



THE BISIE TIN MINING PROJECT
NORTH KIVU PROVINCE
DEMOCRATIC REPUBLIC OF CONGO

ENVIRONMENTAL & SOCIAL MANAGEMENT PROGRAMME

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LIST OF ACRONYMS

ABM	Alphamin Bisie Mining SA
AfDB	African Development Bank
AMD	Acid Mine Drainage
ASM	Artisanal Small-scale Mining
ASMIMSP	Artisanal Small-scale Mining Impact Mitigation Strategy & Plan
CES	Coastal and Environmental Services
COD	Chemical Oxygen Demand
CP	Compensation Plan
DFS	Definitive Feasibility Study
DRC	Democratic Republic of the Congo
E&S	Environment & Social
EA&R-SH	Environmental Affairs and Rehabilitation – Section Head
EHS	Environmental Health and Safety
EMP	Environment Management Plan
EMPP	Environmental Management Plan of the Project
EPFI	Equator Principles Financial Institution
ESA-M	Environmental and Social Affairs Manager
ESHIA	Environmental, Social and Health Impact Assessment
ESMPr	Environmental & Social Management Programme
ESMP/s	Environmental & Social Management Plan/s
FAO	Food and Agriculture Organisation
CESMP	Construction Phase ESMP
OESMP	Operational Phase ESMP
DESMP	Decommissioning Phase ESMP
DPF	Diesel Particulate Filter
FDP	Farmer Development Programme
GM	General Manager
HA	Hectare
HAZOP	Hazard & Operability Study
HDPE	High-density Polyethylene
H&SMP	Health & Safety Management Programme
H&S-SH	Health & Safety Section Head
HSS	Health Safety and Security
ICMM	International Conference on Mining and Metals
IDC	Industrial Development Corporation (Government of South Africa)
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
KPA/I	Key Performance Area/Indicator
LTV	Long-term Trigger Value
MAMSL	Metres Above Mean Sea Level
MICOA	Ministry of Coordination of Environmental Affairs
MPC	Mining and Processing Congo
MSDS	Material Safety Data Sheets

MW	Megawatt
NGO	Non-Governmental Organisation
NPO	Non-profit Organisation
OHS	Occupational Health & Safety
OP	Operating Procedure
PAC	Project-Affected Community
PAP	Project-Affected People
P-CRIA	Project-level Conflict and Risk Impact Assessment (P-CRIA)
PS	Performance Standard
QA/QC	Quality Assurance / Quality Control
ROM	Run of Mine
RTI	Respiratory Tract Infection
SAP	Social Action Plan
SCC	Species of Conservation Concern
SEP	Stakeholder Engagement Plan
SLC	Sublevel Caving
SOP	Standard Operating Procedure
STV	Short-term Trigger Value
TA	Territorial Administrator
TB	Tuberculosis
TM	Technical Manager
TSF	Tailings Storage Facility
VCT	Voluntary Counseling & Testing
VPSHR	Voluntary Principles on Security and Human Rights Initiative
WASH	Water, Sanitation and Hygiene
WHO	World Health Organisation
WRD	Waste Rock Dump

1. INTRODUCTION

1.1 PROJECT OVERVIEW

Alphamin Bisie Mining SA (ABM SA), also referred to as the 'proponent', intends to develop the Bisie Tin Mining Project (referred to as the 'the project') in the North Kivu province of the Democratic Republic of the Congo (DRC). The proposed project will entail the establishment of an underground tin mining operation; with the required processing and supporting infrastructure being located on the surface of the valley area to the west of the existing exploration camp. Currently there is only an exploration camp, and the village of Ma Noire located lower down the valley, approximately 1.5km southwest of the exploration camp.

EOH Coastal & Environmental Services (CES) has been appointed to undertake an Environmental, Social and Health Impact Assessment (ESHIA) for the proposed project which informed the Definitive Feasibility Study (DFS) planning process - which was completed in March 2016. This was deemed necessary to update the initial Project Environmental Impact and Management Plan undertaken during the course of 2012 and 2013 (by a Congolese consultant), which was submitted in 2014 and subsequently approved in order to secure the necessary mining (exploitation) permit issued by the national mining ministry in 2015.

This ESHIA process and subsequent reporting is therefore not required to seek authorisation or approval from any mandated national or provincial authority in the DRC, but is being generated to assist ABM in following applicable national and international reporting standards and specifications as it relates to mining projects of this nature.

1.2 LOCATION, MINING RIGHTS AND HISTORY

The project is located in a remote area of the Walikale Territory near the town of Walikale (approximately 60km away from the proposed mine site). This area is approximately 160km west-northwest of the North Kivu provincial capital, Goma (see Figure 1.1). The Bisie project is a mixed tin, copper, lead and zinc orebody of which Alphamin Resources Corporation (AFM) holds 80.76% direct interest, with the balance being held by the South African Government's Industrial Development Corporation (IDC--14.25%) and the DRC Government (5%). ABM commenced with its exploration (drilling) programme in August 2012.

The substantial tin (cassiterite) deposits in the area have been subject to artisanal small-scale mining (ASM) activity since 2002. This contributed to a lucrative small-scale illicit industry supplying a significant percentage of the cassiterite exported from the DRC at the time. Significant illegal artisanal mining activity has taken place on the site since 2002, with these activities supporting local and immigrant miners, local communities, rebel factions, as well as DRC army units, exporters and both domestic and international financiers over this period. However, the scale and rate of artisanal mining has decreased substantially in the last few years due to more difficult mining conditions (longer and deeper tunnels required to reach the deeper orebody making this mining activity extremely dangerous).

In addition, any ASM activity at the site is now deemed clearly illegal as it relates to the national laws and regulations governing ASM activities and mining areas which have bringing the DRC ASM sector into conformity with conflict-free legislation of the DRC, the International Conference of the Great Lakes Region (ICGLR) intergovernmental body, the U.S. Dodd-Frank act and the guidelines of the Organisation for Economic for Economic Co-operation and Development (OECD) guidelines. As per government decree all artisanal mining has now ceased on the Mpama North Ridge, the main site of ASM activity to date, as of April 2015, and the site of ABM's planned industrial underground mine¹.

¹ At the height of the artisanal mining era in Bisie, Ma Noire settlement had a population of approximately 12,000 inhabitants. It is an illegal settlement that is not registered with the relevant national departments. According to the DRC Mining Code, there can only be semi-permanent structures in registered artisanal settlements, and when the ASM move, they must dismantle the structures, and leave the site as it was. This has not been the case for Ma Noire, even after the illegal ASM site of 45' was dismantled early in 2015 – activities have continued on 15', and the settlement is still inhabited by artisans, their families, local members of the Bangandula Clan, as well as some ABM SA locally recruited staff."

Alphamin Resources Corporation acquired Mining Processing Congo (MPC) in 2012 and changed the name of the Bisie Tin Project operating company to Alphamin Bisie Mining, Society Anonyme, in 2015.

Figure 1: Project study area



Figure 2: The mine site at present: exploration camp and the village of Ma Noire

1.3 PURPOSE OF THIS REPORT

ABM aims to be the leader in socially and environmentally responsible mining in the region and, as such, will seek compliance with local and international standards. According to the Equator Principles III (2013), the primary tool for implementing sound Environmental & Social (E&S) management is through the preparation and implementation of a series of Environmental and Social Management Plans (ESMPs) that will include a Construction Phase ESMP (CESMP), Operational Phase ESMP (OESMP) and Decommissioning Phase ESMP (DESMP). The requirements and specifications for these stand-alone, or phased, ESMPs are detailed in this Environmental and Social Management Programme (ESMPr). The ESMPr (this report) has been standardised and adapted to the requirements stipulated in the International Finance Corporations (IFC) Performance Standards on Environmental and Social Sustainability (2012) and associated Environmental, Health and Safety (EHS) Guidelines.

1.4 STRUCTURE OF THE REPORT

The content of the various sections of this ESMPr is summarised below.

- **Chapter 1** provides an overview of the Bisie Tin Mining Project and details of the team members that drafted this report.
- **Chapter 2** provides a summary of the project description.
- **Chapter 3** provides a background to the ESMPr and details of relevant management plans required in each phase of the operation to ensure compliance with relevant standards.
- **Chapter 4** provides the applicable legislation and relevant local and international policies and standards.
- **Chapter 5** identifies the training needs that include staff training and community training and partnerships that will be required to implement the ESMPr.
- **Chapter 6** contains community engagement and on-going consultation and communication requirements.
- **Chapter 7** contains the organisational capacity and human resources requirement to implement the ESMPr.
- **Chapter 8** presents the anticipated scopes for the ESMP's that will need to be prepared, as well as the specific mitigation measures that would be required to manage the range of identified environmental and social impacts. These are presented in tabular format.
- **Chapter 9** describes the monitoring and review procedure implemented by the management team.
- **Chapter 10** provides detail of the monitoring programme required to address the completeness of the proposed mitigation measures.
- **Chapter 11** details the decommissioning and closure phase requirements for the project, as well as the estimated preliminary costs required for this.

1.5 OBJECTIVES OF THE ENVIRONMENTAL & SOCIAL MANAGEMENT PROGRAMME

This document is intended to assist ABM to implement a sound environmental and social (E&S) management system. It represents the company's commitment to addressing and managing the potential negative and positive environmental and social impacts associated with the construction, operation and closure phases of the project in a systematic, efficient and effective manner. The objectives of the document are to:

1. Ensure the project is compliant with applicable national E&S legal requirements.
2. Identify the required mitigation measures that are needed in order to reduce negative E&S impacts and enhance positive ones.
3. Ensure that all mitigation measures and recommendations identified during the Environmental, Social and Health Impact Assessment (ESHIA) are incorporated into documents that are referenced and expanded if necessary during the various phases

- of the project.
4. Outlines management structures and human resource requirements to ensure that the implementation of the ESMPr is possible for all phases of the project.
 5. Identifies relevant documents and procedures to be developed that will facilitate the implementation of the ESMPr.

1.6 ENVIRONMENTAL, SOCIAL & HEALTH IMPACT ASSESSMENT PROCESS TO DATE

In 2015, ABM appointed EOH Coastal & Environmental Services (CES) to conduct an ESHIA completed to local Congolese standards, as well as international standards, benchmarked against the IFC Performance Standards. Table 1.1 presents the report volumes that were produced during the ESHIA process. All documents prepared as part of the ESHIA process were in accordance with required international standards.

Table 1.1: Reports produced for the updated ESHIA process

Report/Specialist Study	Affiliation	Name of Lead Specialist(s)
Environmental Scoping Report (September 2015)	CES	Marc Hardy, Dr Ted Avis
Social Impact Assessment (November 2015)	CES	Marc Hardy, Jan Hough,
Health Impact Assessment (November 2015)	CES/Kameco	Jan Hough, Jules Mulya
Aquatic Ecology Impact Assessment (November 2015)	CES	Dr C. Mack, Justin Green
Terrestrial Ecology Impact Assessment (November 2015)	CES	Mike Bailey
Air Quality Impact Assessment (September 2015)	Airshed	Dr T. Bird, Dr L. Berger
Surface & Groundwater Impact Assessment (November 2015)	CES	Bill Rowlston
Traffic and Transport Impact Assessment (November 2015)	CES	Tom King
Waste Impact Assessment (November 2015)	CES	Dr K. Whittington-Jones
Draft ESHIA Report (January 2016)	CES	Marc Hardy, Dr Ted Avis
Draft ESMPr (January 2016)	CES	Marc Hardy, Dr Ted Avis
Final ESHIA Report August 2016)	CES	Marc Hardy, Dr Ted Avis

2. PROJECT DESCRIPTION²

2.1 PROJECT RATIONALE

The Company announced a 34% increase to the Mpama North October 2015 Mineral Resource estimate in May 2016. This updated Mineral Resource estimate included Measured Mineral Resources of 0.46 Mt at 4.31% tin for 19 600 tonnes contained tin (0.5% cut-off), Indicated Mineral Resources of 4.14 Mt at 4.55% tin for 188 400 tonnes contained tin (0.5% cut-off), and Inferred Mineral Resources of 0.54 Mt at 4.25% tin for 22 800 tonnes contained tin (0.5% cut-off). In addition, a Probable Mineral Reserve estimate of some 152 800 tonnes of tin contained in 3.52 Mt at 4.34% tin (1.8% cut-off) was declared. Given the significant increase in the Mineral resource estimate at Mpama North the Company elected to update its original Feasibility Study. The results of the updated Feasibility Study were announced on 28 June 2016, and included the following key results:

- Cash cost per tonne of tin produced and sold of US\$ 7 396 and US\$ 8 935 respectively;
- US\$ 262.7 million NPV at an 8% real discount rate;
- Real, after tax IRR of 48.4%; and
- 23 month payback period post first tin production.

2.2 MINING

Mining by means of underground, mechanized mining methods is proposed, with the mining operations being performed by a suitably qualified, professional mining contractor. Mining is envisaged at a rate of 350,000 tons per annum of ore, commencing from 50m below surface down to an ultimate depth of 500m. Access to the underground workings will be via a single trackless decline developed at 5m wide x 5m high. Access to each level will be via a level cross cut on each level. Levels will be located 20m apart vertically. All development will be completed using mechanised drill, blast, support, load and haul methods.

2.2.1 Mining Method

Sublevel caving (SLC) is a long hole mining method in which the orebody is drilled and blasted while the surrounding waste is allowed to cave in on top of the ore. The mining face is progressively retreated allowing the waste to cave in behind the mining face. This method is well suited to orebodies where the surrounding rock mass is weak. It can only be applied in either very wide orebodies or in narrow but steeply dipping orebodies. The process of drilling, blasting and loading is similar to long hole open stoping except that no pillars are left and that the direction of mining is always in retreat back towards the access to the level.

Sublevel spacing is typically between 15 m and 25 m and is selected based on the orebody geometry and equipment that is utilised for drilling and loading. Access to each sublevel will be from the decline, via an access cross cut close to the centre of the orebody. Ore drives will be driven out to the extent of the orebody in either direction from the access. At the limit of the orebody slot raises will be developed. The slot raise will be opened up to the full width of the orebody to establish a full width mining face. Blast hole rings are then drilled and blasted advancing the face in retreat from the limit of the orebody towards the access. Rings can be pre-drilled if ground conditions are sufficiently good so that hole losses are not excessive or they are drilled as required for blasting. Typically 2 rings are blasted and loaded out at a time. Two or more faces can be established on levels below each other provided that each level lags a suitable distance, typically at least 20 m behind the face above it.

A critical part of sublevel caving is grade control. The only way to determine when to stop loading after a blast is to monitor the grade of the ore being loaded. When the grade drops below the planned cut-off loading must be stopped and the next rings blasted. When the ore is visually distinct from the waste this is more easily achieved. It can be done in ores which

² The reader is referred to Chapter 3 of the ESHIA report for a more detailed description of the project.

are not visually distinguishable from waste by a well-planned and managed system of grade control by sampling and monitoring of the material movements from a blast, commonly referred to as cave management. This mining method is very productive and requires minimal waste development.

2.2.2 Ore Handling

Ore will be transported by underground truck to the Run of Mine (ROM) pad, situated 400m from the portal. Waste rock will be transported to a waste dump 1 km from the portal.

2.2.3 Material Handling

Material will be delivered to the mine on low-bed trucks and will be transported down the decline to the required level. Small materials, explosives and explosive accessories will be transferred into individual operating sections on the level. Equipment such as pipes and winches will be stored on surface and will be transferred to underground sections when needed.

2.2.4 Water Handling

Water discharged from the mining operations or from seepage will be controlled at source, where possible, and pumped to a drainage system where the dirty water will be allowed to gravitate to a collection sump located at the ramp system. Water from the stoping horizon will be allowed to gravitate to the crosscut below and collected in a sump equipped with a dirty water pump. From here it will be pumped with footwall development water to a sump and from these sumps to the decline pumping systems. The larger particles in the water will be allowed to settle in sumps before being pumped to surface. The sumps will be cleaned of grit and sludge using the Load-Haul-Dump (LHD) vehicles and diesel trucks. This service water will then be pumped to the processing plant for recycling. Drinking water will be provided at the ramp access located on each level.

2.2.5 Trackless vehicle maintenance

Trackless machinery will be used for all footwall waste development, and to deliver materials to the required section at each level. Maintenance, servicing and workshop facilities will be established on surface only. These workshops will provide the necessary resources to maintain the vehicles and provide for weekly and monthly scheduled servicing as well as major component change-outs. Designated surface areas will be provided for trackless machinery to ensure the daily maintenance and operating checks are complied with. In addition, these designated areas will be used for fuelling, lubrication and washing of the machines on a daily basis. No underground workshops have been planned.

2.2.6 Personnel transportation

Employees will be transported by bus to the mine from the on-site employee camp. Underground employees proceed to the change house, change into their Personal Protective Equipment (PPE), collect underground lamps and self-rescue pack and report to the shaft bank for clocking in and transport underground. Underground employees will be transported to and from their specific underground working areas by enclosed vehicles.

2.2.7 Underground Infrastructure

For the underground operation relating to the production areas, services for compressed air feed, water reticulation and power supply are required. A set of raises connecting each level, in close proximity to the level access, will be established. These raises will function as return ventilation raises, service raises for pipes and cables, as well as a second means of egress from the mine. The mine dewatering system, consisting of a series of dirty water pumps and a cascade pumping system will be maintained and extended as the mine progresses deeper.

2.2.8 Surface Support Infrastructure

The following surface infrastructure will be established on surface in the general plant area:

- Workshops
- Offices
- Stores
- Medical station

The following infrastructure will be located at the portal location:

- Dirty water receiving dam and settling facility
- Compressor house
- Mining control room
- Service water dam and reticulation to underground workings.

2.2.9 Development and Mining Schedule

Mine development has been assumed to start in Quarter 3 of 2016. Scheduling determined that a mine will have an estimated life of 12 years.

2.3 METALLURGICAL PROCESSING

The Bisie tin plant is designed to treat a maximum of 500,000 t/a of ore and produce 30,000 t/a of tin concentrate. Although originally envisaged as a 500,000 t/a operation, changes in the mining plan resulted in the ore feed reducing to 360,000 t/a, to produce a product of 24,000 t/a of 60 % tin concentrate. The plant will probably run at a reduced tonnage during the initial years of operation. This will be accomplished by reducing operating time rather than hourly throughput. The plant comprises the following processes:

1. Crushing of Run of Mine ("RoM") ore to -10 mm.
2. Screening of the crushed ore into -10 +1 mm and -1 mm fractions.
3. The -10 +1 mm is processed by jigging.
4. Jig concentrate is milled to 80 % -425 μ m and processed using gravity spiral concentrators.
5. Spiral concentrate is milled and sulphides removed by flotation to provide the bulk of the final concentrate.
6. Spiral tailings are reground to 80 % -106 μ m, sulphides are removed by flotation, and a final tin concentrate produced by a second flotation stage.
7. Jig tailings are discarded to a tailings stockpile, part of the tailings storage facility.
8. The -1 mm screened from the crushed ore is processed using gravity spiral concentrators. There are two spiral concentration sections:
 - The primary concentrate is combined with the jig spiral concentrate for grinding and sulphide flotation.
 - The secondary concentrate is combined with the sulphide concentrates and tin flotation tailings to form a \pm 10 % tin low-grade concentrate.
9. The -1 mm spiral tails are thickened and discarded. Combined final concentrates are treated through a magnetic separator to remove iron, then filtered and bagged for sale.

The crusher plant has been designed to run at 50 % utilisation and the remainder of the plant at 85 %.

2.3.1 Ore Handling and Preparation

The plant will be fed with ore by Front-End-Loader (FEL) from a mine stockpile. A primary jaw crusher will reduce the ore from approximately 400 mm to less than 100 mm. The ore will then be screened and crushed in a secondary and a tertiary cone crusher. The tertiary crusher will be in closed circuit with a screen. The final crusher product will be -10 mm. Crushed ore will be stored on a stockpile. A FEL will reclaim the ore and discharge into a hopper and belt feeder arrangement. This will feed a screen where the ore will be split into a +1 mm fraction and a -1 mm fraction. Test work results indicated the split is expected to be 75 % coarse, 25

% fine.

2.3.2 Concentration and Flotation

Milled material will be subjected to gravity concentration on a series of spiral concentrators. Concentrate will be reground in a closed circuit ball mill to liberate fine tin, and any sulphides present will be removed by flotation, followed by the tin concentrate. The -1 mm crushed fines will be subjected to gravity concentration on a series of spiral concentrators. Concentrate will be added to the jig spiral concentrate stream for treatment. The concentrate will be classified as low-grade tin concentrate and added to the tin flotation tailings and sulphide concentrates. The tin flotation circuit will consist of six flotation cells. During this stage various reagents such as caustic soda, sulphuric acid and copper sulphate are used in small amounts. Flotation tailings will also be classified as a low-grade tin concentrate and will be filtered and stored pending sale. All sulphide concentrate will be added to this low grade concentrate stream.

2.3.3 Separation and Filtration

The two high-grade tin concentrates produced - coarse and fine spiral, and flotation concentrates - will be combined. Sulphide flotation tailings and floated tin concentrate are pumped to a magnetic separator for removal of magnetite. The magnetite concentrate contains some tin and is added to the low-grade tin concentrate. A dedicated high-grade concentrate filter will reduce the moisture content to 6% for bagging and despatch. The low-grade tin concentrate will also be filtered in a dedicated low-grade concentrate filter which will reduce the moisture content to 6 % and then bagged for despatch and sale.

2.3.4 Tailings

The thickened flotation circuit tailings will be deposited in the Tailings Storage Facility (TSF) by means of a dedicated pipeline. Water will be recovered from the tailings dam by a pump on a floating barge and pumped back to the plant. General plant area run-off water will be collected in a stormwater pond and pumped to the plant to serve as dilution and make-up water. As far as possible all recovered water will be re-used in the plant.

2.3.5 Waste Rock Dump

The waste rock and jigs tailings dump will be located adjacent to, and immediately north of, the preferred TSF location.

2.3.6 Water Services

Raw water will be pumped from the Bisie River to a storage tank, and from there it is pumped to the plant area before being filtered and used as spray water, reagent make-up water and as pump gland seal water. The water quality will be assessed, and if necessary treated to provide potable water for general use. Thickener overflow water and tailings return water will be clarified in a settling cone and collected in a process water tank. From this tank it will be distributed to the required process areas, mainly for milling and jigging dilution.

2.4 ADDITIONAL INFRASTRUCTURE

2.4.1 Electrical power generation

Because the Bisie project area is so remote, it has practically no industrial or social infrastructure. The mine will have 4MW of installed electrical power. Power will be generated on-site using diesel powered generator sets. The diesel will be delivered to Bisie at a rate of 45 tankers per month.

2.4.2 Access roads

A gravel access road to Bisie will be constructed as part of the project infrastructure. The access road will be approximately 32km long and branch off from the N3 near the village of Logu. Due to the size of the operation, low volumes of traffic are expected on this road. An estimate of <10 articulated trucks and <15 passenger vehicles per day can be expected.

2.4.3 Accommodation Camps

Accommodation for skilled and unskilled personnel during the construction phase will be provided in a temporary accommodation camp to be constructed within the mine project area, whereas permanent accommodations will be provided during the operations phase.

2.4.4 Domestic and Hazardous waste disposal facility

A domestic (non-hazardous) waste disposal facility, along with a sewerage treatment plant, is also required to deal with inert wastes and treat sewerage for the construction camp, and eventually the processing plant and workshop areas. A small hazardous waste disposal facility will also be constructed for the storage of any hydrocarbon or hazardous material wastes generated as a result of construction and operational activities. These will be located in close proximity to the explosive storage magazine, so as to restrict access to these sites.

2.4.5 Sewage treatment facility

The proposed sewage treatment plant will have to process black and grey sewerage (emanating from ablution, office and kitchen areas) for 600 people in the construction phase. This is on average sewerage treatment volume of 120 000 litres per day. During peak inflow (early morning and early evening) a flow of 42 000 litres is expected. The peak flow is expected within a one hour period and therefore the submersible pumps are designed to handle these volumes. The packet treatment plant is based on the sequential batch principle which is ideally suited for small to medium applications. Being manufactured from standard tanks assembled on site, the benefit of standard off the shelf equipment is used and this allows for easy to manufacture, assemble and commission on site. The operational sequence of the plant consists of:

- collecting raw sewage into the sump tank through the roughing strainer where large pieces of debris is removed,
- transfer to the buffer tank,
- transfer to the reacting tank,
- primary aeration for 6- 8 hours for digestion of organic matter,
- stagnation to create anoxic conditions for nitrification,
- secondary aeration,
- flocculant dosing and settling for 60 minutes, decanting with chlorination,
- reaction time for chlorine and finally discharge to the environment.
- sludge is removed according to a sequence controlled by the PLC.

As part of standard operating procedure for the treatment plant the following parameters will be monitored:

- Incoming pH
- Incoming conductivity
- Incoming Chemical Oxygen Demand (COD)
- Outgoing pH
- Outgoing conductivity
- Outgoing COD & Final chlorine

From time to time it is necessary to monitor the microbiological population in the reaction tank to ensure that the unit is functioning properly and that optimal settling takes place. Sludge is collected in drying beds consisting of sand beds in shallow concrete beds or earthen containments. Dried sludge is removed and disposed of and the sand is replenished.

2.4.6 Explosives magazine

Also necessary will be the construction of an explosives storage magazine that will have to be located approximately 700m away from any inhabited or utilized structures as a standard safety measure.

2.4.7 Waste oil storage, treatment and disposal

All waste oil will be stored on site in a set of above ground storage tanks until such time as it is removed to Lubumbashi (probably twice a year) where it will be treated by a “cracker” technology plant that converts waste oil into diesel, but ultimately a hazardous residue remains post conversion. This residue will need to be disposed of appropriately by the contracted service provider in Lubumbashi, with appropriate proof of safe disposal documentation and certification being made available to ABM on each occasion by the elected service provider.

2.4.8 Fixed wing airstrip

The project requires air transport for purposes of emergency and medical evacuation or urgent treatment, and for anticipated transport of key construction and operation personnel on a routine basis. Therefore, a fixed wing dirt airstrip will be created parallel to the Logu-Bisie Access Road, near the village of Kokoli (Figure 3.2b above), in full compliance with all relevant DRC legislation and accepted safety norms commonly used.

2.5 PERSONNEL REQUIREMENTS

The project development plan envisages employing 700 people during construction of the mine. Under steady state operations, approximately 450 people will be permanently employed by the project. Of the total labour requirements for operations, it is estimated that no more than 5% will be expatriates and 95% or more will be locally recruited.

2.6 PRODUCT EXPORT

Tin concentrates will be trucked to Mombasa where they will be transferred to ocean freight and shipped to tin smelters located in the Far East. Approximately 45 truckloads of product will be dispatched from Bisie to Mombasa on a monthly basis.

2.7 PROJECT IMPLEMENTATION SCHEDULE

Project implementation – the construction period - is scheduled to take 18-months, commencing in 2017 with production of tin anticipated in the last quarter of 2018 or first quarter of 2019.

2.8 PROVISIONAL MINE LAYOUT

Figure 2.1 provides a design level illustration of what the mine, processing plant and associated infrastructure will entail. Please note that these layouts are reflective of both technical and environmental constraints and opportunities that the project location presents.

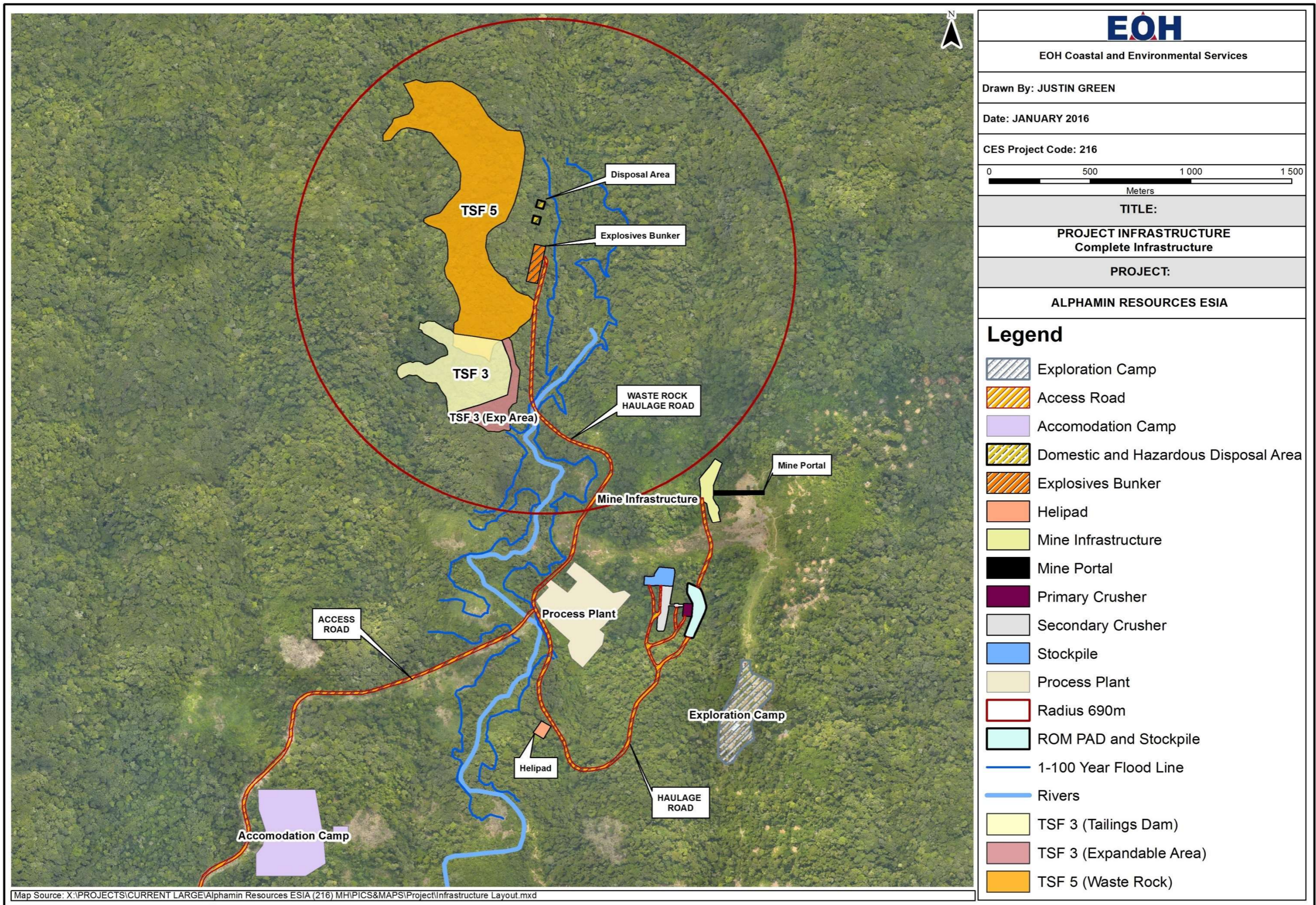


Figure 3: Proposed mine layout

3. THE ENVIRONMENTAL AND SOCIAL MANAGEMENT PROGRAMME AND ASSOCIATED MANAGEMENT PLANS

3.1 INTRODUCTION

This ESMPr summarises ABM's commitments to address and mitigate risks and impacts identified as part of the ESHIA reporting process, through avoidance, minimisation and compensation/offset (Equator Principles III, 2013). It establishes mitigation measures which define desired outcomes and actions to address the issues raised during the E&S assessment, as measurable events to the extent possible, with elements such as performance indicators, targets or acceptance criteria that can be tracked over defined time periods, and with estimates of the human and other resources and responsibilities for implementation.

More specifically, and in line with best practice, the ESMPr includes the following components:

- *Mitigation*: This identifies feasible and cost-effective measures that may reduce potentially significant adverse environmental and social impacts to acceptable levels. The programme should include compensatory measures if mitigation measures are not feasible, cost-effective, or sufficient.
- *Monitoring*: Environmental and social monitoring during project implementation provides information about key environmental and social aspects of the project. The focus is particularly on monitoring the E&S impacts of the project and the effectiveness of mitigation measures and management interventions.
- *Capacity Development and Training*: To support timely and effective implementation of mitigation measures, the ESMPr draws attention to the necessary roles and capabilities of ABM personnel mandated to perform these. The ESMPr must provide a specific description of institutional arrangements, specifying who is responsible for carrying out the mitigation and monitoring measures.
- *Implementation Schedule and Cost Estimates*: For all three aspects (mitigation, monitoring, and capacity development), the ESMPr provides an implementation schedule for measures that must be carried out as part of the project, and in addition, highlights the need for ABM to allocate capital and recurrent cost estimates in the respective phases ESMPs (CESMP OESMP and DESMP).

The ESMPr ensures that:

1. **During project planning and design** all mitigation measures identified during the ESIA that could be incorporated into the layout or design of the project are considered. Although some of the identified responsibilities can be passed on to various third parties, such as contractors for construction-related impacts or sub-contractors for various operational activities, the ultimate responsibility for ensuring compliance with the objectives of E&S management rests with ABM and their project managers. A good approach to facilitate legal enforceability of the ESMPr is for it to be integrated in the tender and contractual documents as a set of environmental specifications.
2. **During construction** all constraints, restrictions and actions required to minimize construction related impacts are implemented.
3. **During commissioning and operation**, detailed standard operating procedures are developed so that all constraints, restrictions and actions required to minimize impacts caused by commissioning and operation are developed, implemented and monitored for all aspects of the project.
4. **During the life of the project** continue to enhance positive impacts and ensure mitigation for negative impacts. An important component of this is monitoring, evaluation and communication of findings, and adherence to the principle of continued improvement.
5. **During decommissioning**, detailed procedures are developed to ensure that the project area is rehabilitated to an acceptable and previously agreed-to level.

An ESMPr does not present technical details and specifications for managing construction or operational phase impacts since many of these have not been finalised yet. Rather, it maps out broad management initiatives and principles, and establishes a framework within which environmental issues and aspects are managed at various stages in the project. The framework and principles do not deal with the specific project specifications of construction or operational impacts, and usually reflect the company's commitment and responsibility to manage project impacts.

Although much of this responsibility is passed on to various third parties, such as contractors for construction related impacts or sub-contractors for various operational activities, the ultimate responsibility for ensuring compliance with the objectives of this ESMPr rest with ABM and its project managers.

3.2 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLANS

The ESHIA process is normally conducted prior to preparation of the final design and operational details of the development (i.e. before definitive engineering studies are undertaken). While it is possible to identify and assess potential E&S impacts at this early stage, in many cases, the outcome of the assessment process results in modifications to the original conceptual plans, which helps to avoid or minimise impacts at the outset. Thus, while it is possible to identify a number of specific mitigation measures applicable to the construction and operational phases at the time of completing the ESHIA, it is usually not possible to develop detailed specifications and standard operating procedures (SOP's). It is also not advisable, as it is necessary to allow for modification of these mitigation measures as the plans for the development mature and unfold. An ESMPr allows for this flexibility and this approach has been adopted for the current development (see Chapter 8).

In large and complex projects it is usually necessary to expand and add to the environmental management initiatives and principles developed in the ESMPr for the construction, operation and decommissioning phases of a project as the project evolves. Therefore, the ESMPr guides the development of the required Environmental and Social Management Plans (ESMPs) and SOP's necessary for each project phase. All these ESMPs will be continually implemented and periodically audited, reviewed, and, if required, redeveloped to ensure that the procedures are efficient and serve their purpose. Further detail on the ESMP requirements for each phase of the project is provided below.

3.3 CONSTRUCTION PHASE ESMP (CESMP)

A comprehensive Construction Phase Environmental and Social Management Plan (CESMP) will be employed during the construction phase. This will list activities during the construction phase that are likely to have environmentally and socially significant impacts, and provide mitigation measures and specifications to minimise impacts. ABM will implement the CESMP for all activities that will occur during the construction phase (see Tables 8.1 and 8.2) based on local and international standards, and especially IFC Performance Standards on Environmental and Social Sustainability (2012). This will be done to protect human health and the environment from the potential impacts of its activities, and to assist in maintaining and improving the quality of the environment.

The format of the CESMP is that of a checklist, to ensure that all specifications are included in the design phase. The design phase requires ongoing and in-depth discussions between the contractors final design team and the environmental practitioner. The engineer will have to cost for and be available for ongoing discussions with the environmental practitioner at all stages of final design. The key aim of the CESMP is to ensure that the final design stages of the project and its entire associated infrastructure, during its construction, operation, closure, and post-closure phases:

- Adheres to Congolese law.

- Adheres to applicable International Best Practice including the IFC Performance Standards on Environmental and Social Sustainability (2012), IFC General EHS Guidelines (2007) and the IFC EHS Guidelines for Mining (2007);
- Takes due cognisance of the biophysical, social and economic environment in which the project will operate.

While the contractor is required to adhere to all the standards and policies outlined in this document (as detailed in chapter 4 of this report), the following checklist of criteria will be included as a minimum in the final project design, *inter alia*:

1. Any changes to the proposed location of primary infrastructure will take due cognisance of the environment and local communities and in particular impacts on the adjacent terrestrial and aquatic environments and the local setting.
2. Runoff and stormwater controls are to be developed to prevent increased turbidity and pollution of fresh water due to increased runoff.
3. Erosion control measures are to be developed for the various project components where bare ground is exposed or where soil is stockpiled.
4. Any elements of the project that will result in air emissions or fugitive dust (such as product conveyors) will be designed in such a way so as to ensure that the required emissions are limited and ambient air quality standards are consistently achieved.
5. Noise reduction measures to ensure that the relevant noise limits are not exceeded at the boundary of the site.
6. To prevent/contain oil spillages and chemical pollution of terrestrial and aquatic areas, at least the following must be incorporated into the design of the relevant components:
 - Oil traps, cut-off drains, sumps and settling ponds to be installed at all vehicle servicing areas, areas with hydraulic and transformer oils and other areas where needed.
 - Specific approved areas to be dedicated as routine service areas.
 - Fuel and chemical storage tanks to be designed in suitably bunded areas and in accordance with the accepted international standards.
 - An emergency response/preparedness plan for chemical spills and related incidents to be developed.
 - A training and awareness programme for handling chemical products to be developed and implemented.
7. Environmental performance objectives and measurable indicators against which the performance of the project can be measured and monitored have been developed and these will be applicable to all phases of the project to ensure the impact on the marine and terrestrial biophysical environment is minimal.

3.4 OPERATIONAL PHASE ESMP (OESMP)

As described for the CESMP above, the Operational Phase ESMP (OESMP) also lists activities during the operational phase that are likely to have environmentally and socially significant impacts, and provides mitigation measures. ABM will implement the OESMP for all operational activities as required by local and international standards and guidelines, and especially IFC Performance Standards on Environmental and Social Sustainability (2012). This will be done to protect human health and the environment from the potential impacts of its activities, and to assist in maintaining and improving the quality of the environment.

In some cases Standard Operating Procedures (SOP) and/or Method Statements will be adequate to manage certain aspects of the operation. These should focus on the measures and actions necessary to comply with specific regulations and other applicable standards. For example, an SOP can be developed to deal with the handling and use of chemicals and pesticides. Environmental management during the operational phase will deal with impacts associated with, and caused by, the operational phase of the project. The OESMP eventually becomes the environmental, social, safety and occupational health operational procedure, much like specifications, that govern the actual day-to-day operational activities of the

operation, and must therefore be practical, implementable and precise. They will form part of the Technical Operational Procedures that detail exactly how each operation needs to be undertaken and by whom, as well as when, to ensure efficient, safe and environmentally and socially acceptable operations. They deal with the "on-the-ground" management of actions that may have a direct impact on the environment and people.

3.5 DECOMMISSIONING PHASE ESMP (DESMP)

The Decommissioning Phase ESMP (DESMP) is typically encountered within extractive industries such as oil and gas exploration and extraction, and mineral mining extraction such as the Bisie Tin Mining Project. A Closure and Rehabilitation Plan forms an intricate part of the DESMP. As the final phase in the project cycle, decommissioning may present positive environmental opportunities associated with the return of the land for alternative use and the cessation of impacts associated with operational activities. However, depending on the nature of the operational activity, the need to manage risks and potential residual impacts may remain well after operations have ceased. Examples of potential residual impacts and risks include contamination of soil and groundwater and old (unserviceable) structures.

4. APPLICABLE POLICIES, LEGISLATION AND STANDARDS

This chapter details the national laws and regulations governing mining permit applications, operations and requirements for the management of environmental and social impacts that ABM needs to adhere to. It also presents the international standards applicable to projects seeking financing from Equator Principles Financial Institutions (EPFI). A number of local and international standards and guidelines are applicable to the project and are briefly discussed below. These standards and guidelines will be incorporated into the respective ESMPs over the course of the project's lifespan.

4.1 THE DRC LEGAL AND REGULATORY FRAMEWORK

4.1.1 Constitution of the DRC

The DRC Constitution (February 18, 2013 as amended, particularly article 123-15, Law No. 11/009 dated July 9, 2011) created the basic principles of environmental protection, and the Environmental Protection Law was passed. The Environmental Protection Law enacted basic principles to serve as the basis for special laws required to regulate different environmental sectors. For example, it introduced the obligation to conduct an environmental and social impact assessment, an environmental audit, and to establish an institutional framework to manage this. Additionally, it contains the national regulation on human rights, with specific reference to state institutions, and equal representation of men and women, adherence to the declaration of human rights, the African Charter, and UN conventions regarding children and women's rights. The constitution explicitly protects the following freedoms:

- Opinion, conscience and religion (Article 22);
- Expression (Article 23);
- Information, press and communication (Article 24);
- Privacy (Articles 29 and 31);
- Movement (Article 30);
- Assembly, demonstration and petition (Articles 25, 26 and 27, respectively);
- Asylum (Article 33) and;
- Protection of foreign nationals and their property (Article 32).

Regulations relating to the environment are contained in Article 53 of the DRC Constitution, stating that:

- Every person has a right to a healthy environment and which is favourable to his/her full development.
- The environment must be protected.
- The State must look after the protection of the environment and the health of the people.

Following on article 53, the DRC Constitution provides for laws to be made concerning, inter alia, "*the protection of the environment and tourism*" (Article 123), while Article 203 allows for co-operative governance between the central government and provincial administration in order "*to protect the environment, natural sites and landscapes, and the conservation of such sites*". The Constitution of the Democratic Republic of the Congo of 18 February 2006 makes the following provisions relevant to this project:

- All Congolese are equal before the law and have the right to equal protection by the law (article 12);
- No Congolese shall be subject to discrimination, whether on the basis of law or executive action, on the grounds of religion, family origin, social status, residence, political opinions or convictions or of belonging to a race, ethnic group, tribe or cultural or linguistic minority (article 13);
- The State is mandated to ensure and promote the peaceful and harmonious

- coexistence of all of the country's ethnic groups; and
- It also ensures the protection, promotion and development of vulnerable groups and of all minorities (Article 51).

4.1.2 *National Environmental Action Plan (NEAP)*

The National Environmental Action Plan (NEAP), formulated in 1997, formalised and identified that the management system of the country's natural resources was insufficient, and a new framework was required. The major issues identified were:

- Poverty, population growth and environmental ignorance as major factors in environmental damage;
- Water pollution and national water quality standards;
- Soil degradation, specifically in highly populated regions;
- Air pollution; and
- Urban degradation from poor planning, immigration and population growth.

4.1.3 *Mining provisions*

Commercial mining activities are regulated under the Mining Code, Law No 007/2002 of 11 July 2002, which relates to prospecting, exploitation, processing, transportation and sale of minerals (including artisanal activities). It specifies the need for an ESIA, Mitigation and Rehabilitation Plan (MRP) and an Environmental and Social Management Plan (ESMP), which are defined in the law as:

- ESIA:** A priori scientific analysis of the foreseeable potential effects a given activity will have on the environment, as well as the analysis of the acceptable levels thereof and the mitigating measures to be taken to ensure the conservation of the environment, subject to the best technology available, at a viable economic cost;
- MRP:** Plan required for the operations relating to a mineral or quarry exploration right or a Temporary Quarry Exploitation License pursuant to which a holder undertakes to carry out certain mitigation measures of the impact of his activities on the environment, as well as rehabilitation measures where said activities take place, including the holder's undertaking to provide a financial guarantee to cover or guarantee the mitigation and rehabilitation costs of the environment; and
- ESMP:** Environmental specifications of the project consisting of a program for the implementation and monitoring of measures contained in the ESIA in order to eliminate, reduce and possibly offset the damaging consequences.

An application for a mining right/licence requires the submission of specified documentation, including:

- A valid Exploitation Certificate;
- An exploration MRP, detailing amongst others, the character, quality, volume and geographical location of the mineral resources and extraction process;
- A feasibility study for the deposit and its exploitation;
- The technical framework plan for the development;
- The ESIA and ESMP for the proposed development;
- A consultation report, detailing interactions between the stakeholders and local authorities;
- Details regarding the public benefit provided by the project;
- A financing plan identifying financing outline and source, including closure; and
- Application proof of payment.

The Mining Code further contains sections relating to the protection of the environment, cultural heritage (for all phases), health and safety and public consultation measures (refer Title VIII: Obligations of the Holders of Mining or Quarry Rights; Chapter II: Obligations relating

to the activities relating to Mining or Quarry Titles; Articles 202 to 218). Furthermore, restrictions on land occupation (for mining related activities) liability for damages caused and fair compensation for economic and physical displacement are detailed (refer Title XI: Relations between the Holders of Mining Rights and/or Quarry Rights Themselves and with the Occupants of the Land; Chapter II: Holders' Relations with the Occupants of the Land; Articles 279 to 282). Disputes resolution (i.e. judicial and arbitration procedures and measures) are detailed as well. Mining concession titleholders are liable for damage to the environment from his/her activities only for noncompliance with the approved environmental plan and mitigation measures (including project changes throughout the duration of the project life cycle).

The Mining Code, combined with Decree No. 038/2003 of March 26, 2003 relating to "Mining Regulations" provides requirements for Mining and Quarry establishment, and issues the following mining rights:

- (i) Mining Permit ("PE"),
- (ii) Small-scale Mining Permit ("PEPM"),
- (iii) Mining Permit for Tailings ("PER") and
- (iv) Authorization for Permanent Quarry Exploitation ("AECF")

These are granted subject to previously established terms and conditions, among others, the submission of the Environmental Impact Assessment (EIA) and Environmental Management Plan of the Project (EMPP) and the approval thereof. These plans obligate mining and quarry titleholders to take into account environmental aspects of their projects, not only when constructing or developing the mine, including the setting-up of plants and other facilities, but also for the operational phase of the mine. In addition to their other rights, mining titleholders have to acquire the Environmental Exploitation License, required for the construction, development and operation of mines. If mining titleholders have to construct industrial facilities for their operations, they must, in addition to meeting the obligations set forth in the provisions of the Mining Code and Regulations, obtain the Exploitation License, as established by relevant provisions of the Environmental Protection Law and Decree on Classified Facilities. The mining permit (PE) is required prior to setting up, converting, extending, moving or operating their mining facilities. The National Minister of Mines is empowered to issue the mining licence, and the Governor of the Province in which the operation is located is empowered to issue a provincial decree which authorises mining activities. ABM met these requirements by initiating an ESIA process in 2012 that was conducted by their appointed Congolese consultant³. The required exploration and exploitation (mining) permits have previously or subsequently been issued by the relevant organs of state.

4.1.4 Mining Regulations

The Mining Regulations, Decree No 038/2003 of 26 March 2003 provides additional regulations in the addenda, by setting out further scope and objectives of the ESIA and ESMP reports (Articles 450 to 457), as well as directives for public participation (Articles 451, 225 and 478 to 480). The regulation addenda are:

- Schedule II: Financial surety for rehabilitation;
- Schedule III: Environmental Code of Conduct for Prospectors;
- Schedule V: Conduct Code for Artisanal Miners;
- Schedule VII: MRP;
- Schedule VIII: Guidelines for preparing an MRP;
- Schedule IX: Guidelines for preparing an ESIA and ESMP;
- Schedule X: Closure measures;
- Schedule XI: Classification of mine waste/tailings and their properties;
- Schedule XII: Sensitive environments;

³ Mining Processing Conco SPRL (2012) Etude D'Impact Environnemental et Plan de Gestion Environnemental du Project. Prepares en vue de la transformation Partielle en permis de Recherches no 5266 en Permis d'Exploitation "(PE). prepared for Mining Processing Congo (MPC)

- Schedule XIII: Method for the measurement of noise, and;
- Schedule XIV: Structural stability of mine waste storage sites.

4.1.5 The Environmental Protection Act (2012)

The DRC specifies protection of cultural resources through the Environmental Protection Act (EPA). This act specifies general principles which serve as a basis for specific laws for governing the different sectors of the environment. The DRC Environmental Protection Act came into effect in 2012. Article 203 of this act allows for cooperative governance between central government and the provincial administration. A number of important principles related to sustainable development and environmental management have been incorporated into the EPA, including the Polluter Pays Principle and the Precautionary Principle. Both of these are relevant to the management of wastes and the associated environmental risks. Although the Act does make provision for development of regulations related to management of environmental risks, including wastes, none have yet been promulgated.

The Draft Framework Law on the Environment makes provisions for the control of urban, industrial and medical wastes. Environmental quality standards relating to mining operations are included in Annexure IX of the Mining Code (Decree No. 038/2003 of 26 March 2003) while Annex XII covers classification of mining wastes and their characteristics (including standards for effluents).

4.1.6 Other Environmental Legislation

Above and beyond the legislation just mentioned, various laws relate to natural resource management within the DRC. Brief descriptions are contained within Table 4.4 below.

Table 4.4: Other DRC legislation pertinent to the project

Aspect	Regulation
Environmental	<ul style="list-style-type: none"> • United Nations Framework Convention on Climate Change (UNFCCC), COP 21, 2015. • National Environmental Action Plan (NEAP), 1997. • Framework Law on the Environment (Act No. 11/009 of the 9 July 2011). • Ordinance No 07/018 of 16 May 2007.
Mining	<ul style="list-style-type: none"> • Mining Code (Law No 007/2002 of 11 July 2002). • Mining Regulations (Decree No 038/2003 of 26 March 2003).
Soil and land use	<ul style="list-style-type: none"> • Article 28 (Topography, Geology and Land Use) from Chapter II of Schedule IX, Mining Regulations, Decree no. 038/2003 of 26 March 2003. • Article 75 (Dead Ground Management) of Chapter V of Schedule IX, Mining Regulations, Decree no. 038/2003 of 26 March 2003. • Framework Law on the Environment (Act No. 11/009 of the 9 July 2011).
Water	<ul style="list-style-type: none"> • Article 30 to 33 from Chapter II of Schedule IX, Mining Regulations, Decree no. 038/2003 of 26 March 2003. • Articles 53 to 74 of Schedule IX of the Mining Regulations, Decree no. 038/ 003 of 26 March 2003.
Climate and air quality	<ul style="list-style-type: none"> • Framework Law on the Environment (Act No. 11/009 of the 9 July 2011). • Article 29 (Climate and Air Quality) of schedule IX of the Mining Regulations, Decree no. 038/2003 of 26 March 2003. • Articles 49 to 52 of Schedule IX of the Mining Regulations, Decree no. 038/2003 of 26 March 2003.
Waste management	<ul style="list-style-type: none"> • Framework Law on the Environment (Act No. 11/009 of the 9 July 2011).
Biodiversity and protected areas	<ul style="list-style-type: none"> • Framework Law on the Environment (Act No. 11/009 of the 9 July 2011). • Forest Code (Law 011 2002 of 28 May 2002). • Nature Conservation Law (Regulation no 69-041) of 22 August 1969. • Articles 34 to 37 (Biological Environment) of Schedule IX of the Mining Regulations, Decree no. 038/2003 of 26 March 2003. • Schedule XII of the Mining Regulations; Decree no. 038/2003 of 26 March 2003.
Noise and vibration	<ul style="list-style-type: none"> • Schedule XIII of the Mining regulations, Articles 1 to 6. • Articles 46 to 48 from Chapter II of Schedule IX, Mining Regulations, Decree no. 038/2003 of 26 March 2003.
Cultural Heritage	<ul style="list-style-type: none"> • Framework Law on the Environment (Act No. 11/009 of the 9 July 2011). • Article 46 of the Constitution of the DRC of 18 February 2006. • Articles 205 and 206 of the Mining Code and Regulations.

4.2 INTERNATIONAL GUIDELINES

4.2.1 Equator Principles

The Equator Principles provide a credit risk management framework to assist Equator Principle Financial Institutions (EPFIs) in determining, assessing, and managing environmental and social risks, to capital works that exceed US\$10 million. The Equator Principles set minimum standards to support responsible decision making, with EPFI's not administering loans to borrowers who will not, or cannot, comply with the social and environmental policies set by the principles. The Equator Principles (Equator Principles Association, 2006) are as follows:

Table 4.1: The Equator Principles

The EPFI will only provide Project Finance and Project-Related Corporate Loans to Projects that meet the requirements of Principles 1-10.

Principle 1: Review and Categorisation

When a Project is proposed for financing the EPFI will, as part of its internal environmental and social review and due diligence, categorise it based on the magnitude of its potential environmental and social risks and impacts. Such screening is based on the environmental and social categorisation process of the International Finance Corporation (IFC). Using categorisation the EPFI's environmental and social due diligence is commensurate with the nature, scale and stage of the Project, and with the level of environmental and social risks and impacts. The categories are:

Category A – Projects with potential significant adverse environmental and social risks and/or impacts that are diverse, irreversible or unprecedented (applicable to the Bisie Tin Project);

Category B – Projects with potential limited adverse environmental and social risks and/or impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures; and

Category C – Projects with minimal or no adverse environmental and social risks and/or impacts.

Principle 2: Environmental and Social Assessment

For all Category A and Category B Projects the EPFI will require the client to conduct an Assessment process to address, to the EPFI's satisfaction, the relevant environmental and social risks and impacts of the proposed Project (which may include the illustrative list of issues found in Exhibit II ^[1]). The Assessment Documentation should propose measures to minimise, mitigate, and offset adverse impacts in a manner relevant and appropriate to the nature and scale of the proposed Project.

The Assessment Documentation will be an adequate, accurate and objective evaluation and presentation of the environmental and social risks and impacts, whether prepared by the client, consultants or external experts. For Category A, and as appropriate, Category B Projects, the Assessment Documentation includes an Environmental and Social Impact Assessment (ESIA). One or more specialised studies may also need to be undertaken. Furthermore, in limited high risk circumstances it may be appropriate for the client to complement its Assessment Documentation with specific human rights due diligence. For other Projects, a limited or focused environmental or social assessment (e.g. audit), or straightforward application of environmental siting, pollution standards, design criteria, or construction standards may be carried out.

For all Projects, in all locations, when combined Scope 1 and Scope 2 Emissions are expected to be more than 100 000 tonnes of CO₂ equivalent annually, an Alternatives Analysis will be conducted to evaluate less Greenhouse Gas (GHG) intensive alternatives.

Principle 3: Applicable Environmental and Social Standards

The Assessment process should, in the first instance, address compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues. EPFIs operate in diverse markets: some with robust environmental and social governance, legislation systems and institutional capacity designed to protect the people and the natural environment; and some with evolving technical and institutional capacity to manage environmental and social issues. The EPFI will require that the Assessment process evaluates compliance with the applicable standards as follows:

1. For Projects located in Non-Designated Countries, the Assessment process evaluates compliance with the then applicable IFC Performance Standards on Environmental and Social Sustainability (Performance Standards) and the IFC / World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines) (Exhibit III ^[2]).

2. For Projects located in Designated Countries, the Assessment process evaluates compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues. Host country laws meet the requirements of environmental and/or social assessments (Principle 2), management systems and plans (Principle 4), Stakeholder Engagement (Principle 5) and, grievance mechanisms (Principle 6).

The Assessment process will establish to the EPFI's satisfaction the Project's overall compliance with, or justified deviation from, the applicable standards. The applicable standards (as described above) represent the minimum standards adopted by the EPFI. The EPFI may, at their sole discretion, apply additional requirements.

Principle 4: Environmental and Social Management System and Equator Principles Action Plan

For all Category A and Category B Projects the EPFI will require the client to develop or maintain an Environmental and Social Management System (ESMS). Further, an Environmental and Social Management Plan (ESMP) will be prepared by the client to address issues raised in the Assessment process and incorporate actions required to comply with the applicable standards. Where the applicable standards are not met to the EPFI's satisfaction, the client and the EPFI will agree on an Equator Principles Action Plan (AP). The Equator Principles AP is intended to outline gaps and commitments to meet EPFI requirements in line with the applicable standards.

Principle 5: Stakeholder Engagement

For all Category A and Category B Projects the EPFI will require the client to demonstrate effective Stakeholder Engagement as an ongoing process in a structured and culturally appropriate manner with Affected Communities and, where relevant, other stakeholders. For Projects with potentially significant adverse impacts on Affected Communities, the client will conduct an Informed Consultation and Participation process. The client will tailor its consultation process to: the risks and impacts of the Project; the Project's phase of development; the language preferences of the Affected Communities; the decision-making processes; and the needs of disadvantaged and vulnerable groups. This process should be free from external manipulation, interference, coercion and intimidation.

To facilitate Stakeholder Engagement the client will, commensurate to the Project's risks and impacts, make the appropriate Assessment Documentation readily available to the Affected Communities, and where relevant other stakeholders, in the local language and in a culturally appropriate manner. The client will take account of and document the results of the Stakeholder Engagement process, including any actions agreed resulting from such process. For Projects with environmental or social risks and adverse impacts disclosure should occur early in the Assessment process, in any event before the Project construction commences, and on an ongoing basis. EPFIs recognise that indigenous peoples may represent vulnerable segments of project-affected communities. Projects affecting indigenous peoples will be subject to a process of Informed Consultation and Participation, and will need to comply with the rights and protections for indigenous peoples contained in relevant national law, including those laws implementing host country obligations under international law. Consistent with the special circumstances described in with adverse impacts on indigenous people will require their Free, Prior and Informed Consent (FPIC).

Principle 6: Grievance Mechanism

For all Category A and, as appropriate, Category B Projects, the EPFI will require the client, as part of the ESMS, to establish a grievance mechanism designed to receive and facilitate resolution of concerns and grievances about the Project's environmental and social performance. The grievance mechanism is required to be scaled to the risks and impacts of the Project and have Affected Communities as its primary user. It will seek to resolve concerns promptly, using an understandable and transparent consultative process that is culturally appropriate, readily accessible, at no cost, and without retribution to the party that originated the issue or concern. The mechanism should not impede access to judicial or administrative remedies. The client will inform the Affected Communities about the mechanism in the course of the Stakeholder Engagement process.

Principle 7: Independent Review

For all Category A and, as appropriate, Category B Projects, an Independent Environmental and Social Consultant, not directly associated with the client, will carry out an Independent Review of the Assessment Documentation including the ESMPs, the ESMS, and the Stakeholder Engagement process documentation in order to assist the EPFI's due diligence and assess Equator Principles compliance. The Independent Environmental and Social Consultant will also propose or opine on a suitable Equator Principles AP capable of bringing the Project into compliance with the Equator Principles, or indicate when compliance is not possible. An Independent Review by an Independent Environmental and Social Consultant is required for Projects with potential high risk impacts including, but not limited to, any of the following:

- Adverse impacts on indigenous peoples
- Critical habitat impacts
- Significant cultural heritage impacts
- Large-scale resettlement

In other Category A, and as appropriate Category B, Project-Related Corporate Loans, the EPFI may determine whether an Independent Review is appropriate or if internal review by the EPFI is sufficient. This may take into account the due diligence performed by a multilateral or bilateral financial institution or an OECD Export Credit Agency, if relevant.

Principle 8: Covenants

An important strength of the Equator Principles is the incorporation of covenants linked to compliance. For all Projects, the client will covenant in the financing documentation to comply with all relevant host country environmental and social laws, regulations and permits in all material respects. Furthermore for all Category A and Category B Projects the client will covenant the financial documentation:

- a) To comply with the ESMPs and Equator Principles AP (where applicable) during the construction and operation of the Project in all material respects; and
- b) To provide periodic reports in a format agreed with the EPFI (with the frequency of these reports proportionate to the severity of impacts, or as required by law, but not less than annually), prepared by in-house staff or third party experts that (i) document compliance with the ESMPs and Equator Principles AP (where applicable), and (ii) provide representation of compliance with relevant local, state and host country environmental and social laws, regulations and permits; and
- c) To decommission the facilities, where applicable and appropriate, in accordance with an agreed decommissioning plan.

Where a client is not in compliance with its environmental and social covenants, the EPFI will work with the client on remedial actions to bring the Project back into compliance to the extent feasible. If the client fails to re-establish compliance within an agreed grace period, the EPFI reserves the right to exercise remedies, as considered appropriate.

Principle 9: Independent Monitoring and Reporting**Project Finance**

To assess Project compliance with the Equator Principles and ensure ongoing monitoring and reporting after Financial Close and over the life of the loan the EPFI will, for all Category A and, as appropriate, Category B Projects, require the appointment of an Independent Environmental and Social Consultant, or require that the client retain qualified and experienced external experts to verify its monitoring information, which would be shared with the EPFI.

Project-Related Corporate Loans

For Projects where an Independent Review is required under Principle 7 the EPFI will require the appointment of an Independent Environmental and Social Consultant after Financial Close, or require that the client retain qualified and experienced external experts to verify its monitoring information which would be shared with the EPFI.

Principle 10: Reporting and Transparency

The following client reporting requirements are in addition to the disclosure requirements in Principle 5. For all Category A and, as appropriate, Category B Projects:

- The client will ensure that, at a minimum, a summary of the ESIA is accessible and available online.
- The client will publicly report GHG emission levels (combined Scope 1 and Scope 2 Emissions) during the operational phase for Projects emitting over 100,000 tonnes of CO₂ equivalent annually. Refer to Annex A for detailed requirements on GHG emissions reporting.

The EPFI will report publicly, at least annually, on transactions that have reached Financial Close and on its Equator Principles implementation processes and experience, taking into account appropriate confidentiality considerations. The EPFI will report according to the minimum reporting requirements detailed in Annex B.

Financing for the project may be provided by EPFI's thus requiring the project and the supporting EIA (now referred to as an ESHIA) to comply with the International Finance Corporation (IFC) policies and standards.

4.2.2 IFC Performance Standards and requirements

The IFC is a member of the World Bank Group, and one of the largest development institutions that focuses exclusively on the private sector in developing countries (IFC, 2012). The IFC was established in 1956 and works in developing countries to create job opportunities, generate tax revenue, improve corporate governance and, perhaps the most important of all, ensuring that projects contribute to the upliftment of its countries' local communities. In respect of the latter, it is also the IFC's vision for people to be presented with the opportunity to escape poverty and improve their lives.

The IFC published its Performance Standards (PS) on Environmental and Social Sustainability in April 2006, and published comprehensive Guidance Notes in April 2007. Since then the Performance Standards and Guidance Notes have been revised, and the updated versions were published and took effect from January 2012. The updated Performance Standards are listed in Table 4.2.

Table 4.2: IFC Performance Standards

Performance Standard	Key objectives
PS 1: Assessment and management of environmental and social risks and impacts	<ul style="list-style-type: none"> ➤ To identify and evaluate environmental and social risks and impacts of the project. ➤ To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize and, where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment. ➤ To promote improved environmental and social performance of clients through the effective use of management systems. ➤ To ensure that grievances from Affected Communities and external communications from other stakeholders are responded to and managed appropriately. ➤ To promote and provide means for adequate engagement with Affected Communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.
PS 2: Labour and Working Conditions	<ul style="list-style-type: none"> ➤ To promote the fair treatment, non-discrimination, and equal opportunity of workers. ➤ To establish, maintain, and improve the worker-management relationship. ➤ To promote compliance with national employment and labour laws. ➤ To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain. ➤ To promote safe and healthy working conditions, and the health of workers. ➤ To avoid the use of forced labour.
PS 3: Resource efficiency and pollution prevention	<ul style="list-style-type: none"> ➤ To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities. ➤ To promote more sustainable use of resources, including energy and water. ➤ To reduce project-related GHG emissions.
PS 4: Community Health, Safety and Security	<ul style="list-style-type: none"> ➤ To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances. ➤ To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.
PS 5: Land Acquisition and Involuntary Resettlement	<ul style="list-style-type: none"> ➤ To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs. ➤ To avoid forced eviction. ➤ To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by: <ul style="list-style-type: none"> - Providing compensation for loss of assets at replacement cost and - Ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected. ➤ To improve, or restore, the livelihoods and standards of living of displaced persons. ➤ To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.
PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	<ul style="list-style-type: none"> ➤ To protect and conserve biodiversity. ➤ To maintain the benefits from ecosystem services. ➤ To promote the sustainable management of living natural resources through the adoption of practices that integrates conservation needs and development priorities.
PS 7: Indigenous Peoples	<ul style="list-style-type: none"> ➤ To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples. ➤ To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts. ➤ To promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner. ➤ To establish and maintain an ongoing relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the project's life-cycle. ➤ To ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples when the circumstances described in this Performance Standard are present. ➤ To respect and preserve the culture, knowledge, and practices of Indigenous Peoples.
PS 8: Cultural Heritage	<ul style="list-style-type: none"> ➤ To protect cultural heritage from the adverse impacts of project activities and support its preservation. ➤ To promote the equitable sharing of benefits from the use of cultural heritage.

In addition to the performance standards, the IFC has developed general environmental, health and safety (EHS) guidelines (IFC, 2007a) and industry-specific EHS guidelines that serve as a technical reference to support the implementation of the IFC performance standards. The industry-specific EHS guidelines for mining were released in 2007 (IFC, 2007b). Performance Standard 1 is of particular relevance in determining the scope of work for the proposed project, and specifically states that potential social and environmental (including labour, health, and safety) risks and impacts must be considered in an integrated manner.

The ESHIA process must be based on current information, including an accurate project description, and appropriate social and environmental baseline data. For this reason the impact assessment should only be undertaken once the project description and design has been advanced well enough to allow for adequate assessment of impacts. Furthermore, it is important to note that impacts must be assessed for the direct project area as well as areas of influence, which may include related facilities, such as power transmission corridors, access roads and disposal areas etc. Consideration must be given to areas potentially impacted by cumulative impacts from further planned developments that may occur later or at a different location. Refer to the ESHIA report (CES, August 2016) for a full description thereof.

Performance Standards 7 and 8 are unlikely to be applicable to, or have significant bearing on, this ESHIA process as no Indigenous Peoples (as defined by PS 7) are found within the project study area, or area of influence, and similarly, no heritage features of cultural or archaeological artefacts have been identified in the study area to date.

4.2.3 IFC General Environmental, Health and Safety Guidelines

The General EHS Guidelines provide an organized, hierarchical and best-practice approach to managing environmental, health and safety issues at facility or project level, which in broad terms comprises the following steps:

- Identifying EHS project hazards and associated risks as early as possible in the facility development or project cycle.
- Understanding the likelihood and magnitude of EHS risks, based on the nature of the project activities and the potential consequences to workers, communities, or the environment if hazards are not adequately managed.
- Prioritising risk management strategies with the objective of achieving an overall reduction of risk to human health and the environment, focusing on the prevention of irreversible and / or significant impacts.
- Favouring strategies that eliminate the cause of the hazard at its source to avoid the need for EHS controls.
- When impact avoidance is not feasible, incorporating engineering and management controls to reduce or minimize the possibility and magnitude of undesired consequences.
- Preparing workers and nearby communities to respond to accidents, including providing technical and financial resources to effectively and safely control such events, and subsequently restoring workplace and community environments to a safe and healthy condition.
- Improving EHS performance through a combination of ongoing monitoring of facility performance and effective accountability.

The Guidelines are organised in four main sections:

1. Environmental;
2. Occupational Health and Safety;
3. Community Health and Safety;
4. Construction and Decommissioning.

4.2.4 IFC Sector Specific Guidelines

The EHS General Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines, which provide details of risks and impacts specific to particular industries, and guidance on the management. The IFC EHS Guidelines for Mining (30 April 2007) are applicable to this project. The guidelines detail industry-specific impacts and ways in which to manage them. They cover environmental, occupational health and safety, community health and safety, and performance indicators and monitoring.

4.2.5 World Health Organisation Guidelines for Drinking Water Quality (2011)

The primary purpose of the WHO Guidelines for drinking-water quality is the protection of public health and it provides the recommendations for managing the risk from hazards that may compromise the safety of drinking-water. The Ministerial Diploma of 18/2004 was adapted from the WHO drinking water guidelines and will be adopted for managing the drinking water quality supplied for the mining construction and operation.

4.2.6 International Environmental Conventions to which the DRC is signatory

The DRC is a signatory to a number of international environmental conventions which are applicable to this project. Some of the more important conventions are listed in Table 4.3 below. Note that a Protocol of Signature is an instrument subsidiary to a treaty, and drawn up by the same parties. Such a Protocol deals with ancillary matters such as the interpretation of particular clauses of the treaty, those formal clauses not inserted in the treaty, or the regulation of technical matters. Ratification of the treaty will normally *ipso facto* involve ratification of such a Protocol.

When countries become signatory to Conventions, Protocols, Treaties and Agreements, they accede to incorporate the conventions, principles and standards into their legislation. Either new laws are developed or, as in most cases, regulations are drawn up or amended. This is done to ensure compliance by the countries' citizens and to provide measures to be able to enforce the protocols. The table below provides details on the conventions, however, it is noted that compliance to DRC's legislation would ensure compliance to the conventions.

Table 4.3: International Environmental Conventions to which the DRC is a signatory

Aspect	Agreement/Convention
Climate change and air quality	<ul style="list-style-type: none"> • Conference of Parties 21, United Nations Climate Change Conference, Paris 2015 • United Nations Framework Convention on Climate Change (UNFCCC), 1994. • Kyoto Protocol, 1997. • Vienna Convention for the Protection of the Ozone Layer, 1985. • Montreal Protocol on Substances that Deplete the Ozone Layer, 1989.
Biodiversity and protected areas	<ul style="list-style-type: none"> • Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar/Wetlands Convention), 1971. • Convention on the International Trade of Endangered Species of Wild Fauna and Flora (CITES), 1973. • United Nations Convention on Biological Diversity, 1992 (UNCBD). • Cartagena Protocol on Biosafety (CPB). • United Nations Convention to Combat Desertification, 1994 (UNCCD). • United Nation's Forum on Forests (UNFF). • Treaty on Central African Forests Commission, 2004. • Bonn Convention on Migratory Species.
Cultural heritage	<ul style="list-style-type: none"> • United Nations Educational, Scientific and Cultural Organization (UNESCO) Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property, 1970. • UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage, 1972 (World Heritage Convention).
Human Rights	<ul style="list-style-type: none"> • International Convention on the Prevention and Punishment of the Crime of Genocide. • International Covenant on Civil and Political Rights. • International Covenant on Economic, Social and Cultural Rights.

Aspect	Agreement/Convention
	<ul style="list-style-type: none"> • International Convention on the Elimination of All Forms of Racial Discrimination (ICERD). • International Convention on the Elimination of All Forms of Discrimination Against Women. • Convention on the Rights of the Child.
Labour Health and Safety	<ul style="list-style-type: none"> • Stockholm Convention on Persistent Organic Pollutants. • Rotterdam Convention on the Prior Informed Consent Procedure on Certain Hazardous Chemicals and Pesticides in International Trade (1998). • Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. • Elimination of all forms of forced and compulsory labour – Convention 29 and 105. • Elimination of discrimination in respect of employment and occupation – Convention 100 and 111.

4.3 PROJECT OBLIGATIONS

In addition to adhering to the above described laws, regulations and standards, ABM will adopt industry best practice management systems that will be implemented in a manner that ensures all requirements presented here are met.

Ongoing performance monitoring and reporting on the E&S management objectives, as it relates to the various project phases, will be made available to the necessary authorities and key stakeholders on a periodic basis.

As part of its on-going engagement with affected communities, ABM is also required to disclose its various E&S management plans in advance of project implementation to affected communities and stakeholders, and provide updates throughout the life of the project as mitigation measures are adjusted and upgraded to reflect the feedback from the affected communities.

5. TRAINING AND AWARENESS PROGRAMMES

5.1 INTRODUCTION

ABM personnel and its contractors, including third parties, will be conversant with all environmental and social legislation and international best practice applicable to their contract. They will need to be appropriately trained in environmental management in order to possess the skills necessary to impart on their subordinates.

All personnel involved in the construction and operation of the project will undergo a training and awareness programme on E&S management prior to commencing activities. ABM will develop a procedure for environmental training which will lay out in detail the methodology for developing and presenting environmental awareness and induction training.

Information will be transferred in an appropriate manner and training courses will take language and cultural and educational levels into consideration. In particular, the training of illiterate staff will require the development of appropriate training programmes and extensive use of signage (such as pictures, logos, drawings etc). A site Environmental Handbook will be developed and distributed to all literate personnel. This handbook will cover some of the information presented in the Environmental Awareness and Induction Training. Records will be maintained of all training interventions.

5.2 GENERAL STAFF E&S TRAINING

ABM will ensure that its staff and other employed parties or their contractors, who carry out any aspects of the work, in any phase of the project, are adequately trained with regard to the implementation of the ESMP described here. Contractors and third parties will be aware of their health, safety, environmental and social requirements and obligations, and these will be legally and contractually binding on them. A training-needs-analysis that would cover EHS and Community issues would need to be developed and should identify the appropriate training programmes and target groups.

The training staff will be appropriately trained in their respective disciplines and will possess the skills necessary to train, inform and sensitise all personnel involved in the project. All personnel involved in the construction and operation of the project will be required to participate in an EHS and Community induction programme. Training programmes will be targeted at three distinct levels of employment, i.e. executive, middle management and labour, and awareness training programmes will contain the following information:

- The names, positions and responsibilities of personnel to be trained.
- The framework for appropriate training plans.
- The summarised content of each training course.
- A schedule for the presentation of the training courses.

The range of topics that need to be covered in the awareness training will, inter alia, include:

- ABM Environmental Policy;
- ABM Health and Safety Policy;
- ABM Community Policy;
- ABM Environmental Objectives and Targets;
- Organizational structure and responsibilities;
- Aspects of routine day-to-day operational activities, which can have environmental, social, safety or health impacts;
- Environmental and safety hazards which could arise from non-routine situations and corrective actions;
- The importance of environmental and safety Incident reporting and completion of

- appropriate reports;
- Emergency Preparedness and Response;
- Channels of communication for discussing and reporting E&S issues;
- Documentation systems so that appropriate records of E&S matters are maintained;
- Responsibilities under the applicable E&S legislation and international best practice;
- Responsibilities related to Labour and Working Conditions, in particular, the requirements of IFC Performance Standard 2 that will apply to project and their contractors;
- Culturally appropriate behaviour; and
- Community engagement, security and grievances.

Additional training on cultural heritage and culturally appropriate behaviour, and on health, safety, environmental and social hazards which could arise from non-routine situations and corrective actions will be provided. Training will highlight the importance of incident reporting and completion of appropriate reports, channels of communication for reporting EHS and Community issues and incidents, documentation systems and responsibilities under DRC legislation. It is proposed that an EHS and Community Handbook be developed and distributed to all literate personnel.

5.3 COMMUNITY HEALTH AND SAFETY TRAINING, AWARENESS AND COMPETENCE

Depending on the interaction with the host communities, staff and contractors of ABM may have to undergo community health & safety training. The objectives of the community health and safety are:

- Induction and training to raise awareness about local community norms and mores;
- Specific community-based interventions based on the proactive identification of safety behaviour and trends; and
- Training for community-based monitoring of health and safety issues addressed by the Community Health and Safety Operating Procedure.

Many aspects of community engagement related to the project involve partnerships with NGOs and other relevant local government and non-government structures. These partnerships may be facilitated under the following operating procedures:

- Community Health and Safety;
- Resettlement;
- Emergency Preparedness and Response;
- Rehabilitation and Closure; and
- Stakeholder Engagement.

5.4 EMERGENCY PREPAREDNESS AND RESPONSE TRAINING AND AWARENESS

Where the project involves specifically identified physical elements, aspects and facilities that are likely to have significant E&S impacts, ABM will establish and maintain an Emergency Preparedness and Response (EPR) Plan, in collaboration with appropriate and relevant third parties. The EPR plan will be developed to respond to accidental and emergency situations associated with the project in a manner that will assist in preventing and mitigating any harm to people and/or the environment. In particular, the EPR plan will address:

- Areas where accidents and emergency situations may occur (high risk areas);
- Communities and individuals that may be impacted (high risk receptors);
- Response procedures;
- Provision of equipment and resources;
- Designation of responsibilities;

- Communication, including that with potentially affected communities; and
- Periodic training to ensure effective response.

All staff, including contractors, will adhere to ABM's EPR plans, including incident and accident-reporting requirements, as well as all relevant DRC legislation. Where necessary, Method Statements or SOPs that detail the exact process, resource requirements and responsibilities for ensuring that these emergency procedures are documented and enforceable will be developed.

EPR training and awareness will form part the EPR plan to be developed. Incidents that will be considered during the development of the EPR include but will not be limited to:

- Details on emergency organisation (manpower) and responsibilities, accountability and liability;
- A list of key personnel to be contacted;
- Details of emergency services applicable to various areas along the access route that components or product will need to be transported, and for the site itself (e.g. the fire department, spill clean-up services, etc.);
- Internal and external communication plans, including prescribed reporting procedures where required by legislation;
- A risk assessment and Hazard and Operability Study (HAZOP) to identify all potential incidents and emergencies;
- Actions to be taken in the event of different types of emergencies;
- Incident recording, progress reporting and remediation measures required to be implemented;
- Information on hazardous materials, including the potential impact associated with each, and measures to be taken in the event of accidental release; and
- Training plans, testing exercises (including fire drills) and schedules for effectiveness;

Training and awareness components to be considered will include:

- Accidental discharges to water and land;
- Accidental exposure of employees to hazardous substances;
- Medical evacuation;
- Work stoppage incidents requiring medical intervention across all aspects of the operation;
- Accidental fires and fire drill; and
- Vehicle accidents, including vehicle collisions with pedestrians.

6. COMMUNITY ENGAGEMENT

6.1 INTRODUCTION

The stakeholder and community engagement process is a crucial process for any Category A project. It is vital that all interested and affected parties (I&APs) are not only aware of the project and its possible negative implications, but also understand the project and its potential benefits to their communities and surrounding environment. Failure to do so could cause disputes and disagreements between communities, the developer and government authorities and the disruption of established structures such as community administration.

6.2 STAKEHOLDER ENGAGEMENT PLANNING

A Stakeholder Engagement Plan (SEP) is the basis for building strong, constructive and responsive relationships that are essential for the successful management of a project's E&S impacts. This is an on-going process that may involve, in varying degrees, the following elements: Stakeholder engagement planning; disclosure and dissemination of information; consultation and participation; a grievance mechanism; and on-going reporting to affected communities.

The main objectives of an SEP are as follows:

- Disclosure of planned project activities;
- Identification of concerns and grievances from stakeholders;
- Harnessing of local expertise and knowledge from interested and affected people;
- Response to grievances and enquiries of stakeholders; and
- Promoting collaborative efforts.

Stakeholder engagement is initiated during the ESHIA process and continues for the duration of the project's life cycle. As a minimum, the SEP will be:

- Underpinned by the concept of free prior and informed consent; and
- Structured in accordance with IFC's guideline document "Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets" (IFC, 2007).

Disclosure of relevant project information helps affected communities and other stakeholders understand the risks, impacts and opportunities of the project. ABM will provide affected communities with access to relevant information and consultations and will avail the affected communities the opportunity to express their views on project risks, impacts and mitigation measures in a non-intimidating setting. This will allow ABM the opportunity to consider and respond to them.

In instances where stakeholder engagement is the responsibility of the Congolese authorities, ABM will collaborate with the responsible government agency, to the extent permitted by the agency, to achieve outcomes that are consistent with the required objectives. In addition, where government capacity is limited, ABM will play an active role during the stakeholder engagement planning, implementation and monitoring stages. According to the IFC Performance Standard 1 requirement, if the process conducted by the government does not meet the relevant requirements, ABM will conduct a complementary process and, where appropriate, identify supplemental actions. The benefits of timely stakeholder engagement include the following:

- It assists the developer to address relevant issues, including those raised by the different stakeholder groups.
- It harnesses traditional knowledge which conventional approaches often overlook.

- It improves information flow between the developers and different stakeholder groups, improving the understanding and 'ownership' of a project.
- It enables project proponents to better respond to different stakeholders' needs.
- It helps to identify important environmental characteristics or mitigation opportunities that might have been overlooked during the ESHIA process.
- It helps to ensure that the magnitude and significance of impacts has been properly assessed; and improves the acceptability and quality of mitigation and monitoring processes.
- It may avoid escalation of potential conflicts between the company and the stakeholders.

6.3 CONGOLESE LEGISLATION ON STAKEHOLDER ENGAGEMENT

Both the Constitution and Environment Law establish the rights of citizens to have information about, and to participate in, decision-making about activities which may affect the environment. In summary, the directive requires that a Stakeholder Engagement process is carried out whenever the proposed activity implies the permanent or temporary relocation of people or communities, and the relocation of goods or assets or restrictions on the use of or access to natural resources.

Stakeholder Engagement is expected to identify the I&APs, disseminate information to them, manage a dialogue with the proponent of the activity, assimilate and take into account public comments received and feedback the outcomes of the dialogue and inputs so as to demonstrate how these have been taken into account in the design of the activity.

Stakeholder Engagement is an integral part of the ESIA process and will not end with the issuing of the environmental license but will continue during the construction and operational phases of the planned activity.

6.4 THE INTERNATIONAL FINANCE CORPORATION'S HANDBOOK ON STAKEHOLDER ENGAGEMENT (2007)

In 2007, the IFC published stakeholder engagement guidance notes in the form of a handbook to support projects to deal and engage with its stakeholders. According to this source, eight central pillars of a stakeholder engagement plan include the following:

1. Stakeholder identification and analysis;
2. Information disclosure;
3. Stakeholder consultation;
4. Negotiation and partnership;
5. Grievance management;
6. Stakeholder involvement and project monitoring;
7. Reporting to stakeholders; and
8. Management functions.

According to the IFC (2007), for any stakeholder plan, identifying the direct and indirect stakeholders is an important step which needs to form the basis for future engagement. Different stakeholders also have different interests in a project, and hence identifying such stakeholders not only ensures that different interest groups are being considered by a project, but also that such interests are incorporated into the design of a project to ameliorate future negative project impacts.

Identifying such stakeholders also needs to be strategic and prioritised; constantly referring to previous stakeholder engagements and consultations to direct future engagement. For example, a socio-economic fact sheet or data on the affected population can be used to identify stakeholders and, more importantly, particular subsets of stakeholders such as vulnerable groups. As encouraged by the IFC, in any engagement with stakeholders or the

surrounding communities, the following questions need to be asked:

- Why are we engaging with these stakeholders at this particular phase of the project?
- What local and international requirements have to be met with regard to this consultation?
- Who are the stakeholder groups?
- Are there any sub-stakeholder groups that require special attention (vulnerable population)?
- What techniques or methods will be most affected in dealing with these stakeholders and to ensure their participation in the process?
- Who in the company will bear the responsibility for managing this stakeholder engagement?
- How are we going to capture, record, track and disseminate the results of our engagement processes and sessions?

Building upon these questions, engagement needs to be a two-way exchange of views and opinions in a process through which the project developer listens, but also addresses views and concerns from its stakeholders in a culturally appropriate manner. Attention also needs to be provided to gender inclusivity, especially for the project at hand as women are often marginalised and excluded from decision-making.

A decent community engagement strategy is nothing without proper documentation. *“Documenting consultation activities and their outcomes is critical to effectively managing the stakeholder engagement process”* (IFC, 2007). The process needs to be highly organised and records need to be kept of each consultation. Each issue raised needs to be documented, as well as the action undertaken for each issue raised by a stakeholder during a consultation session. Documenting such issues and/or concerns also needs to be followed by corrective actions by the developer, and reported back in a timely way to those consulted with clarification steps.

Realising that different stakeholders’ interests need to be accounted for, it is often difficult to establish who needs to be present during stakeholder engagement sessions. Identifying and working through community representatives is therefore encouraged by the IFC. Such representatives may include an area’s elected officials, authorities or tribal leaders. However, communities are not homogenous and representatives from different interest groups such as women, youth and the elder will, where possible be considered.

The villages of Ma Noire and Logu are the only directly affected communities, and will therefore be the target of the bulk of the ongoing engagement with ABM. As the other major centres in the area such as Osokari and Walikale will be sources for labour, wider engagement with these communities will also be required throughout the project life cycle as indirectly affected communities.

6.5 PROPOSED STAKEHOLDER ENGAGEMENT PLAN

Community engagement will be undertaken in accordance with the requirements of the Congolese Legislation and the IFC. This will be achieved through the development of a SEP prior to any further project-related activities that affect the stakeholders and surrounding villages in any way. The SEP must include an External Communications and Grievance Mechanism procedure. These requirements are interpreted as follows:

- When local communities may be affected by risks or adverse impacts from a project, the project sponsor will undertake consultation with them;
- Community engagement will be free of external manipulation, interference or coercion and intimidation; and conducted on the basis of timely, relevant, understandable, inclusive, culturally appropriate and accessible information;
- Stakeholder engagement must be initiated early in the environmental, social and

health assessment process (scoping phase) and continue on an on-going basis throughout the life of the project; and

- Affected communities must be provided with opportunities to express their views on project risks, impacts and mitigation measures and allow the project proponent to consider and respond to them.

As part of this process, ABM will develop a list of stakeholders which will be captured in the SEP. The list will be considered dynamic and will need regular updating, as the relationship between stakeholders and ABM develops and changes.

6.6 EXTERNAL COMMUNICATIONS AND GRIEVANCE MECHANISM

ABM will implement and maintain a procedure for external communications that includes, at a minimum, methods to:

- Receive and register external communications from the public;
- Screen and assess the issues raised and determine how to address them;
- Provide, track and document responses, if any; and
- Adjust the management program, as appropriate. In addition, ABM will make publicly available periodic reports on their E&S sustainability.

ABM will establish a Grievance Mechanism to receive and facilitate resolution of affected communities' concerns and grievances about its E&S performance. ABM's grievance mechanism will seek to resolve concerns promptly, using an understandable and transparent consultative process that is culturally appropriate and readily accessible, and at no cost and without retribution to the party that originated the issue or concern. Judicial or administrative remedies will not be impeded by the implementation of the Grievance Mechanism and will inform the affected communities of the procedure and requirements of the mechanism during stakeholder engagement process.

ABM will conduct periodic reporting to the affected communities on progress with implementation of the project, issues that involve on-going risk to or impacts on affected communities and issues that the consultation process or Grievance Mechanism have identified as a concern to those communities. The frequency of these reports will be proportionate to the concerns of affected communities but not less than once annually.

7. ORGANISATIONAL REQUIREMENTS FOR IMPLEMENTATION

This section outlines the proposed organisational structures and other activities that will be required to implement the ESMP. This organisational structure is subject to change and is meant to ensure that the various ESMPs are adequately implemented. The key management roles and functions required to manage and implement the various management instruments are discussed below. The actual titles used for each position may change once the project is implemented, but the responsibilities will largely remain unchanged.

7.1 GENERAL MANAGER (GM)

The EHS and Community responsibility of the General Manager (GM) will be to ensure that all personnel abide with the requirements of the ESMP, and that all areas of the project are constructed and operated in such a manner that they meet all specified legal and contractual EHS and Community requirements. All senior mine managers will report directly to the GM, and all will ensure that all areas of the operations are designed, constructed, operated and decommissioned to meet the specified EHS and Community parameters and contractual and legal requirements.

7.2 TECHNICAL MANAGERS (TM)

The role of the Technical Managers (TM) will be to ensure that all areas of the project are designed, constructed and operated to meet the specified contractual and legal requirements. The Technical Managers will report directly to the General or Mining Manager.

7.3 HEALTH, SAFETY & SECURITY (HSS) MANAGER

Management of the Health, Safety and Security (HSS) issues of the project will be the responsibility of the HSS Department headed by an HSS Manager (HSS-M). The HSS Department is responsible for ensuring implementation and compliance of all HSS actions specified in this ESMP relating to all project operations.

The HSS-M will report directly to the GM, and is responsible for ensuring that the project operates in a socially responsible manner in all aspects of its operations. Specific roles and responsibilities of the HSS-M are expected to be as follows:

1. Development of the HSS documentation required for all aspects of the project.
2. Implementation of the project's HSS Plan and relevant ESMP aspects.
3. Continuous review of the suitability and effectiveness of the activities described in all HSS documentation.
4. Oversee liaison activities with local stakeholders.
5. Ongoing liaison with appropriate project personnel.
6. Maintain and manage the HSS monitoring programme.
7. Ongoing reporting to the senior management team
8. Oversight function to ensure integration of health, safety and security with environmental management and social development activities.

The HSS-M will be assisted by the Section Head – Health & Safety.

7.4 SECTION HEAD - HEALTH & SAFETY (H&S-SH)

The Health & Safety Section Head (H&S-SH) will report directly to the HSS-M and will be responsible for the management of all aspects related to health and safety issues, and coordinate health and safety related to all aspects of the mining operation and associated facilities. The Section Head will be responsible for ensuring the successful implementation and supervision of the following Operating Procedures:

- Construction Health and Safety Management Plan
- Occupational Health and Safety Management Plan

The H&S-SH will work together with the Senior Management to ensure that health and safety standards are met at all times, that emergency equipment is available at all times and ensure that appropriate management interventions are implemented during all phases of the project. Responsibilities include:

1. Ensuring all project activities are assessed using a systematic risk assessment approach.
2. Ensuring a safe working culture is adopted and embraced by all project employees.
3. Ensuring that health and safety of employees is a project priority.
4. Ensuring implementation and compliance with all safety aspects of the EMP.
5. Ongoing liaison with Senior Managers and contractors through the GM regarding safety compliance.
6. Providing appropriate training on Occupational Health & Safety (OHS) aspects for ABM employees and contractors.
7. Ongoing liaison with national and provincial Government agencies and regulatory authorities.
8. Ensuring that all incidents are reported to the GM within 24 hours. Significant incidents (loss of life, serious injury, etc.) will be reported immediately to the GM.

7.5 ENVIRONMENTAL & SOCIAL AFFAIRS MANAGER (ESA-M)

The Environmental and Social Affairs Manager (ESA-M) will report directly to the GM and will be responsible for the management of all aspects related to resettlement, social management, community and skills development, implementation of the social action plan as well as stakeholder engagement. The ESA-M will ensure successful on-site implementation and supervision of Stakeholder Engagement and coordinate Community and Skills Development initiatives. The ESA-M will have the following roles and responsibilities:

1. Plan, mobilise and allocate resources for the implementation of the ESMP, the necessary Monitoring Programme, Compensation Plan (CP) and Social Action Plan (SAP);
2. Continuous review of the suitability and effectiveness of the activities described in all EHS documentation;
3. Be responsible for the financial management and delivery of entitlement payments;
4. Play a central role in the allocation of alternative farmland if necessary;
5. Liaise with local government on the implementation of the CP and SAP;
6. Coordinate the elaboration of the SAP;
7. Address grievances through the established Grievance Mechanism;
8. Providing regular feedback to the Territorial and/or Sector and Provincial Government on the progress of the SAP;
9. Ongoing reporting to the senior management team and the board.

The ESA-M may be assisted by a Section Head – Environmental Affairs and Rehabilitation, as well as with a staff complement which may include a Compensation Officer, Community Liaison Officer(s), Driver(s), Database clerk(s) and Enumerator(s).

7.6 SECTION HEAD - ENVIRONMENTAL AFFAIRS AND REHABILITATION (EA&R-SH)

The Environmental Affairs and Rehabilitation - Section Head (EA&R-SH) will report directly to the ESA-M, and will be responsible for the management of all aspects related to environmental compliance with the ESMP, internal Operating Procedures and policies. The Section Head will be responsible for ensuring the successful on-site implementation of the environmental aspects of the ESMP. Specifically, the EA&R-SH will be responsible for rehabilitation activities across the mine site, as well as managing the environmental aspects of the dams. The EA&R-SH will work together with Senior Management to ensure that environmental management and rehabilitation are implemented during all phases of the project. Responsibilities include:

1. Ensuring that all the environmental authorisations and permits required in terms of the

- applicable legislation have been obtained prior to activities commencing on the ground.
2. Ensuring implementation and compliance with the ESMPr and various Internal Operating Procedures.
 3. Monitoring and regulating compliance by all personnel and contractors.
 4. Execution of the environmental components of the Environmental and Social Monitoring Programme.
 5. Keeping accurate and detailed records of all activities on site.
 6. Continued and ongoing liaison with Senior Managers and contractors through the E&S Department regarding environmental compliance.
 7. Conducting environmental awareness training.
 8. Ensuring that all sites disturbed during all phases of the operation are effectively rehabilitated as soon as possible.
 9. Monitoring and verifying that environmental impacts are kept to a minimum.
 10. Reviewing and approving method statements with input from the Section Head, in order to ensure that the environmental specifications in the ESMPs are adhered to.
 11. Ordering the removal of, or issuing spot fines to contractors for person/s and/or equipment not complying with the specifications of the ESMPs.
 12. Ongoing liaison with national and local Government agencies and regulatory authorities.
 13. Monitoring all contractors' compliance with the ESMPs.
 14. Recommending actions to the HSS-M and ESA-M in the event of non-compliance.
 15. Ensuring operational compliance of the dams with recommendations provided in the ESIA.
 16. Community Health and Safety Management
 17. Environmental Emergency Preparedness Management Operating Procedure

8. STRUCTURE AND IMPLEMENTATION OF THE ENVIRONMENTAL AND SOCIAL MANAGEMENT PLANS

8.1 INTRODUCTION

The purpose of this section of the ESMP is to provide detailed recommendations aimed at mitigating negative impacts and enhancing benefits associated with the construction, operational and decommissioning phases of the project. As discussed in Chapter 3 of this report, these requirements have been presented as a framework to allow for a certain degree of flexibility in the development of specific mitigation measures as more detailed design or technical information is made available.

The framework ESMP requirements for the project life cycle are detailed in Table 8.1. The specific mitigation measures required for implementation during each phase of the project's life cycle are contained in Tables 8.2 to 8.4. These measures will be taken into consideration by ABM when developing the final suite of ESMPs.

8.2 FRAMEWORK REQUIREMENTS

The framework requirements for both the construction and operational phases for the development are detailed in Table 8.1. Included are a number of plans targeting specific phases of the project and also a number of "cross-cutting" plans. The latter are applicable to both the construction and operational phases. Once developed for the construction phases, these cross cutting plans can then be reviewed and, where required, updated to address environmental and social issues associated with the operational phase.

Table 8.1: Framework Environmental & Social Management Plans

PHASE/DOCUMENT TITLE	SCOPE	COMPLY WITH
FEASIBILITY PHASE		
Environmental & Social Management Programme - ESMPr (This document)	Provide an overview of the affected environment, the project and list impacts. Provide overview of legal requirements to be complied with, and define environmental standards. Present details on content of all mitigation measures and management plans, as well as organisational structures and monitoring strategies.	➤ IFC Performance Standard 1 (Chapter 4).
CONSTRUCTION PHASE		
Construction Environmental & Social Management Plan (CESMP).	<p>The CESMP must deal with all E&S issues associated with establishing the project. Environmental impacts relating all identified environmental aspects and including blasting, air quality, soil erosion and controls, noise, vegetation, surface and ground water, fauna, dust, vegetation, fauna, bulk earth works, materials handling and surface water run-off will need to be covered. This ESMP will also need to deal with the social impacts of the construction including labour requirements and how local labour will be selected and managed, and must:</p> <ul style="list-style-type: none"> • specify the E&S contractual obligations for contractors; • define the EHS and Security role of ABM and contractor staff; and • apply aspects of all other ESMPs as applicable. <p>In addition to the above, the CESMP will deal specifically with waste handling and disposal during construction (especially since there are no formalised hazardous waste sites in and around the project area), occupational health and safety specific to these facilities during construction, and any other specific aspects not covered elsewhere. Certain aspects will be covered by the cross cutting plans.</p> <p>With respect to the proposed facility, the following aspects will require careful consideration:</p> <ol style="list-style-type: none"> 1. Design areas for storage of all potentially hazardous chemicals e.g. fuel and oil etc, according to international standards. 2. Designate a specific banded area for the offloading and storage of chemicals/hazardous materials. 3. Undertake all handling and disposal of hazardous waste in accordance with international good practice. 4. Supply Personnel Protective Equipment (PPE) and ensure use where necessary 5. Dispose of waste in an environmentally compliant manner. 	<ul style="list-style-type: none"> ➤ IFC Performance Standards 1, 2, 3, 4, & 6. ➤ Relevant Congolese legislation (Chapter 4). ➤ Site rules for Contractors. ➤ The following IFC EHS Guidelines: <ul style="list-style-type: none"> • Air Emissions and Ambient Air Quality • Wastewater discharge quality • Ambient Water Quality / Quantity (including fish and invertebrates) • Water Conservation • Hazardous Materials Management • Waste Management • Noise • Communication and Training • Physical Hazards • Chemical Hazards • Personal Protective Equipment (PPE) • Monitoring • Life and Fire Safety • Traffic Safety • Disease Prevention • Emergency Preparedness and Response • Community Health & Safety • Occupational Health and Safety
OPERATIONAL PHASE		
Operational Environmental & Social Management Plan (OESMP).	<p>This OESMP must deal with all E&S issues associated with the operation of the facility. The scope of this plan will be similar to that of the CESMP, although the priority issues requiring careful consideration will be slightly different and longer term. As their focus is on the operation of the facility. Based on the impact assessment, the issues that the OESMP will need to focus on are likely to be the following:</p> <p><i>Environmental impacts:</i></p> <ul style="list-style-type: none"> • Contamination of soil, surface and ground water • Ambient and workplace air quality • Ambient and workplace noise • Energy and water consumption • Land and Natural Resource Use • Flora and fauna • Waste management • Acid Mine Drainage (AMD) • Conservation of unaffected areas <p><i>Social Impacts:</i></p> <ul style="list-style-type: none"> • Traffic • Socio-Economic (Labour requirements and how local labour will be managed) • Occupational health and safety, including explosion risks • Ongoing management of community expectations • Influx management • Monitoring of local security situation <p>In addition to the above, the OESMP will need to include a specific requirement for the implementation of a formal Environmental and Social Management System (ESMS) and deal with any other specific aspects not covered elsewhere. Certain aspects will be covered by the cross cutting plans.</p>	<ul style="list-style-type: none"> ➤ IFC Performance Standards 1, 2, 3, 4, & 6. ➤ Relevant Congolese legislation (Chapter 4) ➤ Site rules for Contractors ➤ The following IFC EHS Guidelines: <ul style="list-style-type: none"> • Air Emissions and Ambient Air Quality • Wastewater discharge quality • Ambient Water Quality / Quantity (including fish and invertebrates) • Water Conservation • Hazardous Materials Management • Waste Management • Noise • Communication and Training • Physical Hazards • Chemical Hazards • Personal Protective Equipment (PPE) • Monitoring • Life and Fire Safety • Traffic Safety • Disease Prevention • Emergency Preparedness and Response • Community Health & Safety • Occupational Health and Safety
DECOMMISSIONING PHASE		
Decommissioning Phase ESMP (DESMP) and Decommissioning and Closure Plan (as per ICMM)	Refer to Chapter 11 for the Conceptual Closure Plan requirements and specifications. This will be incorporated in both the DESMP and Final Decommissioning and Closure Plan to be developed in the final years of operational activity.	<ul style="list-style-type: none"> ➤ The requirements of DRC law; ➤ The targets set by the ICMM Mine Closure Toolkit (2008); ➤ International Finance Corporation's Standards on Environmental and Social Sustainability (IFC, 2012); ➤ International Finance Corporation's Environmental, Health and Safety General Guidelines (IFC, 2007); and ➤ International Finance Corporation's Environmental, Health and Safety (EHS) Guidelines for Mining (IFC, 2007).

PHASE/DOCUMENT TITLE	SCOPE	COMPLY WITH
Rehabilitation Management Plan	<p>A rehabilitation plan provides guidelines and measures required to restore mined land and explore the options, possibilities and end-points along the path towards restoration. The monitoring of successful rehabilitation should include monitoring of vegetation cover, erosion and alien invasive species. Thus rehabilitation is a continuous process and should commence during operation through to closure phase. It may not always be possible to restore the land to its initial status at closure. The rehabilitation concepts to be explored are defined as follows:</p> <ul style="list-style-type: none"> • Restoration: The return of a damaged ecosystem to its original state. • Rehabilitation: The return of a damaged ecosystem to its original state, taking into consideration that it is questionable if complete restoration will be achieved. • Revegetation: The process of establishing vegetation on the degraded environment. • Replacement: The process where vegetation is established on the degraded environment, but this vegetation differs from pre-mining vegetation. Such an option would most often result from post-mining conditions being incompatible with the original land-use. An example would be to plant economically or socially important crops instead of the original vegetation due to changed soil properties. 	<ul style="list-style-type: none"> ➤ Good practice guidelines on mining and biodiversity (International Council on Mining & Metals, 2006). ➤ IFC EHS Guidelines for Mining (2007).
CROSS-CUTTING PLANS		
Project-level Conflict and Risk Impact Assessment (P-CRIA)	<p>It is recommended that a Project-level Conflict and Risk Impact Assessment (P-CRIA) study is undertaken for the project in accordance with International Alert's methodology developed for these purposes (International Alert, 2005). This is necessary in order to address deficiencies in general ESIA processes that are often criticised as being incapable of "analysing and assessing the full range of issues that might cause, trigger or exacerbate tensions or violent conflict"</p>	<ul style="list-style-type: none"> ➤ in accordance with International Alert's methodology developed for these purposes (International Alert, 2005)
Labour Recruitment, Procurement and In-migration Management Plan	<p>In order to avoid spontaneous settlement and speculative in-migration adjacent to or within the project area, and to ensure consistency of these practices on behalf of contractors, ABM must implement a Recruitment, Procurement and In-migration Management Plan, which will include a Local Hiring and Purchasing Plan and a Temporary Employment Plan. ABM will make commitments to deal with local expectations and risks, specifically maximizing local hiring for the unskilled job opportunities and local purchasing in the areas of project influence during the construction and operational phases. A Local Hiring and Purchasing Policy is required to govern ABM and their contractors' hiring processes and purchasing programmes in the area of influence. The objectives are to:</p> <ul style="list-style-type: none"> • Develop procedures and practices that maximize opportunities for hiring local workers, and to minimize social risks in the areas of influence. • Develop transparent procedures that allow access to project jobs by the local population in an organized and fair manner. • Establish a hiring process that respects local cultural and social norms in order to facilitate local participation and avoid conflicts and other negative social impacts. • Promote fair practices in the hiring of local workers that protect against unauthorized third-party job brokers, child and forced labour, and discrimination. • Promote employment of women. <p>Contractors, in consultation with ABM will design and implement a Temporary Employment Programme for the local population that will anticipate the demand for a skilled and unskilled work force, duration of the employment, and the requirements the applicant will have to meet to be accepted. The objectives of this program are to:</p> <ul style="list-style-type: none"> • Maximize the number of local personnel hired in the project's direct area of influence. • Minimize local expectations in terms of potential employment. • Prevent the migration of unwanted people towards the project area in search of work. <p>This programme will be provided to the authorities, the local populations and stakeholders through an office or offices that will be opened for that purpose. ABM and Contractors will provide information to the community and local stakeholders, through local and regional communication media, on the location of offices where they may learn about job opportunities and the priorities that will be given to local workers. These offices will in turn provide information on jobs and will identify the number of available positions and application requirements. It must be made clear that no workers will be hired at the construction sites. To decrease and control the flow of people seeking employment in the project area, it will be made clear that members of the population directly impacted by the project will be given preference when hiring, as long as they qualify technically and meet ABM requirements. Recruiting strategies will identify the methods used for informing candidates that equal priority will be given to project affected people for unskilled positions. The above measures will serve to minimize in-migration to the project area. Furthermore, no goods and services can be procured from the project gate or stalls adjacent to the road. This discourages opportunistic traders into the area.</p>	<ul style="list-style-type: none"> ➤ Congolese Labour legislation including: ➤ IFC Performance Standards 1 & 2 ➤ All relevant International Labour Organisation Conventions ➤ IFC (2009). Projects and People. A handbook for addressing project induced in-migration. ➤ The following IFC EHS Guidelines: <ul style="list-style-type: none"> • Communication and Training • Personal Protective Equipment (PPE) • Water quality & Availability • Life and Fire Safety • Traffic Safety • Disease Prevention • Emergency Preparedness and Response
Integrated Waste Management Plan	<p>The Integrated Waste Management Plan will include a commitment for ABM to manage all waste streams in a manner that minimizes the likelihood of harm to the environment or human health. Furthermore, all waste streams will be managed according to the waste management hierarchy which requires that production of wastes is avoided and minimized. Wastes will then be re-used or recycled and where this is not possible, it will be disposed of in an environmentally responsible manner and in line with the relevant legal and other obligations. This plan will cover all solid and liquid wastes, both hazardous and non-hazardous, and will also cover the management of leachate from the waste facilities, TSF and WRD.</p>	<ul style="list-style-type: none"> ➤ Congolese legislation (see Chapter 4 for relevant environmental legislation) ➤ IFC Performance Standard 3 ➤ The following IFC EHS Guidelines: <ul style="list-style-type: none"> • Wastewater & Ambient Water Quality • Water Conservation • Hazardous Materials Management • Waste Management • Contaminated land • Communication and Training • Chemical Hazards • Personal Protective Equipment (PPE) • Monitoring • Transportation of Hazardous substances (e.g. Hydrocarbon) • Emergency Preparedness and Response
Occupational Health and Safety Management Plan	<p>Construction and operation of the mine facilities will present a number of significant hazards to employees. As such, ABM will implement a comprehensive Occupational Health and Safety Management Plan or system. This Plan will include a detailed assessment of all occupational hazards associated with operation of the mine and mineral processing and a clear set of procedures aimed at minimizing harm to employees during the course of their activities on site. This plan must at least cover the following:</p>	<ul style="list-style-type: none"> ➤ IFC Performance Standards 1 & 2 ➤ The following IFC EHS Guidelines: <ul style="list-style-type: none"> • General facility design • Communication and Training

PHASE/DOCUMENT TITLE	SCOPE	COMPLY WITH
	<ul style="list-style-type: none"> • Handling and storage of hazardous chemicals (such as hydrocarbon); • HIV and AIDS; • Risks associated with operation of WRD, TSF, Crushers, and the processing plant; • Workplace air quality; and • Workplace noise. 	<ul style="list-style-type: none"> • Physical Hazards • Chemical Hazards • Drinking water quality • Personal Protective Equipment (PPE) • Monitoring • Life and Fire Safety • Traffic Safety • Transportation of Hazardous substances • Emergency Preparedness and Response
<p>Emergency Preparedness Management Plan</p>	<p>Emergency preparedness strategies are required to deal with general spillages of any kind, as well as management procedures for emergencies during natural disasters, fire and accidents. Spillage response and management is particularly important in areas adjacent to riparian environments where spillages may easily enter these waters. Service providers and required facilities will need to be identified. The identification of upset conditions that can cause major environmental impacts (e.g. major storm events, catastrophic fires, explosions etc) is required, and measures to effectively handle these must be developed. A number of action plans or SOPs are therefore anticipated, such as:</p> <ul style="list-style-type: none"> • Emergencies Preparedness for Spillages action plan; • Disaster Management and Facility Evacuation Plan 	<ul style="list-style-type: none"> ➢ IFC Performance Standards 1, 2 & 4 ➢ The following IFC EHS Guidelines: <ul style="list-style-type: none"> • General facility design • Communication and Training • Personal Protective Equipment (PPE) • Monitoring • Life and Fire Safety • Transportation of Hazardous substances • Emergency Preparedness and Response
<p>Community Health and Safety Management Plan</p>	<p>Construction and operation of the mining facilities may present a number of hazards to local communities. As such, ABM will develop a Community Occupational Health and Safety Management Plan. This Plan will include a detailed assessment of all hazards associated with operation of the mine facilities that may impact negatively on local communities. It will also include a clear set of procedures aimed at minimizing harm to community members. This plan must at least cover the following:</p> <ul style="list-style-type: none"> • Handling and storage of hazardous chemicals, • HIV and AIDS, • Transport of materials and product, • Ambient air quality, • Ambient noise 	<ul style="list-style-type: none"> ➢ IFC Performance Standards 1 & 4 ➢ The following IFC EHS Guidelines: <ul style="list-style-type: none"> • General facility design • Communication and Training • Physical Hazards Chemical Hazards • Personal Protective Equipment (PPE) • Monitoring • Ambient noise and air quality • Waste management • Transportation • Emergency Preparedness and Response
<p>Environmental & Social Monitoring Plan</p>	<p>The objectives of the Environmental & Social Monitoring Plan are to:</p> <ul style="list-style-type: none"> • Characterise environmental features (e.g. surface water) and identify changes or trends in their condition or state over time. • Identify specific existing or emerging problems in condition or state. • Gather information to design specific impact prevention or remediation programmes. • Determine whether project goals, such as compliance with regulations or implementation of effective control actions, are being met. • Provide early warning for emergencies such as floods. <p>It is anticipated that at least the following environmental and social components will need to be monitored:</p> <ul style="list-style-type: none"> • Water quality (Rivers, wetlands, wells and boreholes for water quality and quantity). • Meteorological conditions (important for management of leachate and interpretation of ambient air quality data and will include wind speed and direction; relative humidity; ambient temperature; rainfall and evaporation). • Use of natural resources, including power and water and greenhouse gas monitoring. • Waste disposal monitoring will need to be implemented during the construction and operational phase to confirm the effectiveness of the Integrated Waste Management Plan. • Ambient noise and air quality to ensure compliance with the required limits. • Occupational health and safety monitoring including entrance, exit and surveillance medicals for employees, workplace noise, lighting and air quality etc. • Storm water quality • Social monitoring to ensure that grievances are being attended to and that any necessary changes to the overall process are being timeously and sensibly made. <p>It is proposed that monitoring takes place at two levels, namely Internal Monitoring by a suitably qualified person within ABM and External Monitoring through a contracted independent body.</p>	<ul style="list-style-type: none"> ➢ IFC Performance Standards 1, 2, 3, 4, 6 & 8 ➢ IFC General EHS Guidelines (2007) ➢ IFC EHS Guidelines for mining (2007) ➢ Relevant national and international legislation / agreements (see Chapter 4)
<p>Hazardous Chemical Management Plan</p>	<p>The construction and operation of the mine will involve the storage and use of hazardous substances such as hydrocarbons. If not managed correctly, these could result in harm to the environment, in particular soil and water, as well as workers and community members. Details of management requirement for hazardous chemicals and waste containing hazardous substances during construction, operation and decommissioning phases are contained in waste related mitigation measures. The objectives of this plan are to ensure that:</p> <ul style="list-style-type: none"> • The use and management of hazardous chemicals is carefully controlled and only used by authorised personnel; • The likelihood of harm to humans or the environment is minimised; <p>This management plan will need to cover at least the following:</p> <ul style="list-style-type: none"> • Approval and procurement of hazardous chemicals; storage of chemicals, disposal of expired chemicals and containers • Emergency response • Availability of Material Safety Data Sheets (MSDS) 	<ul style="list-style-type: none"> ➢ IFC Performance Standards 1, 2, 3, & 4 ➢ IFC General EHS Guidelines (2007) <ul style="list-style-type: none"> • General facility design • Communication and Training • Chemical Hazards • Personal Protective Equipment (PPE) • Monitoring • Life and Fire Safety • Transportation of Hazardous substances ➢ Emergency Preparedness and Response ➢ IFC EHS Guidelines for mining (2007) ➢ Relevant national and international legislation / agreements including protocols related to banned and restricted chemicals.

PHASE/DOCUMENT TITLE	SCOPE	COMPLY WITH
Roads and Transport Management Plan	<p>The construction and operational phases of the project will result in an increase in traffic volume which could pose a risk to the health and safety of the community and the mine employees. The objective of this plan is therefore to reduce the risk of injury to community members and employees. The management plan will cover at least the following:</p> <ul style="list-style-type: none"> • Emphasizing safety aspects among drivers; • Improving driving skills and requiring licensing of drivers; • Adopting limits for trip duration and arranging driver rosters to avoid over tiredness; • Avoiding dangerous routes and times of day to reduce the risk of accidents; • Regular maintenance of vehicles and use of manufacturer approved parts to minimise potentially serious accidents caused by equipment failure; • Minimise pedestrian interaction with construction vehicles; and • Using signage and flag persons to warn of dangerous conditions. 	<ul style="list-style-type: none"> ➤ IFC Performance Standards 1, 2, & 4 ➤ IFC General EHS Guidelines (2007) ➤ The following IFC EHS Guidelines: <ul style="list-style-type: none"> • Communication and Training • Physical Hazards • Chemical Hazards • Personal Protective Equipment (PPE) • Monitoring • Traffic Safety • Transportation of Hazardous substances ➤ Emergency Preparedness and Response ➤ Relevant national and international legislation / agreements (see Chapter 4)
Storm Water Management Plan	<p>If not managed, storm water run-off can result in the pollution and contamination of the soils and the freshwater systems in the adjacent riparian area. The objective of this plan is to:</p> <ul style="list-style-type: none"> • Protect the health, welfare and safety of the public and to protect property from flood hazards by safely routing and discharging storm water from developments; and • Preserve the natural environment. <p>This management plan will need to cover at least the following:</p> <ul style="list-style-type: none"> • Incorporate measures to divert clean storm water away from sources of potential pollution, including waste storage and disposal areas and other operation areas; and • Reduce the contact between storm water and hazardous chemicals. 	<ul style="list-style-type: none"> ➤ IFC Performance Standards 1, 3 & 6 ➤ IFC General EHS Guidelines (2007) ➤ The following IFC EHS Guidelines: <ul style="list-style-type: none"> • General facility design • Communication and Training • Monitoring ➤ Emergency Preparedness and Response ➤ IFC EHS Guidelines for mine (2007) ➤ Relevant national and international legislation / agreements (see Chapter 4)
Security Management Plan	<p>This plan provides guidelines and standards that ABM and security contractors need to adhere to during the operational phase of the project, in addition to all current laws, regulations and international conventions. Since components of project security may be out-sourced to third parties, it is important to ensure that these third party service providers also comply with the overall management plans and policies established for the project. This ESMP needs to detail how this will be achieved, and cover topics such as:</p> <ul style="list-style-type: none"> • Selection of security personnel • Securing the plant and operations • Monitoring of safety and security • Physical security enhancement • Inherently safer options • Restricted access to information • Public Disclosure • Security risk assessment 	<ul style="list-style-type: none"> ➤ IFC Performance Standard 4 ➤ The following IFC EHS Guidelines: <ul style="list-style-type: none"> • Communication and Training • Monitoring • Emergency Preparedness and Response • Firearms and the use of force • Establish a Security Community Liaison Forum. • Regular alcohol testing campaigns to be implemented. ➤ Adherence to the requirements of the Voluntary Principles on Security and Human Rights and the Extractive Industries Transparency Initiative. ➤ The appropriate laws of the DRC pertaining to security and human rights.
Greenhouse Gas (GHG) and Energy Management Plan	<p>The significance of a project's contribution to GHG emissions varies between industry sectors. The prescribed threshold according to the IFC Performance Standard 3 is 25,000 tons CO₂ equivalent per year for the aggregate emissions of direct sources and indirect sources associated with purchased electricity for own consumption. This or similar thresholds will apply to such industry sectors or activities as energy, transport, heavy industry, agriculture, forestry, and waste management in order to help promote awareness and reduction of emissions. Performance Standard 3 (Pollution Prevention and Abatement) sets the following standard for GHG Emissions:</p> <ul style="list-style-type: none"> • The client will promote the reduction of project-related GHG emissions in a manner appropriate to the nature and scale of project operations and impacts. • During the development or operation of projects that are expected to or currently produce significant quantities of GHGs, the client will quantify direct emissions from the facilities owned or controlled within the physical project boundary and indirect emissions associated with the off-site production of power used by the project. Quantification and monitoring of GHG emissions will be conducted annually in accordance with internationally recognized methodologies. In addition, the client will evaluate technically and financially feasible and cost-effective options to reduce or offset project-related GHG emissions during the design and operation of the project. These options may include, but are not limited to, carbon financing, energy efficiency improvement, the use of renewable energy sources, alterations of project design, emissions offsets, and the adoption of other mitigation measures such as the reduction of fugitive emissions. 	<ul style="list-style-type: none"> ➤ IFC Performance Standard 3

8.3 SPECIFIC LIFE CYCLE MITIGATION MEASURES

In addition to the framework requirements, a number of specific mitigation measures have emerged out of the E&S assessment. These mitigation measures will, where possible, be incorporated into the relevant management plans referred to under the framework requirements. Alternatively, they may be incorporated into other forms of instructional documents such as SOPs or Method Statements for specific activities.

This section provides detailed recommendations aimed at mitigating negative impacts and enhancing beneficial impacts associated with all phases of the project's life cycle. Specific requirements aimed at mitigating the various E&S impacts identified during the ESHIA process have been included and will be considered by ABM for implementation. As described in Chapter 3 of this report, it should be noted that a certain degree of flexibility is allowed in the development and implementation of the specific mitigation measures contained here (Table 8.2). These requirements will, where possible, be incorporated into the relevant management plans referred to under the framework requirements.

Table 8.2: Construction, Operational and Decommissioning Phase ESMP specifications

IMPACT AREA	SOURCE OF IMPACTS	MITIGATION MEASURES	PARTY RESPONSIBLE	PHASING
HEALTH, SECURITY & SAFETY MANAGER (HSS-M)		HEALTH & SAFETY SECTION HEAD (H&S-SH)	ENVIRONMENTAL & SOCIAL AFFAIRS MANAGER (ESA-M)	ENVIRONMENTAL AFFAIRS AND REHABILITATION SECTION HEAD (EA&R-SH)
1A. AIR QUALITY MEASURES (CONSTRUCTION PHASE)				
Land clearing activities such as bulldozing and scraping of road and blasting	PM ₁₀ and PM _{2.5} concentrations and dustfall rates	<ul style="list-style-type: none"> Water sprays at area to be cleared. Moist topsoil will reduce the potential for dust generation when tipped onto stockpiles. Ensure travel distance between clearing area and topsoil piles are at a minimum. 	HSS-M ESA-M	Construction phase
Road construction activities such as road grading	PM ₁₀ and PM _{2.5} concentrations and dustfall rates	<ul style="list-style-type: none"> Water sprays at area to be graded. Freshly graded areas to be kept to a minimum. Dustfall buckets placed around the proposed project site. 		
Wind erosion from exposed areas	PM ₁₀ and PM _{2.5} concentrations and dustfall rates	<ul style="list-style-type: none"> Ensure exposed areas remain moist through regular water spraying during dry, windy periods. 		
1B. AIR QUALITY MEASURES (OPERATION PHASE)				
Blasting	Airborne dust from demolitions	<ul style="list-style-type: none"> Dust generation can be controlled by ensuring blasting, and subsequent emission via the ventilation portal, only occurs during midday when there is no inversion layer. 	ESA-M H&S-SH	On-going during operational phase
Crushing and screening	PM ₁₀ and PM _{2.5} concentrations and dustfall rates	<ul style="list-style-type: none"> Dust generation at crushing and screening to be controlled through the use of hooding and fabric filters on the crushers. 		On-going during operational phase
Vehicle and generator exhaust gas	Elevated DPM concentrations across to mine and plant areas	<ul style="list-style-type: none"> A 90% control efficiency (CE) can be achieved by fitting diesel particulate filters (DPF's) on vehicles and generators. Vehicle inspection and maintenance programs provide further assistance in control. 		On-going during operational phase
Vehicle activity on unpaved haul roads	PM ₁₀ , PM _{2.5} , NO ₂ , SO ₂ , and DPM concentrations and dustfall rates	<ul style="list-style-type: none"> Water sprays with chemicals on unpaved roads to ensure a minimum of 90% CE, especially during the drier months (April to October). 		On-going during operational phase
Materials handling	PM ₁₀ and PM _{2.5} concentrations and dustfall rates	<ul style="list-style-type: none"> Run of mine ore is forecast at 10-15% moisture content. 		On-going during operational phase
General	PM ₁₀ and PM _{2.5} concentrations and dustfall rates	<ul style="list-style-type: none"> A dustfall monitoring network to be installed. PM_{2.5} and PM₁₀ ambient sampler with no exceedances of 600mg/m².day 		On-going during operational phase
1C. AIR QUALITY MEASURES (DECOMMISSIONING AND CLOSURE PHASE)				
Wind erosion from exposed areas	PM ₁₀ and PM _{2.5} concentrations and dustfall rates	<ul style="list-style-type: none"> Demolition of infrastructure to have water sprays where a lot of vehicle activity is required. Ensure site is restored to pre-mining conditions. 	ESA-M EA&R-SH	Decommissioning and Closure phase
1D. AIR QUALITY MEASURES (GENERAL)				
General	Construction, Operation or Decommissioning activities	<ul style="list-style-type: none"> In places of constant human occupation pollutant concentrations should not exceed the residential limit of 600 mg/m²/day. On-site dustfall rates should be below the non-residential limit of 1 200 mg/m².day. Hooding with fabric filters on the crushers. Vehicles exhaust emission testing as part of an inspection and maintenance program. All vehicles to have DPF's. The installation of a meteorological station. 	HSS-M H&S-SH ESA-M	All phases
General Monitoring	Construction, Operation or Decommissioning activities	<ul style="list-style-type: none"> Dustfall monitoring Erection of a meteorological station 		All phases
Ambient Air Quality Monitoring	N/A	<ul style="list-style-type: none"> It is recommended that site inspections and progress reporting be undertaken quarterly during operations, with annual environmental audits being conducted. Monthly dustfall monitoring as well as ambient PM₁₀ and PM_{2.5} monitoring. Meteorological monitoring. 		All phases
Financial provision	N/A	<ul style="list-style-type: none"> Mine annual budget to provide a clear indication of the capital and annual maintenance costs associated with dust control measures and dust monitoring plans. Costs related to inspections, audits, environmental reporting and I&AP liaison should also be indicated where applicable. 		Planning phase
2A. AQUATIC ECOLOGY MEASURES (CONSTRUCTION PHASE)				
Sedimentation and elevated turbidity in rivers	Vegetation clearing, silt preparation and soil works, vehicle movements	<ul style="list-style-type: none"> Develop and implement a Riparian Zone Management Plan (RZMP). Riparian zones are typically established on the border of water bodies and serve to protect and provide a buffer zone for water bodies such as lakes, navigable perennial/intermittent streams, and non-navigable streams. Develop a Stormwater Management Plan. Construct a settling pond(s)/paddocks to settle out sediments before their release into the Bisie River. Develop and implement a Surface Water Monitoring Plan that will incorporate both water quality and quantity measures. Prevent or limit disturbance to water resources during the planning phase. Water resources should be protected by implementing the recommended guidance contained in the Water Quality section of IFC General EHS Guidelines (2007): <ul style="list-style-type: none"> Understand the quality, quantity, frequency and sources of liquid effluents in its installations. This includes knowledge about the locations, routes and integrity of internal drainage systems and discharge points. Plan and implement the segregation of liquid effluents principally along industrial, utility, sanitary, and stormwater categories, in order to limit the volume of water requiring specialized treatment. Characteristics of individual streams may also be used for source segregation. Identify opportunities to prevent or reduce wastewater pollution through such measures as recycle/reuse within their facility, input substitution, or process modification (e.g. change of technology or operating conditions/modes). Assess compliance of wastewater discharges with the applicable: (i) discharge standard (if the wastewater is discharged to a surface water or sewer), and (ii) water quality standard for a specific reuse (e.g. if the wastewater is reused as process water). Land clearing should only take place in the dry season or at the end of the wet season. If this is not possible, suitable temporary berms 	HSS-M H&S-SH ESA-M	Construction phase

IMPACT AREA	SOURCE OF IMPACTS	MITIGATION MEASURES	PARTY RESPONSIBLE	PHASING
HEALTH, SECURITY & SAFETY MANAGER (HSS-M)		HEALTH & SAFETY SECTION HEAD (H&S-SH)		ENVIRONMENTAL & SOCIAL AFFAIRS MANAGER (ESA-M)
		ENVIRONMENTAL AFFAIRS AND REHABILITATION SECTION HEAD (EA&R-SH)		
		<p>must be constructed prior to clearing in order to contain any soils that may be eroded by heavy rainfall. These soils should be rehabilitated as soon as possible in order to prevent ingress into surrounding water courses.</p> <ul style="list-style-type: none"> • Site infrastructure such as roads and fences should be aligned with the natural drainage lines to minimise additional erosion. • Natural drainage lines must not be impeded or otherwise interfered with. • Erosion should be monitored over the entire site and, where initial indications of erosion are detected, appropriate remedial measures must be taken as soon as possible. • The TSF and WRD sites should be located away from drainage lines or rivers and best industrial practice put in place in terms of design, operation and maintenance of the TSF and WRD sites. 		
Contamination from non-ore pollutants	Construction activities, labour camps, vehicle movements	<ul style="list-style-type: none"> • Strict management of hazardous chemicals must be implemented. • Prevention of hydrocarbon spills from machinery and vehicles by the use of drip-trays and permanent bunded areas for overnight parking. This should include any workshops envisaged for the project. In addition, workshops should be fitted with oil traps and sumps to ensure that no contaminated water/hydrocarbons are allowed to escape. • Domestic effluent from the construction camps should be treated in on-site waste water treatment works and final effluent should be a quality that allows reuse for irrigation or mine process water. • Any effluent discharged into the environment must be treated to relevant national or international standards. • All contaminated water run-off from mine sites must be contained and treated prior to discharge. 	HSS-M EA&R-SH H&S-SH	Construction phase
Habitat Modification	Project footprint, Construction activities, vegetation clearing, labour camps, vehicle movements	<ul style="list-style-type: none"> • Where appropriate, slash and debris should be stockpiled above the high water mark to prevent materials from entering streams and rivers during maintenance activities. This should NEVER be disposed of in stream/river courses or in riparian zones. • Avoid soil exposure and compaction to protect ground vegetation by avoiding the operation of wheeled or tracked equipment in proximity to the ordinary high-water mark for perennial streams except on roads or at stream crossings. • Minimise the number and size of stream crossings for vehicle movement within the riparian zones. Where crossings are necessary, international best practice in the use of bridges, hardened fords, pipes and culverts should be adopted. Recommended stream crossing measures should include: <ul style="list-style-type: none"> ○ Minimise vehicular movement over perennial and intermittent streams, and river areas. Where crossing is necessary, a right angle approach should be used in addition to use of bridges, fords, pipe culverts, and other techniques to minimize impacts to stream banks, flow, water quality. ○ Crossing structures such as bridges, culverts and fords should be designed to withstand peak flows of high intensity storms, and ensure that movement of aquatic species is not impaired. ○ Vehicle movement over unprotected streambeds should be prevented. If crossing is necessary, a hard rock stream bottom is preferable. ○ Road drainage should be diverted to vegetation and not into the stream. ○ Approaches to crossing should be stabilized with aggregate to avoid increased sediment entering the stream. 	HSS-M EA&R-SH H&S-SH	Construction phase
2B. AQUATIC ECOLOGY MEASURES (OPERATION PHASE)				
Sedimentation and elevated turbidity in rivers	Project footprint, Construction activities, vegetation clearing, labour camps, vehicle movements	<ul style="list-style-type: none"> • Mine water and surface run-off from the mining areas should be detained in sedimentation ponds before the clear surface water (if uncontaminated) is allowed to flow into the adjacent drainage lines or streams. • The applicant should establish a water management system in the permit area including measures to protect each water category. The title holder must follow through the measures contributing to maintaining water quality until completion of the mining operations. • All contaminants are to be stored and treated so as to eliminate any water pollution risk. No stream or river can be used for partial or total wastewater treatment purposes. No wastewater dilution is allowed. • Non-contaminated runoff waters are impounded by drainage ditches built around the components of the site that could cause contamination. This might include mine tailings areas to be drained into the environment. • Contaminated runoff waters coming from hazardous areas such as concentrator plant, mineral stock-piling, concentrates, mine tailings accumulation areas are to be drained and treated before being disposed of at the discharge point. • Mixing mining wastewaters with other waters is forbidden. 		
Contamination from non-ore pollutants	Project footprint, Construction activities, vegetation clearing, labour camps, vehicle movements	<ul style="list-style-type: none"> • Contaminated water from the process plant should be stored in a dedicated storage reservoir and fed back to the process water reticulation together with the supernatant or decant water from the TSF. • Any effluent discharged into the environment must be treated to relevant national or international standards 	HSS-M H&S-SH ESA-M	Operation phase
Change in water chemistry	Siltation, sediment and surface runoff, mechanical spillages, etc	<ul style="list-style-type: none"> • Temperature of effluent prior to discharge does not result in an increase greater than 3°C of ambient water temperature. • Discharge of effluent with TSS of more than 10% of the receiving stream should not occur • Discharge of effluent with a pH that fluctuates more than 10% of the receiving stream should not occur. • The applicant shall make an inventory of all the locations of storage areas and tailings areas, their size and capacity as well as the type of mining waste contained in each storage or tailings area. • The applicant must provide for a wastewater drainage system separate from non-contaminated wastewaters as well as from drainage basin runoff waters and, if necessary, modifications brought to the natural flow of the waters. • Non-contaminated runoff waters are impounded by drainage ditches built around the components of the site including mine tailings accumulation areas to be drained into the environment. • Contaminated runoff waters coming from hazardous areas such as mineral stock-piling, concentrates, mine tailings accumulation areas, are drained and treated before being disposed of at the discharge point. • Mixing mining wastewaters with other waters is forbidden. 		
3A. HEALTH MEASURES (ALL PHASES)				
Poor health facilities and lack of equipment and medicine	Living standard, relocation, lack of services	<ul style="list-style-type: none"> • Possible support of a health post in the area that could benefit most of the PACs. • Prior to the development and implementation of any healthcare assistance programme, a memorandum of understanding (MoU) must be developed with the local leaders, health authorities and the Government to ensure that the project does not become the <i>de facto</i> government in the area. • A clinic at the mining site itself should offer on-site occupational and emergency services to cater for its workforce. • Strengthen partnerships with local health authorities and NGOs. 	HSS-M H&S-SH	All phases

IMPACT AREA	SOURCE OF IMPACTS	MITIGATION MEASURES	PARTY RESPONSIBLE	PHASING
HEALTH, SECURITY & SAFETY MANAGER (HSS-M)		HEALTH & SAFETY SECTION HEAD (H&S-SH)	ENVIRONMENTAL & SOCIAL AFFAIRS MANAGER (ESA-M)	ENVIRONMENTAL AFFAIRS AND REHABILITATION SECTION HEAD (EA&R-SH)
Tuberculosis	Living standards, relocation, lack of services	<ul style="list-style-type: none"> Labour accommodation units to be properly planned to avoid overcrowded living conditions. As part of the labour recruitment policy, all labour to undergo a pre-employment health screening assessment. This should include specific tests for TB and Respiratory Tract Infections (RTIs) and the possibility of multi-drug resistance types. Develop a Health and Safety Management Plan (H&SMP) which includes an emergency preparedness and response plan. The H&SMP should address the following (cf. IFC, 2012: p. 9): <ul style="list-style-type: none"> Specific emergency response procedures; Trained emergency response teams; Emergency contacts and communication systems; Procedures for interaction with local and regional emergency and health authorities; Permanently stationed emergency equipment and facilities; Protocols for fire truck, ambulance and other emergency vehicle services; Evacuation routes and meeting points; and Drills. Develop an awareness campaign both for communicable- and non-communicable diseases and prevention strategies. This campaign should be aimed both at the workforce and also the wider PACs. Labour policies to be developed to avoid job-seeking immigrants. Influx management. Support existing TB and RTI campaigns either from the government or NGOs in the area. 		All phases
Respiratory Tract Infections	Living standards, relocation, lack of services	<ul style="list-style-type: none"> Same mitigation measures as for tuberculosis. 		All phases
Malaria	Living standards, relocation, lack of services	<ul style="list-style-type: none"> The project designs must consider reducing the possible sources of vector breeding habitats. Support existing malaria programmes in the area. Develop an integrated workplace malaria management policy. Develop a vector control programme for reducing the vector densities in and around the project area. 		All phases
Diarrhoeal Diseases	Living standards, relocation, lack of services	<ul style="list-style-type: none"> Existing Water, Sanitation and Hygiene (WASH) community programmes could be supported. 		All phases
Cholera	Living standards, relocation, lack of services	<ul style="list-style-type: none"> Surveillance in detecting the first case of cholera could be strengthened by building a strong relationship with the health authorities in the area. Early detection signs should be reported to the mine. 		All phases
Schistosomiasis (Bilharzia)	Living standards, relocation, lack of services	<ul style="list-style-type: none"> Ensure the project site or water body does not become a breeding site for snail hosts. New employees to undergo a health examination to test for Schistosomiasis. Train employees to not urinate or defecate in open water sources. Engage regularly with health authorities and workers both at provincial and local level to establish trends in the spread of this and other diseases. 		All phases
Soil-Transmitted Helminthiasis (Intestinal Worms)	Living standards, relocation, lack of services	<ul style="list-style-type: none"> The same impacts as for diarrhoeal diseases apply. 		All phases
HIV and AIDS	Living standards, relocation, lack of services	<ul style="list-style-type: none"> Develop an HIV and AIDS policy both for the workforce and PACs. Develop an HIV and AIDS management programme for the workforce and PACs, which should focus on prevention, control and awareness. Support existing HIV and AIDS Government and/or NGO programmes in the area. Provide free condoms at the mine's clinic, as well as in other health posts in the area. The mine should offer free Voluntary Counselling and Testing (VCT) for its workforce and closest PACs from which its labour is sourced from. 		All phases
Malnutrition	Living standards, relocation, lack of services	<ul style="list-style-type: none"> Nutritional trends to be monitored. Possibly develop a Farmer Development Programme (FDP) to include assistance with land clearance, as well as provision of seeds and farming equipment. Support food garden programmes at selected schools in the area. Support existing NGO or Government programmes. 		All phases
Cardiovascular Diseases	Living standards, relocation, lack of services	<ul style="list-style-type: none"> Support existing NGO or government programmes. Support existing health facilities with training. 		All phases
Diabetes Mellitus	Living standards, relocation, lack of services	<ul style="list-style-type: none"> Provide a healthy balanced diet to the workforce. 		All phases
Cancer	Living standards, relocation, lack of services	<ul style="list-style-type: none"> Create awareness amongst the workforce. Support existing Government or NGO cancer programmes in the area. 		All phases
Mental Health, Health-Seeking Behaviours, Substance-Abuse, Domestic Violence	Living standards, relocation, lack of services	<ul style="list-style-type: none"> All the measures already listed apply. In addition, the project could offer or provide support with an existing youth campaign targeting substance abuse. 		All phases
3B. HEALTH MITIGATION AND ENHANCEMENT PLAN MEASURES (ALL PHASES)				
Preventing the spread of communicable- and non-communicable diseases	Living standards, relocation, lack of services	<ul style="list-style-type: none"> Develop a Health and Safety Management Programme (H&SMP). Develop a Code of Conduct for the workers to adhere to particular health and safety rules. Develop a Community Health Monitoring Programme. Prevent the spread of diseases during the construction of the mining site. 	HSS-M H&S-SH ESA-M	All phases, but especially the design and operation phases
Healthcare Awareness and Support	N/A	<ul style="list-style-type: none"> Develop a Community Health Programme. 		
Health Partnership	N/A	<ul style="list-style-type: none"> Strengthen partnerships with the local health authorities in the area. 		

IMPACT AREA	SOURCE OF IMPACTS	MITIGATION MEASURES	PARTY RESPONSIBLE	PHASING
HEALTH, SECURITY & SAFETY MANAGER (HSS-M)		HEALTH & SAFETY SECTION HEAD (H&S-SH)		ENVIRONMENTAL & SOCIAL AFFAIRS MANAGER (ESA-M)
				ENVIRONMENTAL AFFAIRS AND REHABILITATION SECTION HEAD (EA&R-SH)
Farmers Development Programme	N/A	<ul style="list-style-type: none"> Develop a Farmers Development Programme (FDP). Support food garden programs. 		
4A. SOCIAL MEASURES (ALL PHASES)				
Loss of agricultural land	Vegetation clearing of mine footprint, access road clearing	<ul style="list-style-type: none"> As part of the CP development process, establish a local working group that includes representatives from the PAC's, Government, local authorities and NGO's active in the area. No household's land to be affected prior to the completion of the CP. Those farmers and/or households affected by the loss of agricultural land/structures etc. must be assisted to find alternative farmland and preparing their new fields prior to losing their land. This land should be at least the same or have a better quality, and no farmer must be worse off after displacement. As far as reasonably possible, land parcels should be able to sustain the affected farmer at the time of land acquisition. Alternative land should be a negotiation between those affected and the government. Land should not be offered without meaningful consultation and an option analysis. These mitigating measures are good practice guidelines of the IFC under its PS 5, which are collectively referred to as 'transitional support'. 	HSS-M H&S-SH ESA-M	All phases
Altering villagers' sense of place	Relocation, large scale project infrastructure and change	<ul style="list-style-type: none"> Sensitize Ma Noire and Logu residents as to what visual and social changes may result from the various project phases. Establish a labour desk away from the mine site to deter in-migrant job seekers as far as possible. 		All phases
Disruption to graves and sacred sites	Grave site disturbance and relocation	<ul style="list-style-type: none"> Record each affected graveyard and gravesite in the area with the assistance of local residents. In the event that gravesites need to be exhumed and relocated, consult the affected villagers to state their preference in this regard. Should any mortal remains be discovered in underground workings during the construction or operational phases, a Chance Find Procedure must be developed that stipulates the actions, requirements and responsibilities of ABM. Develop a Stakeholder Engagement Plan (SEP) to define the consultation mechanisms and responsibilities that will guide this ongoing engagement between the PACs and ABM. 		All phases
Heightened food insecurity	Loss of agricultural land and subsistence farming	<ul style="list-style-type: none"> Implementation of the FDP. Assist the community with a food garden project. 		All phases
Disruption or changes to natural resource utilisation	Loss of agricultural land and subsistence farming	<ul style="list-style-type: none"> Ensure that existing access routes to natural resources are not affected as far as possible. 		All phases
Increased household agricultural production interventions	Loss of agricultural land and subsistence farming	<ul style="list-style-type: none"> Develop a Farmers Development Plan (FDP) in consultation with the affected villagers, local stakeholders (including NGOs) and government authorities. 		All phases
Employment opportunities	Employment gain through mine staff, employment loss through loss of agricultural land and subsistence farming	<ul style="list-style-type: none"> Develop a Labour, Recruitment and Influx Management Plan (LRIMP). Adhere to the DRC Labour Code. Adhere to the recommendations contained in IFC PS 2 (Labour and Working Conditions) Establish a labour desk/employment committee off-site to ensure that recruitment is done in a fair and transparent way, and that job creation opportunities are maximised. Developing a Stakeholder Engagement Plan (SEP). Ensure fair access to the benefits of the project, as well as transparent and effective communication with local stakeholders. Implement a training programme to build capacity in local people linked to targets for the phased replacement of expatriate staff with nationals. 		All phases
Training opportunities, expansion of local skills; The creation of Small, Medium and Micro Enterprises (SMMEs); Reduction in ASM opportunities in the study area	Economic stimulus related to the mine and job creation	<ul style="list-style-type: none"> The measures detailed under ABM's memorandum of understanding for the Lowa Alliance are applicable here. 		All phases
Local socio-economic development	Economic stimulus related to the mine and job creation	<ul style="list-style-type: none"> The measures detailed under ABM's memorandum of understanding for the Lowa Alliance are applicable here. 		All phases
Further attacks from armed groups	Civil conflict	<ul style="list-style-type: none"> Retain sufficient security personnel on site for the duration of the projects' lifespan. Continue active intelligence gathering in the study area. Ensure there is ongoing communication and dissemination of militia/rebel faction movements among security cluster stakeholders. 		All phases
Temporary or permanent influx of job seekers	Economic stimulus related to the mine and job creation	<ul style="list-style-type: none"> The measures detailed under "Employment opportunities" are applicable here. 		All phases
Community conflict due to perceived differential benefits from the project	Civil conflict	<ul style="list-style-type: none"> The measures under "Employment opportunities" apply. Undertake a Project-level Conflict and Risk Impact Assessment (P-CRIA) in order to assess the full range of issues that might cause, trigger or exacerbate tensions or violent conflict. Implementation of the Artisanal and Small Scale Mining Impact Mitigation Strategy & Plan (ASMIMS&P) 		All phases
Security personnel risks	Civil conflict	<ul style="list-style-type: none"> Establish a Security Community Liaison Forum. Regular alcohol testing campaigns on security personnel to be implemented. Adherence to the requirements of the Voluntary Principles on Security and Human Rights and the Extractive Industries Transparency Initiative. 		All phases
Diarrhoeal Diseases	Living standards, relocation, lack of services	<ul style="list-style-type: none"> Existing Water, Sanitation and Hygiene (WASH) community programmes to be supported. 		All phases
Cholera	Living standards, relocation, lack of services	<ul style="list-style-type: none"> The mitigation measures of "Diarrhoeal Diseases" apply. 		All phases
Malaria	Living standards, relocation, lack of services	<ul style="list-style-type: none"> Project designs to reduce the possible sources of vector breeding habitats. Support existing malaria programmes in the area. 	All phases	

IMPACT AREA	SOURCE OF IMPACTS	MITIGATION MEASURES	PARTY RESPONSIBLE	PHASING
HEALTH, SECURITY & SAFETY MANAGER (HSS-M)		HEALTH & SAFETY SECTION HEAD (H&S-SH)	ENVIRONMENTAL & SOCIAL AFFAIRS MANAGER (ESA-M)	ENVIRONMENTAL AFFAIRS AND REHABILITATION SECTION HEAD (EA&R-SH)
		<ul style="list-style-type: none"> Develop an integrated workplace malaria management policy for the mine's own workforce. Develop a vector control programme for reducing the vector densities in and around the project area. 		
Sexually Transmitted Diseases and HIV and AIDS	Living standards, relocation, lack of services	<ul style="list-style-type: none"> Develop an HIV and AIDS policy both for the workforce and PACs. Develop an HIV and AIDS management programme for the workforce and PACs, which should focus on prevention, control and awareness. Support existing HIV and AIDS Government and/or NGO programmes in the area. Provide free condoms at the mine's clinic, as well as in other health posts in the area. The mine should offer free Voluntary Counselling and Testing (VCT) for its workforce and closest PACs from which its labour is sourced from. 		All phases
Increase in air pollutants; Nuisance impacts (odours, visual impact and attraction of pest and vermin) arising from waste management; Potential safety risks	Living standards, relocation, lack of services	<ul style="list-style-type: none"> The mitigation measures of air quality management apply. 		All phases
Impacts on land and water resources arising from TSF or WRD leachate	Living standards, relocation, lack of services	<ul style="list-style-type: none"> The management of waste rock and tailings will conform to the requirements of the DRC legislation. The tailings facility must be sited in a location such that in the event of failure, pollution of soil and water as well as physical risk to communities is minimised. The integrity of the waste rock dump and tailings facility must be inspected regularly by suitably qualified personnel throughout the life of the mine. Access to the TSF and waste rock dump will be restricted as far as practical and all local communities will be informed of the potential risks associated with these facilities through site notices and community meetings. Ongoing monitoring of ground and surface water quality around the TSF and waste rock dumps. 		All phases
Road safety risks	Living standards, relocation, lack of services	<ul style="list-style-type: none"> Implementation of a speed limit appropriate to the design and construction factors and characteristics of the roads used. Delivery vehicles will not be overloaded and loads will be securely fastened. Spot checks on drivers to ensure they are not under the influence of drugs or alcohol. Pre-operational checks of vehicles. In the event that accidents do occur, an emergency response plan is to be provided in each vehicle. 		All phases
Pollution of land and water as a result of inadequate waste management and disposal	Living standards, relocation, lack of services	<p>General wastes</p> <ul style="list-style-type: none"> All wastes must be managed according to the requirements of DRC legislation. The proposed general landfill site must be sited, designed and operated to international standards in order to isolate the wastes and prevent environmental contamination, particularly groundwater contamination. Until such time as this facility is fully operational, all general waste produced during the construction phase will be stored on site in a secure access control area, in a legally-compliant manner that minimises environmental impacts. The landfill site must be located and designed in such a way so as to minimise the risk of contamination of this ground water resources; Implementation of a ground water monitoring system in the vicinity of the constructed landfill site in order to detect any changes to the quality of sub-surface water. All employees, contractors and visitors to the site will be informed of correct waste management procedures, including separation of general and hazardous waste at source. <p>Hazardous wastes</p> <ul style="list-style-type: none"> The Integrated Waste Management Plan for the facility must cover the management of hazardous wastes. Prior to safe disposal at the on-site hazardous landfill facility all hazardous wastes must be temporarily stored at the temporary hazardous waste storage facility. This facility should be designed to include secondary containment lined and covered to protect the contents from weather (sunlight and rain). If wastes are corrosive, the base of the storage facility should be lined with an acid-resistant coating. Where possible, empty containers for hazardous chemicals will be returned to suppliers. Where empty containers for hazardous chemicals (hydrocarbons, pesticides, laboratory chemicals, degreasing agents etc.) cannot be returned to the suppliers, they must be triple-rinsed, punctured and stored in a secure area until such time as they can be disposed of safely. Rinse water may not be discharged directly to the environment. Empty pesticide containers should be disposed of according to the Food and Agricultural Organisation's Guidelines on Management Options for Empty Pesticide Containers (Food and Agriculture Organisation (FAO) 2008). As per the FAO (2008) guidelines, burning of empty pesticide containers should be strongly discouraged. Specific guidance on the management of empty pesticide containers is provided by the FAO (2008). A hydrocarbon management procedure should be designed and implemented. Copies of this document should be made available at designated facilities where hydrocarbons are used or stored. The purpose of this procedure is to provide for the proper storage and handling of hydrocarbons, including waste hydrocarbons, on site and hence prevent any form of contamination. This procedure will need to cover sludge from diesel and waste oil tanks. It is recommended that soil contaminated with hydrocarbon should be immediately removed and disposed of at a soil bioremediation facility on site or else disposed of as hazardous waste. Material Safety Data Sheets (MSDS) for all chemicals must be readily available on site and the precautions stipulated in these must be adhered to at all times. All staff must be trained on the correct management of bunded facilities, including the discharge of collected liquids; Spill kits must be readily available at strategic points throughout the site and staff must be trained on the correct use of these kits; No hazardous wastes should be disposed of into drains/sewers as this may impact negatively on the performance of the sewerage treatment plant. Medical waste must be managed according to the management procedure described in Annex 3 of the ICRC Medical Waste Management (2011) and the requirements of the DRC legislation. This material can be incinerated or disposed on at the on-site hazardous waste landfill. On-site landfill facilities must be designed by an experienced and accredited independent engineer and must meet international design 		All phases

IMPACT AREA	SOURCE OF IMPACTS	MITIGATION MEASURES	PARTY RESPONSIBLE	PHASING
HEALTH, SECURITY & SAFETY MANAGER (HSS-M)		HEALTH & SAFETY SECTION HEAD (H&S-SH)	ENVIRONMENTAL & SOCIAL AFFAIRS MANAGER (ESA-M)	ENVIRONMENTAL AFFAIRS AND REHABILITATION SECTION HEAD (EA&R-SH)
		<p>standards for facilities of this sort.</p> <ul style="list-style-type: none"> A Landfill Management Plan will be prepared and implemented. Leachate generated by the on-site landfill facilities must be contained and any containment facilities must be designed to accommodate the maximum predicted leachate production during a 1:50 year flood event. All leachate must be treated on site unless a legal and internationally-acceptable off-site treatment option is proven to be viable. In the case of the latter, the proponent will retain responsibility for ensuring that the leachate is disposed of in a manner that does not present risk to environmental or human health. The Environmental Monitoring Plan for the mine will include comprehensive monitoring for possible impacts of the landfill sites on water resources. A hazardous Materials Management Plan will be developed for the operation and will explicitly cover off-site transport of hazardous wastes. 		
Potential wastewater and sewage sludge impacts on the receiving environment; Potential wastewater and sewage sludge nuisance impacts (odour and flies)	Living standards, relocation, lack of services	<ul style="list-style-type: none"> All domestic wash water and sewage from all sites will be diverted to the septic tanks or packaged sewage treatment plants for treatment and discharge from these facilities must meet the DRC discharge standards prior to release into the process water pond. Sewage sludge from these facilities should be managed as described in the EHS Guidelines for Water and Sanitation (2007). The pre-treatment of oil and grease containing effluents from canteens by the use of a grease trap prior to discharge into sewage treatment facilities. All sewage treatment facilities to be well maintained. The performance of the sewage treatment systems to be monitored regularly. In the event that sludge must be removed from the system(s), it must be disposed in a manner that minimises potential risk to human health and the environment and should comply with the National legislation. The environmental monitoring programme for the facility must incorporate monitoring points that are able to detect a negative impact on the environment associated with the discharge of treated sewage. 		All phases
Disposal of run-off/storm water	Living standards, relocation, lack of services	<ul style="list-style-type: none"> The management of all run-off must comply, as a minimum, with the requirements of DRC legislation but preferably with the requirements of the IFC's General EHS Guidelines (2007). A Storm Water Management Plan must be developed for the mine and it should incorporate measures to divert clean storm water away from stockpiles, waste storage and disposal areas and other operation areas. Mitigation measures should be aimed at reducing contact between storm water and hazardous chemicals. This needs to be considered during the planning of the storm water drainage system for the mine facilities. In terms of minimising discharge of pollutants and run-off quantity requiring treatment, all storm water run-off must be properly segregating and clean water run-off diverted to prevent it mixing with water containing a high solids content, to minimize the volume of water to be treated prior to release. All run-off from machine wash areas must pass through an oil trap and should be treated as hazardous due to the presence of hydrocarbon. All other run-off water must pass through a sediment trap to remove the majority of suspended solids prior to discharge to the environment. All settled material must be disposed of at the landfill. The quality of all liquid waste streams discharged from the site, including storm water, must be monitored regularly to ensure compliance with relevant legislation and standards. 		All phases
Agricultural land compensation of Ma Noire residents	Living standards, relocation, lack of services	<ul style="list-style-type: none"> A comprehensive Compensation Plan (CP) needs to be developed in fulfilment of national legislation, but also cognizant of any relevant PS 5 specifications in this regard. Similarly, a Farmers Development Programme (FDP) should be developed with the intent of assisting Manoire residents increase agricultural production in their locality. 		All phases
Local Economic Development	Economic stimulus related to the mine and job creation	<ul style="list-style-type: none"> A Social Action Plan (SAP) will be developed by ABM in consultation with the government and affected communities. The plan should have key commitments and needs to include annual budgets at least for a three-year commitment period. A Stakeholder Engagement Plan (SEP) will be developed in parallel with the SAP and disclosed to all stakeholders involved, which includes all the affected community members. 		All phases
Ongoing conflict and use of Security Personnel	Civil conflict	<ul style="list-style-type: none"> A Project-level Conflict and Risk Impact Assessment (P-CRIA) study is undertaken by ABM in accordance with International Alert's methodology developed for these purposes. A Community Liaison Forum (CLF) should be established with a grievance mechanism for workers and/or villagers to voice any concerns/issues regarding security personnel with the proponent. This will be an integral part of the forthcoming SEP and SAP. A labour desk/employment committee should be established for the mine at a location removed from the mine site (Osakari and/or Walikale). A Labour, Recruitment and Influx Management Plan (LRIMP) should be developed and disclosed to all stakeholders involved prior to the commencement of recruitment. As far as possible, those labourers involved in the construction phase should be incorporated in the permanent staff for the operational phase. As far as reasonably possible, a plan for gradual replacement of expatriate workers by local people should be developed and implemented. A Code of Conduct should be developed for the use of any security personnel that fulfils the Voluntary Principles on Security & Human Rights VPI's) 		All phases
4A. SURFACE AND GROUNDWATER MEASURES (CONSTRUCTION PHASE)				
Impacts of tailings storage facility on aquatic biota; Abstraction of water	Surface discharge and groundwater seepage	<ul style="list-style-type: none"> There are no practical mitigation measures for this impact: the impacts are identical for the without and with mitigation scenarios. 	ESA-M EA&R-SH	Construction phase
Sedimentation and elevated turbidity in rivers (construction); Contamination by non-ore pollutants (construction)	Surface discharge, mechanical vehicle pollution, construction material pollution	<ul style="list-style-type: none"> Mitigation measures in place from the aquatic ecology section are relevant here. 		
Contamination of groundwater sources by non-ore pollutants	Surface discharge and groundwater seepage	<ul style="list-style-type: none"> Strict management of all hazardous materials, such as hydrocarbons and chemicals, must be implemented. Storage areas must be on bunded impervious surface. Spills must be cleaned up and remediated immediately after occurrence. 		

IMPACT AREA	SOURCE OF IMPACTS	MITIGATION MEASURES	PARTY RESPONSIBLE	PHASING
HEALTH, SECURITY & SAFETY MANAGER (HSS-M)		HEALTH & SAFETY SECTION HEAD (H&S-SH)		ENVIRONMENTAL & SOCIAL AFFAIRS MANAGER (ESA-M)
				ENVIRONMENTAL AFFAIRS AND REHABILITATION SECTION HEAD (EA&R-SH)
		<ul style="list-style-type: none"> Prevention of hydrocarbon spills from machinery and vehicles by the use of drip-trays and permanent bunded areas for overnight parking. This should include any workshops envisaged for the project. In addition, workshops should be fitted with oil traps and sumps to ensure that no contaminated water/hydrocarbons are allowed to escape. Domestic effluent from the construction camps should be treated in on-site waste water treatment works and final effluent should be of high quality and used for irrigation or mining and process purposes. All contaminated water run-off from mine sites must be contained and treated prior to discharge. Any effluent discharged into the environment must be treated to relevant national or international standards. Solid waste disposal sites must be lined with impervious material. A groundwater monitoring system must be installed, and groundwater quality must be monitored regularly and frequently. 		
4B. SURFACE AND GROUNDWATER MEASURES (OPERATION PHASE)				
Reducing flow rate by abstracting water from the Bisie River	Construction and operation water abstraction	<ul style="list-style-type: none"> Minimise abstractions by recycling as much previously-used water as possible. Limit abstractions to 50% of the flow rate prevailing at the time of abstraction. Use surface and groundwater sources conjunctively in accordance with seasonal variations in their capacity to supply. 	HSS-M EA&R-SH	Operation phase
Increasing flow rate by discharging effluent into the Bisie River	Construction and operation water discharge	<ul style="list-style-type: none"> No mitigation measures are necessary for this impact, but it would be prudent, in order to minimise the abstraction of water from surface and groundwater sources, to treat all effluent so that they can be safely re-used for some purpose on the site. 		
Failure of TSF structures (operations)	Unsafe design and operational damage	<ul style="list-style-type: none"> Ensure that the TSF is designed and constructed to the highest possible safety standards, to withstand an appropriately extreme flooding event, taking into account the hazards to human life and health, property and the environment associated with such a failure event. Ensure that the TSF is regularly and frequently inspected by appropriately qualified and experienced experts, and that all defects are remedied without delay. 		
Discharges into rivers	Construction and operation water discharge	<ul style="list-style-type: none"> The quality of all effluent must accord with DRC or international standards, whichever is the more stringent requirement. Water pumped from mine workings must be appropriately treated to remove metals and increase pH before discharge into the river. Sewage must be treated to accord with DRC and international standards, whichever is the more stringent, before discharge into the river. The quality of effluent must be regularly and frequently monitored, the reasons for any non-conformances must be investigated as soon as they come to light and measures put in place to rectify them. Strict management of all hazardous materials, such as hydrocarbons and chemicals, must be implemented. Storage areas must be on bunded impervious surface. Spills must be cleaned up and remediated immediately after occurrence. Prevention of hydrocarbon spills from machinery and vehicles by the use of drip-trays and permanent bunded areas for overnight parking. This should include any workshops envisaged for the project. In addition, workshops should be fitted with oil traps and sumps to ensure that no contaminated water/hydrocarbons are allowed to escape 		
Failure of the TSF	Unsafe design and operational damage	<ul style="list-style-type: none"> Ensure that the TSF is designed to the highest possible safety standards, to withstand an appropriately extreme flooding event, taking into account the hazards to human life and health, property and the environment associated with such a failure event. Ensure that the TSF is regularly and frequently inspected by appropriately qualified and experienced experts, and that all defects are remedied without delay. If the tailings prove to be acid generating, treat them before transmission to the TSF to increase the pH level. 		
Seepage from the TSF	Surface and groundwater discharge and seepage	<ul style="list-style-type: none"> Ensure that the TSF is designed and constructed to the highest possible standards to eliminate, as far as possible, leakage through the dam wall and internal hydraulic control systems. Line the basin with appropriate material. Equip the facility with an internal drainage/penstock system, and an external system to remove and treat leachate before discharge into the environment. If the tailings prove to be acid generating, treat them before transmission to the TSF to increase the pH level. Install boreholes to monitor the groundwater around the TSF, and monitor groundwater quality regularly and frequently. Ensure that the TSF is regularly and frequently inspected by appropriately qualified and experienced experts, and that all defects are remedied without delay. 		
Contamination from non-ore surface sources	Mechanical and process leakage and spills, labour camp effluent and waste	<ul style="list-style-type: none"> Strict management of all hazardous materials, such as hydrocarbons and chemicals, must be implemented. Storage areas must be on bunded impervious surface. Spills must be cleaned up and remediated immediately after occurrence. Prevention of hydrocarbon spills from machinery and vehicles by the use of drip-trays and permanent bunded areas for overnight parking. This should include any workshops envisaged for the project. In addition, workshops should be fitted with oil traps and sumps to ensure that no contaminated water/hydrocarbons are allowed to escape. Domestic effluent from the mine camps should be treated in on-site waste water treatment works and final effluent should be of high quality and used for irrigation or mining and process purposes. All contaminated water run-off from mine sites must be contained and treated prior to discharge. Any effluent discharged into the environment must be treated to relevant national or international standards. Solid waste disposal sites must be lined with impervious material. A groundwater monitoring system must be installed, and groundwater quality must be monitored regularly and frequently. All water storage dams must be lined with HDPE or similar impervious material. 		
Contamination of groundwater from TSF	Surface and groundwater discharge and seepage	<ul style="list-style-type: none"> Line the basin with appropriate material. Equip the facility with an internal drainage/penstock system, and an external system to remove and treat leachate before discharge into the environment. If the tailings prove to be acid generating, treat them before transmission to the TSF to increase the pH level. Install boreholes to monitor the groundwater around the TSF, and monitor groundwater quality regularly and frequently. 		

IMPACT AREA	SOURCE OF IMPACTS	MITIGATION MEASURES	PARTY RESPONSIBLE	PHASING
HEALTH, SECURITY & SAFETY MANAGER (HSS-M)		HEALTH & SAFETY SECTION HEAD (H&S-SH)		ENVIRONMENTAL & SOCIAL AFFAIRS MANAGER (ESA-M)
		ENVIRONMENTAL AFFAIRS AND REHABILITATION SECTION HEAD (EA&R-SH)		
		<ul style="list-style-type: none"> Ensure that the TSF is regularly and frequently inspected by appropriately qualified and experienced experts, and that all defects are remedied without delay. 		
Decant of mine water into groundwater resources	Surface and groundwater discharge and seepage	<ul style="list-style-type: none"> Maintain continuous pumping in the mine to restrict build-up of water levels and limit the possibility of outflows. 		Operation phase
4B. SURFACE AND GROUNDWATER MEASURES (CLOSURE PHASE)				
Impacts on surface water resources	Abstraction, process water discharge, soil works and accidental leakages/spills	<ul style="list-style-type: none"> Remove all above-ground structures, including all hazardous materials storage facilities. Remove any areas of contaminated soils. Empty and clean out water storage dams. Re-vegetate the entire site: maintain stormwater management system until the site is sufficiently vegetated to prevent further erosion Cap and re-vegetate the TSF. Ensure that all stockpiled material (subsoil and topsoil) are appropriately sited and shaped to reduce wind-blown and stormwater transported sediments. Other mitigation measures include wetting, canvassing or netting down stockpiles, and construction of wind breaks. Develop a Storm Water Management Plan to mitigate any excessive sedimentation observed as a result of mining activity. 	HSS-M EA&R-SH	Decommissioning and Closure phases
Impacts on groundwater resources	Abstraction, process water discharge, soil works and accidental leakages/spills	<ul style="list-style-type: none"> All water dams, stockpile areas and the mineral processing plant must be rehabilitated after the cessation of mining. Waste rock dumps and the TSF should be rehabilitated through suitable capping, the nature of which will depend on future geochemical and water balance studies. Mine access areas where rainfall may accumulate, and infiltrate to the mine workings, should be minimised or shaped to divert water. A groundwater monitoring system should be developed and implemented to monitor groundwater levels and groundwater quality on a regular basis, as determined by a suitably qualified hydrogeologist. Groundwater impact assessments should be reviewed/updated prior to mine closure to plan for post-mining rehabilitation. 		
Loss of aquatic biodiversity from cumulative impacts	Cumulative disturbance	<ul style="list-style-type: none"> Treated through the mitigation measures already included for previous phases. 		
5A. TERRESTRIAL ECOLOGY MEASURES (ALL PHASES)				
Loss and fragmentation of Primary Forest	Mine infrastructure footprint clearing, access roads	<ul style="list-style-type: none"> Layout of the access road to use existing roads and paths wherever possible. Locate project infrastructure as wherever possible in impacted areas or secondary forest. Where possible limit the extent of primary forest clearing to a minimum. Demarcating the construction area and ensure that the vegetation on the other side of these "barriers" is not disturbed. Design and implement a Rehabilitation Management Plan and Biodiversity Monitoring Plan during the construction and operational phase to ensure that the project has no unnecessary negative impacts on this plant community. 	HSS-M EA&R-SH	All phases
Loss and fragmentation of Secondary Forest	Mine infrastructure footprint clearing, access roads	<ul style="list-style-type: none"> Where possible limit the extent of secondary forest clearing to a minimum. Design and implement a Biodiversity Monitoring Plan during the construction and operational phase to ensure that the project has no unnecessary negative impacts on this plant community. Design and implement a Rehabilitation Management Plan. Restoration of this vegetation type after mining and bridge/culvert construction. Reducing the number of crossings through careful planning and design. Using bridge designs that afford the lowest impact on this vegetation. Areas within the project area that are not required during mining should be demarcated as no-go areas and conserved. These areas provide important refugia for birds, reptiles, amphibians and mammals. The width of the haul road and subsequent clearing during construction must be kept to a minimum. 		
Loss and fragmentation of riparian areas and flooded valley floors	Mine infrastructure footprint clearing, access roads	<ul style="list-style-type: none"> Restore this vegetation type after mining and construct appropriate bridges and culverts to ensure impacts are kept as local as possible and do not affect areas downstream. Reduce the number of crossings to a minimum through careful planning and design. Use bridge designs that afford the lowest impact on this vegetation. Design and implement a Biodiversity Monitoring Plan during the construction and operational phase to ensure that the project has no unnecessary negative impacts on this habitat type. Design and implement a Rehabilitation Management Plan. 		
Loss of biodiversity (general)	Mine infrastructure footprint clearing, access roads	<ul style="list-style-type: none"> Only clear the minimum area of forest required to complete construction of mine infrastructure. This must be undertaken by demarcating the construction area and ensuring that the vegetation outside these "barriers" is not disturbed. Prevent mining employees from harvesting plants for personal use, firewood or charcoal within the project area. Design and implement a Rehabilitation Management Plan. Maintain ecological corridors within the study area. These may overlap with delineated set aside areas. 		
Light pollution	Mine infrastructure	<ul style="list-style-type: none"> Externally visible lighting to be kept to an absolute minimum,; Internal lighting to be shielded by blinds, curtains or by eliminating outward-facing windows in building designs, to prevent spillage of light into the surrounding natural environments. Long-wavelength light sources should be used. 		
Noise Pollution	Mine infrastructure, haulage route	<ul style="list-style-type: none"> Construct berms to shield sensitive areas (e.g. wetlands) from noise. Where these are available use low-noise models of mining and transport equipment (this would be of benefit to mining personnel as well); Ensure that all equipment is properly maintained and faulty silencers are replaced immediately. 		
Dust pollution	Mine infrastructure, vehicle entrainment	<ul style="list-style-type: none"> Dust-reducing equipment and machinery to be used in the mining and process plant area. Haul roads to be watered down, or treated with polymers to inhibit dust generation. Road speeds to be limited to curtail dust generation. 		

IMPACT AREA	SOURCE OF IMPACTS	MITIGATION MEASURES	PARTY RESPONSIBLE	PHASING
HEALTH, SECURITY & SAFETY MANAGER (HSS-M)		HEALTH & SAFETY SECTION HEAD (H&S-SH)		ENVIRONMENTAL & SOCIAL AFFAIRS MANAGER (ESA-M)
				ENVIRONMENTAL AFFAIRS AND REHABILITATION SECTION HEAD (EA&R-SH)
Loss of Species of Conservation Concern	Mine infrastructure footprint clearing, access roads	<ul style="list-style-type: none"> Identify and where possible avoid cutting down SCC species. Only clear the minimum area of forest required to complete construction of mine infrastructure. Prevent mining employees from harvesting plants for personal use, firewood or charcoal within the project area. Design and implement a Rehabilitation Management Plan. Maintain an ecological corridor within the project area. 		
Invasion of alien species	Disturbance and introduction from construction activities	<ul style="list-style-type: none"> Monitor the project area for any new invasive plant species, and Eradicate alien plants as they appear. 		
6A. TRAFFIC AND TRANSPORT MEASURES (ALL PHASES)				
Road safety risks	Increased vehicles and access	<ul style="list-style-type: none"> A speed limit appropriate to the design and construction factors and characteristics of the roads used to be specified for all delivery vehicles Heavy delivery vehicles should not travel between 10pm and 6am unless it is absolutely unavoidable. Delivery vehicles will not be overloaded and loads must be securely fastened. Spot checks on drivers to ensure they are not under the influence of drugs or alcohol. Within each vehicle, an emergency response plan to be provided. This should specify the actions required of the driver in the event of an accident. 	HSS-M H&S-SH ESA-M	All phases
Congestion	Increased vehicles and access	<ul style="list-style-type: none"> In Uganda and Kenya delivery trucks should be instructed not to form convoys, but instead maintain sufficient distance between them so that other drivers may pass safely. 		
Abnormal loads	Load character	<ul style="list-style-type: none"> For all countries, the transport of abnormal loads to be arranged in consultation with the local authorities. As far as possible deliveries of abnormal loads will be scheduled to avoid periods when significant volumes of construction traffic are making deliveries to site. 		

9. MANAGEMENT IMPLEMENTATION AND REVIEW

9.1 INTRODUCTION

ABM will establish procedures to monitor and measure the effectiveness of the ESMP/s as well as compliance with any related legal and/or contractual obligations and regulatory requirements and applicable standards. Where the Authorities or other third party has responsibility for managing specific risks and impacts and associated mitigation measures, ABM will collaborate in establishing and monitoring the implementation and effectiveness of such mitigation measures. Where appropriate, ABM will consider involving representatives from affected communities to participate in monitoring activities.

A number of monitoring and review measures that are in accordance with the IFC Performance Standard 1 have been adopted and are described below.

9.2 CHECKING AND MONITORING

Checking and monitoring will be implemented and is required to ensure that ESMP (Construction, Operation and Decommissioning) management activities are being implemented and desired outcomes are being achieved. If not, then corrective action will be identified and implemented. This component includes five key relevant activities:

- Defining objectives and targets;
- Monitoring selected E&S quality variables as defined in the objectives and targets;
- On-going inspections and continuous improvement of general state of the operations;
- Internal audits to assess the robustness of the ESMPs and SOPs or to focus on a particular performance issue; and,
- External audits to provide independent verification of the efficacy of the ESMPs (Construction, Operation and Decommissioning) and its associated reports and procedures.

9.2.1 Performance objectives and targets

Performance objectives and targets (measurable indicators) against which the performance of the project can be measured and monitored will be developed as part of ESMP and SOP report development, and agreed upon for activities in all phases of the project's life cycle. These objectives and targets will be clearly defined and incorporated, where appropriate, as contractual obligations that have to be fulfilled by third parties. In so doing, ABM will be better able to manage its Health, Safety and Environmental risks and obligations. Objectives and targets will be reviewed on a regular basis. In cases where objectives and targets are not met, new and revised method statements indicating proposed corrective measures will be developed and approved.

9.2.2 Monitoring Programmes

ABM and its contractors will establish procedures to monitor and measure the effectiveness of the management plans, as well as compliance with any related legal and/or contractual obligations and regulatory requirements. The variables that are to be monitored are to be defined in the respective ESMPs to be developed. Results obtained from the monitoring programme will be structured and presented for review on an on-going basis so that if objectives and targets are not met, corrective action can be taken. It is required that all monitoring programmes are to be headed by appropriate personnel in the organisational structure. Where appropriate, ABM will consider involving representatives from affected communities to participate in the monitoring activities. Where skills do not exist, or where significant impacts are involved, ABM will retain external experts to verify its monitoring information. In instances where a third party has responsibility for managing specific risks and impacts and associated mitigation measures, ABM will collaborate in the establishment and monitoring of such activities.

9.2.3 On-going inspections and continuous improvement

On-going inspection and continuous improvement will form a key component of the ESMPs as documents associated with the ESMPs will be regularly reviewed and updated. Research on certain aspects will be undertaken to refine environmental management and to ensure that the levels of environmental protection outlined in this ESMP are achieved.

Owing to the transient nature of the construction phase, the greatest source of information will be obtained through on-going visual inspection. At the same time some potential impacts are difficult to monitor quantitatively, such as soil erosion and waste management. An on-going, but pragmatic inspection regime will be developed that allows for potential E&S non-conformances to be identified proactively so that mitigation can be quickly and effectively implemented.

9.2.4 Internal and external audits

Audits of the environmental performance of the project will be undertaken on an annual basis by accredited institutions. The purpose of the audits will be to:

- Assess compliance with the conditions of the Environmental Licence and Certification,
- Determine if the objectives and targets outlined in the ESMPs and SOPs are being met.

The findings of external, internal and informal environmental reviews will be recorded and items requiring action will be identified. The implementation of these actions will be assessed in the following audit. Where the monitoring data and the inspection reports highlight problems, an internal audit can be used to ascertain the source of the problem and to define action to prevent its recurrence.

The three key areas for audit are operating efficiencies of facilities, project procedures and their implementation, and Contractor's E&S performance.

9.3 INCIDENTS REPORTING, NON-COMPLIANCE AND CORRECTIVE ACTION

9.3.1 Incident Documentation and Reporting

ABM and its contractors will develop procedures for managing E&S incidents, subject to approval by its senior management. A report will be completed for all incidents, and appropriate action taken where necessary to minimise any potential impacts. The relevant Congolese authorities will be informed of any environmental incident, in accordance with legislative requirements. A procedure for reporting E&S complaints from the affected community and employees will be developed prior to the onset of construction activities and will be applicable to all phases.

Notification of an incident or emergency will include the following:

- Description of the incident;
- The location of the emergency or incident;
- The name and telephone number of the designated contact person;
- The time of the emergency or incident;
- The suspected cause of the emergency or incident;
- The environmental harm and/or environmental nuisance caused, or suspected to be caused, by the emergency or incident; and
- The action taken to prevent future occurrence of the incident and mitigate any harm and/or environmental nuisance caused by the emergency or incident.

The Incident reporting and documentation requirements will be based on best practice principles, and will take the following requirements into account:

- Documents associated with the ESMPs will be regularly reviewed and updated by all environmental management parties;
- External environmental audits will be conducted quarterly during the construction phase and annually during the operation phase by accredited institutions that are vetted by the local authorities. Internal audit will be conducted regularly for the duration of the project's life cycle. The purpose of the audits will be to assess compliance with the conditions of the Environmental Licence, and objectives and targets outlined in the ESMPs, and its various management tools;
- The findings of external, internal and informal environmental reviews will be recorded and items requiring action will be identified from the recommendations made and Action Plans developed;
- ABM is contractually obliged to fulfil any reasonable recommendations, and implementation of applicable ESMP.

9.3.2 *Non-Compliance*

An ESMP is deemed not to have been complied with when:

- There is evidence of contravention of the recommendations in the document, its environmental specifications or the developed Method Statements or Standard Operating Procedures;
- If Company activities take place outside the legal boundaries of the concession area;
- Environmental damage ensues due to negligence;
- Personnel fail to comply with corrective or other instructions that have been issued as corrective measures; and
- Personnel fail to respond adequately to complaints from the public or Congolese authorities.

9.3.3 *Corrective Action*

There are several mechanisms for implementing corrective action and they include verbal instructions, written instructions and contract notices.

Verbal instructions are likely to be the most frequently used form of corrective action and are given in response to minor transgressions that are evident during routine site inspections. Verbal instructions are also used to create further awareness amongst Contractors, as often the transgressions are a function of a lack of awareness.

Written instructions will be given following an audit. The written instructions will indicate the source or sources of the problems, and proposed solutions to those problems. The implementation of these solutions can also be assessed in a follow-up audit and further written instructions issued if required. All written instructions will be centrally logged to ensure that there is an auditable record of such instructions and how they were responded to.

A contract notice is a more extreme form of written notice because it reflects the transgression as a potential breach of contract. If there is not an adequate response to a contract notice, then the next step can be to have the contractor removed from the site and the contract cancelled. Contracts will be drafted with this in mind.

9.4 MANAGEMENT REVIEW

The process of management review is in keeping with the principle of continual improvement. As such, ABM will develop a management review procedure to ensure that the Company defines and maintains a documented process and agenda for Senior Managers to periodically review the continuing suitability, adequacy and effectiveness of the ESMP. The management review, which will be conducted annually, will include a review of internal and external audit

reports as well as well as the cost estimates for implementation of the ESMPr. The purpose of the review is to critically examine the effectiveness of the ESMPr and its implementation and to decide on potential modifications as and when necessary.

9.5 FINANCIAL RESOURCES

The proponent will be responsible for ensuring that sufficient financial resources are made available for the effective implementation of the requirements of this ESMPr. Where applicable, and particularly during the construction phase, ABM will need to ensure that all contractors are aware of their obligations in terms of this ESMPr and that they have made appropriate financial provisions to ensure full compliance.

10. MONITORING PROGRAMME

10.1 INTRODUCTION

This Monitoring Programme outlines the E&S monitoring requirements for the Construction and Operational Phases of the ABM Bisie Tin Mining Project. This programme has been based on the findings of the ESHIA and the contents of the ESMP and will be periodically reviewed and updated. Please note that where standards are available for the host country, these will be compared to international standards and where there is a difference, the most stringent requirement for each monitoring parameter will be adopted.

10.1.1 Objectives

The objectives of the Monitoring Programme are:

- To confirm compliance with commitments to legislative and non-legislative E&S Standards detailed in Chapter 4,
 - The Quality of Water for Human Consumption;
 - IFC Performance Standards on Environmental and Social Sustainability (2012);
 - IFC General EHS Guidelines (2007);
 - Environment, Health and Safety Guidelines for Mining. (IFC, December 2007), and;
 - Guidelines for Drinking Water Quality (WHO, 2011).
- To provide early warning of potential impacts, determine the extent of predicted impacts and identify any unforeseen impacts associated with the project activities;
- To provide a baseline E&S data set;
- To provide feedback on the adequacy of environmental management practices and allow improved practices to be developed to continuously improve operations;
- To detect and measure environmental trends or changes and enable analysis of their cause; and
- To provide site management with information and data that can be used as a basis for decision making.

Baseline data will be used to compare pre-project conditions with future phases of the project. Where baseline conditions are not known or deficient, this programme describes additional baseline data requirements.

10.1.2 Monitoring Categories

Three monitoring categories shall be included and these are described below.

1. **Discharge (Emission) Monitoring:** - This will involve monitoring of contaminants being discharged or emitted from construction and operational activities into the environment. Discharge or emission monitoring will be undertaken either at the discharge point or within the local catchment area. Discharge monitoring will provide direct information concerning the concentrations and loads of contaminants being discharged from the operation, and will also serve as a link between ambient monitoring results and the operation itself.
2. **Ambient Monitoring:** - This involves the monitoring of background conditions and receiving environments that could be affected by project construction activities. While discharge monitoring should determine if environmentally significant releases have occurred, effects on the ultimate receptors within the receiving environment beyond the boundary of the facility can be determined only by ambient monitoring. Ambient monitoring will be undertaken for surface water (both upstream and downstream in project-affected rivers), groundwater, ambient dust, noise & vibration monitoring, workplace air quality,

3. **Investigation Monitoring:** - This will be completed as required to determine the occurrence, nature and extent of possible impacts following an environmental incident, such as oil spillage, or to verify/refute third-party claims of environmental impacts. For example, investigation monitoring may be undertaken upstream of a routine monitoring point to identify a source of contamination.
4. **Occupational Health and Safety Monitoring:** - The working environment will be monitored for occupational hazards relevant to the project. Occupational Health and Safety monitoring will be designed and implemented by accredited professionals as part of an occupational health and safety monitoring program with recognition for post-closure long term health concerns. As part of the monitoring programme, occupational accidents, diseases and dangerous occurrences and accidents will be documented for all facilities.

10.1.3 Monitoring Responsibilities

Implementation of the environmental component of the programme is primarily the responsibility of the Environmental Manager. However, the Occupational Health and Safety Manager will be responsible for monitoring employee health statistics while the Health Coordinator will be responsible for monitoring public health issues. The Human Resources Manager will be responsible for monitoring employment statistics. ABM, through the EHS Manager, will ensure that bio-physical monitoring responsibilities are clearly defined within the EHS Department. Where appropriate, ABM will consider involving representatives from affected communities to participate in the monitoring activities. Where skills do not exist, or where significant impacts are involved, ABM will retain external experts to verify its monitoring information. In instances where a third party has responsibility for managing specific risks and impacts and associated mitigation measures, ABM will collaborate in the establishment and monitoring of such activities.

10.1.4 Quality Assurance / Quality Control

ABM will implement a Quality Assurance / Quality Control (QA/QC) programme as part of the monitoring programme. The programme will include the following elements:

1. All sample vessels shall be clearly labelled;
2. Results of all duplicates and blanks are checked against other samples for compliance. Where non-compliance is found, the on-site laboratory will be notified and asked to re-run the test;
3. The regular maintenance and calibration of on-site monitoring equipment, as per the manufacturers' instructions;
4. The regular use of appropriately qualified and regulated external laboratories to verify on-site monitoring results;
5. Chain-of-custody procedures for sample handling and transportation;
6. On-site laboratory procedures manual for analytical methodologies; and
7. Standard sampling procedures for laboratory samples will be adhered to and the samples analysed within 48 hours as per procedure.

10.1.5 Review and Modification of the Monitoring Programme

Data from the monitoring programme will be continually reviewed and trends will be identified. The monthly Environmental Report will subsequently become a basis for discussion on monitoring programme effectiveness, and the need (if any) for changes to sampling sites, sampling frequencies and analytical methods. The environmental report will also include recommendations from the MICOA regarding any necessary changes to the programme. Modification of the programme will also be required:

1. When the configuration or operation of the Project changes significantly; and/or
2. Where environmental or social impacts vary from initial predictions; and/or
3. In response to new company commitments, legislative / financing requirements or

stakeholder concerns.

10.1.6 Reporting

Monitoring results will be compiled by the Environmental Manager for submission to the General Manager on a monthly basis. Environmental monitoring results shall be incorporated into quarterly, bi-annual and annual reports.

10.2 REGULATORY FRAMEWORK AND POLICY GUIDELINES

Regulatory framework and policy guidelines including applicable national legislation and guidelines as well as international guidelines and conventions have been discussed in chapter 4 of this report.

In accordance with IFC Performance Standards (IFC, 2012), in particular PS 1 (*Assessment and Management of Environmental and Social Risks and Impacts*), ABM will establish procedures to monitor and measure the effectiveness of the management programme, as well as compliance with any related legal and/or contractual obligations and regulatory requirements.

Where the government or other third party has responsibility for managing specific risks and impacts and associated mitigation measures, the client will collaborate in establishing and monitoring such mitigation measures. Where appropriate, clients will consider involving representatives from Affected Communities to participate in monitoring activities.

In addition and as required by Performance Standard 3 "*When host country regulations differ from the levels and measures presented in the EHS Guidelines, clients will be required to achieve whichever is more stringent*".

10.3 WATER QUALITY MONITORING

There are two major watercourses located within, or in the vicinity of the project area; the Oso and Bisie Rivers. Issues affecting ambient water quality mainly relate to surface run-off from areas subject to mining activities and effluent discharge and an increase in turbidity near cleared areas and the seepage of process water from backfill to the groundwater system. Water quantity, both ground and surface water, will be affected by increased water use associated with the mining operations.

The surface and ground water as well as waste and wastewater specialist reports identified a number of mitigation measures, based on informed predictions, aimed at reducing potential impacts on the ambient water quality. In order to track impacts and the effectiveness of proposed mitigation measures, a pre-construction ambient water baseline must be established over a period of one year and key indicators must continue to be monitored throughout the life of the project.

This baseline and subsequent monitoring must cover both water availability (quantity through water level) and quality for both surface and groundwater sources. As water from both of these sources is used by local communities, the baselines for surface and ground water may include all monitoring group parameters listed in this chapter. Until a statistically-valid baseline has been established (as per the parameter's and limits detailed in Table 10.1), the results will be compared with potable water guidelines listed in this chapter in order to identify areas of concern.

If project-related contamination or sedimentation is identified and poses a risk to downstream water resource use or aquatic ecology, ABM will undertake to mitigate the effects of the contamination without delay, compensate for any loss of water use, and prevent further deterioration. These measures may include changes to operational practices.

It should be noted that the TSF will be lined, however, measure will be implemented for possible seepage of leachate. A moderate potential exists for AMD formation from the waste stockpile and TSF due to the high sulphur content and acid generation potential. As a result of AMD, the potential exists for low pH water, bearing high concentrations of Al, Cd, Co, Cr, Cu, Fe, Mn, Ni, V, and Zn to seep into the aquifers beneath these facilities during the operational phase.

Table 10.1: Proposed Parameters for regular *in situ* Ground and Surface Water Monitoring

Variable	Units	Limits	References
Salinity, Electrical conductivity / salinity	mS/m or ppt	Total Dissolve Solids/Salts TDS (mg/l) = EC (mS/m) x 6.5 at 25 °C.	DWAF 1996
		Recommended range for groundwater TDS is 4.55 to 6207.5 mg/l (0.7 to 955 mS/m).	UK DWI 2006
		For potable water TDS should be ≤600 mg/l and will be unpalatable at ≥1000 mg/l.	WHO 2011
pH @ 25°C	1 – 14 pH units	Surface water (freshwater) pH 6 to 9	ANZECC 2000
		Groundwater pH 4.7 to 9.6	UK DWI 2006
Temperature	°C	<3° differential	IFC 2007
Dissolved Oxygen (DO)	Mg/L or % O ₂	Surface water (freshwater) 5.5 to 6 mg/l	CCME 1999
		Groundwater 0.1 to 14.7 mg/l	UK DWI 2006
Turbidity	NTU	1 NTU	WHO 2011
AMD (Sulphate and Heavy metals: As, Al, Co, Cr, Zn, Cd, Cu, Fe, Ni, V, Mn);		See Table 10.2 and 10.5 (for sulphate)	ANZECC 2000 WHO 2011
Aquatic life including invertebrate sampling and analysis	SASS5 Score and Shannon Weiner Diversity Index (Invertebrate)		DWAF 1996
	Fish catch per unit effort numbers and fish species diversity.		
<p>DWAF, Department of Water Affairs and Forestry; UK DWI, United Kingdom Drinking Water Inspectorate; WHO, World Health Organization; ANZECC, Australian and New Zealand Environment and Conservation Council; MICOA, Ministry of Coordination of Environmental Affairs; CCME, Canadian Council of Ministers of the Environment; IFC, International Finance Corporation.</p>			

10.3.1 Ambient Surface Water Monitoring

The Australian and New Zealand Guidelines for fresh and marine water quality (ANZECC 2000) were considered for adoption in this ESMP. It is recommended that these guideline limits (Table 10.2) should be used as reference until a statistically valid ambient surface water quality baseline is established for the site and a 24-monthly value per site is recommended. The objectives of ambient surface water monitoring include:

1. To establish a comprehensive pre-development surface water baseline, including reference sites, covering both quality and quantity of resources.
2. To identify any Project-related impacts on surface water quality by monitoring water quality upstream and downstream of the Project site.
3. To assess the effectiveness of mitigation measures aimed at minimizing impacts of the mine on surface water resources.

According to the ANZECC (2000), two indicative values are recommended for use; Long-term trigger value (LTV) and Short-term trigger value (STV).

The LTV is the maximum concentration (mg/L) of a contaminant in the irrigation water which can be tolerated assuming 100 years of irrigation.

The STV is the maximum concentration (mg/L) of contaminant in the irrigation water which can be tolerated for a shorter period of time (20 years) assuming the same maximum annual irrigation loading to soil as LTV.

Table 10.2: Proposed Parameters for Surface Water Monitoring

Parameter	Unit	ANZECC	
		STV	LTV
Aluminium	mg/l	5	20
Arsenic	mg/l	0.1	2
Beryllium	mg/l	0.1	0.5
Boron	mg/l	0.5	0.5 to 15
Cadmium	mg/l	0.01	0.05
Chromium VI	mg/l	0.1	1
Cobalt	mg/l	0.05	0.1
Copper	mg/l	0.2	5
Fluoride	mg/l	1	2
Iron	mg/l	0.2	10
Lead	mg/l	2	5
Lithium	mg/l	2.5	2.5
Manganese	mg/l	0.2	10
Mercury	mg/l	0.002	0.002
Molybdenum	mg/l	0.01	0.05
Nickel	mg/l	0.2	2
Nitrogen	mg/l	5	25
Phosphorus	mg/l	0.05	0.8
Selenium	mg/l	0.02	0.05
Uranium	mg/l	0.01	0.1
Vanadium	mg/l	0.1	0.5
pH		6	9
Zinc	mg/l	2	5

ANZECC; Australian and New Zealand Guidelines for fresh and marine water quality, LTV; Long-term trigger value, STV; Short-term trigger value

In addition to the water quality monitoring, SASS5 bio-monitoring methodology for aquatic life including invertebrate sampling and analysis should be considered as part of the surface water ecological health monitoring. The SASS5 method is fully described in Dickens and Graham (2002) and has been specifically designed to comply with international accreditation protocols of this nature. The SASS5 method is an adaptation to South African conditions of the British Biological Monitoring Working Party (BMWP) method. It has been assumed that conditions in the DRC would conform, largely, to those found in South Africa.

10.3.2 Groundwater Monitoring

Due to the proximity of water supply boreholes and streams to the proposed mine, ground water monitoring will be conducted quarterly and will include monitoring of boreholes and community wells. The objectives of the groundwater monitoring are as follows:

1. To establish the seasonal baseline ground water level and quality.
2. To track trends in ground water quality and levels relative to the pre-mining baseline
3. To determine whether village water sources are adequately protected from mine-related impacts.

4. To indicate when corrective or prevention measures are required to maintain water levels and quality.
5. To monitor the effectiveness of mitigation measures.

Groundwater is a slow-moving medium and drastic changes in the groundwater composition are not normally encountered within days. However, monitoring of the ground water resource is as important as the ambient surface water. Until such time as the groundwater quality for the area is established and in the absence of guideline limits for ground water quality in the DRC, the groundwater quality will be benchmarked against those of the IFC EHS Guidelines for Mining. Groundwater level monitoring points, including village wells, will be identified and included in the water quantity monitoring regime.

10.3.3 Potable Water Quality

The monitoring of potable water on site will be adequately treated and benchmark against the most stringent standards on the WHO (2011) Drinking Water standards (Table 10.3).

Table 10.3: Potable Water Quality Guidelines applicable to the project

Pollutant/Measure	Units	WHO
Arsenic	mg/l	0.01
Barium	mg/l	0.7
Boron	mg/l	0.5
Bromine	mg/l	-
Chromium	mg/l	0.05
Calcium	mg/l	-
Fluoride	mg/l	1.5
Manganese	mg/l	0.4
Magnesium	mg/l	-
Molybdenum	mg/l	0.07
Selenium	mg/l	0.01
Uranium	mg/l	0.015
Sodium	mg/l	-
Nitrate (NO ₃) as N	mg/l	-
Nitrite (NO ₂)	mg/l	-
Ammonium (NH ₄)	mg/l	-
Phosphorous (P)	mg/l	-
Sulphate	mg/l	-
Total Suspended Solids	mg/l	-
Soluble Organic Carbon	mg/l	-
Cadmium	mg/l	0.003
Cyanide	mg/l	0.07
Mercury	mg/l	0.006
Aluminium	mg/l	-
Iron	mg/l	-
Zinc	mg/l	-
Chloride	mg/l	5
Chlorine	mg/l	-
Chlorite	µg/l	700
Antimony	µg/l	20

Pollutant/Measure	Units	WHO
Copper	mg/l	2
Lead	µg/l	10
Nickel	µg/l	70
Coliform organisms (Total Coliform and E. Coli)	MPN/100ml	-
Turbidity	NTU	-
Hardness	mg CaCO ₃ /l	-
Conductivity	mS/cm	-
pH		-
Dissolved salts	mg/l	-

Note: The blue highlighted cells indicate the most stringent requirements that will be adopted

10.3.4 Point Source Discharge

This section provides effluent monitoring details, guidelines and standards for point source discharge for process effluent (inclusive of all effluent discharge from mine and processing plants, waste disposal facilities, or drainage from WRD or TSF, storm water and site runoff) and sanitary effluent. It is intended that the tailing and underground decant water will be captured, treated and reused as process water. Discharged process effluent and sanitary effluent will comply with the limits specified in Tables 10.4 and 10.5, respectively. In cases where it is likely that storm water may have been contaminated by chemicals directly associated with the mining project operations, the monitoring parameters provided in Table 10.4 would have to be extended to include such chemicals.

Table 10.4: Process Effluent Discharge Guidelines applicable to the project

Pollutant/Measure	Units	AfDB	IFC Mining (2007)
Aluminium	mg/l	-	-
Ammonia	mg/l	-	-
Arsenic	mg/l	-	0.1
Beryllium	mg/l	-	-
BOD	mg/l	50	50
Boron	mg/l	-	-
Cadmium	mg/l	0.1	0.05
Chromium (Total)	mg/l	1	-
Chromium (VI)	mg/l	-	0.1
COD	mg/l	100	150
Copper	mg/l	1	0.3
Cyanide	mg/l	-	1
Cyanide (Free)	mg/l	-	0.1
Cyanide (Total)	mg/l	0.5	-
Cyanide WAD	mg/l	-	0.5
dissolved oxygen	mg/l	-	-
Floating material	Present / Absent	-	-
Fluorides	mg/l	-	-
Iron (Total)	mg/l	-	2
Lead	mg/l	0.5	0.2
Manganese	mg/l	-	-

Pollutant/Measure	Units	AfDB	IFC Mining (2007)
Mercury	mg/l	0.01	0.002
Nickel	mg/l	5	0.5
Nitrate	mg/l	-	-
Nitrite	mg/l	-	-
Nitrogen	mg/l	15	-
Oil and Grease	Present / Absent	20	10
Poly-aromatic Hydrocarbons (PAH)	mg/l	-	-
pH	S.U.	6 - 9	6 – 9
Phenols	mg/l	-	0.5
Phosphorous	mg/l	2	-
Residual chlorine	mg/l	-	-
Selenium	mg/l	-	-
Silver	mg/l	-	-
Substances that react with methylene blue	mg/l	-	-
Sulphide like hydrogen disulphide	mg/l	-	-
Temperature	° C	-	<3° differential
Tin	mg/l	-	-
Total Suspended Solids	mg/l	-	50
Uranium	mg/l	-	-
Zinc	mg/l	-	0.5

Note: The blue highlighted cells indicate the most stringent requirements that will be adopted

β: Applicable to all discharge if the recipient body is the sea / ocean

Table 10.5: Sanitary Effluent Discharge Guidelines applicable to the project

Pollutant/Measure	Units	IFC Gen. EHS (2007)	AfDB	Most Stringent
Colour	Present / Absent	-	-	Absence
Smell	Present / Absent	-	-	Absence
Total Suspended Solids	mg/l	50	-	50
pH	S.U.	6-9	-	6-9
COD	mg/l	125	100	100
BOD	mg/l	30	50	30
Oil and Grease	mg/l	10	-	10
Total Nitrogen	mg/l	10	15	10
Total Phosphorus	mg/l	2	2	2
Total Coliform bacteria	MPNb/100ml	400a	400g	400
Temperature increase	°C	-	-	35°

10.3.5 Water and Effluent Sampling Locations

The location of all surface and ground water quality sampling points are provided in Table 10.6 and Figure 10.1. Control sampling points, typically unaffected by project activities, are included in the monitoring points and form part of the water monitoring programme. Sites for monitoring of point source discharges (including storm water run-off and sanitary effluent) have not yet

been identified but will be identified for inclusion by ABM as part of its detailed design and mine planning activities. This monitoring plan will then be updated accordingly.

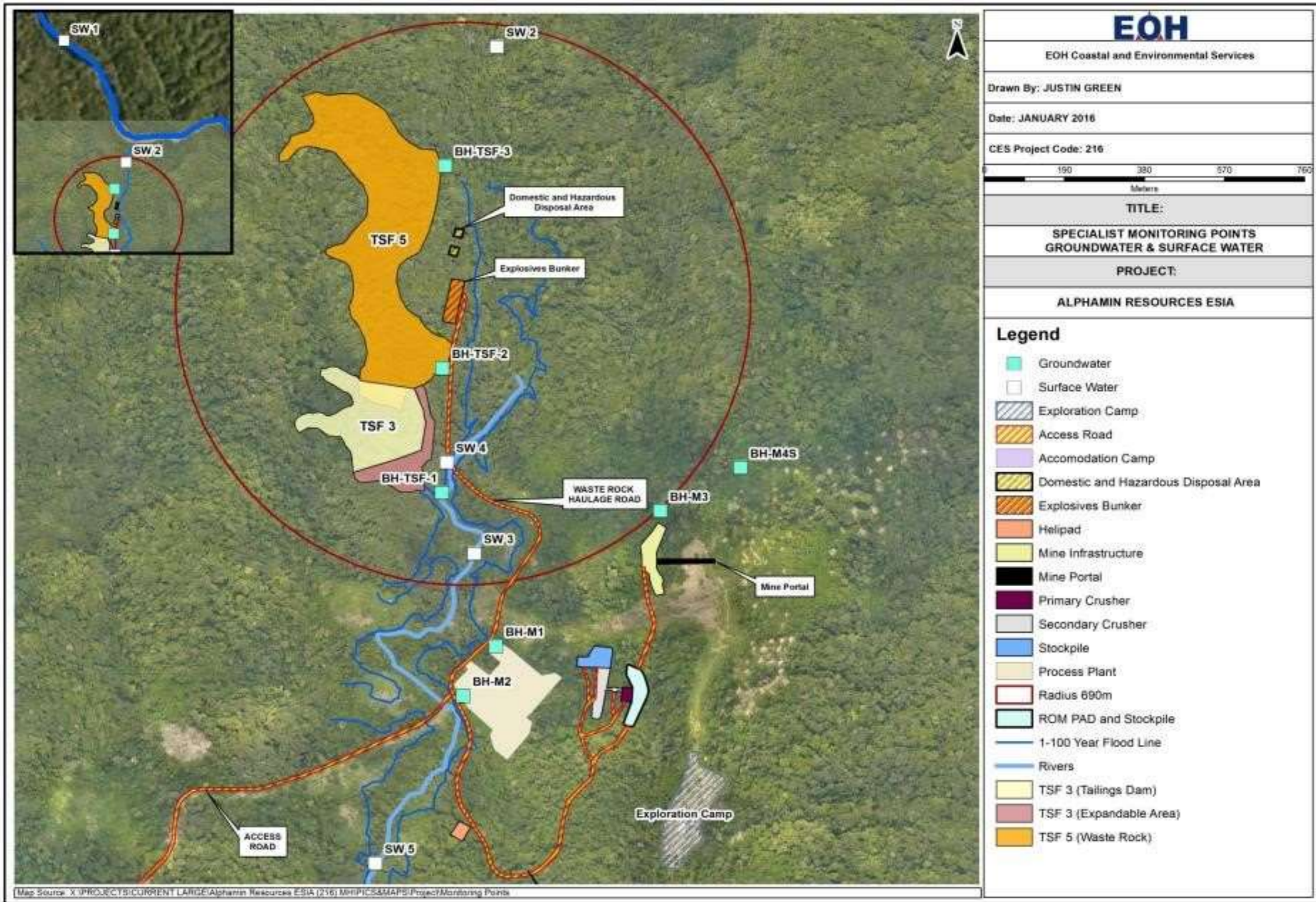


Figure 4: Location of surface and groundwater monitoring points

It is important to note that despite the baseline data collection being conducted over the period of one year, the data obtained will nevertheless provide only a 'snap shot' of the water quality situation in the project area. Other variables, such as climate change, droughts and floods will also affect longer term variability in water quality parameters. In order to enable some interpretation of these longer term drivers, an offsite "control" monitoring site will be included in the monitoring plan. This area will not be affected by project activities and therefore changes measured here over time will provide some insight into longer term trends in water quality unrelated to project activities.

Table 10.6: Surface and ground water sampling points

Proposed Surface Water Monitoring Sites				
Site Name (River)	Site Type	Requirement	Latitude	Longitude
Oso River – SW 1	River	SASS5	1° 0'34.47"S	27°44'1.65"E
Bisie River – SW 2	Stream		1° 1'17.50"S	27°44'23.06"E
Bisie River – SW 3	Stream		1° 1'57.65"S	27°44'17.09"E
Bisie River – SW 4	Stream		1° 1'50.36"S	27°44'19.20"E
Bisie River – SW 5	Stream		1° 2'22.06"S	27°44'13.72"E
Proposed Ground Water Monitoring Sites				
Site ID	Site Type	Requirement	Latitude	Longitude
BH-M1	Mine	ISO5667-1 ASTM D4448-01 (2013) Standard Guide for Sampling Ground-Water Monitoring Wells	1° 2'40.88"S	27°44'22.98"E
BH-M2	Mine		1° 2'80.82"S	27°44'20.46"E
BH-M3	Mine		1° 2'40.26"S	27°44'35.63"E
BH-M4S	Mine		1° 1'50.78"S	27°44'41.81"E
BH-M4D	Mine		1° 1'50.78"S	27°44'41.81"E
BH-TSF-1	TSF		1° 1'52.74"S	27°44'18.84"E
BH-TSF-2	TSF		1° 1'42.93"S	27°44'18.87"E
BH-TSF-3	TSF		1° 1'26.91"S	27°44'19.09"E

SW = Surface Water; BH = Borehole; SASS5 = South African Scoring System Version 5

10.3.6 Monitoring Frequency

The frequency of monitoring for surface and groundwater, including the bio-monitoring of invertebrates, is summarized in Table 10.7.

Table 10.7: Water, Sediment and Invertebrate Monitoring Frequency

Aspects	Requirement	Frequency
Potable water quality	<ul style="list-style-type: none"> Listed parameters in Table 10.5 All parameters are to be analysed to determine the baseline values. Based on the results obtained, the monitoring parameter list can be adjusted. Analysis for some parameters, where analysis is expensive, can also be curtailed if concentrations are consistently within acceptable limits. 	<ul style="list-style-type: none"> Twice a month initially for one year (baseline) and then once every quarter. Monitor full suite of parameters once in a three year cycle.
	Listed parameters in Tables 10.1 and 10.2	Twice a month during the construction and operational phases
Surface water quality	Listed parameters in Table 10.1	Twice a month for the first year (baseline) and then once every quarter.
	Listed parameters in Tables 10.2	Twice a month during the construction and operational phases
	Listed parameters in Table 10.5	Twice a month during the construction and operational phases.
Groundwater quality	Listed parameters in Table 10.1	Twice a month initially for the first year (baseline) and then once every quarter.
	Listed parameters in Table 10.5	Twice a month during the construction and operational phases.

Aspects	Requirement	Frequency
Water level	Groundwater level monitoring points including village wells	Every two weeks in Year 1 for baseline flow determination and once quarterly during construction and operational phases.
Sanitary effluent	Listed parameters in Table 10.4	Twice a month during the construction and operational phases for internal monitoring and once every quarter by a certified laboratory.
Invertebrate sampling and analysis	SASS5 Score and Shannon Weiner Diversity Index	Once a year for the life of the project

10.3.7 Quality Control Measures

Surface and Ground Water:

The following quality control measures will be applied:

1. Water sampling will always be done upstream of any water disturbance and positioned with the mouth facing upstream of water flow.
2. No overflow of water from the sample bottles will be allowed since some bottles are treated. No rinsing will be done when collecting water samples.
3. The right sample bottles will be used for each category of parameters namely chemical, physical and bacteriological. Shipment of samples will be done within 48 hours to the laboratory for analysis.
4. All the samples will be transported in cooler boxes to avoid significant change in temperature.
5. Samples will always be accompanied with shipping documents indicating the code for the sample as labelled on the bottle.

10.3.8 Contingency

If metal concentrations at village water sources approach or exceed drinking water quality criteria and are higher than the typical background (baseline) concentrations, ABM will undertake investigations to determine whether project activities are the root cause. If so, the company will undertake all steps practicable to ensure that compliance with drinking water guidelines or background concentrations is maintained. If required, alternative water supplies will be provided. If water levels are reduced due to project related activities, similar corrective measures as for water quality will be implemented. In this case, measures to ensure that affected communities have continued access to water will be put in place.

If exceedance of drinking water guidelines or background concentrations at village water sources provided by ABM is not attributable to project activities, ABM will endeavour to determine the cause of the exceedance and assist the community with the management of water quality issues for example by informing the community of contamination pathways and measures that may be implemented to prevent contamination or by informing relevant government institutions.

10.4 METEOROLOGY

It will be necessary to collect meteorological data to facilitate the analysis of water, erosion and ambient air quality monitoring data.

10.4.1 Objectives

The objectives of the meteorological monitoring are to compile a record of on-site climatic data to assist in the environmental management of the Project, in particular, the design and sizing of water management structures, to improve the accuracy of hydrological models and to aid in the interpretation of ambient air quality monitoring data.

10.4.2 Parameters, Frequency and Sampling location

An on-site Automated Weather Station should be commissioned at the mine premises that measures hourly values for the following parameters: wind speed and direction, ambient temperature, relative humidity, barometric pressure, solar radiation, and precipitation. This will allow for data to be collected continuously and will be downloaded and stored securely at regular intervals (at least monthly). Such a meteorological station would require calibration annually.

10.4.3 Quality Control Measures

The quality control of data obtained from the automated weather station will be managed according to the Guidelines on Quality Control Procedures for Data from Automated Weather Stations (2004).

10.5 AIR QUALITY MONITORING

Air Quality Performance indicators are usually selected to reflect both the source of the emission directly and the impact on the receiving environment. Ensuring that no visible evidence of windblown dust exists represents an example of a source-based indicator, whereas maintaining off-site dustfall levels to below 600 mg/m²/day represents an impact- or receptor-based performance indicator. Source-based performance indicators have been included in most international regulations. Source based performance indicators for the unpaved roads would be no visible dust when trucks/vehicles drive on the roads. Dust fallout in the immediate vicinity of the haul road perimeter must be less than 1200 mg/m²/day and less than 600 mg/m²/day at the sensitive receptors (villages en route).

From all activities associated with the proposed activities, dust fallout rates will not exceed 600 mg/m²/day outside the project area for on-site activities or at the sensitive receptor areas for on-site and off-site activities. Depositional dust that may be generated from active construction and operational areas (e.g. access roads and construction sites) will be monitored within the project area, at nearby villages and at suitable control sites and compared against the American Society for Testing and Materials (ASTM) D1739:1970 (Table 10.8). Duplicate samples and blank samples will be sent for analysis. The monitoring frequency will be monthly using fall out dust buckets.

Table 10.8: Acceptable dust fall rates as measured (using ASTM D1739:1970 or equivalent) at and beyond the boundary of premises where dust originates

Areas	Site ID	Dust fall rate (mg/m ² /day, 30-days average)	Frequency and Permitted Frequency of exceeding dust fall rate
Residential Area	Residential	D < 600	Monthly Two within a year, not sequential months
Non-Residential Area	Plant	600 < D < 1200	Monthly Two within a year, not sequential months

Background levels of gaseous pollutants, such as SO₂, Ozone, NO_x, NO₂, Benzene, and CO are always critical to determine if the environment is already under stress. The ambient air quality parameters that are to be measured and their applicable guidelines are shown in Table 10.9.

Table 10.9: Applicable Air Quality Guidelines

Pollutant/Measure	Averaging Period	Units	WHO
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Particulate matter (PM ₁₀)	1 Year	µg/m ³	30
	24-hours	µg/m ³	75
Particulate matter (PM _{2.5})	1 Year	µg/m ³	15
	24-hours	µg/m ³	37.5
Nitrogen dioxides (NO ₂)	1 Year	µg/m ³	40
	24-hours	µg/m ³	
	1-hour	µg/m ³	200
Sulphur dioxide (SO ₂)	1 Year	µg/m ³	-
	24-hours	µg/m ³	50
	1-hour	µg/m ³	
	10 minutes	µg/m ³	500
Ozone (O ₃)	1 Year	µg/m ³	-
	24-hours	µg/m ³	-
	8-hours	µg/m ³	160
	1-hour	µg/m ³	-
Sulphur dioxide (SO ₂)	24-hours	mg/Nm ³	2000
Lead (Pb)	1 Year	mg/Nm ³	-
Nitrogen Dioxides (NO ₂)	1-hour	mg/Nm ³	600
Ozone (O ₃)	24-hours	mg/Nm ³	-
Particulate Matter	24-hours	mg/Nm ³	100
Sulphur Dioxide (SO ₂)	24-hours	mg/Nm ³	2000
Carbon Monoxide (CO)	1-hour	mg/Nm ³	-

Ambient PM₁₀ and dust fall monitoring will be conducted on a continuous basis as part of mine's management plan. Dust fallout and ambient PM₁₀ monitoring can serve to meet various objectives, such as:

- Compliance monitoring;
- Validate dispersion model results;
- Use as input for health risk assessment;
- Assist in source apportionment;
- Temporal trend analysis;
- Spatial trend analysis;
- Source quantification; and,
- Tracking progress made by control measures.

10.5.1 Dust Monitoring

Management of the proposed Bisie Tin Project will implement and maintain a dust monitoring programme during the project life in order to collate continuous dust deposition data and have a repository of records covering the construction, operation and closure phase of the proposed operation. Availability of such records will assist management in managing dust impact, resulting in the reduction of respiratory diseases that are as a result of air pollution, reduced

risk of damage to property, improved visibility, fewer disturbances to existing flora and fauna habitats, and a reduction in air pollution.

As the amount of soil exposed is directly proportional to the amount of dust generated and the amount of dust transported, construction during the windy periods may be limited. If construction has to be done during this period, only a small area will be disturbed at a time. As haul roads are a major source of dust, reducing speed of trucks to 30km/h in haul roads will reduce dust immensely.

In order to determine the windy periods, a wind anemometer will be installed on site. Wind speed will be recorded daily and when speeds it exceeds 5.4 m/s (this is the threshold for transporting particles) extra dust control measures will be carried out. During dust generating periods, sprinkling of the area until it is moist is ideal for haul roads and traffic routes (Smolen et al., 1988). It must be noted however that excessive sprinkling to manage dust may result in runoff from the site.

Mulching of recently disturbed areas can reduce the amount of wind erosion by 80% (Smolen et al., 1988). Other methods of reducing dust erosion include using wind breaks which can be natural or constructed. On disturbed areas which are not expected to handle traffic vegetative cover can be planted.

10.5.2 PM₁₀ Monitoring Programme

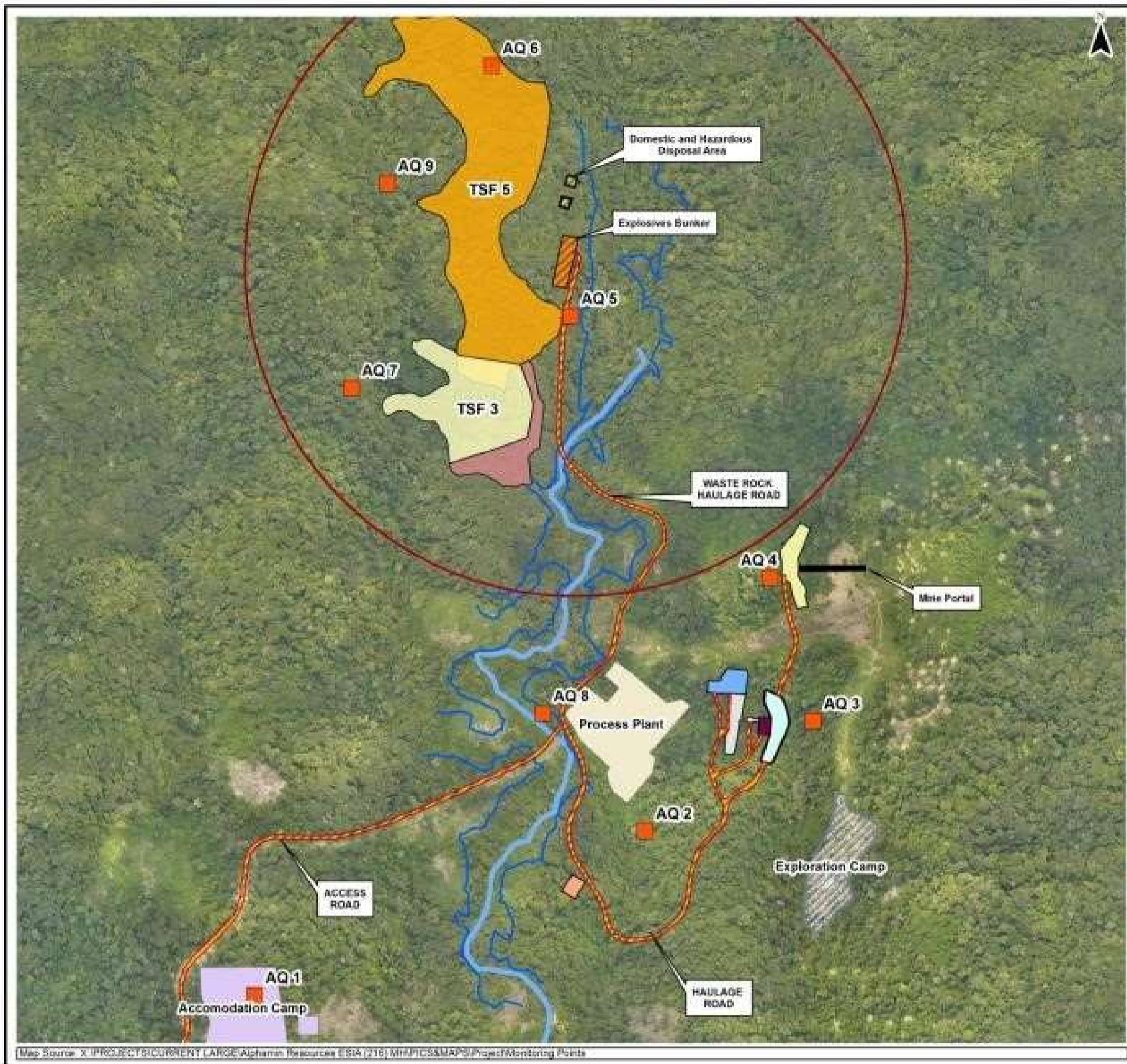
The project will establish a fine particulate monitoring programme, which will include one particulate instrument to monitor PM₁₀ and PM_{2.5} from the open pits and the material handling area. At least, two instruments will be purchased and located in the mine area and at a sensitive receptor downwind. Air dispersion modelling will always use site specific data as this data is extremely useful when analysing ambient concentrations of pollutants.

10.5.3 Sampling Locations

The required air quality sampling point locations are resented in Table 10.10 and Figure 10.2 below.

Table 10.10: Air Quality Sampling Locations at Sensitive Receptors

PROPOSED NOISE MONITORING SITES					
Site ID	Site Type	Class	Type of Monitoring	Latitude	Longitude
AQ 1	Accommodation Camp	1	Meteorological station; PM monitoring	1° 2'26.79"S	27°43'58.99"E
AQ 2	Mine	2	Dustbucket	1° 2'15.80"S	27°44'25.07"E
AQ 3	Mine	2	Dustbucket	1° 2'80.42"S	27°44'36.31"E
AQ 4	Mine	2	Dustbucket	1° 1'58.81"S	27°44'33.41"E
AQ 5	TSF	2	Dustbucket	1° 1'41.31"S	27°44'20.11"E
AQ 6	TSF	2	Dustbucket	1° 1'24.50"S	27°44'14.83"E
AQ 7	TSF	2	Dustbucket	1° 1'46.12"S	27°44'50.45"E
AQ 8	Processing Plant	2	Dustbucket	1° 2'70.91"S	27°44'18.24"E
AQ 9	TSF	2	Dustbucket	1° 1'32.39"S	27°44'70.84"E



[Map Source: X:\PROJECTS\CURRENT LARGE\Alphamin Resources\ESIA\216\MHF\PCS&MAPS\ProjectMonitoring Points

Figure 5: Air quality monitoring locations

10.6 NOISE AND VIBRATION MONITORING

A monitoring plan will be implemented to determine potential sources of noise, any increases and decreases in noise levels, and determine the level of mitigation required. Noise will be monitored monthly at the village closest to the mining activities, namely Ma Noire and the accommodation camp. Noise monitoring results will be benchmarked with ambient thresholds and occupational noise exposure within the mining facility as shown in the guideline limits below (Table 10.11).

Table 10.11: Ambient and Occupational Noise Level Guidelines (IFC 2007)

Ambient Noise	Applicability	Day time (07:00 – 22:00)	Night time (22:00 – 07:00)
		One hour LA _{eq} (dBA)	
	Beyond boundary of the facility	55	45
Occupational Noise	Applicability	Equivalent Level	Maximum
		8 hour LA _{eq, 8h} (dBA)	LA _{max, fast}
	Operational areas	85	110
	Control rooms and offices	50	-

Ground-borne vibration that may be generated from active construction areas and mining related activities will be monitored within the project area, at nearby villages and at suitable control sites. Monitoring results will be compared to international accepted safe PPV thresholds based on infrastructural types. The monitoring frequency shall be monthly and/or event based.

10.6.1 Sampling Locations

The locations of noise sampling points at the sensitive receptor are provided in Table 10.12 and their relative location in the project area is shown in Figures 10.3 below.

Table 10.12: Noise Sampling Locations at Sensitive Receptors

Site ID	Location	Latitude	Longitude
N 1	Ma Noire	1° 2'59.30"S	27°44'12.15"E
N 2	Accommodation Camp	1° 2'27.36"S	27°43'57.59"E
N 3	Processing Plant	1° 2'30.45"S	27°44'23.57"E
N 4	Mine Portal	1° 1'59.89"S	27°44'36.18"E

Components to be included in the proposed monitoring plan are discussed in Table 10.13 below.

Table 10.13: Ambient and Occupational Noise Monitoring

Method	Monitoring locations	Frequency	Target	Reporting
Monitoring in accordance with the IFC EHS guidelines; Noise measurement will be taken for a 24 hour period at each location	The noise measurements will be taken at the measurement locations N1 – N4) as per the baseline study	To be conducted on a quarterly basis throughout the life of mine. Once it is established that the mitigation measures have decreased the specific noise levels from the mining activities, the noise monitoring will be carried out on a bi-	Noise levels from the proposed mining activities should not result in a maximum increase in the existing background/ambient levels of 3dBA at the surrounding villages.	A report will be compiled quarterly/ bi-annual, depending on the intervals of the monitoring programme then submitted to management to ascertain compliance with the required standards

		annual basis thereafter.		
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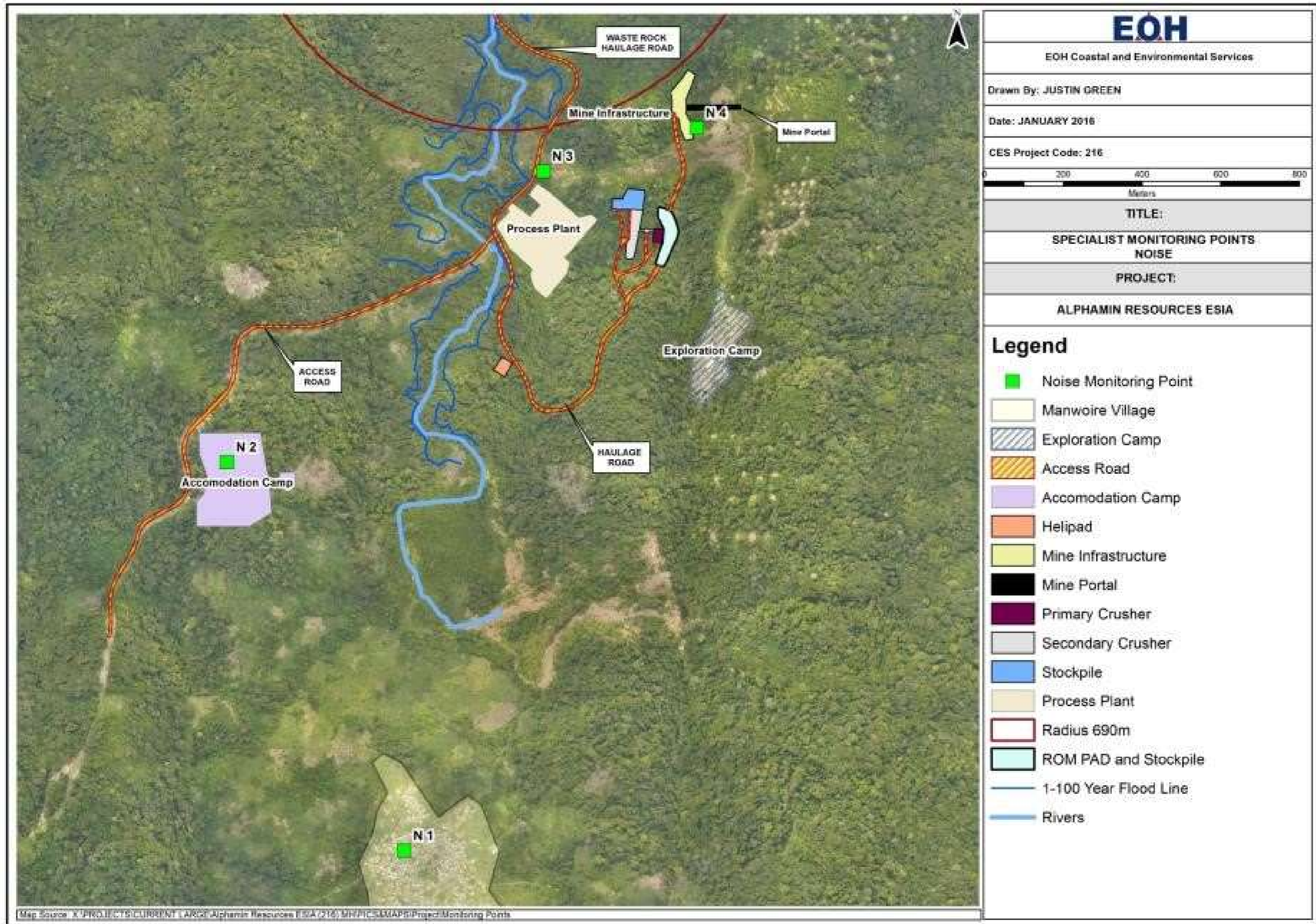


Figure 6: Noise monitoring locations

10.7 WASTE DISPOSAL FACILITIES AND PRACTICES

Various types of waste will be generated during the construction and operational phase. Major waste streams will be domestic waste, hazardous waste and construction waste. Management practices and disposal facilities will require monitoring to ensure compliance with best waste management practices.

10.7.1 Objectives

The objectives for monitoring waste disposal facilities are:

- To minimize the impact of wastes on human and environmental health.
- To ensure compliance with the Congolese waste management legislation.
- To comply with the EIA waste management commitments.

10.7.2 Parameters and Frequency

Parameters will include the physical state of waste storage facilities, volumes of waste generated, waste separation, presence of disease vectors, compliance with environmental/mining license conditions and state of housekeeping. Monitoring of waste management facilities will be conducted monthly.

10.7.3 Sampling Locations

Waste management will be monitored across the site as a whole.

10.7.4 Quality Control Measures

The waste management team will undergo basic training in waste management and records of their training will be maintained. Waste disposal log-books will be maintained and monthly averages used to identify areas where waste could not have been collected accordingly. Periodic waste discussions focused on lessons learnt will be held with the waste management team to identify areas of improvement. Periodic inspections and observations will be done to monitor waste management practices and behaviour and all the waste management records will be maintained in record books for inspections. Best management practices will also be attained through adherence to waste management permit conditions and general recommendations in the Regulations.

10.7.5 Contingency

ABM will ensure that non-compliances are attended to and where a storage facility cannot conform to the best practices perhaps due to location or other reasons, use of such facilities for waste management will be suspended until corrective measures are put in place.

10.8 SOIL AND REHABILITATION MONITORING

It is recommended that the success of the rehabilitation exercise be monitored from the commencement date and for five years subsequent to the final implementation phase. This recommendation is based on the need for clearer scientific understanding within the rehabilitation field, particularly with respect to indigenous rehabilitation and the natural processes of succession. In the first few years of mining specific Key Performance Indicators will need to be developed.

This can be achieved by setting up an on-going research project in which records kept by the Rehabilitation Officer (EA&R-SH) are analysed and assessed in a scientific basis. Coupled with this information, it is recommended that data be captured on a GIS system, to facilitate both management of rehabilitation and monitoring. The incorporation of general weather conditions affecting the success of rehabilitation should be incorporated into the monitoring programme.

The Rehabilitation Officer must compile quarterly monitoring reports to establish the success of the growth of planted species, the establishment of spontaneously germinating species, including weed species that are systematically removed. Any other important information will also be noted.

10.9 OCCUPATIONAL HEALTH AND SAFETY MONITORING

Occupational health and safety monitoring programmes will verify the effectiveness of prevention and control strategies. The selected KPIs are to be representative of the most significant occupational, health, and safety hazards, and the implementation of prevention and control strategies. The occupational health and safety monitoring programme will be designed and implemented by accredited professionals and will include plans for mitigating post-closure long term health concerns. Facilities will also maintain a record of occupational accidents and diseases and dangerous occurrences and accidents.

As a minimum, the occupational health and safety monitoring programme will include:

- **Safety Inspection, Testing and Calibration:** This will include regular inspection and testing of all safety features and hazard control measures focusing on engineering and personal protective features, work procedures, places of work, installations, equipment, and tools used. The inspection will verify that issued PPE continues to provide adequate protection and is being worn as required. All instruments installed or used for monitoring and recording of working environment parameters will be regularly tested and calibrated, and the respective records maintained.
- **Surveillance of the Working Environment:** Employers will document compliance using an appropriate combination of portable and stationary sampling and monitoring instruments. Monitoring and analyses will be conducted according to internationally recognized methods and standards. Monitoring methodology, locations, frequencies, and parameters will be established individually for each project following a review of the hazards. Generally, monitoring will be performed during commissioning of facilities or equipment and at the end of the defect and liability period, and otherwise repeated according to the monitoring plan.
- **Surveillance of Workers Health:** When extraordinary protective measures are required (for example, against biological agents and/or hazardous compounds), workers will be provided appropriate and relevant health surveillance prior to first exposure, and at regular intervals thereafter. The surveillance will, if deemed necessary, be continued after termination of the employment.
- **Training and Induction:** Training and induction activities for employees and visitors will be adequately monitored and documented (curriculum, duration, and participants). Emergency exercises, including fire drills, will be documented adequately. Service providers and contractors will be contractually required to submit to the employer adequate training and induction documentation before start of their assignment.

The employer will establish procedures and systems for reporting and recording occupational accidents and dangerous occurrences, and incidents. These systems will enable workers to report immediately to their immediate supervisor any situation they believe presents a serious danger to life or health. The systems and the employer will further enable and encourage workers to report to management all:

- Occupational injuries and near misses
- Suspected cases of occupational disease
- Dangerous occurrences and incidents

All reported occupational accidents, occupational diseases, dangerous occurrences, and incidents together with near misses will be investigated with the assistance of a person knowledgeable/competent in occupational safety. The investigation will:

- Establish what happened
- Determine the cause of what happened
- Identify measures necessary to prevent a recurrence

10.10 SOCIO-ECONOMIC MONITORING

ABM is responsible for implementing all compensation strategies developed and defined in the Compensation Plan. ABM will therefore assume responsibility for providing the funding for monitoring of affected persons and project affected people. Such monitoring is required to ensure that compensation mechanisms and strategies are properly implemented, is in line with the CP, that grievances are being attended to, and that any necessary changes to the overall process are being done in good time and sensibly. To be compliant with best practice monitoring will need to take place at two levels.

Internal Monitoring will be conducted by a suitably qualified person within the management of ABM. The form that this monitoring takes is flexible and can be tailored to the personnel and capacity of the management team. However it is strongly recommended that monitoring have at least three data sources. These would be:

- The Grievance
- Register results and minutes of the local level engagement programme as per the OP - Stakeholder Engagement
- Qualitative monitoring database developed as the baseline for the Social Impact Assessment for the project.

External Monitoring will be conducted through a contracted independent body so as to provide external third party verification of social monitoring data gathered by the internal monitoring team. Monitoring reports are a valuable tool in identifying problems in the implementation of the resettlement project and should be used as such. The monitoring team will revisit the monitoring plans after each monitoring exercise to evaluate findings and take necessary steps to rectify issues that have been highlighted by the monitoring reports. A manual for the usage of the protocols will be developed by the independent monitor.

The external Monitoring Team will visit the project area upon completion of the first phase of agricultural compensation and then two years later. The subsequent frequency can be determined after the first two visits. External monitoring will pay particular attention to the following aspects:

- Ensure that households who have lost crops and other forms of livelihood production have received fair compensation and that compensation rates are reviewed regularly.
- Examine the livelihood restitution strategies as determined by the OP - Resettlement and measure their progress. Indicators will be developed as part of the OP - Resettlement.

The following indicators will form part of the socio-economic internal and external monitoring framework:

10.10.1 Agriculture

Suggested indicators for monitoring:

1. Food security (including aspects of nutritional/health status by age and gender);
2. Commercial agricultural and farming income-generation;
3. Household incomes (not only money, but surrogate indicators such as suite of assets)

- owned (e.g. radios, bicycles, television, etc));
- 4. Housing, quality of roof, walls, floor;
- 5. Expenditure patterns;
- 6. Indebtedness/savings;
- 7. Access/use of services (social and physical infrastructure);
- 8. Project Affected People's views on progress toward restoration/enhancement especially those to be physically relocated;
- 9. Waged full/part-time jobs by household (ABM and non-ABM created jobs) by development phase (construction/operations);
- 10. Small-scale 'business' start-ups;
- 11. Numbers of shops/trading activities in villages/project area;
- 12. Changes in gender livelihood-focused activities and incomes;
- 13. Status of Vulnerable PAPs;
- 14. Grievances and resolution outcomes;
- 15. Livelihood diversity and relative contributions (numbers/incomes from charcoal production, fishing, bee-keeping/honey production, fishing, etc);
- 16. Improvement in production and income for women and youth.

10.10.2 Education

Suggested indicators for monitoring:

- 1. Where applicable, primary and basic enrolment levels by gender;
- 2. School buildings and equipment, including chairs;
- 3. Secondary enrolment levels by gender;
- 4. Pupil/teacher ratio;
- 5. Adult education enrolment level by gender;
- 6. Distance to primary school.

10.10.3 Health

Suggested indicators for monitoring:

- 1. Availability of and distance to safe drinking water and sanitation;
- 2. Incidence of main diseases/gender/age;
- 3. Death rates of main diseases/gender/age;
- 4. Maternity rates;
- 5. Mortality rate of infant/mothers during delivery;
- 6. Trained health staff/catchment population;
- 7. Distance to health centre;
- 8. Child nutrition: height for age (stunting), weight for age (wasting);
- 9. If possible, incidence of HIV and AIDS and of other STDs by gender and age;
- 10. All communicable and vector-related diseases.

10.10.4 Wider 'social' indicators (not in order of importance)

Suggested indicators for monitoring:

- 1. Local hiring as per policy;
- 2. Grievance and resolution outcomes;
- 3. Market prices (bartering items) for key food items;
- 4. Relevant information tracking from external parties;

5. Costs of social/welfare provisions/services (schools, clinics and medicines, local transport etc.);
6. Inflation (food basket);
7. Influx/in-migration;
8. Security/community incidents;
9. Number of local companies involved in supplying goods and services/value of goods and services provided (ABM local purchasing);
10. Return of youths to villages;
11. Village demographic changes (by age/sex);
12. Birth rates;
13. Nationalization progress (expatriates to nationals);
14. Intra-household conflicts;
15. Intra-community (villages) conflicts (elders/youths, political factionalism).

10.10.5 *Transport safety monitoring*

Transportation monitoring is required within and outside the project property to ensure that spacing, speed limits and other traffic regulations, protection of pedestrians and accident are adhered to. Proposed technologies could include using a satellite tracking and monitoring system.

11. DECOMMISSIONING AND CLOSURE REQUIREMENTS

11.1 CONCEPTUAL MINE CLOSURE PLAN

In accordance with DRC Mining legislation and IFC requirements, a Mine Closure Plan for the project will be required. This plan must support the operation in achieving a post closure status that leaves behind a positive legacy in the community. Health, safety, social, environmental, legal, governance and human resource aspects will need to be considered and addressed. As the project is currently in its feasibility stage, it is not possible to produce a detailed Closure Plan at this time.

However, it is possible to develop a conceptual closure plan that takes into consideration all relevant Congolese laws and the principles of the Integrated Mine Closure approach developed by the International Council on Mining and Metals (ICMM, 2008 - Figure 10.1). This approach encourages planning for closure becoming part of the design of a mine operation in order to facilitate closure. When a project is designed, there is a lot of scope to do so with closure in mind. For example, designing mine infrastructure in relation to the community's requirements.

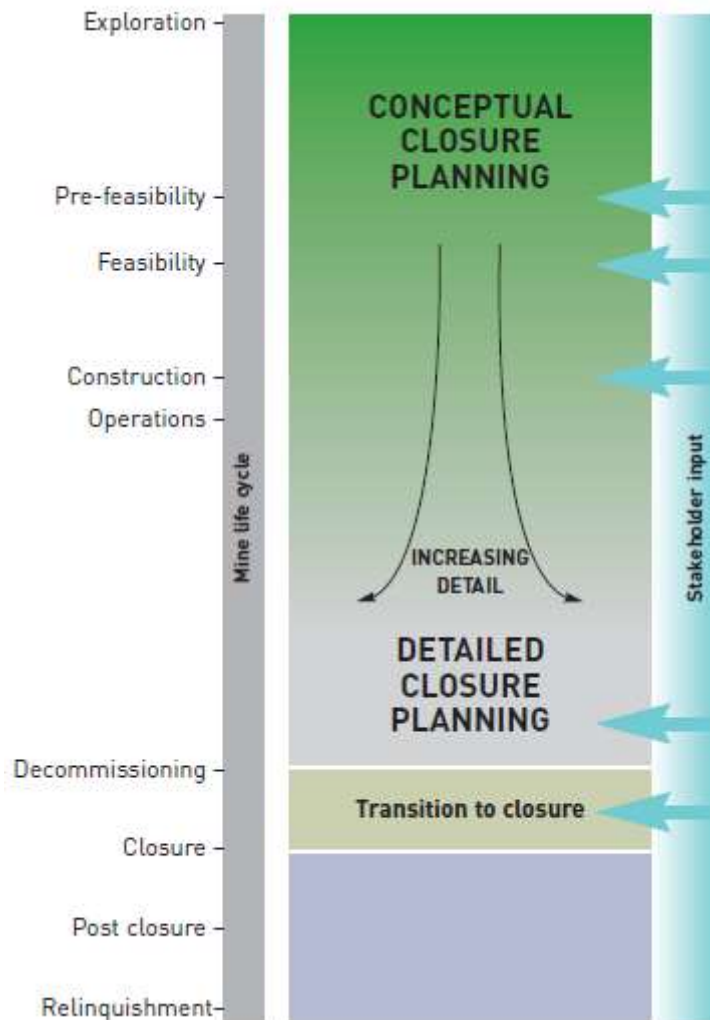


Figure 7: The integrated mine closure planning approach recommended by the ICMM (2008)

A mine closure plan for the project will be developed by ABM, initiated at this early stage as a Conceptual Closure Plan. A conceptual closure plan should communicate an outcome and goals of the closure activities, whereas a detailed plan includes milestones, detailed methodologies of achieving these, monitoring and validation processes. This can only come later at the more detailed engineering design phase. The Conceptual Closure Plan (presented in this chapter) is developed and used during exploration, pre-feasibility, feasibility/design and construction to guide the direction of activities. Its active life may be a few years, but if well-defined and based

on effective community and stakeholder engagement, it may not change much during this time. However, any closure plan must be reviewed at regular intervals over the life of the mine. Any change to, or new development associated with the project as currently proposed, would automatically trigger a revision of the Closure Plan and its budget to ensure that sufficient funds are available to cover any additional costs. This section of the report therefore serves to provide some of the broader principles and methodologies that will be adopted by the company for closure planning, and essentially provides the outcome and objectives of the Conceptual Closure Plan.

The **target closure outcomes** of the mine closure plan should be to (ICMM, 2008):

1. Restore as much as possible of the mine area to a condition consistent with the pre-determined post closure land use objective;
2. Ensure that the mine area is left in a condition which poses an acceptable level of risk to public health and safety;
3. Reduce, as far as is practically possible, the need for post closure intervention, either in the form of monitoring or on-going remedial works;
4. Minimise or prevent post-closure environmental degradation (to the soils, water and air), by ensuring that the mine area is left in a condition that is chemically and physically stable;
5. As far as practical, minimise the immediate negative economic impacts to local communities associated with mine closure and maximise the likelihood of lasting benefits to local communities. This will include leaving infrastructure in place that has a post mining value to the communities.

The standards against which the success of decommissioning, rehabilitation and closure of the mine area will be determined have yet to be formulated but should, as a minimum, comply with:

- The requirements of DRC law;
- The targets set by the ICMM Mine Closure Toolkit (2008);
- International Finance Corporation's Standards on Environmental and Social Sustainability (IFC, 2012);
- International Finance Corporation's Environmental, Health and Safety General Guidelines (IFC, 2007); and
- International Finance Corporation's Environmental, Health and Safety (EHS) Guidelines for Mining (IFC, 2007).

The **objectives** of the mine closure plan are further expanded upon below:

- **Physical Stability** - Mine structures that remain post closure should be physically stable such that they do not pose a hazard to public health and safety as a result of failure or gradual degradation. These structures should only erode and/or release solids into the environment to the extent that degradation of the surrounding area does not occur.
- **Chemical Stability** - The infiltration, leachate or run-off from the mine site or waste storage facilities should not endanger public health and safety or result in the pollution of soil, surface water or groundwater, or non-compliance with statutory water quality limits.
- **Land Use** - Post closure, the mine site should be compatible with the surrounding land, to the extent that it is both practical and economical to do so.
- **Social** - Post closure the mine should ensure that the needs of communities impacted and dependent on the mine are appropriately addressed. Social risks must be identified, and goals need to be defined and set for, *inter alia*, the following: poverty alleviation, education, health care, employment and employability, improving social infrastructure. This will include leaving infrastructure in place that has a post mining value to the communities.

11.2 CLOSURE OUTCOMES, OBJECTIVES AND TARGETS

The planning stage for decommissioning and closure has commenced and in broad terms the

main objective will be to remove as much infrastructure as possible and rehabilitate what remains to resemble the pre project land state as closely as possible. At this stage, the proposed post closure land use will be a combination of agriculture and wilderness. Closure objectives have been developed against the background of the project location in the rural parts of North Kivu Province. The following objectives have been set by ABM:

- Disturbed areas other than those comprising the subsided area and the mineralised waste facilities will be returned to as close to their original state as practicable;
- Permanent visible features such as the mineralised waste facilities and related environmental bunds as well as safety bunds around the subsided area will be left in a form that blends with the surrounds;
- Contamination beyond the mine site by wind, surface runoff or groundwater movement will be prevented through appropriate erosion resistant covers, containment bunds and drainage to the subsided area;
- Linear infrastructure comprising roads, pipelines, power lines, conveyors and related components will be removed and the disturbed land rehabilitated to blend with the surrounding natural environment, and;
- Socio-economic impacts (including the loss of employment) will be minimised through careful planning and preparation for closure beginning three to five years before closure takes place.

The above principles and concepts will be refined as part of on-going detailed closure planning and costing during the life of mine. The target closure outcomes and goals are expressed in terms of several key performance areas. These are summarised in Table 11.1 below.

Table 11.1: Performance parameters for the mine post closure

Key Performance Area	Key Performance Indicator	Standard Adopted / Target Value
TSF and WRD geochemistry	Levels of toxicity and AMD potential of the tailings and waste rock	Any runoff discharged into the environment should meet IFC effluent standards
Dust fallout rates	To achieve compliance with the IFC standards in terms of dust emissions considering nuisance dust, ingestible and inhalable size fractions (PM ₁₀), toxicity or radiological dose measured anywhere around the mineralised waste facilities where 3rd party land use does or might occur in future.	IFC Dust and PM 10 standards IFC Environmental, Health and Safety Guidelines Mining
The quality of runoff from the TSF and WRD facilities	Post decommissioning, the closure solution requires that runoff and seepage is environmentally neutral, with concentrations of contaminants that do not exceed average environmental backgrounds in order to avoid detrimental impacts	IFC Environmental, Health and Safety Guidelines Mining
The quality of groundwater in the vicinity of the plant, WRD and TSF	The magnitude and extent of contaminant plumes should indicate a temporal trend of improvement with time. Beyond the limits of an agreed buffer zone, the concentration of contaminants in the groundwater should not pose a further risk to existing or future potential groundwater resource users in terms of toxicological or radiological limits.	WHO drinking water standards will be met on the perimeter of the waste rock dumps, TSF and plant with respect to TDS (<1000mg/l), SO ₄ <250mg/l, Cu (<1.0 mg/l, Co<0.5mg/l, Cl<250mg/l).
Sediment loads	Sediment loads should be at levels that do not impact on aquatic and terrestrial ecosystems and downstream users	IFC guideline specifies TSS <50mg/l which would apply to the point of discharge of surface water to the natural streams
Long term aftercares costs	To design the TSF as close to a self-sustaining structure as practically possible	No standard applicable

Key Performance Area	Key Performance Indicator	Standard Adopted / Target Value
Erosion	The soil formation rate should be greater than or equal to the rate of soil erosion	Since soil formation is a long-term process, it is necessary to assume that the erosion rate on sustainable natural slopes is less than or equal to the accretion rate on these slopes.
Relinquishment of ownership	The TSF and WRD complex should be capable of being responsibly relinquished without the expectation that the state or third party has sophisticated or specialist knowledge or understanding of the risks and hazards associated with the dam during the aftercare phase.	No standard applicable

11.3 DECOMMISSIONING, REHABILITATION AND CLOSURE OF THE PROJECT SPECIFIC COMPONENTS

11.3.1 Underground workings

On cessation of underground mining activity the mine portals (entrance tunnels) will be sealed to prevent any access by the public thereafter. Prior to this any equipment or infrastructure located underground that may contain hazardous materials or substances will be brought to the surface for appropriate treatment and disposal. The following specifications are applicable:

- The sealing of shafts, adits and all other person-accessible excavations to the underground workings.
- The seal to the underground workings will be constructed from materials which will require sophisticated demolition equipment to breakthrough.
- Of significant importance is to limit the opportunity for inflow of surface water into the subsided mine area. To control this, bunds will be built on the upslope portion of the subsided area to direct surface run-off water away from the subsided area.

11.3.2 TSF and WRD

On decommissioning, the top surface of the TSF will be graded to form a “dome”, to allow incidental rainfall to run off the stack and to reduce water ingress into the tailings mass. The tailings stack will have an external slope of 1:3 (vertical: horizontal) to ensure it is a stable landform in the long term and to make it suitable for rehabilitation.

The TSF is expected to be capped with a nominal 500 mm thick layer of selected mine waste or suitable borrow material in order to reduce wind and water erosion of the tailings. This capping design assumes that tailings are geochemically stable, however based on geochemical analysis a number of the samples tested are deemed to be potentially acid generating and the TSF will thus be covered in a manner that ensures minimal ingress of oxygen and water in perpetuity. Furthermore, in order to ensure the long term stability of the cover material, options for re-vegetation of the cover must be investigated (including growth trials) and reported on in the update of this closure plan.

The WRD will be established adjacent to, and north of, the TSF. The WRD will consist of all overburden and waste material generated during mining. The slope angle of the WRD will not exceed 1:3.3 (17°) and this angle will also be maintained for WRD areas that have reached final profiling. It is recommended that upon closure the WRD sides and tops are covered with soil, and vegetated with indigenous species during the wet season. Generally, average re-profiled outer slopes that have been re-vegetated will curb storm water flow velocities on the slopes. In addition, this should reduce precipitation percolating into the WRD. Should the WRD not be decommissioned with a proper cover system, monitoring of geotechnical properties within the WRD must be undertaken on an on-going basis to ensure the stability of the WRD.

In addition to the above mentioned objectives, the shaping of the WRD slopes will be undertaken during the operational phase of the mine. Waste rock with moderate to high potential for generation of acid must be separated from non-acid generating waste rock. Acid generating waste rock must be carefully managed during the mining process and can be encapsulated within non-acid generating waste rock with neutralising potential in order to prevent/minimise the risk of acid mine drainage formation. Run-off from the surface of the waste rock dumps should be directed via the site drainage system into the open pit. This will minimise the risk of contamination of local watercourses with inter alia sediment. Chemical analysis will be completed for representative waste, tailings and ore samples at regular intervals during the operational life of the mine. The test work will confirm whether the proposed acid generation mitigation measures are effective and will guide any further actions. The preliminary closure and rehabilitation action identified by the engineering team to date include:

- The facilities (WRD and TSF) will be shaped to a landform that blends with the surroundings as part of concurrent rehabilitation and in accordance with visual impact mitigation measures.
- The top of the TSF facility will be allowed to dry out for approximately 2 years before the final cap is put in place and sealed for rehabilitated. During this time, the dust pollution will be controlled through vegetation growth. This will require:
 - Rip and re-compact base of waste rock;
 - Place waste rock $\pm 15\text{m}$ high (compaction would be recommended to reduce oxygen inside the waste rock);
 - Place Jigs tailings over waste rock, 5-10m thick (this will act as a capillary break which will reduce infiltration);
 - Place a 500mm clay layer on the WRD that is sloped towards the Bisie River; and
 - Vegetate at closure.
- Runoff and eroded material from the dump surface will be captured behind a perimeter bund and allowed to evaporate. Along the eastern perimeter, the runoff and eroded material will be directed to the pollution control trench.
- Seepage will be directed to a cut off drain.
- Aftercare and maintenance will be designed and implemented for the post closure phase.
- Surface and groundwater quality will be monitored regularly for a period to be agreed upon with the relevant authorities.

11.3.3 Mineral processing plant, power generation plant, water reservoirs, workshops, administration, fuel storage areas and other infrastructure

Certain infrastructure may remain post closure. The haul road could be handed to the appropriate government department (i.e. Department of Roads) and could potentially be utilised by the local communities once mining has been completed. Similarly the power transmission lines, water reservoirs and clinic could be handed over to the appropriate government departments in order to provide services to the local communities in the area. This could be to the benefit of the local communities as water, electricity and healthcare are scarce commodities within the region.

In addition to this, it is assumed that the buildings of the administration block, workshop and maintenance area will remain to support post closure use by communities, assuming that they are structurally sound. Once closure is complete, a decision to either demolish remaining facilities or hand them over to the local authorities for conversion into social infrastructure (e.g. schools) will need to be made using a consultative process. The structural integrity of any structures that are to remain on site for use by local communities must be assessed by an independent specialist prior to handover. Any structures that are found to be structurally defective must either be demolished or repaired prior to handover. All other infrastructure will be decommissioned as follows:

- Any surface buildings and infrastructure which are no longer required will be demolished, unless specific directives to the contrary are received from the authorities. Such directives may result from communities' requests. This will need to be confirmed through a

stakeholder engagement process undertaken as part of the closure plan goal refinement exercise.

- All brick and concrete buildings associated with the processing plant will be demolished and the rubble buried either on site to a minimum depth of 1.0m or used as cover material for the TSF cover construction.
- The processing plant, primary crusher and conveyors will all be dismantled, and salvageable elements will be de-contaminated and sold. Conveyor belts and concrete footings as well as non-salvageable steel will be disposed of within the tailings facility.
- Foundations will either be removed or will be covered with a layer of soil, or soil forming material, the depth of which will need to be determined following appropriate trials.
- Non-re-useable materials including rubble and waste will be disposed of at suitable sites in accordance with the waste management and disposal plan that will be developed.
- The residual excavations after removal of the processing plant and primary crusher will be backfilled and levelled with selected non-AMD generating material from the underground mining operations and covered with 500 mm of stockpiled topsoil. The plant area will be landscaped and shaped to ensure that it is contiguous with, and blends into, the surrounds.
- Following the removal of the infrastructure a soil contamination assessment will be undertaken by an independent specialist and remediation and re-vegetation activities implemented where necessary.
- Support infrastructure buried underground such as tanks and their pipes, other pipes and service tunnels will, depending on the proposed future use of the site, either be kept as is or be unearthed and removed from the site. If they are to be left *in-situ*, the integrity of all underground pipes and tanks will be assessed by an independent expert. If the integrity of sub-surface infrastructure is compromised, it will be removed.
- Any sub-surface infrastructure (including but not limited to pipes and tanks) that are likely to contain hazardous chemicals (including fuel) must be removed.
- Remaining openings and access ways of support infrastructure will be blanked.
- A detailed plan indicating the location of any remaining infrastructure will form part of the closure plan.
- Electrical equipment and infrastructure i.e. generators will be removed from the site. The soils in the vicinity of the generators will be assessed for contamination and appropriate decontamination measures will be implemented, in accordance with DRC regulatory requirements.
- All disused mining plant and equipment such as the processing plant and heavy machinery will be removed from the site. It is not anticipated that any of this machinery or equipment will be contaminated. However, the mine will confirm this before any machinery or equipment is removed from the site. If any of the machinery or equipment is found to be contaminated it will be appropriately decontaminated before being removed.
- During the mitigation and rehabilitation works, particular attention will be paid to the places where equipment will be parked. The mine will assess these sites and if the soils are contaminated appropriate remedial measures will be taken in compliance with DRC regulatory requirements.
- There will be a landfill on site for general and hazardous waste. The design of this dump/s has not yet been finalized. However the following design principles will apply:
 - The dump will be designed according to generally acceptable environmental standards and in compliance with DRC legislation.
 - The dump will be well managed at all times and wastes deposited will be covered in an on-going manner.
 - On completion of the land fill the covers will be completed and re-vegetation of the cover undertaken.
 - The slopes of the dump will be designed to ensure that erosion is properly controlled at all times and stability of the slopes ensured.
 - The closure plan for the mine will include details for the closure of the landfill and will ensure that the closure of this specific facility meets the requirements of DRC legislation and international best practice. Post-closure monitoring of these facilities may be required.

- The soil and vegetation function of the mine footprint will be restored.

11.3.4 Post closure mine site inspection, environmental monitoring and reporting

The post closure period usually comprises three phases:

- Active phase, years 1-2
- Passive phase, years 3-5
- Inspection phase, years 5-8

ABM will have a retrenchment strategy in place prior to closure to be compliant with IFC Performance Standard 2. In addition to this, during the active two-year period the company will continue supplying specific social services to surrounding communities in line with the corporate social responsibility agreements associated with the project.

During the life of the mine, the company will continuously engage the local authorities and traditional leadership structures as part of the hand over process (i.e. handing over the infrastructure and services). All actions will be guided by the on-going dialogue between the mine and relevant stakeholders. The passive three-year period will most likely entail the handover of the infrastructure and services to the local entity. Alphamin proposes that at the same time it will provide advice on technical or social issues that may arise during this 3-year period with a final sign off taking place in the 5th year post closure. Alphamin will implement a programme of post closure environmental inspection and monitoring to assess the success of mine reclamation and verify that the various components of the closed mine are not adversely impacting adjacent watercourses and groundwater, and do not pose a potential health risk and/or danger to the public. The regularity of the monitoring will be dependent on the aspect being monitored, for example dust and groundwater monitoring will be ongoing and will be initiated prior to construction to obtain baseline values, whereas biodiversity monitoring will take place progressively throughout the operational and closure phases. An independent consultant will conduct the site inspection and environmental monitoring.

ABM proposes that post closure environmental inspection and monitoring be conducted bi-annually for the first 2 years to establish seasonal variations. Bi-annual site visits will be made in before the rains and at the end of the rains (active phase). It is expected that final inspection and monitoring will be conducted 5 years after mine closure but this will depend on the success of the closure and rehabilitation process (passive phase). The findings of this inspection will determine whether or not any further post closure site inspection is necessary (inspection phase). Post closure environmental inspections will focus on:

- TSF and WRD wall stability;
- Erosion on the waste rock dump sidewalls and upper surfaces;
- Surface and ground water quality and quantity
- Success of establishing an indigenous vegetation cover on the mine dumps, workshops and fuel storage areas;
- Any activity by the general public or persons unknown that may adversely affect the stability of disused mine structures, pose a danger to the community or possibly result in environmental degradation; and
- The condition of site access roads, bridges and culverts.

Consultations will be held with local community leaders to listen to and record any issues of concern pertaining to the closed mine site.

An external consultant should produce an annual post-closure environmental monitoring report at the end of years 1 and 2 and a final post closure environmental report at the end of year 5. These post closure environmental reports will be submitted to DRC government entities and made available to all stakeholders. The reports will present the findings of the mine site inspections/walkovers and the results of the environmental monitoring programmes. Where

rehabilitation/reclamation activities have not obtained the desired result, the consultant will make recommendations on what additional reclamation work is required to achieve full reclamation. Any areas of concern will be highlighted. The reports will include a post closure photographic record of mine reclamation.

11.4 SOCIAL COMPONENTS OF CLOSURE

ABM recognises the importance of public participation in all phases of the project. The company will therefore be guided by the approach recommended by the ICMM, as it is recognized that to achieve effective closure that is beneficial to the operating company and the community that hosts it, the views, concerns, aspirations, efforts and knowledge of various internal and external stakeholders must be brought together. For Alphamin this will involve:

- Incorporating closure planning into the early stages of project development and operations;
- Collating the goals and views of various stakeholders (project owner, local community, government, and non-governmental organizations (NGOs)) at the early feasibility (EIA) stage of project development to inform closure and post closure goals;
- Acting to meet the goals by working with the relevant stakeholders;
- Using the concepts of risk and opportunity to both minimize liability and maximize benefits to all relevant parties;
- Using multidisciplinary expertise and multi-stakeholder processes to ensure that mitigation of risk in one area does not increase risks in another; and
- Ensuring that the social closure phase ties in with the infrastructural and environmental closure phases.

Thus, engagement with internal and external stakeholders will be undertaken throughout the life cycle of the project, and to achieve lasting benefits at a local and regional level, ABM appreciates that the views of external stakeholders must be understood. To ensure that these benefits are delivered, Alphamin will identify key external stakeholders and engage with them in a planned manner to foster a two-way understanding of what mutually beneficial outcomes are. These outcomes will be explained and presented in the Comprehensive Closure Plan.

11.5 CALCULATION OF FUTURE FINANCIAL CLOSURE LIABILITY

The calculation of the financial closure liability associated with ABM's underground tin mining operation at Bisie has been undertaken by following best international practice methodology (Australia, USA, Canada and South Africa) as detailed in the Guideline Document for the Evaluation of the Quantum of Closure - Related Financial Provision Provided by a Mine as published by the South African Department of Mineral Resources, dated January 2005.

The best practice procedure for calculating financial closure liability is summarised as follows:

- Step 1: Determine the primary mineral and saleable mineral by-products.
- Step 2: Determine the risk class of the mine.
- Step 3: Determine the area sensitivity in which the mine is located.
- Step 4.1: Determine the level of information available for calculating the financial liability.
- Step 4.2: Determine the closure components associated with the mine.
- Step 4.3: Determine the unit rates for the associated closure components.
- Step 4.4: Determine and apply various weighting factors (site specific).
- Step 4.5: Identify the areas of disturbance.
- Step 4.6: Identify any specialist studies required.
- Step 4.7: Calculate the closure liability using the guideline template provided.

11.5.1 Step 1: Mine Type and Saleable Mineral

The guideline requires that the type of mineral mined or processed, and the saleable mineral and by-products (not trace elements) be identified.

- Mine/process type – Underground mine with gravity concentrator plant
- Saleable mineral – Tin in concentrate
- By-products – Copper, lead, zinc, silver

11.5.2 Step 2: Risk Ranking

According to the guideline, the Bisie Project (due to its minerals mined, tonnages (greater than 10,000 tonnes per month), underground workings and concentrator plant) is classified as a Class A – High risk facility. The risk ranking class is used later to determine the multiplication factors applied to the master rate (see Step 4.3).

11.5.3 Step 3: Environmental Sensitivity of the Project Area

The Bisie Project is classified as having a Low environmental sensitivity based on the classification criteria listed in Table 11.2 below. The environmental sensitivity ranking is used later to determine the multiplication factors applied to the master rate (see Step 4.3).

Table 11.2: Sensitivity Ranking

Sensitivity	Sensitivity Criteria		
	Biophysical	Social	Economic
Low	<ul style="list-style-type: none"> • Largely disturbed from natural state, • Limited natural fauna and flora remains, • Exotic plant species evident, • Unplanned development, • Water resources disturbed and impaired. 	<ul style="list-style-type: none"> • The local communities are not within sighting distance of the mining operation, • Lightly inhabited area (rural). 	<ul style="list-style-type: none"> • The area is insensitive to development, • The area is not a major source of income to the local communities.
Medium	<ul style="list-style-type: none"> • Mix of natural and exotic fauna and flora, • Development is a mix of disturbed and undisturbed areas, within an overall planned framework, • Water resources are well controlled. 	<ul style="list-style-type: none"> • The local communities are in proximity of the mining operation (within sighting distance), • Peri-urban area with density aligned with a development framework, • Area developed with an established infrastructure. 	<ul style="list-style-type: none"> • The area has a balanced economic development where a degree of income for the local communities is derived from the area, • The economic activity could be influenced by indiscriminate development.
High	<ul style="list-style-type: none"> • Largely in natural state, • Vibrant fauna and flora, with species diversity and abundance matching the nature of the area, • Well planned development, • Area forms part of an overall ecological regime of conservation value, • Water resources emulate their original state. 	<ul style="list-style-type: none"> • The local communities are in close proximity of the mining operation (on the boundary of the mine), • Densely inhabited area (urban or dense settlements), • Developed and well-established communities. 	<ul style="list-style-type: none"> • The local communities derive the bulk of their income directly from the area, • The area is sensitive to development that could compromise the existing economic activity.

11.5.4 Step 4.1: Determine the Level of Information

The level of information available allows authorities to either accept (and/or independently review) the financial closure liability submitted, otherwise follow the 'rule-based' approach. Since no detailed Closure Plan for the Bisie Project has been developed and/or approved by the Democratic Republic of Congo's Ministry of Mines, and subsequently no detailed breakdown of costs can be prepared and sufficiently motivated for, the step-by-step 'rule-based' approach for calculating closure liability should be followed.

11.5.5 Step 4.2: Determine the Closure Components

The closure components relevant to the site-specific conditions are to be determined from the list provided below:

1. Dismantling of processing plant & related structures (incl. conveyors & power lines)? **Yes**
2. Demolition of steel buildings & structures? **Yes**
3. Demolition of reinforced concrete buildings & structures? **Yes**
4. Rehabilitation of access roads? **No**
5. Demolition & rehabilitation of electrified railway lines? **No**
6. Demolition & rehabilitation of non-electrified railway lines? **No**
7. Demolition of housing &/or administration facilities? **Yes**
8. Opencast rehabilitation including final voids & ramps? **No**
9. Sealing of shafts, adits & inclines (excl. backfill of decline voids)? **Yes**
10. Rehabilitation of overburden & spoils? **Yes**
11. Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)? **No**
12. Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)? **Yes**
13. Rehabilitation of subsided areas? **Yes**
14. General surface rehabilitation? **Yes**
15. River diversions? **No**
16. Fencing? **Yes**
17. Water management? **No**
18. 2 to 3 years of maintenance & aftercare? **Yes**

11.5.6 Step 4.3: Determine the Unit Rates

The unit (Master) rates, for each closure component is taken from the Earthworks bill of quantities as submitted by Civicon to MDM in October 2015. Furthermore, a Multiplication Factor is applied depending on the Risk Ranking and the Environmental Sensitivity (calculated in Step 2 and 3 previously).

Table 11.3: Master rates for rehabilitation

Description	Unit	Master rate (US\$)	Factor
Dismantling of processing plant & related structures	t	300	1.00
Demolition of steel buildings and structures	t	300	1.00
Demolition of reinforced concrete structures	m ²	48.5	1.00
Demolition of housing &/or administration facilities	m ²	15.0	1.00
Sealing of shafts, adits & inclines	m ³	1,200	1.00
Rehabilitation of overburden & spoils	m ²	2.5	1.00
Rehabilitation of processing waste deposits	m ²	2.5	1.00
Rehabilitation of subsided areas	m ²	2.5	1.00
General surface rehabilitation	m ²	2.5	1.00
Fencing	m	1.5	1.00
2 to 3 years of maintenance & aftercare	year	24,000	1.00

11.5.7 Step 4.4: Determine the Weighting Factors

Weighting Factors based on the specific mine/process location are selected from the table below.

Table 11.4: Weighting Factors

Weighting factor 1 – Nature of terrain	Flat Weighting 1.0	Undulating Weighting 1.10	Rugged Weighting 1.20
Weighting factor 2 – proximity to urban centre and services	Urban Weighting 1.0	Peri-urban Weighting 1.10	Rural Weighting 1.20

11.5.8 Step 4.5: Identify Areas of Disturbance

The future areas of disturbance at the Bisie Project are listed as:

- Trucking and ventilation portals,
- Explosives magazine,
- Concentrator plant,
- Waste rock dumps,
- Tailings storage facility,
- Topsoil stockpile,
- Conveyors,
- Haul roads,
- Construction camp,
- Administration buildings, and
- Landfill site.

11.5.9 Step 4.6: Identify Closure Costs from Specialist Studies

The risk ranking identifies what type of specialist studies should be carried out to ensure successful closure of the mine and process operation. Table 11.5 details these categories:

Table 11.5: Specialist study requirements

Risk Ranking	Specialist Studies
Class A – High risk	<ul style="list-style-type: none"> • Water pollution potential studies • Overall quantified risk assessment
Class B – High risk	<ul style="list-style-type: none"> • Screening level risk assessment
Class C – Low risk	<ul style="list-style-type: none"> • Screening level risk assessment

It is accepted that proposed project is classified as a Class A risk ranking requiring the additional studies presented above. This is particularly relevant to potential AMD and Ground/Surface water impacts assessed in the ESHIA report (EOH CES, January 2016).

11.5.10 Step 4.7: Calculate the Closure Liability

The provisionally estimated financial closure liability associated with the Bisie Project is **US\$1,876,198** for the future areas of disturbance (at the end of Life of Mine, LOM) are presented in Table 11.6.

Table 11.6: Projected project closure liability costs

Description	Unit	Rate (US\$)	Quantity	W1	W2	Cost (US\$)
Dismantling of processing plant & related structures	t	300	1,194	1.2	1.2	515,808
Demolition of steel buildings and structures	t	300	65	1.2	1.2	28,080
Demolition of reinforced concrete structures	m ²	48.5	2,440	1.2	1.2	170,410
Demolition of housing &/or administration facilities	m ²	15.0	680	1.2	1.2	14,688
Sealing of shafts, adits & inclines	m ³	1,200	100	1.2	1.2	172,800
Rehabilitation of overburden & spoils	m ²	2.5	10,000	1.2	1.2	36,000
Rehabilitation of processing waste deposits	m ²	2.5	157,670	1.2	1.2	567,612
Rehabilitation of subsided areas	m ²	2.5	30,000	1.2	1.2	108,000
General surface rehabilitation	m ²	2.5	40,000	1.2	1.2	144,000
Fencing	m	1.5	7,000	1.2	1.2	15,120
2 to 3 years of maintenance & aftercare	year	24,000	3	1.2	1.2	103,680
TOTAL						\$1,876,198

The above costing and specifications will be reviewed during the mines operational phase for comprehensiveness, with the definitive Closure and Rehabilitation Plan that will be developed prior to the cessation of mining and operational activities (approximately 2029-2030) detailing the definitive costs, actions and requirements for closure.

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