations are conducted in English, which is the official language of Ghana. In addition to formalised training, the operation also undertakes informal workplace observations and more formalised audits where deviations from procedures are identified and corrected. An initial evaluation is undertaken by the relevant supervisor with further evaluation by the SH&E Coordinator.

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## PRINCIPLE 5 – EMERGENCY RESPONSE

### **PROTECT COMMUNITIES AND THE ENVIRONMENT THROUGH THE DEVELOPMENT OF EMERGENCY RESPONSE STRATEGIES AND CAPABILITIES.**

**Standard of Practice 5.1: Prepare detailed emergency response plans for potential cyanide releases.**

in full compliance with

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

not in compliance with

#### **Summarise the basis for this Finding/Deficiencies Identified:**

The operation is in full compliance with Standard of Practice 5.1; prepare detailed emergency response plans for potential cyanide releases.

The facility has developed an Emergency Response Plan to address potential releases of cyanide that may occur on site or may otherwise require response.

The following Emergency Response Guides address the potential releases of cyanide that may occur on site or may otherwise require response.

- Orica Emergency Response Guide - Sodium Cyanide rev 10, Sept 2019 contains response to a cyanide emergency/ incident including specific Emergency Response Guides.
- Barbex Technical Services Ltd, Sodium Cyanide Emergency Response Plan, Rev 22, 15 Nov 2020. This contains Plan Activation, Response Task, Resources, Preparedness, Toxicity First Aid and Medical Treatment.

The Plan considers the potential failure scenarios appropriate for its site-specific environmental and operating circumstances.

Orica Emergency Response Guide - Sodium Cyanide rev 10, Sept 2019 contains response to a cyanide emergency/ incident including specific Emergency Response Guides as follows:

- Dry Sodium cyanide Spill - Inside Buildings / Storage Facility;
- Dry Sodium Cyanide Spill -Outside Buildings/ Storage Facility;
- Dry Sodium Cyanide Spill - Inside a Shipping Container;
- Shipping Container Decontamination
- Handling Wet Sodium Cyanide
- Sodium Cyanide Spill to Waterway;
- Response to a Fire in the Vicinity of Stored Cyanide;
- Roll over of a Shipping Container.

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These scenarios are the ones appropriate to the site specific environmental and operating circumstances of a Box to Sparge transfer facility that handles solid cyanide under cover.

The Barbex Technical Services Ltd, Sodium Cyanide Emergency Response Plan, Rev 22, 15 Nov 2020 (Barbex ERP), states the following. The purpose of this Emergency Response Plan is to establish guidelines, assign responsibilities provide coordinated response and promote awareness in responding to emergencies that may affect any part of the warehouse facility, and transport route, which includes communities and the environment.

The Emergency Response Plans do not address power outages as there is a backup generator (100 kilovolt amps). The generator is of sufficient capacity to power the entire facility. The electrician manually starts the generator in the event of a power failure. In the event of a power failure the plant remains in a safe situation.

The Emergency Response Plans and supporting procedures provide:

- Specific response actions, as appropriate for the anticipated emergency situations, such as evacuating site personnel and potentially affected communities from the area of exposure; as detailed in the Specific Emergency Response Guides.
- Use of cyanide antidotes and first aid measures for cyanide exposure;
- Control of releases at their source; and
- Containment, assessment, mitigation and future prevention of releases.

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**Standard of Practice 5.2: Involve site personnel and stakeholders in the planning process.**

in full compliance with

The operation is

in substantial compliance with

Standard of Practice 5.2

not in compliance with

**Summarise the basis for this Finding/Deficiencies Identified:**

The operation is in full compliance with Standard of Practice 5.2; involve site personnel and stakeholders in the planning process.

The Transfer Facility has involved its workforce and stakeholders in the emergency response planning process.

The workforce and stakeholders assigned emergency response duties are specified within the Barbex ERP. Section 5.5.1 (Emergency Response Duties) and 5.5.2 (Emergency Response Procedures) of the ERP details the duties and response actions required for individual persons involved in the management of the emergency.

Copies of the ERP have been sent to key stakeholders (Hospitals, Fire Service and EPA) with Barbex completing a follow up discussion with the hospitals (Sam Jonas Medical Facility, and Tarkwa Municipal Hospital) each year.

Copies of the Orica and Barbex ERP have been sent to the Ghana EPA and the Minerals Commission, Ghana during the audit period.

Orica play a significant advisory and technical role in the emergency response process in the event of a cyanide release. Orica has assisted in the original development of the Barbex ERP.

Communities have not been consulted with regard to Box to Sparge Facility specific emergencies as no neighbouring communities have been identified as likely to be affected as the nearest community is approximately 5 km from the facility.

Communities are consulted with regards to the transportation of solid cyanide to and from the facility as part of the International Cyanide Code certification of the transport company involved, Stellar Logistics Limited. Stellar Logistics were first certified on 01 November 2012 and their latest certification was on 09 August 2018.

Local response agencies such as outside responders and medical facilities have been involved in the emergency planning and response process. External responders include medical facilities, EPA and mine emergency response teams. Letters have been sent to key stakeholders (Fire Service, EPA, and AngloGold Ashanti) with Barbex completing a follow up discussion with the local hospitals (Sam Jonas Medical Facility, and Tarkwa Municipal Hospital) each year. A visit to the Sam Jonas Medical Facility was undertaken during the site visit.

The roles and responsibilities of the police are consistent with their normal duties associated with traffic and crowd control. Fire services for the Transfer Facility are provided by the Ghana National Fire Service Tarkwa District (Western Region).

The Box to Sparge Facility has engaged in regular consultation and communication with stakeholders to assure that the ERPs address current conditions and risks.

Section 6.6 (Updating) of the Barbex ERP states the following. The plan shall be reviewed and evaluated as changes take effect or at least annually and will be issued to stakeholders if amendments to the plan are relevant to them.

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The site representative had a discussion with the stakeholders when the plan was given to them. It was discussed with the EPA when they come to site as part of their regular inspections.

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**Standard of Practice 5.3: Designate appropriate personnel and commit necessary equipment and resources for emergency response.**

in full compliance with

The operation is  in substantial compliance with **Standard of Practice 5.3**

not in compliance with

**Summarise the basis for this Finding/Deficiencies Identified:**

The operation is in full compliance with Standard of Practice 5.3; designate appropriate personnel and commit necessary equipment and resources for emergency response.

The Barbex ERP includes the following:

- a) Section 3.3 Authority and Resource Mobilisation, of the Barbex ERP designates authority to the emergency response coordinator. It states that “The emergency response coordinators in Barbex Technical services (BTS) have the explicit authority to commit resources necessary to implement the plan during an emergency situation”.
- b) Tables 3.1 and 3.2 of the ERP list the Internal Emergency Numbers and the ERT members and numbers respectively. In addition, Appendix 1 of the Barbex ERP lists all the relevant external and internal ERT contacts and their contact details (mobile, office and email). The ERT has a team leader and four responders.
- c) Section 6.2 of the ERP details the required training modules and their training frequency for the ERT personnel. Section 6.3 also details the requirements for emergency response stimulation drills to be held yearly and includes the required participants (internal and external).
- d) Tables 3.1 and 3.2 of the ERP list the Internal Emergency Numbers and the ERT members and numbers respectively. In addition, Appendix 1 of the ERP lists all the relevant external and internal ERT contacts and their contact details (mobile, office and email).
- e) Section 5.5.1 Emergency Response Duties details the duties and roles described for all designated response personnel. This includes; coordinators, team leader, responders, medical facilities, fire service, police, etc.
- f) Section 5.4 Equipment and Materials lists the emergency response equipment kept on site to respond to all incidents both on site and along the transport routes to the customer mines.
- g) Section 6.4. Maintenance and Inspection of Response Equipment states that the equipment is inspected against required quantities to ensure availability.
- h) Section 5.5.1 Emergency Response Duties details the duties and roles of outside responders including; medical facilities, fire service, police, communities.

Section 3.1 details the internal notification mechanism. Figure 4.1 details the response action flowchart.

The facility has confirmed that outside entities included in the Plan are aware of their involvement and are included as necessary in mock drills or implementation exercises.

External responders, medical facilities and communities have been advised of their roles and/or mutual aid during an emergency response, as appropriate. However, the nature of the Transfer Facility operation, and limited local availability of qualified external responders means that emergency response is largely self-contained. Section 5.5.1 (Emergency Response Duties) and 5.5.2 (Emergency Response Procedures) of the ERP

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identifies the roles and responsibilities of outside responders (Hospitals, Police, and Fire Services), and Barbex has advised them of their designated responsibilities through correspondence and their involvement in emergency response exercises. Barbex has sent letters to these outside responders and for the hospitals, has followed up with annual meetings. The mock drill of the 18 February 2020 was observed that the Municipal Fire Service was involved. The Orica Emergency Response Guide includes Appendix 3 - Orica response to a Reported Cyanide Incident, which includes attendance at an incident by product specialists if necessary.

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**Standard of Practice 5.4: Develop procedures for internal and external emergency notification and reporting.**

in full compliance with

The operation is

in substantial compliance with

**Standard of Practice 5.4**

not in compliance with

**Summarise the basis for this Finding/Deficiencies Identified:**

The operation is in full compliance with Standard of Practice 5.4; develop procedures for internal and external emergency notification and reporting. The Plan includes procedures and contact information for notifying management, regulatory agencies, outside response providers and medical facilities of the emergency, as appropriate.

Procedures and contact information for notifying the shipper (Orica), the receiver/consignee (various mines), regulatory agencies (Ghana EPA), outside response providers (Municipal Fire Service), medical facilities (Sam Jonas Medical Facility, and Tarkwa Municipal Hospital) and potentially affected communities of an emergency are all contained in Appendix 1 (Emergency Call List) of the Barbex ERP. Section 4.2 External Notification Mechanism of the Barbex ERP details the process to be followed in the event of an emergency.

The Barbex ERP includes procedures and contact information for notifying potentially affected communities of incidents and/or response measures in the event of a transportation incident (Section 5.5.1). The Box to Sparge Facility is located on the AngloGold Ashanti Iduapriem mining lease adjacent to the Goldfields Tarkwa mining lease. The closest community is approximately five kilometres from the Transfer Facility gate. Due to the nature of activities on site and the distances involved communities are unlikely to be impacted and have not been consulted within regard to the Box to Sparge Facility specific emergencies. Responsibilities have been allocated within the ERP for communicating with the media. Section 5.6 (Media) of the Barbex ERP designates the Barbex Tarkwa Site Manager as the media contact.

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**Standard of Practice 5.5: Incorporate into response plans and remediation measures monitoring elements that account for the additional hazards of using cyanide treatment chemicals.**

in full compliance with

The operation is  in substantial compliance with **Standard of Practice 5.5**

not in compliance with

**Summarise the basis for this Finding/Deficiencies Identified:**

The operation is in full compliance with Standard of Practice 5.5; incorporate into response plans and remediation measures monitoring elements that account for the additional hazards of using cyanide treatment chemicals.

The ERP describes specific, appropriate remediation measures, such as recovery or neutralisation of solutions or solids, decontamination of soils or other contaminated media and management and/or disposal of spill clean-up debris, and provision of an alternate drinking water supply, as appropriate. Section 4.4 (Clean-up and Decontamination) of the ERP details steps for cleaning up and decontaminating an area specifically for: personnel; clothing including PPE; and contaminated areas and equipment.

Appendix 6 -Test Methods for Cyanide on Surfaces and in Water and Soil of the ERP identifies what treatment chemical is to be used for remediation purposes, how it is prepared to the appropriate concentration, the end point of remediation, how samples will be taken, and what the final concentration allowed in residual soil as evidence that the release has been completely cleaned up.

The Barbex ERP Section 5.4 Equipment and Materials lists the emergency response equipment kept on site to respond to all incidents, which includes the chemicals used for remediation purposes.

In addition, there is the following procedure, EP-SOP-003 Disposal of Cyanide contaminated Liquid Waste Rev 8, 20 Feb 2020 that details how any contaminated liquid is to be disposed of.

The Barbex ERP in Section 4.4.6 Sodium Cyanide Spill to Water includes the following: "Prohibits the use of chemicals such as sodium hypochlorite, ferrous sulphate, hydrogen peroxide, etc. to treat cyanide spills into water bodies".

The Barbex ERP addresses the potential need for environmental monitoring to identify the extent and effects of a release. Section 4.5 (Environmental Monitoring) of the ERP states that Barbex shall arrange for the incident area to be monitored in conjunction with the Ghana EPA and in accordance with direction from the Ghana EPA and the product manufacturer (Orica). The ERP details a monitoring programme to be implemented in the event of an accident or incident involving a cyanide release.

The following procedures detail the sampling methodologies and parameters to be used:

EP-SOP-001 Surface Water Sampling, Rev 5, 19 Sep 2019;

EP-SOP-002 Water Quality Monitoring and QA Program Rev 5, 15 May 2019; (includes Actions Taken on Exceedances of Regulatory Standards, stating that an environmental incident will be raised in such an event. Includes: Attachment 1, a diagram of sampling points and their locations at the Barbex facility; Attachment 2, a table of sampling points, frequency of sampling parameters.)

EP-SOP-005 Air Monitoring Rev 6, 20 Feb 2020.

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**Standard of Practice 5.6: Periodically evaluate response procedures and capabilities and revise them as needed.**

in full compliance with

The operation is

in substantial compliance with

**Standard of Practice 5.6**

not in compliance with

**Summarise the basis for this Finding/Deficiencies Identified:**

The operation is in full compliance with Standard of Practice 5.6; periodically evaluate response procedures and capabilities and revise them as needed.

The ERP contains provisions for periodically reviewing and evaluating the ERP's adequacy and they are being implemented and to evaluate the Plan after any emergency that required its implementation, and for revising it as necessary.

Section 6.6 (Updating) of the ERP states: The Safety Health & Environmental Coordinator is responsible for updating and reviewing the plan including contact telephone numbers and informing all plan holders of any changes. A record plan of amendments shall be kept. The plan shall be reviewed and evaluated as changes take effect or at least annually and will be issued to stakeholders if amendments to the Plan are relevant to them. The ERP is reviewed annually and mock drills performed twice in a year. The ERP was last reviewed on 15 November 2020. The Orica Emergency Response Guide - Sodium Cyanide was last reviewed in Sept 2019. Section 4.0 Review states "This guide shall be reviewed as a minimum on a biennial basis and following incidents, where the guide is utilised. The site has not had an emergency involving cyanide and therefore had not had to review or update the guide on this basis.

It is stated in Barbex Technical Services Ltd, Sodium Cyanide Emergency Response Plan, rev 22, 15 Nov 2020 that mock drills will be undertaken twice a year. This includes cyanide and non-cyanide scenarios.

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