



## **Bisha Mine, Eritrea: Environmental Management Plans (EMPs)**

For:  
BMSC

17<sup>th</sup> February 2010

Citrus Partners LLP  
30 Gay Street Bath  
BA1 2PS  
United Kingdom  
[www.citrus-partners.com](http://www.citrus-partners.com)



## Table of Contents

<b>1</b>	<b>Noise Management Plan</b>	<b>7</b>
1.1	Introduction	7
1.2	Objectives	7
1.3	Scope	7
1.4	Regulatory Requirements	7
1.5	Potential Impacts	8
1.6	Noise Management Procedures	10
1.7	Roles & Responsibilities	12
1.8	Training	13
1.9	Monitoring & Reporting	13
<b>2</b>	<b>Wildlife &amp; Habitat Management Plan</b>	<b>15</b>
2.1	Introduction	15
2.2	Objectives	15
2.3	Scope	15
2.4	Regulatory Requirements	15
2.5	Potential Impacts	16
2.6	Habitat Protection	16
2.7	Wildlife Management Procedures	17
2.8	Roles & Responsibilities	18
2.9	Training	18
2.10	Monitoring & Reporting	18
<b>3</b>	<b>Non-Hazardous Waste Management Plan</b>	<b>20</b>
3.1	Introduction	20
3.2	Objectives	20
3.3	Scope	20
3.4	Regulatory Requirements	20
3.5	Waste Hierarchy Approach	21
3.6	Wastes Produced by the Project	21
3.7	Waste Management Procedures	22
3.8	Waste Containers	23
3.9	Waste Management Documentation	24
3.10	Roles & Responsibilities	25
3.11	Training	26
3.12	Monitoring & Reporting	26
<b>4</b>	<b>Petroleum and Oils Management Plan</b>	<b>27</b>
4.1	Introduction	27
4.2	Objectives	27
4.3	Scope	27
4.4	Regulatory Requirements	27
4.5	Potential Impacts	28
4.6	Petroleum and Oil Management Procedures	28
4.7	Roles & Responsibilities	30
4.8	Training	31
4.9	Monitoring & Reporting	31
<b>5</b>	<b>Topsoil Management Plan</b>	<b>32</b>
5.1	Introduction	32
5.2	Objectives	32
5.3	Scope	32
5.4	Regulatory Requirements	32
5.5	Potential Impacts	33
5.6	Topsoil Management Procedures	36
5.7	Roles & Responsibilities	38
5.8	Training	38

5.9	Monitoring & Reporting.....	38
<b>6</b>	<b>Waste Water Management Plan .....</b>	<b>39</b>
6.1	Introduction .....	39
6.2	Objectives .....	39
6.3	Scope.....	39
6.4	Regulatory Requirements.....	39
6.5	Waste Water Impacts .....	41
6.6	Waste Water Management Procedures .....	42
6.7	Roles & Responsibilities .....	43
6.8	Training.....	43
6.9	Monitoring & Reporting.....	43
<b>7</b>	<b>Air Quality Management Plan .....</b>	<b>44</b>
7.1	Introduction .....	44
7.2	Objectives .....	44
7.3	Scope.....	44
7.4	Regulatory Requirements.....	44
7.5	Potential Air Emission Sources & Impacts .....	46
7.6	Air Quality Management Procedures .....	47
7.7	Roles & Responsibilities .....	51
7.8	Training.....	51
7.9	Monitoring & Reporting Procedures .....	51
<b>8</b>	<b>Cyanide Management Plan.....</b>	<b>53</b>
8.1	Introduction .....	53
8.2	Objectives .....	53
8.3	Scope.....	53
8.4	Regulatory Requirements.....	53
8.5	Potential Impacts .....	54
8.6	Cyanide Management Procedures .....	55
8.7	Roles & Responsibilities .....	58
8.8	Training.....	59
8.9	Monitoring & Reporting.....	59
<b>9</b>	<b>Occupational Health &amp; Safety Plan .....</b>	<b>62</b>
9.1	Introduction .....	62
9.2	Purpose .....	62
9.3	Scope.....	62
9.4	Regulatory Requirements.....	62
9.5	Specific Requirements.....	62
9.6	Definitions .....	63
9.7	Abbreviations.....	64
9.8	Leadership and Commitment .....	65
9.9	Planning.....	70
9.10	Implementation .....	72
9.11	Monitoring and Evaluation .....	77
9.12	Audit and Review.....	79
<b>10</b>	<b>Emergency Preparedness &amp; Response Plan.....</b>	<b>81</b>
10.1	Introduction .....	81
10.2	Objectives .....	81
10.3	Scope.....	81
10.4	Regulatory Requirements.....	82
10.5	Response Procedures .....	83
10.6	Roles & Responsibilities .....	92
10.7	Training.....	93
10.8	Monitoring & Reporting.....	95
<b>11</b>	<b>Tailings Management Plan .....</b>	<b>97</b>

11.1	Introduction .....	97
11.2	Objectives .....	97
11.3	Scope.....	97
11.4	Regulatory Requirements.....	97
11.5	Potential Impacts .....	98
11.6	Tailings Management Procedures.....	99
11.7	Roles & Responsibilities .....	101
11.8	Training.....	101
11.9	Monitoring & Reporting.....	101
<b>12</b>	<b>Terrain and Erosion Control Management Plan .....</b>	<b>102</b>
12.1	Introduction .....	102
12.2	Objectives .....	102
12.3	Scope.....	102
12.4	Regulatory Requirements.....	102
12.5	Potential Impacts .....	103
12.6	Terrain and Erosion Management Procedures .....	104
12.7	Roles & Responsibilities .....	107
12.8	Training.....	107
12.9	Monitoring & Reporting.....	107
<b>13</b>	<b>Transportation Management Plan .....</b>	<b>109</b>
13.1	Introduction .....	109
13.2	Objectives .....	109
13.3	Scope.....	109
13.4	Regulatory Requirements.....	109
13.5	Potential Impacts .....	110
13.6	Transportation Management Procedures.....	112
13.7	Roles & Responsibilities .....	114
13.8	Training.....	114
13.9	Monitoring & Reporting.....	114
<b>14</b>	<b>Hazardous Substances Management Plan .....</b>	<b>115</b>
14.1	Introduction .....	115
14.2	Objectives .....	115
14.3	Scope.....	115
14.4	Regulatory Requirements.....	115
14.5	Potential Impacts .....	116
14.6	Hazardous Substances Management Procedures.....	116
14.7	Roles & Responsibilities .....	118
14.8	Training.....	118
14.9	Monitoring & Reporting.....	119
<b>15</b>	<b>Waste Rock Management Plan.....</b>	<b>120</b>
15.1	Introduction .....	120
15.2	Objectives .....	120
15.3	Scope.....	120
15.4	Regulatory Requirements.....	120
15.5	Potential Impacts .....	120
15.6	Waste Rock Management Procedures.....	122
15.7	Roles & Responsibilities .....	123
15.8	Training.....	123
15.9	Monitoring & Reporting.....	123
<b>16</b>	<b>Water Resources Management Plan .....</b>	<b>125</b>
16.1	Introduction .....	125
16.2	Objectives .....	125
16.3	Scope.....	125
16.4	Regulatory Requirements.....	125
16.5	Potential Issues and Impacts.....	127

---

16.6	Water Resources Management Procedures .....	128
16.7	Roles & Responsibilities .....	129
16.8	Training.....	129
16.9	Monitoring & Reporting.....	129
<b>17</b>	<b>Monitoring Plan .....</b>	<b>131</b>
17.1	Introduction .....	131
17.2	IFC Guidelines For Project Monitoring .....	131
17.3	Scope.....	132
17.4	Environmental Monitoring.....	132
17.5	Social Monitoring .....	148
17.6	Auditing and Continual Improvement .....	154
17.7	Record Keeping and Reporting .....	154
<b>18</b>	<b>Construction Environmental &amp; Social Management Plan .....</b>	<b>155</b>
18.1	Introduction .....	155
18.2	Objectives .....	155
18.3	Scope and Structure.....	155
18.4	Regulatory Requirements.....	155
18.5	BMSC Policies .....	156
18.6	Potential Impacts of Construction.....	162
18.7	Environmental Management Procedures .....	164
18.8	Social & Community Management Procedures.....	170
18.9	Contractor Responsibilities.....	176



# 1 Noise Management Plan

## 1.1 Introduction

The *Noise Management Plan* is designed to ensure the control and limitation of potential sources of noise during the construction, operation and closure phases of the Bisha Project. The plan describes the proposed measures that shall be used to protect people and settlements in close proximity to the Project from any adverse impacts related to airborne or groundborne noise. The plan recognises that the generation of some noise emissions is inevitable but, nevertheless, sets out a systematic approach for noise control, monitoring plans to assess potential effects during construction and operation, and monitoring plans for determining the effectiveness of mitigation.

## 1.2 Objectives

The objectives of this Management Plan are to:

- Establish Standard Operating Procedures (SOPs) for Bisha construction, operations and closure activities;
- Define BMSC requirements and procedures to guide the Project Management Team and other project contractors;
- Define targets;
- Define mitigation measures;
- Define roles and responsibilities; and
- Define monitoring and reporting procedures.

## 1.3 Scope

The plan addresses the management of noise during construction, operations and closure associated with the Bisha mine. This plan covers all activities that could result in adverse noise through all phases of the Project. The management plan includes:

- Identification of permissible sound levels;
- Description of baseline noise;
- Implementing noise mitigation measures;
- Developing and implementing noise monitoring plan to verify compliance with relevant regulations;
- Employee training awareness; and
- Continuous improvement programme.

## 1.4 Regulatory Requirements

### 1.4.1 Eritrean Requirements

Eritrea does not have regulations specifically related to noise levels, but has implemented regulations related to environmental management plans.

Eritrean requirements for environmental management plans are outlined in “National Environmental Assessment Procedures and Guidelines” Ministry of Land, Water and Environment, March 1999.

### 1.4.2 International Finance Corporation Environmental Guidelines

IFC Environmental Health & Safety Guidelines for Mining sets out the following management strategies with regard to noise<sup>1</sup>:

- *Noise levels at the nearest sensitive receptor should meet the noise guidelines in the General EHS Guidelines;*
- *Where necessary, noise emissions should be minimized and controlled through the application of techniques which may include:*

<sup>1</sup> International Finance Corporation. *Environmental, Health & Safety Guidelines for Mining*. 10 December 2007.



- *Reduction of noise from drilling rigs by using downhole drilling or hydraulic drilling*
  - *Implementation of enclosure and cladding of processing plants;*
  - *Installation of proper sound barriers and / or noise containments, with enclosures and curtains at or near the source equipment (e.g. crushers, grinders, and screens);*
  - *Installation of natural barriers at facility boundaries, such as vegetation curtains or soil berms; and*
  - *Optimisation of internal-traffic routing, particularly to minimize vehicle reversing needs (reducing noise from reversing alarm) and to maximize distances to the closest sensitive receptors.*
- *For blasting-related emissions (vibration, airblast, overpressure, fly rock), the following control and minimization techniques are recommended:*
    - *Mechanical ripping should be used, where possible, to avoid or minimize the use of explosives;*
    - *Use of specific blasting plans, correct charging procedures and blasting ratios, delayed / microdelayed or electronic detonators, and specific in-situ blasting tests (the use of downhole initiation with short-delay detonators improves fragmentation and reduces ground vibrations);*
    - *Development of blast design, including a blasting-surfaces survey, to avoid overconfined charges, and a drill-hole survey to check for deviation and consequent blasting recalculations;*
    - *Implementation of ground vibration and overpressure control with appropriate drilling grids; and*
    - *Adequately designing the foundations of primary crushers and other significant sources of vibrations.*

IFC General EHS Guidelines<sup>2</sup> also include procedures for ambient and worker noise management.

#### 1.4.3 International Good Practice

EU Directive 2002/49/EC (June 2002) provides a common basis for tackling noise issues. The underlying principles are as follows:

- **Monitoring the environmental problem;** *by requiring competent authorities in Member States to draw up "strategic noise maps" for major roads, railways, airports and agglomerations, using harmonised noise indicators Lden (day-evening-night equivalent level) and Lnight (night equivalent level). These maps will be used to assess the number of people annoyed and sleep-disturbed respectively throughout Europe;*
- **Informing and consulting the public** *about noise exposure, its effects, and the measures considered to address noise;*
- **Addressing local noise issues** *by requiring competent authorities to draw up action plans to reduce noise where necessary and maintain environmental noise quality where it is good. The directive does not set any limit value, nor does it prescribe the measures to be used in the action plans, which remain at the discretion of the competent authorities and*
- **Developing a long-term EU strategy,** *which includes objectives to reduce the number of people affected by noise in the longer term, and provides a framework for developing existing Community policy on noise reduction from source.*

### 1.5 Potential Impacts

Noise impacts will occur in all phases of the Project, with noise being generated from a number of sources including:

Road traffic;

Air traffic;

Impact equipment (pile drivers, jack hammers, drills, pneumatic tools);

Stationary equipment (compressors, generators, pumps);

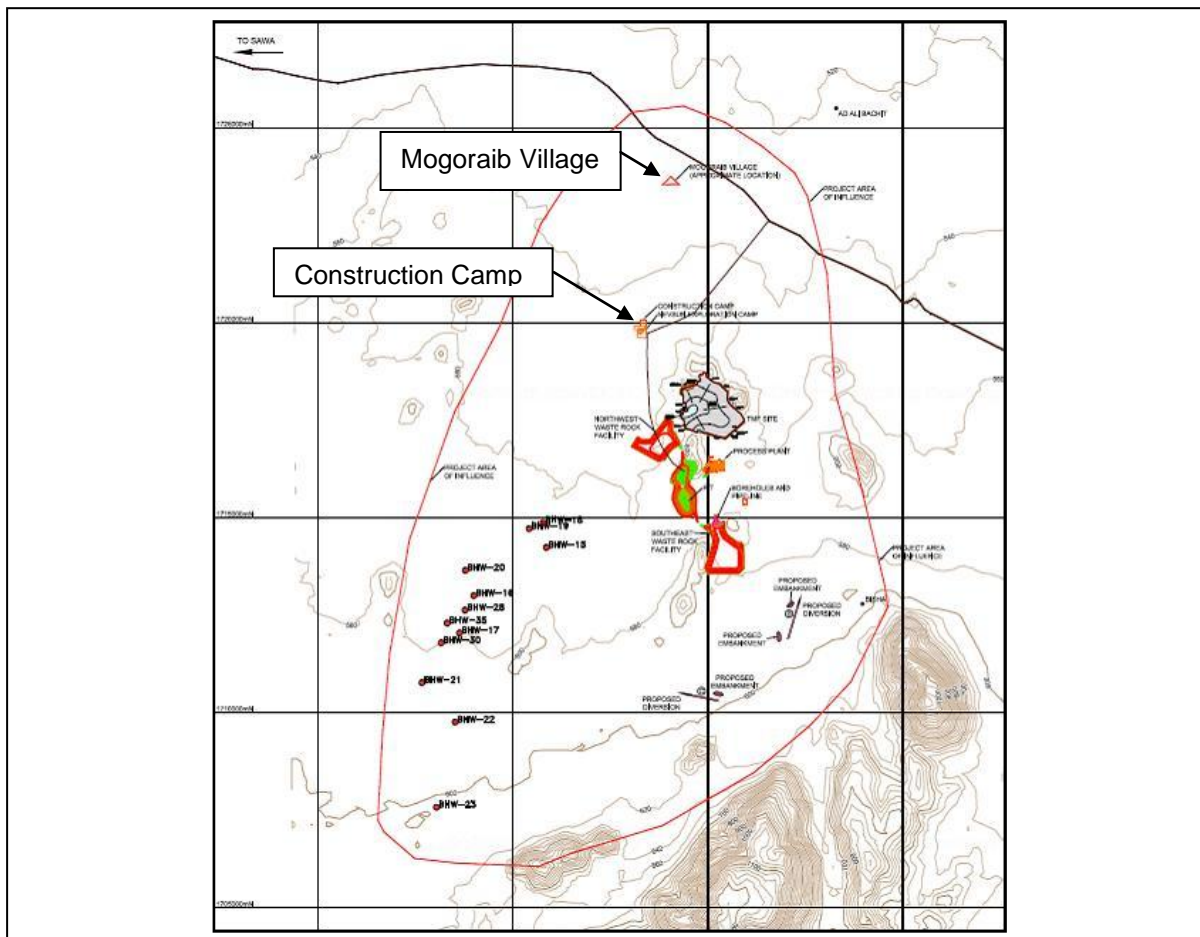
<sup>2</sup> International Finance Corporation. *General EHS Guidelines*. 30 April 2007.

- Blasting;
- Materials handling equipment (crushers, concrete mixers, cranes);
- Earth moving equipment (trucks, loaders, dozers, scrapers); and
- Other internal combustion engine powered equipment.

The following represent the greatest potential impacts: blasting operations; the diesel generators in so far as they affect the immediate vicinity; mine haulage trucks; the primary crusher; and the grinding circuit. In general, many equipment noise sources will have their own mitigation features implemented by manufacturers.

The primary noise receptors for the Project will include the site workers; both when they are on the site and when they are in the construction camp. The nearest village to the Project is Mogoraib which, at 7 km from the mine, is unlikely to be affected by traffic noise, although blasting could be audible. These receptors are shown in Figure 1 below.

**Figure 1: Noise Receptors**



Note grid lines are on a 5 km spacing

### 1.5.1 Construction Phase

During the construction phase, a higher level of noise is usually tolerated if the duration of works is relatively short. Also, the construction stage works are frequently associated with noise mitigation measures such as natural topographical obstructions (different ground elevation), which shield construction noise.

Controlling construction noise involves noise level and time restrictions. The shorter the work phase, the more likely that a higher level of construction noise will be acceptable. As the length of the construction period increases, the tolerable exceedance of the background level is reduced.



### 1.5.2 Operations Phase

During the operations phase, the key issues related to noise concern the ongoing excavation of soils involving blasting and earth moving, as well as the use of various crushers, mills and a power plant.

### 1.5.3 Closure Phase

The closure phase will generally involve less noise generation due to the absence of operational equipment. Much of the area will be reclaimed with a covering of soil, involving limited use of earth moving equipment.

## 1.6 Noise Management Procedures

### 1.6.1 Construction Phase

The following procedures shall be adopted by BMSC to minimise the impacts of construction noise:

#### *General*

Develop a noise monitoring programme for the construction phase.

Schedule noisy construction activities at normal working hours to the extent possible.

Perform regular inspection and maintenance of construction vehicles and equipment to ensure that they have mufflers installed and worn parts are replaced.

Limit equipment on-site – only have necessary equipment on-site.

Reduce power operation – use only necessary size and power.

Consider noise barriers, baffles, sound insulation or enclosures for particularly noisy equipment such as generators, crushers, grinders, compressor, pumps, gearboxes etc.

Staff accommodation will be sited away from major noise sources.

Consider the strategic placement of topsoil stockpiles, so as to create buffer zones between operational areas and sensitive receptor locations.

#### *Road Traffic*

Avoid trucking operations during night-time, where possible.

During routine maintenance, check that noise abatement devices are in good order (e.g., brakes, exhaust mufflers, engine hoods).

Select vehicles with minimum noise output including tyre noise.

#### *Air Traffic*

Avoid low altitude flights and restrict air traffic to daytime hours.

#### *Impact Equipment*

Use of a noise-attenuating jacket around the jackhammer.

Avoid operating numerous pneumatic tools at the same time and spread operations throughout working periods.

#### *Stationary Equipment*

Position equipment in sheltered locations, e.g. behind an earth berm if possible.

Keep equipment in good condition.

Most stationary diesel-powered equipment will be enclosed in insulated buildings.

#### *Blasting*

Use delays, both surface and down hole.

Follow approved blasting practices.

Select time when the environment is least sensitive to noise impact (e.g., daytime hours).

#### *Materials Handling Equipment*

Place crushers behind engineered or natural berms if possible.

Maintain equipment in good working condition.

Turn equipment off when not in use.



Mobile equipment will have exhaust muffling maintained at manufacturer's specifications.

#### *Earth Moving Equipment*

Where possible, restrict equipment age so only newer, more efficient machinery will operate.

Operate equipment within specification and capacity (e.g. don't overload machines).

Use noise abatement accessories such as sound hood and mufflers.

#### *Other Internal Combustion Powered Equipment*

Equipment restrictions: use equipment conforming to noise standards.

Intake and exhaust silencers: ensuring equipment has quality mufflers installed.

Reduced power option: use only necessary size and power.

Equipment maintenance: maintain equipment on a regular basis, replace worn parts, lubricate as required.

### **1.6.2 Operational Phase**

The following procedures shall be adopted by BMSC to minimise the environmental impacts of noise during the operational phase:

#### *General*

Comply with established noise limits; a 100m wide buffer along the property perimeter will be considered.

Provide an air inlet silencer and exhaust silencers for combustion engines and other units.

Utilise sound insulation on equipment and sound barriers around stationary equipment.

Conduct noise survey at the property line and at the location of critical receptors when the Project attains full production capacity and annually thereafter during daytime and night-time hours to confirm compliance.

#### *Road Traffic*

Avoid trucking operations during night-time.

Select vehicles with minimum noise output including tyre noise, exhaust and compressor/fan noise.

During routine maintenance, check that noise abatement devices are in good order (e.g., brakes, exhaust mufflers, engine hoods).

Place speed limit for the plant area and on the haul road and use shallow slopes for the haul road.

Endeavour to fit all mobile equipment with "smart alarms". Reverse warning alarms are required for safety purposes on all mobile equipment operating on a mining site, which adequately alert nearby people.

Educate truck drivers about the characteristics of diesel engines (i.e., that the flat torque characteristic allows ascending an incline in a higher gear, which is a less noisy operation).

#### *Air Traffic*

Avoid low altitude flights.

Restrict air traffic to daytime hours.

#### *Impact Equipment*

Use of a noise-attenuating jacket around the jackhammer.

Avoid operating numerous pneumatic tools at the same time and spread operations throughout working periods.

#### *Stationary Equipment*

Position equipment in sheltered locations, e.g. behind the earth berm if possible.

Keep equipment in good condition.

#### *Blasting*

Select time when the environment is least sensitive to noise impact (e.g., daytime hours).

Monitor blasts and revise blast design, as required.



Limit groundborne vibration and minimize air over pressure by taking care in unusual situations e.g. corners and geological considerations in blast.

Adequate stemming of holes.

Use of downhole initiation with short delay detonators; this improves fragmentation whilst at the same time minimises ground vibration which is directly related to Maximum Instantaneous Charge (MIC) and not to the total charge in the blast.

Ensure the correct blasting ratio is obtained; the blasting ratio is a measure of the amount of work expected per unit volume of explosives i.e. tonnes/kg.

Notify nearest residences (if present) prior to the blast.

Eliminate exposed detonating cord and secondary blasting.

Restrict blasts to favourable weather conditions (wind and temperature gradient).

Use hole spacing to ensure that the explosive force is just sufficient to break the ore to the required size.

Perform blasting in depressed pits (normal production practice at Bisha).

#### *Outdoor Materials Handling Equipment*

Place crushers in sheltered/enclosed locations if possible.

Maintain equipment in good working condition.

Turn equipment off when not in use if practicable.

Use of noise absorbing pads at foundations of vibrating equipment to reduce noise emissions.

#### *Earth Moving Equipment*

Where possible, restrict equipment age so only newer, more efficient machinery will operate.

Operate equipment within specification and capacity (e.g. don't overload machines).

Use noise abatement accessories such as sound hood and mufflers.

#### *Primary Plant Facilities*

Equipment restrictions: use equipment conforming to noise standards.

Provide building with walls absorbing noise.

Use of rubber linings on chutes and transfer points.

Maintain equipment on a regular basis, replace worn parts, lubricate as required.

Provide diesel plant units with efficient intake and exhaust silencers.

Restrict use of sirens and reversing alarms to the minimum.

Use conveyor system with low noise output, paying particular attention to rollers.

Enclose conveyors where necessary.

Minimize height which material drops from plant and machinery.

### **1.6.3 Transportation Noise During Construction and Operation**

The following measures will be implemented to minimize transportation-related noise impacts:

enforce speed limits in relation to road conditions and on-route communities;

maintain road surfaces in good repair to reduce tyre noise;

assure continuous traffic flow to avoid prolonged idling; and

schedule transportation for daytime hours whenever possible.

## **1.7 Roles & Responsibilities**

Overall responsibility for the implementation of this Management Plan shall rest with the Bisha Environment Manager who shall report on progress to the Bisha General Manager. Others with responsibility for the implementation of this Management Plan shall include:



- SENET, as EPCM Contractor, shall be responsible for the integration of these procedures and requirements into their operating procedures and plans;
- Bisha Mine Manager shall be responsible for ensuring that these procedures and requirements are implemented for all mine operations;
- Bisha Mill Manager shall be responsible for ensuring that these procedures and requirements are implemented for all mill operations.

### 1.8 Training

All employees of BMSC and Contractors to BMSC shall be provided with toolbox training in noise management. Additional, specialist training shall be provided to plant operators and key personnel involved in activities which involve noisy operations. Consultation with stakeholder communities should be held regularly to determine the success and effectiveness of noise management practices and to address any community concerns. This will help to ensure that the amenity of the community is recognised and taken into account by the company. The frequency of these meetings will be agreed with the stakeholder communities; but are expected to be monthly at the start of the Project and become less frequent as the Project becomes established. All complaints related to noise will be logged and addressed by the BMSC Environment Department.

### 1.9 Monitoring & Reporting

Noise monitoring procedures shall be as follows:

- SENET shall report on a monthly basis to the Bisha Environment Manager on the implementation of this Management Plan during the construction phase, including:
  - Noise reduction actions undertaken;
  - Noise monitoring undertaken;
  - Maintenance of mobile and fixed plant to reduce noise impact;
  - Non-compliances identified; and
  - Corrective actions planned and undertaken.
- Bisha Environment Manager will inspect operations on a monthly basis and will maintain appropriate records. The inspection will include:
  - Evidence of excessive noise;
  - Condition of noise control equipment;
  - Condition of the generators, trucks and primary crushers;
  - Use of ear protection by personnel working in noisy areas; and
  - Compliance with applicable regulatory and corporate requirements.

Monitoring of changes in noise levels within the operational area will be done to ensure that noise levels do not increase significantly over the life of the Project and do not breach noise thresholds for ambient and worker noise. It will be done at the same locations and will require establishing representative sampling locations to assess the potential effects of noise levels across the site. Any complaints from the community should be documented and managed through to resolution. In the event that public complaints arise, steps should be taken to investigate the root cause without delay and remedial action should be taken to correct the deficiency. Actions should ensure that similar incidents do not occur and should be reported to the Bisha Environment Manager as part of the performance reporting process.

Noise monitoring will be assessed against World Bank Guidelines. Noise impacts should not exceed the levels presented in *Table 1* below, or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site. A map of monitoring locations has been developed by the Environment Department.

Table 1 Noise Level Guidelines

Receptor	One Hour LAeq (dBA)	
	Daytime 07:00 - 22:00	Night time 22:00 - 07:00



Residential; institutional; educational	55	45
Industrial; commercial	70	70

BMSC will liaise with local communities on noise issues. In the event that noise mitigation measures implemented do not reduce noise to acceptable levels at receiving locations, the addition of noise treatments to those receiving locations should be investigated.

Hearing tests will be included as part of the worker H&S Programme. Any hearing loss detected in the occupation monitoring programme will be investigated to establish if this has been due to workplace noise and actions taken as appropriate.



## 2 Wildlife & Habitat Management Plan

### 2.1 Introduction

This *Wildlife & Habitat Management Plan* is designed to ensure the protection of livestock and wildlife habitat and resources surrounding the Bisha Project during all phases of the Project. The Plan sets out methods for avoiding impacts during construction; monitoring to assess potential impacts during construction; monitoring plans to determine the effectiveness of mitigation and, if required, mitigation works during the operational phase of the Project.

### 2.2 Objectives

The objectives of this Management Plan are to:

- Establish Standard Operating Procedures (SOPs) for Bisha construction, operations and closure activities;
- Define BMSC requirements and procedures to guide the Project Management Team and Project contractors;
- Define plans/measures for impact mitigation;
- Define roles and responsibilities; and
- Define monitoring and reporting procedures.

A map of all habitats within the Project footprint will be produced during the construction phase.

### 2.3 Scope

The plan addresses the management of habitats and wildlife during construction, operations and closure. This plan covers all activities that could result in adverse effects on wildlife through all phases of the Project. The *Noise Management Plan* refers to noise issues that could impact wildlife and presents mitigation measures to address these.

### 2.4 Regulatory Requirements

#### 2.4.1 Eritrean Requirements

The Ministry of Agriculture of the Government of Eritrea has promulgated the “Forestry and Wildlife Conservation and Development Proclamation No. 155/2006” that has superseded all rules, regulations and provisions of the “Forest and Wildlife Conservation and Development Proclamation No. 192/1980” which was inherited from the Ethiopian Administration in Eritrea. The proclamation empowers the Ministry of Agriculture to establish a system of protected areas in the country.

The key elements of Proclamation 155/2006 enable the Government of Eritrea to:

- Issue regulations to govern implementation of the proclamation and monitor their implementation and enforcement;
- Establish a programme for reforestation and afforestation involving individual, community and government initiatives;
- Identify endangered and other indigenous tree and wildlife species which may require specific conservation programs and develop such programmes; and
- Enforce this proclamation, establishing a unit for the protection of forestry and wildlife and appointing enforcement officers.

#### 2.4.2 International Finance Corporation Environmental Guidelines

IFC Performance Standard 6, Biodiversity Conservation is pertinent to the management of domestic livestock and wildlife and IFC Environmental Health & Safety Guidelines for Mining sets out the following recommendations with regard to wildlife<sup>3</sup>:

#### *Terrestrial Habitat Alteration*

<sup>3</sup> International Finance Corporation. *Environmental, Health & Safety Guidelines for Mining*. 10 December 2007.



- *Minimizing the creation of barriers to wildlife movement, providing alternative migration routes when the creation of barriers cannot be avoided.*

## 2.5 Potential Impacts

Baseline studies have documented 17 mammal, 91 bird, 8 reptile species and 3 amphibian species in the Project Area (although many other species may exist as wildlife populations are recovering). Wildlife species include two antelope species (Dorcas gazelle and Soemmerring's gazelle), warthogs, aardvarks, ground-nesting birds such as Arabian bustard, guinea fowl and ostrich, birds of prey, wading birds, shorebirds, dik-dik, and carnivores such as jackal, hyena and fox.

Potential impacts to wildlife and livestock include:

- Habitat loss related to the development of the open pit, waste rock dump, the tailings impoundment, the processing plant and other associated Project facilities;
- Disturbance such as noise and vehicle traffic that may affect the movement and behaviour of wildlife, including vehicle fatalities;
- Habitat/vegetation loss and alteration;
- Roadways (increased traffic, crossing issues, fragmentation of foraging/migration habitats, noise, increased access to remote areas, road strikes/mortality, illegal hunting);
- Dust (deposition on forage/vegetation, visibility);
- Access to Project site and ancillary facilities (fencing, security) including pipelines with roadways;
- Tailings management issues (bird & small mammals – assuming wet tailings, access);
- Airstrip (similar to roadways – noise, access to adjacent habitats, crossing issues, dust and air emissions on vegetation, bird air strikes);
- Increased wildlife-livestock interactions when competing for remaining rangeland resources in the area;
- Access to water resources tailing pond water, disruption of water supply at seeps or wells used by wildlife and domestic animals;
- Amphibians and reptiles – reliance on water present during rainy season for reproduction and dispersal;
- Timing of activities (i.e., clearing and grubbing) especially related to migratory and breeding bird species.

## 2.6 Habitat Protection

### 2.6.1 Key Habitat Types

The Bisha area supports six main habitat types. Each habitat is characterised by the dominant shrub, tree, or vegetation species found within the habitat. These include:

- *Acacia laeta*;
- *Acacia tortilis*;
- *Acacia orfota*;
- *Cadaba rotundifolia*;
- *Hyphaene thebaica* (riverine forest); and
- *Aristida mutabilis* (open grassland)).

There are three mammal species that are of management concern in the Project Area:

- Dorcas gazelle;
- Soemmerring's gazelle; and



- Eritrean warthog.

Both of the gazelles are identified as vulnerable species due primarily to habitat loss and loss of habitats through over-grazing and competition with livestock. The warthog is listed as endangered due to threats to habitat from agricultural activities and over-hunting in parts of its range

### 2.6.2 Habitat Restoration and Enhancement

To mitigate the losses associated with habitat removal and alteration, habitat restoration and enhancement measures will be implemented. Potential strategies will include:

- Mapping and monitoring impacts to habitats within the Project Area, particularly during land clearance activities;
- Limiting access by Project personnel to adjacent habitats to reduce potential habitat degradation and interaction with wildlife;
- Providing improved habitat areas some distance away from the facility boundary to attract or displace wildlife to the newly-enhanced habitat thereby reducing the potential for human-wildlife contact;
- Planting of viable forage tree species (i.e., *Acacia spp.*) away from Project facilities to increase potential foraging (i.e. for wildlife and livestock), and animal husbandry opportunities;
- Piloting and implementing a *community plantation strategy* which will provide both forage and community benefits; and
- Applying enhancement measures such as supplemental planting programs to increase the agricultural productivity value of existing habitats.

The schedule for undertaking these activities will be agreed with the local communities, stakeholders and government and is envisaged to run throughout the project life.

## 2.7 Wildlife Management Procedures

### 2.7.1 General Management Techniques

The following management practices will be implemented:

- There will be a no feeding policy for wildlife;
- Where flexibility is possible, mine facilities will be located in unproductive habitat or non-grazing areas;
- Fencing will be used to prevent access to areas of the mine unsafe for wildlife, cattle herds or herders (such as TMF, pits, WRFs, plant area and active roads);
- Deliberate fires or other burning of vegetation will be strictly forbidden;
- Hazardous materials and wastes will be managed to prevent accidental exposure to wildlife and herds;
- All trapping, hunting or disturbance to wild animals will be strictly forbidden;
- All collecting of forest fruits, fibres, medicinal plants and or decorative plants will be prohibited;
- All illegal wood-cutting will be prohibited;
- Smoking will be strictly controlled and limited to designated smoking areas and butts placed in sand buckets;

Noisy activities including road traffic, air traffic, impact equipment (pile drivers, hammers, drills, pneumatic tools), stationary equipment (compressors, generators, pumps), blasting, materials handling equipment (crushers, concrete mixers, cranes) and earth moving equipment (trucks, loaders, dozers, scrapers) will be managed to minimise potential disturbance to wildlife;

- Any sightings of fauna species of conservation interest will be reported to the Bisha Environment Manager;



- Dust suppression activities will be undertaken on a routine basis to avoid dust disturbance to flora and fauna;
- No pets or other animals will be permitted to be brought to the site;

All organic non-hazardous domestic waste will be stored temporarily in secure (weather-proof) bins, designed for this purpose. The HSEC Department will establish a schedule for domestic waste collection which is frequent enough to avoid the build up of odour or attraction of vermin.

- Although the airstrip is not within the main Project Area, it may have an impact on the wildlife and domestic animal populations in the area, hence.
  - Runways will be clear at all times when aircraft are landing or taking off.
  - The airport management will ensure large bird nesting and roosting does not occur within the vicinity of approach and take-off routes, aircraft parking areas, taxiways and other facilities.
- For the tailings pond, it may be necessary to use additional techniques to prevent wildlife incursions: these could include pyrotechnics, catch and release, and distress calls;
- The Bisha mine will not use lethal techniques of bird and animal control, unless it has consulted with the Ministry of Agriculture and receives permission to use such techniques.

## 2.8 Roles & Responsibilities

Overall responsibility for the implementation of this Management Plan will rest with the Environment Manager who will report on progress to the General Manager. Others with responsibility for the implementation of this Management Plan will include:

- SENET, as EPCM Contractor, will be responsible for the integration of these procedures and requirements into their operating procedures and plans;
- Bisha Mine Manager will be responsible for ensuring that these procedures and requirements are implemented for all mine operations;
- Bisha Mill Manager will be responsible for ensuring that these procedures and requirements are implemented for all mill operations.

## 2.9 Training

All employees will be provided with training on awareness of wildlife and habitat management, including details of actions to be taken when wildlife of conservation concern is identified. In addition, special instructions will be provided to catering personnel on not feeding wildlife and the secure storage and disposal of kitchen wastes.

## 2.10 Monitoring & Reporting

The Environment Manager will maintain updated records on the following:

- BSMC will monitor and map habitats within the construction and other land clearance areas; as far as possible, a record will be kept of the type of habitat and flora species; where trees are removed, the species and tree age/diameters will be logged;
- Wildlife mortalities will be recorded for both the site and on the transportation route (e.g., from air strikes, vehicle strikes, shooting (i.e. military or illegal), other sources);
- Wildlife monitoring will be undertaken as the Project progresses and at key locations. The results of the wildlife surveys will be used by the Environment Department to determine the effectiveness of mitigation and protection measures. Monitoring will include the numbers and location of:
  - Large mammals;
  - Birds (including migratory birds);
  - Reptiles (watercourses and TMF); and
  - Domestic livestock.



SENET will report on a monthly basis to the Environment Manager on the implementation of this Management Plan during the construction phase. The Environment Manager will be responsible for record-keeping.

Regular reporting will be undertaken via the monthly SEMS Report that will be prepared and submitted to the Bisha General Manager. Reporting will include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

Further information on environmental monitoring and reporting requirements and procedures is set out in the Monitoring Plan and in the Social & Environmental Management System.



## 3 Non-Hazardous Waste Management Plan

### 3.1 Introduction

The *Non-Hazardous Waste Management Plan* is designed to ensure the effective collection, storage, management and disposal of non-hazardous waste. The plan contains methods that shall be used to prevent adverse effects occurring during construction and operations, monitoring plans to assess potential effects during construction and operation, and monitoring plans for determining the effectiveness of mitigation.

### 3.2 Objectives

The objectives of this Management Plan are to:

- Establish Standard Operating Procedures (SOPs) for Bisha construction, operations and closure activities;
- Define BMSC requirements and procedures to guide the Project Management Team and other Project contractors;
- Define roles and responsibilities;
- Presenting mitigation measures; and
- Define monitoring and reporting procedures.

### 3.3 Scope

The plan addresses the management of non-hazardous industrial and domestic waste. The plan covers all activities that could result in the generation of non-hazardous waste and the potential adverse effects of non-hazardous waste and domestic waste throughout all phases of the Project. For the purposes of this plan, domestic waste is defined as kitchen, biological, and general camp waste; industrial waste includes inert bulk wastes other than mining wastes.

### 3.4 Regulatory Requirements

#### 3.4.1 Eritrean Requirements

Part four of the 'Management of Environmental Quality and Natural Resources' of the Environment Proclamation, Government of Eritrea, 1996 covers legislation relating to waste management.

In Chapter 1, 'Environmental Quality Management', Article 62 on Waste Management states the following:

- The import of toxic and hazardous wastes is prohibited.
- Collection, treatment and disposal of waste, including the location and administration of landfills and other waste disposal sites, shall be subject to license, permit or approval procedures which require prior environmental impact assessment, as provided in part Three, Chapter V of this proclamation.
- The Agency, jointly with line ministries concerned and in collaboration with relevant private sector entities, shall prepare and propose for adoption standards for:-
  - domestic and industrial waste collection, treatment and disposal;
  - collection, treatment, and disposal of toxic and hazardous wastes.
- Such standards shall ensure that all wastes are collected, treated and disposed of in an environmentally sound manner.
- The Agency, jointly with the line ministries concerned, shall develop policies and programmes to promote the reduction of amounts of wastes and the recycling of wastes.

#### 3.4.2 International Finance Corporation Environmental Guidelines

IFC Environmental Health & Safety Guidelines for Mining sets out the following recommendations with regard to non-hazardous waste<sup>4</sup>:

#### **General Non-Hazardous Waste**

<sup>4</sup> International Finance Corporation. *Environmental, Health & Safety Guidelines for Mining*. 10 December 2007. pp 8.



Recommended practices for the management of household and non-process related industrial waste include the following:

- Non-hazardous solid waste should be collected for disposal at an approved sanitary landfill;
- External landfills should be audited to ensure appropriate waste management practices. When such a facility is not available within a feasible distance, the mine should establish and operate its own with appropriate regulatory permits and scientifically defensible studies that can demonstrate that the disposal of the hazardous waste will not impact human health and the environment;
- Non-hazardous solid waste should not be disposed of together with waste rock or overburden except under exceptional circumstances to be fully documented in the environmental and social assessment of the project.

IFC General Environmental, Health & Safety Guidelines sets out the following recommendations with regard to non-hazardous waste<sup>5</sup>:

Facilities that generate and store wastes should practice the following:

- Establishing a waste management hierarchy that considers prevention, reduction, reuse, recovery, recycling, removal and finally disposal of wastes.
- Avoiding or minimizing the generation of waste materials, as far as practicable;
- Where waste generation cannot be avoided but has been minimized, recovering and reusing waste;
- Where waste cannot be recovered or reused, treating, destroying, and disposing of it in an environmentally sound manner.

### 3.5 Waste Hierarchy Approach

The Project will employ the waste hierarchy approach whereby the first aim will be to reduce the amount of waste generated through design, use of approved suppliers for materials, contract arrangements, minimisation of over-ordering etc. Under the waste management hierarchy, management options will be evaluated in the following sequence to minimise the amount of waste generated for final disposal:

**Reuse:** as far as practicable, wastes will be reused.

**Recycle:** There are currently no recycling facilities in Eritrea. Materials or goods that are waste but cannot be reused can often be recycled i.e. paper, wood, metal, plastic, and glass; this recycling may occur on the site, in the immediate communities or in the region.

**Segregation:** segregation of inert, hazardous and non-hazardous wastes will be carried out. Segregation of materials such as wood, metal, plastic and inert materials should be the initial targets as this may provide benefits such as cost savings for waste disposal and benefits to the community.

**Recovery:** if neither reuse nor recycling can be carried out, materials should be considered for recovery as a last resort.

**Send for disposal:** where none of the above are practicable the waste can be sent for disposal at controlled on-site disposal location.

### 3.6 Wastes Produced by the Project

Typical non-hazardous wastes that will be generated from construction and operations are listed below:

- **Domestic Wastes**
  - food waste (i.e., any food remains or wastes that have been in direct contact with food such as containers, napkins, wrappers);
  - paper and cardboard;
  - some plastics; and
  - general camp and office wastes such as used office supplies, liners.
- **Inert Bulk Waste**

<sup>5</sup> International Finance Corporation. *General Environmental, Health & Safety Guidelines* 30 April 2007. pp 47.



- Conveyor belts, tyres;
- Crusher and chute liners, screen elements;
- Motors, v-belts;
- Piping and fittings;
- Rebars;
- Building and bulk debris, cladding, carpeting, drywall, light bulbs (except in the case of mercury vapour/low energy bulbs. These must be disposed of as per hazardous waste requirements), broken glass, insulation and timber; and
- scrap metals.

### 3.7 Waste Management Procedures

#### 3.7.1 Waste Recycling

Several of the wastes listed above can be recycled normally, such as:

- paper and cardboard;
- printer and copier cartridges;
- some plastics;
- some scrap metal;
- glass bottles and jars; and
- aluminium and tin cans.

BMSC will consult with the community on the demand for any recyclable products such as scrap metal, cardboard and wood which may have a value or a use locally. BMSC will also look at commercial options for recycling; if recycling facilities are available and accessible on a commercially-justifiable basis, waste will be recycled. If not, waste will be disposed of in accordance with this Management Plan.

The HSEC Department will identify what waste recycling routes are available to the Project, appoint suitable contractors and establish a series of recycling points for glass, paper, cardboard and tin. Recycling containers will be clearly labelled and preferably colour-coded.

For non-recyclable waste, the procedures are documented below.

#### 3.7.2 Domestic Waste

- Food wastes will be collected from the food waste bins in the accommodations complex, service complex, and other facilities and immediately placed and sealed in plastic bins.
- The plastic bins will then be stored in enclosed storage areas before transport directly to the incinerator storage area, where they will be fed to the incinerator.

Burning of hazardous domestic waste will be prohibited at all times.

All organic non-hazardous domestic waste will be stored temporarily in secure (weather-proof) bins, designed for this purpose.

The Environment Manager will establish a schedule for domestic waste collection which is frequent enough to avoid the build up of odour or attraction of vermin.

The volume of domestic waste material will be highly variable; monitoring will be conducted with the use of a Waste Inventory which will take into account any recycled waste materials. The approximate volume of wastes generated will be registered in order to establish a reliable baseline for waste minimisation purposes.

#### 3.7.3 Solid Waste

This includes all office wastes, concrete, steel, rubble, timber, plasterboard and mixed construction waste. These are all classified as *non-hazardous*. These will mainly be generated during the operational phase with minor amounts generated in the construction and decommissioning phases.



- Wastes will be segregated at source prior to being transported to the waste storage area on hard-standing with controlled access. The site will be installed with an apron and appropriate perimeter drainage. Areas used for loading and unloading will also have suitable drainage structures, spill containment and other control equipment. Suitable protection from rainfall and sunlight will be provided.
- A separate area will be provided for hazardous waste.
- Copies of waste contractor's licenses and those of the disposal facilities used by the contractors will be kept on site.
- The area used for waste storage will be covered to prevent contact with rain water.

#### **3.7.4 Liquid Wastes**

Liquid waste procedures apply to all non-hazardous liquid wastes on the site. The procedure for managing these wastes is as follows:

- Any spills will be cleaned up using absorbent materials and placed in bins, unless washing is appropriate and the liquid will not impact the wastewater treatment plant;
- There will be no onsite disposal of liquid direct to the soil surface or storm water collection system; and
- Non-hazardous waste bins will be finally disposed of to the incinerator or the landfill which is an engineered cell within the TMF.

#### **3.7.5 Laboratory Waste**

Laboratory wastes will comprise a mixture of non-hazardous and hazardous materials. Non-hazardous are likely to include glass products, non-hazardous reagents and bi-products used on-site. The procedures for managing this waste will be as follows:

- Liquid wastes from the laboratory will not be disposed of down sinks, to the ground or storm water drainage system;
- Liquid wastes will be collected for temporary storage and disposal by licensed contractor; and
- It may be possible to co-ordinate waste pick-ups to coincide with the collection of waste solvent from the workshops and maintenance areas.

#### **3.7.6 Litter**

This includes any general litter on-site, and the objective is to minimise the visual impact of litter on the site and surrounding area, and minimise the potential to attract vermin. This will be achieved through the provision of appropriate disposal facilities around the Project Area and the education of the work force in the importance of litter control.

### **3.8 Waste Containers**

#### **3.8.1 Storage**

- Separate bins for food waste, metals, paper and other waste will be located throughout the accommodations complex, service complex, process plant, underground shops, and other facilities on site for immediate sorting of domestic waste;
- Steel bins and dumpsters will be located at each major facility for the collection of burnable and non-burnable materials and recyclable wastes such as scrap metal, timber, tyres, and unsalvageable equipment;
- Hauliers will have appropriate training and hauling will be undertaken in a manner that prevents inadvertent release of wastes or recyclables enroute;
- Solid wastes which are inadvertently dumped in unauthorized locations will be removed immediately and disposed at an approved facility;
- Hauliers will provide receipts or other confirmation that recyclables and wastes were disposed at authorised, approved facilities;



- Non-toxic, non-food solid wastes will be sorted in the waste transfer storage area into four types - combustible, non-combustible, recyclable, and reusable; -
- Combustible items will be burned in the incinerator (if suitable for disposal), while non-combustible items will be landfilled or recycled if practical' and
- Aerosol cans will be punctured and drained prior to incinerating.

Inert bulk wastes that cannot readily be recycled or reused, such as general debris or incinerator ash, will be stored in bins and dumpsters in the waste transfer storage area and transferred to the landfill.

### 3.8.2 Containers

- Drums, bins, receptacles, and dumpsters used for storage of waste will be selected based on waste material requirements, prevention of wildlife attraction (steel or heavy-duty plastic containers with positive clamping lids), and transport requirements (truck, forklift).
- All containers will be labelled to identify only those wastes for which they are suitable.

### 3.8.3 Landfill

- Inert solid wastes will be deposited into a small area of the TMF which will be in an area where drainage can be controlled.
- Purpose designed and built landfill cells will be prepared within the TMF. Landfill cells will be designed to prevent the inflow of rainfall runoff from upslope areas and will be lined. Once a cell is full, it will be covered with impermeable lining material and will then be progressively buried by tailings. Any leachate will be collected by the TMF drainage system and will be pumped back into the TMF.

### 3.8.4 Waste Transfer Storage Area

- A fenced area will be established for the handling and transfer of wastes. Fencing will be 2 m high, slatted-type and partially buried to prevent animals burrowing underneath.
- Non-food waste products that are not incinerated or landfilled immediately will be collected, sorted, and placed in designated areas within the fenced area. Depending on the nature of the waste, it will be placed in sealed, wildlife-resistant containers and stored for transport to the incinerator or landfill.

### 3.8.5 Incinerator

- A high capacity, dual-chamber, diesel oil-fired incinerator will be provided as a modular package for the incineration of combustible waste. The incinerator will also be able to burn waste oil.
- The unit will be pre-assembled complete with a diesel storage tank and will be housed in a pre-engineered module adjacent to the Camp site. The facility will be sized for a peak load of 500 people during construction and will be downsized to the demand of a 300-person permanent camp during operations.
- Incinerator ash will be collected regularly in sealed, wildlife-resistant containers and transported to the landfill for disposal or disposed of in the waste rock dump *provided this is authorised with the government.*

### 3.8.6 Domestic Sewage and Greywater

- Treated effluent will be discharged to a temporary lagoon during construction (where water will evaporate) and to the processing plant during operations.

## 3.9 Waste Management Documentation

The Mine Services Department will maintain an inventory of all wastes arising on site including a description of the waste, its source, classification and volume. An example of a waste inventory is as follows:

### Example Waste Inventory



Waste Materials	Estimated quantity		Planned Actions		
	Vol (m <sup>3</sup> )	Mass (t)	On-site recycling/reuse (specify method and use and if waste processing licence or exemption are held or required)	Off-site recycling/reuse (specify recycler and recycling outlet)	Disposal (specify incinerator or landfill site)
Rubble/mixed construction waste					
Paper					
Glass					
Cardboard					
Tyres					
Plastic					
Aluminium					
Lubricants					
Waste oils					
Solvents					
Reagents					

This Environment Manager will be responsible for preparing and filing Waste Consignment Notes for any wastes leaving the site. Waste Consignment Notes will detail:

- Nature of waste;
- Waste classification;
- Waste volume;
- Date of collection;
- Disposal route; and
- Details of haulier.

The Environment Manager will designate employees with authorisation for waste disposal, using a template similar to the following:

Waste Consignment Note: Ref.....			Register of Waste Carriers/Contractors/ Disposal Sites & Transfer Stations			
Date	Carrier/ Disposal Site Name	Carrier/ Disposal Site Address	Details of Carrier's/ Disposal Site License			Description of Waste to be Carried
			Reference	Original Inspected		
				By	Date	

### 3.10 Roles & Responsibilities

Overall responsibility for the implementation of this Management Plan shall rest with the Environment Manager who shall report on progress to the General Manager. Others with responsibility for the implementation of this Management Plan shall include:



- SENET, as EPCM Contractor, shall be responsible for the integration of these procedures and requirements into their operating procedures and plans;
- Bisha Mine Manager shall be responsible for ensuring that these procedures and requirements are implemented for all mine operations;
- Bisha Mill Manager shall be responsible for ensuring that these procedures and requirements are implemented for all mill operations.

### **3.11 Training**

All employees of BMSC and Contractors to BMSC shall be provided with basic training in waste management. Additional, specialist training shall be provided to plant operators and key personnel involved in activities which involve non-hazardous waste management.

### **3.12 Monitoring & Reporting**

Waste monitoring procedures shall be as follows:

- SENET shall report on a monthly basis to the Bisha Environment Manager on the implementation of this Management Plan including:
  - Construction of waste storage facilities;
  - Use of recycling facilities;
  - Vermin and litter control; and
  - Status of wastes inventory.
- Bisha Environment Manager shall inspect the condition of waste storage and waste disposal areas on a monthly basis and shall maintain appropriate records. The inspection shall include:
  - Physical walk-over and inspection of the condition of all areas;
  - Review of waste documentation;
  - Condition of waste transfer and storage areas;
  - Condition of landfill;
  - Condition of incinerator;
  - Condition of recycling activities (if undertaken); and
  - Compliance with applicable regulatory and corporate requirements.
- Bisha Environment Manager shall prepare and update the Waste Inventory as the mine develops.

Audit and inspection will comprise the following:

- Designated waste storage locations will be marked on a plan;
- Each waste storage area will be numbered to facilitate inspections;
- Monthly inspections of waste storage areas will be conducted;
- Any spills, leaks, poor containment, lack of labelling or other issues will be recorded and reported to the relevant department for corrective action; and
- Corrective actions will be documented on completion.

Further information on environmental monitoring and reporting requirements and procedures is set out in the Monitoring Plan and in the Social & Environmental Management System.



## 4 Petroleum and Oils Management Plan

### 4.1 Introduction

The *Petroleum and Oils Management Plan* is designed to ensure the effective storage, management and disposal of petroleum and oils by the Bisha Project. The plan contains methods that shall be used to prevent adverse effects occurring during construction and operations, monitoring plans to assess potential effects during construction and operation, and monitoring plans for determining the effectiveness of mitigation.

### 4.2 Objectives

The objectives of this Management Plan are to:

- Establish Standard Operating Procedures (SOPs) for Bisha construction, operations and closure activities;
- Define BMSC requirements and procedures to guide the Project Management Team and other Project contractors;
- Define plans/measures for impact mitigation;
- Define roles and responsibilities; and
- Define monitoring and reporting procedures.

### 4.3 Scope

The plan addresses the management of petroleum and oils during construction, operations and closure associated with the Bisha mine. This plan covers all planned activities that could result in adverse effects to human health and safety and environmental quality through all phases of the Project. The *Spill Prevention and Emergency Response Plan* addresses issues related to the management of accidental releases of petroleum and oils.

### 4.4 Regulatory Requirements

#### 4.4.1 Eritrean Requirements

Eritrea does not have regulations specifically related to Petroleum and Oils management, but has implemented regulations related to environmental management plans. Eritrean requirements for environmental management plans are outlined in “*National Environmental Assessment Procedures and Guidelines*” Ministry of Land, Water and Environment, March 1999.

#### 4.4.2 International Finance Corporation Environmental Guidelines

IFC revised General Environmental Health & Safety Guidelines and the Environmental Health and Safety Guidelines for Mining cover several aspects of oils and petroleum management. These recommendations are set out below:<sup>67</sup>:

- *Providing adequate secondary containment for fuel storage tanks and for the temporary storage of other fluids such as lubricating oils and hydraulic fluids;*
- *Using impervious surfaces for refueling areas and other fluid transfer areas;*
- *Training workers on the correct transfer and handling of fuels and chemicals and the response to spills;*
- *Providing portable spill containment and cleanup equipment on site and training in the equipment deployment;*
- *Assessing the contents of hazardous materials and petroleum-based products in building systems (e.g. PCB containing electrical equipment, asbestos-containing building materials) and process equipment and removing them prior to initiation of decommissioning activities, and managing their treatment and disposal; and*
- *Assessing the presence of hazardous substances in or on building materials (e.g., polychlorinated biphenyls, asbestos-containing flooring or insulation) and decontaminating or properly managing contaminated building materials.*

<sup>6</sup> International Finance Corporation. *Environmental, Health & Safety Guidelines for Mining*. 10 December 2007.

<sup>7</sup> International Finance Corporation. *General Environmental, Health & Safety Guidelines* 30 April 2007.



IFC Performance Standard 3, Pollution Prevention and Abatement also provides useful guidance in relation to petroleum and oils.

#### 4.5 Potential Impacts

The key issues related to the management of petroleum and oils are:

- Design, construction and installation of appropriate storage facilities;
- Management and maintenance of storage facilities;
- Fuel and oil handling; and
- Management and disposal of waste oil.

#### 4.6 Petroleum and Oil Management Procedures

##### 4.6.1 Design, Construction and Installation of Appropriate Storage Facilities

The following provisions will be built into the Project design to minimise the potential for spills:

All pipeline materials will be selected with respect to corrosion potential and material transfer;

Appropriate signage will be used to identify potential spill risks and other hazards;

All storage facilities for hydrocarbons and oils will be provided with suitable secondary containment and spill detection devices;

Secondary containment will comprise non-permeable, chemically-resistant material. Secondary containment will be capable of containing the larger of 110 % of the largest tank or 25% percent of the combined tank volumes in areas with above-ground tanks with a total storage volume equal or greater than 1,000 litres;

Storage facilities will be designed to comply with American Petroleum Institute (API) Std 650 '*Welded Steel Tanks for Oil Storage*' and other applicable API standards. API 650 establishes minimum requirements for material, design, fabrication, erection, and testing for vertical, cylindrical, aboveground, closed- and open-top, welded carbon or stainless steel storage tanks;

In accordance with manufacturers design protocols, shut-off and diversion valves will be installed on all pipelines and processing facilities to enable selected pipeline segments or facilities to be separated into emergency intervals;

There will be no below ground bulk storage of hydrocarbons;

Above ground tanks will be equipped with volume-measuring devices, which serve as an indicator for losses occurring within the tanks and the internal pipeline system;

All transfer and filling operations will be undertaken in designated areas with impervious surfaces and fitted with drainage systems that include oil-water interceptors;

All drum storage of fuel and lubricants will be under cover from both rain and sun;

Smoking will be strictly prohibited from any areas where fuel loading operations take place;

Bulk storage facilities will be located away from offices and the camp;

Storage facilities must have the relevant material safety data sheets (MSDS) displayed prominently;

The base of containment areas will be sloped so that spilt oil may be recovered and removed;

Storage containers will be equipped with wide-mouth, long-necked funnels to reduce spills during filling; and

Storage containers will be equipped with pressure relief valves to reduce a build-up of pressure which could cause leaks.

##### 4.6.2 Management and Maintenance of Storage Facilities

- Any accidental damage to containment structures will be inspected immediately and repairs undertaken. The extent of damage will be reported in writing to the mine and plant manager, or designate, as well as remedial repairs effected together with the date of repairs and any follow up inspection.



The following inspection schedule will be followed for fuel and oil storage areas:

Facility/Equipment	Inspection Schedule	Inspection Procedures
Bulk storage tanks	<ul style="list-style-type: none"> <li>Weekly by facility operators</li> <li>Quarterly by Environment Manager</li> <li>Annually by BMSC EHS Dept</li> </ul>	<ul style="list-style-type: none"> <li>Weekly visual inspections</li> <li>Quarterly visual inspections and records review</li> <li>Annual visual inspections and records review</li> <li>Period integrity testing according to manufacturers' instructions</li> <li>Report and repair leaks promptly</li> </ul>
Diesel generator building	<ul style="list-style-type: none"> <li>Monthly by Environment Manager</li> </ul>	<ul style="list-style-type: none"> <li>Visual inspection and records review</li> </ul>
Fuelling points	<ul style="list-style-type: none"> <li>Weekly by Environment Manager</li> </ul>	<ul style="list-style-type: none"> <li>Visual inspection</li> </ul>
Spill kits	<ul style="list-style-type: none"> <li>Quarterly by Environment Manager</li> <li>Annually by BMSC EHS Dept</li> </ul>	<ul style="list-style-type: none"> <li>Visual inspection and records review</li> </ul>
Other hazardous materials storage areas	<ul style="list-style-type: none"> <li>Monthly by Environment Manager</li> </ul>	<ul style="list-style-type: none"> <li>Visual inspection and records review</li> </ul>

#### 4.6.3 Inventory Management

Bulk materials, including those products discussed in this plan, will be transported to the Bisha site. The division managers will reconcile total amounts received against amounts ordered. The senior manager for each division will regulate use.

Fuel and gasoline use will be automatically metered as it is distributed from bulk tanks. The metered volumes will be summarized weekly and reconciled against manual dipping of the tanks. The exception will be use for power generators where weekly fuel use will be recorded. Lubricant and other petroleum products will be inventoried monthly.

#### 4.6.4 Fuel and Oil Handling

Handling procedures are set out below.

Product	Safe Handling Procedures
Diesel	<ul style="list-style-type: none"> <li>Do not get in eyes, on skin or on clothing. Avoid breathing vapours, mist, fume or dust. Do not swallow. Wear protective equipment and/or garments if exposure conditions warrant. Wash thoroughly after handling. Launder contaminated clothing before reuse. Use with adequate ventilation.</li> <li>Keep away from heat, sparks, and flames. Store in a well-ventilated area. Store in a closed container. Bond and ground during transfer.</li> </ul>
Lubricants, hydraulic oil, transmission fluid	<ul style="list-style-type: none"> <li>Wear protective clothing and impervious gloves when working with used oils and transmission fluids.</li> <li>Keep container closed until ready for use.</li> </ul>
Aviation Gasoline	<ul style="list-style-type: none"> <li>Avoid skin contact. Launder contaminated clothing before reuse.</li> <li>Store in a flammable liquids area. Store away from heat, ignition sources, and open flames. Bond and ground during transfer. Aviation gasoline will burn vigorously and can explode with the right fuel-air mixture.</li> </ul>
Unleaded Gasoline	<ul style="list-style-type: none"> <li>Avoid skin contact. Launder contaminated clothing before reuse.</li> <li>Store in a flammable liquids area. Store away from heat, ignition sources, and open flames. Bond and ground during transfer. Gasoline will burn vigorously and can explode with the right fuel-air mixture.</li> </ul>
Varsol	<ul style="list-style-type: none"> <li>Avoid eye contact. Use with adequate ventilation. Wash thoroughly after handling.</li> </ul>



Product	Safe Handling Procedures
	<ul style="list-style-type: none"> <li>• Empty container retains residue. Follow label instructions. Avoid repeated skin contact.</li> <li>• Store in cool, ventilated area, away from ignition sources and incompatibles. Keep container tightly closed.</li> </ul>
Ethylene Glycol	<ul style="list-style-type: none"> <li>• Use adequate ventilation, wear protective gloves and chemical safety goggles if possibility of eye contact.</li> <li>• Keep in tightly closed container, stored in a cool, dry, ventilated area. Separate from acids and oxidizing materials. Containers of this product may be hazardous when empty since they retain product residues (vapours; liquids).</li> </ul>
Automotive grease	<ul style="list-style-type: none"> <li>• Minimize breathing vapor, mist or fumes. Avoid prolonged or repeated contact with skin. Remove contaminated clothing; launder or dry-clean before re-use. Remove contaminated shoes and thoroughly clean before re-use; discard if oil-soaked. Cleanse skin thoroughly after contact, before breaks and meals, and at end of work period.</li> <li>• Product is readily removed from skin by waterless hand cleaners followed by washing thoroughly with soap and water.</li> <li>• To prevent fire or explosion risk from static accumulation and discharge, effectively ground product transfer system in accordance with the National Fire Code. Keep containers closed when not in use. Do not store near heat, sparks, flame or strong oxidants.</li> </ul>

A contract supplier will fill fuel tanks in the main fuel farm; fuelling is the contractor's responsibility. Fuel transfer will take place inside the bunded area; general procedures to be followed are presented below. For fuelling station tanks, if they are used, similar procedures will be followed:

- Before fuel transfer verify that:
  - all fuel transfer hoses have been connected properly and couplings are tight;
  - transfer hoses are not obviously damaged;
  - fuel transfer personnel are familiar with procedures;
  - for fuelling stations, personnel are located at both the fuel truck and fuel transfer tank(s) and have the ability to shut off fuel flow manually;
  - a means of communication has been established between the two people transferring fuel; and
  - a high liquid level shutoff device can be substituted for the person at the delivery tank, in which case operation of the shutoff should be verified each time it is used.
- Transfer fuel as per established procedures of the fuelling contractor.
- The Contractor (or mine employee in the case of fuelling station tanks) will report any accidents or spills immediately to the mine or plant manager and in writing to Bisha Mining SC's Vice-President Regulatory Affairs.

#### 4.6.5 Management and Disposal of Waste Oil

- Used oil is a hazardous waste.
- All used petroleum products will be collected in tanks marked "Waste Oil" (signage will also be in Tigrigna and Arabic) and disposed of under the direction of the mine services manager.
- Empty petroleum containers will, unless otherwise directed, be stored on site in a designated area and returned to the supplier on back hauls.

#### 4.7 Roles & Responsibilities

Overall responsibility for the implementation of this Management Plan shall rest with the Bisha Environment Manager who shall report on progress to the Bisha General Manager. Others with responsibility for the implementation of this Management Plan shall include:

- SENET, as EPCM Contractor, shall be responsible for the integration of these procedures and requirements into their operating procedures and plans;
- Bisha Mine Manager shall be responsible for ensuring that these procedures and requirements are implemented for all mine operations; and



- Bisha Mill Manager shall be responsible for ensuring that these procedures and requirements are implemented for all mill operations.

#### **4.8 Training**

All employees of BMSC and Contractors to BMSC shall be provided with training in the management and handling of fuels and lubricants. Additional, specialist training shall be provided to plant operators and key personnel involved in activities which involve frequent contact with, and use of, fuels and lubricants.

#### **4.9 Monitoring & Reporting**

Fuel and lubricants inspection procedures shall be as outlined in *Section 1.6.2*.

The Bisha Mine Services Department will maintain an inventory of all chemicals purchased, delivered, stored and used at the Bisha Mine site. This inventory will be updated on a monthly basis.

This Bisha Mine Service Department will collect and maintain records on fuels and lubricants in consultation with the mine manager, for the following:

- reconciled bulk inventory;
- weekly use summaries;
- weekly reconciliation for each storage tank;
- overfill alarm tests;
- pressure tests (if applicable);
- inspections and maintenance checks of storage tank system, piping and delivery system;
- any alteration to the system;
- reports of leaks or losses;
- reports of spill responses; and
- records of training.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period; and
- Any other issues of concern.

Further information on environmental monitoring and reporting requirements and procedures is set out in the Monitoring Plan and in the Social & Environmental Management System.



## 5 Topsoil Management Plan

### 5.1 Introduction

The *Topsoil Management Plan* is designed to ensure the protection of soil resources during the construction, operation and closure phases of the Bisha Project. The plan contains the methods that shall be used to prevent adverse effects to soil resources, monitoring plans to assess potential effects during construction and operation, and monitoring plans for determining the effectiveness of mitigation.

### 5.2 Objectives

The objectives of this Management Plan are to:

- Establish Standard Operating Procedures (SOPs) for construction, operations and closure activities;
- Define BMSC requirements and procedures to guide the Project Management Team and other project contractors;
- Define mitigation measures;
- Define roles and responsibilities;
- Define monitoring and reporting procedures.

### 5.3 Scope

The plan addresses the management of topsoil during construction, operations and closure associated with the Bisha mine. This plan covers all activities that could result in adverse effects on topsoil and through all phases of the project. The plan principally relates to soil quality, the maintenance of the productive capacity of local soils and stripped topsoil, and erosion control from stripped topsoil.

The *Terrain and Erosion Control Plan* addresses issues related to the management of soils that are not directly impacted by the Project, but which may be affected by through erosion by water or wind. Protection of soil resources from contamination from spills is addressed in the *Spill Prevention and Emergency Response Plan*. Topsoil issues are also addressed in the *Cultural Heritage Plan* and the *Conceptual Closure and Reclamation Plan (CCRP)*.

### 5.4 Regulatory Requirements

#### 5.4.1 Eritrean Requirements

In the 1996 document by the Government of Eritrea, entitled Environment Proclamation 69/1995, the following Article 60 relates to soil quality (Part Four, Chapter 1, Environmental Quality Management):

- a) *All activities having significant impacts on soil quality shall be subject to license, permit or approval procedures which require prior Environmental Impact Assessment, as provided in part Three, Chapter V of this Proclamation.*
- b) *The Agency, jointly with line ministries and in collaboration with relevant private sector entities, shall prepare and propose for standards for:-*
  - *Arresting and preventing all forms of erosion and desertification;*
  - *Preserving soil and sub-soil from all forms of degradation.*
- c) *Such standards shall be responsive to and consistent with the characteristics of the Eco-Geographic regions of Eritrea as defined in the National Environmental Management Plan.*

#### 5.4.2 International Finance Corporation Environmental Guidelines

IFC Environmental Health & Safety Guidelines for Mining sets out the following recommendations with regard to soil conservation<sup>8</sup>:

<sup>8</sup> International Finance Corporation. *Environmental, Health & Safety Guidelines for Mining*. 10 December 2007. pp 10.



- *Where topsoil is pre-stripped, it should be stored for future site rehabilitation activities. Topsoil management should include maintenance of soil integrity in readiness for future use. Storage areas should be temporarily protected or vegetated to prevent erosion;*
- *Conserving the quality and composition of growth medium for use (e.g. for capping) during site reclamation and closure activities;*
- *Ensuring that the growth medium is sufficient to support native plant species appropriate for the local climate and consistent with proposed future land uses. Overall thickness of the growth medium should be consistent with surrounding undisturbed areas and future land use.*

## 5.5 Potential Impacts

Impacts to topsoil will occur in all phases of the Project. Impacts will be greatest during construction when topsoil is removed and terrain disturbed for the open pit and associated facilities (i.e., the plant site and crusher area, service road from the pit to plant site, camp and access road, three service roads, airstrip, the TMF and WRFs).

Impacts during the operations phase will be related to the continued development of the open pit and management of associated waste rock, and there shall be some impacts during closure as facilities are dismantled and removed.

Most of the hills are sparsely vegetated with Acacia species, while the riverine areas are dominated with open upper riverine forest cover. The Fluvisol soil units are typically covered with evergreen *Cadaba rotundifolia* (Kulmet), whereas Cambisol soil units have *Acacia orfota* (Ghemrot) shrubs. The vulnerability of topsoil resources under baseline conditions in the area is related to moderate erosion risk, due to erosion by wind or heavy precipitation events, exacerbated by limited vegetation cover.

Slopes within the majority of the Project Area are gentle with an average slope gradient of <1%, with the exception of hillslopes which are often have a gradient >30%. Erosion risk is greatest in disturbed areas with increased slope angles and in the proximity of natural watercourses and constructed diversion channels. Current drainage patterns follow the natural incised valley forms but do not sustain permanent flows within the project area, so that under current baseline conditions, significant erosion only occurs during major precipitation events in the rainy season and during periods of high winds.

The implications for topsoil management relate to the availability of sufficient soil resources for effective rehabilitation of project-impacted areas and the priority of protecting available soil resources during stripping of construction areas and the handling, stacking and storing of topsoil. Conservation of topsoil quantities and also of topsoil vegetative productivity is a priority concern.

Impacts on topsoil will occur through:

Erosion due to:

Clearance of vegetation prior to topsoil stripping and exposure of topsoil to wind and precipitation;

Redirection of drainage courses during construction;

Stripping, loading, hauling and handling of topsoil;

Storage of topsoil in stockpiles;

Lifting of topsoil from stockpiles and redistribution on rehabilitated surfaces;

Wind and water erosion of recently relaid topsoil in rehabilitated areas, prior to its stabilization with vegetation growth;

Erosion of topsoil in areas which will not be stripped for project activities but which may be impacted by traffic routes or new drainage configurations; and

Failure to achieve sustainable vegetation cover in rehabilitated areas due to planting of inappropriate species or due to overgrazing, leading to breakdown of cohesive soil structure and increased vulnerability to erosion.

Loss of soil productivity and agricultural capacity:

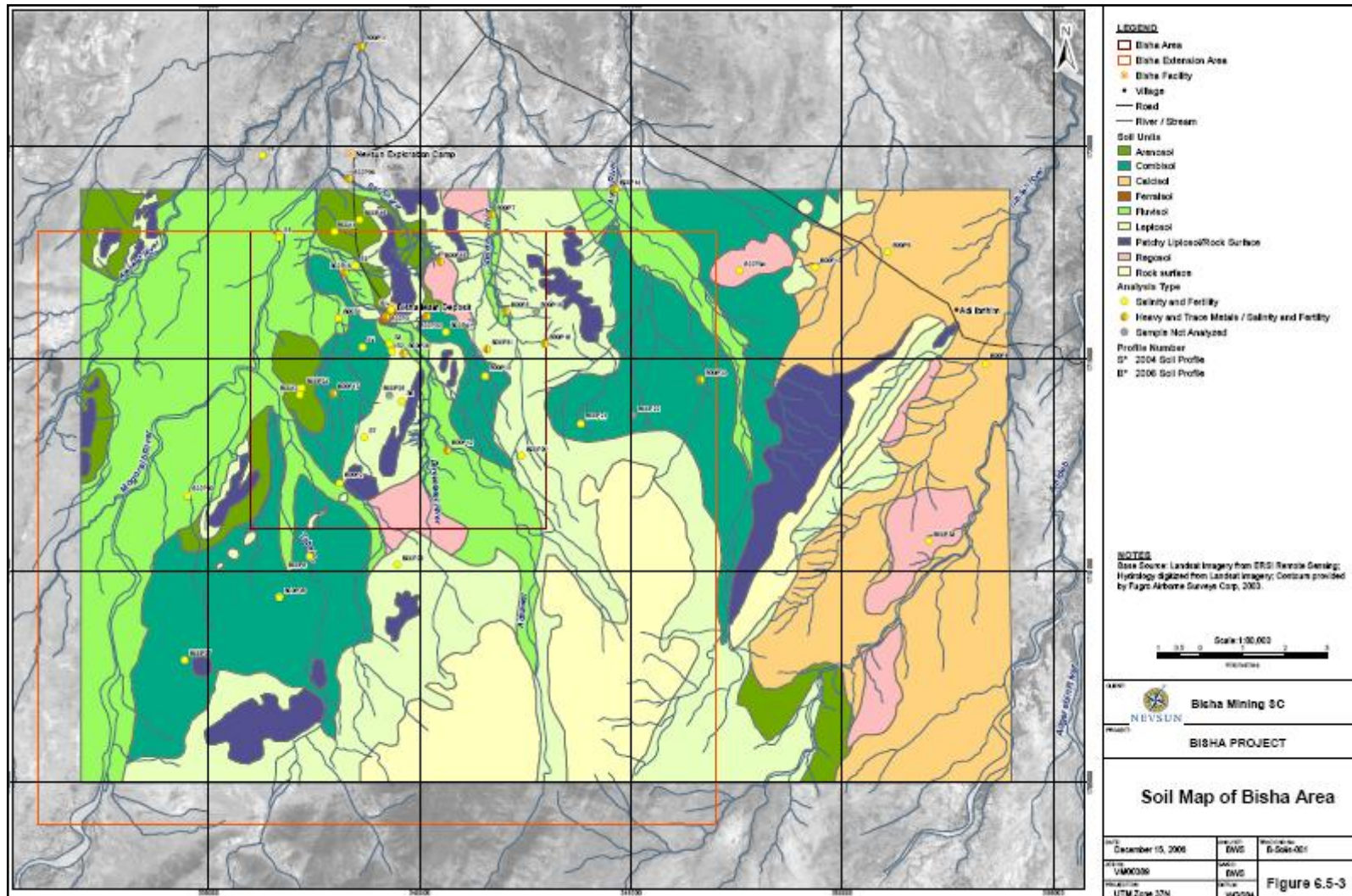


Loss of soil structure and *biota* due to stripping and stacking in stockpiles;

Potential contamination of soil resources from hazardous materials and spillage of fuels, lubricants and reagents; and

Temporary and permanent loss of productive, agricultural land, either through permanent change of land use such as to open pit mining areas or the processing plant area, or through temporary occupation by mine services and installations.

Figure 1 below illustrates soil types in the Bisha area.





### 5.5.1 Construction Phase

During the construction phase, the key issues related to soils concerns the stripping of topsoil and the storage and management of removed topsoil in stockpiles.

### 5.5.2 Operations Phase

During the operations phase, the key issues related to soils concern the ongoing stripping of topsoil and the storage and management of removed topsoil in stockpiles.

Drainage from waste rock piles and tailings impoundment area may result in an increase in metals and nutrient concentrations in soils from acidic water and metals leaching from tailings area. However, acidic water and metals leaching effects on soils will be limited to the immediate area of the tailings. The tailings impoundment is a zero discharge with seepage collection.

### 5.5.3 Closure Phase

There will be some localized reclamation of disturbed sites. These areas will have organic materials and fertilizers incorporated to increase overall soil quality using best soil management practices including re-grading, re-contouring and ameliorating soil, waste rock dump, and tailings facility cover.

At closure, the waste rock dump, tailings facility and other mine facilities will be reclaimed with a covering of soil. Some re-grading and re-contouring will be carried out. The tailings impoundment will be capped with NAG rock.

## 5.6 Topsoil Management Procedures

### 5.6.1 Topsoil Stripping

The following procedures shall be adopted by BMSC to minimise the environmental impacts of topsoil stripping:

Stripping and clearance operations shall be undertaken on an as-required basis, so that at any time, only the minimum quantity of topsoil is in storage and stripped areas remain exposed for the minimum period of time.

A map of topsoil storage locations, quantities and soil types shall be prepared and updated.

Prior to the commencement of stripping activities, the area to be stripped shall be clearly marked out in the field; for access roads, the vegetation stripping area shall be marked out to avoid unnecessary vegetation removal.

Topsoil stripping and stacking shall be undertaken only under favourable weather conditions and shall not be undertaken in periods of heavy rainfall or high winds.

Stripping depth shall be clearly indicated to the machine operator.

Stripping activities shall be carried out using a suitably light front-loader and tractor for haulage; haulage vehicles shall adhere to designated routes to minimise soil compaction.

Loaders should not operate on top of topsoil stockpiles.

Off-cuts of cleared vegetation shall be made available to the local community.

Drainage from the disturbance area shall be directed towards suitable perimeter drains and sediment control structures.

Indications/evidence encountered during the stripping operations of possible presence of archaeological/cultural-heritage asset(s) at the site shall be immediately reported to the Environment Department; stripping activities at the site shall be suspended until approval to proceed is obtained from the department under the *Chance Finds Procedure*.

### 5.6.2 Topsoil Storage/Management of Stockpiles



The following procedures shall be implemented by BMSC to conserve topsoil resources and promote effective reinstatement:

A detailed Topsoil Storage Plan shall be finalised prior to the commencement of stripping and clearance activities. This will comprise a map and inventory that will set out the location, size and construction features of topsoil stockpiles; as construction activities have already commenced, *the preparation of a map of Topsoil Storage Locations is needed urgently; this requirement has been identified as high priority in the Construction Environmental & Social Management Plan (CESMP);*

Topsoil and subsoil shall be segregated and stored separately;

If appropriate and subject to available quantities and practicality, where separate soil types can be distinguished on the basis of soil type and biological viability they shall be stored separately with appropriate measures for their management and conservation;

Topsoil stockpiles shall be restricted in height to minimise wind erosion;

To reduce the loss of soil to wind erosion, topsoil stockpiles will be constructed and managed to take account of the prevailing wind direction;

Stockpile storage areas shall have been prepared in advance by removal of topsoil and subsoil and the laying down of a free-draining gravel layer on top of the scarified rock surface; the free-draining base, in conjunction with drainage diversion channels shall minimise the effects of saturation and a raised phreatic surface within each stockpile;

To the extent possible, reclamation material stockpiles shall be located on ground surrounded by natural wind barriers to minimize the potential for wind erosion.

Topsoil mounds shall be partially-compacted on the top layer to reduce the potential for wind erosion; in general, however, compaction shall be minimised to promote aeration, maintain soil vertical structures, reduce runoff and encourage infiltration;

Surface drainage channels shall be constructed on the up-slope side of each topsoil stockpile to divert surface run-off around and away from the stockpile; the mounds shall be configured to avoid ponding and promote free drainage; where necessary, side berms and contour drains shall be installed;

As soon as practicable, the surface of topsoil stockpiles shall be conditioned and seeded with native grass species to encourage soil binding and reduce the potential for wind and water soil erosion; as appropriate, and depending on soil type, fast-growing native species of legume may also be used to bind the soil surface layers and return nitrogen to the soil substrate; for steeper slopes, geomembrane stabilizers shall be used for slope stabilisation;

Stripped vegetation can also be placed on stockpiles to assist with erosion control soon after establishment. Placing of such material will also facilitate recolonisation of the stockpiles;

A toe drainage collection ditch shall collect any surface run-off from the stockpile and shall feed the collected water to an impoundment and sediment trap; this shall be cleared periodically and sediment retained for the rehabilitation process;

During the dry season, directional spraying, or similar control measures, may be used to maintain soil moisture and reduce the potential for wind erosion if considered necessary;

Seeding shall take place, initially, on perimeter stockpiles and vegetation screening shall be used, where appropriate, to provide further protection from windblown dust;

Hazardous materials shall be stored in designated areas on sealed surfaces within bermed containment, with suitable drainage, protection from sunlight and rainfall and installed with suitable capacity to contain spills, and shall not be placed directly upslope of soil storage mounds;

Soil storage areas shall be clearly marked and vehicle activity restricted appropriately;

Where soils provide a protective layer (e.g., below the WRF, TMF and seepage retention pond and collection ditches) of down gradient soil quality, this soil cover shall be left *in situ*.

Soils surrounding the waste rock dump sites, with potential acid seepage and metal leachate, shall be protected by constructing collection ditches graded to report to the open pit. Soils surrounding the tailings impoundment shall be protected from acid seepage and metal leachate by constructing collection ditches graded to report to collection pond. The collection ditches and retention pond shall



be lined with either a high density polyethylene geomembrane liner or a linear low density polyethylene geomembrane liner.

At closure, there shall be some localized reclamation of disturbed sites. These areas shall have organic materials and fertilizers incorporated to increase overall soil quality using best soil management practices including re-grading, re-contouring and ameliorating soil, waste rock dump, and tailings facility cover.

- Given the nature of the mining operation, it is accepted that long-term storage of topsoil will be inevitable, but not-with-standing this, topsoil storage should ideally be for less than one month and should not exceed six months.
- Topsoil that has been stored for long periods of time is sterile, but is still better for plant growth than most overburden materials, and so should not be discarded.

## **5.7 Roles & Responsibilities**

Overall responsibility for the implementation of this Management Plan shall rest with the Bisha Environment Manager who shall report on progress to the Bisha General Manager. Others with responsibility for the implementation of this Management Plan shall include:

- SENET, as EPCM Contractor, shall be responsible for the integration of these procedures and requirements into their operating procedures and plans;
- Bisha Mine Manager shall be responsible for ensuring that these procedures and requirements are implemented for all mine operations.

## **5.8 Training**

All employees of BMSC and Contractors to BMSC shall be provided with basic training in the protection of topsoil resources. Additional, specialist training shall be provided to plant operators and key personnel involved in activities which involve topsoil stripping or storage.

## **5.9 Monitoring & Reporting**

Topsoil monitoring procedures shall be as follows:

- SENET shall report on a monthly basis to the Bisha Environment Manager on the implementation of this Management Plan during the construction phase, including:
  - Quantities of topsoil removed;
  - Storage locations, quantities and type of topsoil;
  - Storage procedures and methods used.
- Bisha Environment Manager shall prepare and update the Topsoil Storage Plan (essentially a map and inventory of topsoil stockpiles) as the mine develops and maintain an inventory of topsoil volumes.



## 6 Waste Water Management Plan

### 6.1 Introduction

The *Waste Water Management Plan* is designed to ensure the environmentally-sound disposal of waste water generated from the Bisha project during the construction, operations and closure phases of the Project. The plan establishes guidelines for waste water quality and management, monitoring and reporting.

### 6.2 Objectives

The objectives of this Management Plan are to:

- Establish Standard Operating Procedures (SOPs) for Bisha construction, operations and closure activities;
- Define BMSC requirements and procedures to guide the Project Management Team and other project contractors;
- Define mitigation measures;
- Define roles and responsibilities;
- Define monitoring and reporting procedures.

The targets of this Management Plan are to:

- Ensure that waste water is treated within appropriate regulatory and industry guidelines;
- Ensure that there are no regulatory or community concerns or complaints regarding waste water treatment and management.

### 6.3 Scope

Waste water in the context of a mining operation is defined as process wastewater, tailings waste water, stormwater, pit water and sanitary sewage. Waste water from processes and tailings will be directed to the tailings management facility (TMF) and is therefore covered in the *Tailings Management Plan*. Waste water arising from the waste rock dumps will be addressed in the *Waste Rock Management Plan*. This plan covers all activities that could result in adverse effects of stormwater and sanitary sewage on humans, livestock and the environment.

#### 6.3.1 Pit Water

Water pumped out of the pit will report to the process plant and/or to the tailings impoundment facility. Considerations of (i) discharge volume & quality and (ii) water requirement of the process plant will determine the ratio of the amount that will feed the process plant to that which will go to the tailings impoundment facility.

#### 6.3.2 Domestic Waste Water

The main sources of domestic waste water within the Project area include:

- The main Bisha camp (for both construction and operations staff); and
- The Process Plant.

The maximum numbers of people that are expected to be accommodated at these facilities during peak construction is approximately 700, of which 500 will be accommodated at the Bisha camp site and 200 to reside in accommodation provided by their employers (contractors, sub-contractors etc)<sup>9</sup>. Approximately 400 staff will be present during peak production, all of whom will reside at the Bisha camp site. Facilities will need to be provided at the process site as 75 staff will be working there.

## 6.4 Regulatory Requirements

### 6.4.1 Eritrean Requirements

Eritrea does not have regulations specifically related to waste water treatment, but has implemented regulations related to environmental management plans.

<sup>9</sup> These numbers may be refined as the project moves into final design.



Eritrean requirements for environmental management plans are outlined in “National Environmental Assessment Procedures and Guidelines” Ministry of Land, Water and Environment, March 1999.

In line with industry best practice, sampling and analysis of effluent from the domestic wastewater treatment plant will be carried out on a weekly basis to determine if the quality of water complies with the standards as set out in international environmental regulations and guidelines.

#### **6.4.2 International Finance Corporation Environmental Guidelines**

IFC Environmental Health & Safety Guidelines for Mining sets out the following recommendations with regard to waste water management<sup>10</sup>:

*Projects with the potential to generate process wastewater, sanitary (domestic) sewage, or stormwater should incorporate the necessary precautions to avoid, minimize, and control adverse impacts to human health, safety, or the environment.*

*In the context of their overall ESHS management system, facilities should:*

- *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 their 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 for irrigation).*

*When wastewater treatment is required prior to discharge, the level of treatment should be based on:*

- *Whether wastewater is being discharged to a sanitary sewer system, or to surface waters*
- *National and local standards as reflected in permit requirements and sewer system capacity to convey and treat wastewater if discharge is to sanitary sewer.*
- *Assimilative capacity of the receiving water for the load of contaminant being discharged.*
- *Intended use of the receiving water body (e.g. as a source of drinking water, recreation, irrigation, navigation, or other).*
- *Presence of sensitive receptors (e.g., endangered species) or habitats.*
- *Good International Industry Practice (GIIP) for the relevant industry sector.*

<sup>10</sup> International Finance Corporation. *General Environmental, Health & Safety Guidelines for Mining*. 30 April 2007.

**IFC Indicative Guideline Values Applicable to Sanitary Wastewater Discharges**

Indicative Values for Treated Sanitary Sewage Discharges (a)		
Pollutants	Units	Guideline Value
pH	pH	6-9
BOD	mg/l	30
COD	mg/l	125
Total Nitrogen	mg/l	10
Total Phosphorus	mg/l	2
Oil and Grease	mg/l	10
Total Suspended Solids	mg/l	50
Total Coliform Bacteria	MPN(b) / 100 ml	400(a)
Notes: a Not applicable to centralized, municipal, wastewater treatment systems which are included in EHS Guidelines for Water and Sanitation. b MPN = Most Probable Number		

**Stormwater**

- *Stormwater drains, ditches, and stream channels should be protected against erosion through a combination of adequate dimensions, slope limitation techniques, and use of rip-rap and lining. Temporary drainage installations should be designed for recurrence periods of at least a 10-year/24-hour event, while permanent drainage installations should be designed for a 100-year/24-hour recurrence period. Consideration of the intended life of diversion structures, as well as the recurrence interval of any structures that drain into them, should be taken into account when the above intervals are defined. For facilities that are expected to operate over long periods, regional predictions of changes in precipitation, as currently predicted by climate change models, should be considered in determining the robustness of the project's design parameters for water management.*
- *Smaller frequent storms can cause erosion at similar scales to larger infrequent storms, therefore drainage structures should also have 'low flow' channels.*
- *Stormwater settling facilities should be designed and maintained according to internationally accepted good engineering practices, including provisions for capturing of debris and floating matter. Sediment control facilities should be designed and operated for a final Total Suspended Solids (TSS) discharge of 50 mg/l. Discharge water quality should also be consistent with the receiving water body use, taking into consideration background conditions and opportunities for overall improvement of the receiving water body quality.*

IFC Performance Standard 3, Pollution Prevention and Abatement, and Performance Standard 4, Community Health and Safety are also relevant to waste water management issues.

**6.5 Waste Water Impacts**

Waste water can be harmful to humans and the environment due to the various components which can include:

- Faecal bacteria;
- Phosphates;
- Nitrates;
- BOD;
- Metals;
- Oil and grease (largely removed by grease traps where required); and
- Total suspended solids.



### 6.5.1 Construction Phase

Up to 500 personnel will be present at the Bisha camp during the construction phase. A sewage treatment plant (STP) will be installed for sewage treatment for the life of the project.

### 6.5.2 Operations Phase

The greatest impact from waste water will be generated during the operational phase when there will be large numbers of personnel present on site on an ongoing basis for the life of the project. Stormwater may impact the movement of materials to and from the site as some roads may be impassable for short periods of time. During the rainy season, transport movements will be scheduled and coordinated with weather forecasts to minimize the impact of road flooding,

### 6.5.3 Closure Phase

At closure, stormwater management facilities will be engineered to allow long-term water management if required. All other waste water management facilities will be decommissioned.

## 6.6 Waste Water Management Procedures

### 6.6.1 Stormwater Management

- The Process Plant Area will be installed with a network of perimeter drains to collect storm water.
- No discharges to the environment will be permitted from the Process Plant Area from storm water, unless it has been tested and proven to be suitable for release by the Bisha Environment Manager.
- The Process Plant Area will be kept free of chemicals and other materials which may contaminate storm water collected from the area.
- Stormwater diversion channels are to be kept free of debris to ensure that clean stormwater is carried away from the Process Plant Area.
- Stormwater courses are to be kept free of debris to minimise the volume of stormwater contacting the working areas (and therefore minimise sediment laden run-off).
- If waste rock dumps are used as part of water management structures, consideration will be given to minimizing the potential for acid leachate to enter surface watercourses at concentrations that would adversely impact downstream water quality e.g. through the use of NAG rock.

### 6.6.2 Domestic Waste Water Management

- The technology used for the proposed wastewater treatment plant includes the Submerged Aerated Media (SAM) as well as Re-activated Sludge (RAS) technology. RAS technology is used to seed the raw sewage with sludge rich in bacteria. The plant identified as a Low Maintenance Plant (LMP) is unique in that it combines the use of both anaerobic as well as aerobic environments for maximum efficiency of sewage treatment.
- Treated effluent will be discharged to a temporary lagoon during construction (where water will evaporate) and to the processing plant during operations.
- The plant is easy to operate and does not require permanent staff on site. There are no moving parts in the plant and the whole plant is built underground. The SAM and RAS-based treatment plant proposed for the Bisha project does not require periodic removal of sludge from the chambers and its incineration elsewhere. Neither does it entail vacuum-truck transportation of sewage to and/or from the treatment plant.

### 6.6.3 Pit Water Management

- Any water collecting in the bottom of the open pit will be pumped to a lined storage pond and used as process water if the water is of appropriate quality. If pit water is not of an appropriate quality for use as process water, it will be pumped to the TMF for disposal.



## 6.7 Roles & Responsibilities

Overall responsibility for the implementation of this Management Plan will rest with the Bisha Environment Manager who will report on progress to the Bisha General Manager. Others with responsibility for the implementation of this Management Plan will include:

- SENET, as EPCM Contractor, will be responsible for the integration of these procedures and requirements into their operating procedures and plans;
- Bisha Mine Manager will be responsible for ensuring that these procedures and requirements are implemented for all mine operations;
- Bisha Mill Manager will be responsible for ensuring that these procedures and requirements are implemented for all mill operations.

## 6.8 Training

Specialist training only will be provided to plant operators and key personnel involved in activities which waste water management. All staff will be made aware of the importance of water conservation and appropriate water conservation techniques.

## 6.9 Monitoring & Reporting

Down gradient monitoring wells will be installed 50 m from the outer perimeter of the leach field at three sites on each of the distal sides of the field from the septic tanks. Shallow groundwater quality will be monitored when present on a monthly basis for parameters including:

- Faecal bacteria;
- Phosphates;
- Nitrates;
- BOD;
- Metals;
- Oil and grease (largely removed by grease traps where required); and
- Total suspended solids.

WHO water criteria (listed in the table) will be used as guidelines for acceptable quality. Should an increasing trend in any of the parameters become apparent, monitoring will be increased to weekly until the source of the increase is determined and management actions result in a decrease in the subject pollutant.

Waste water monitoring procedures will be as follows:

- SENET will report on a monthly basis to the Bisha Environment Manager on the implementation of this Management Plan during the construction phase.
- Bisha Environment Manager will inspect the condition of the Project area on a monthly basis and will maintain appropriate records. The inspection will include:
  - The efficient performance of the sewage treatment plant;
  - The quality of effluent;
  - The integrity of storm water drains.

The Bisha Environment Manager will be responsible for record-keeping.

Regular reporting will be undertaken via the monthly SEMS Report that will be prepared and submitted to the Bisha General Manager. Reporting will include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

Further information on environmental monitoring and reporting requirements and procedures is set out in the Monitoring Plan and in the Social & Environmental Management System.



## 7 Air Quality Management Plan

### 7.1 Introduction

The *Air Quality Management Plan* is designed to ensure the minimisation of air quality impacts related to the Bisha Project during the construction, operations and closure phases of the Project. The plan establishes guidelines for air quality and emissions management, monitoring and reporting.

### 7.2 Objectives

The objectives of this Management Plan are to:

- Establish Standard Operating Procedures (SOPs) for Bisha construction, operations and closure activities;
- Define BMSC requirements and procedures to guide the Project Management Team and other project contractors;
- Define impact mitigation measures;
- Define roles and responsibilities;
- Define monitoring and reporting procedures.

The targets of this Management Plan are to:

- Keep ambient air quality within appropriate regulatory guidelines and standards;
- Keep all air emissions within appropriate regulatory and industry guidelines;
- Protect workers, local communities, livestock, wildlife and vegetation from adverse impacts due to dust emissions;
- Avoid nuisance from odour and dust; and
- Achieve zero regulatory or community concerns regarding air quality/emissions management.

### 7.3 Scope

This plan covers all activities that could result in air emissions through all phases of the project. This includes the following activities:

- Equipment selection (vehicles, stationary combustion equipment, etc.);
- Vehicle traffic and use of heavy equipment (emissions, dust);
- Extraction of ore and waste rocks/overburden;
- Facilities and mine construction;
- Waste management (tailings and waste rock, incineration);
- Blasting;
- Power generation;
- Facility operations (carbon regeneration kiln); and
- Concentrate storage and shipping.

Electric power at the mine will be purchased over the fence from a third party; port facilities are on the national grid. As far as possible, Bisha management shall ensure that third-party facilities that are dedicated for the use of the Project meet the same requirements as BMSC owned and operated facilities.

### 7.4 Regulatory Requirements

#### 7.4.1 Eritrean Requirements

Eritrea does not currently have regulations specifically related to air quality and emissions, but has implemented regulations related to environmental management plans.

Eritrean requirements for environmental management plans are outlined in “National Environmental Assessment Procedures and Guidelines” Ministry of Land, Water and Environment, March 1999.

#### 7.4.2 International Finance Corporation Environmental Guidelines

Air quality guidelines are set out in the revised General Environmental, Health and Safety Guidelines published by IFC on 30 April 2007. Key guidelines related to air quality are summarised below.



### Point Source Emission Limits

Air emission guidelines for small combustion facilities (<50 MWth) are set out in the IFC General EHS Guidelines<sup>11</sup> as follows:

#### Key Point Source Emission Limit Values for Liquid-Fuelled Boilers (<50 MWth)

Pollutant	Limit Value (mg/m <sup>3</sup> )
Particulate matter	- 50-100
NO <sub>x</sub>	- 1460-1850
SO <sub>2</sub>	- 1.5 – 3% (2000 mg/m <sup>3</sup> also specified)

In addition, as the net rated thermal input of the power generation system is expected to exceed 50MW, the IFC Thermal Power guidance (2008) is also expected to apply to the reciprocating engines:

#### Key Point Source Emission Limit Values for Reciprocating Engines (>50 MWth)

Pollutant	Limit Value (mg/m <sup>3</sup> )
Particulate matter	- 50
NO <sub>x</sub>	- 1460-1850
SO <sub>2</sub>	- 2% or less (1,170 mg/m <sup>3</sup> also specified)

### Ambient Air Quality Standards

Ambient air quality standards are set out in the IFC General Environmental, Health and Safety Guidelines<sup>12</sup> as follows:

#### Ambient Air Quality Limit Values (EU Ambient Air Quality Limits)

Pollutant	Limit Value (µg/m <sup>3</sup> )
SO <sub>2</sub>	<ul style="list-style-type: none"> <li>▪ 24-hour average</li> <li>▪ 1-hour average</li> <li>▪ Annual average (for protection of vegetation)</li> </ul>
NO <sub>2</sub>	<ul style="list-style-type: none"> <li>▪ 125 (not to be exceeded more than 3 times per year)</li> <li>▪ 350 (not to be exceeded more than 24 times per year)</li> <li>▪ 20</li> </ul>
NO <sub>2</sub>	<ul style="list-style-type: none"> <li>▪ Annual average</li> <li>▪ 1-hour average</li> </ul>
Particulate matter (PM <sub>10</sub> )	<ul style="list-style-type: none"> <li>▪ 40</li> <li>▪ 200 (not to be exceeded more than 18 times per year)</li> </ul>
Particulate matter (PM <sub>10</sub> )	<ul style="list-style-type: none"> <li>▪ Annual average</li> <li>▪ Maximum 24-hour average</li> </ul>
Ozone	<ul style="list-style-type: none"> <li>▪ 40</li> <li>▪ 50 (not to be exceeded more than 35 times per year)</li> </ul>
Ozone	<ul style="list-style-type: none"> <li>▪ 8-hour daily maximum</li> <li>▪ 120 (not to be exceeded on more than 25 days per year)</li> </ul>

### 7.4.3 Technical Requirements

The following technical requirements will be used to align the Project with international good practice. As far as practical, the Bisha mine will seek to meet these requirements.

#### Incinerators

Technical requirement and emissions standards are outlined in EU Directive 2000/76/EC on the incineration of waste and as set out below:

Pollutant	Limit Value (mg/m <sup>3</sup> )
Dust	- 30
TOC	- 10
HCl	- 10
HF	- 1
SO <sub>2</sub>	- 50
NO <sub>x</sub>	- 500

#### Heavy-Duty Vehicles

<sup>11</sup> General Environmental, Health and Safety (EHS) Guidelines, International Finance Corporation, 30 April 2007

<sup>12</sup> General Environmental, Health and Safety (EHS) Guidelines, International Finance Corporation, 30 April 2007.



Technical requirement and emissions standards are outlined in EU Directive 97/68/EC on emissions from non-road mobile machinery as outlined below.

Pollutant	Limit Value (g/kWh)
CO	- 30
HC	- 10
NO <sub>x</sub>	- 10
PM	- 1
SO <sub>2</sub>	- 50
Smoke	- 500

### Fuel

Technical requirement and emissions standards are outlined (but not limited) in the following regulations:

- European Community Directive 98/70; and
- “Diesel Fuel Regulations” (SOR/97-110), Canada, 1997.

Jurisdiction	Maximum Sulphur Content
EU	- 0.1%
Canada	- 15ppm

The Project will source the lowest sulphur-content fuel reasonably available on commercial terms within Eritrea. The Eritrea Petroleum Corporation and its parent agency, the Department of Energy, indicate that the current sulphur-content limit for diesel used in the country is 0.1%. It is likely that this limit will be revised down to 0.05% in the future.

## 7.5 Potential Air Emission Sources & Impacts

Air emissions relate principally to exhaust emissions from plant, equipment, vehicles and dust. The potential for dust to be emitted during construction is strongly dependent on the type and nature of activities taking place, such as the movements of vehicles and their speed, soil stripping activities, trench excavation, backfill and reinstatement. Wind speed and wind direction relative to receptors are also key factors in determining the magnitude and duration of air quality impacts.

### Construction Phase

Potential sources of dust and gaseous emissions during the construction phase include:

- Land clearance and preparation;
- Drilling, blasting and excavation;
- Heavy vehicle operation, particularly on unsealed roads;
- Topsoil / overburden loading, unloading, transportation and storage;
- Access road construction;
- General vehicle use; and
- Power generation.

### Operations Phase

Potential sources of dust and gaseous emissions during operation of the mine include:

- Ore processing and leaching has the potential for the release of gases and fumes;
- General vehicle use/vehicle exhaust emissions;
- Drilling, blasting and excavation;
- Deposition and storage of spent ore;
- Ore crushing, stockpiling and reclamation;
- Operation of the conveyor;
- Open pit operations;



- Topsoil transportation and storage;
- Wind erosion of cleared surfaces;
- Overburden transportation and storage;
- Heavy vehicle operations;
- Power generation; and
- Waste incinerator.

Potential impacts associated with gaseous and dust emissions include:

- Vegetation stress;
- Nuisance impacts associated with the soiling action of deposited dust within local communities;
- Health impacts to workers;
- Visual impacts and community perception of the mine.

Isopleths which illustrate the major emissions are included in the original 2006 SEIA (Figures 7.4.2-7.4.9).

## 7.6 Air Quality Management Procedures

### 7.6.1 General Procedures During Construction

General emissions control measures during Construction shall include:

- Use of low sulphur and low aromatic fuel, if available and competitively priced;
- Prohibiting of engine idling to reduce greenhouse gas emissions;
- Equipment maintenance to be undertaken in accordance with manufacturer's instructions and at the specified maintenance interval;
- Avoid vehicle and machinery idling;
- Unnecessary and/or unused lighting and air conditioning shall be turned off;
- All air conditioned buildings will be appropriately insulated;
- Vapour recovery units will be used on fuel/chemical storage tanks;
- Dust collection systems will be used for bulk materials unloading;
- Land disturbance will be minimised;
- Vehicle movements will be optimised to eliminate unnecessary vehicle movements;
- Dust suppression measures will be used throughout construction; and
- Uncontrolled burning of domestic waste on site shall be prohibited.

### 7.6.2 General Procedures During Operations

General emissions control measures during mining/production operations shall include:

- Use of low sulphur and low aromatic fuel, if available and competitively priced;
- Equipment maintenance to be undertaken in accordance with manufacturer's instructions and at the specified maintenance interval;
- Equipment operators will be trained in and will follow equipment operational guidelines and standards;
- Vehicles and/or construction equipment left idling for more than 10 minutes shall be turned off until required;



- Unnecessary and/or unused lighting and air conditioning shall be turned off;
- All air conditioned buildings will be appropriately insulated;
- Vapour recovery units will be used on fuel/chemical storage tanks;
- Dust collection systems will be used for bulk materials unloading;
- Covers or dust control devices will be used for crushing and milling operations;
- Land disturbance will be minimised;
- Vehicle movements will be optimised to eliminate unnecessary vehicle movements; and
- Dust suppression measures will be used throughout operations (wetting work areas, roads, and storage piles; installing equipment covers; minimizing drop distances by using adjustable height conveyors; and using dust hoods and shields);
- The surface feeder at each truck dump will be enclosed in a profiled steel clad structure; the truck dumps its load through a flexible entry curtain;
- All conveyor belts will be enclosed by a hinged cover above and a tray below; the low speed of the belts will minimise dust generation;
- At conveyor transfer points, dust will be contained by transfer chutes complete with curtains and rubber seals;
- Concentrate stockpiles will be entirely enclosed within the storage buildings; and
- Uncontrolled burning of domestic waste on site shall be prohibited at all times. All combustible domestic waste will be incinerated on site if it is not disposed into landfill.

The following management procedures have been developed to reduce potential air and dust emissions from specific operations.

### **7.6.3 Conveyors, Crushers, Material Stockpiles**

The following procedures will be adopted to limit dust emissions from conveyors, crushers, and material stockpiles:

- Raw material handling areas, such as loading and unloading, transfer points and conveyor belts will be designed to avoid the generation of fugitive dust through careful siting and sheltering and to collect dust as far as possible;
- Material drop heights will be minimised;
- All dusty work areas such as crushers, conveyors, hoppers or truck loading will be designed to avoid dust emissions through careful siting, regular cleaning of equipment and use of water sprays as appropriate;
- All heavy vehicles transferring raw materials across the site will be fitted with appropriate sheeting and covers for dust control;
- Fork-lift trucks will be fitted with an efficient exhaust system and diesel trucks equipped with micro-particle filters;
- Waste containers for materials which could be blown about by the wind will be located in areas sheltered from the wind or, preferably, covered to avoid windblown dust; and
- Raw material conveyors will be covered to prevent wind exposure.

### **7.6.4 Topsoil, Aggregate and Overburden Storage**

The following procedures will be adopted to limit dust emissions from topsoil:

- Topsoil stockpiles will be oriented in the direction of the prevailing wind, as far as practicable, to minimise windblown dust;
- Topsoil stockpiles will be restricted to a maximum height of 2 m to reduce the potential for windblown dust;



- As soon as practicable, topsoil stockpiles will be conditioned and seeded with native grass species to encourage soil binding and reduce the potential for wind and water soil erosion; and
- Vegetation screening will be used, where appropriate, to provide further protection from windblown dust.

In terms of tailings area, various options are being considered for dust management. These include wet suppression, surface cover, use of magnesium chloride etc. Further work will be conducted to assess the most effective option for the control of dust from tailings.

**7.6.5 Access Roads and Cleared Areas**

The following procedures will be adopted to limit dust emissions from access roads, cleared areas and conveyors:

- A 50 kph maximum speed limit will be imposed at all times;
- Vehicles will follow specific access routes and use designated turning areas;
- All heavy vehicles leaving the site will be fitted with appropriate sheeting and covers to control dust from haul loads;
- Routine dust suppression will be carried out on unpaved roads. Chemical dust suppressants will only be used if water availability is limited;
- Paved areas will be installed with perimeter drains and sediment traps for the collection of dust/sediment in storm water runoff; and
- Vegetation screening will be used, where appropriate, to provide further protection from windblown dust.

**7.6.6 Emissions Control Technologies for Major Emission Sources**

All plant instrumentation such as gas analysers and flow meters will be regularly calibrated to ensure that plant is operating efficiently and SO<sub>2</sub> conversion is effective, i.e. the catalyst is working efficiently (99.7% conversion of SO<sub>2</sub> to SO<sub>3</sub>) in accordance with the supplier guarantees. Appropriate emissions control features will be installed and operated in accordance with manufacturer’s instructions on all equipment.

**7.6.7 Air Quality Management and Monitoring**

**Effects Monitoring**

BMSC will collaborate with other industry and government-sponsored monitoring programmes to measure the effects of air quality occurring in the Bisha project area during the construction and operations phases of the project. Information collected during monitoring program for this project will be made available to the public.

**Sampling Requirements**

Sampling for ambient air quality will be undertaken as outlined below.

Parameter	Sampling Frequency	Sampling Duration
TSP	Weekly	24 hrs
PM10	Weekly	24 hrs
PM2.5	Weekly	24 hrs
SO <sub>2</sub>	Monthly	30 days
NO <sub>x</sub>	Monthly	30 days

Appropriate sampling equipment will be selected based on accuracy, ease of use, durability in the field and cost. Sampling locations will be determined using the output of a dispersion model (to identify areas of maximum concentration). In addition, certain measurements will be collected at nearby sensitive receptors including occupied dwellings and ecologically-sensitive areas.

Emissions monitoring for stack emissions from incinerators and power plants will be undertaken as follows:



Pollutant	Sampling Frequency
Dust	Annually
TOC (incinerators only)	Annually
HCl (incinerators only)	Annually
HF (incinerators only)	Annually
SO <sub>2</sub>	Annually
NO <sub>x</sub>	Annually

### **Air Quality Data Parameters**

Parameter	Rationale	Analysis Required
24 hr TSP	<ul style="list-style-type: none"> <li>TSP (particles less than 35 µm in aerodynamic diameter) is generated from mechanical mining activity</li> </ul>	<ul style="list-style-type: none"> <li>Filter weight (from which dust concentration is determined) every 6 days</li> <li>Composition of the dust for metals quarterly</li> </ul>
24 hr PM10	<ul style="list-style-type: none"> <li>PM10 (particles less than 10 µm in aerodynamic diameter) is generated from mechanical mining activity and diesel combustion and has been extensively related to human health impacts.</li> <li>PM10 is a better indicator of mechanical mining emissions than finer particles.</li> </ul>	<ul style="list-style-type: none"> <li>Filter weight (from which particulate concentration is determined) every 6 days</li> <li>Composition of the dust for metals quarterly</li> </ul>
24 hr PM25	<ul style="list-style-type: none"> <li>PM2.5 (particles less than 2.5 µm in aerodynamic diameter) is generated from mechanical mining activity and especially from diesel combustion. While there is no WB or WHO guideline, there are relevant guidelines in other jurisdictions.</li> </ul>	<ul style="list-style-type: none"> <li>Filter weight (from which particulate concentration is determined) every 6 days</li> <li>Composition of the dust for metals quarterly</li> </ul>

### **Sampling locations**

Sampling locations of ambient air quality will be selected to provide monitoring data from the following locations:

- Within or adjacent to the open pit;
- Within or adjacent to the TMF;
- Within or adjacent to the Waste Rock Facility areas;
- Within or adjacent to the Bisha camp site;
- Adjacent to Mogoraib village;
- 5 km upwind and downwind of the prevailing wind direction.

Other sampling points may be included if considered appropriate.

### **Completion of the Monitoring Programme**

The detailed monitoring programme will be finalised and submitted for review to the government's Impact Review Committee (IRC) and the Mine Control Unit of the Department of Mines (Ministry of Energy and Mines) for their review and approval prior to commencement of construction/operations.

### **Record Keeping Activities**

Regular record keeping will help to identify and address air quality issues in a timely manner. Record keeping will be undertaken as follows:

- BMSC will implement an ambient air quality and emission monitoring programme and an appropriate monitoring protocol will be established (based on this Plan);
- Emission reporting protocols will include a controlled emissions reporting protocol as well an emergency reporting protocol; and



- BMSC will maintain monitoring records and prepare an annual emissions report

The annual emission report will include the following information for each piece of equipment/activities emitting pollutants:

- Fuel consumption;
- Mileage;
- Operational hours;
- Volume of excavated ground, gravel, moved soil etc.;
- Volume of ore, overburden, tailings and waste rock;
- Volume of materials transported/shipped;
- Volume and type of wastes incinerated;
- Environmental monitoring records and observations related to air quality;
- Unexpected/emergency emissions; and
- Public complaints on air quality.

#### **7.6.8 GHG Monitoring**

The monitoring of GHG emissions is becoming a standard requirement under international good practice. BMSC will conduct annual monitoring of GHG emissions. It is likely that GHG monitoring during operations will involve inventories being developed using mass balance, stoichiometric calculations and internationally accepted 'factors'. Key data that will be collected on a semi-continuous basis to support the inventory will include:

- Diesel consumption by mining vehicles;
- Explosives use;
- Extent of electricity import and export;
- Power generation/fuel type (emissions);
- Incineration (emissions);
- Employee road and air miles;
- Road miles by HGVs importing plant;
- Road miles by HGVs exporting concentrate.

This data will be used to prepare an annual GHG emissions inventory and to track emissions over the course of project development.

### **7.7 Roles & Responsibilities**

Overall responsibility for the implementation of this Management Plan will rest with the Bisha Environment Manager who will report on progress to the Bisha General Manager. Others with responsibility for the implementation of this Management Plan will include:

- SENET, as EPCM Contractor, will be responsible for the integration of these procedures and requirements into their operating procedures and plans;
- Bisha Mine Manager will be responsible for ensuring that these procedures and requirements are implemented for all mine operations;
- Bisha Mill Manager will be responsible for ensuring that these procedures and requirements are implemented for all mill operations.

### **7.8 Training**

All employees of BMSC and Contractors to BMSC will be provided with basic training in air quality protection. Additional, specialist training will be provided to plant operators and key personnel involved in activities which involve dust and gaseous emissions.

### **7.9 Monitoring & Reporting Procedures**

Air monitoring procedures will be as follows:

- SENET will report on a monthly basis to the Bisha Environment Manager on the implementation of this Management Plan during the construction phase, including:



- Air quality protection actions undertaken;
- Air quality monitoring undertaken by suitably trained personnel;
- Servicing of mobile and fixed vehicles and plant;
- Non-compliances identified;
- Corrective actions planned and undertaken.
- Bisha Environment Manager will inspect the condition of the Project area on a monthly basis and will maintain appropriate records. The inspection will include:
  - Evidence of dust, smoke, odour or other nuisance;
  - Condition of emission control equipment;
  - Condition of the incinerator;
  - Compliance with applicable regulatory and corporate requirements.

Monitoring of changes in ambient air quality will be undertaken to ensure that air quality in the area does not undergo any adverse changes over the life of the project. As noted above, sampling will be conducted at those locations where vegetation monitoring is proposed, in addition to sensitive receptors and locations where the highest concentrations of emissions are expected to occur.

The Bisha Environment Manager will be responsible for record-keeping.

Regular reporting will be undertaken via the monthly SEMS Report that will be prepared and submitted to the Bisha General Manager. Reporting will include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

Further information on environmental monitoring and reporting requirements and procedures is set out in the Monitoring Plan and in the Social & Environmental Management System.



## 8 Cyanide Management Plan

### 8.1 Introduction

The *Cyanide Management Plan* is designed to ensure the effective transport, storage, management and disposal of cyanide by the Bisha Project. The plan contains the methods that shall be used to prevent adverse effects occurring during operations, monitoring plans to assess potential effects during operations, and monitoring plans for determining the effectiveness of mitigation.

### 8.2 Objectives

The objectives of this Management Plan are to:

- Establish Standard Operating Procedures (SOPs) for Bisha construction, operations and closure activities;
- Define BMSC requirements and procedures to guide the Project Management Team and other project contractors;
- Define roles and responsibilities;
- Define monitoring and reporting procedures.

### 8.3 Scope

Cyanide is required by the Project during the gold and silver extraction phase. The plan covers all activities that could result in adverse effects to human health and safety and environmental quality through all phases of the project. Associated plans which also incorporate cyanide management include the *Spill Prevention and Emergency Response Plan*, the *Hazardous Materials Management Plan* and the *Transportation Plan*. The plan takes into account both Eritrean government requirements for the use, handling and transport of cyanide together with international best practice as specified by the International Cyanide Management Code (the 'Code').

### 8.4 Regulatory Requirements

#### 8.4.1 Eritrean Requirements

Part four of the 'Management of Environmental Quality and Natural Resources' of the Environment Proclamation, Government of Eritrea, 1996 covers legislation relating to hazardous substances. This includes cyanide.

In Chapter 1, 'Environmental Quality Management', Article 63 on Toxic and Hazardous Substances states the following:

- The production, sale, distribution, import, export, or transit of toxic and hazardous substances, pesticides and biological agents (e.g., living modified organisms, genetically modified organisms) within Eritrean jurisdiction or control, shall be subject to license, permit or approval procedures which require prior environmental impact assessment, as provided in part Three, Chapter V of this proclamation.
- The Agency, jointly with the line ministries concerned, shall develop a register of toxic and hazardous substances and biological agents whose production, sale, distribution, transport, import or export are restricted or prohibited.

Further, in Part five of the same document, the following is provided in Chapter 1, Monitoring and Inspection under Article 76, Monitoring and Enforcement Responsibility:

- In their respective sectors, line ministries shall be responsible for inspection, enforcement and monitoring of compliance with environmental quality standards, the conduct of environmental audits, and monitoring of the status of biodiversity.
- The Agency shall be responsible for coordinating the overall monitoring of environmental quality and of the status of biodiversity, particularly in cases where two or more line ministries are involved.



- Where a line ministry does not adequately monitor compliance with environmental quality standards and the status of biodiversity in its sector, the Agency is empowered to carry out all necessary sectoral monitoring, inspections and enforcement.

#### 8.4.2 International Finance Corporation Environmental Guidelines

In the IFC Environmental Health & Safety Guidelines for Mining, Cyanide is identified as a Hazardous Material. The guidelines set out the following recommendations with regard to the handling and use of cyanide<sup>13</sup>:

*Cyanide use should be consistent with the principles and standards of practice of the International Cyanide Management Code. The Cyanide Code includes principles and standards applicable to several aspects of cyanide use including its purchase (sourcing), transport, handling / storage, use, facilities decommissioning, worker safety, emergency response, training, and public consultation and disclosure. The Code is a voluntary industry program developed through a multi-stakeholder dialogue under the auspices of the United Nations Environment Programme and the International Council on Metals and the Environment.*

#### 8.4.3 International Code for the Management of Cyanide

The "*International Cyanide Management Code for the Manufacture, Transport and Use of Cyanide in the Production of Gold*" (Cyanide Code) is a voluntary industry programme for the gold mining industry to promote:

- Responsible management of cyanide used in gold mining;
- Enhance the protection of human health; and
- Reduce the potential for environmental impacts.

The Code focuses exclusively on the safe management of cyanide and cyanidation mill tailings and leach solutions. The objective of the Code is to improve the management of cyanide used in gold mining and assist in the protection of human health and the reduction of environmental impacts.

Under IFC EHS Guidelines for the mining sector, companies should "implement the provisions" of the Code. BMSC cannot be a signatory to the Code until it is an operation *producing* gold, however, the company is fully committed to the provisions of the Code including the obligations to carry out third party audits. These audits must be conducted every three years by independent, third-party professionals who meet the Institute's criteria for auditors.

The Code sets out standards of practice for:

- Production;
- Transportation;
- Handling and storage;
- Operations;
- Decommissioning;
- Worker safety;
- Emergency response;
- Training; and
- Public and Agency dialogue.

### 8.5 Potential Impacts

Unlike some synthetic chemicals, cyanide in its bioavailable (and hence toxic) forms is not persistent and will degrade through natural physical, chemical and biological processes into other, less toxic chemicals. Properties of cyanide are as follows:

- Cyanide is a rapidly-acting highly potent poison to people, animals and plants when exposed to high levels and increasing concerns are being raised about the effects of repeat low doses to animals (EA 2003).

<sup>13</sup> International Finance Corporation. *Environmental, Health & Safety Guidelines for Mining*. 10 December 2007. pp 10.



- Cyanide poisoning may occur due to inhalation of cyanide gas (hydrogen cyanide), dusts or mists, absorption through skin following skin contact, or by consuming materials containing cyanide (e.g. drinking water, sediment, soil, plants).
- Exposure to cyanide in solution through consumption of surface water is the main exposure route for most animals affected by cyanide poisoning, but concurrent exposure through inhalation and skin absorption may also occur. In addition, animals may consume cyanide inadvertently in tailings slurry or sediments (e.g., during foraging, when consuming carcasses or preening feathers) (EA 2003).
- While it is a deadly poison when ingested, inhaled or contacted in a sufficiently high dose, it does not accumulate in the food chain, and will generally not give rise to chronic health or environmental problems when present in low concentrations (Environment Australia 2003).
- It oxidizes and degrades when exposed to air or other oxidants.
- Cyanide is ubiquitous in nature, with cyanide-containing chemicals being produced by a wide range of micro-organisms and approximately 2,650 plant species as part of their normal metabolism.
- Cyanides can also occur naturally at low levels in many surface and ground waters.
- Humans and animals may be at risk from cyanide poisoning from eating plant materials that contain cyanide, including cassava, fruit pits (peaches, apricots), almonds and bamboo shoots. Cyanide is also in vitamin B12 (EA 2003).
- Cyanide may degrade or attenuate by natural processes, however, some of the breakdown products are themselves toxic and able to pose unacceptable risks to human health and the environment (e.g. ammonia, cyanate, nitrate, nitrite, metal-cyanide complexes, thiocyanates, cyanogens, cyanogen chloride, chloroamines).
- More elevated levels may be found in certain plants and animals (many plant and insect species contain cyanogenic glycosides) or near certain industrial sources.

Due to the properties identified, the key issues related to the management of cyanide are principally preventing cyanide from coming into contact with the human body and prevention of cyanide solids or liquids reacting to produce cyanide gas. Consideration must therefore be given to the following:

- elimination of direct disposal/spillage of cyanide to the ground, surface water or stormwater drains;
- management and maintenance of storage facilities;
- cyanide handling; and
- cyanide transportation.

## 8.6 Cyanide Management Procedures

*Annex A* to this Plan sets out the principles and standards of practice set out in the Cyanide Code.

### 8.6.1 General

- BMSC is aware of its responsibilities with respect to cyanide transport and handling and must follow the principles and procedures set out in the Cyanide Code (2005).
- The focus of Bisha's cyanide management programme will be prevention of access to the tailings pond to wildlife and livestock, through the use of fencing and other measures, and the prevention of contamination of shallow groundwater.
- An Inco SO<sub>2</sub> cyanide destruct circuit will be used in the mill ahead of the tailings discharge line to ensure residual cyanide (WAD) will be below 2 mg/L.
- Because cyanide is a public concern, BMSC will establish an outreach programme as part of its commitment to further public education and access to information that provides information on the transportation, use and destruction of cyanide at the Bisha Mine.



- BMSC will purchase cyanide from manufacturers employing appropriate practices and procedures to limit exposure of their workforce to cyanide and to prevent releases of cyanide to the environment. BMSC will ensure that selected manufacturers operate to a standard consistent with the Cyanide Code.
- BMSC will implement a comprehensive water management programme to protect against unintentional releases.
- BMSC will implement measures to protect birds, other wildlife and livestock from adverse effects from exposure to cyanide from accidental releases and from direct and indirect discharges of cyanide process solutions to surface and groundwater.

#### 8.6.2 Transportation

- No cyanide will be transported until all transportation management procedures are in place and all road safety upgrades have been completed.
- The preferred method of transportation is via the use of Isotainers which provide a secure and reliable form of transport designed to eliminate environmental releases; BMSC is currently identifying suitable vendors for the cyanide transport containers.
- Cyanide will be transported in bulk on transport trucks placarded as required. Transporters of cyanide will receive instruction in the safe handling this material.
- BMSC will ensure that selected transport companies operate to a standard consistent with the Cyanide Code, hence BMSC will:
  - Establish clear lines of responsibility for safety, security, release prevention, training and emergency response in written agreements with producers, distributors and transporters;
  - Require that cyanide transporters implement appropriate emergency response plans and capabilities, and employ adequate measures for cyanide management; and
  - Only carriers approved by BMSC and which operate to a standard consistent with the Cyanide Code will be used to transport sodium cyanide to the mine site.
- The utmost care will be taken to ensure that spills of sodium cyanide do not occur. However, in the remote possibility of a spill, spill clean-up procedures for hazardous materials will be followed (see *Spill and Emergency Response Plan*).

#### 8.6.3 Handling and Storage

- BMSC will ensure that cyanide handling and storage is undertaken to a standard consistent with the Cyanide Code.
- Design and construct unloading, storage and mixing facilities consistent with sound, accepted engineering practices and quality control and quality assurance procedures, spill prevention and spill containment measures.
- Operate unloading, storage and mixing facilities using inspections, preventive maintenance and contingency plans to prevent or contain releases and control and respond to worker exposures.
- Sodium cyanide will be stored in the mill in a dedicated, bunded area protected from water and provided with adequate ventilation to disperse hydrogen cyanide gas.
- Cyanide will be stored in areas with secondary containment which are routinely inspected and are fitted with alarm systems.
- Only employees trained in the safe handling of sodium cyanide will handle the material and only employees requiring access to the sodium cyanide will be authorized to handle it. This will be limited to a small number of mill employees.
- Materials Safety Data Sheets (MSDS) and handling procedures will be posted in the cyanide storage area such that they can be readily seen and read.
- Operators undertaking hazardous procedures involving cyanide will wear appropriate protective clothing as described in the MSDS and the manufacturer's recommendations for personal protective equipment (PPE).



- Operators will work in pairs with one acting as a 'sentry'. The role of a sentry needs to be carefully defined and followed. As a passive observer in the handling process, the sentry should participate in the process only in an emergency. Hazardous operations include:
  - opening storage containers;
  - dissolving sodium cyanide pellets; and
  - cleaning-up cyanide spillages.
- Bulk storage facilities will be located away from offices and the camp.

#### **8.6.4 Management and maintenance of storage facilities**

- Any accidental damage to containment structures will be inspected immediately and repairs undertaken. The extent of damage will be reported in writing to the mine manager, or designate, as well as remedial repairs affected together with the date of repairs and any follow up inspection.

#### **8.6.5 Closure**

- BMSC will ensure that closure planning is undertaken to a standard consistent with the Cyanide Code.
- On mine closure, all unused sodium cyanide will be destroyed on site or, if a qualified buyer is available, shipped off site in accordance with the Cyanide Code.
- Cyanide tanks and piping will be cleaned and removed from site as recycled scrap metal or buried in the open pit.
- The tailings pond will be covered and reclaimed to minimize erosion by wind and water. Any supernatant water in the pond will be allowed to evaporate before a final cover is placed.

#### **8.6.6 Personal Protective Equipment**

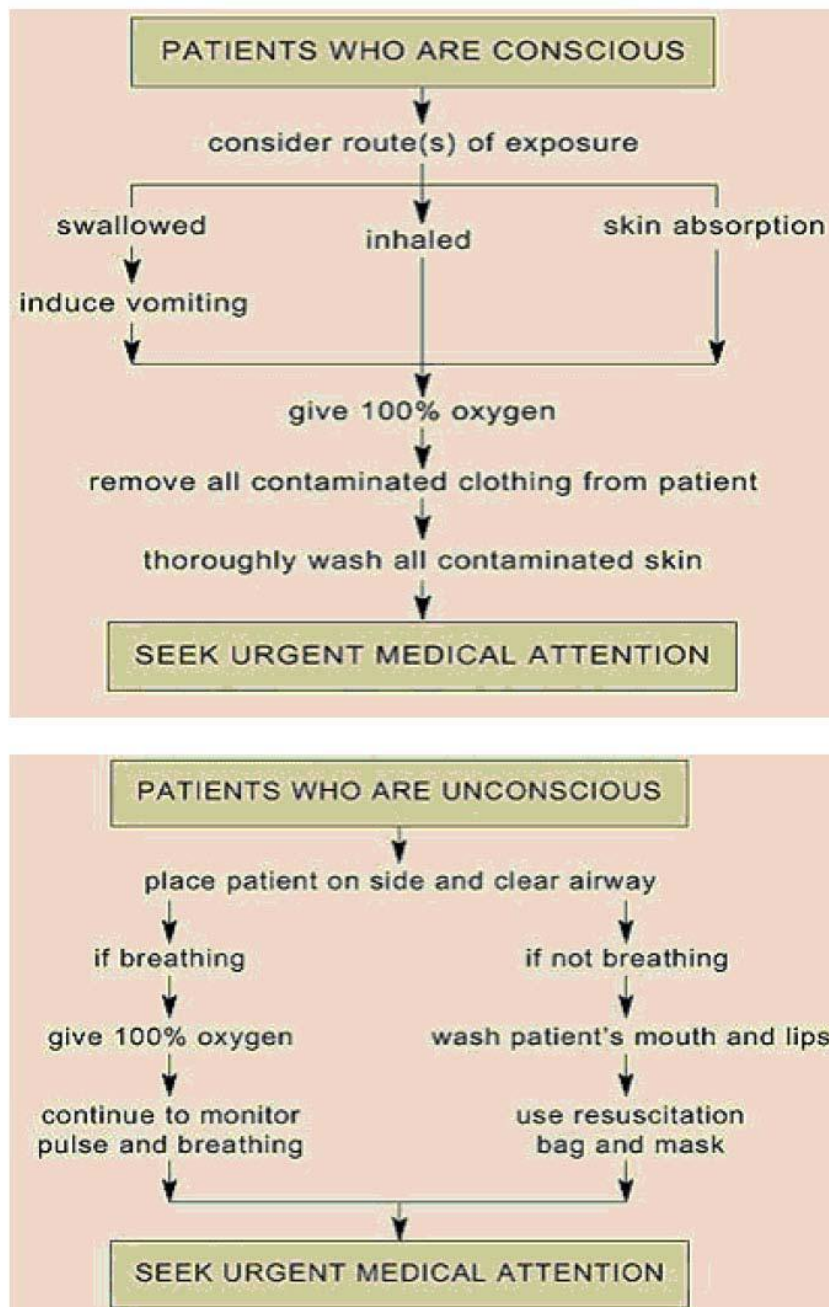
- When handling cyanide in any form, a full-face respirator must be worn at all times.
- For liquid cyanides, workers should also wear disposable coveralls, PVC gloves and waterproof boots. These requirements change over time and should be reviewed on a regular basis.
- Working with cyanide demands a culture of cleanliness. Workers must wash their hands before eating, drinking or smoking and before applying topical lotions, e.g., sunscreen. (Do none of these in areas where cyanide is stored or used).
- Contaminated protective gear and clothing should be securely discarded, or washed before being stored and re-used.

#### **8.6.7 Public Consultation**

- BMSC will ensure that public consultation is undertaken to a standard consistent with the Cyanide Code.
- Steps should include:
  - Explaining to local communities, including along transportation routes, the issues and management techniques being implemented to manage risks to public health and the environment;
  - Providing site visit opportunities for the public;
  - Providing the public the opportunity to communicate issues of concern;
  - Initiating dialogue describing cyanide management procedures and responsively address identified concerns;
  - Developing an emergency response plan in consultation with local organizations and regulatory agencies;
  - Making appropriate operational and environmental information regarding cyanide available to the public.

### 8.6.8 First Aid

The following figure outlines basic first-aid treatment process for cyanide exposure:



### 8.7 Roles & Responsibilities

Overall responsibility for the implementation of this Management Plan shall rest with the Bisha Environment Manager who shall report on progress to the Bisha General Manager. Others with responsibility for the implementation of this Management Plan shall include:

- SENET, as EPCM Contractor, shall be responsible for the integration of these procedures and requirements into their construction plans;
- Bisha Mine Manager shall be responsible for ensuring that these procedures and requirements are implemented for all mine operations;
- Bisha Mill Manager shall be responsible for ensuring that these procedures and requirements are implemented for all mill operations.



## 8.8 Training

BMSC will ensure that worker training is undertaken to a standard consistent with the Cyanide Code.

BMSC employee training for those handling or exposed to cyanide will include:

- Understanding the hazards associated with cyanide use;
- Correct facility operation according to systems and procedures that protect human health, the community and the environment;
- The use of personal protective equipment (PPE); and
- First-aid and emergency response to worker exposures and environmental releases of cyanide.

Well-defined responsibilities will be established for individuals, with clear chains of command and effective lines of communication within the workforce.

All employees will be given orientation training in safety precautions if exposed to cyanide.

Mock safety drills will be undertaken periodically.

First responders will be given special training in treating cyanide poisoning incidents.

## 8.9 Monitoring & Reporting

BMSC shall implement quality control/quality assurance procedures to confirm that cyanide facilities are constructed according to accepted engineering standards and specifications and must implement monitoring programmes to evaluate the effects of cyanide use on wildlife, surface and ground water quality.

The Bisha Mine Services Department will maintain an inventory of all chemicals purchased, delivered, stored and used at the Bisha Mine site. This inventory will include cyanide and will be updated on a monthly basis.

This Bisha Mine Service Department will collect and maintain records on cyanide in consultation with the Bisha Mine and Mill Managers, for the following:

- tracking and recording of all cyanide use;
- reconciled bulk inventory;
- weekly use summaries;
- inspections and maintenance checks of storage areas;
- inspection of handling methods;
- any alteration to the system;
- reports of spill responses; and
- records of training.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

Further information on environmental monitoring and reporting requirements and procedures is set out in the Monitoring Plan and in the Social & Environmental Management System.



**Annex A: Principles and Standards of Practice as defined in the Cyanide Code**

<b>Principles</b>	<b>Standards of Practice</b>
<p><b>1: PRODUCTION</b>  <i>Encourage responsible cyanide manufacturing by purchasing from manufacturers who operate in a safe and environmentally protective manner.</i></p>	<p>1.1 Purchase cyanide from manufacturers employing appropriate practices and procedures to limit exposure of their workforce to cyanide and to prevent releases of cyanide to the environment.</p>
<p><b>2: TRANSPORTATION</b>  <i>Protect communities and the environment during cyanide transport.</i></p>	<p>2.1 Establish clear lines of responsibility for safety, security, release prevention, training and emergency response in written agreements with producers, distributors and transporters.            2.2 Require that cyanide transporters implement appropriate emergency response plans and capabilities, and employ adequate measures for cyanide management.</p>
<p><b>3: HANDLING AND STORAGE</b>  <i>Protect workers and the environment during cyanide handling and storage.</i></p>	<p>3.1 Design and construct unloading, storage and mixing facilities consistent with sound, accepted engineering practices and quality control and quality assurance procedures, spill prevention and spill containment measures.            3.2 Operate unloading, storage and mixing facilities using inspections, preventive maintenance and contingency plans to prevent or contain releases and control and respond to worker exposures.</p>
<p><b>4: OPERATIONS</b>  <i>Manage cyanide process solutions and waste streams to protect human health and the environment.</i></p>	<p>4.1 Implement management and operating systems designed to protect human health and the environment including contingency planning and inspection and preventive maintenance procedures.            4.2 Introduce management and operating systems to minimize cyanide use, thereby limiting concentrations of cyanide in mill tailings.            4.3 Implement a comprehensive water management program to protect against unintentional releases.            4.4 Implement measures to protect birds, other wildlife and livestock from adverse effects of cyanide process solutions.            4.5 Implement measures to protect fish and wildlife from direct and indirect discharges of cyanide process solutions to surface water.            4.6 Implement measures designed to manage seepage from cyanide facilities to protect the beneficial uses of ground water.            4.7 Provide spill prevention or containment measures for process tanks and pipelines.            4.8 Implement quality control/quality assurance procedures to confirm that cyanide facilities are constructed according to accepted engineering standards and specifications.            4.9 Implement monitoring programs to evaluate the effects of cyanide use on wildlife, surface and ground water quality.</p>
<p><b>5: DECOMMISSIONING</b>  <i>Protect communities and the environment from cyanide through development and implementation of decommissioning plans for cyanide facilities.</i></p>	<p>5.1 Plan and implement procedures for effective decommissioning of cyanide facilities to protect human health, wildlife and livestock.            5.2 Establish an assurance mechanism capable of fully funding cyanide-related decommissioning activities.</p>
<p><b>6: WORKER SAFETY</b>  <i>Protect workers' health and safety from exposure to cyanide.</i></p>	<p>6.1 Identify potential cyanide exposure scenarios and take measures as necessary to eliminate, reduce and control them.            6.2 Operate and monitor cyanide facilities to protect worker health and safety and periodically evaluate the effectiveness of health and safety measures.            6.3 Develop and implement emergency response plans and procedures to respond to worker exposure to cyanide.</p>
<p><b>7: EMERGENCY RESPONSE</b>  <i>Protect communities and the environment through the development of emergency response strategies and capabilities.</i></p>	<p>7.1 Prepare detailed emergency response plans for potential cyanide releases.            7.2 Involve site personnel and stakeholders in the planning process.            7.3 Designate appropriate personnel and commit necessary</p>



Principles	Standards of Practice
	equipment and resources for emergency response.
	7.4 Develop procedures for internal and external emergency notification and reporting.
	7.5 Incorporate into response plans monitoring elements and remediation measures that account for the additional hazards of using cyanide treatment chemicals.
	7.6 Periodically evaluate response procedures and capabilities and revise them as needed.
<b>8: TRAINING</b> <i>Train workers and emergency response personnel to manage cyanide in a safe and environmentally protective manner.</i>	8.1 Train workers to understand the hazards associated with cyanide use.
	8.2 Train appropriate personnel to operate the facility according to systems and procedures that protect human health, the community and the environment.
	8.3 Train appropriate workers and personnel to respond to worker exposures and environmental releases of cyanide.
<b>9: DIALOGUE</b> <i>Engage in public consultation and disclosure.</i>	9.1 Provide stakeholders the opportunity to communicate issues of concern.
	9.2 Initiate dialogue describing cyanide management procedures and responsively address identified concerns.
	9.3 Make appropriate operational and environmental information regarding cyanide available to stakeholders.



## 9 Occupational Health & Safety Plan

### 9.1 Introduction

The Bisha *Occupational Health & Safety (OH&S) Plan* is designed to ensure the effective management of worker health and safety by the Bisha Project. The plan contains the methods that shall be used to prevent adverse effects occurring during construction and operations, monitoring plans to assess potential effects during construction and operation, and monitoring plans for determining the effectiveness of mitigation. This Plan has been developed to reflect the requirements of the international safety standard, OHSAS 18001. It is expected that the Bisha mining project will aim for certification to 18001 in the future and is being set up to reflect the requirements of this standard.

### 9.2 Purpose

The purpose of this Occupational Health & Safety Plan is to:

- define and communicate the Health & Safety objectives, principles, expectations and requirements for the Bisha Project;
- define the criteria against which Health & Safety performance will be judged;
- describe areas of Health & Safety responsibilities for the Bisha Project team, including Contractors;
- describe the Occupational Health & Safety Standard Operating Procedures (SOPs) that will ensure that Health & Safety activities are organised, managed and reported in a systematic and consistent manner;
- describe the development of the safety cases and safety plans;
- ensure that the Project provides inherently safe and secure facilities.

### 9.3 Scope

This Occupational Health & Safety Plan is applicable to all Project-related activities. The practices and procedures for safety management referred to in the Plan are applicable to the design, construction and commissioning of the Project and include activities directly related to the Project. At the commencement of each major phase of the project, this document shall be reviewed to ensure it reflects the current policies of BMSC.

### 9.4 Regulatory Requirements

#### 9.4.1 Eritrean Requirements

This plan addresses the requirement under *A Proclamation to Promote the Development of Mineral Resources No. 68 (1995)* (the Proclamation) and *Legal Notice No. 19/1995*. Duties and responsibilities of the mine owner are set out in Section 25 of the Proclamation and Part IV of the Regulations as follows:

- *The licensee shall provide his agents and employees with appropriate work clothing and protective equipment and shall ensure that they are properly trained or otherwise qualified for the work;*
- *The licensee shall also provide appropriate health and medical facilities, commensurate with the level and nature of operations, and he shall follow all necessary procedures for the safe and prudent transport, storage, handling and use of explosives and chemicals; and*
- *The licensee shall immediately notify the Licensing Authority of any act or occurrence which has resulted in loss of life or serious injury to any person or which may jeopardize any property, the environment or operations and shall immediately take such steps as are necessary to mitigate the impact of such situation.*

### 9.5 Specific Requirements

- It is a requirement that all BMSC employees comply with the requirements of this Plan;



- Contractors shall submit their safety management plans to BMSC for review and approval for use; Contractor plans must meet, as a minimum, the standards contained within this document;
- Where the requirements of this plan are of a higher standard or exceed those provided by the Contractors, then this plan and subordinate procedures shall be complied with.

The BMSC *Health and Safety Policy* will be displayed at the relevant project offices as a visual demonstration of BMSC's and the Contractors commitment to the Project Safety Plan.

## 9.6 Definitions

OH&S definitions are given in the table below.

Audit	Systematic examination to determine whether activities and related results conform to planned arrangements and whether these arrangements are implemented effectively and are suitable for achieving the Health & Safety policies and objectives.
Continual Improvement	A process for enhancing the OH&S management system, to achieve improvements in overall health, safety, environment and security performances, in line with the health & safety policies and objectives.
Contractor	For the purpose of this document, where reference is made to Contractor this includes all main Contractors and Construction teams and their subcontractors, suppliers, consultants and vendors.
Corrective action	An action implemented to eliminate the cause of a non-conformity or incident in order to prevent recurrence. The corrective action is commensurate with the severity of the non-conformity, incident or potential incident.
Controlled Activities	These are work-related activities where BMSC can set health & safety standards and directly supervise and enforce their application.
Damage	An incident in which damage is sustained to Companies or Contractors' property.
Fatality	An unexpected death; a death resulting from accident or disaster.
First Aid Incident (FAI)	Any one time treatment and subsequent observation of minor scratches, cuts, burns, splinters, etc which does not require medical care, but may be provided by a physician or registered professional personnel.
Hazard	Source or situation with a potential for harm in terms of human injury or ill health, damage to property, damage to the workplace environment, or a combination of these.
Hazard Identification	Process of recognizing that a hazard exists and defining its characteristics.
Hazard/Risk assessment	The term "Risk Assessment" is used to mean the overall process of estimating the magnitude of risk and deciding what actions will be taken. The term "Hazard Assessment" is used to mean the overall process of determines whether a hazard is significant.
Incident	Undesired event giving rise to death, ill health, injury, damage or other loss.
Injury or Illness	An injury or illness is an abnormal condition or disorder of an individual. Injuries include cases such as, but not limited to, a cut, fracture, sprain, or amputation. Illnesses include both acute and chronic illnesses, such as, but not limited to, a skin disease, respiratory disorder, or poisoning.
Interested parties	Individual or group concerned with or affected by the safety performance of the Project.
Lost Time Incident (LTI)	A Lost Time Incident is a work-related injury/illness/disease resulting in the employee / contractor being unable to attend work on the next calendar day after the day of the injury. (miss one complete shift) If a suitably qualified medical professional advises that the injured person is unable to attend work on the next calendar day after the injury, a lost time injury is deemed to have occurred.
Medical Treatment Incident (MTI)	A Medical Treatment Incident is a work related injury/illness/disease resulting in the management and care of a patient to combat disease or disorder, including wound closing devices such as sutures, staples loss of consciousness etc. It does not include: Visits to physicians or other licensed health care professional solely for observation or counselling. The conduct of diagnostic procedures, such as X-rays and blood tests, including the administration of prescription medications used solely for diagnostic purposes (eg. eye drops to dilate pupils etc.).
Near Miss (NM)	Any unplanned event where controls is lost and/or there is or had the potential to lead to an accident or could be an impairment to employees.
Non-conformance	Any deviation from work standards, practices, procedures, regulations, management system performance etc. that could either directly or indirectly lead to an injury or illness, property damage, damage to the workplace environment, or a combination of these.
Non-work Related Incident	An event that occurs outside of the company or project work location or control.



Objectives	Goals in terms of safety performance that the Project sets itself to achieve.
Occupational Health and Safety	Conditions and factors that affect the well-being of employees, temporary workers, contractor personnel, visitors and any other persons in the workplace.
Performance	Measurable results of the safety management system, related to the Project's safety risks.
Risk	Combination of the likelihood and consequence(s) of a specified event occurring.
Routine Functions	The work activities that the employee regularly performs at least once per week.
Safety	Freedom from danger: protection from or non-exposure to the risk of harm or injury.
Site Manager	Person in charge of a BMSC work site and depending on the site concerned could be a BMSC or Contractor representative.
Subcontractor	A person or company that does part of a job which another person or company is responsible for.
Tolerable Risk	Risk that has been reduced to a level that can be endured by the project having regard to its legal obligation and its own safety policy.
Uncontrolled Activities	If an activity is not controlled or monitored, it is an uncontrolled activity. These are activities where BMSC does not set or influence health & safety standards and does not supervise health & safety performance
Work Environment	The 'work environment' is defined as the establishment and other locations where one of more BMSC employees are working or are present as a condition of their employment.

### 9.7 Abbreviations

ALARP	As Low As Reasonably Practicable
COSHH	Control of Substances Hazardous to Health
ERP	Emergency Response Plan
FAI	First Aid Incident
HAZOP	Hazardous Operation
HAZID	Hazard Identification
HSMP	Health & Safety Management Plan
IRIS	Incident Reporting and Investigation System
JHA	Job Hazard Analysis
JSA	Job Safety Analysis
Bisha	Bisha Project
KPI	Key Performance Indicator
LTI	Lost Time Incident

LTIF	Lost Time Incident Frequency
LOTO	Lock Out/Tag Out
MOC	Management of Change
MTI	Medical Treatment Incident
NCR	Non Conformance Report
NM	Near Miss
OH&S	Occupational Health and Safety
PEP	Project Execution Plan
PIC	Person In Charge
PPE	Personal Protective Equipment
RWC	Restricted Work Case
TRIF	Total Recorded Incident Frequency



## **9.8 Leadership and Commitment**

### **9.8.1 POLICY AND LEADERSHIP**

#### **9.8.1.1 Objectives**

BMSC is committed to maintaining the highest standards and performance of OH&S by all personnel associated with BMSC's activities. BMSC considers safety, health and risk management performance objectives to be commensurate with all other business objectives. BMSC has a Health & Safety Policy which forms the highest level document in this system.



POL 2:

## Health & Safety Policy



The Board of BMSC recognise that the safety and security of its employees and the communities in which it operates is an integral part of its business. We seek to create a mindset where people believe it is possible to work injury free, regardless of what role they perform.

Our guiding principles are:

- All injuries are preventable.
- Our most important objective is safety and health.
- Working safely is a condition of employment.
- Any task that can't be done safely shouldn't be done.

To ensure that these principles are adopted, BMSC will:

- Train and motivate all our people to work in a safe and responsible manner.
- Ensure that health and safety performances comply with relevant legislation and exceed community expectations.
- Establish and maintain a Health & Safety Management System in accordance with the requirements of OHSAS 18001:2007.
- Adhere to local laws as well as international standards on law enforcement in securing its operations, particularly those that relate to the use of force<sup>1</sup>.
- Carry out risk assessments in relation to security issues at each of its project sites.
- Ensure that security is secured in a way that respects and protect human dignity and human rights, avoids creating conflict and address security threats in as peaceful a way as possible.

Stan Rogers, *General Manager*, BMSC: \_\_\_\_\_

Date:

<sup>1</sup>The UN Code of Conduct for Law Enforcement Officials ([http://www.unhchr.ch/html/menu3/b/h\\_comp42.htm](http://www.unhchr.ch/html/menu3/b/h_comp42.htm)) and the UN Basic Principles on the Use of Force and Firearms by Law Enforcement Officials ([http://www.unhchr.ch/html/menu3/b/h\\_comp43.htm](http://www.unhchr.ch/html/menu3/b/h_comp43.htm)) are key in this regard



### 9.8.1.2 Implementation

The BMSC lead Contractor shall develop their own H&S Policy and implementation plan. This must be reviewed and approved by the BMSC HSE team. In the cases of inconsistency, the Bisha OH&S Plan is the primary document. BMSC will assist the Contractor to integrate their safety policies and practices with the Occupational Health & Safety Management Plan and will provide advice to, audit and assist the Contractor's project managers and site personnel to develop, implement and refine their safety management systems and procedures.

The Contractor's Policy and plan shall:

- be consistent with BMSC's OH&S Plan;
- reflect a commitment to safety and health equal to other business objectives;
- establish a commitment to reduce safety and health risks to be as low as reasonably practicable (ALARP);
- require compliance with legal requirements as a minimum requirement;
- commit to a process of continual improvement in its management systems; and
- state when the policy will be reviewed and reissued.

The Contractor shall:

- translate the intent of the OH&S Policy into objectives and targets through the Contractor's work procedures and induction processes which enable the distribution of all relevant information to all personnel.
- discuss the intent of the OH&S Policy at all inductions and regularly at management meetings;
- develop and maintain an accountability system for all levels of the organisation for safety and health management (including KPIs for safety and health management at all levels);
- actively involve all personnel and sub-contractors in understanding and achieving the Health, Safety and Environment Policy objectives;
- provide a periodical report to the HSE team indicating compliance and/or non-compliance with the OH&S Policy and plan, and with legal requirements; and
- develop, implement and maintain an accessible management system which addresses all aspects of this OH&S Plan.

## 9.8.2 Organisation and Responsibilities

### 9.8.2.1 Objective

Every individual in the organisation will have defined and documented OH&S responsibilities.

### 9.8.3 Health & Safety Specific Responsibilities

#### 9.8.3.1 BMSC General Manager

The responsibilities of the BMSC General Manager are to:

- develop, approve and disseminate to all BMSC-controlled facilities, policies that detail the BMSC philosophy in the health and safety management systems;
- provide a working environment that encourages, supports and rewards a positive approach to safety management;
- regularly review BMSC's policies, objectives, targets and performance standards with the site manager (in case of the Project, the Contractor) to attain continuous improvement in health and safety risk management;
- monitor and review the Contractors' health and safety performance and initiate improvements;
- approve funds to allow the full implementation of the OH&S Plan;
- approve work orders to correct potentially dangerous items identified during inspection or audit, and
- arrange independent health & safety audits including audits of the Project construction activities.



### 9.8.3.2 Contractor Construction Manager

The Contractor has the responsibility to deliver the project safely using appropriate risk assessment methodologies and control measures.

The responsibilities of the Contractor are to:

- Formally assign a Safety manager to supervise Project construction and to ensure appropriate levels of supervision at all times.
- Communicate and implement policies that cover BMSC requirements for health and safety;
- arrange HAZOPs and risk assessments of new or modified plant/equipment/systems;
- develop, implement and maintain a management system which ensures compliance with the OH&S Plan;
- select and train staff such that all personnel are competent and fit for the work assigned to them;
- report all serious incidents and hazards immediately;
- only employ contractors/sub-contractors who have the ability to comply with the OH&S Plan;
- maintain a Quality Management System that ensures all health and safety documentation is controlled and up to date;
- put in place an appropriate Project organisational structure and provide sufficient and appropriately skilled personnel for the effective management of health & safety;
- document health and safety responsibilities in the position descriptions for all levels in the construction organisation;
- document health and safety responsibilities for all critical activities;
- review roles, responsibilities, accountabilities and authorities in a formal performance appraisal system; and

### 9.8.3.3 BMSC H&S Manager

- The responsibilities of the BMSC H&S Manager are to:
- Coordinate the implementation and management of the OH&S Plan.
- Set up, maintain and update site HSE Notice Board(s).
- Ensure Material Safety Data Sheet registers are developed and maintained and are available in the appropriate language.
- Participate with the Project Management team in area inspections on a regular basis.
- Participate in any investigations relating to HSE issues.
- Attend meetings of the Project HSE Committee and consult with the Bisha General Manager on HSE issues.
- Assist and / or represent employees with HSE issues.
- Contribute to accident/incident investigations and the preparation of reports.
- Display and disseminate HSE material suitable for Project toolbox topics.
- Attend Project toolbox meetings.
- Compile project safety statistics and safety reports as required.
- Be the custodian of risk, safety, training registers.
- Review training needs for employees and sub-contractors;
- Assist in the conduct of or arrange for job hazard analysis to be conducted for new, changed or additional tasks;
- Cause the review of procedures and work instructions on a scheduled basis;
- Review all health, safety and environmental documentation in a timely manner to ensure it meets BMSC's and the Contractors document control standards;
- In collaboration with the client, participate in incident investigations on all incidents;
- Follow-up on all hazards reported with corrective actions and track to completion;



- Ensure that a system is in place to control all personnel and third parties entering and leaving BMSC's construction areas
- Report all hazards and incidents to the Bisha General Manager.

#### 9.8.3.4 All Project Personnel

- To work in such a manner as to not endanger the health, safety or welfare of any other person;
- To proactively promote a safe working culture through leading by example;
- Report any hazard or potential risk;
- Direct the cessation of any activity that may be seen as a direct violation of this Health & Safety Management Plan or may endanger personnel, plant or the environment.

#### 9.8.3.5 Contractors

- Conduct any activities designated to them in a manner as to not endanger the safety or welfare of any personnel, or present a risk to assets or the environment.
- Ensure that personnel have the necessary training and qualifications specified for these tasks.
- Maintain acceptable standards of housekeeping at the work site and if required participate in any safety inspections and incident / accident investigations as directed.

### 9.8.4 Employee Involvement and Communication

#### 9.8.4.1 Objective

To have effective communications system in place at all levels of the Project so that employees and sub-contractors at all levels are informed and involved in health, safety and risk management.

#### 9.8.4.2 Implementation

The BMSC H&S Manager shall have regular scheduled meetings with the BMSC Construction Manager or their delegate, to review policies, objectives, targets, and performance standards and to audit findings. BMSC requires that the Contractor has a schedule of meetings and sets reporting frequencies, so that all of its employees, sub-contractors and the client are informed of any new technical, operational, safety, health and environmental information. The Contractor is required by BMSC to empower the Contractor's employees and sub-contractors with the ability to discuss any issue affecting their ability to work safely.

The Contractor will ensure the schedule of meetings and reports will include:

- documented weekly toolbox meetings conducted by the Contractor;
- monthly reports to the BMSC H&S Manager;

BMSC requires that a risk-based approach is adopted by the Contractor.

To ensure this approach and to maintain effective communication and employee consultation the Contractor shall:

- provide training for the health, safety and environmental representatives and elect H&S representatives at different levels in the organisation;
- hold a weekly H&S briefing meeting;
- implement consultative processes to develop policies, procedures, work instructions, job safety assessments (JSAs), hazard identification, risk assessment and incident investigations;
- have a formal issue resolution process that allows resolution of any health and safety issue quickly and effectively;
- establish and maintain effective communication processes and advise employees and sub-contractors of the outcome of audits, incident analysis, hazards identified and control measures.

### 9.8.5 Resources

#### 9.8.5.1 Objective

To have sufficient resources for compliance with the OH&S Plan.



### 9.8.5.2 Implementation

The BMSC H&S Manager may regularly review the resources within BMSC itself and those of the Contractor to ensure compliance with the objectives as stipulated by the BMSC Project Agreement. The BMSC H&S Manager may arrange periodical audits to assess the compliance with this Plan and the Contractors health & safety management system including consideration of the adequacy of resources. The Contractor shall review its resources to ensure compliance with its safety management system on a scheduled basis as determined by an internal audit schedule.

## 9.9 Planning

### 9.9.1 Hazard Identification and Risk Management

#### 9.9.1.1 Risk Matrix

All hazards identified shall be assessed in accordance with an agreed "Risk Assessment Matrix" taking into account the probabilities of occurrence and severity of consequences in relation to personnel and assets of the project and surrounding environment.

#### 9.9.1.2 Objective

BMSC will systematically manage all potential risks over the life of the Project. This will involve a process of hazard identification, risk assessment and determination of control measures to ALARP.

#### 9.9.1.3 Implementation

BMSC will participate with the Contractor in a periodical risk assessment, which will result in an update of the Project Risk Register. To meet this objective the Contractor shall:

- develop, implement and maintain a hazard identification and risk assessment process which results in a prioritised corrective action register;
- involve and train all employees and sub-contractors in the hazard identification and risk assessment process so that day-to-day hazards are identified and control measures are determined and implemented;
- demonstrate that the risk of high and significant hazards are reduced to ALARP;
- where the risk of a hazard cannot be reduced to ALARP by conventional control measures, conduct a quantitative risk assessment;
- use the hierarchy of controls for risk reduction;
- conduct a hazard identification and risk assessment on any new project scope of works or modification to any existing facility;
- incorporate the hazard identification and risk assessment process into incident reporting and investigation and the permit to work process;

### 9.9.2 Objectives, Plans and Performance Standards

#### 9.9.2.1 Objective

To establish and monitor performance against measurable and achievable objectives, targets, plans and performance standards.

#### 9.9.2.2 Implementation

Performance targets are proposed by the Contractor, modified if required by BMSC and agreed between the Contractor and BMSC. Targets are based on industry standards.

To meet the objectives the Contractor shall:

- develop measurable and achievable safety and health objectives and targets for the total Project and for each level in their Project organisation;
- develop measurable and achievable health, safety and environmental performance standards which have a mixture of lead (positive) and lag performance indicators for the total company and each level in the organisation;
- develop, implement and maintain management plans for attaining the objectives and compliance with the performance standards;



- evaluate compliance with the health, safety and environment protection objectives at least quarterly and subjecting compliance to formal performance appraisals at least annually;
- provide incentives for achievement of health, safety and environment performance objectives and compliance with performance standards and disincentives for non achievements and non compliance (see Behaviour Based Safety); and
- formally communicate the health, safety and environment protection objectives, performance standards and management plans to all employees.

The Contractor shall consider these major objectives in regard to:

- maintaining the integrity of all plant, equipment and associated facilities;
- providing fit and competent personnel for tasks;
- ensuring the safety of the public;
- providing safe and healthy working environments;
- establishing effective communications processes at all levels;
- maintaining a high quality induction and training system;
- protecting and enhance the environment; and
- identifying all hazards and minimising their risks to ALARP.

The Contractor will continuously monitor and review performance.

### **9.9.3 Legal and Other Requirements**

#### **9.9.3.1 Statutory Requirements**

Site Managers employed by BMSC for the Bisha Project worksites are responsible for the obligations and duties set out in the relevant acts and regulations. The obligations and duties under the relevant Acts and Regulations equally apply to Contractors and Subcontractors that are engaged to do work and any employees of the Contractors and Subcontractors.

#### **9.9.3.2 Objective**

To maintain a procedure for the collection, provision and use of information standards relevant to the safe design and construction of the Project.

#### **9.9.3.3 Implementation**

BMSC considers that, for the efficient construction of the Project, obtaining and dissemination of all relevant legislation, codes of practice, and government guidelines and the development of a management system for the collection and dissemination of such documentation shall be available. Employees of the Contractor require quick access to this information to allow correct decisions to be made in regard to the construction of the facilities.

To meet this objective the Contractor shall:

- have current copies of relevant legislation available at the site and at all project offices;
- provide a service, from its project office, for providing relevant International Standards and government guidelines and codes of practice to construction sites;
- issue monthly health and safety statistics to all construction;
- provide a service from its project office for providing equipment and product information;
- issue relevant H&S alerts (such as disease outbreaks) to all project construction offices; and
- provide up to date facility drawings to its construction sites.

### **9.9.4 Management System Documentation**

#### **9.9.4.1 Objective**

To maintain an up to date and documented management system that is accessible to all employees.

#### **9.9.4.2 Implementation**

To meet this objective the Contractor shall:



- maintain all health and safety data such as H&S statistics, policies, procedures, work instructions, plans and drawings in hardcopy and/or electronic format as part of its overall management system;
- maintain all data in an accessible form for all employees who need to access the data;
- maintain all data so that it is current;
- maintain all data such that it is easily understandable and useable; and
- train all employees and sub-contractors in the relevant aspects of the management system.

## 9.10 Implementation

### 9.10.1 Management of Change

#### 9.10.1.1 Objective

All changes or modification to plant, equipment and systems are to be reviewed for hazards and risk and control measures developed so that such risks are ALARP prior to project implementation. All information related to significant changes or modifications of the Project are to be communicated to relevant employees, sub-contractors and stakeholders.

#### 9.10.1.2 Implementation

BMSC is responsible for ensuring that changes are appropriately considered and approved and recorded before they are implemented. Changes involving major revisions to operating policies or involving significant cost will be submitted to BMSC for approval.

The BMSC H&S Manager is to review all proposals for change and shall cause the appropriate approval of all change to be made to all documents and drawings by the respective competent discipline Engineer. To ensure effective change management, the Contractor shall develop, implement and maintain a Management of Change procedure for controlling changes or modifications to plant, equipment and systems.

The Management of Change procedure shall include:

- use of the hazard identification and risk assessment process to introduce control measures and reduce risk to ALARP;
- control the update of drawings, procedures, work instructions and safety risk assessments for engineering modifications;
- control the update of drawings, procedures, work instructions and safety risk assessments for work activity modifications;
- enforce the authorisation for changes to be made;
- consultation with and training for affected employees, sub-contractors and other affected third parties prior to engineering or project activity;
- the management of change and implementation;
- include a process for control of all relevant health, safety, environment and risk matters;
- management of documents, plans, drawings and data;
- include a process for review and control of documents and drawings;
- include a process for withdrawal of obsolete documents and drawings;
- develop, implement and maintain a procedure for formal handover of work which includes:
  - the person finishing the shift formally hands over the responsibility of the work to the person commencing the shift, this should include a diary or notes of the progress of work and any potential hazards and control measures;
  - the training required for a person commencing work in a new or altered position; and
  - the training and supervision required for a person who has held extended leave.



## 9.10.2 Purchasing and Control of Materials and Services

### 9.10.2.1 Objective

To have systems in place to minimise the hazards and risk associated with the supply of materials and services.

### 9.10.2.2 Implementation

Other contractors may provide goods and services to BMSC directly or indirectly through the Contractor. To meet the objective the Contractor shall:

- incorporate health and safety requirements in the tender specification of all major contracts;
- develop, implement and maintain a sub-contractor selection and management procedure which includes:
- a review of each tendering sub-contractors health and safety systems and performance;
- a review of a sub-contractors health and safety management plan and integration of this with the Contractor's management plan, prior to the commencement of work;
- the requirement of the sub-contractor to use the Contractor's critical procedures such as hazard identification and risk assessment, permit to work, safety risk assessment, communications and emergency response;
- the process for monitoring sub-contractors safety and health performance by auditing and supervision; of the sub-contractors activities;
- verification of compliance with the tender specifications at the completion of contracts for major projects sub-contractors shall work to the Contractor's management system which must comply with this Health & Safety Management Plan;
- incorporate health, safety and environmental requirements into purchase specifications and /or purchase orders;
- consult with employees and sub-contractors prior to purchase of materials and equipment with potential health and safety issues;
- inspect and verify materials against purchase specifications;
- train employees and sub-contractors in the health, safety and environmental implications associated with purchases and the control measures available to minimise risks associated with identified hazards;
- provide that the purchase of chemicals will require competent person to check the health, safety and environmental implications of any new chemical and for material safety data sheets (MSDS) to be made available to employees prior to use of the chemicals concerned; and
- keep MSDS Registers up to date and in a form accessible to employees and sub-contractors in an emergency situation.

## 9.10.3 Standard Operating Procedures (SOPs): Construction Phase

### 9.10.3.1 Objective

To have safe construction procedures which are documented and accessible to all personnel working on the Project. All employees, contractors and sub-contractors are to be trained in the relevant safe construction SOPs.

### 9.10.3.2 Implementation

To meet the objectives the Contractor shall develop, implement, maintain and continually improve a documented safety management system to manage the risks identified by various risk assessment methodologies during construction.

The following SOPs are applicable and supersede any Contractor's procedures unless such procedures exceed the requirement stated herein:

- PPE
- Confined Space Entry



- Working at Height
- LOTO
- Drilling and Blasting
- Hazardous Substances Storage & Handling
- Fire & Explosion Safety
- Crusher Operations
- Loading & Unloading Operations
- Electrical Safety
- Oil Shale & Waste Tips
- Plant & Equipment – General Site Housekeeping
- Machinery Use/ Machinery Guarding
- Lightning Strike precautions
- Dust Control
- Fork Lift Truck Operations
- Site access/egress/fencing
- COSHH Assessment
- Flammable Gases - Storage & Use

*Vehicle Operations*

- Driver Competence
- Rough Terrain Driving
- Vehicle Maintenance

*Emergency Procedures*

- Fire & Explosion Response
- Emergency Spill Response

Detailed SOPs will be required for all of the above. Particular emphasis is placed on PPE provision and care and maintenance activities for which more details are provided below.

### 9.10.3.3 PPE

BMSC and the Contractor are responsible for ensuring that all personnel are provided with appropriate personal protective equipment (PPE) which conforms to the relevant standards and project requirements. All PPE is to comply with applicable CEN/ISO standards for the following:

- Safety helmet;
- Eye protection;
- Gloves;
- Footwear
- Skin protection by way of sunscreen;
- Clothing to protect skin against burns by heat or fire;
- Clothing to protect skin against toxic or volatile chemicals;
- Noise/hearing protection.

Only personnel with the prerequisite training and qualifications will be authorised to use any specialist PPE such as breathing apparatus or rigging harnesses that are required to be used. Worksites will be assessed for specialised 'PPE Zones'.

**BMSC personnel visiting the project, suppliers or subcontractors sites shall comply with the PPE requirements stipulated by the site managers. Compliance is obligatory before entering a worksite.**

When entering construction areas, the minimum PPE shall include:

- long sleeved protective clothing;



- safety footwear;
- safety helmet;
- safety spectacles/goggles;
- gloves (if conducting any manual tasks).

Where there is a potential to fall greater than 2m, the hierarchy of control is:

- Fall Prevention;
- Fall Restraint;
- Fall Arrest.

In all cases where no physical barrier creates a fall potential, personnel shall wear appropriate fall restraint devices. This may include a full body safety harness secured as per the manufacturer's specifications.

Certain areas of the project worksites may be declared PPE free. Such areas may include awnings between crib/ablutions huts; project office areas with clearly defined boundaries, car park areas off the main construction area. The determination for such areas must be approved by the Bisha H&S Manager.

#### **9.10.4 Care and Maintenance**

##### **9.10.4.1 Objective**

To ensure effective systems for conducting planned maintenance, inspection, testing and minor modifications are implemented to reduce risks associated with the maintenance and repair of any equipment and plant associated with the Bisha project to ALARP.

##### **9.10.4.2 Implementation**

BMSC places a high priority on carrying out maintenance which can eliminate unnecessary operational problems and which could result in damage to equipment and /or injury to personnel.

To provide for effective maintenance and repair of such plant, the Contractor shall develop, implement and maintain procedures for inspection, testing and maintenance of plant, equipment and facilities for the Bisha Project. These procedures shall include:

- a hazard identification and risk assessment process to identify and prioritise safety critical items requiring maintenance and to set the frequency of maintenance;
- a validation process for the procedures;
- detail responsibilities for authorising, conducting and supervising maintenance activities;
- the methods of recording all inspections, maintenance repair and plant/equipment alteration;
- the use of hazard identification and risk assessment process, permit to work and JHA prior to undertaking maintenance activities;
- the process of managing certified equipment;
- the method of verifying, after maintenance, that equipment is safe before the equipment is returned to use;
- the process for the installation and subsequent inspection and maintenance of new or modified equipment;
- the process of reporting, isolation, withdrawal and repair of unsafe plant and equipment;
- a process of review and improvement of maintenance procedures which includes employee participation; and
- conduct at specified intervals internal audits of the effectiveness of the company work program in meeting all statutory requirements.

#### **9.10.5 Employee Selection, Competency and Training**

##### **9.10.5.1 Objective**

To provide competent, fit for work and adequately trained personnel for the Bisha Project.

It is a very high priority that personnel engaged for work on the BMSC project are competent and adequately trained in the work tasks they is assigned. Personnel need to be fit for work at all times and



all personnel need to be aware of issues that can affect their concentration and ability to perform efficiently and safely and of the control measures they need to apply to sustain effectiveness.

BMSC is committed to ensuring that a competency management system is in place to ensure that both BMSC and Contractor personnel are competent and well trained in work tasks assigned to them and that the procedures are maintained and continuously improved.

#### **9.10.5.2 Implementation**

The implementation of employee selection, competency and training will be in compliance with BMSC and the Contractor standards and requirements.

#### **9.10.6 Workplace Environment**

##### **9.10.6.1 Objective**

To maintain the Project sites and facilities so that there is always a safe and healthy working environment.

##### **9.10.6.2 Implementation**

The working environment of the project must be maintained to a high standard by the Contractor through the application of rigorous housekeeping and environmental protection practices.

To maintain a safe and healthy working environment, the Contractor shall:

- maintain each work environment to a high standard of housekeeping, cleanliness, hygiene and ergonomics;
- develop procedures, standards, inspection checklists, monitoring programs and inspection schedules for all and environment issues/hazards including:
- Atmospheric contamination
- housekeeping;
- employee amenities;
- ergonomics;
- biological hazards;
- radiation;
- gravitational hazards;
- electrical hazards;
- access/egress;
- noise and vibration;
- occupational hygiene;
- lighting and ventilation;
- temperature extremes;
- fitness for work;
- working hours;
- personal protective equipment;
- signposting;
- smoking; and
- hazardous substances.

#### **9.10.7 First Aid and Emergency Response**

##### **9.10.7.1 Objective**

To demonstrate that there is an effective emergency response process in place which reduces the impact of an emergency to levels that meets the expectations and needs of personnel, sub-contractors, the community and BMSC.



### 9.10.7.2 Implementation

BMSC requires the establishment of an emergency management facility at the Bisha Project facility. All personnel involved in the emergency response team, will be trained in, and understand, the emergency response plan and their respective roles therein. Emergency response simulations are conducted frequently to identify potential risks and to provide feedback to improve the emergency response plan.

The Contractor will have access to BMSC locally based first aid and emergency response resources, as well as the local emergency services.

First aid boxes will be installed in all vehicles used in BMSC operations. All of the Contractor's personnel are to be first aid trained. At all sites and in all vehicles there will be the means to allow anyone to call for medical or other assistance in the event of a serious incident.

To meet the objective the Contractor shall:

- develop, implement and maintain a first aid/medical procedure including:
- use of hazard identification and risk assessment process to identify all types of first aid and medical incidents for the project;
- standards for first aid trained employees and sub-contractors in terms of numbers per workgroup and level of training;
- standards of first aid facilities at each location;
- the procedure for inspection of first aid facilities and provisions;
- the procedure of notifying personnel in control of first aid and medical incidents;
- the procedure for working alone;
- the medical emergency procedure; and
- the procedure for dealing with personnel with specific medical issues.
- develop an emergency response plan to provide the procedure and structure for emergency response incorporating procedures relating to:
  - the initial emergency response and reporting;
  - an emergency organisation;
  - emergency assessment and mobilisation;
  - management of specific potential emergencies such as:
    - response to natural disasters;
    - response to reasonably foreseeable project emergencies
    - response to terrorist threats;
    - search and rescue;
    - medical evacuation;
    - non-company offsite emergencies.
  - conclusion of emergency;
  - emergency response training;
  - emergency response training facility;
  - schedule of emergency exercises;
  - maintenance of emergency response equipment;
- develop, implement and maintain an emergency response manual for the Project. The emergency response manual shall include procedures for integration between the BMSC emergency procedures and the Contractors emergency procedures.

## 9.11 Monitoring and Evaluation

### 9.11.1 Inspection, Testing and Monitoring

#### 9.11.1.1 Objective

To have in place an effective system for inspection, testing and monitoring and to ensure the technical integrity of the Bisha Project.



### 9.11.1.2 Implementation

BMSC considers the inspection, testing and monitoring of its facilities to be critical in ensuring the integrity of the project and for the safety of BMSC and Contractor personnel and the public.

The Contractor is to ensure that procedures for inspection and monitoring are implemented.

The Contractor's inspection, testing and monitoring system shall specify the frequency of all inspections, testing and monitoring and inspection, testing and monitoring checklists.

The frequency of inspections is to be commensurate with:

- the hazard identification and risk assessment process;
- regulatory requirements; and
- best construction/gas industry practice.

### 9.11.2 Health Monitoring Systems

#### 9.11.2.1 Objective

To assess and monitor the health of employees and the effect of the work environment on the health of employees.

BMSC considers that the health of personnel working on the Bisha Project is central to ensuring employees and contractors are fit for work and able to work safely at all times.

#### 9.11.2.2 Implementation

To meet the objective the Contractor shall:

- develop, implement and maintain a health monitoring procedure which will include but not necessarily be limited to :
- pre-employment medicals as an integral part of the recruitment process;
- an audiometric testing program;
- injury management and return to work system;
- eye screening program;
- advice on lifestyle and health issues/controls; and
- develop, implement and maintain a fitness for work procedure consistent with the BMSC fitness for work standards.

### 9.11.3 Incident/Hazard Reporting and Investigation

#### 9.11.3.1 Objective

To demonstrate that a procedure exists for the systematic reporting of hazards, incidents and near misses and for effective follow-up and management review of safety performance and safety objectives and to prevent recurrence of adverse incidents.

#### 9.11.3.2 Implementation

The Contractor will be required to conform with, and input into, BMSC's safety and incident reporting and response programs in addition to any arrangements which it may be required to satisfy in regard to its own reporting procedures.

The BMSC General Manager, in consultation with the Contractor, will be responsible for reporting notifiable incidents in accordance with its legislative and other obligations.

The purpose of this process is to:

- Ensure a systematic approach for reporting and investigating an incident is adopted across the project sites;
- Identify causes of the incident and not attribute blame when conducting investigations; and
- Prevent future incidents.

The BMSC H&S Manager will compile and maintain a record of each significant accident or incident occurring on or in connection with the Bisha project, including details in each case of any corrective action taken.

To meet the objective the Contractor shall:



- develop, implement and maintain a hazard/incident reporting and investigation procedure which includes:
- a hazard /near miss reporting system;
- an incident reporting system;
- hazard and incident investigation system with risk assessment and corrective action processes;
- corrective action register to record all hazards and incidents and progress of the follow-up of corrective actions;
- the process for determining the level of investigation and which positions are involved;
- the time allowed for closeout of all corrective actions to the person or persons who reported the hazard, near miss or incident; and
- the linking of corrective actions with the management of change process.

#### **9.11.4 Health and Safety Information and Reports**

##### **9.11.4.1 Objective**

To maintain a system for the collection, storage, analysis, dissemination and retrieval of all health and safety information.

##### **9.11.4.2 Implementation**

BMSC requires the Contractor to provide health and safety performance data in the Contractor's monthly report.

To meet the objective the Contractor shall:

- develop, implement and maintain a procedure for the collection, maintenance and confidential retention of employee health and safety; and
- develop, implement and maintain a procedure for the analysis and dissemination of health and safety performance for the Bisha project and each site. This procedure will detail the positive performance indicators to be used in addition to lag indicators such as frequency rates to determine safety performance (which procedure shall also show how the project safety performance compares with like industry statistics).

#### **9.12 Audit and Review**

##### **9.12.1 Health & Safety Management System Audit**

###### **9.12.1.1 Objective**

On a scheduled basis verify health and safety performance of the Bisha project against the requirements of this Plan, any licence conditions and other regulatory requirement.

###### **9.12.1.2 Implementation**

This H&S Plan and the construction of the project are subject to BMSC's audit, review and reporting practices and procedures.

BMSC requires the Contractor to develop a policy to conduct audits across its business management systems. The policy relating to audits is to:

- address the utilisation of audits as a tool to ensure continuous improvement within the company and periodically verify that systems are implemented, operating as designed and the prescribed deliverables are forthcoming and accurate;
- address compliance with relevant licence and regulatory requirements or contractual and legal obligations, relevant Eritrean Standards, design and performance criteria, BMSC corporate criteria or any other relevant standard for auditing systems;
- ensure the provision of adequate resources to allow audits to be carried out;
- understand customer requirements and the need to meet or exceed those requirements;
- ensure that audits are objective, systematic and independent;
- plan and manage audit programmes using defined methods and techniques;



- provide audit evidence and audit procedures that are relevant, reliable and sufficient, such that auditors working independently from one another would reach similar conclusions;
- involve key stakeholders in audits and communicate the outcomes to all interested parties; and
- consider the audit process as a positive opportunity to improve the way the project is constructed and managed.

The objectives of the audit management plan are to:

- determine the effectiveness of the Contractor's safety (business) management system;
- verify the level of conformance of the project with legislation, system policies and procedures;
- verify the level to which supplier's systems continue to meet specified requirements and are being implemented; and
- establish actions to rectify deficiencies found during audits.

Additional audits are to be conducted in the event of:

- a major incident;
- recurring incidents; and
- non-compliance to performance standards.

## 9.12.2 Review and Improvement

### 9.12.2.1 Objective

To regularly review the implemented management system to assure the arrangements adopted are effective.

### 9.12.2.2 Implementation

BMSC requires the Contractor to participate in a review with the BMSC H&S Manager of the results of:

- annual health, safety and environmental audits;
- annual risk assessments;
- any review of Health & Safety performance standards.

BMSC and the Contractor are jointly responsible for the review which will include:

- using a corrective action register for all corrective actions resulting from audits;
- using positive performance indicators in addition to lag indicators to assess safety and health performance;
- periodically reviewing and improving the project work program and mandatory procedures.

The outcomes of these reviews are to be formally communicated through routine management meetings. Resources will be allocated by BMSC and the Contractor to close out any action items arising from an audit or review.

The responsibility for ensuring continuous improvement for the construction of the project is delegated to the Contractor.

The Contractor and BMSC will establish a culture that encourages all employees to make recommendations for the continual improvement of the construction and management of the project. These recommendations are to be captured through the system improvement or change management system.



## 10 Emergency Preparedness & Response Plan

### 10.1 Introduction

The *Emergency Preparedness & Response Plan* is designed to ensure the protection of human health and the environment in the areas surrounding the Bisha Project footprint and along all transportation routes during the construction, operations and closure phases of the Project. The *Emergency Preparedness & Response Plan* outlines the responsibilities of Bisha Mining SC, its contractors and employees at the Bisha site. It provides a reference document that can be used for emergencies and outlines the steps to be taken if incidents occur along transportation routes and any incidents which occur during the construction and operation of the mine and processing facilities.

### 10.2 Objectives

The key objectives of the Plan are to:

- Identify the designated personnel and responsibilities for dealing with emergencies on and off-site;
- Provide information to rescue, recovery and clean-up crews, Project personnel, and government agencies in the event of a spill;
- Promote the safe and effective recovery of spilled materials;
- Comply with the Bisha Mining SC environmental policy;
- Comply with Eritrean regulations pertaining to the preparation of contingency plans and reporting requirements; and
- Minimize the environmental impacts of incidents and accidents on water and/or land.

This Plan will address the organization of the Bisha project emergency response measures. Alerting and notification procedures and cleanup strategies are outlined along with the duties and responsibilities of key emergency response personnel.

#### 10.2.1 Recovery objectives

The principal objectives of the Plan are:

- To protect people, wildlife and the environment from environmental incidents and emergencies;
- To ensure that the project can continue to carry out key safety, maintenance, support and administrative functions following an emergency or any serious incident; and
- To ensure that any interruption at any project site or office does not result in a significant loss to its overall performance.

### 10.3 Scope

The *Emergency Preparedness and Response Plan* provides an environmental accident prevention, emergency control, and management plan for the Project. The Plan outlines procedures, organization, and instructions such that project personnel understand and effectively implement environmental protection procedures for both routine activities and unplanned events associated with proposed work. This plan is linked to the *Occupational Health & Safety Plan* for the Project which will be developed prior to construction. These procedures are directed at the both the construction phase and the operation phase of the project.

The Plan provides guidelines for handling on-site and off-site accidents related the following:

- Petroleum products;
- Reagents;
- Explosives;
- Domestic sewage;
- Bush fire
- Tailings;
- Cyanide; and
- Other emergencies.



Detailed cyanide management procedures are set out in the *Cyanide Management Plan*. Detailed handling of petroleum and Oil is addressed in the *Petroleum and Oils Management Plan*, and transportation procedures in the *Transportation Management Plan*.

The Plan sets out:

- A clear chain of command for all emergency activities;
- Accountability for the performance of the spill response;
- Well-defined task and operational hazards/risk assessment; and
- Reporting and record keeping requirements to track progress.

The document provides information to assist and inform all personnel on site so that they can respond to any site emergencies that have the potential to adversely affect the natural environment and/or the safety of personnel.

## 10.4 Regulatory Requirements

### 10.4.1 Eritrean Regulatory Requirements

Key Eritrean regulations that relate to emergency response are as follows:

#### ***Proclamation No. 68/1995 A Proclamation to Promote the Development of Mineral Resources***

Part II, Section 24, Subsection 3 states:

*“The Licensee shall conduct mining operations in such a manner as to ensure the health and safety of his agents, employees and other persons, and to minimize damage or pollution to the environment.”*

Part II, Section 25, Subsection 2 states:

*“The Licensee shall give employees the training and education necessary to carry out mining operations effectively and efficiently and comply with appropriate training programmes.”*

#### ***Legal Notice No. 19/1995 Regulations on Mining Operations***

Part II, Chapter, Part IV, Chapter II Obligations, Section 30 Health, Safety and Environmental Protection, Subsections 2 and 3 states:

*“2. The licensee shall also provide appropriate health and medical facilities, commensurate with the level and nature of operations, and he shall follow all necessary procedures for the safe and prudent transport, storage, handling and use of explosive[s] and chemicals.*

*3. The licensee shall immediately notify the Licensing Authority of any act or occurrence which has resulted in loss of life or serious injury to any person or which may jeopardize any property, the environment or operations and shall immediately take such steps as are necessary to mitigate the impact of such situations.*

### 10.4.2 IFC Guidelines

The IFC General Environmental Health & Safety Guidelines set out the following recommendations with regard to spills and emergency response<sup>14</sup>:

All projects should have an Emergency Preparedness and Response Plan that is commensurate with the risks of the facility and that includes the following basic elements:

- Administration (policy, purpose, distribution, definitions, etc);
- Organization of emergency areas (command centers, medical stations, etc);
- Roles and responsibilities;
- Communication systems;

<sup>14</sup> International Finance Corporation. *General Environmental, Health & Safety Guidelines for Mining*. 30 April 2007. pp 86.



- Emergency response procedures;
- Emergency resources;
- Training and updating;
- Checklists (role and action list and equipment checklist);
- Business Continuity and Contingency.

IFC Performance Standard 3, Pollution Prevention and Abatement is also relevant to emergency preparedness and response.

## 10.5 Response Procedures

### 10.5.1 Emergency Preparedness

Bisha Mining SC is committed to a prevention strategy of ongoing maintenance, inventory control, staff training, and vigilance of all aspects of the work. It will be the responsibility of the environmental and safety staff to know where all hazardous materials are located on the work site.

The construction and operation of the mine and processing facilities for the Bisha project will involve a number of chemical reagents, explosives and oil products. Many of these will be stored on site in large quantities.

Products such as fuel oil will have structures sufficient to contain all of the product contained in storage. However, there will be fuelling of mobile equipment and piping to supply power generators on site. All mobile equipment carrying hazardous materials will have regularly maintained spill kits. In addition significant quantities of sodium cyanide and ammonium nitrate will be stored in a dry solid form.

The following activities and procedures will be standard practice on the site:

- **Inventory control:** All hazardous materials will be subject to strict inventory control from the time they enter the site. Logs will be kept as required for inspection by the regulatory agencies;
- All hazardous materials used on site will have a **Material Safety Data Sheets** (MSDS) accompanying the product. These MSDS will be available in English and, where possible, also be available in the two local languages.
- **Storage:** All hazardous goods will be stored in a manner that is required for the individual product as set out in the manufactures' (MSDS).
- **Daily inventory Balance:** All liquid products kept on site will be checked on a daily basis and a balance sheet of inflow and outflow maintained.
- **Disposal:** All hazardous materials will be disposed of in strict compliance with the laws and regulations of Eritrea and international best practices.
- **Staff Reminders:** Pre-Job meetings/safety meetings will contain a component to constantly remind employees to look out for ways to improve environmental and safety performances.
- **Transportation:** regularly maintained spill kits in trucks carrying hazardous materials will be available along with suitable communications equipment for haulage contractors in Eritrea.

A Health & Safety / Emergency Response Card will be prepared and provided to all workers, to be carried at all times. This will set out:

- Key policies and procedures;
- What to do in an emergency;
- Key contacts and telephone numbers.

Haulage contractors will have suitable communications equipment to enable BMSC to be immediately informed of, and react to, any off-site incidents.

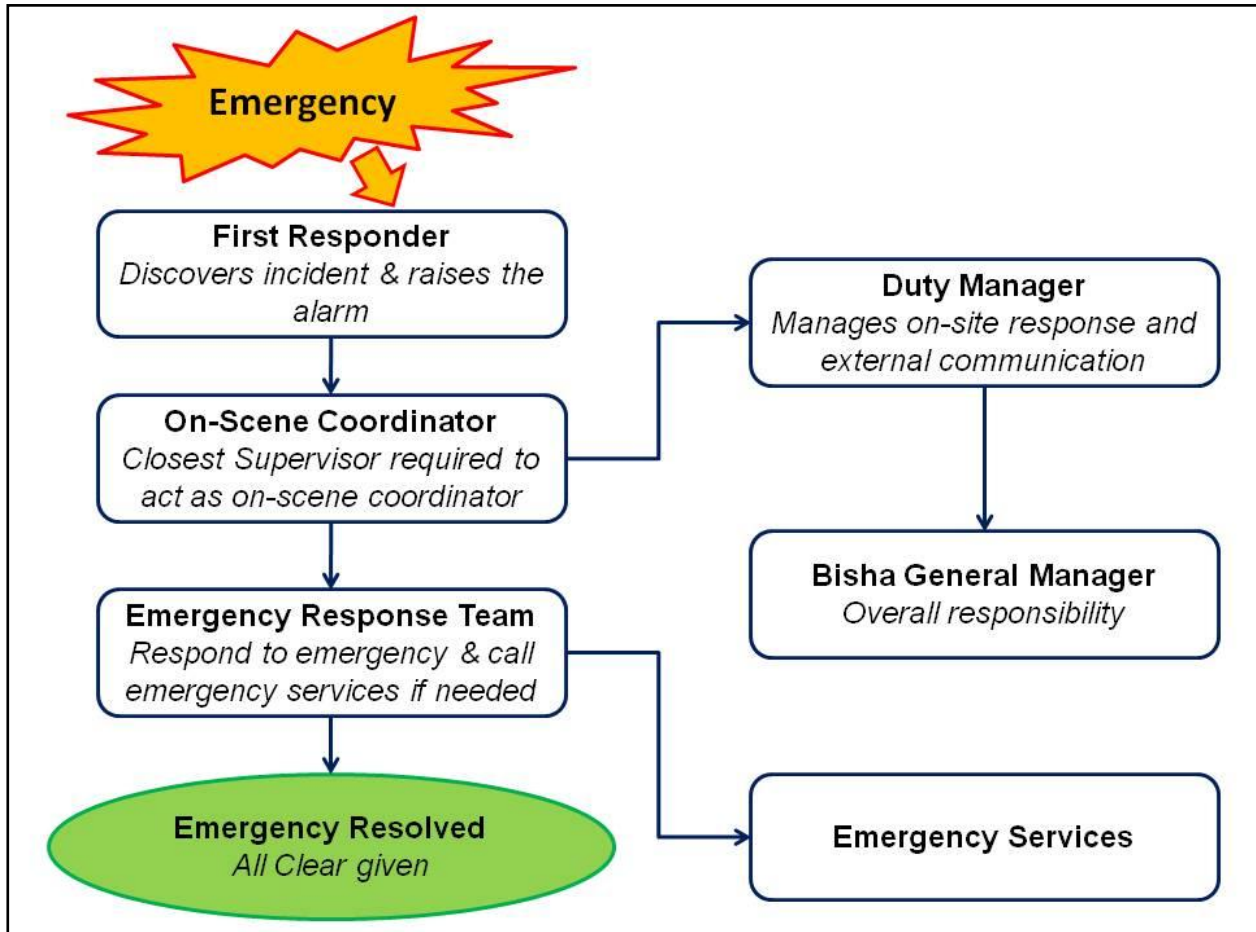
#### 10.5.1.1 Local Liaison

BMSC shall discuss and agree all emergency response plans and procedures with local emergency services and local administrations. Emergency response plans will be included in public consultation and disclosure activities.

### 10.5.2 Emergency Response Roles & Responsibilities

The following diagram sets out basic roles and responsibilities with regard to emergency response. A designated person (Bisha H&S Manager) will be identified for first response and their contact details made available through worksites, offices, the mine, the plant and on Emergency Response Cards. Details of the relevant emergency services will also be provided.

Figure 1 Summary of Emergency Response Procedures



### 10.5.3 Disaster scenarios

Potential events that could impact Project-related activities or assets range from major physical incidents such as fire, to failure of significant computer or communications systems. These potential events could include:

- Fire (contained and conflagration);
- Explosion (accident or terrorist);
- Flood, earthquake;
- Epidemic or pandemic;
- Weather impact – extreme temperatures or dust storm;
- Aircraft accident;
- Road incident or road obstruction (accident, chemical spill, impassable river crossings, bridge collapse etc.);
- Spillage of hazardous or potentially-hazardous materials (on or off-site);
- Industrial action;
- Criminal, sabotage or arson attack;
- Security emergency;
- Geopolitical emergency;
- Interruption to utilities supplies;
- Interruption to telecommunications system; and/or



- Access roads closed.

A risk assessment approach shall be taken to consider the worst-case scenario as the total loss of the Project site. In response to an unplanned disaster at this location, the prime concerns are to:

- Protect Project personnel, the community, assets and information;
- Ensure that the Project continues to operate with no effect on schedule; and
- Ensure that stakeholders, and staff do not lose confidence in the project and its ability to continue.

There are three time frames defined:

- Critical functions like power, infrastructure to be restored within 24 hours;
- Important functions like process raw material storage to be restored within 1-3 days; and
- Other activities to be restored within 10 days.

Recovery activities beyond 10 days will require extensive mobilisation of resources and be subject to a detailed project plan.

#### **10.5.4 General Procedures**

The Emergency Response Plan allows for the fact that emergency events can occur and develop rapidly, requiring personnel to act without waiting for further guidance. The following shall be considered in the implementation of any emergency response:

- Health or epidemic alert;
- Liaison with the local health authorities;
- Equipment requirements to assist in an emergency situation;
- Training requirements;
- Personnel needs – resources;
- Public interface;
- Environmental impact;
- Social impact; and
- Reputation of stakeholders and the Project.

On discovery of an incident, the On-Scene Coordinator will undertake an initial assessment of the emergency and collect the following key information:

- The nature of the incident;
- What hazards are involved;
- Who is in charge;
- Location of the incident;
- The physical situation;
- Type of substances involved;
- Injuries to people;
- Environmental impact.

From the nature of the Project, and on the basis of preliminary risk assessment, particular attention has been paid to high risk areas.

#### **10.5.5 First Aid and Medical Emergencies**

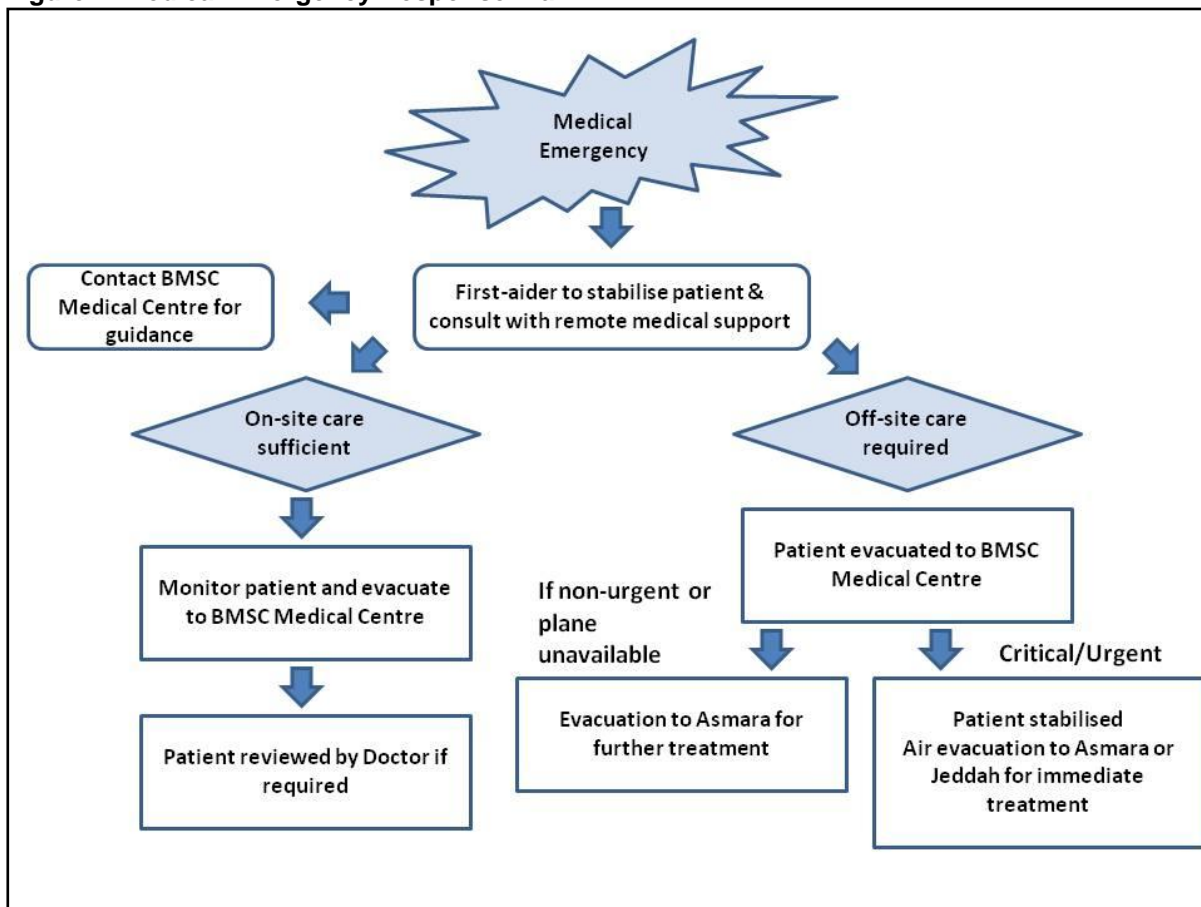
##### **10.5.5.1 First Aid & Medical Response**

Basic first aid training will be provided to all BMSC staff, contractors and consultants by their respective employers.

At least one member of each working team must be qualified first-aider. Each working team must be equipped with a suitable first aid kit.

In the case of medical emergencies, the Medical Emergency Response Plan will be implemented.

Figure 2 Medical Emergency Response Plan



### 10.5.5.2 Medical Emergencies Amongst Local Communities

BMSC will provide general support to the local health care centre in Mogoraib village, but all health care services will be provided by the local medical staff and not by BMSC.

At the discretion of the Bisha General Manager, the BMSC Medical Centre may treat local residents on a strictly exceptional basis, but the objective is for all medical treatment to be provided by local health care practitioners.

### 10.5.5.3 Security Emergencies within the Local Area

In the event of a security emergency within the local area the following procedures will be implemented:

- The Bisha General Manager will announce a security emergency and an “emergency stand down” will be implemented;
- All BMSC workers and contractors will withdraw to secured sites (such as the accommodation area and processing plant) and await further instructions;
- The Bisha General Manger will liaise with government and security force representatives to determine the nature and likely duration of the security emergency and an event-specific action plan will be prepared and implemented. This may include, but not be limited to a range of actions such as:
  - Resumption of normal working activities;
  - Increasing site security and security of in-bound and out-bound transportation;
  - Evacuation of non-essential personnel and placement of Bisha project on temporary care and maintenance until the security emergency is resolved.

## 10.5.6 Cyanide Response

### 10.5.6.1 Cyanide Spill Response (Off-Site)

Prior to the commencement of cyanide transport activities, BMSC and its transport contractor(s) will notify local emergency services of the routes and quantities of cyanide that will be transported on a daily basis.



The haulage contractor(s) will ensure that all drivers are equipped with suitable communications equipment to enable an incident to be reported promptly. The Haulage contractor will be responsible for the preparation of suitable incident response procedures for all incidents occurring outside the Bisha concession area. In the case of an off-site incident:

- The contractor will immediately inform the appropriate emergency services and the Bisha Mine Manager and send its own Emergency Response Team (ERT) to the location.
- Working with the appropriate emergency services, the ERT will take control of the incident and rectify the situation; if it is considered that the exclusion zone set up around the incident requires to be communicated with the local communities, the BMSC Community Relations Officer will be involved and briefed.
- The ERT will neutralise any spill using sodium hypochlorite and clean the location; any contaminated material created by the incident will be stored in Hazardous Waste Storage Bins.
- The contaminated material will be checked by the Safety and Environment Department. For all spills, the Community Relations Officer will be briefed in order to address any community concerns that may be raised.

Should an incident occur with the transport of cyanide, as with any other vehicle incidents, a full incident investigation will be undertaken involving all parties involved in the incident. Actions arising from the incident investigation will be implemented immediately and subsequently audited, including the actions undertaken by third parties, such as the haulage contractor.

#### 10.5.6.2 Cyanide Spill Response (On-Site)

In the event of a spill occurring, the spill response plan will be initiated. In summary, should a spill be observed:

- The employee shall immediately contact the nearest supervisor. Before contacting the ERT, the supervisor shall observe the location and ensure that all personnel are safe, and then prevent anyone from entering the area, for example cordoning off the area with danger tape.
- After this initial assessment, the supervisor will contact the ERT providing details on the location of the spill, its size (a small spillage (spillage  $\leq$  50 litre) or a large spillage (spillage  $\Rightarrow$  50 litre)), the concentration of the cyanide spill and the urgency of the situation (e.g. is it contained or flowing off the site).

In case of a small spillage, the ERT may determine that the spill can be dealt with by the Safety and Environment Department. In coordination with the Safety and Environment Department, the supervisor will coordinate workers equipped with appropriate PPE, to use absorbent material or approved reagents stored near the cyanide storage tanks, to control and remediate the spill. Through the use of field measurements of cyanide, the supervisor will determine whether adequate reagent has been used to neutralize any spilled cyanide.

Used absorbent materials, and/or reagent and the contaminated soil etc. will be placed in heavy duty plastic bags and then stored in Hazardous Waste Storage Bins. The contaminated material will be checked to assess its cyanide concentration; once the remaining material has been classified as non-hazardous, it will be disposed of into the tailings management facility.

The Project and site managers shall ensure that emergency response procedures are reviewed for accuracy, adequacy and compatibility. The Safety and Environment Department shall ensure that responsible individuals are nominated for developing and maintaining emergency response procedures associated with any project, new long or short-term sites or office locations, for all stages of an emergency.

### 10.5.7 Fire Response

#### 10.5.7.1 Fire Prevention and Control

The scope of this fire prevention and protection plan is intended to give a guide on effective fire protection on the project.

The following requirements and activities are considered as the minimum for the company's fire prevention and protection plan:

- Selection and use of portable fire extinguishers;
- The layout of storage areas and material;
- The segregation of non-compatible materials;



- Providing and maintaining adequate access into storage areas and other facilities;
- General housekeeping and the disposal of waste and other debris;
- The entire storage site for hazardous goods shall be kept free from the accumulation of unnecessary combustible materials. Weeds and grass shall be kept down and a clear up of the entire area shall be made on a regular basis.
- Rubbish, brush, long grass or other combustible material shall be removed from the immediate areas where flammable liquids are stored and handled.
- Waste should be removed at regular intervals.
- Metal bins with close-fitting lids should be provided for oily rags, wood shavings, and other highly-combustible wastes.
- Explosives storage magazines, their design, and their locations;
- Control of vegetation or other developments which may have vulnerability to fire;
- Fuel storage depots;
- Driveways (aisle firebreaks) between and around combustible storage shall be provided and maintained free from accumulation of rubbish, equipment or other articles or materials;
- Sulphur handling area and early detection and extinguishing systems;
- Providing and maintaining fire warning signs, if and when necessary;
- Providing, maintaining, checking and inspecting fire extinguishers and other fire control devices;
- Clear instruction to the personnel for fire protection and prevention; and
- Instruction and training on the use of fire extinguishers.

The three factors for a fire are: heat, fuel and oxygen. Removal of any one of the three will extinguish a fire. Fire extinguishers cool, smother, or inhibit chemical chain reaction. Another method is to remove or shut off the fuel supply.

The following general procedures will be applied to prevent fires and control fires should they occur.

- Compliance with work permit procedures and conditions against possible ignition of oil and gas from process operations. The Company must also take steps to prevent ignition of construction materials, lubricants, and fuels used in the job itself.
- Electrical equipment should be checked regularly for defects.
- Smoking is prohibited in work areas.
- Welding equipment, heating appliances and other open flames or hot surfaces should be segregated from combustible materials.
- Open fires and/or burning of materials are strictly prohibited.
- Proper bonding and grounding techniques shall be used for any operation where static electricity could become an ignition source.
- Material Safety Data Sheets shall be available for all kind of dangerous products (including flammable). The Material Safety Data Sheets will describe which type of fire extinguisher must be used in case of a fire.
- Scheduled inspections are necessary to discover deficiencies and keep the fire prevention status up-to-date with existing job conditions. As work progresses, changes in fire prevention needs may be required.
- The Company must take into account the potential hazards that can be encountered on site; protection of machinery and equipment; control of ignition sources; storage of flammable and combustible materials; housekeeping; staff training and end-of-shift checks.
- The following principles of project layout and organization can also help minimise fire risks:
- Avoid congestion around machinery and equipment where there is a high level of activity and traffic,
- Operations having a high fire risk, such as welding and spray coating or painting, should be isolated from flammable and explosive materials or specially protected,
- Provide adequate emergency access and egress,
- Storage of flammable and explosive materials on the site should be restricted to minimum quantities necessary for the job.
- All flammable liquids will be kept in securely capped metal containers or steel drums on which the contents are clearly marked. Gasoline, acetone spirits and other volatile liquids with flash points below 38°C will be kept in strong metal lockers located in well-ventilated, non-combustible huts or sheds. Drums containing flammable fluids shall provided with proper bung vents. Flammable storage areas will be securely locked (or fenced), posted with a warning sign "Danger: Flammable Area" and will be located at least 15 m away from the nearest building or storage area for combustible. No other materials will be stored with flammable liquids.



#### 10.5.7.2 Other protection

An alarm system, e.g., telephone system, siren, etc., shall be established whereby employees on the site can alert the appropriate supervisors and/or the Emergency Response Team. The alarm procedure and reporting instructions shall be conspicuously posted at telephones or communication systems and at employee entrances. Given the layout of the Project Area, there will need to be a communication system to all employees across the area, from the plant area to the pits, which will ensure all staff are quickly alerted to an emergency and understand their duties and response.

All emergency equipment shall be kept in a continuous state of readiness.

#### 10.5.7.3 Fire Prevention Monitoring

The Safety and Environment Department and the Emergency Response Team members shall act as monitors and point out any fire hazards and fire fighting obstructions to the Environment Manager. In addition the Health & Safety Officers shall note weekly whether clear access to fire fighting equipment is maintained. Any deficiencies shall be reported promptly to the Health & Safety Supervisor.

#### 10.5.7.4 Bush Fire Prevention and Protection During Construction

Construction of the Bisha Project will take place in an area of light scrub. Construction work in such areas will be conducted at all times with the aim of preventing fires from any source of ignition related to the construction work.

Prevention methods will include;

- Work will be carried out where possible in areas cleared of debris and any work with the potential to generate a spark will only be carried out in areas cleared of debris;
- Adherence to local fire control fire bans; and
- Awareness of employees to fire risk by Toolbox meetings and supervision.

Equipment necessary to assist in the prevention or suppression of fires will be determined by Fire Risk Analysis.

#### 10.5.7.5 Fire Hazard Areas

The Company will provide and maintain an Emergency Response Team, including where necessary the provision of:

- Adequate availability of first-aid fire fighting equipment in order to suppress/contain fire spread in the event of any outbreak of fire at any point on or adjacent to the site under his control.
- Prompt warning of an outbreak of fire shall be advised to personnel in accordance with the Emergency Response Plan.
- Establishment of an Emergency Response Team at each work site. There shall be an appointed Fire Fighter/Fire Officer for each camp.
- The Company shall ensure that employees engaged in work are properly trained in the use of portable fire fighting equipment and that such equipment is readily available.

The Company shall ensure that all statutory provisions administered by local authorities and which may be in force from time to time in relation to bush fire danger are complied with, and will liaise with the local authorities. Notwithstanding any other requirement, BMSC shall ensure that every vehicle and item of construction plant is fitted with a fire extinguisher.

Every vehicle shall be fitted with a sound, efficient exhaust system free from leaks, and maintained in a sound efficient condition.

#### 10.5.7.6 Welding During Fire Danger Periods

Where welding work is to take place during any period of fire danger, the minimum requirement that will be implemented will include:

- The area where welding is taking place will be cleared of all flammable material to a minimum distance of 4m of both sides of the area;
- A "firewatch" is to inspect all areas adjacent to welding and grinding operations to ensure that the site is left in a safe state.



## 10.5.8 Spill Prevention and Response

### 10.5.8.1 Design Provisions for Spill Prevention

The following provisions will be built into the Project design to minimise the potential for spills:

- All pipeline materials will be selected, carefully, with respect to corrosion potential and material transfer;
- Appropriate and adequate signage and marking will be placed where potential spills are anticipated;
- of hazardous materials pipelines and tankage;
- All storage facilities for hydrocarbons, cyanide, reagents and other potentially-hazardous materials will be provided with suitable secondary containment and spill detection devices;
- In accordance with manufacturers design protocols, shut-off and diversion valves will be installed on all pipelines and processing facilities to enable selected pipeline segments or facilities to be separated into emergency intervals;
- Where a pipeline crosses a permanent or ephemeral water course, closing valves will be present immediately outside of the flood zone at each side of the crossing;
- There will be no below ground bulk storage of hydrocarbons;
- Above ground tanks will be equipped with volume-measuring devices, which serve as an indicator for losses occurring within the tanks and the internal pipeline system;
- Operators of these control systems will be appropriately trained in order to be able to identify and to react to indicators for spillages;
- Visual inspections of tanks, pipelines and associated equipment will be routinely carried out and any non-conformances reported to the Environment Manager; records of all inspections will be kept by the Environmental Engineer; inspections will include the tanks, bunding, foundation and supports; and
- Visible leaks which result in a loss of chemicals from tank seams, gaskets, rivets or bolts will be promptly reported and addressed.

### 10.5.8.2 Spill Response Planning

The Spill Response Plan includes the following provisions:

- A qualified individual will be assigned with responsibility for spill prevention and response i.e. to co-ordinate and lead the team;
- The Plan will be reviewed by qualified and experience professionals familiar with the facilities, to confirm that the Plan has been prepared in accordance with best practice;
- Details of the Plan will be discussed with local communities through the ongoing programme of community consultation and led by the Community Relations Officer;
- The Plan will be discussed with the local emergency services and, as appropriate, annual reviews will be undertaken. This is particularly important in the early stages of the Project as the site is developed and import requirements for raw materials, including chemicals, are variable;
- Clearly marked spill response equipment (spill containment and clean-up kits) will be located at strategic points which will be moved as required to be near potential spill risk areas as the Project passes through the different Phases.
- Sufficient equipment will be maintained to ensure that contingency stocks are available in the event of a major spill requiring emergency response;
- Responsibilities are assigned for maintaining and regularly updating the inventory of the available equipment for spill response;
- All response procedures include clear responsibilities for immediate actions to be carried out by the operator detecting the spill, and will provide advice on any actions, which may only be carried out by the Emergency Response Team (ERT);
- Material Data Safety Sheets (MSDSs) will be maintained on site for all potentially hazardous materials; staff will be familiar with both the content and location of the MSDSs; and
- The location and phone numbers for the ERT, fire service and other appropriate emergency services will be clearly visible in all operational areas.

### 10.5.8.3 Spill Response

- In the case of small spills, which can be mitigated with readily available clean-up equipment, operators will be responsible for initiating immediate clean-up action and for reporting the spill and the completed actions.



- After identification and reporting of a significant spill, the ERT will be deployed immediately in order to eliminate the source of the spill and to perform emergency response measures for preventing further migration of hydrocarbons and other pollutants into soil and/or water.
- The general response procedures for spills to soil will be as outlined below:
- The source of the spill is closed or, where immediate closure is not possible, isolated by appropriate catchment provisions.
- The spilled material will be contained using booms, earthen dams, or other techniques.
- For oils, free product will be recovered as technically feasible. This may involve special seasonal and regional provisions. Sorbent material, such as sawdust or synthetic sorbents, may be used to soak the free oil for small-scale spills.
- Once contamination has been removed from the soil, the soil will be remediated in accordance with accepted remediation procedures so that it prevents no significant risk to the environment.
- The general response procedures for spills to surface water will be as outlined below:
- The source of the spill is closed or, where immediate closure is not possible, isolated by appropriate catchment provisions.
- For contaminants such as free oil, these will be contained by permanent booms.
- Such free oil will be recovered by pumps, and then transferred to oil preparation facilities for separation and further processing.
- Residual oil in the water may either be burnt or recovered using sorbent material.
- If sorbent material is utilised, then the spent sorbent material should subsequently be disposed of in accordance with accepted procedures.
- Once free oil has been removed, the banks will be remediated in accordance with accepted procedures.
- The general response procedures for spills involving grease, solvents, reagents will be as outlined below:
- Any spills of oils, grease, solvents or other hazardous materials in the maintenance areas, fuel storage areas or transfer areas will be cleaned up using absorbent materials and placed in appropriate storage containers for appropriate disposal, and will not be washed and dispersed of with water.

## 10.5.9 RECOVERY FROM AN EMERGENCY SITUATION

### 10.5.9.1 Designation of “All Clear”

Typically, the ERT shall remain in control until the emergency is determined to be over, i.e., medical response to all injured persons is complete, fires are out, spills are stopped and contained, any other situation prompting the emergency is under full control, and the chance of a recurring emergency is deemed minimal. It is the Leader of the ERT who will determine when the emergency is over and the “All-Clear” can be issued.

In the same way the alarm system was sounded to announce an emergency, the “All-Clear” signal will be sounded when the emergency is declared over. In the event of a facility-wide evacuation, local area, or building evacuations, employees would remain at the pre-determined accumulation points until told it was safe to return to work.

### 10.5.9.2 Start-up of Facility Processes/Regular Operations

If the emergency situation required that facility processes or operations were interrupted or shut-down, the start-up and return to normal operations will follow pre-determined start-up procedures for each particular operation. Following the “All-Clear” alarm employees will only initiate the start-up procedures when given instructions to do so by their supervisors.

## 10.5.10 POST EMERGENCY MITIGATION

### 10.5.10.1 On-site Cleanup

Once the emergency has been declared to be over, the typical ERT’s actions will include:

Documentation of the incident;

- Initiation of the emergency incident investigation, reporting, and record keeping;
- Initiation of cleanup which will be the responsibility of the Safety and Environment Department who shall also develop a clean-up plan with the involvement of the ERT;



- Immediately provide for treating, storing or disposing of recovered waste, contaminated soil or surface water, or any other material that results from the incident;
- Follow-up communication with outside emergency response personnel including notification to any outside agencies or emergency response personnel which were notified during the emergency that operations are about to resume; and
- Ensure that all emergency equipment is cleaned or replaced, and is fit for use before operations are resumed.

The ERT are responsible only for *response* during the emergency, i.e., stopping and containing spills, medical services, firefighting, or conducting rescue operation. The clean up and decontamination after the emergency has been declared over is the responsibility of Safety and Environment Department.

#### 10.5.11 General Decontamination Approach

In the event of an emergency situation involving hazardous materials, employees involved in the incident, emergency response personnel, emergency response equipment, buildings, process equipment, containment pads, and floors all may come in contact with hazardous materials. Employees, emergency response personnel, and equipment must be decontaminated of all chemicals and dusts prior to returning to normal operations.

As part of the clean-up effort, the ERT will ensure that all emergency response, mobile equipment and/or processing equipment involved in the emergency response or clean-up activities will be cleaned and any necessary service performed before re-use or storage. This is essential, as the emergency response equipment must be in a ready condition before placing back into storage. Similarly, processing equipment will be decontaminated before being placed back into normal operation.

The equipment cleaning will typically consist of a rinse down of the equipment with a mildly alkaline solution. However, Material Safety Data Sheets should be consulted to provide guidance on decontamination. The equipment will be scrubbed as necessary to remove any solids. The Emergency Co-ordinator and the clean-up plan must ensure that the resulting washing liquids are handled and disposed of properly. Care should be taken to perform decontamination within permanent or temporary containment systems to prevent further soil and/or surface water contamination.

##### 10.5.11.1 Assistance with Offsite Mitigation Actions

In the event that an emergency has impacts outside the facility boundary, the ERT will be responsible for mitigation actions in conjunction with the Safety and Environment Department and the Community Relations Officer. However, the community stakeholders will be involved in the planning and clean-up process. If there has been an impact on third party land, once all appropriate stakeholders have been identified, a clean-up committee shall be established lead by the Community Relations Officer. The committee shall establish the scope, authority, workplan and schedule of the clean-up.

#### 10.5.12 Emergency Incident Investigation and Documentation

During any emergency incident, documentation of the emergency begins with the initial report of the emergency by the first responder. Key persons keeping a log of the incident include the Security personnel taking the call, the Leader of the ERT, who immediately begins a log of the incident and of the emergency response at the scene. All of these documents, as well as others generated throughout the emergency, become part of the emergency record. In addition, emergencies must be investigated and documented, and corrective actions taken to ensure that such emergencies can be prevented in the future. Once the emergency is declared over by the ERT, the incident investigation process begins, under the direction of the Leader of the ERT, with the purpose of:

- Determining the root cause of the emergency;
- Determining if appropriate emergency response was taken;
- Determining if the Emergency Response Plan, emergency response organisation, and emergency procedures were adequate or need to be modified;
- Determining corrective and preventative actions to prevent recurrence; and
- Documenting the incident and corrective actions.

### 10.6 Roles & Responsibilities

Overall responsibility for the implementation of this Management Plan shall rest with the Bisha Environment Manager who shall report on progress to the Bisha General Manager.



Others with responsibility for the implementation of this Management Plan shall include:

- SENET, as EPCM Contractor, shall be responsible for the integration of these procedures and requirements into their operating procedures and plans;
- Bisha Mine Manager shall be responsible for ensuring that these procedures and requirements are implemented for all mine operations;
- Bisha Mill Manager shall be responsible for ensuring that these procedures and requirements are implemented for all mill operations.

BMSC will ensure that at all times, a “Duty Manager” is clearly designated who will have responsibility for coordinating and managing emergency response activities.

## 10.7 Training

All employees of BMSC and Contractors to BMSC shall be provided with basic training in spill and emergency response. Additional, specialist training shall be provided to plant operators and key personnel.

### 10.7.1 Orientation and Training

- All employees, contractors and visitors will be introduced and instructed on the policies and procedures established with this plan. Area specific inductions will be given to individuals working in high risk activity areas such as the mill, the open pit, or the open areas surrounding the mine.
- Safety and environmental concerns and awareness will also be discussed at every safety meeting and at the start up of any new operations that may affect the environment. If an incident happens all employees will be informed and re-instructed and retrained as deemed necessary.
- The training for spill response will be part of the worker orientation at the site. All personnel will be made aware of the products present on site through the orientation program and the availability of Material Safety Data Sheets (MSDS) in prominent locations. Supervisors who will fill the role of Spill Response Coordinator, the Spill response Supervisor and the Clean up Crew will receive a more detailed training allowing them to respond quickly and safely to any spill on the site. Specified disaster response teams will receive additional training as well.
- All employees on site will have valid WHMIS certificates and will be familiar with MSDS. Each employee will be made aware of the locations of storage facilities and the locations of spill containment and recovery equipment.
- Drills and Practice will include planned and unplanned mock drills.

### 10.7.2 Responsibilities

The ultimate responsibility for up-to-date emergency training plans is with the Environment Manager.

- The Environment Manager, in consultation with the Bisha General Manager or designate will review the emergency preparedness and response procedures on a regular basis. Review of the emergency response procedures will include the periodic verification of any telephone number contacts for the various organizations that may be needed. Such verification will be undertaken at a minimum of once per year.
- Revisions will be made to the procedures where necessary to comply with changing site conditions and any new relevant legislation.
- Personnel will be notified on any changes and if necessary, retraining will take place.

### 10.7.3 Drills and Practices

Personnel at the site will undertake periodic testing of the emergency response procedures.

These tests will be undertaken on a twice-yearly basis. These intervals will be more frequent if there is a high turnover of employees at the site. The outcome of each exercise will be recorded, and reviewed for areas of improvement by the responsible person for the respective area.



#### 10.7.4 Areas Covered

Emergency preparedness training will, at a minimum, address the following:

- Medical emergency, accident or fatality;
- Cyanide spill;
- Fuel spill or effluent spill or leak;
- Fire;
- Dust storm;
- Flood;
- Earthquake; and
- Missing person(s).

#### 10.7.5 Testing and Review

Each plan is to be tested annually and plans are to be reviewed every six months by the Project and crisis management and teams.

##### *Fire Equipment Inspections*

- Fire equipment inspections shall be the responsibility of the Environment & Safety Manager.
- Fire extinguishers shall be inspected at least weekly to ensure that they are in operating readiness. Their general condition should be checked along with hoses, nozzles, seals, gauges, inspection cards, weight, location, and mounting brackets.
- Stored pressure types and the cartridges of cartridge pressure models shall be weighed at least once each year and subjected to a thorough maintenance inspection.
- Hydrostatic tests will be made on dry chemical extinguishers every 10 years and on other types every 5 years. The test pressure shall be 75 % of the factory test pressure, which is noted on the nameplate. This testing should be undertaken by a suitably-qualified contractor, who will tag the extinguisher which has been hydrostatically tested indicating the date of the test each.
- Other equipment, fire alarm systems, etc., shall be inspected in accordance with manufacturer's recommendation and/or requirements of the insurance company, and local authorities.

##### *Tools and Equipment Inspections*

- Portable electric tools shall be given a preventive maintenance inspection at least once every 3 months.
- Portable air compressors shall be checked monthly for internal flammable sludge build-up, along with other listed inspection items.
- Oily rags and papers shall not be allowed to accumulate on equipment or in operator's cab and enclosures.
- Gas welding equipment shall be checked for leaks prior to each use by the user. Hose pressure shall be bled off when equipment is temporarily out of operation.
- Temporary heaters, internal combustion engines, and other heat producing equipment shall be adequately supervised and maintained.

##### *Material Inspections*

- All flammable material received on the job shall be reported to the appropriate supervision for proper storage. The Environment & Safety Manager shall be consulted on questions concerning flammable materials.
- Stored flammables and combustible materials shall be checked for fire hazards at least once each week.
- Fuel cans used for petrol shall be approved safety cans and shall have the upper part and top painted red to identify them. These cans shall only be used for petrol, and petrol shall not be placed in unmarked cans.
- Drums, cans and other flammable liquids containers shall be tightly closed, except when being filled or emptied.

##### *Work Area Inspections*

- A system of periodic fire prevention inspections shall be set up. The frequency of such inspections will be determined by the specific site characteristics and/or task requirements.
- A fire prevention inspection checklist shall be used as a guide for determining the extent of the inspection to ensure consistent and thorough monitoring of affected work areas.



- Field supervisors shall be responsible for housekeeping control to prevent the excess accumulation of trash and other combustibles.
- Foremen shall inspect work areas prior to the start of heat producing work. All fire hazards shall be eliminated or protected before the work starts. All necessary permits shall be obtained prior to the start of work.
- All work, where there may be an accumulation of hazardous gases or vapours from cleaning, spray painting, and use of adhesives, shall be free of ignition sources.
- Foremen shall check their work areas at the end of their workday. Special attention shall be given to welding and burning areas, smoking areas, housekeeping, and access route clearances. They shall also check on machine and equipment shutdown, and flammable storage areas.
- Plant supervisors shall make a fire check at the close of each shift, inspecting for gas leaks, equipment shutdown, and cigarette disposal. Oily rags shall be placed in closed metal containers.
- Ashtrays, wastebaskets, storerooms, oily mops, and office machinery are sources of fires and will be emptied regularly.
- Welders shall be responsible for shutting off their equipment at the end of a workday. Welding and burning areas shall where necessary be checked for a minimum of 30 minutes after the work has ceased.
- Offices, canteens, cabins, shall have a map with the location of the fire extinguishers and with escape routes.
- Petrol, acetone and alcohol shall not be used as a solvent for cleaning clothes, tools, equipment or exterior of buildings. Only approved solvents shall be used for cleaning purposes.
- Smoking is only allowed in designated areas.
- Regular thorough inspections of the work areas and buildings to detect and eliminate fire hazards or the potential sources of fire.
- Gasoline and diesel powered equipment should only be used in well-ventilated areas. Exhaust pipes should be kept away from combustible materials. Engines must be stopped before refuelling takes place if possible.
- Kitchen areas are a particular location for fire hazards and shall be monitored to ensure that electrical fittings are being turned off after use and do not present a fire hazard.

## 10.8 Monitoring & Reporting

A key part of preparedness for emergencies is to ensure that all preparations and emergency equipment are in place and functioning as intended. There are two aspects to this:

- routine site inspections; and
- training updates.

Monitoring procedures shall be as follows:

- SENET shall report on a monthly basis to the Bisha Environment Manager on the implementation of this Management Plan during the construction phase, including:
  - Training undertaken (numbers of staff, courses etc);
  - PPE quantities and locations;
- Bisha Environment Manager shall inspect the Project on a monthly basis and shall maintain appropriate records. The inspection shall include:
  - Training;
  - PPE;
  - Site conditions;
  - Observations of management practices;
  - Rehearsals and exercises.
  - Compliance with applicable regulatory and corporate requirements.
- Bisha Environment Manager shall prepare and update the Spill and Emergency Response Plan on a periodic basis.

The Bisha Environment Manager shall be responsible for record-keeping.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;



- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

Further information on environmental monitoring and reporting requirements and procedures is set out in the Monitoring Plan and in the Social & Environmental Management System.



# 11 Tailings Management Plan

## 11.1 Introduction

The *Tailings Management Plan* is designed to ensure the effective management and disposal of tailings residues which will be produced by on-site operations at the Bisha Project site during the operational phase of the Project. The plan contains methods that shall be used to prevent adverse effects occurring during construction, operations and closure and monitoring plans for determining the effectiveness of any mitigation measures.

## 11.2 Objectives

The objectives of this Management Plan are to:

- Establish Standard Operating Procedures (SOPs) for Bisha construction, operations and closure activities;
- Define BMSC requirements and procedures to guide the Project Management Team and other project contractors;
- Define mitigation measures;
- Define roles and responsibilities; and
- Define monitoring and reporting procedures.

The targets of this management plan are to ensure ARD prevention, no seepage losses, and permanent stability.

## 11.3 Scope

The plan addresses the management of tailings generated from the process operations at the site. Operations on-site will produce three types of tailings residues requiring on-site disposal. Tailings residues will include: primary ore, supergene ore and oxide orewaste roc. It is anticipated that 18.1 million tonnes of tailings will be produced during the lifetime of the project.

Other plans with reference to tailings management include the *Waste Rock Management Plan*, *Cyanide Management Plan* and *Waste Water Management Plan*.

The design of the tailing management facility and waste rock storage locations has been undertaken in consultation with an independent tailings review panel (ITRP) comprising leading mining and geotechnical experts.

## 11.4 Regulatory Requirements

### 11.4.1 Eritrean Requirements

There are no specific Eritrean requirements concerning the management of tailings.

### 11.4.2 International Finance Corporation Environmental Guidelines

IFC Environmental Health & Safety Guidelines for Mining sets out the following recommendations with regard to waste rock<sup>15</sup>:

*Recommended tailings management strategies include:*

- *Consideration of zero discharge tailings facilities;*
- *Independent (third party) assessment of risks to surface and groundwater and users of those resources downstream of the facility together with mitigation of impacts including lining of the facility if required;*
- *Monitoring of the tailings facility, both of the physical structure and of water quality in surrounding areas;*
- *Management as potentially-acid-generating (PAG) materials;*

<sup>15</sup> International Finance Corporation. *Environmental, Health & Safety Guidelines for Mining*. 10 December 2007. pp 10.

- On-land disposal in a system that can isolate acid leachate-generating material from oxidation or percolating water, such as a tailings impoundment with dam and subsequent dewatering and capping. On-land disposal alternatives should be designed, constructed and operated according to internationally recognized geotechnical safety standards;
- Freeboard on tailings facilities should have sufficient capacity for retaining maximum process flow in addition to the peak 1:100 years contributions from precipitation ice or snow melt;
- Thickening or formation of paste for backfilling of pits and underground workings during mine progression.

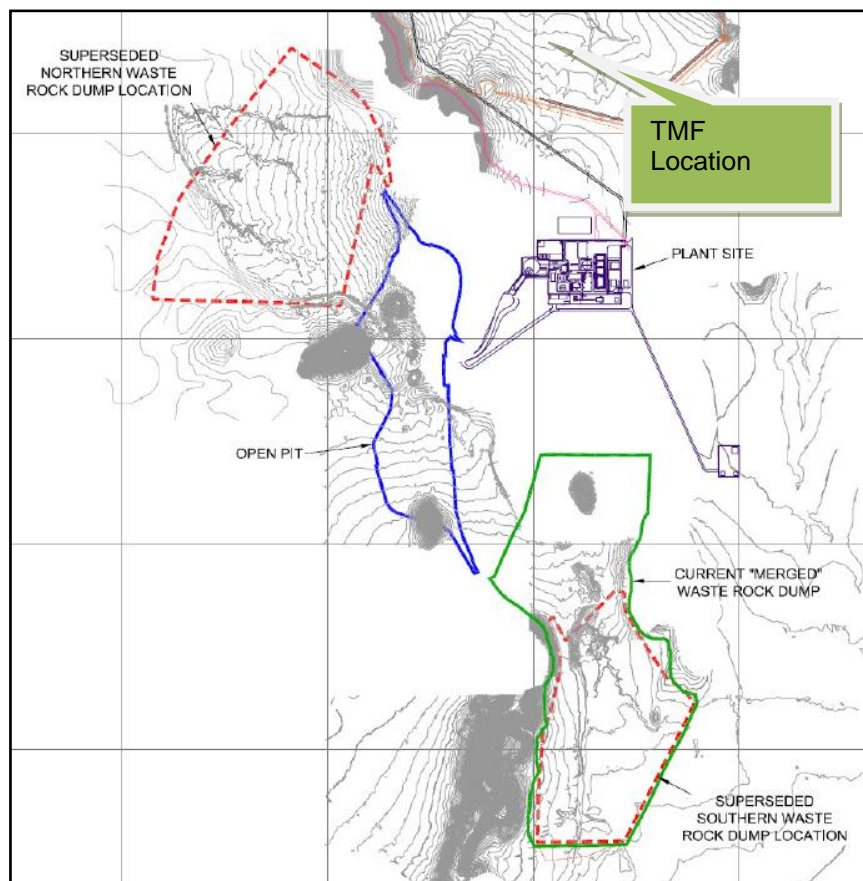
IFC Performance Standard 3 Pollution Prevention and Abatement is also relevant to tailings management.

### 11.5 Potential Impacts

Gold ore will be processed using CIL technology, using cyanidation. Copper and zinc ores will be processed using a flotation process to produce concentrates. The tailings (and waste rock) from the supergene and primary ores are likely to be highly acid-generating due to a high pyrite content.

Figure 1 provides the location for the tailings management facility.

**Figure 1 TMF Location and Plant Layout**



#### 11.5.1 Construction Phase

It is during the (design and) construction phase that key consideration has to be given to the long-term management of the tailings management facility (TMF) to prevent the generation and migration of Acid Rock Drainage (ARD) and to ensure the safety and integrity of the TMF. Therefore, construction will include:

- A tailings impoundment;
- Runoff collection; and

- Seepage collection.

### 11.5.2 Operations Phase

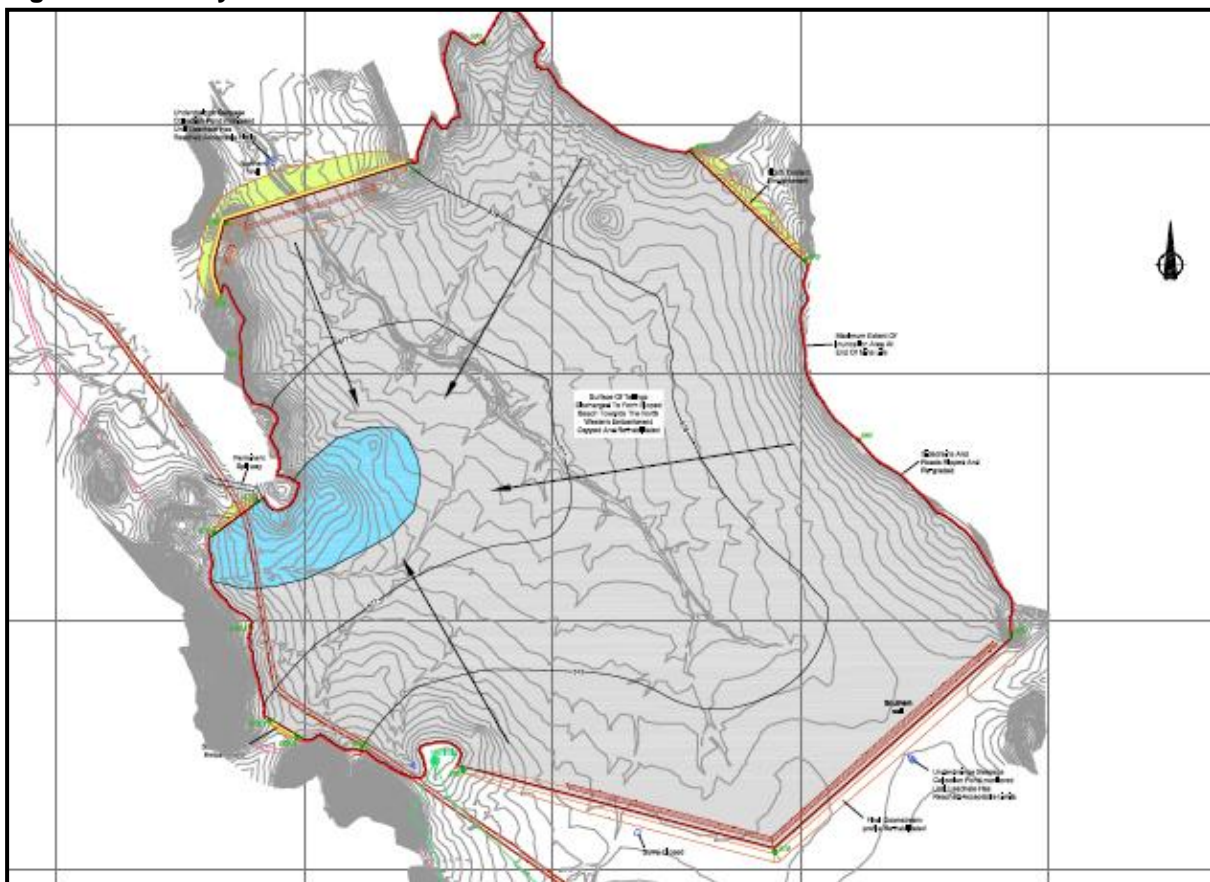
During the operations phase, the potential impacts from the tailings need to be considered carefully as the volume of tailings increases over time. The tailings product solids by weight percentage will vary by ore type, operating conditions and tailings pipeline management requirements.

### 11.5.3 Closure Phase

Once operations have ceased at the site, long term tailings water management will still be required at the site to prevent potential impacts.

Figure 2 provides an overview of the layout and operation of the TMF.

**Figure 2 TMF Layout**



## 11.6 Tailings Management Procedures

### 11.6.1 Design and Operation

- A topographical survey of the tailings storage area shall be undertaken so that the designs can be prepared with greater confidence.
- Tailings are to be stored in a tailings management facility, the basin of which will be lined with a suitable low permeability liner comprised of HDPE or bitumen impregnated geotextile.
- A starter dam will be provided to allow sufficient storage capacity for the first two years of development.
- Tailings will be thickened at the process plant to reclaim as much water as possible prior to their disposal in the tailings impoundment.



- Tailings will be hydraulically pumped from the plant process area through a pipeline to the tailings impoundment.
- The tailings pipeline will be protected to prevent transport-related accidents.
- The tailings pipeline will be designed such that any spillages will not flow towards water courses;
- The tailings impoundment must have sufficient storage to accommodate all the tailings from the site for the duration of the project.
- All dyke crest elevations will be set to include 1.5 m of freeboard as a minimum.

### 11.6.2 Tailings Water Management

#### *Hydrology and Water Balance*

- Tailings will be thickened at the process plant to an average thickened tailings product of approximately 65% solids by weight.
- Free water from discharged tailings and seasonal runoff will collect in a small pond in the centre of the tailings impoundment, from which it will evaporate.
- No operational spillway will be required for the impoundment during operations; However, an emergency spillway will be established during operations and at closure. A
- A sufficient freeboard of 1.5 m will be maintained during mine operations.
- The design inflow event is the Probable Maximum Flood (PMF) which is calculated based on the estimated Probable Maximum Precipitation (PMP).
- A tailings water balance shall be modeled.
- The project shall be designed to recycle as much water as practical.
- The tailings Impoundment will be a zero discharge facility; the tailings dam will be sealed against seepage and any seepage that does occur will be pumped back to the impoundment.

#### *Drainage*

- The tailings impoundment must be provided with drainage measures to handle both internal and external drainage conditions. Internal drains must be provided to collect internal seepage and consolidation water.
- To ensure adequate drainage, a finger drain shall be constructed underneath the Starter Dyke running parallel with the impoundment alignment. Seepage through the impoundment will report to this drain and be discharged into a collection pond at the toe of the impoundment.
- Collected seepage will be pumped back into the impoundment, with a portion of the collected seepage evaporated from the collection pond.
- To minimize freshwater contact with the tailings material, diversion channels and ditches will be constructed around the tailings impoundment to carry water to a collection pond.
- External drains comprising of collection ditches will be required to handle any runoff from the downstream slopes of the embankment.
- The catchment ditch at the toe of the dam will be designed to collect both seepage and runoff from peak rainfall events.
- Collection ditches will be lined with either a High Density Polyethylene (HDPE) geomembrane liner or a Linear Low Density Polyethylene (LLDPE) geomembrane liner, and will be graded to the collection pond.
- Seepage estimates for the tailings impoundment will be carried out with finite element modeling using appropriate computer programs.
- Water is critical for the operation of the tailings pond, and there may be a small excess of water in the tailing pond at the discharge beach. As the water can be reused, the plant operation shall have the ability to recycle this water and keep it at a minimum level.



### 11.6.3 Closure

- At closure, the tailings impoundment will be allowed to evaporate dry to stabilize it and the surface covered and re-vegetated if vegetation trials during operations prove successful.
- An emergency spill way will be constructed to ensure long-term stability in any weather conditions.

### 11.7 Roles & Responsibilities

Overall responsibility for the implementation of this Management Plan will rest with the Bisha Environment Manager who will report on progress to the Bisha General Manager who has overall responsibility for the TMF. Others with responsibility for the implementation of this Management Plan will include:

- SENET, as EPCM Contractor, will be responsible for the integration of these procedures and requirements into their operating procedures and plans;
- Bisha Mine Manager will be responsible for ensuring that these procedures and requirements are implemented for all mine operations;
- Bisha Mill Manager will be responsible for ensuring that these procedures and requirements are implemented for all mill operations.

### 11.8 Training

All employees of BMSC and Contractors to BMSC shall be provided with basic training in tailings management as part of their initial training. Additional, specialist training shall be provided to plant operators and key personnel involved in activities which involve tailings management.

### 11.9 Monitoring & Reporting

Responsibility for the monitoring detailed above shall be as follows:

- SENET shall report on a monthly basis to the Bisha Environment Manager on the implementation of this Management Plan.
- Bisha Environment Manager shall inspect the condition of the TMF after every major rain event and shall maintain appropriate records. The inspection shall include:
  - Physical walk-over and inspection of the condition of all areas;
  - Seepage quantity and quality monitoring (pH, metals etc).
  - Compliance with applicable regulatory and corporate requirements.

An annual independent geotechnical inspection shall also be undertaken.

The Bisha Environment Manager shall be responsible for record-keeping.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

Further information on environmental monitoring and reporting requirements and procedures is set out in the Monitoring Plan and in the Social & Environmental Management System.



## 12 Terrain and Erosion Control Management Plan

### 12.1 Introduction

The *Terrain and Erosion Control Management Plan* is designed to ensure the protection of soils and the maintenance of terrain in the areas surrounding the Bisha Project footprint during the construction, operations and closure phases of the Project. The plan contains methods that will be used to prevent adverse effects occurring during construction and operations, monitoring plans to assess potential effects during construction and operation, and monitoring plans for determining the effectiveness of mitigation.

### 12.2 Objectives

The objectives of this Management Plan are to:

- Establish Standard Operating Procedures (SOPs) for Bisha construction, operations and closure activities;
- Define BMSC requirements and procedures to guide the Project Management Team and other project contractors;
- Define plans/measures for impact mitigation;
- Define roles and responsibilities; and
- Define monitoring and reporting procedures.

### 12.3 Scope

The plan addresses the management of terrain and erosion during construction, operations and closure. The plan covers all activities that could result in adverse effects on the terrain through all phases of the project. The *Terrain and Erosion Control Plan* addresses issues related to the management of soils within the Project Area that are not directly impacted by the Project, but which may be affected by subsequent erosion by water or wind. The management of stripped and stockpiled topsoil is addressed in the *Topsoil Management Plan*.

### 12.4 Regulatory Requirements

#### 12.4.1 Eritrean Requirements

Eritrea does not have regulations specifically related to terrain and erosion control, but has implemented regulations related to environmental management plans.

Eritrean requirements for environmental management plans are outlined in “National Environmental Assessment Procedures and Guidelines” Ministry of Land, Water and Environment, March 1999.

#### 12.4.2 International Finance Corporation Environmental Guidelines

IFC Environmental Health & Safety Guidelines for Mining sets out the following management strategies with regard to erosion<sup>16</sup>:

*Erosion of exposed ground surfaces and sedimentation of drainage systems may occur during any stage of the mine cycle. Recommended erosion prevention and control strategies include:*

- *Establishing riparian setback zones;*
- *Reducing exposure of sediment-generating materials to wind or water (e.g. proper placement of soil and rock piles);*
- *Reducing or preventing off-site sediment transport (e.g. use of settlement ponds, silt fences);*
- *Timely implementation of an appropriate combination of contouring techniques, terracing, slope reduction /minimization, runoff velocity limitation and appropriate drainage installations to reduce erosion in both active and inactive areas;*

<sup>16</sup> International Finance Corporation. *Environmental, Health & Safety Guidelines for Mining*. 10 December 2007.



- *Final grading of disturbed areas, including preparation of overburden before application of the final layers of growth medium, should be along the contour as far as can be achieved in a safe and practical manner;*
- *Revegetation of reclaimed areas including seeding, should be performed immediately following application of the growth medium to avoid erosion;*
- *Access and haul roads should have gradients to limit erosion, and road drainage systems should be provided;*
- *Stormwater drains, ditches, and stream channels should be protected against erosion through a combination of adequate dimensions, slope limitation techniques, and use of rip-rap and lining. Temporary drainage installations should be designed for recurrence periods of at least a 10-year/24-hour event, while permanent drainage installations should be designed for a 100-year/24-hour recurrence period. Consideration of the intended life of diversion structures, as well as the recurrence interval of any structures that drain into them, should be taken into account when the above intervals are defined. For facilities that are expected to operate over long periods, regional predictions of changes in precipitation, as currently predicted by climate change models, should be considered in determining the robustness of the project's design parameters for water management;*
- *Smaller frequent storms can cause erosion at similar scales to larger infrequent storms, therefore drainage structures should also have 'low flow' channels;*
- *Surface drainage from disturbed areas, including areas that have been graded, seeded, or planted, should be treated for sediment removal;*
- *Facilities should be designed for the full hydraulic load, including contributions from upstream catchments and non-mined areas;*
- *Stormwater settling facilities should be designed and maintained according to internationally accepted good engineering practices, including provisions for capturing of debris and floating matter. Sediment control facilities should be designed and operated for a final Total Suspended Solids (TSS) discharge of 50 mg/l and other applicable parameters and guideline values. Discharge water quality should also be consistent with the receiving water body use, taking into consideration background conditions and opportunities for overall improvement of the receiving water body quality.*

## **12.5 Potential Impacts**

### **12.5.1 Construction Phase**

During the construction phase, key issues relate to soil removal and terrain disturbance for the open pit and associated facilities including the plant site and crusher area, service road from the pit to plant site, camp and access road, three service roads, airstrip, the tailings impoundment and waste rock dump site. The key issues related to erosion include the minimization of disturbance and the design of activities and facilities to minimize the potential for future erosion to occur.

### **12.5.2 Operations Phase**

During the operations phase, there will be some impact on terrain. Erosion issues relate to soils which will continue to be removed and stockpiled. Erosion by water is likely to occur during the rainy season. Specific measures for the control of gulleying on the TMF will be required. Sheet wash across large exposed surfaces associated within the plant and the pit may lead to localised rilling.

### **12.5.3 Closure Phase**

There will be some localized reclamation of disturbed sites, including re-grading, re-contouring and ameliorating soil, waste rock dump, and tailings facility cover, thereby reducing potential erosion.



## 12.6 Terrain and Erosion Management Procedures

### 12.6.1 Construction Phase

#### *Terrain*

The effects on the terrain can be minimized and managed using relatively standard mitigation measures. These measures include:

- Minimizing the project footprint to limit surface disturbance; and
- Where practicable and depending on its acid-producing potential, using waste rock as an alternative construction aggregate.

If new facilities are required during the operations phase, they will be built in areas that have been previously disturbed so as to avoid disturbing new areas. The following measures will be followed during design to reduce the area to be disturbed:

- Grouping administrative buildings and mine site facilities wherever possible;
- Constructing waste rock dumps bounding the open pit on the northern and southern ends to reduce drainage control concerns;
- Using existing roads to access the site, and limiting linear developments throughout the project development area as much as feasible; and
- Using drainage control measures and culverts to control natural runoff and overland flow.

Adverse effects on terrain stability will be reduced by:

- using appropriate blasting methods that are in accordance with regulatory requirements and industrial best practices procedures;
- reducing as much as feasible slope gradients along road cuts and disturbed areas to gradients at or below the angle of repose of those disturbed surfaces; and
- where appropriate, using drainage control measures and culverts to manage the natural flow of surface runoff.

#### *Erosion*

##### *Site Clearance*

- Vegetation stripping and clearance operations will be undertaken on an as-required basis, so that stripped areas will remain unused for the minimum period of time;
- Prior to the commencement of stripping activities, the stripping panel will be clearly marked out in the field; for access roads, the vegetation stripping area will be marked out to avoid unnecessary vegetation removal.
- Stripping depth will be clearly indicated to the machine operator.
- Stripping activities will be carried out using a scraper or suitably light front-loader and tractor for haulage; haulage vehicles will adhere to designated routes to minimise soil compaction.

##### *Access Roads*

- Access routes will use established roads wherever possible. In instances where un-sealed roads must be used, route selection will include consideration of the condition of these routes and the need for the implementation of additional erosion control measures, with particular reference to where the road structures and associated drainage intersect current or planned drainage patterns.
- The moisture content of access road surface layers will be maintained through routine spraying or the use of an appropriate dust suppressant.
- Access roads will be designed with a camber to avoid ponding and to encourage drainage to side drains; where necessary, culverts will be installed to permit free drainage of existing water courses.
- Access road surfaces will be suitably compacted to limit sediment release.
- Access road side drains will be protected with sediment traps and/or gabions to reduce the erosive velocity of water during storm events; where necessary geomembrane lining to drains will be employed.



- Routine inspections will be undertaken to ensure that side drains and culverts are kept free of debris.
- Access road verges will be planted with fast-growing grass or other species to reduce erosion potential.
- Off road driving and the creation of new roads/tracks will be avoided where ever possible and penalty clauses for off road driving offences should be included in contractor contracts.

#### *Water Management*

This management objective seeks to control the interaction of precipitation, surface water runoff, and contact with friable soil and rock material. This scope includes the management of existing natural drainage systems, the construction of modified drainage routes, the location of impoundment structures, catch basins, settling ponds and other surface water collection facilities. Design of water control structures will necessarily include the calculation of storm event runoff and peak flows. The following principles will apply to the management of water and erosion control:

- Ditches and culverts will be used as required to manage drainage. Roads and other corridors will be designed and constructed to minimize changes to natural drainage patterns as much as possible. Culverts and other drainage systems will be constructed so that water does not build up on one side of a road and cause those soils to become waterlogged and the soils down slope to become dry.
- The perimeter drainage system of each site operational area will be kept free of blockages or obstructions and inspected on a regular basis.
- Continuous maintenance will be provided to drainage structures to collect sediment and prevent silting and modification of runoff patterns; including in culverts and side drains.
- Drainage channels will be lined and will be of sufficient capacity to carry storm flows.
- If necessary, water bars will be constructed within working areas and around access routes to control surface water runoff and erosion. Water bars will be designed to simulate the slope contour and direct and diffuse surface water away from disturbed areas.
- Flumes, berms or other similar structures will also be provided to control drainage and migration of sediment where cross drainage is necessary (e.g. if slopes are cut).
- Diversion channels for the collection of normal surface drainage to prevent its passage into operational areas (perimeter ditches or open-pits, overburden and uneconomic ore stockpiles), will endeavour to direct unimpacted flows downstream to the natural drainage course to which they would previously have fed.
- Energy diffusers will be installed at the outlet of drainage channels to reduce erosion in downstream river courses.

#### *Soil Stabilisation*

- Soil stabilisation measures will be applied to any areas where uncontrolled erosion is affecting topsoil. Erosion matting may be used locally to:
  - Provide immediate protection to the working areas on slopes and adjacent to access routes.
  - Minimise washing-out of seeds.
  - Enhance the micro-climatic conditions of the soil for plant germination and growth.
- Once installed, erosion mats will be regularly inspected for degradation and installation integrity. Mats will be maintained and replaced as appropriate to achieve project needs.

### **12.6.2 Operational Phase**

#### ***Terrain***

Concurrent rehabilitation opportunities are limited by the geometry of the ore body, but disturbed areas will be rehabilitated as soon as is practically feasible. For example, the dyke walls of the Tailings Management Facility (TMF) can be revegetated while the main surface of the facility is still active. Borrow



pits and other disturbed sites will be rehabilitated as soon as they have reached the end of their life. This will assist in reducing the mine's final rehabilitation liability on closure.

### **Erosion**

- During operations, soil will continue to be removed from the pit and stockpiled for later use. Topsoil management procedures are described in the *Topsoil Management Plan*.
- A plan will be produced of appropriate topsoil storage locations and a topsoil balance maintained.
- Pit slopes in the mined area will be designed with regular benches for maximum stability and to restrict any slope failure to the individual benches; at closure, pit slopes will be profiled and will incorporate benches with lined drainage ditches feeding laterally at low gradient to the pit bottom drainage management system; vegetation will be established on the pit-slope benches to minimise any failure and material movement across benches.
- Overburden and non-economic ore stockpiles will be constructed to ensure stability under conditions of saturation and/or seismic disturbance; the profile will incorporate benches with drainage channels for control of surface run-off and the base of each stockpile will be of free-draining coarser material.

### **12.6.3 Closure Phase**

#### **Terrain**

At closure the waste rock dump, tailings facility and open pit will be reclaimed with a covering of soil. Some re-grading and re-contouring will be carried out. The tailings impoundment will be capped with NAG rock. Slopes at the base of mountains will be lost during the construction and operation phases at the open pit and where aggregate materials are removed for construction and development.

#### **Erosion**

##### *Seeding and Re-vegetation*

- At closure, a vegetative soil cover system will be placed over the top surface and along benches; the proposed cover system will incorporate a subsoil cap of up to 50 cm with a minimum 10 cm topsoil layer; herbaceous vegetation will be seeded over the top surface and shrubs along benches.
- Seeding and re-vegetation contribute to establishing a vegetative cover on disturbed soil as a means to control erosion and to restore disturbed areas to beneficial uses as quickly as possible. The vegetative cover reduces erosion potential, slows down runoff velocities, physically binds soil with roots and reduces water infiltration through evapotranspiration.
- Native species will be used for the re-vegetation, the exact species will be chosen based on trials and then experience as the further areas are re-vegetated.

##### *Vegetation and Agricultural Management of Rehabilitated Areas*

- The aftercare of rehabilitated areas is critical to achieve sustainable vegetative growth, with corresponding control of erosive impacts. Management practice aims to minimise degradation of vegetated surfaces and ensure long-term effectiveness of drainage patterns and water courses. Uncontrolled livestock access and overgrazing or other agricultural practices is considered inappropriate at this stage of rehabilitation.

#### **Post-closure Plan and Management Strategy**

A post-closure plan should be developed to ensure the following:

- Restoration and stabilization of disturbed areas;
- Long-term sustenance of seeded and planted vegetation cover on disturbed lands;
- Long-term geotechnical and chemical stability of tailings; and



- Maintenance of integrity of drainage & sediment-control structures to ensure effective post-closure drainage and minimal soil erosion.

## 12.7 Roles & Responsibilities

Overall responsibility for the implementation of this Management Plan shall rest with the Bisha Environment Manager who shall report on progress to the Bisha General Manager. Others with responsibility for the implementation of this Management Plan shall include:

- SENET, as EPCM Contractor, shall be responsible for the integration of these procedures and requirements into their operating procedures and plans;
- Bisha Mine Manager shall be responsible for ensuring that these procedures and requirements are implemented for all mine operations;
- Bisha Mill Manager shall be responsible for ensuring that these procedures and requirements are implemented for all mill operations.

## 12.8 Training

All employees of BMSC and Contractors to BMSC shall be provided with basic training in the protection of terrain and reduction of erosion. Additional, specialist training shall be provided to mine operators, plant operators and key personnel involved in activities which involve activities likely to impact terrain or erosion.

## 12.9 Monitoring & Reporting

Bisha has a distinct wet and dry season. The soils monitoring programme will include two rounds of samples per year during construction and operations (May and August) to determine if any seasonal variations do occur. Thereafter, annual monitoring will take place once per year, preferably at the end of the dry season (early August).

Monitoring will be conducted with test pits located downwind and down gradient from mine facilities such as waste rock pile, tailings impoundment, open pit, plant site and pipe line from mill to the tailings impoundment; and upwind and upstream from these facilities at designated control points.

The suite of analyses for the monitoring programme include:

- Soil chemistry:
  - pH;
  - Anion exchange capacity;
  - Electrical conductivity;
  - Metals (full suite using ICP-MS);
  - Toluene-extractable organics;
- Soil structure:
  - Clay fraction (<0.002mm);
  - Particle size distribution;
  - Water retention;
  - Permeability
  - Total suspended solids.

Sampling frequency and parameters analyzed will be reassessed based on results from air quality and surface water monitoring results but are likely to be more frequent during the rainy season to correspond with rains.

Terrain and erosion monitoring procedures shall be as follows:

- SENET shall report on a monthly basis to the Bisha Environment Manager on the implementation of this Management Plan during the construction phase, including:
  - Quantities of vegetation removed;
  - Storage locations, quantities and type of topsoil and overburden;
  - Storage procedures and methods used.
- Bisha Environment Manager shall inspect the condition of areas on monthly basis and shall maintain appropriate records. The inspection shall include:



- Areas prone to erosion;
- Evidence of erosion;
- Condition of access roads;
- Condition of cleared areas;
- Condition of perimeter drains (if installed) and associated settlement ponds (if installed);
- Compliance with applicable regulatory and corporate requirements.

The Bisha Environment Manager shall be responsible for record-keeping.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

Further information on environmental monitoring and reporting requirements and procedures is set out in the Monitoring Plan and in the Social & Environmental Management System.



## 13 Transportation Management Plan

### 13.1 Introduction

The *Transportation Management Plan* for the Bisha Project includes the transport of materials and supplies to the Project site together with concentrates and wastes generated from the Project site. The destination of materials from the Project will be the port at Massawa on the Red Sea Coast. The plan contains methods that will be used to prevent adverse effects occurring along transportation routes, monitoring plans to assess potential effects, and for determining the effectiveness of mitigation during construction and operation.

### 13.2 Objectives

The objectives of this Management Plan are to:

- Establish Standard Operating Procedures (SOPs) for Bisha construction, operations and closure activities;
- Define BMSC requirements and procedures to guide the Project Management Team and other project contractors;
- Define mitigation measures;
- Define roles and responsibilities; and
- Define monitoring and reporting procedures.

### 13.3 Scope

The plan addresses the management of the transportation of all personnel, supplies, materials, mine components, concentrates and wastes to and from the Project. Transport methods will include road, sea and air transportation. The majority of materials will be shipped to the Port of Massawa on the Red Sea Coast and will then be transported via road to the Bisha site.

Concentrates and back-haul transport will follow the same route and concentrates will be shipped from the Port of Massawa to overseas smelters. Gold bullion will be shipped by air and some personnel movement to and from the mine will also be undertaken by air. This plan covers all activities that could result in adverse effects from the transportation of materials to and from the Project.

A number of management plans are related to the transportation issues of the project and include the *Cyanide Management Plan*, *Noise Management Plan*, *Petroleum and Oils Management Plan*, *Air Quality Management Plan*, *Community Health and Safety Plan*, *Emergency Preparedness & Response Plan*, and the *Occupational Health and Safety Plan*.

### 13.4 Regulatory Requirements

#### 13.4.1 Eritrean Requirements

Eritrea does not have regulations specifically related to transportation, but has implemented regulations related to environmental management plans.

Eritrean requirements for environmental management plans are outlined in “National Environmental Assessment Procedures and Guidelines” Ministry of Land, Water and Environment, March 1999.

Jurisdictional duties for road upgrades and the BMSC’s limitations for any upgrades or road construction need to be determined in line with Eritrean law.

#### 13.4.2 International Finance Corporation Environmental Guidelines

IFC Environmental Health & Safety Guidelines for Mining covers several aspects of transportation issues associated with mining operations. These recommendations are set out below:<sup>17</sup>:

- *Hazardous materials should be handled, stored, and **transported** so as to avoid leaks, spills or other types of accidental releases into soils, surface water, and groundwater resources;*

<sup>17</sup> International Finance Corporation. *Environmental, Health & Safety Guidelines for Mining*. 10 December 2007. Pp8.



- *Using, handling, and **transporting** explosives in accordance with local and / or national explosives safety regulations;*
- *Sources of noise emissions associated with mining may include noise from vehicle engines, loading and unloading of rock into steel dumpers, chutes, power generation, and other sources related to construction and mining activities. Additional examples of noise sources include shoveling, ripping, drilling, blasting, **transport** (including corridors for rail, road, and conveyor belts), crushing, grinding, and stockpiling. Good practice in the prevention and control of noise sources should be established based on the prevailing land use and the proximity of noise receptors such as communities or community use areas;*
- *Cyanide use should be consistent with the principles and standards of practice of the International Cyanide Management Code.<sup>7</sup> The Cyanide Code includes principles and standards applicable to several aspects of cyanide use including its purchase (sourcing), **transport**, handling / storage, use, facilities decommissioning, worker safety, emergency response, training, and public consultation and disclosure. The Code is a voluntary industry program developed through a multi-stakeholder dialogue under the auspices of the United Nations Environment Programme and the International Council on Metals and the Environment.*
- *Blasting-permit procedures should be implemented for all personnel involved with explosives (handling, **transport**, storage, charging, blasting, and destruction of unused or surplus explosives).*
- *Specific audited procedures should be implemented for all activities related to explosives (handling, **transport**, storage, charging, blasting, and destruction of unused or surplus explosives) in accordance with relevant national or internationally recognized fire and safety codes.*
- *Qualified security personnel should be used to control **transport**, storage, and use of explosives on site. Remote cameras and image recording should be used to record proper use of procedures during these activities.*
- *Physical hazards in mining activities may include: the threat of landslides or land collapse in aboveground or underground mining environments; hazards related to **transport** (e.g. trucks, railways), and use of fixed and mobile equipment, lifting and hoisting devices, and moving machinery; electrical hazards; work in confined spaces or excavations; and water related hazards. Recommended prevention and control strategies [for transport] include:*
  - *Installing safety barriers in high-risk locations of internal roads / **transport** corridors. Barriers may be constructed with refuse or other materials capable of stopping vehicles.*
- *Community health and safety issues that may be associated with mining activities include **transport** safety along access corridors, **transport** and handling of dangerous goods, impacts to water quality and quantity, and potential for transmission of communicable diseases resulting influx of project labor. Recommendations for the management of these issues are described in the General EHS Guidelines.*

Performance Standard 4, Community Health and Safety is also relevant to transportation management.

### 13.5 Potential Impacts

Impacts from transportation will occur in all phases of the Project, however, they will be greatest during the operational phase. In the first two years of the Project, the gold produced by the mine will be transported by air. After this period, and particularly during years 5 to 10, when copper concentrate production from the mine is at its peak, road transport will be the predominant transportation method. On average, 23 trucks per day of concentrate are expected to leave the mine. With approximately 3 trucks per day delivering inbound supplies, the total mine traffic is estimated to be 26 trucks per day, or 161 trucks per week. As a result, for the busiest portion of the Massawa-Asmara highway, and based on the provided 2000 data, the total traffic will increase by approximately 2% (although the proportion of heavy traffic will increase significantly more than this).

Potential impacts include animal road kills, driver and public safety concerns and safety issues related to transportation along many portions of the route that are steep, narrow, winding, and have varied users from large trucks, to buses, to donkeys, and goat herding.

Traffic safety is a key issue on the portion of the transportation corridor between Asmara and the Bisha Mine as mine traffic will significantly increase heavy freight traffic; between Agordat and Bisha most of the traffic will be mine-related.

It is anticipated that the percentage increase in truck traffic between Massawa and Asmara due to the Bisha project will not measurably increase traffic noise. Some increase will occur between Asmara and Bisha, particularly on the leg between Agordat and Bisha. Dust will be of most concern on unpaved roads between the mine and Agordat, and will increase proportionally to the increase in traffic. *Figure 1* illustrates the route between Akordat (Agordat) and the Red Sea Coast at Massawa.

**Figure 1 Road Conditions along the Principal Transportation Route**



Each phase of Project implementation presents different transportation impacts, and these are summarised for the construction, operations and closure/post closure phases.

### **13.5.1 Construction Phase**

During the construction phase, access roads will be constructed and there will be limited transportation impacts off-site. Supplies and materials will be brought to the Project via the route illustrated above.

### **13.5.2 Operations Phase**

During the operations phase, the mode of transportation for the extracted materials will change from air (for gold) to road transport (for concentrate). Road haulage will reach a peak during years 5 to 10.

### **13.5.3 Closure Phase**

At closure, all materials no longer required on site will be removed from site by road; the volume of traffic generated by the site will be greatly reduced during this phase.

### **13.5.4 Massawa Port**

The current plans are to use and upgrade the existing cement production port facilities in Massawa. The marine structures comprise a rockfill jetty and a pile-supported jetty head. Once details of the area of operations, upgrades and responsibilities are determined the environmental management of the port will be developed and integrated into the EMPs for the mine and the design of the jetty and loading facility will be finalised.



### 13.5.5 Air Transport

Periodically, gold-silver doré bars will be exported from the mine via aircraft. Designated personnel will travel to and from the mine via aircraft. The Eritrean government has constructed an airstrip north of the mine site. It is likely that air transport will comprise two to three flights per week with a twin engine (5 to 20 passenger) aircraft. Air transport will be coordinated through the BMSC transportation manager.

## 13.6 Transportation Management Procedures

### 13.6.1 General

The following procedures are designed to mitigate any adverse impacts associated with transport.

- All transportation will be undertaken along pre-designated routes that have previously been surveyed by BMSC or its contractors. BMSC will approve all designated transportation routes.
- BMSC will ensure that consultation is undertaken with local communities, police, military and emergency services and along transportation routes. BMSC will provide local community representatives and government authorities with a summary of driving practices adopted by BMSC.
- BMSC will discuss and agree *Emergency Response Procedures* with local emergency services and local administrations. Emergency response plans will be highlighted in public consultation and disclosure activities.
- Pre-construction building condition assessments will be undertaken along principal transport routes for buildings considered to be at potential risk from transportation vibration, and for other culturally-sensitive buildings and structures adjacent to principal transport routes.
- Route condition assessments will be undertaken on an annual basis as a minimum and specific inspections of river crossings will be undertaken after extreme weather events and at the end of the rainy season.
- BMSC will require all transportation contractors to use modern efficient vehicles with appropriate noise and emission control measures. At least one vehicle in each transportation convoy is to be equipped with a suitable VHF radio for routine and emergency communications.
- BMSC will require all transportation contractors to ensure and demonstrate that all drivers are appropriately trained and hold an appropriate valid driving license.
- BMSC will ensure that all drivers are trained in the EMSC emergency response procedures.

### 13.6.2 Safety

- The preferred route between the mine and Massawa port was chosen due to the better road surface condition and terrain. Trucks that are appropriately sized for the relatively narrow roads and which can negotiate the sharp road-bends on the route between Agordat and Massawa will be used. The size and capacity of trucks that BMSC will acquire will be similar to those of trucks that are already in operation in the country and which regularly use the transportation corridor under consideration.
- Mitigation of safety issues is a priority for BMSC. Mine trucks will have a speed limit set for travel through villages where there are no posted speed limits. Speed limits will be determined on the basis of BMSC's consultation with local Police Departments and town/village administrators. Guidance from relevant central government shall also be sought, as well as agencies and national organizations (MoTC, NICE, etc).
- Limits will be set through discussion with the villages to achieve a practical compromise. In addition, BMSC will sponsor a Traffic Awareness Programme for affected villages to reduce the risk of accident with people or farm animals. This will be achieved by BMSC working with the local Police Departments and administrations. BMSC will assist in developing the programme and will fund its implementation.
- During the rainy season, BMSC will ensure that all river crossings are inspected on a daily basis and all BMSC staff and contractors are informed if any river crossings are considered impassable. In that event, all fording of rivers by wheeled vehicles will be prohibited until the "all clear" is announced.

### 13.6.3 Noise

- The increase in truck traffic between Massawa and Asmara will not measurably increase traffic noise. Some increase will occur between Asmara and Bisha, particularly on the leg between Agordat and Bisha. Increased traffic noise will be managed at night by ceasing travel at 11:30pm



due principally to safety reasons, but with the secondary benefit of noise reduction through the night; trucks will commence travel again at 5:30 AM.

- Speed limits will be enforced in relation to road conditions and location of sensitive receptors such as important wildlife habitat, camp site and on-route communities.
- Maintain road surfaces in good repair to reduce tyre noise . BMSC is responsible for access roads within project site; repair and maintenance of public roads will be financed and undertaken by government.
- Assure continuous traffic flow to avoid prolonged idling and reduce the emissions of greenhouse gases.
- All large trucks will be equipped with truck muffler systems, shall be maintained regularly and there will be a limit using engine braking systems.
- Schedule transportation for daytime hours whenever possible.

#### 13.6.4 Dust

- Dust will be of most concern on unpaved roads between the mine and Agordat, and will increase proportionally to the increase in mine-related traffic. BMSC will undertake an ongoing review of dust generation and maintain an ongoing dialogue with local villages. Following the dialogue, decisions will be made, and steps taken, by either or both parties to address the issue.
- If dust related to mine truck traffic becomes problematic in some villages, discussion will be held with village elders to arrive at a solution. The use of dust suppressants may be considered as an option or the paving of key stretches of road may also be considered.

#### 13.6.5 Exhaust Emissions

- BMSC will maintain all vehicles according to manufacturer instructions through regular scheduled maintenance in the mine mechanical shop by licensed mechanics. Engine and exhaust systems will be operated at manufacturer's specifications to minimize exhaust gases.
- Contractors will be encouraged to maintain their vehicles according to factory specifications as well.

#### 13.6.6 Accident Response (Off-Site)

Prior to the commencement of haulage activities, BMSC and its transport contractor(s) will notify local authorities and emergency services of the routes and quantities of materials that will be transported on a daily basis.

The haulage contractor(s) will ensure that all drivers are equipped with suitable communications equipment to enable an incident to be reported promptly (this is assumed to be mobile phones, unless significant gaps are identified in which case an alternative communication system needs to be developed). Spill response equipment will be kept and maintained on trucks. The Haulage contractor will be responsible for the preparation of suitable incident response procedures for all incidents occurring outside the Project site.

In the case of an off-site incident with a truck outside the Project site:

- The contractor will immediately inform the appropriate emergency services and the BMSC Environment Manager and send its own Emergency Response Team (ERT) to the location.
- Working with the appropriate emergency services, the ERT will take control of the incident and rectify the situation; if it is considered that the exclusion zone set up around the incident requires to be communicated with the local communities, the BMSC Community Relations Manager will be involved and briefed.
- The ERT will neutralise any spills and clean the location; any contaminated material created by the incident will be stored in Hazardous Waste Storage Bins. Once the material has been classified it will be disposed of in a designated area.
- For all incidents and accidents, the Community Relations Team will be briefed in order to address any community concerns that may be raised.



### 13.7 Roles & Responsibilities

Overall responsibility for the implementation of this Management Plan shall rest with the Bisha Environment Manager who shall report on progress to the Bisha General Manager. Others with responsibility for the implementation of this Management Plan shall include:

- SENET, as EPCM Contractor, shall be responsible for the integration of these procedures and requirements into their operating procedures and plans;
- Bisha Mine Manager shall be responsible for ensuring that these procedures and requirements are implemented for all mine operations;
- The Bisha H&S Manager will coordinate all aspects of mine transport to ensure efficient and effective transportation services for the mine. The H&S Manager will also be responsible for ensuring driver orientation, overseeing regularly scheduled maintenance and mechanical inspection of trucks.

### 13.8 Training

All employees of BMSC and Contractors to BMSC shall be provided with training in the procedures to be following with respect to transportation issues. Additional, specialist training shall be provided to plant operators and key personnel involved in activities which involve transportation of hazardous materials or explosives. In addition, transportation and shipping contractors must have compliant Environmental, Health, and Safety systems in place as part of their contract. All contractors will be periodically audited by the company.

### 13.9 Monitoring & Reporting

Transportation monitoring procedures shall be as follows:

- SENET shall report on a monthly basis to the Bisha Environment Manager on the implementation of this Management Plan during the construction phase, including:
  - Quality of access roads;
  - Number and size of trucks used;
- Bisha Environment Manager shall inspect the condition of areas on monthly basis and shall maintain appropriate records. The inspection shall include:
  - Road conditions along the preferred southern route to Massawa Port;
  - Driver orientation;
  - Driver updates;
  - Maintenance and mechanical inspection of trucks;
  - Compliance with applicable regulatory and corporate requirements.

In addition, all trucks shall be inspected for essential systems prior to each trip. The Bisha Environment Manager shall be responsible for record-keeping.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

Further information on environmental monitoring and reporting requirements and procedures is set out in the Monitoring Plan and in the Social & Environmental Management System.



## 14 Hazardous Substances Management Plan

### 14.1 Introduction

The *Hazardous Substances Management Plan* is designed to ensure the effective storage, management and disposal of all hazardous materials used at the Bisha Project. The plan contains methods that will be used to prevent adverse effects occurring during construction and operations, monitoring plans to assess potential effects during construction and operation, and monitoring plans for determining the effectiveness of mitigation.

### 14.2 Objectives

The objectives of this Management Plan are to:

- Establish Standard Operating Procedures (SOPs) for Bisha construction, operations and closure activities;
- Define BMSC requirements and procedures to guide the Project Management Team and other project contractors;
- Define roles and responsibilities;
- Define mitigation measures;
- Define monitoring and reporting procedures.

### 14.3 Scope

The plan addresses the management of hazardous materials during construction, operations and closure associated with the Bisha mine. This plan covers all planned activities that could result in adverse effects to human health and safety and environmental quality through all phases of the project. Hazardous substances associated with the Bisha mine include:

- Petroleum products (diesel fuel, gasoline, lubricants, hydraulic fluids, oil and solvents);
- Propane gas;
- Explosives use and storage, including the use of explosives magazines;
- Ammonium nitrate (used with diesel fuel to produce ANFO explosive); and
- Mill reagents (flotation collectors such as xanthate, frothing agents such as MIBC, flocculants, sodium cyanide, and quicklime)

Associated plans which also cover hazardous materials management include *Petroleum and Oils Management Plan*, the *Cyanide Management Plan* and the *Emergency Preparedness & Response Plan*.

### 14.4 Regulatory Requirements

#### 14.4.1 Eritrean Requirements

Part Four of the 'Management of Environmental Quality and Natural Resources' of the Environment Proclamation, Government of Eritrea, 1996 covers legislation relating to hazardous substances. Chapter 1, 'Environmental Quality Management', Article 63 on Toxic and Hazardous Substances states the following:

- The production, sale, distribution, import, export, or transit of toxic and hazardous substances, pesticides and biological agents (e.g., living modified organisms, genetically modified organisms) within Eritrean jurisdiction or control, shall be subject to license, permit or approval procedures which require prior environmental impact assessment, as provided in part Three, Chapter V of this proclamation.
- The Agency, jointly with the line ministries concerned, shall develop a register of toxic and hazardous substances and biological agents whose production, sale, distribution, transport, import or export are restricted or prohibited.

Part Five of the same Proclamation, in Chapter 1, Monitoring and Inspection under Article 76, Monitoring and Enforcement Responsibility states that:

- In their respective sectors, line ministries shall be responsible for inspection, enforcement and monitoring of compliance with environmental quality standards, the conduct of environmental audits, and monitoring of the status of biodiversity.



- The Agency shall be responsible for coordination overall monitoring of environmental quality and of the status of biodiversity, particularly in cases where two or more line ministries are involved.
- Where a line ministry does not adequately monitor compliance with environmental quality standards and the status of biodiversity in its sector, the Agency is empowered to carry out all necessary sectoral monitoring, inspections and enforcement.

#### 14.4.2 International Finance Corporation Environmental Guidelines

IFC Environmental Health & Safety Guidelines for Mining sets out the following recommendations with regard to hazardous materials<sup>18</sup>:

##### **Hazardous Materials**

*Hazardous materials should be handled, stored, and transported so as to avoid leaks, spills or other types of accidental releases into soils, surface water, and groundwater resources. In order to minimize the risk associated with accidental spills from storage tanks and pipelines (e.g. tailings pipelines) the recommended mitigation measures include:*

- *Providing secondary containment to restrict movement into receiving water bodies (e.g. sumps, holding areas, impermeable liners), for example:*
  - *Constructing pipelines with double-walled or thickwalled sections at critical locations (e.g. large stream crossings)*
  - *Installing shutoff valves to minimize spill volumes and to isolate flow in critical areas*

*Additional detailed guidance for hazardous materials management including spill prevention and control planning for the handling, storage, and transport of such materials as fuels and chemicals is provided in the General EHS Guidelines.*

#### 14.5 Potential Impacts

The key issues related to the management of hazardous substances are:

- Direct discharge of product to the ground, surface water or stormwater drains;
- Product spillage during filling/refuelling operations;
- Breach of secondary containment bunding;
- Fire; and
- Gaseous emissions/odour.

#### 14.6 Hazardous Substances Management Procedures

##### 14.6.1 General Procedures

The following general procedures will be adopted:

- 
- Maintain an inventory of hazardous materials including a summary of the physical and chemical properties of the materials held or generated, to ensure that these are understood and that appropriate measures are in place to mitigate the potential hazards posed by them both to humans and the environment; this will include provision of Material Safety Data Sheets (MSDSs) for all stored materials and details on the segregation of potentially reactive materials. MSDSs will be held in both English and the two local languages.
- Appropriate Personal Protective Equipment (PPE) will be made available to personnel involved in fuel and hazardous substance handling operations; all relevant personnel will be trained in the use and maintenance of protective equipment.
- All personnel will be trained in the use of fire extinguishers.
- Fuel storage and handling areas will be located away from offices and domestic facilities.
- Hazardous substances storage areas will be protected from rainfall and direct sunlight.
- Materials will be clearly labelled, segregated, protected from general access and stored on pallets to prevent the contamination of runoff.
- Suitable fire-fighting equipment will be located close to hazardous material storage areas.

<sup>18</sup> International Finance Corporation. *Environmental, Health & Safety Guidelines for Mining*. 10 December 2007. pp 10.



- Surface runoff/storm water drainage from material storage areas will be directed through a perimeter drainage system to oil/water separators and sediment traps.
- Oil-filled electrical appliances will be maintained in good and fire-resistant condition.
- The overall volume of hazardous materials purchased and present on site will be minimised through careful stock control and materials inventory.
- The Bisha Environment Manager will assess suitable locations for materials storage and stipulate the minimum distances from water courses etc.
- All suppliers to the Bisha project will provide BMSC with:
  - all pertinent data necessary to ensure maximum protection of the environment, health and safety;
  - instructions in the use, operation, storage, transportation, handling and disposal of the Goods supplied, sufficiently clear and specific for use by non-technical personnel;
  - appropriate shipping certification; and
  - labelling in compliance with any Workplace Hazardous Materials Information System prepared for Owner's project.
- Hazardous materials or Goods containing hazardous materials shall be packed, documented and marked strictly in accordance with statutory requirements or the laws and regulations of all parties having jurisdiction over the goods.
- Liquid Hazardous Wastes

Liquid waste procedures apply to solvents and reagents (see laboratory waste below), waste oils, solvents or greases from maintenance or workshop areas:

- Any spills of oils, grease, solvents or other hazardous materials in the maintenance areas, fuel storage areas or loading/unloading areas will be cleaned up using absorbent materials and placed in bins, not washed.
- Waste oils and solvents will be stored in separate drums on pallets, on paved areas equipped with secondary containment and protected from the weather; drums will be clearly labelled with their contents.
- Waste oils will not be stored for extended periods in underground sumps; tanks and sumps will be emptied and inspected regularly for any signs of cracks or holes. The findings of the inspection will be recorded; any cracks or holes will be repaired, and any repairs conducted will be recorded.
- As far as possible, waste oils will be reused.
- If waste oil is not of suitable quality for onsite use, it will be collected by a licensed contractor for offsite recycling; copies of contractor licenses will be retained onsite. If recycling is not possible it will be burnt.
- Spill cleanup and fire extinguishing equipment will be available in the storage area, and personnel will be trained in its use.
- There will be no onsite disposal of waste oils and solvents direct to the soil surface or storm water collection system.
- Hazardous Substances Storage
- Storage areas will be designed to adequately and safely store a sufficient quantity of substances required for the project.
- The storage area will be properly designed to contain and prevent contamination of the environment, particularly soil and groundwater.
- Floor, curbing, walls and roofs will be designed to adequately contain spills and protect the storage area from weather where necessary.
- Spill kits, protective equipment, and other necessary equipment will be in the storage area or approximate to the storage area to clean and mitigate spills.
- Fire prevention systems will be designed to be appropriate and adequate to the material being stored.
- Only containers that are in good condition will be used.
- Incompatible (e.g., bases and acids) materials will not be stored in the same container and will be stored in safe manner and distance to prevent accidents.
- To provide a safe work area, walls, dykes, berms, or separate facilities of other means will separate incompatible materials.
- Drums, containers, and storage areas will be properly labelled, marked, placarded, and secured.
- Sufficient storage space between containers will be allowed for safe access and handling of containers.



- No smoking, fire prevention and management practices will be developed specific to the materials being stored.

#### *Transportation of Hazardous Substances*

- Non-compatible materials will be transported by separate shipment;
- Fire extinguisher and fire prevention materials shall be adequate and appropriate for the material being transported;
- Containers will be appropriate for the material being shipped;
- Containers will be properly secured;
- Containers and trucks will be properly marked, labelled and placarded;
- Manifests will be maintained in accordance with Eritrean regulations;
- Spill response materials will be adequate and appropriate for materials being transported; and
- Driver teams will be adequately trained and equipped for spill first response, containment and communication.

#### *Explosives Storage and Handling*

- All blasting activity will be performed by a specialist contractor who will be responsible for blasting design, explosives calculations, delivering blasting agents to the blast-holes, placing powder or emulsion in the holes, charging the holes, placing detonators and boosters, filling the holes with stemming material and tie-in patterns.
- The blasting contractor will provide the explosives, boosters, detonators, transport it to site and store it until required in the explosive magazines, which the contractor will supply. The contractor will also supply mixing and delivery trucks. BMSC will provide fuel, oil and accommodation for the contractor.
- Explosive magazines will be constructed away from receptors at designated limits in accordance with Eritrean legislation.
- A plan will be produced of explosives storage locations.

### **14.7 Roles & Responsibilities**

Overall responsibility for the implementation of this Management Plan shall rest with the Bisha Environment Manager who shall report on progress to the Bisha General Manager.

Others with responsibility for the implementation of this Management Plan shall include:

- SENET, as EPCM Contractor, shall be responsible for the integration of these procedures and requirements into their operating procedures and plans;
- Bisha Mine Manager shall be responsible for ensuring that these procedures and requirements are implemented for all mine operations;
- Bisha Mill Manager shall be responsible for ensuring that these procedures and requirements are implemented for all mill operations.

### **14.8 Training**

All employees of BMSC and Contractors to BMSC shall be provided with basic training in the management and handling of hazardous substances. Additional, specialist training shall be provided to plant operators and key personnel involved in activities which involve frequent contact with, and use of, hazardous substances.

The workplace hazardous material information system (WHMIS) will be utilized to screen and classify materials. Hazardous materials and wastes require special handling and training procedures. All employees will be provided with training under the umbrella of the WHMIS system so that they can identify hazardous materials; know how to obtain appropriate information on special handling procedures required, i.e., know where Material Safety Data Sheets (MSDS) are to be found and how to read them; precautions required and protective equipment required and know how to label and package hazardous substances. Records of completion of WHMIS training will be kept for all employees.

Employees who are tasked with receiving, off loading and storing potentially hazardous substances will receive hazardous substances handling training. This training will be directed at ensuring that appropriate employees know how hazardous materials are to be packaged, handled, and labelled during transport and during storage.



## 14.9 Monitoring & Reporting

All hazardous materials will be subject to strict inventory control from the time they enter the site. The Bisha Mine Services Department will maintain an inventory of all hazardous substances purchased, delivered, stored and used at the Bisha Mine site. This inventory will be updated on a monthly basis. Logs will be kept as required for inspection by the regulatory agencies.

The Bisha Environment Manager will conduct routine inspections of all hazardous substances storage areas, worksite areas to look for spills, leaks, overflows and compliance with the procedures. Where necessary, Corrective Actions will be recommended. The Bisha H&S Manager will monitor all activities to do with explosives use and storage.

This Bisha Mine Service Department will collect and maintain records on hazardous substances in consultation with the mine manager, for the following:

- reconciled bulk inventory;
- weekly use summaries;
- weekly reconciliation for each storage area;
- overfill alarm tests;
- pressure tests (if applicable);
- inspections and maintenance checks of storage tank system, piping and delivery system;
- any alteration to the system;
- reports of leaks or losses;
- reports of spill responses; and
- records of training.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

Further information on environmental monitoring and reporting requirements and procedures is set out in the Monitoring Plan and in the Social & Environmental Management System.



## 15 Waste Rock Management Plan

### 15.1 Introduction

The *Waste Rock Management Plan* is designed to ensure the effective storage, management and disposal of waste rock generated by the Bisha Project during the construction, operations and closure. The plan contains the methods that shall be used to prevent adverse effects occurring during construction and operations, monitoring plans to assess potential effects during construction and operation, and monitoring plans for determining the effectiveness of mitigation.

### 15.2 Objectives

The objectives of this Management Plan are to:

- Establish Standard Operating Procedures (SOPs) for Bisha construction, operations and closure activities;
- Define BMSC requirements and procedures to guide the Project Management Team and other project contractors;
- Define mitigation measures;
- Define roles and responsibilities; and
- Define monitoring and reporting procedures.

### 15.3 Scope

The plan addresses the management of waste rock and covers all activities that could result in the generation of waste rock adverse effects throughout all phases of the project. Other plans with reference to waste rock include the *Non-Hazardous Waste Plan* and the *Topsoil Management Plan*.

### 15.4 Regulatory Requirements

#### 15.4.1 Eritrean Requirements

No specific Eritrean regulatory requirements concerning waste rock management have been identified.

#### 15.4.2 International Finance Corporation Environmental Guidelines

IFC Environmental Health & Safety Guidelines for Mining sets out the following recommendations with regard to waste rock<sup>19</sup>:

*Recommendations for management of waste rock dumps include the following:*

- *Vegetation should be cleared and topsoil pre-stripped and stored for future site rehabilitation activities. Topsoil storage areas should be temporarily protected or vegetated to prevent erosion;*
- *Dumps should be planned with appropriate terrace and lift height specifications based on the nature of the material and local geotechnical considerations;*
- *Management of Potentially Acid Generating (PAG) wastes should be undertaken as described in additional IFC guidance;*
- *Non-hazardous solid waste should not be disposed of together with waste rock or overburden except under exceptional circumstances to be fully documented in the environmental and social assessment of the project.*

### 15.5 Potential Impacts

The Bisha project will generate significant volumes of waste rock. Waste Rock Facilities (WRFs) need to be designed appropriately to be stable to avoid catastrophic failure during adverse weather, earthquakes and general operating conditions. WRFs also have the potential to generate acid runoff, depending on the type of rock.

In the case of Bisha, it is likely that much of the waste rock will be potentially acid-generating (PAG). This can potentially impact groundwater and surface water resources, unless protection and mitigation

<sup>19</sup> International Finance Corporation. *Environmental, Health & Safety Guidelines for Mining*. 10 December 2007. pp 10.

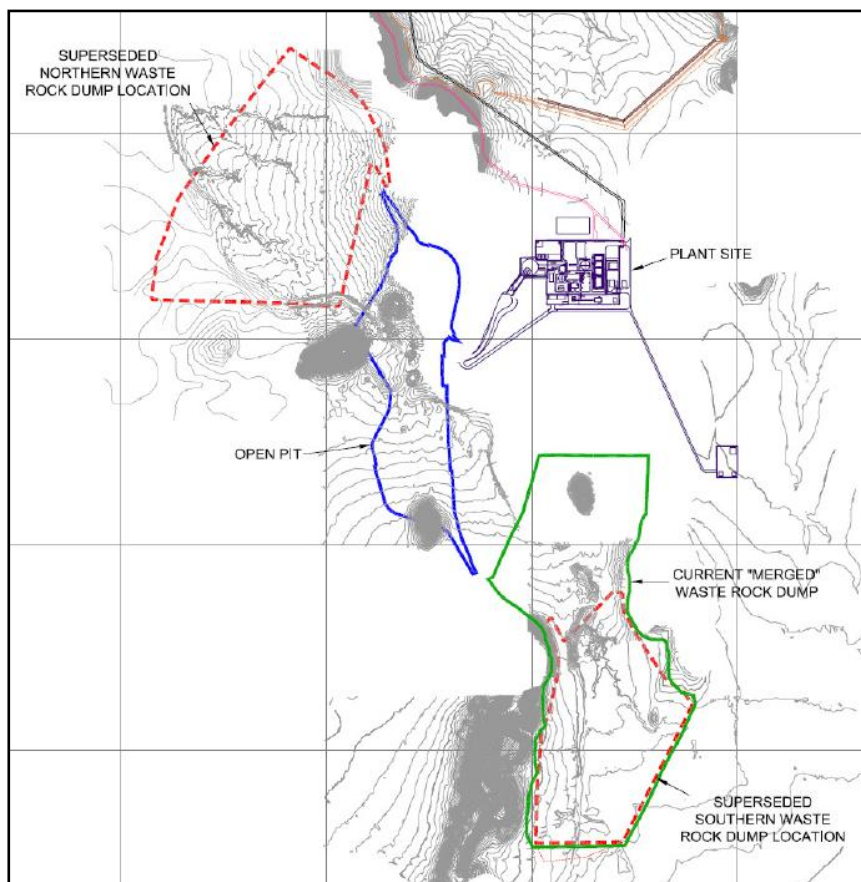
measures are employed. The WRFs at the Bisha site are anticipated to cover an area of 200 hectares (ha).

Due to the size and extent of the WRFs, consideration must be given to the following:

- layout;
- foundation conditions;
- stability; and
- overall waste rock dump management.

An initial representation of the location and layout of the WRFs is provided below.

**Figure 1 Bisha Mine – Planned Location of Waste Rock Facilities (WRFs)**



### 15.5.1 Construction Phase

During the construction phase, the key issues relate to planning for the location of the WRFs and design studies to address dump foundations and stability.

### 15.5.2 Operations Phase

During the operations phase, the management of the stability of the WRFs will be of main concern, in addition to the management of runoff and any potential leachate produced.

### 15.5.3 Closure Phase

Following closure, a programme of monitoring will need to be undertaken for a number of years to ensure WRF stability and the continued management of water and any potential leachate generated.



## 15.6 Waste Rock Management Procedures

### 15.6.1 Layout

- The WRFs shall be placed close to the pit to minimize haul distances while maintaining, as a minimum, a setback of 100 m from the ultimate design crest for pit slope stability considerations.
- During operations, all surface drainage to and from the waste dumps will be captured in a system of interceptor ditches and runoff collection ponds and drains, and not released to the environment.
- The waste rock generated by the pit excavation below the present ground surface will be dumped into 10 m high lifts across the natural ground surface after water collection measures have been completed.
- Waste rock will be routinely sampled and tested during mine operation to assess its acid generation potential. Material with significant acid generation potential (PAG rock) will be placed on the dumps located such that drainage from this area of the dumps will flow toward the open pit, or other runoff collection and treatment facilities.
- Material with nil or lower acid generating potential (NAG rock) shall be placed in a separate area from where drainage would naturally flow away from the mine.

### 15.6.2 Foundation Conditions

- A geotechnical site investigation programme shall be undertaken on the site proposed to be used for WRFs. Samples from test pits shall undergo testing in a geotechnical laboratory for physical and geochemical properties.

### 15.6.3 Stability Analysis

- Waste rock dumps shall be of moderate height, and shall be placed on relatively level ground with good geotechnical foundation conditions.
- The overall dumps slopes shall be designed to be no steeper than 3 horizontal:1 vertical to ensure that the waste rock dumps will have ample geotechnical stability. A stability analysis shall be carried out to confirm the natural angle of repose for waste rock.
- WRFs will be designed using the same data used for the design of the Tailings Management Facility with regard to the Probable Maximum Precipitation (PMP) event and the maximum ground acceleration (earthquake) event.
- The results of the stability analysis shall be used to determine whether or not specific foundation preparation will need to be carried out for the WRFs.

### 15.6.4 Waste Rock Dump Development

- Good access shall be established between the pit working area and the WRFs.
- Consideration of the location of the WRFs in relation to the working pit must be established at an early phase.
- If WRFs are used as part of water management structures, consideration will be given to minimizing the potential for acid leachate to enter surface watercourses at concentrations that would adversely impact downstream water quality.

### 15.6.5 Waste Rock Facility Water Management

- Careful surface water management for the WRFs will be necessary to both limit uncontrolled water flow into the open pit and to prevent release of contaminated drainage from the site.
- A series of perimeter ditches shall be installed around the WRFs to intercept expected surface flows up to the design event and direct them into collection ponds.
- The collection ponds shall be sized to store design storm volumes.
- During the operating life of the mine, collected water will be stored for use as mill process water or disposed of in the tailings impoundment.
- Following mine operation, all waste dump drainage will be directed to the open pit.



### 15.6.6 Waste Rock Facility Closure

- For final closure of the mine, the angle-of-repose slopes of individual lifts of the WRFs will be re-sloped to angles of 3 horizontal to 1 vertical, or flatter, to provide long-term stable slopes.
- An overall WRF drainage plan will be designed for closure.
- WRF closure design will include control measures to minimize infiltration and water movement through the dump and allow for vegetation to establish itself.
- Drainage from the WRFs will be free flowing into the open pit which will capture any seepage. The drainage to the open pit from the southern dump will run around the Freketetet dewater array even though this array will have been grouted and abandoned.
- Any seepage which bypasses the low permeability geotechnical barrier and under-drains into the underlying sediments is predicted to flow towards the open pit where, due to evaporation, the pit will act as a groundwater sink, with a standing water level approximately 90 m below the current standing water level in the bedrock.

### 15.7 Roles & Responsibilities

Overall responsibility for the implementation of this Management Plan shall rest with the Bisha Environment Manager who shall report on progress to the Bisha General Manager. Others with responsibility for the implementation of this Management Plan shall include:

- SENET, as EPCM Contractor, shall be responsible for the integration of these procedures and requirements into their operating procedures and plans;
- Bisha Mine Manager shall be responsible for ensuring that these procedures and requirements are implemented for all mine operations.

### 15.8 Training

All employees of BMSC and Contractors to BMSC shall be provided with training in waste rock management as part of their initial training. Additional, specialist training shall be provided to plant operators and key personnel involved in activities which involve waste rock transportation, storage and placement.

### 15.9 Monitoring & Reporting

The main performance concern for the WRFs will be maintenance of the water management facilities. During mining operations, runoff collection ditches and ponds will be inspected after every major rain event, and maintenance carried out as necessary. Following closure, water management systems will be inspected annually, and any required maintenance carried out until abandonment.

Stability analyses carried out at the commencement of the project shall ensure that there are no stability concerns with the WRFs. Hence, there shall be no critical issues requiring instrumentation or monitoring, and no monitoring is expected.

Acid rock drainage and metal leaching from waste rock and tailings solids and seepage will be monitored on a monthly basis during operations and continue post mining. The need for treatment of ARD drainage will be assessed from water quality samples collected during the operations and closure phases.

The physical stability of mine waste handling facilities (tailings impoundment dykes and WRFs) and the water diversion system will be monitored annually by an independent geotechnical engineer and a report prepared for BMSC which will be forwarded to the Department of Mines. Weekly visual inspections of these facilities will be conducted by mine personnel and observations logged for inspection by the independent geotechnical engineer, and government regulators upon request.

Responsibility for the monitoring detailed above shall be as follows:

- SENET shall report on a monthly basis to the Bisha Environment Manager on the implementation of this Management Plan.
- Bisha Environment Manager shall inspect the condition of the WRFs after every major rain event and shall maintain appropriate records. The inspection shall include:
  - Physical walk-over and inspection of the condition of all areas;



- Condition of access roads between the pit and WRFs;
- Compliance with applicable regulatory and corporate requirements.

The Bisha Environment Manager shall be responsible for record-keeping.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

Further information on environmental monitoring and reporting requirements and procedures is set out in the Monitoring Plan and in the Social & Environmental Management System.



## 16 Water Resources Management Plan

### 16.1 Introduction

The *Water Resources Management Plan* designed is to ensure the protection of water resources in the areas surrounding the Bisha Project during the construction, operations and closure phases of the Project. The plan contains methods that will be used to prevent adverse effects occurring during construction and operations, monitoring plans to assess potential effects during construction and operation, and monitoring plans for determining the effectiveness of mitigation measures.

### 16.2 Objectives

The objectives of this Management Plan are to:

- Establish Standard Operating Procedures (SOPs) for Bisha construction, operations and closure activities;
- Define BMSC requirements and procedures to guide the Project Management Team and other project contractors;
- Define roles and responsibilities;
- Define monitoring and reporting procedures.

### 16.3 Scope

The plan addresses the management of water resources during construction, operations and closure associated with the Bisha mine. This plan covers all activities that could result in adverse effects on water resources through all phases of the project. For the purposes of this plan, water resources include both surface water and groundwater resources. The management of process and waste water associated with the Project is addressed in the *Waste Water Management Plan* and the *Tailings Management Plan*.

### 16.4 Regulatory Requirements

#### 16.4.1 Eritrean Requirements

The Ministry of Land, Water and Environment (Water Resources Department) has drafted a *Water Law* and efforts are being made to finalize and have it pass into legislation. The draft law deals with the institutional and regulatory issues, water use, water rights, environmental issues and water quality. Currently water use is subject to the overlapping of water development interests of the Ministries of Agriculture, Public Works and local Government.

Eritrea has also implemented regulations related to environmental management plans which are outlined in "National Environmental Assessment Procedures and Guidelines" Ministry of Land, Water and Environment, March 1999.

#### 16.4.2 International Finance Corporation Environmental Guidelines

IFC Environmental Health & Safety Guidelines for Mining sets out the following recommendations with regard to changes to water resources<sup>20</sup>:

##### ***Water Conservation and Quality***

*Management of water quality and its use, in and around mine sites, can be a significant issue. Potential contamination of water sources may occur early in the mine cycle during the exploration stage and many factors including indirect impacts (e.g. in-migration) can result in impacts to water quality. Reduction of surface and groundwater availability is also a concern at the local level and for communities of downstream mining sites, particularly in arid regions. Mining activities should therefore include adequate monitoring and management of water use, in addition to treatment of effluent streams including stormwater run-off from the mine property.*

##### ***Water Conservation***

<sup>20</sup> International Finance Corporation. *Environmental, Health & Safety Guidelines for Mining*. 10 December 2007.



Mines use large quantities of water, mostly in processing plants and related activities, but also in dust suppression among other uses. Water is lost through evaporation in the final product but the highest losses are usually into the tailings stream. Recommended practices for water conservation include:

- Establishing a water balance for the mine and related process plant circuit to identify opportunities to minimize water losses;
- Developing a Sustainable Water Supply Management Plan to manage water use, avoid depletion of aquifers, and minimize impacts to downstream water users;
- Minimizing the amount of fresh water used to the minimum required for make-up;
- Consider recycling and treatment of process water where feasible (e.g. return of supernatant from tailings pond to process plant).

### **Water Quality**

Recommended practices to manage impacts to water quality include:

- The quality and quantity of mine effluent, including stormwater, leach pad drainage, process effluents, and overall mine works drainage should be managed and treated to meet the applicable effluent discharge guideline;
- In addition, discharges to surface water should not result in contaminant concentrations in excess of local ambient water quality criteria outside a scientifically established mixing zone. Receiving water-body use and assimilative capacity, including the impact of other sources of discharges to the receiving water, should be considered with respect to acceptable pollution loadings and effluent discharge quality as described in the General EHS Guidelines;
- Efficient oil and grease traps should be installed and maintained at refueling facilities, workshops, parking areas, fuel storage depots, and containment areas;
- Water quality in open storage systems (e.g. leachate areas, solution ponds, and tailings ponds or impoundments) should be established based on the results of a site-specific ecological risk assessment or else meet the effluent guideline values in Section 2.0.
- Sanitary wastewater should be managed via septic or surface treatment and discharge systems as described in the General EHS Guidelines

### **Groundwater Resource Protection**

In addition to the prevention and control of effluents, wastes, and potential releases of hazardous materials, additional recommendations for the management of potential sources of groundwater contamination, primarily associated with leaching and solution mining activities as well as tailings management include the following:

*Leaching:* Operators should design and operate surface heap leach processes with:

- Adequate liners and sub-drainage systems to collect, recycle, or treat solution, and minimize ground infiltration;
- Pipeline systems carrying pregnant solutions should be designed with secondary banded protection;
- Leak detection equipment should be installed for pipeline and plant systems;
- Evaporation ponds and other impoundments should be lined, and be equipped with leak detection systems;
- Sufficient monitoring wells should be installed around leach pads to enable monitoring of water levels and quality.

*Solution Mining:* Operators should design and operate solution mining projects with consideration of the following:

- Proper location and operating practices based on the characteristics of the confining strata, to ensure the movement of leaching solution is minimized beyond the extraction area;



- *Sufficient monitoring wells should be installed around cavities to enable monitoring of pressure levels, as well as water quantity and quality.*

### **Chemical Integrity**

*Surface water and groundwater should be protected against adverse environmental impacts resulting from mining and processing activities. Leaching of chemicals into the environment should be prevented, so as to avoid endangering public health or safety or exceed water quality objectives in downstream surface water and groundwater systems.*

## **16.5 Potential Issues and Impacts**

The Project Area is located in an area with an arid/semi-arid climate characterized by low mean annual rainfall, high monthly temperatures and excessive evapotranspiration rates. The Bisha concession consists of rolling plains mantled by clay-rich residual soils and broken by occasional steep, rocky hills and ridges. Except for more dense riparian cover along water courses, vegetation is generally sparse.

Drainage of the area is to the north in which runoff generated by summer rains is delivered to the Barka River via the Mogoraib and Shatera stream systems.

### **16.5.1 Construction Phase**

Water supply needs for the Project will come from a combination of surface water collection from rainfall events, pit seepage and a groundwater production well field. Hydrogeological assessments indicate that the pit will act as a groundwater sink and no significant pit seepage is anticipated. Well testing has demonstrated that the ten most productive boreholes in the Mogoraib well-field have a combined yield of 127.5 l/sec, while it is estimated that the dewatering well-field across the Freketet River could provide a minimum of 25 l/sec under conditions of concurrent pumping and taking into account the resulting well interference. Thus these two well fields have a potential yield of 153 l/sec; i.e. significantly higher than the project water demand of (263 m<sup>3</sup>/hour). This groundwater withdrawal has the potential to affect groundwater availability in nearby communities. Initial studies however have indicated that drawdown will have a negligible effect on the Mogoraib community well.

### **16.5.2 Operations Phase**

The rivers and streams in the Project area are restricted to intermittent flow following rainfall events during the rainy season of June to September. Run-off from these rainfall events will be modified by the Project, principally by the diversion of the Freketet River, but also due to surface water management at the open pit and waste rock dump, site facilities, tailings impoundment and roadways. Impacts to surface water flows and local groundwater recharge are currently under assessment.

### **16.5.3 Closure Phase**

At mine closure, the open pit formed during the operational phase of the Project will begin to fill with water, but due to high evaporation rates, the water level in the pit will remain below the groundwater level in the area. This will result in the flow of groundwater to the pit, potentially affecting groundwater use in the area. Initial studies indicated that drawdown from the pit after closure will have a negligible effect on the Mogoraib community well.

Further investigations are currently in progress to assess the effect of the Project groundwater withdrawal and open pit on the regional groundwater regime. The quality of the pit water after closure is expected to be poor, becoming acidic with high concentrations of some metals. Pit water will not be suitable for community use.



## 16.6 Water Resources Management Procedures

### 16.6.1 Water Management and Discharges from the Process Area

- The Process Area will be installed with a network of perimeter drains to collect storm water run-off which will be held in lined storage ponds prior to discharge.
- No discharges to the environment will be permitted from stormwater or process water, unless it has been tested and proven to be suitable for release by the HSEC Department.
- The process area will be kept free of chemicals, oils and other materials which may contaminate storm water drainage from the area.
- Storm water diversion channels are to be kept free of debris to ensure clean storm water is carried away from the process area.

### 16.6.2 Groundwater Abstraction from the Project Groundwater Wells

- All construction activities associated with the groundwater abstraction wells, are to be undertaken in a manner that prevents any surface run-off entering the well bore.
- Groundwater wells will be constructed in accordance with best international practice; well design will ensure protection from the ingress of sediment.
- No fuel storage or other chemicals which have the potential to contaminate groundwater are to be located within 50 m of the wells. All such chemicals will be stored with suitable secondary containment. Adsorbent booms or similar materials should be available in the event of an emergency spill.
- Abstraction is to cease if monitoring shows that there is an unacceptable impact on a neighbouring well (e.g. groundwater levels fall to a point which threatens the viability of the water abstraction).
- Upon closure the Freketet dewatering array will be abandoned and the wells grouted to prevent these forming a conduit for any surface contamination entering the aquifer. Based on discussions with the Eritrean Government the wells along the Mogoraib River will be abandoned to remove any risks to the aquifers presented by these wells falling into disuse.

### 16.6.3 Water Management and Discharge from the Open Pit, Stockpiles and Waste Dumps

- All Waste Rock Facilities (WRFs) are to be installed with under-liners and an under-drainage collection system.
- Drainage from WRFs will be collected in lined evaporation ponds.
- At closure, the operational under-drainage collection ponds will be removed and drainage from both of the WRFs will be directed towards the open pit through lined channels.
- All ore stockpiles are to be installed with impermeable under-liners and a drainage collection system.
- Drainage from ore stockpiles will be collected in lined evaporation ponds.
- No net discharges from the open pit are expected, and on closure the pit lake level is estimated to be below the discharge elevation. As a result, the pit will act as a groundwater sink and will not discharge water to the environment.
- No fuel storage or other chemicals which have the potential to contaminate groundwater are to be located within 10 m of surface water courses. All such chemicals will be stored with suitable secondary containment. Adsorbent booms or similar materials should be available adjacent to such stores, ready for use in the event of an emergency spill.
- Storm water channels are to be kept free of debris to minimise the volume of storm water contacting the working areas (and therefore minimise sediment laden run-off).
- Contact water collection ponds are to be kept free of debris and sediment build-up will be removed regularly to maintain the capacity of the collection pond.



#### 16.6.4 Surface Water Management

- All material used in the diversion system in contact with water is to be sourced from non-PAG sources;
- At times of rainfall and river flows, surface water is to be monitored for quantity and quality. Flood risk is to be monitored and any local communities are to be alerted as soon as possible of risk of flooding of agricultural areas and villages;
- The impacts of flooding are to be evaluated after each flood event and appropriate changes made to management practices and procedures.

#### 16.6.5 Tailings Water Management

Specific issues concerning tailings water management are discussed under the *Tailings Management Plan*.

### 16.7 Roles & Responsibilities

Overall responsibility for the implementation of this Management Plan shall rest with the Bisha Environment & Safety Manager who shall report on progress to the Bisha Mine Manager. Others with responsibility for the implementation of this Management Plan shall include:

- SENET, as EPCM Contractor, shall be responsible for the integration of these procedures and requirements into their operating procedures and plans;
- Bisha Mine Superintendent shall be responsible for ensuring that these procedures and requirements are implemented for all mine operations;
- Bisha Mill Superintendent shall be responsible for ensuring that these procedures and requirements are implemented for all mill operations.

### 16.8 Training

All employees of BMSC and Contractors to BMSC shall be provided with training in the protection of water resources. Additional, specialist training shall be provided to plant operators and key personnel involved in activities which involve activities likely to impact water resources. Orientation of all employees will be undertaken to instill a culture of water conservation.

### 16.9 Monitoring & Reporting

Water resources monitoring procedures shall be as follows:

- SENET shall report on a monthly basis to the Bisha Environment Manager on the implementation of this Management Plan during the construction phase, including:
  - Collection of climate data at the current station and addition of evaporation data;
  - Development of a numerical model to obtain long-term prediction of the effects due to groundwater withdrawal/dewatering;
  - The effect of groundwater withdrawal/dewatering and its implications for other environmental resources, including habitat diversity, surface water, vegetation and soil saturation;
  - Maintenance of river discharge measurements. These measurements should be carried out frequently during all flood events. Attempts should be made to collect manual flow measurements for the entire duration of the wet season;
  - An inventory of all groundwater users, identifying any potential conflicts and proposed resolutions;
  - During flood events, observation of rivers which will be crossed by the proposed tailing facility access road and tailings line for bed changes (locations of degradation and aggradation), sediment loading, flooding extent (width) and changes in river path. This will aid in determination of the most suitable method of road and tailings line crossing.
- Bisha Environment Manager shall inspect the condition of areas on a monthly basis and shall maintain appropriate records. The inspection shall include:
  - Groundwater monitoring (quality and quantity) will be conducted through all mine phases to provide information to be used in the mine's adaptive management;
  - Evidence of any reduction of water resources;



- Records and evaluations of flood events;
- Condition of wells;
- Efficiency of wells.

The Bisha Environment Manager shall be responsible for record-keeping.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha Mine Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

Further information on environmental monitoring and reporting requirements and procedures is set out in the Monitoring Plan and in the Social & Environmental Management System.



## 17 Monitoring Plan

### 17.1 Introduction

Monitoring is a key tool to ensure that impact mitigation plans are working effectively and to assess compliance against regulatory requirements and other agreed performance standards.

Monitoring is also used to identify areas of non-compliance and/or poor performance and to assess the effectiveness of measure to improve performance.

Monitoring is a key tool to enable mitigation and management measures to be adjusted to respond to inevitable changing conditions and the unexpected. Mitigation and management of a project before it is constructed depend on assessment of potential impacts and public and government concerns expressed through consultation and the approval process. It is almost impossible to fully and accurately predict all environmental impacts which might arise from a project at this early stage. Even the best impact assessment may fail to identify and mitigate all negative impacts which a project could have on the natural and social environment. In addition, no project is implemented in a static environment. Other changes in other conditions could lead to negative environmental impacts arising from a project which it would have been impossible to predict at the time of assessment. For these reasons, monitoring and evaluation of a project's environmental impact following approval and implementation is an important part of the overall project cycle.

Project-related monitoring is planned to take place at two levels:

- **Government Level:**

The Department of Environment is responsible for the overall monitoring of the effectiveness of the environmental assessment process in Eritrea. This includes monitoring of approved projects in order:

- to ensure that negative environmental impacts arising from project implementation do not exceed allowable limits;
- to provide lessons learned from project implementation which can be fed back into the environmental assessment process (via improved questionnaires for Environmental Evaluation and improved scoping procedures for full EIAs).
- to provide a link to the post-environmental auditing of projects which will be undertaken by the Department of Environment (or its zonal branch offices) and other relevant Government agencies as part of the overall environmental management programme for Eritrea.

- **Project Level :**

- In recognition of the full integration of environmental management into the emerging Eritrean economy, day-to-day monitoring of environmental performance will be the responsibility of the Bisha project.
- The results of the monitoring will be sent to the Department of Environment or its representatives at agreed intervals.
- The Department of Environment or any other relevant Government agency has the right to undertake inspection of a project site in order to confirm adherence to monitoring procedures at any time.

### 17.2 IFC Guidelines For Project Monitoring

International good practice, as reflected in the IFC Performance Standards for Social and Environmental Sustainability require that:

*Procedures will be established to monitor and measure the effectiveness of the Management Programme. Qualified external experts will be retained to verify monitoring information. Corrective and preventive actions will be implemented<sup>21</sup>.*

<sup>21</sup> Performance Standard 1: Social & Environmental Assessment and Management Systems. Para 24. International Finance Corporation, Performance Standards for Social and Environmental Sustainability



Based on the findings of the SEIA and regulatory and other conditions, Environmental Management Plans (EMPs) are developed to manage and mitigate identified impacts. Performance monitoring is an essential part of ensuring compliance with requirements and with the implementation of a continuous improvement approach to environmental and social performance.

In addition to monitoring activities by BMSC, It should be understood that the Eritrean Department of Environment is responsible for co-ordinating all efforts of monitoring of mitigation activities by government agencies.

### 17.3 Scope

This Monitoring Plan covers the Environmental and Social Management Plans which have been prepared for the Bisha project:

### 17.4 Environmental Monitoring

This section provides a summary of monitoring requirements as outlined in the suite of Management Plans that have been developed for the project.

#### 17.4.1 Air Quality

Air quality monitoring requirements are set out in the Air Quality Management Plan as follows.

#### Monitoring and Reporting Procedures

Air monitoring procedures will be as follows:

- SENET will report on a monthly basis to the Bisha Environment Manager on the implementation of this Management Plan during the construction phase, including:
  - Air quality protection actions undertaken;
  - Air quality monitoring undertaken by suitably trained personnel;
  - Servicing of mobile and fixed vehicles and plant;
  - Non-compliances identified;
  - Corrective actions planned and undertaken.
- Bisha Environment Manager will inspect the condition of the Project area on a monthly basis and will maintain appropriate records. The inspection will include:
  - Evidence of dust, smoke, odour or other nuisance;
  - Condition of emission control equipment;
  - Condition of the incinerator;
  - Condition of the seedbed;
  - Compliance with applicable regulatory and corporate requirements.

Monitoring of changes in ambient air quality will be done to ensure that air quality in the area does not undergo any adverse changes over the life of the project. It will be done at the same locations where the vegetation monitoring will be done and will require establishing representative sampling locations to assess the potential effects of acid deposition, fugitive dust emissions and the mobilization of metals / elements through changes in soil chemistry during construction and mine operations.

An air quality risk assessment plan shall be prepared which will:

- identify zones (or areas) of different severity levels with respect to their vulnerability to potential impacts of air emissions;
- help identify emissions or sources of greatest risk to beneficial uses of the environment;
- provide for assessment of the environmental and health impacts of air emissions and establishment of air quality management priorities;
- serve as a basis for selecting locations for dust and gaseous emission monitoring and for establishing mitigation measures.

An air quality emergency mitigation plan shall also be prepared which will:



- outline procedures for coordinating activities with local authorities and local health institutions to develop an Emergency Abatement plan;
- specify arrangements and procedures for having local communities report adverse health effects experienced as a result of release of dust and gaseous emissions into the environment;
- establish air pollution alert procedures and protocols; implementation strategy for an emergency abatement plan if the concentration of air quality indicator is predicted to exceed the standard limit.

**Effects Monitoring**

BMSC will collaborate with other industry and government-sponsored monitoring programs to measure the effects of air quality occurring in the Bisha project area during the construction and operations phases of the project. Information collected during the monitoring program for this project will be made available to the public.

**Sampling Requirements**

Sampling will be undertaken as outlined below.

Parameter	Sampling Frequency	Sampling Duration
TSP	Weekly	24 hrs
PM10	Weekly	24 hrs
PM2.5	Weekly	24 hrs
SO2	Monthly	30 days
NOx	Monthly	30 days

**Air Quality Data Parameters**

Parameter	Equipment	Rationale	Analysis Required
24 hr TSP	Mini Partisol 2100	<ul style="list-style-type: none"> <li>• TSP (particles less than 35 µm in aerodynamic diameter) is generated from mechanical mining activity</li> </ul>	<ul style="list-style-type: none"> <li>• Filter weight (from which dust concentration is determined) every 6 days</li> <li>• Composition of the dust for metals quarterly</li> </ul>
24 hr PM10	Mini Partisol 2100	<ul style="list-style-type: none"> <li>• PM10 (particles less than 10 µm in aerodynamic diameter) is generated from mechanical mining activity and diesel combustion and has been extensively related to human health impacts.</li> <li>• PM10 is a better indicator of mechanical mining emissions than finer particles.</li> </ul>	<ul style="list-style-type: none"> <li>• Filter weight (from which particulate concentration is determined) every 6 days</li> <li>• Composition of the dust for metals quarterly</li> </ul>
24 hr PM25	Mini Partisol 2100	<ul style="list-style-type: none"> <li>• PM2.5 (particles less than 2.5 µm in aerodynamic diameter) is generated from mechanical mining activity and especially from diesel combustion. While there is no WB or WHO guideline, there are relevant guidelines in other jurisdictions.</li> </ul>	<ul style="list-style-type: none"> <li>• Filter weight (from which particulate concentration is determined) every 6 days</li> <li>• Composition of the dust for metals quarterly</li> </ul>

The monitoring programme will be finalized and submitted for review to the government’s Impact Review Committee (IRC) and the Mine Control Unit of the Department of Mines (Ministry of Energy and Mines) for their review and approval prior to commencement of construction/operations.

**Record Keeping**

The Bisha Environment Manager will be responsible for record-keeping.

Regular reporting will be undertaken via the monthly SEMS Report that will be prepared and submitted to the Bisha General Manager. Reporting will include:

- A summary of activities undertaken during the reporting period;



- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

Regular record keeping will help to identify and address air quality issues in a timely manner. Record keeping will be undertaken as follows:

- BMSC will implement an ambient air quality and emission monitoring programme and an appropriate monitoring protocol will be established (based on this Plan);
- Emission reporting protocols will include a controlled emissions reporting protocol as well an emergency reporting protocol; and
- BMSC will maintain monitoring records and prepare an annual emissions report

The annual emission report will include the following information for each piece of equipment/activities emitting pollutants:

- Fuel consumption;
- Mileage;
- Operational hours;
- Volume of excavated ground, gravel, moved soil etc.;
- Volume of ore, overburden, tailings and waste rock;
- Volume of materials transported/shipped;
- Volume and type of wastes incinerated;
- Environmental monitors records and observations related to air quality;
- Unexpected/emergency emissions; and
- Public complaints on air quality.

#### 17.4.2 GHG Monitoring

The monitoring of GHG emissions is becoming a standard requirement under international good practice. BMSC will conduct annual monitoring of GHG emissions. It is likely that GHG monitoring during operations will involve inventories being developed using mass balance, stoichiometric calculations and internationally accepted 'factors'. Key data that will be collected on a semi-continuous basis to support the inventory will include:

- Diesel consumption by mining vehicles;
- Explosives use;
- Extent of electricity import and export;
- Power generation/fuel type (emissions);
- Incineration (emissions);
- Employee road and air miles;
- Road miles by HGVs importing plant;
- Road miles by HGVs exporting concentrate.

This data will be used to prepare an annual GHG emissions inventory and to track emissions over the course of project development.

#### 17.4.3 Noise

Noise monitoring requirements are set out in the Noise Management Plan as follows.

#### Monitoring and Reporting Procedures

Noise monitoring procedures shall be as follows:

- SENET shall report on a monthly basis to the Bisha Environment Manager on the implementation of this Management Plan during the construction phase, including:
  - Noise reduction actions undertaken;
  - Noise monitoring undertaken;
  - Maintenance of mobile and fixed plant to reduce noise impact;
  - Non compliances identified; and



- Corrective actions planned and undertaken.
- Bisha Environment Manager will inspect the condition of the Project area on a monthly basis and will maintain appropriate records. The inspection will include:
  - Evidence of excessive noise;
  - Condition of noise control equipment;
  - Condition of the generators, trucks and primary crushers;
  - Use of ear protection by personnel working in noisy areas; and
  - Compliance with applicable regulatory and corporate requirements.

Monitoring of changes in noise levels within the operational area will be done to ensure that noise levels do not increase significantly over the life of the project. It will be done at the same locations and will require establishing representative sampling locations to assess the potential effects of noise levels across the site. Any complaints from the community should be documented and managed through to resolution. In the event that public complaints arise, steps should be taken to investigate the root cause without delay and remedial action should be taken to correct the deficiency. Actions should ensure that similar incidents do not occur and should be reported to the Bisha Environment Manager as part of the performance reporting process.

BMSC should conduct ongoing liaison with the adjoining communities. In the event that noise mitigation measures implemented do not reduce noise to acceptable levels at receiving locations, the addition of noise treatments to those receiving locations should be investigated.

The monitoring programme will:

- provide clear, hands-on direction how to minimize noise and explain rationale;
- provide clearly regulatory requirements and corporate standards for environmental performance pertaining to noise control;
- form the link between operations, safety and environmental programs;
- provide monitoring results that will be regularly reviewed to ensure the noise management systems are operating as designed;
- identify the reporting requirements to document and communicate the monitoring results; and
- ensure that all environment, health and safety (EH&S) risks are addressed.
- 
- A Noise Modeling and Assessment Plan should be prepared to achieve the following:
  - assess noise impact of the open pit mine.
  - plot noise contours and predict noise emissions which helps to determine “Noise Zone Description”.

The ambient noise monitoring program during both, the construction and operation stages should include one full day (day and night) measurements semiannually (during wet and dry seasons) to determine noise parameters such as the equivalent continuous noise level (Leq) in decibels (dBA), the A-weighted sound pressure level that is exceeded for 10%, 50% and 90% of the time over which a given sound is measured (L10, L50 and L90) and frequency noise analysis.

Measurements will be taken at noise-sensitive locations within the Bisha deposit area where noise levels are likely to be the highest. In addition, ambient noise monitoring will be performed at neighboring communities of Hashakito, Takur, Bisha, and Ad-Ibrihim. Noise measurements will adhere to recognized standards such as ANSI S12.18-19941 or ISO/DIS 1996-2.2.2. Noise monitoring will be evaluated against IFC/WB Guidelines, which are:

Receptor	One Hour LAeq (dBA)	
	Daytime 07:00 - 22:00	Night time 22:00 - 07:00
Residential; institutional; educational	55	45
Industrial; commercial	70	70



The following items are to be included in a noise monitoring report:

- the type of monitoring test conducted (that is, the construction stage or operation);
- the noise limits (daytime & night time) for the facility;
- description of the nearest affected receivers;
- the monitoring locations;
- the noise instrumentation used;
- the weather conditions during noise survey;
- the time and duration of monitoring, including dates;
- the results of noise monitoring at each monitoring location;
- a statement outlining the development's compliance or non-compliance with the limit; and
- where noise exceedances are found; the reason for non-compliance should be stated; and the strategies to be used to manage the noise exceedance.

Quality control/quality assurance (QC/QA) will be implemented with an audit program that will be developed prior to commencing the operation. The audit program will address procedures covering non-compliance with consent limits or failure to meet environmental quality objectives. These procedures will include identification of non-compliance and the planning and carrying out of such corrective action as may be necessary. The corrective action may involve supplementary monitoring to identify the source of the non-conformance and/or may involve modifying operational procedures to avoid any occurrence or minimize any adverse effects. In this way, BMSC (Bisha Mine Share Company) will demonstrate its commitment to continuing to manage noise and blast impacts and improving environmental quality.

### **Record Keeping**

The Bisha Environment Manager shall be responsible for record-keeping.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

This noise management plan may be modified from time to time to reflect updated practices and procedures necessitated by a change in circumstances, and reviewed internally on commencement of mining.

### **17.4.4 Topsoil**

Topsoil monitoring requirements are set out in the Topsoil Management Plan as follows.

#### **Monitoring and Reporting Procedures**

Topsoil monitoring procedures shall be as follows:

- SENET shall report on a monthly basis to the Bisha Environment Manager on the implementation of this Management Plan during the construction phase, including:
  - Quantities of topsoil removed;
  - Storage locations, quantities and type of topsoil;
  - Storage procedures and methods used.
- Bisha Environment Manager shall inspect the condition of topsoil storage areas on monthly basis and shall maintain appropriate records. The inspection shall include:
  - Evidence of erosion;
  - Condition of the seedbed;
  - Condition of perimeter drains (if installed) and associated settlement ponds (if installed);
  - Compliance with applicable regulatory and corporate requirements.



- Bisha Environment Manager shall prepare and update the Topsoil Storage Plan (essentially a map and inventory of topsoil stockpiles) as the mine develops and maintain an inventory of topsoil volumes.

Monitoring of changes in soil conditions shall be done to ensure that the soils in the area do not undergo any adverse changes over the life of the project. It shall be done at the same locations where the vegetation monitoring shall be done and shall require establishing representative sampling locations to assess the potential effects of acid deposition, fugitive dust emissions and the mobilization of metals / elements through changes in soil chemistry during construction and mine operations

### Record Keeping

The Bisha Environment Manager shall be responsible for record-keeping. Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

### 17.4.5 Terrain & Erosion Control

Terrain and erosion control monitoring requirements are set out in the Terrain Erosion Control Management Plan as follows.

### Monitoring and Reporting Procedures

The Bisha has a distinct wet and dry season. The soils monitoring program will include two rounds of samples per year spanning during construction and the operation phase (May and August) to determine if any seasonal variations do occur. Thereafter, annual monitoring will take place once per year, preferably at the end of the dry season (early August).

Monitoring will be conducted with test pits located downwind and down gradient from mine facilities such as waste rock pile, tailings impoundment, open pit, plant site and pipe line from mill to the tailings impoundment; and upwind and upstream from these facilities at designated control points.

The suite of analyses for the monitoring programme include:

- Soil chemistry:
  - pH;
  - Anion exchange capacity;
  - Electrical conductivity;
  - Metals (full suite using ICP-MS);
  - Toluene-extractable organics;
- Soil structure:
  - Clay fraction (<0.002mm);
  - Particle size distribution;
  - Water retention;
  - Permeability.

Sampling frequency and parameters analyzed will be reassessed based on results from air quality and surface water monitoring results.

Terrain and erosion monitoring procedures shall be as follows:

- SENET shall report on a monthly basis to the Bisha Environment Manager on the implementation of this Management Plan during the construction phase, including:
  - Quantities of vegetation removed;
  - Storage locations, quantities and type of topsoil and overburden;
  - Storage procedures and methods used.



- Bisha Environment Manager shall inspect the condition of areas on monthly basis and shall maintain appropriate records. The inspection shall include:
  - Areas prone to erosion;
  - Evidence of erosion;
  - Condition of access roads;
  - Condition of cleared areas;
  - Condition of perimeter drains (if installed) and associated settlement ponds (if installed);
  - Compliance with applicable regulatory and corporate requirements.

### **Record Keeping**

The Bisha Environment Manager shall be responsible for record-keeping.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

### **17.4.6 Wildlife**

Wildlife and domestic livestock monitoring requirements are set out in the Wildlife Management Plan as follows.

### **Monitoring and Reporting Procedures**

The Bisha Environment Manager will maintain updated records on the following:

- Wildlife and domestic livestock mortalities (e.g., from air strikes, vehicle strikes, shooting (i.e. military or illegal), other sources);
- Wildlife monitoring - weekly site inspections and wildlife counts. This will include the numbers and location of:
  - Large mammals;
  - Birds (including migratory birds);
  - Reptiles (watercourses and TMF);
  - Domestic livestock.

For livestock, a monitoring plan comprising the following will be undertaken:

- Quarterly qualitative assessment of livestock and herd health (e.g. surveys with local herders and livestock owners);
- Annual sampling programme for tissues (liver and kidney) from domestic livestock (i.e. goats and/or sheep); and
- Annual blood sampling program for domestic livestock (i.e. goats, sheep, donkeys, camels, cattle).

Livestock monitoring will be undertaken on a monthly basis if complaints relating to livestock are received.

SENET will report on a monthly basis to the Bisha Environment Manager on the implementation of this Management Plan during the construction phase.

### **Record Keeping**

The Bisha Environment Manager will be responsible for record-keeping.

Regular reporting will be undertaken via the monthly SEMS Report that will be prepared and submitted to the Bisha General Manager. Reporting will include:



- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

#### 17.4.7 Ecology and Habitat Monitoring

In addition to the wildlife monitoring Bisha will commission regular ecological & habitat monitoring. This will be undertaken on a six monthly basis by a qualified ecologist.

The baseline data on habitats will form the base case of the monitoring. The Bisha Environment Manager will maintain updated records on the following:

- habitats lost and gained.
- Assessment of key causes for habitat loss and gain.

Based on the results of the monitoring, Bisha will review management plans focused on or influencing ecology and habitat and revise these appropriately to improve the protection and promotion of habitats around the Project.

#### Record Keeping

The Bisha Environment Manager will be responsible for record-keeping.

Reporting of results will be undertaken via the monthly SEMS Report that will be prepared and submitted to the Bisha General Manager. Reporting will include:

- A summary of the ecological & habitat monitoring undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

#### 17.4.8 Water Resources Management

Water resources monitoring requirements are set out in the Water Resources Management Plan as follows.

#### Monitoring and Reporting Procedures

Groundwater quantity and quality will be measured both on and off the Bisha site. A detailed groundwater level and quality monitoring network will be established over the region to monitor the impacts of production from water wells and from pit dewatering activities. The monitoring will include points in the shallow alluvial aquifers used by the local populace and in the deeper bedrock aquifers. The exact location of monitoring will depend on the location of the production water wells. Monitoring will commence before mining starts and will continue post mining. Water quality samples will be collected quarterly throughout the life of the mine. Automated water level monitoring will be established to collect data on a regular basis to observe long term trends.

Water resources monitoring procedures shall be as follows:

- SENET shall report on a monthly basis to the Bisha Environment & Safety Manager on the implementation of this Management Plan during the construction phase, including:
  - Collection of climate data at the current station and addition of evaporation data;
  - Development of a numerical model to obtain long-term prediction of the effects due to groundwater withdrawal/dewatering;
  - The effect of groundwater withdrawal/dewatering and its implications for other environmental resources, including habitat diversity, surface water, vegetation and soil saturation;
  - Maintenance of river discharge measurements at the site. These measurements should be carried out frequently during all flood events. Attempts should be made to collect manual flow measurements for the entire duration of the wet season;



- An inventory of all groundwater users, identifying any potential conflicts and proposed resolutions;
- During flood events, observation of rivers which will be crossed by the proposed tailing facility access road and tailings line for bed changes (locations of degradation and aggradation), sediment loading, flooding extent (width) and changes in river path. This will aid in determination of the most suitable method of road and tailings line crossing.
- Bisha Environment & Safety Manager shall inspect the condition of areas on monthly basis and shall maintain appropriate records. The inspection shall include:
  - Groundwater monitoring (quality and quantity) will be conducted through all mine phases to provide information to be used in the mine's adaptive management;
  - Evidence of any reduction of water resources;
  - Records and evaluations of flood events;
  - Condition of wells;
  - Efficiency of wells.

**Sampling Requirements**

Sampling will be undertaken as outlined below.

Sample Type/Location	Initial Sampling Frequency	Sampling Suite
<b>Groundwater</b>		
Project Area (wells)	Monthly	<i>Field:</i> Groundwater levels, pH, electrical conductivity and temperature. <i>Laboratory:</i> Alkalinity, nitrates, phosphates, sulphates, chlorides, COD, TDS, TSS, and metals. , and initially total coliform bacteria

The monitoring programme will be finalized and submitted for review to the government's Impact Review Committee (IRC) and the Mine Control Unit of the Department of Mines (Ministry of Energy and Mines) for their review and approval prior to commencement of construction/operations. The final analytical suite will be determined on completion of the first four months of sampling. It is anticipated that the final monitoring suite will be vary between the groups of wells in the different areas. Once this suite is determined, this procedure will be up dated

**Record Keeping**

The Bisha Environment & Safety Manager shall be responsible for record-keeping.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha Mine Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period; and
- Any other issues of concern.

**17.4.9 Waste Water Management**

Waste water monitoring requirements are set out in the Waste Water Management Plan as follows.

**Monitoring and Reporting Procedures**

Down gradient monitoring wells will be installed 50 m from the outer perimeter of the leach field at three sites on each of the distal sides of the field from the septic tanks. Shallow groundwater quality will be monitored when present on a monthly basis for parameters including:

- Faecal bacteria;
- Phosphates;
- Nitrates;
- BOD;
- Metals;



- Oil and grease (largely removed by grease traps where required); and
- Total suspended solids.

WHO drinking water criteria (listed in the table) will be used as guidelines for acceptable quality. Should an increasing trend in any of the parameters become apparent, monitoring will be increased to weekly until the source of the increase is determined and management actions result in a decrease in the subject pollutant.

Waste water monitoring procedures will be as follows:

- SENET will report on a monthly basis to the Bisha Environment Manager on the implementation of this Management Plan during the construction phase.
- Bisha Environment Manager will inspect the condition of the Project area on a monthly basis and will maintain appropriate records. The inspection will include:
  - The efficient performance of the sewage treatment plant;
  - The quality of effluent;
  - The integrity of storm water drains.

### Record Keeping

The Bisha Environment Manager will be responsible for record-keeping.

Regular reporting will be undertaken via the monthly SEMS Report that will be prepared and submitted to the Bisha General Manager. Reporting will include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

#### 17.4.10 Waste Rock

Waste rock monitoring requirements are set out in the Waste Rock Management Plan as follows.

### Monitoring and Reporting Procedures

The main performance concern for the waste rock dumps will be maintenance of the water management facilities. During mine operation, runoff collection ditches and ponds will be inspected after every major rain event, and maintenance carried out as necessary. Following closure, water management systems will be inspected annually, and any required maintenance carried out until abandonment.

Stability analyses carried out at the commencement of the project shall ensure that there are no stability concerns with the waste rock dumps. Hence, there shall be no critical issues requiring instrumentation or monitoring, and no monitoring is expected.

Acid rock drainage and metal leaching from waste rock and tailings solids and seepage will be monitored on a monthly basis during operations and continue post mining. The need for treatment of ARD/ML drainage will be assessed from water quality samples collected during the operations and closure phases.

The physical stability of mine waste handling facilities (tailings impoundment dykes and waste rock piles) and the water storage dyke and diversion will be monitored annual by an independent geotechnical engineer and a report prepared for Nevsun which will be forwarded to the Department of Mines. Weekly visual inspections of these facilities will be conducted by mine personnel and observations logged for inspection by the independent geotechnical engineer, and government regulators upon request.

Responsibility for the monitoring detailed above shall be as follows:

- SENET shall report on a monthly basis to the Bisha Environment Manager on the implementation of this Management Plan.
- Bisha Environment Manager shall inspect the condition of the waste rock dumps after every major rain event and shall maintain appropriate records. The inspection shall include:



- Physical walk-over and inspection of the condition of all areas;
- Condition of access roads between the pit and waste rock dumps;
- Compliance with applicable regulatory and corporate requirements.

### **Record Keeping**

The Bisha Environment Manager shall be responsible for record-keeping.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

#### **17.4.11 Tailings**

Tailings monitoring requirements are set out in the Tailings Management Plan as follows.

### **Monitoring and Reporting Procedures**

Responsibility for the monitoring detailed above shall be as follows:

- SENET shall report on a monthly basis to the Bisha Environment Manager on the implementation of this Management Plan.
- Bisha Environment Manager shall inspect the condition of the TMF after every major rain event and shall maintain appropriate records. The inspection shall include:
  - Physical walk-over and inspection of the condition of all areas;
  - Seepage quantity and quality monitoring.
  - Compliance with applicable regulatory and corporate requirements.

An annual independent geotechnical inspection shall also be undertaken on an annual basis.

### **Record Keeping**

The Bisha Environment Manager shall be responsible for record-keeping.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

#### **17.4.12 Non-Hazardous Industrial & Domestic Waste**

Waste monitoring requirements are set out in the Non-Hazardous Industrial & Domestic Waste Management Plan as follows.

### **Monitoring and Reporting Procedures**

Waste monitoring procedures shall be as follows:

- SENET shall report on a monthly basis to the Bisha Environment Manager on the implementation of this Management Plan including:
  - Construction of waste storage facilities;
  - Use of recycling facilities;
  - Vermin and litter control;
  - Status of wastes inventory.



- Bisha Environment Manager shall inspect the condition of waste storage and waste disposal areas on a monthly basis and shall maintain appropriate records. The inspection shall include:
  - Physical walk-over and inspection of the condition of all areas;
  - Review of waste documentation;
  - Condition of waste transfer and storage areas;
  - Condition of landfill;
  - Condition of incinerator;
  - Condition of recycling activities (if undertaken);
  - Compliance with applicable regulatory and corporate requirements.
- Bisha Environment Manager shall prepare and update the Waste Inventory as the mine develops.

### Record Keeping

The Bisha Environment Manager shall be responsible for record-keeping.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

Audit and inspection will comprise the following:

- Designated waste storage locations will be marked on a plan;
- Each waste storage area will be numbered to facilitate inspections;
- Monthly inspections of waste storage areas will be conducted using the Environmental Inspection Checklist;
- Any spills, leaks, poor containment, lack of labelling or other issues will be recorded and reported to the relevant department for corrective action;
- Corrective actions will be documented on completion.
- Waste management procedures will be audited on a bi-annual basis using an Audit Protocol.

### 17.4.13 Spills and Emergency Response

Spills and emergency response monitoring requirements are set out in the Spills and Emergency Response Management Plan as follows.

#### Monitoring and Reporting Procedures

A key part of preparedness for emergencies is to ensure that all preparations and emergency equipment are in place and functioning as intended. There are two aspects to this:

- routine site inspections; and
- training updates.

Monitoring procedures shall be as follows:

- SENET shall report on a monthly basis to the Bisha Environment Manager on the implementation of this Management Plan during the construction phase, including:
  - Training undertaken (numbers of staff, courses etc);
  - PPE quantities and locations;
- Bisha Environment Manager shall inspect the Project on a monthly basis and shall maintain appropriate records. The inspection shall include:
  - Training;
  - PPE;
  - Site conditions;
  - Observations of management practices;
  - Rehearsals and exercises.
  - Compliance with applicable regulatory and corporate requirements.



- Bisha Environment Manager shall prepare and update the Spill and Emergency Response Plan on a periodic basis.

### **Record Keeping**

The Bisha Environment Manager shall be responsible for record-keeping.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

#### **17.4.14 Hazardous Substances**

Hazardous substance monitoring requirements are set out in the Hazardous Substances Management Plan as follows.

#### **Monitoring and Reporting Procedures**

All hazardous materials will be subject to strict inventory control from the time they enter the site. The Bisha Mine Services Department will maintain an inventory of all hazardous substances purchased, delivered, stored and used at the Bisha Mine site. This inventory will be updated on a monthly basis. Logs will be kept as required for inspection by the regulatory agencies.

The Bisha Environment Manager will conduct routine inspections of all hazardous substances storage areas, worksite areas to look for spills, leaks, overflows and compliance with the procedures. Where necessary, Corrective Actions will be recommended.

### **Record Keeping**

This Bisha Mine Service Department will collect and maintain records on hazardous substances in consultation with the mine manager, for the following:

- reconciled bulk inventory;
- weekly use summaries;
- weekly reconciliation for each storage area;
- overflow alarm tests;
- pressure tests (if applicable);
- inspections and maintenance checks of storage tank system, piping and delivery system;
- any alteration to the system;
- reports of leaks or losses;
- reports of spill responses; and
- records of training.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

#### **17.4.15 Petroleum & Oils**

Petroleum and oils monitoring requirements are set out in the Petroleum & Oils Management Plan as follows.

#### **Monitoring and Reporting Procedures**



The Bisha Mine Services Department will maintain an inventory of all chemicals purchased, delivered, stored and used at the Bisha Mine site. This inventory will be updated on a monthly basis.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

### **Record Keeping**

The Bisha Mine Services Department will maintain an inventory of all chemicals purchased, delivered, stored and used at the Bisha Mine site. This inventory will be updated on a monthly basis.

This Bisha Mine Service Department will collect and maintain records on fuels and lubricants in consultation with the mine manager, for the following:

- reconciled bulk inventory;
- weekly use summaries;
- weekly reconciliation for each storage tank;
- overfill alarm tests;
- pressure tests (if applicable);
- inspections and maintenance checks of storage tank system, piping and delivery system;
- any alteration to the system;
- reports of leaks or losses;
- reports of spill responses; and
- records of training.

The Bisha Environment Manager shall be responsible for record-keeping.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

### **17.4.16 Cyanide**

Cyanide monitoring requirements are set out in the Cyanide Management Plan as follows.

#### **Monitoring and Reporting Procedures**

BMSC shall implement quality control/quality assurance procedures to confirm that cyanide facilities are constructed according to accepted engineering standards and specifications and must implement monitoring programs to evaluate the effects of cyanide use on wildlife, surface and ground water quality.

The Bisha Mine Services Department will maintain an inventory of all chemicals purchased, delivered, stored and used at the Bisha Mine site. This inventory will include cyanide and will be updated on a monthly basis.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.



## Record Keeping

This Bisha Mine Service Department will collect and maintain records on cyanide in consultation with the Bisha Mine and Mill Managers, for the following:

- Tracking and recording of all cyanide use;
- reconciled bulk inventory;
- weekly use summaries;
- inspections and maintenance checks of storage areas;
- inspection of handling methods;
- any alteration to the system;
- reports of spill responses; and
- records of training.

The Bisha Environment Manager shall be responsible for record-keeping.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

### 17.4.17 Reclamation & Closure

Reclamation and closure monitoring requirements are set out in the Reclamation & Closure Management Plan as follows.

#### Monitoring and Reporting Procedures

Closure and post-closure monitoring will document the progress of the closure and reclamation effort. The elements of these monitoring programs will include:

- Inspection of the physical conditions (e.g., for evidence of erosion and landslides) at the end of the initial rainy season post-closure;
- Inspection of the plantings after the first year post-closure;
- After two years, evaluation of the effectiveness of the reclamation effort (e.g., number and type of plant species, plant heights, productivity);
- Demonstration that water quality objectives are met; and
- Assessment of the adequacy and performance of drainage structures and sediment control systems.

Closure and post-closure monitoring and control programs will be conducted twice per year (dry and wet seasons) for a period of five years after closure has been completed. In the event that deficiencies in vegetation establishment are identified, appropriate mitigation measures will be taken to correct these deficiencies.

Monitoring will include field reconnaissance during the first growing season to evaluate revegetation success. The establishment of exotic plant species will also be monitored for at least a two-year period post-closure. Exotic or invasive plants will be physically, mechanically, or chemically removed or treated to limit their establishment. Monitoring will also be used to identify areas that may require supplemental irrigation or nutrients. Vegetation sampling methods will be specified as the Plan is refined but no later than five years before closure.

Monitoring program results will be used to inform and refine ongoing reclamation activities. Therefore adjustments may need to be made to the programs based on observations in the field. The monitoring program will allow for the identification of problems and potential modifications of methods such as:

- Improvements in clearing methods;
- Improvements in methods of seed collection and preservation to increase species diversity;
- Replacement of plant species that do not thrive; and
- Improvement in sowing and planting methods.



## Record Keeping

The Bisha Environment Manager shall be responsible for record-keeping.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

### 17.4.18 Transportation

Transportation monitoring requirements are set out in the Transportation Management Plan as follows.

#### Monitoring and Reporting Procedures

Transportation monitoring procedures shall be as follows:

- SENET shall report on a monthly basis to the Bisha Environment Manager on the implementation of this Management Plan during the construction phase, including:
  - Quality of access roads;
  - Number and size of trucks to be used;
- Bisha Environment Manager shall inspect the condition of areas on monthly basis and shall maintain appropriate records. The inspection shall include:
  - Road conditions along the preferred southern route to Massawa Port;
  - Driver orientation;
  - Driver updates;
  - Maintenance and mechanical inspection of trucks;
  - Compliance with applicable regulatory and corporate requirements.

## Record Keeping

The Bisha Environment Manager shall be responsible for record-keeping.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

### 17.4.19 Occupational Health & Safety

The worker health monitoring program will have three key components:

- health surveillance
- exposure assessment
- environmental monitoring
- quality of life

Health surveillance programs will include monitoring for respiratory conditions and hearing loss. Exposure assessment will include regular area and personal monitoring programs. Biological monitoring may be used if approved by workers. BMSC will use the ACGIH® exposure limits as guidance. Physical, chemical, biological and ergonomic hazards will be assessed in the environmental monitoring program. Quality of life surveys will be used to assess psycho-social effects of camp life.



## 17.5 Social Monitoring

This section provides a summary of monitoring requirements as outlined in the suite of Management Plans that have been developed for the project.

### 17.5.1 SMP01 Cultural Heritage

Cultural heritage and archaeological monitoring requirements are set out in the Cultural Heritage Management Plan as follows.

#### Monitoring and Reporting Procedures

Cultural heritage monitoring procedures shall be as follows:

- SENET shall report on a monthly basis to the Bisha Environment Manager on the implementation of this Management Plan during the construction phase, including:
  - "Watching briefs" they participate in at specific areas/construction sites;
  - The erection and maintenance of demarcation fencing around sites;
  - The protection of sites by careful siting of access routes or facilities;
  - Induction training including cultural heritage awareness given to staff and planned;
  - Cultural heritage-related complaints and actions taken; and
  - Cases of damage to, or disruption of, cultural heritage properties and actions taken.
- Bisha Environment Manager will conduct routine inspections of site activities in consultation with the Construction Manager and Mine Manager to assess the potential for chance finds at work sites and any other cultural heritage issues that may arise.
- Bisha Environment Manager will conduct an inspection of any cultural heritage field activities and documentation that are implemented as a result of a chance find or other event that results in archaeological field work. The inspection shall include:
  - Details of all work specifications prepared and implemented;
  - Monitoring/"watching briefs" conducted at specific construction and other sites;
  - Consultation with local communities related to cultural resources;
  - Communication and cooperation with SENET and the National Museum;
  - How the Cultural Heritage Database is being maintained;
  - Information dissemination regarding cultural heritage;
  - Performance of SENET in managing cultural resources at specific construction sites;
  - Cultural heritage-related complaints and actions taken; and
  - Cases of damage to, or disruption of, cultural heritage properties and actions taken

#### Record Keeping

The Bisha Community Relations Manager shall be responsible for record-keeping.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

### 17.5.2 SMP02 Stakeholder Engagement

Stakeholder engagement monitoring requirements are set out in the Stakeholder Management Plan as follows.

#### Monitoring and Reporting Procedures

Stakeholder engagement monitoring procedures shall be as follows:

- The Bisha Public Consultation Officer shall report on a monthly basis to the Bisha Community Relations Manager, including on:
  - Engagement activities;
  - Visitors to the Store Front Information Centres;



- Level of participation by different stakeholder groups (e.g. women);
  - Comments from, and feedback provided to, stakeholders;
  - Commitments made to local communities by the Project;
  - Disclosure materials disseminated: types, frequency, and location;
  - Community attitudes and perceptions;
  - Community complaints and their resolution;
  - Community relations staff, their duties/activities and staff changes;
  - Committees, groups and partnership activities related to engagement; and
  - Project website.
- Bisha Community Relations Manager shall regularly participate in engagement activities and shall inspect BMSC documentation on a monthly basis. The inspection shall include:
    - Stakeholder engagement records;
    - Budget expenditure records;
    - Complaints forms, log and records detailing how complaints were resolved;
    - Public comments books/ other documents showing issues raised by stakeholders;
    - The schedule/action plan for implementing the engagement program;
    - Commitments register for local communities;
    - Community relations staff reports;
    - Correspondence received by government or other stakeholders; and
    - Disclosure materials disseminated.

The community engagement process will be used to measure the effectiveness of BMSC activities within the community and to track changes in the relationship between the project and its host communities over the life of the project. BMSC will conduct regular consultation with local communities and governments and will make known any complaints regarding the project.

Monitoring will be conducted to ensure that BMSC is achieving the actions defined in the stakeholder engagement program as well as to monitor community perceptions and attitudes. BMSC will use the stakeholder database and tracking system that contains records for all engagement activities for the project to establish a monitoring program. Key metrics should be monitored on a regular basis, and recommended requirements are outlined below.

Parameter/Metric	Frequency	Rationale	Description
<b>Engagement activities</b>	Monthly	Corporate policy requires effective engagement with host communities and government about project activities	By stakeholder group (e.g. communities, government, other) By activity type (e.g. public meeting, public awareness / education workshop etc)
<b>Information materials disseminated</b>	Monthly	Indicator of published material disclosed Indicator of information/feedback provided to stakeholders	Type of materials disclosed; Total materials disseminated
<b>Participation by women</b>	Monthly	Indicator of women's participation Traditional roles mean women are not generally involved/consulted on activities outside the home	Total women involved in meetings; Women's issues and concerns raised
<b>Visitors to store front information centres</b>	Monthly	Indicator of interest in the project and stakeholder concerns Indicator of level of participation	By geographic location; By gender
<b>Complaints/grievances</b>	Monthly	International standards require grievance process Indicator of community attitude toward project	Complaints received; Complaints resolved By type of complaint (e.g. noise, dust, traffic, employment, compensation etc)

As the project progresses into the operations phase, there may be additional metrics that further demonstrate the ongoing relationship between the project and key stakeholders. Information collected during the monitoring program for this component will be made available to the public.

**Record Keeping**

The Bisha Public Consultation Officer shall be responsible for record-keeping.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:



- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

**17.5.3 SMP03 Human Resources & Employment**

Recruitment and employment monitoring requirements are set out in the Human Resources and Employment Plan as follows.

**Monitoring and Reporting Procedures**

Human resources monitoring procedures shall be as follows:

- The Bisha Human Resources Manager shall maintain records on the following:
  - Recruitment conducted;
  - Recruitment and employment targets;
  - How the Employment Database is being maintained;
  - Training conducted/given to staff and planned;
  - Interviews and random selection processes;
  - Job descriptions and selection criteria;
  - Information dissemination regarding employment, including vacancy announcements;
  - Operation of recruitment offices;
  - Equities and inequities in recruitment process (e.g. gender, ethnicity, age);
  - Employee grievances and actions taken;
  - Cases of corruption and disciplinary actions taken; and
  - Working conditions and related issue.
- Bisha Human Resources Manager shall inspect recruitment offices and BMSC/SENET documentation on monthly basis and shall maintain appropriate records. The inspection shall include:
  - Records of recruitment processes;
  - Records of employees hired;
  - Records of hours worked;
  - Records of wages paid;
  - Records of grievances and of disciplinary actions taken;
  - Condition of workers on site and worker camp areas;
  - Records of training given to staff;
  - Condition and operation of recruitment offices;
  - Other spot checks of relevant practices and documentation;
  - Compliance with applicable regulatory and corporate requirements.
- SENET will report on a monthly basis to the Bisha Human Resources Manager on the implementation of this Management Plan during the construction phase.

Monitoring recruitment and employment activities will be done to track the number of local, national and expatriate employees hired in different skill categories over the life of the project. In addition, monitoring the recruitment and employment process will aim to ensure that recruitment and employment procedures are being implemented in a transparent manner and in accordance with national and international standards.

BMSC will use the personnel database that contains records for all personnel employed for the project to establish a monitoring program for recruitment and employment. Key metrics should be monitored on a regular basis, and the minimum requirements are outlined below.

Parameter/Metric	Frequency	Rationale	Description
New hires	Monthly	Employment targets require national employment to be maximised in all skill	By skill category (e.g. unskilled, semi-skilled, skilled)



		categories Indicator of national skills enhancement	
		Mining Agreement requires BMSC to report on local/national/expatriate employment	By geographic location (Local/National/Expatriate)
		Indicator of temporary versus long-term employment Indicator of contractor performance on national employment	By organisation (BMSC, SENET or other direct contractor)
<b>Total employees/hours</b>	Monthly	Indicator of employees on site; national employment achieved	Persons to date; Man hours to date
<b>Wages paid</b>	Monthly	Indicator of indirect economic benefit	Wages paid this month
<b>Training to staff</b>	Monthly	Indicator of national skills enhancement	Persons trained; Man hours
<b>Local worker training</b>	Quarterly	Indicator of local skills enhancement Corporate policy requires support for employment to local communities	Persons trained; Persons employed (for project or elsewhere)
<b>Employee grievances</b>	Monthly	International standards require grievance process Indicator of employment conditions	Grievances received; Grievances resolved

Information collected during the monitoring program for this component will be made available to the relevant government agencies. Limited information that is not confidential or sensitive will also be made available to the public.

**Record Keeping**

The Bisha Human Resources Manager shall be responsible for record-keeping.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

**17.5.4 SMP04 Community Assistance**

Community assistance and development monitoring requirements are set out in the Community Assistance Plan as follows.

**Monitoring and Reporting Procedures**

Community assistance and development monitoring procedures shall be as follows:

- The Bisha Public Consultation Officer shall monitor the implementation of the community assistance program and report to the Bisha Community Relations Manager on at least a quarterly basis, including:
  - The number and value of projects supported for community assistance;
  - Villages benefiting from improved water, sanitation or other similar systems;
  - New or improved infrastructure developments funded;
  - Training, skills development and capacity building provided including the number of sessions held and number of people trained;
  - The number of awareness raising materials distributed to target stakeholders;
  - Public attitudes to community development initiatives; and
  - Performance of the Community Action Group and implementing partners.
- The Bisha Community Relations Manager shall inspect community assistance projects and documentation on a quarterly basis and shall maintain appropriate records. The inspection shall include:
  - Records of community assistance activities/meetings/events;
  - Records of funds disbursed;
  - Feedback from local communities related to projects implemented;
  - Records of training given to communities;



- Condition and operation of specific projects (e.g. for infrastructure projects);
  - Status of projects already implemented;
  - Review of projects being planned;
  - Spot checks on the activities of the Community Action Group; and
  - Review of progress and performance of implementing partners or operators.
- The Bisha Community Relations Manager shall report findings from regular inspections to the community assistance Steering Committee;
  - Each project or initiative to be funded by BMSC as part of the community assistance program shall have its own specific monitoring and evaluation procedures; and
  - The Community Action Group shall participate in monitoring Project progress of community assistance projects and related activities.

The planning for each individual project will include definition of specific objectives, expected measurable results and key indicators of success. Key indicators must be able to show statistically significant results or improvements. To achieve this may require specific baseline studies and data collection to be carried out prior to implementation of the community assistance project.

BMSC will develop key indicators and measurable results for each community assistance initiative to monitor how these projects change the social and economic conditions of the recipient communities. Communities that are beneficiaries of the projects being implemented will be included in the monitoring program.

#### **Record Keeping**

The Bisha Public Consultation Officer shall be responsible for record-keeping.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

#### **17.5.5 SMP05 Land Use**

Land use management monitoring requirements are set out in the Land Use Management Plan as follows.

#### **Monitoring and Reporting Procedures**

Land use management monitoring procedures shall be as follows:

- The Bisha Community Relations Manager shall monitor the implementation of the program and report to the Bisha General Manager on at least a quarterly basis, including:
  - Specific mitigation measures developed and implemented;
  - Engagement conducted with government and affected communities;
  - In-kind support provided to families/households;
  - Funds disbursement history;
  - Activities conducted by government versus BMSC related to mitigation measures;
  - Affected people involved with the Agriculture Improvement Program;
  - Support for vulnerable people;
  - Performance of implementing partners;
  - Perceptions/attitudes of affected people towards the program; and
  - Complaints process.
- Each measure or initiative to be funded by BMSC as part of this plan shall have its own specific monitoring and evaluation procedures; and



- Affected people shall participate in monitoring progress of each of the mitigation measures implemented through this plan.

Monitoring land use activities and land-based productivity initiatives will be done to monitor whether commitments made by the project have been implemented and whether inputs are delivered on schedule and as agreed with affected communities.

The planning for each individual project will include definition of specific objectives, expected measurable results and key indicators of success. Key indicators must be able to show statistically significant results or improvements. To achieve this may require specific baseline studies and data collection to be carried out prior to implementation of the land-based initiative or project.

BMSC will develop key indicators and measurable results for each land-based productivity initiative to monitor how these projects change the social and economic conditions of the recipient households or communities. Households/communities that are beneficiaries of the projects being implemented will be included in the monitoring program.

Monitoring for land-based productivity initiatives is expected to continue for a short time after projects or programs have been implemented however this will be for a defined and finite period (up to 1 or 2 years).

### **Record Keeping**

The Bisha Community Relations Manager shall be responsible for record-keeping.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period; and
- Any other issues of concern.

### **17.5.6 SMP06 Community Health & Safety**

Community health and safety monitoring requirements are set out in the Land Use Management Plan as follows.

#### **Monitoring and Reporting Procedures**

Community health and safety monitoring procedures shall be as follows:

- SENET shall report on a monthly basis to the Bisha Health & Safety Manager on the implementation of this Management Plan including:
  - Workforce conduct within the community;
  - Any instances of workforce non-compliance with Project rules and regulations;
  - Condition of access roads and dust suppression activities;
  - Security arrangements;
  - Employee personal health program;
  - Implementation of the substance and alcohol abuse policy; and
  - Time lost to illness or disease by workers.
- Bisha Health & Safety Manager shall inspect the condition of areas of activity at the site on a monthly basis and shall maintain appropriate records. The inspection shall include:
  - Safety practices in areas that could impact communities;
  - Spot checks of vehicles entering/exiting nearby local communities;
  - Spot checks to indicate that workers and communities are aware of health issues, the Code of Conduct and other Project rules;
  - Conditions of roads and other areas prone to dust;
  - Health and safety inductions;
  - Record for the personal health program;
  - Records for the drug and alcohol testing program;



- Lost time incident statistics; and
- Records related to education events to raise health & safety awareness in communities.

The community engagement process will be used to measure the effectiveness of measures to protect community health and safety. BMSC will conduct regular consultation with local communities and government and will make known any complaints regarding traffic, nuisance noise and vibration (e.g. from blasting), dust and air quality, workforce conduct in the community, downstream water quality and site security. BMSC will ensure that modification and/or improvement of onsite or offsite health and safety controls is conducted in the event that any of these issues is of public concern.

### **Record Keeping**

The Bisha Health & Safety Manager shall be responsible for record-keeping.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- Any other issues of concern.

### **17.6 Auditing and Continual Improvement**

Despite careful planning, it is highly probable that certain components of the monitoring plan will need to be modified. Therefore, it will be necessary to audit or review the plan to pinpoint those components needing correction, adjustment, or upgrading. Operational aspects of the plan, as well as any paperwork that deals with the plan, will be reviewed. A goal will be to continuously audit all aspects of the plan for effectiveness.

Formal evaluations of the monitoring plan will be documented, deficiencies noted in the report, and progress in addressing deficiencies tracked in writing. Responsibilities to address deficiencies and accountabilities will be assigned and deadlines for addressing required changes will be set. The Bisha Mine Manager will assume overall responsibility for the process; authorization for expenditures may be required from other management personnel.

### **17.7 Record Keeping and Reporting**

Monitoring records will be maintained for all significant environmental matters. This will include accidents, spills fires occupational illnesses and other emergencies. This information will be reviewed and evaluated to improve the effectiveness of all the programs that involve environmental and health and safety programs.



## 18 Construction Environmental & Social Management Plan

### 18.1 Introduction

The *Construction Environmental & Social Management Plan* ('CESMP') is designed to ensure the control and limitation of disturbance to the Bisha site and its surrounding environment during pre-construction and construction activities. The Plan describes the measures to be used to protect the public and local communities, workers, the environment, wildlife and ecological habitats in proximity to the site.

This CESMP defines the specific actions that will be required of the main EPCM contractor, and other contractors and subcontractors as appropriate, who will be involved in Project construction in order to comply with the commitments made in the Project Social and Environmental Impact Assessment (SEIA) and Social and Environmental Action Plan (SEAP) together with the specific requirements of the Project Social and Environmental Management Plans (EMPs).

The Plan recognises that some disturbance to the environment and local communities is inevitable but sets out a systematic approach for the minimisation of disturbance together with monitoring plans to assess the effectiveness of mitigation.

### 18.2 Objectives

The specific objectives of the Plan are to:

- Define Eritrean legal requirements;
- Define BMSC corporate policies and procedures to guide the contractors and sub-contractors;
- Establish a framework for environmental management of all construction activities conducted within the Bisha Project Area;
- Identify the key environmental, heritage and socioeconomic issues that are relevant to construction activities in the Bisha Project Area;
- Prevent the pollution of soil, ground water and surface water resources during construction;
- Prevent the mobilisation of contaminated soils and sediment;
- Minimise noise and vibration during construction activities;
- Minimise odours, greenhouse gases, ozone-depleting gases and the generation of dust;
- Ensure waste minimisation and sound waste management practices;
- Establish effective traffic management;
- Protect ecological habitats within and surrounding the BMSC site;
- Define roles and responsibilities; and
- Define monitoring and reporting procedures.

### 18.3 Scope and Structure

The specific focus of this Plan is on the management of construction impacts associated with the Bisha mine including the accommodation camp, plant site earthworks, access roads and construction of the mill. The CESMP follows the structure below:

- Section 2: describes Eritrean legal requirements for construction activities;
- Section 3: describes BMSC corporate policies;
- Section 4: outlines the main impacts associated with construction;
- Section 5: describes the procedures for environmental management; and
- Section 6: describes requirements for auditing and reporting.

### 18.4 Regulatory Requirements

#### 18.4.1 Eritrean Requirements

The "National Environmental Assessment Procedures and Guidelines, March 1999" (NEAPG) outline the Eritrean requirements for environmental assessment. SEIA is the responsibility of the Department of Environment (DoE) of the Ministry of Land, Water and Environment. The procedures outline six main stages in the EIA process comprising:

1. Project Screening;
2. Preparation of Terms of Reference (ToRs);
3. Implementation of the SEIA and development of the Environmental Management Plan;



4. Review of the Application (SEIA/SEAP);
5. Project Approval; and
6. Monitoring and Evaluation.

Mining legislation in Eritrea also outlines two key provisions for the environmental assessment of projects: A Proclamation to Promote the Development of Mineral Resources No. 68/1995. Article 43 defines the type of mineral license to be awarded; initial (prospecting licenses) can be converted to exploration licenses and so on provided that legal obligations and fees are met; a Mining Licence entitles the licensee to a 90% interest and the State of Eritrea holds the remaining 10% interest, without cost.

Regulations on Mining Operations, Legal Notice No. 19/1995, Article 5. The holder of a Mining Licence shall pay the Eritrean government royalty for all minerals produced, income tax in accordance with the Proclamation No.68/1995, a licence renewal fee and annual rental fees for licence areas.

The Development of Mineral Resources Proclamation No. 24/1995 and Mining Operation Regulation requires biodiversity conservation and sustainable use as well as the protection of environmental and archaeological sites. Both require that an EA be completed and submitted before a mining license is granted. Section 30 of Legal Notice No. 19/1995 also lays out the duties of the licensee with regards to worker training, transport and the storage of explosives and chemicals. The mining licensee must also undertake progressive reclamation and have the area restored upon termination of the license.

The development of environmental legislation in Eritrea is currently underway and draft framework laws are in progress. The Eritrean government is focussing on the protection of its valuable ecological and cultural heritage and it is expected that the legislative climate will evolve fairly quickly going forwards. Eritrea has yet to adopt international laws, other than the Treaties which the country has ratified, but it is also likely that the relevant EU, WHO and ILO standards will be integrated in due course.

The Bisha Project and SEIA process provide an opportunity for local capacity building in relation to emerging law.

#### **18.4.2 International Finance Corporation Environmental Guidelines**

With regards to construction, IFC General Environmental Health & Safety Guidelines set out management strategies on the following<sup>22</sup>:

- Environment;
- Noise and Vibration;
- Soil Erosion;
- Air Quality;
- Solid Waste;
- Hazardous Materials;
- Wastewater Discharges;
- Contaminated Land;
- Occupational Health and Safety;
- Community Health and Safety;
- General Site Hazards;
- Disease Prevention; and
- Traffic Safety.

#### **18.5 BMSC Policies**

BMSC policies on Environment, Health and Safety, Social Responsibility and Employees will be followed during all construction activities on the Bisha site. The Policies are reproduced below. Adherence to these policies is obligatory for all contractors and sub-contractors to the Bisha Project.

<sup>22</sup> International Finance Corporation. *General Environmental, Health & Safety Guidelines*. 30 April 2007.



**POL 1:**

**Environmental Policy**

The Board of BMSC is committed to protecting the environment by applying sound environmental management practices that minimise environmental impacts from exploration through to decommissioning and closure.

We pledge to:

- comply with all host country environmental laws and regulations together with industry best practice standards or whichever is the more stringent of the two;
- commit the necessary resources to support and implement the company's environmental policy;
- establish and maintain an Environmental Management System (EMS) in line with ISO 14001:2004;
- be committed to continual improvement in environmental performance by developing environmental indicators, monitoring and auditing performance, and by implementing corrective actions where needed;
- report externally on environmental performance and encourage dialogue with employees, local communities and other stakeholders to promote environmental awareness;
- include environmental performance criteria in decisions on promotions, salary increases and awarding contracts;
- apply the principles of BAT (Best Available Technology) to environment management;
- reduce, re-use and recycle resources and implement proper waste management practices;
- train, motivate and ensure that all employees adhere to environmental protection and pollution prevention policies;
- incorporate an emergency preparedness and response system into standard operating practices; and
- monitor and report on performance through periodic audits.



**POL 2:**

**Health & Safety Policy**

The Board of BMSC recognise that the safety and security of its employees and the communities in which it operates is an integral part of its business. We seek to create a mindset where people believe it is possible to work injury free, regardless of what role they perform.

Our guiding principles are:

- all injuries are preventable;
- our most important objective is safety and health;
- working safely is a condition of employment; and
- any task that can't be done safely shouldn't be done.

To ensure that these principles are adopted, BMSC will:

- train and motivate all our people to work in a safe and responsible manner;
- carry out risk assessment for all construction and operational activities;
- ensure that health and safety performances comply with relevant legislation;
- assist the local community in health awareness activities;
- establish and maintain a health & safety management system in accordance with the requirements of OHSAS 18001:2007;
- adhere to local laws as well as international standards on law enforcement in securing its operations, particularly those that relate to the use of force<sup>1</sup>;
- carry out risk assessments in relation to security issues at each of its project sites; and
- ensure that security is managed in a way that respects and protects human rights, avoids creating conflict and addresses security threats in as peaceful a way as possible.



**POL 3:**

**Social Responsibility Policy**

The Board of BMSC recognises that corporate success is predicated on communities sharing the benefits of project development. BMSC management will conduct the company's business activities to:

- conduct business within a framework that promotes worker and community health and safety, environmental protection, human rights, community involvement, community benefits and the quality of life for employees and their families;
- actively promote understanding by all BMSC employees, of culture, language and history of the communities, regions and countries in which we work;
- work to protect cultural heritage resources potentially affected by our activities;
- conduct activities in a manner that respects traditional-use rights, cultures, customs and social values;
- promote job equity and equal access to employment opportunities for women;
- build capacity by sharing environmental and social experiences and solutions with local communities and regional and national governments;
- actively consult with local communities to identify and resolve environmental and social issues;
- procure materials, goods and services in a manner that enhances local benefits and protects against unethical practices such as child labour and forced labour;
- establish social responsibility performance criteria; and
- monitor and report externally on performance through periodic audits.



**POL 4:**


**Employee Policy**

BMSC holds its employees in the highest esteem and understands that their goodwill, loyalty and dedicated work effort is the key to the success of the Company.

The Company is committed to the creation of a work environment which helps and encourages employees to reach their personal and professional goals, as well as ensures the timely achievement of Company business objectives. In achieving the above objectives, BMSC will:

- establish a sound human resources policy framework which meets all aspects of the Eritrean Labour Law and international labour standards and conventions;
- ensure that conditions of employment adhere to the standards of freedom, security, equity and dignity;
- ensure that involuntary labour is not used by BMSC or its contractors, specifically the use of Eritrean National Service personnel on extended service;
- abide by minimum age laws and conventions and prohibit all forms of child labour;
- not discriminate against potential or existing employees on the basis of religion, ethnicity, gender or other factors;
- adopt recruitment procedures which facilitate the employment of people from the immediate Project area and local communities in the first place;
- ensure fair entitlements, benefits and remuneration, of a level which is in keeping with Eritrean norms and laws and enables BMSC to attract and retain employees;
- ensure effective employee administration and records management systems;
- implement mechanisms for the fair and consistent measurement of employee performance;
- provide avenues for the timely, confidential and appropriate resolution of employee grievances and complaints;
- foster a culture of teamwork and cooperation within BMSC and the development of strong relationships between employees across all departments;
- actively provide Company information to employees and consult with workers on issues that affect them;
- provide appropriate training to ensure that each employee has the required skills and knowledge to perform their allocated duties in a safe and competent manner; and
- continuously develop and improve human resources management systems, policies and practices.



	<b>POL 5:</b>
	<b>Code of Conduct</b>
<p>BMSC is committed to maintaining good relations with its employees, neighbours and other communities potentially affected by the Project. All employees, contractors and subcontractors will be required to uphold the highest Code of Conduct at all times. The scope of the Code of Conduct will be reviewed by BMSC management on a regular basis.</p>	
<ul style="list-style-type: none"><li>● <b>Health &amp; Safety of Yourself, other Employees/Contractors and the Community:</b><ul style="list-style-type: none"><li>○ The Project has a zero tolerance to crimes and violence.</li><li>○ Use of force will not be tolerated and all disagreements must be resolved through appropriate legal channels.</li><li>○ Vehicles must be operated safely and in accordance with established speed limits in local communities.</li><li>○ No job should be undertaken if it is not safe to do so.</li></ul></li><li>● <b>Private Property:</b><ul style="list-style-type: none"><li>○ Respect the private property of others.</li><li>○ Private property must not be removed, damaged or altered unless with the prior approval of the community and/or owner and as part of the agreed Project plan.</li></ul></li><li>● <b>Natural Resources:</b><ul style="list-style-type: none"><li>○ Hunting wildlife is prohibited.</li><li>○ The carrying of firearms, explosives etc is prohibited.</li><li>○ Workers are forbidden to collect natural resources (e.g. plants or animals, geological samples etc) unless specifically authorised to do so as part of Project activities.</li><li>○ Cutting trees within the mine property is against Ministry of Agriculture regulations on tree protection and preservation.</li><li>○ Vegetation that is permitted to be cleared from construction sites is the property of local communities and the company has committed to provide these resources to the community as appropriate.</li><li>○ Workers shall dispose of waste in a responsible manner and in accordance environmental procedures.</li></ul></li></ul>	



- **Religious and Sacred Structures/Areas:**
  - Respect the religious shrines and burial sites and practices of the local population.
  - Do not disturb shrines and other religious monuments (adjust work program in order to avoid creating the need to disturb such structures).
  - Recognise that shrines and sacred sites may include trees, sheds, piles of pebbles, and piles of offerings.
  - Follow BMSC Project procedures if chance finds are encountered.
- **Alcohol and Illegal Substances:**
  - An Alcohol and Substance Abuse Policy is in place for the Project.
  - Alcohol consumption is discouraged.
  - No illegal substances may be consumed at any time, and the use of medicines must be authorised by the site doctor or nurses.
  - Random drug testing will be done.
- **Avoid Micro-economic Distortion:** Avoid over-payment for goods and/or services by agreeing any payment in advance, keeping in mind that locally accepted prices for goods and services are likely to be considerably lower than in cities and other areas of Eritrea. Goods and services acquired by company personnel from community members must be paid for “on the spot” not on “credit”.
- **Community Goodwill vs. Opportunity Seekers:** Respect the goodwill of the community; however care should be taken to not take advantage of this goodwill. Employees and contractors are encouraged to return the gestures of goodwill, at their own discretion, however this needs to be balanced with the potential to create expectations that goodwill will be met by payment.
- **Religious / Traditional Days of Celebration:** Respect the religious and/or traditional days of celebration and their restrictions (as advised by the community relations team).
- **Respect Community Members and the Traditional Leadership:** Any contact with community members shall be conducted in a manner commensurate with the traditional culture of the area.
- **Respect requests of Community Leaders:** Any request / issue raised by community leaders shall be directed to the Community Liaison Officers or other member of the community relations team. Any complaints shall be treated under the procedure defined by the BMSC Stakeholder Engagement Programme.
- **Harassment:** Harassment of any kind will not be tolerated from personnel engaged with the Project. Harassment may take many forms including religious and ethnic slurs, jokes, statements, gestures, impeding another’s movement, culturally offensive writing or pictures, and unwelcome sexual advances or conversations.
- **Security:** Workers must carry appropriate identification at all times and there will be no access to site by non-authorised personnel. Workers must be willing to produce identification upon request.

## 18.6 Potential Impacts of Construction

Construction works have the potential to cause a number of impacts to the biophysical and socio-economic environment. In the case of Bisha, it is expected that most of these impacts are minor and short-lived, subject to the implementation of appropriate mitigation measures. The expected impacts are described below.



### 18.6.1 Air Quality

Air emissions relate principally to exhaust emissions from plant, equipment and vehicles together with dust. The potential for dust to be emitted during construction is strongly dependent on the type and nature of activities taking place, such as the movements of vehicles and their speed, soil stripping activities, trench excavation, backfill and reinstatement.

Wind speed and wind direction relative to receptors are also key factors in determining the magnitude and duration of air quality impacts. Potential sources of dust and gaseous emissions during the construction phase include:

- Land clearance and preparation;
- Drilling, blasting and excavation;
- Heavy vehicle operation, particularly on unsealed roads;
- Topsoil / overburden loading, unloading, transportation and storage;
- Extraction of borrow materials;
- Access road construction;
- General vehicle use; and
- Power generation.

Other atmospheric emissions from activities at the site will include dust generation, odours, particulate and fugitive emissions, greenhouse gases (GHG) and ozone-depleting gases (ODS). Sources of these atmospheric emissions could include clean and contaminated soil, other sediments, vehicle emissions, materials (e.g. asphalt) and fugitive sources from remnant building and infrastructure materials.

### 18.6.2 Noise and Vibration

There is some potential for noise and vibration impacts to be perceptible to persons at the Bisha site and camps from most activities including site clearance, soil stripping, excavation and earthworks, installation of underground services and roadways, construction of buildings and landscaping.

During the construction phase, a higher level of noise is usually tolerated if the duration of works is relatively short. Controlling construction noise involves both noise level and time restrictions. The shorter the work phase, the more likely that higher level of construction noise will be acceptable. As the length of the construction period increases, the tolerable exceedance of the background level is reduced.

### 18.6.3 Soil Disturbance and Erosion

Impacts to terrain and erosion will occur in all phases of the Project although the effects will be greatest during construction. During construction the main areas of potential concern regarding soil disturbance are:

- earthworks for the open pit, tailings area, tailings dam and plant site including cut and fill and levelling operations;
- road construction;
- waste rock hauling and dumping; and
- total particulate movement during periods of excessive wind.

Minor disturbances will also occur due to normal vehicle traffic required to service the above Project activities.

The key issues related to erosion include rainfall and runoff from areas of freshly disturbed soil. Erosion issues are expected to decline as disturbed areas and water courses are subject to engineered protection designed to minimise disturbance.

### 18.6.4 Flora and Fauna

Potential impacts associated with construction activity include the following:

- direct loss of native vegetation through tree removal;
- loss of habitat for existing fauna and habitat fragmentation;
- loss of amenity, natural screening or recreational space;
- potential soil erosion; and
- generation of dust and alterations to other vegetation communities due to changed runoff regimes, mobilisation of higher levels of contaminants and increased turbidity.



### 18.6.5 Archaeology & Cultural Heritage

Whilst the project Area has been cleared of archaeological sites, it may be possible that there will be 'chance finds' during construction activities. BMSC has developed a Chance Finds Procedure as described in Section 5.5 below.

### 18.6.6 Roads and Public Transport Network

The increased traffic on the local roads during the construction period is likely to have the following impacts:

- noise and vibration;
- air emissions;
- traffic congestion;
- safety issues to the public; and
- risk of traffic impact with humans or fauna including livestock which is of particular importance to community livelihoods.

### 18.6.7 Waste Generation

Typical wastes that will be generated from construction and operations are listed below:

- Hazardous Wastes
  - waste oils, lube oil and solvents;
  - used oil and chemical drums;
  - laboratory and medical wastes; and
  - chemical waste products, from construction, processing, tails treatment etc.
- Domestic Wastes
  - food waste (i.e., any food remains or wastes that have been in direct contact with food such as containers, napkins, wrappers);
  - biological waste from sewage treatment and first aid operations;
  - paper and cardboard;
  - some plastics; and
  - general camp and office wastes such as used office supplies, liners.
- Inert Bulk Waste
  - conveyor belts, tyres;
  - crusher and chute liners, screen elements;
  - motors, v-belts;
  - piping and fittings;
  - rebar;
  - building and bulk debris, cladding, carpeting, drywall, light bulbs (except in the case of mercury vapour/low energy bulbs);
  - incinerator ash; and
  - scrap metals.

## 18.7 Environmental Management Procedures

In response to potential environmental impacts, BMSC has developed a series of management procedures which are designed to eliminate adverse impacts and, where this is not possible, to reduce adverse impacts to an acceptable level.

It is obligatory for all contractors and sub-contractors to the Project to follow these procedures and to report on their implementation.

Specifically, the Contractor is referred to the Environmental Management Plans (EMPs) which have been developed for the Bisha Project. A summary of these EMPs is provided below and the procedures are summarised by environmental issue.



Table 5.1: Summary of Management Plans

EMP	Summary of Content
<b>EMP 01 Noise Management Plan</b>	The Noise Management Plan addresses the control and limitation of potential sources of noise during the construction, operation and closure of the Bisha Project. The plan describes the proposed measures that shall be used to protect people and settlements in close proximity. The procedure recognises that the generation of some noise emissions is inevitable but, nevertheless, sets out a systematic approach for noise control, monitoring plans to assess potential effects during construction and operation, and monitoring plans for determining the effectiveness of mitigation.
<b>EMP 02 Wildlife Management Plan</b>	The Domestic Livestock and Wildlife Management Plan is to ensure the protection of livestock and wildlife habitat and resources surrounding the Bisha Project footprint during all phases of the Project. The Plan sets out methods for avoiding impacts during construction, monitoring to assess potential impacts during construction, monitoring plans to determine the effectiveness of mitigation and, if required, mitigation works during the operational phase of the Project.
<b>EMP 03 Non-Hazardous Industrial and Domestic Waste</b>	The Non-Hazardous Waste Management Plan is to ensure the effective collection, storage, management and disposal of non-hazardous waste within the Bisha Project footprint during the construction, operations and closure phases of the Project. The plan contains methods that shall be used to prevent adverse effects occurring during construction and operations, monitoring plans to assess potential effects during construction and operation, and monitoring plans for determining the effectiveness of mitigation.
<b>EMP 04 Petroleum and Oils</b>	The Petroleum and Oils Management Plan is to ensure the effective storage, management and disposal of petroleum and oils by the Bisha Project. The plan contains methods that shall be used to prevent adverse effects occurring during construction and operations, monitoring plans to assess potential effects during construction and operation, and monitoring plans for determining the effectiveness of mitigation.
<b>EMP 05 Topsoil Management Plan</b>	The Topsoil Management Plan is to ensure the protection of soils in the areas surrounding the Bisha Project footprint during the construction, operations and closure phases of the Project. The plan contains methods that shall be used to prevent adverse effects occurring during construction and operations, monitoring plans to assess potential effects during construction and operation, and monitoring plans for determining the effectiveness of mitigation.
<b>EMP 06 Waste Water Management</b>	The Waste Water Management Plan is to ensure environmentally sound disposal of waste water generated from the Bisha Project during the construction, operations and closure phases of the Project. The plan establishes guidelines for waste water quality and management, monitoring and reporting. The targets of this Management Plan are to ensure waste water is treated within appropriate regulatory and industry guidelines and to ensure there are no regulatory or community concerns or complaints regarding waste water treatment and management.
<b>EMP 07 Air Quality Management Plan</b>	The Air Quality Management Plan is to ensure the minimisation of air quality impacts related to the Bisha Project during the construction, operations and closure phases of the Project. The plan establishes guidelines for air quality and emissions management, monitoring and reporting.
<b>EMP 08 Cyanide Management Plan</b>	The Cyanide Management Plan is to ensure the effective transport, storage, management and disposal of cyanide by the Bisha Project. The plan contains methods that shall be used to prevent adverse effects occurring during operations, monitoring plans to assess potential effects during operations, and monitoring plans for determining the effectiveness of mitigation.
<b>EMP 10 Emergency Preparedness &amp; Response Plan</b>	The Emergency Response Plan is to ensure the protection of human health and the environment in the areas surrounding the Bisha Project footprint and along all transportation routes during the construction, operations and closure phases of the Project. The plan outlines the responsibilities of BMSC, its contractors and employees at the Bisha site. It provides a reference document that can be used for emergencies and outlines the steps to be taken if incidents occur along transportation routes and any incidents which occur during the construction and operation of the mine and processing facilities.
<b>EMP 11 Tailings Management Plan</b>	The Tailings Management Plan is to ensure the effective management and disposal of tailings residues which will be produced by on-site operations at the Bisha Project site during the operational phase of the Project. The plan contains methods that shall be used to prevent adverse effects occurring during construction, operations and closure and monitoring plans for determining the effectiveness of any mitigation measures.
<b>EMP 12 Terrain and Erosion Control</b>	The Terrain and Erosion Control Management Plan is to ensure the protection of in-situ soils and maintenance of terrain in the areas surrounding the Bisha Project footprint during the construction, operations and closure phases of the Project. The plan contains methods that will be used to prevent adverse effects occurring during construction and operations, monitoring plans to assess potential effects during construction and operation, and monitoring plans for determining the effectiveness of mitigation.
<b>EMP 13 Transport Management Plan</b>	The Transportation Management Plan for the Bisha Project includes the transport of materials and supplies to the Project site and concentrates and wastes generated from the Project site. The destination of materials from the Project will be the port at Massawa on the Red Sea coast. The plan contains methods that will be used to prevent adverse effects occurring along transportation routes, monitoring plans to assess potential effects, and for determining the effectiveness of mitigation during construction and operation.
<b>EMP 14 Hazardous Substances Management</b>	The Hazardous Substances Management Plan is to ensure the effective storage, management and disposal of all hazardous materials used at the Bisha Project. The plan contains methods that shall be used to prevent adverse effects occurring during construction and operations, monitoring plans to assess potential effects during construction and operation, and monitoring plans for determining the effectiveness of mitigation.



<b>EMP</b>	<b>Summary of Content</b>
<b>EMP 15 Waste Rock Management</b>	The Waste Rock Management Plan is to ensure the effective storage, management and disposal of waste rock generated by the Bisha Project footprint during the construction, operations and closure phases of the Project. The plan contains methods that shall be used to prevent adverse effects occurring during construction and operations, monitoring plans to assess potential effects during construction and operation, and monitoring plans for determining the effectiveness of mitigation.
<b>EMP 16 Water Resources Management</b>	The Water Resources Management Plan is to ensure the protection of water resources in the areas surrounding the Bisha Project during the construction, operations and closure phases of the Project. The plan contains methods that will be used to prevent adverse effects occurring during construction and operations, monitoring plans to assess potential effects during construction and operation, and monitoring plans for determining the effectiveness of mitigation measures.
<b>EMP 17 Monitoring Plan</b>	Provides the social and environmental monitoring programme for the Project including the responsibility, frequency and parameters for monitoring.
<b>EMP 18 Construction Environmental &amp; Social Management Plan (this plan)</b>	Describes the priority environmental mitigation and monitoring actions which need to take place early in the construction programme to minimise the risk of adverse environmental and social impacts.

### 18.7.1 Air Quality

*During all stages of construction, BMSC is committed to minimising and managing potential atmospheric impacts on construction workers, nearby communities and the surrounding environment. Procedures to reduce potential impacts are given below.*

#### *Management Procedures*

- Water will be applied by water truck whenever unsealed surfaces have the potential to release excessive levels of dust. The frequency of dust suppression may be increased according to dust observations and in periods of prolonged dry conditions.
- Construction machinery and vehicles will be well maintained in good working order.
- Progressive decommissioning and engineering principles will be applied to reduce dust generation from stockpiles of soil and vegetative materials to the extent possible and practical.
- Vehicles must not be over loaded or loaded to the point that spillage may occur.
- Vehicle emissions will be kept to a minimum by avoidance of unnecessary engine running time.
- Access roads will be dampened using directional sprayers and vehicle speeds on access roads will be restricted.
- The use of ozone-depleting substances (ODSs) will be avoided unless specifically permitted by BMSC; if ODSs are present in refrigerants or air con systems, they must be approved by the Environment Department.
- Complaints related to atmospheric emissions from stakeholders will be responded to within 48 hours using the standard Grievance Mechanism.
- Low sulphur and low aromatic fuel will be used, as available.
- Equipment maintenance will be undertaken in accordance with manufacturer's instructions and at the specified maintenance interval.
- Vapour recovery units will be used on fuel/chemical storage tanks.
- Dust collection systems will be used for bulk materials unloading.
- Land disturbance will be minimized through careful delineation of construction areas.
- Uncontrolled burning of domestic waste on site shall be prohibited at all times.
- Vehicles (both on and off-site) will observe designated rights of way and speed limits,

### 18.7.2 Noise

*BMSC is committed to minimising and managing environmental impacts from noise and vibration during the construction phase of the Bisha Project.*

#### *Management Procedures*

- Work will be undertaken within the agreed working hours.
- All construction plant, machinery and vehicles will be maintained and in good working order.



- Noise will be reduced where possible and by using low noise equipment, acoustic barriers and other noise abatement devices.
- Impacts at sensitive locations will be reduced through implementing noise insulation treatments such as suitable façade constructions, acoustic ventilation paths and minimisation of structure borne sound transmission paths.
- Vibration will be minimised to the extent practical at any neighbouring premises. Blasting will occur at scheduled times and a horn will sound, warning nearby residents of an impending blast and potential vibration.
- Complaints will be responded to within 24 hours and mitigation measures checked and improved within 48 hours.
- A noise monitoring programme will be developed for the construction phase.
- Noisy construction activities will be scheduled during normal working hours to the extent possible.
- Regular inspection and maintenance of construction vehicles and equipment will be performed to ensure that quality mufflers are installed and worn parts are replaced.
- Noise barriers, baffles, sound insulation or enclosures for particularly noisy equipment such as generators, crushers, grinders, compressor, pumps, gearboxes, etc., will be considered and utilized where feasible and practical.
- Staff accommodation will be sited away from major noise sources.
- Night-time trucking operations will be avoided, where possible.
- Noise abatement devices will be checked during regular maintenance to ensure that they are in good order (e.g., brakes, exhaust mufflers, engine hoods).
- Vehicles with minimum noise output, including tyre noise, will be selected where practical.

### 18.7.3 Erosion Control

*BMSC is committed to minimising and managing environmental impacts at the site from erosion during the construction phase of the Bisha Project.*

#### *Management Procedures*

- Stockpiles must not be located in stormwater flows or close to river courses.
- The size and area of stockpiles of soil will be minimised.
- Land clearance will be minimised.
- Stockpiles that may be susceptible to erosion must be terraced, covered or have suitable erosion control measures such as silt fences and hay bales.
- Temporary cut off drains, bunding, and other sediment control measures such as sediment traps, hay bales, silt fences and sediment basins, grass swales and buffer strips will be used to capture sediments and nutrients during construction.
- Access routes will use established roads wherever possible.
- The moisture content of access road surface layers will be maintained through routine directional spraying or the use of an appropriate dust suppressant as agreed with the authorities.
- Access roads will be designed with a camber to avoid ponding and encourage drainage to side drains; where necessary, culverts will be installed to permit free drainage of existing water courses.
- Access road surfaces will be suitably compacted to limit sediment release of loose material.
- Access road side drains will be protected with sediment traps and/or gabions to reduce the erosive velocity of water during storm events; regular maintenance of sediment traps will be undertaken.
- Routine inspections will be undertaken to ensure that side drains and culverts are kept free of debris.
- Access road verges will be planted with vegetation (if possible) to reduce erosion potential.
- Off road driving and the creation of new roads/tracks will be avoided wherever possible.

### 18.7.4 Terrestrial Flora and Fauna

*BMSC is committed to minimising and managing impacts on terrestrial flora and fauna from the construction phase at the Bisha site.*

#### *Management Procedures*



#### Flora & Fauna

- Vegetation stripping and clearance operations will be undertaken on an as-required basis, so that stripped areas will remain unused for the minimum period of time; in addition, the minimum area possible will be cleared.
- Prior to the commencement of stripping activities, the stripping panel will be marked out in the field.
- Stripping depth will be clearly indicated to the machine operator.
- Stripping activities will be carried out using a scraper or suitably light front-loader and tractor for haulage; haulage vehicles will adhere to designated routes to minimise soil compaction.
- The area of land to be disturbed through construction activities will be minimised.
- The impact of dust on surrounding vegetation will be minimised by the air quality management strategies described previously.
- Construction activities will be avoided along river boundaries and close to areas of riverine vegetation (e.g. along the Mogoraib, Shatera, Freketetet and their tributaries)
- Fauna sitings will be registered and reported to the Environment Department
- Workers will avoid deliberate disturbance of fauna.
- Lighting of fires will be prohibited and smoking restricted to designated areas.

#### 18.7.5 Archaeological Sites

*BMSC is committed to the protection of cultural and archaeological heritage through the implementation of appropriate management procedures.*

The majority of known archaeological/cultural heritage sites and artefacts within the Project area were excavated, retrieved and relocated prior to earthworks activities. However, there are two sites where relocation activities are required outside of the general construction areas. These are where the proposed river diversion structures will be located. There is a plan to excavate these locations in mid- 2009.

Otherwise, issues arising during construction should be limited to the discovery of chance finds/new sites. The procedures outlined below shall be implemented to deal with chance finds and any resulting archaeological field work that may be required.

For land clearance activities, the following procedures will be adopted:

- Should any archaeological artefacts (relics, bricks, bones, ceramics, graves etc) be encountered, activities should halt immediately and the site should be isolated and clearly marked;
- The Bisha Environment Manager should be informed immediately;
- The Bisha Environment Manager should liaise with the relevant ministry to determine the need for further investigation/appropriate action; and
- Any subsequent investigation or excavation works should be conducted by a suitably-qualified archaeologist.

If necessary, further detailed excavation works should be conducted under the guidance of the relevant national and regional authorities as follows:

- All necessary permits and licenses for archaeological investigation should be obtained.
- Any archaeological finds should be discussed with the local community to establish local significance (even in the absence of legal protection status);
- Topographic mapping of the areas to be excavated should be carried out, to identify the likely spatial extent of deposits;
- The exact area for excavation should then be selected according to the density and physical distribution of archaeological material;
- Trial pits should be dug by hand excavation at the conventional 5cm levels to register archaeological elements together with the physical characteristics of the strata;
- The excavation process and the different archaeological material (ceramics, stones, charcoal, seeds, bones, etc.) should be registered in detail using photographs and field diaries;
- Any material found in the pits should be treated (washed and tagged) and later classified in accordance with generally accepted criteria;
- Samples of material should be sent to specialised laboratories for carbon-dating (e.g. using the C14 method), together with samples of organic remains and soil, which should be analysed for the identification of pollen;



- An analysis of the spatial distribution of the material recovered at each of the levels surveyed should be carried out.

It is BMSC's employees and the Contractor's responsibility to ensure that this procedure is complied with at all times by all employees while working with the Bisha Project. All BMSC employees involved in excavation works (pit expansion, soil stripping, cut and fill operations) should be provided with appropriate training in the reporting procedures for the protection of archaeology. Auditing and inspection should only be carried out by suitably-qualified archaeologists in the event that chance finds are encountered.

Clearance for Ordnance has been undertaken by the Eritrean military. In the unlikely event, however, that uncleared ordnance is encountered during construction works, work must stop immediately and the site supervisor must inform the H&S Manager who will then provide direct instructions to the team. In any event, the protection of personnel safety is the first concern.

### 18.7.6 Roads and Public Transport Network

*BMSC is committed to minimising and managing impacts related to traffic during the construction phase of the BMSC Project.*

*Management Procedures*

- Consideration will be given to all other site users, not involved in construction activity.
- In the event that road closures are required for construction works, stakeholders will be given prior notice of closure times a minimum of 48 hours in advance.
- Vehicles will be well maintained and in good working order.
- Speed limits will be set and observed to minimise dust generation and the risk of accidents.
- Particular attention will be paid to vehicle routes through villages and where there are pedestrians and/or livestock using the roads.
- Traffic routing will observe marked rights of way and reverse parking will be used for light vehicles.
- Heavy vehicles will obey speed limits already set in the area.
- Vehicles will not be loaded above the height of the side and tailboards.
- All loads to and from the site will be covered to prevent the loss of materials.
- Maximum vehicle loads, as agreed with the Ministry of Transport, will not be exceeded.
- Vehicle emissions will be kept to a minimum by avoidance of unnecessary engine running time.
- All complaints involving vehicle movements relating to construction activity will be responded to within 24 hours and action taken within 48 hours.

### 18.7.7 Waste Management and Minimisation

*BMSC is committed to managing and minimising wastes originating from construction activities during the construction phase of the Bisha Project.*

Waste generated as a result of construction activities need to be well managed in order to minimize the impacts on the Project. Where possible the waste hierarchy approach will be used:

- Reuse: as far as practicable, wastes will be reused; reuse may be in a different form or for a different function.
- Recycle: there are currently no recycling facilities in Eritrea. Materials or goods that are waste but cannot be reused can often be recycled i.e. paper, wood, metal, plastic, and glass; this recycling may occur on the site, in the immediate communities or in the region.
- Segregation: segregation of inert, hazardous and non-hazardous wastes will be carried out whenever possible. Segregation of materials such as wood, metal, plastic and inert materials should be the initial targets as this may provide benefits such as cost savings for waste disposal.
- Recovery: if neither reuse nor recycling can be carried out, materials should be considered for recovery as a last resort.
- Send for disposal: where none of the above are practicable the waste can be sent for disposal at controlled on-site disposal location. Further options analysis for waste disposal, including the treatment of hazardous wastes, is being undertaken by BMSC.
- Further waste management procedures are documented in EMP 03 Non-Hazardous Waste Management.



## 18.8 Social & Community Management Procedures

In response to potential social & community impacts, BMSC has developed a series of management procedures which are designed to eliminate adverse impacts and, where this is not possible, to reduce adverse impacts to an acceptable level.

It is obligatory for all contractors and sub-contractors to the Project to follow these procedures and to report on their implementation.

Specifically, the Contractor is referred to the Social Management Plans (SMPs) which have been developed for the Bisha Project. A summary of these SMPs is provided below and the procedures are summarised by issue.

**SMP01 Cultural Heritage Management Plan** is designed to ensure that the Bisha Project has minimal impact on the cultural resources of the Project Area, through the implementation of effective mitigation and monitoring measures through construction, operation and closure. The plan contains the methods to map, document, and excavate known cultural resources, procedures for dealing with chance finds, and monitoring plans and for determining the effectiveness of mitigation measures.

**SMP 02 Stakeholder Engagement Plan (SEP)** provides a comprehensive summary of the consultation activities which have taken place since the commencement of exploration activities at Bisha. The Bisha Project has long been committed to a technically and culturally appropriate approach to consultation and disclosure. Since the beginning of key Project activities in 2004, the goal has been to ensure adequate information is provided to Project Affected People and other stakeholders in a timely manner, whilst aiming not to unduly raise expectations, particularly among local communities near the Bisha Mine site. Through the first phases of engagement efforts, Bisha Mining SC has aimed to provide sufficient opportunity for primary stakeholders to voice their concerns and opinions about Project aspects that may affect them. The engagement process that Bisha Project has adopted can be described by three consecutive phases: First Phase: Planning and Scoping the SEIA Process; Second Phase: Project Assessment Stage (including the SEIA report preparation); and Third Phase: Engagement during Construction and into Operations. Between 2004 and late 2006, consultation and disclosure activities were conducted around the various feasibility studies being undertaken and also the submission of the draft SEIA documentation to the relevant authorities (Phases 1 and 2). Now the Project is moving into construction activities, engagement is focused on Phase 3 of the program, including keeping authorities and communities informed about progress during construction works and helping local people and other Eritreans access employment, business and community development opportunities that will arise from the Project.

**SMP 03 Human Resources and Employment Plan** commits the Company to hiring skilled Eritrean nationals and skilled and semi-skilled locals where possible in line with an Employment and Training Strategy. This commitment is fully compatible with BMSC's Social Responsibility policy which refers to the company's commitment to conduct its activities in a manner that contributes to the sustainable development of the communities in which the company operates and serves to ensure that local communities share in the benefits of Project development.

**SMP 04 Community Assistance Plan:** BMSC has prepared a Community Assistance Plan as a framework for its donations program with respect to communities located close to the Bisha mine site. The Plan will help put into practice BMSC's intention that its activities should contribute to the sustainable development of communities in which the company operates. BMSC will support its community assistance giving through a budget that is established at the beginning of each year. In addition, where there is a specific need and an opportunity, BMSC will consider provision of in-kind support. The latter may involve use of Bisha Project equipment or volunteers from the Bisha Project workforce for a specific community purpose. Benefits of the company's giving will be maximized by identifying low-cost but high-benefit opportunities.

**SMP 05 Land Use Management Plan** is designed to ensure that the BMSC mitigates and/or compensates for impacts to land and land use that will occur as a result of the Bisha Project.

**SMP 06 Community Health and Safety Plan:** The scope of the Community Health and Safety Plan includes measures to address potential impacts of Project-related activities beyond the Project site perimeter. The plan will be active from the beginning of the construction phase to the end of Project life. The plan takes a holistic approach to human health and wellbeing, and will take into account impacts through the physical, social and cultural environments, and upon institutional and individual behaviours.



Major contractors will be required, as part of their contract terms, to have Community Health and Safety plans that meet BMSC expectations as well as legislative standards as set out in applicable acts and regulations.

The principal requirements of these plans is described below,

### 18.8.1 Protection of Cultural Heritage

*BMSC is committed to the protection of cultural heritage at the Bisha Project.*

Cultural heritage impacts will occur predominantly in the construction phase, because land clearance and other intrusive activities are required to prepare the site and build Project facilities. Although construction of the Project will be phased, it is understood that the maximum extent of the facility footprint would be determined in the first year. The majority of known archaeological/cultural heritage sites and artefacts within the Project area were excavated, retrieved and relocated prior to earthworks activities. However, and in the case of Chance Finds, the following procedures will be employed:

- All personnel involved in land clearance and excavation should take responsibility for managing archaeological protection, and should be trained in these aspects;
- Should any archaeological artefacts (relics, bricks, bones, ceramics, graves etc) be encountered, activities should halt immediately and the site should be isolated and clearly marked;
- BMSC employees should respect the cultural and social significance of any such finds during the life of mine and should be strictly prohibited from interfering with or disturbing any such deposits;
- The Bisha Community Relations Manager should be informed immediately;
- The Bisha Community Relations Manager should liaise with the relevant ministry to determine the need for further investigation/appropriate action; and
- Any subsequent investigation or excavation works should be conducted by a suitably-qualified archaeologist.

### 18.8.2 Stakeholder Engagement Plan

#### 18.8.2.1 General Activities

*The Bisha Project will continue to use proven methods of engagement that have already been established by BMSC, such as the village-based Community Liaison Officers (CLO) and the Store Front Information Centres. Additional methods will include disclosure of Project information (newsletters, information sheets), regular meetings of the Information Update Committee, meetings with government and institutional stakeholders etc.*

#### 18.8.2.2 Contractor Responsibilities

SENET must participate in the stakeholder engagement process alongside BMSC representatives throughout their tenure onsite. While BMSC will retain the responsibility for its stakeholder engagement programme, the contractor is obliged to fully participate in that process during site construction.

SENET will be required to participate in, and in some cases undertake, community relations activities as required throughout the term of the contract. Such liaison activities may include but are not limited to:

- Providing communities with prior notice of all construction activities and likely impacts, including potential risks to health and safety;
- Providing stakeholders affected by the Project with regular information on the progress of work and any implications for these stakeholders;
- Managing any complaints or grievances; and
- Providing local communities with timely information regarding employment opportunities, requirements, and employment and recruitment policies.

SENET must collaborate with BMSC to identify and report any new significant issues that may arise during the construction period. It is expected that relevant staff within SENET will work directly with BMSC's community relations team.



### 18.8.2.3 Community Complaints

BMSC will establish a complaints process for local communities through its stakeholder engagement programme. Complaints related to construction activities shall be managed through this complaints management process.

In the case that a complaint is lodged to SENET, they must direct the complainant to BMSC. The complaints resolution procedure developed by BMSC for issues related to construction activities is likely to involve SENET during the construction phase. SENET is required to train their staff to direct any complaints received to the BMSC community relations team. SENET is responsible for participating in the complaints process and consideration and response to stakeholder complaints in coordination with BMSC. Such complaints may be associated with environmental issues for example those related to noise, water supply interruption or traffic accidents.

### 18.8.3 HR & Recruitment

#### 18.8.3.1 BSMC Policy and Procedures

Approximately 358 workers will be required for the construction of the Bisha Mine and ancillary facilities. The majority of the construction workforce is expected to be skilled Eritreans from Asmara and the highlands; although the Project intends to hire suitable locals for positions to the extent they are available. It is estimated that 90% of construction workers will be Eritrean nationals.

There is a high expectation of local employment in the local villages as well as within the wider Zoba Gash Barka and the country as a whole. Implementation of this plan is central to managing employment expectations as it sets out specific actions for the Project to ensure that opportunities for local employment are maximised, and that there is a fair distribution of jobs. This is vital to maintaining a good relationship between the Project, nearby villages and other stakeholders. *BMSC will adopt the following best practice principles in relation to recruitment:*

- Utilisation of skilled and experienced mining industry expatriates as required; expatriates will only be brought in to fill positions for: (a) skilled and experienced operators for specific mining and processing plant and machinery, not available in-country; (b) skilled and experienced mine trained supervisors in mining, processing and engineering; and (c) high level mining industry professionals;
- Hiring of experienced Eritrean nationals with transferable skills, for example from the construction industry – Eritreans identified will be trained to enable them to perform their job to the standards required for an international mining project;
- Training of Eritrean employees will commence during the construction phase and intensify during and following production start-up;
- Training shall be provided to ensure that all recruits have the necessary skill and knowledge levels defined for each position;
- Replacement during the operations period of many expatriates following building of training and experience levels among Eritrean employees;
- Recruitment procedures will be transparent, public and open to all and shall be publicised in advance, including distribution of information to affected communities and regional stakeholders;
- The Project shall manage some form of recruitment office (e.g. the existing Store Front Information Centres) in each of the regions (or local centres) as appropriate through construction and operations;
- The Project team will ensure that forced labour is not used by BMSC or its contractors, specifically the use of Eritrean National Service personnel on extended service;
- Lists of “ Preferred Individuals” will not be accepted (e.g. lists provided by non-BMSC personnel to seek favour for certain individuals outside of the formal recruitment process);
- Unwarranted influxes of individuals into the Project area will be minimised through proactive policies and procedures to reduce in-migration in search of employment; and
- Employment conditions will meet national laws and international standards and there shall be no discrimination on the grounds of religion, ethnicity, gender or other factors.



### 18.8.3.2 Contractor Responsibilities

The EPCM contractor must develop and implement a fair and transparent employment programme that is in line with BMSC's requirements. Such programme must not discriminate, as a minimum, against gender, ethnicity, or age. The programme will be implemented in collaboration with BMSC.

The EPCM contractor must ensure that a clear and sufficiently specific description of available jobs and skill levels required is accessible to interested parties in advance of recruitment. SENET shall collaborate with BMSC to address issues of in-migration related to job seeking. This will involve clear disclosure of recruitment and employment policies to local and regional communities and recruitment practices that minimise the risk of in-migration. Employment expectations are high, and it is particularly important that SENET assist to manage expectations through the disclosure process, making clear the limited number of jobs available and the short-term nature of construction jobs.

BMSC and SENET shall ensure that National Service personnel on extended service are not used by BMSC or its contractors, and demobilisation certificates shall be required to be kept on file for all Eritrean workers. Conditions to this effect shall be included in contracts with all contractors.

### 18.8.3.3 Workforce Conduct

SENET is responsible for supporting a workforce culture that promotes health and safety for both the workforce and the local community. This includes developing appropriate social codes of conduct in terms of behaviour with the local community and worker camp regulations regarding drinking, drug use, gambling, and prostitution. At a minimum, BMSC's Code of Conduct (Policy 5) must be adhered to. Rules should also be in place regarding access to accommodation facilities, and no access should be granted to unauthorised personnel. BMSC has a zero tolerance to violence and illegal activities within the workforce. Additionally, workplace information and education programmes regarding the spread of HIV/AIDS and other sexually transmitted diseases must be implemented in collaboration with BMSC and relevant government partners.

The supply of recreational facilities such as a sports field may be useful in promoting a safe and healthy worker environment.

Procedures for workforce management and the behaviour of workers should be standardised, as is reasonable, such that all contractors and subcontractors will be required to ensure similar standards within their own workforce.

### 18.8.4 Community Assistance Plan

*The BMSC approach to community development includes the following guiding principles:*

- Coordination with the Eritrean government is critical for successful implementation, hence:
  - BMSC will work closely with various government agencies and ministries to co-ordinate local development priorities with regional/national programmes in order to create a coherent development process;
  - Proposals for specific community development initiatives will be introduced to national and Zoba level governments first, prior to final approval;
  - It is expected that line ministries within Gash Barka as well as local authorities will take the lead on community assistance initiatives in collaboration with BMSC (e.g. Department of Agriculture in Barentu would lead agriculture extension service projects to be implemented);
  - Any external implementing partners that may be required will be introduced to the government and the community prior to any visits to the area; and
  - BMSC shall consult with government on the best approach to allocate community assistance funds including how this information should be disclosed to the Project area population and other interested parties.
- Community development initiatives should benefit the community as a whole or a large portion of the community (rather than individual households);
- It is the ethos of BMSC that only independent projects that have ownership within the community will deliver sustainable and development beyond the life of the mine;
- Initiatives that contribute to or promote the health and well-being of communities are a priority for funding, and vulnerable and disadvantaged groups will also be targeted;



- Eritrean organisations and government agencies will provide expertise in the design, planning and achievement of development goals;
- Partnerships will be used to allow the Company to tie its community assistance projects into longer term programmes and plans for the Dighe and Gogne sub-Zobas, Zoba Gash Barka and the country as a whole (*Annex A* provides details of several potential partners in the CAP);
- All projects that are proposed for implementation under the plan will be carefully reviewed to ensure that the goals and objectives are in line with those of BMSC; and
- Project proposals must demonstrate how the project benefits will be sustainable in the long-term and funds should not be used for supporting the operating costs of projects.

All potential projects will be subject to the BMSC Project Approval Process. BMSC will require support from SENET in the implementation of the Community Assistance Plan.

#### **18.8.5 Land Use Management Plan**

*The BMSC approach to land use management is driven by the following objectives:*

- Mitigation measures, including any compensation for Project-affected persons, will be carried out in compliance with Eritrean legislation and only with the approval of relevant government representatives;
- Impacts from permanent or temporary land acquisition on assets and livelihoods will be mitigated, and both physical and economic displacement will be taken into consideration;
- Affected livelihoods will be restored as a minimum, or preferably improved, and living conditions of affected households will be improved;
- Cash compensation is not a preferable method of compensation for land use effects as a result of the Bisha Project (government do not agree there is a need to compensate for use of state owned land or assets on such land), however compensation will be provided in-kind;
- Families affected by the loss of cultivated land and/or seasonal dwellings will be provided with in-kind support for land-based activities or non-land based options including employment, in addition to the measures allocated by government;
- All mitigation measures related to grazing land and associated assets will be delivered at the community-level since the predominant impacts relate to loss of access to land used by various herders from a number of nearby villages;
- The implementation and outcomes of this plan will be monitored and evaluated as part of a transparent process involving independent parties;
- The complaints management process established for the Project will also be used to handle land use-related complaints (and shall be audited at regular intervals); and
- Affected families and communities will be engaged, informed and consulted during the course of plan development, implementation and evaluation.

To this effect, BMSC has drawn up a schedule of compensation measures and will work towards further implementation as the construction phase progresses,

#### **18.8.6 Community Health & Safety**

*Community health and safety protection is of prime importance to the Bisha Project therefore BMSC has developed specific measures to ensure that local communities are not adversely affected by off-site incidents or other hazards that may occur as a result of Project activities.*

BMSC recognises that it is necessary to collaborate with local communities and authorities to develop appropriate health and safety safeguards because the Bisha mine will introduce new activities to a largely rural setting. Furthermore, and since the Bisha Project is the first modern mining project in Eritrea, it will introduce a range of actions within the country that have not been dealt with either by regulators or by the general population.

During the construction phase, the key issues related to community health & safety will be dust arising from earthworks activities and vehicles, an increasing number of new arrivals at site to take up temporary construction jobs and traffic in local communities.



Traffic will not increase significantly during construction and therefore the risk to public safety is expected to be minimal in comparison to operations. Dust will be of most concern on unpaved roads between the mine and Agordat (although there are government plans to surface the Agordat to Mogoraib road), and will increase proportionally to the increase in traffic. The key issues related to air emissions include vegetation stress, soil deposition in neighbouring communities, and visual impacts.

Potential issues related to the workforce and local communities include unfavourable interactions that may arise between Project personnel and residents (e.g. conflicts, fighting, prostitution etc). The Project will require security to protect both the workforce and to prevent unauthorised access from the site. The presence of an exclusion zone around the site may impact users of rangelands and herding routes. A "security zone" has been established around the Project area (which limits access by local communities to the Project site as well as other land outside the site as defined by the government).

The Bisha Project has developed a range of community health & safety procedures to ensure the protection of local people, their properties, assets and livestock from potentially hazardous activities conducted for the Project. SENET will be expected to comply with all procedures under the Community Health & Safety Plan.

### 18.8.7 Security and the Use of Force

*BMSC intends to comply with the Voluntary Principles on Security and Human Rights<sup>23</sup> and the IFC's Performance Standard 4 on Community Health, Safety and Security.*

BMSC intends to use a private security firm to provide site security and will conduct the relevant assessments and apply applicable standards to any individual or company it contracts for such activities. To this end, BMSC has developed and adopted a standard/procedure that describes the minimum requirements for all personnel, contractors and sub-contractors related to security arrangements and the use of force.

This security standard is designed to help the Company to protect its people and assets in a way that minimizes conflict and respects the human rights of its stakeholders. The security standard is as follows:

- BMSC will adhere to local laws as well as international standards on law enforcement in securing its operations, particularly those that relate to the use of force<sup>24</sup>;
- BMSC will carry out risk assessments in relation to security issues at each of its Project sites;
- Each BMSC site will develop a *Security Plan* in order to prevent or mitigate any threats identified in its risk assessment. The *Security Plan* will determine how personnel will be deployed at the project sites;
- The objective of the *Security Plan* will be to ensure that security is deployed in a way that respects and protects human dignity and human rights, avoids creating conflict and addresses security threats in as peaceful a way as possible;
- BMSC will therefore seek to ensure that force is a last resort and is used in a way that minimises damage and injury, and respects and preserves human life;
- BMSC will only use armed guards where the above risk assessment determines that this is the only way to mitigate the risks identified or where it is required by law;
- Force should only be used for preventive and defensive purposes in proportion to the nature and extent of the threat. BMSC's security personnel should accordingly:
  - First try to resolve any security incidents without using force; and
  - Only use the minimum force needed if this fails.
- Firearms will only be used in accordance with the above principles and where human life is at risk and less extreme measures are not sufficient;
- In every instance in which a firearm is discharged, a report should be made promptly to BMSC's central office;
- Security personnel must ensure that medical aid is given to anybody injured in any incident at the earliest possible moment;

<sup>23</sup> For more information consult [www.voluntaryprinciples.org](http://www.voluntaryprinciples.org)

<sup>24</sup> The UN Code of Conduct for Law Enforcement Officials ([http://www.unhchr.ch/html/menu3/b/h\\_comp42.htm](http://www.unhchr.ch/html/menu3/b/h_comp42.htm)) and the UN Basic Principles on the Use of Force and Firearms by Law Enforcement Officials ([http://www.unhchr.ch/html/menu3/b/h\\_comp43.htm](http://www.unhchr.ch/html/menu3/b/h_comp43.htm)) are key in this regard.



- A community complaints process will be in place to allow the local community to express concerns about the security arrangements and acts of BMSC security personnel;
- BMSC will investigate any credible allegations of unlawful or abusive acts of its security personnel, take action to prevent recurrence, and report unlawful and abusive acts to public authorities when appropriate;
- Where BMSC uses public or government security services to protect its operations, they must guarantee that existing international guidelines and standards for the use of force are respected;
- BMSC will conduct due diligence on security providers to avoid retaining the services of any group or individual that has previously been responsible for violations of human rights or humanitarian law;
- BMSC will provide training regarding the use of force (and where applicable, firearms) and appropriate conduct toward workers and the local community and monitor to ensure that security personnel abide by this standard; and
- BMSC will never place or pressure employees to work in areas of high risk to personal security.

BMSC will coordinate with the Department of Mines to maintain dialogue with the Eritrean military about their current activities and future plans for national security measures in the region. This will include dialogue about the “security zone” that has been established in the area and includes the Project site.

## 18.9 Contractor Responsibilities

### 18.9.1 Main Responsibilities

SENET, as EPCM Contractor, shall be responsible for the integration of these procedures and requirements into their construction plans. The CESMP is also applicable to all other contractors and subcontractors working on the Project.

All construction contractors will be required to comply with this CESMP and to incorporate additional procedures and mitigation measures as required during construction.

All contractors will also be required to comply with the *Occupational Health & Safety Plan* and *Emergency Preparedness & Response Plan (ERP)* to protect their employees during the works they shall undertake. In particular, contractors will be required to comply with the security measures as proposed in the *Community Health & Safety Plan*.

Construction activities should be accomplished with due consideration for the operating and reclamation phases of the Project. The contractor must complete reclamation activities for any works which are not to be incorporated into the operations phase. In addition, the contractor must:

- Ensure that all employees have adequate personal protective equipment (steel-toed boots, gloves, safety glasses, hard hats, dust masks, or other items as specific to the job) and that it is being worn on the job site in areas where it is required or needed;
- Plan construction activities such that disturbed areas are minimised;
- Locate and mark the disturbance boundary for all mining infrastructure;
- Clearly identify boundary limits for laydown areas, clearing, stripping, excavations, borrow areas, and quarries;
- Restrict the movement of trucks and other construction equipment to clearly delineated corridors between the construction site and any quarries and borrow pits;
- Ensure that employees understand and adhere to established boundary limits and travel corridors;
- Undertake clearing and grubbing operations to minimise long-term surface damage and recover as much topsoil as possible; and
- Place topsoil in a designated storage area such that it can be used for future reclamation activities.
- Additional responsibilities are described below.



### 18.9.2 Staff Accommodation

Man-camp-type accommodation will be established within the Project Area boundary to house non-local workers. A plan for the location and design of such facilities must be prepared by the EPCM contractor and approved by BMSC prior to its implementation.

The worker accommodation site(s) must:

- Be located in an environment that does not pose a health or safety risk to workers;
- Provide reasonable living conditions to workers including sanitation, washing and catering provisions;
- Provide a clean potable water supply;
- Be equipped with an appropriate septic system and waste management programme; and
- Be in a location that does not disrupt local residents.

### 18.9.3 Training

The workforce in construction activities will be appropriately skilled, have appropriate experience or will be trained in the associated skills necessary and will be trained in occupational health and safety. The size of the workforce will fluctuate depending on construction activity. All personnel employed on site during construction works will be required to undergo environmental awareness training to educate them on their responsibilities, communications procedures and requirements, incident response procedures and integration of environmental management and occupational health and safety.

SENET will procure the Project construction capacity and senior management staff and will utilise local Eritrean staff in as many levels of the organisation as can be practically filled by locally qualified individuals. SENET will also provide Project controls and procurement functions.

SENET's Project organisation structure should define the major responsibilities of each manager, officer, and supervisor. The structure should show how the health, safety, environmental, and social programmes fit within the organisational structure. It should also demonstrate the direct line responsibility of those programmes through to the highest levels of the organisation. Those key decision-makers should be signatory to the corporate commitment to the health, safety, environmental, and social policies and should fully support the implementation of those policies at all levels of the organisation.

Well-defined responsibilities will be established for individuals, with clear chains of command and effective lines of communication within the workforce.

SENET must work with Bisha staff to ensure that their staff are properly trained for implementation and performance of environmental monitoring and social programmes. Environmental training programmes should review procedures for complying with regulatory requirements and good practice. These programmes should be designed to increase awareness of the need for environmental protection, pollution prevention, sound construction practices, and regulatory compliance.

All employees retained by the EPCM contractor must be trained by qualified personnel who are responsible for environmental and social programmes in the following areas:

- Issues surrounding the mine site (e.g., agricultural practises, nearby residences, offsite traffic hazards);
- Traffic and transport safety;
- Potential environmental effects and mitigation measures;
- Environmental monitoring programmes;
- Sampling, testing, and analytical procedures (as appropriate);
- Data management and compilation procedures;
- Data interpretation;
- Quality assurance and quality control (QA/QC) procedures and practices;
- Reporting procedures;
- Specific instruction on emergency response procedures and policies;
- Workforce "Code of Conduct" requirements;
- Community relations and communication; and



- Complaints handling and management.

SENET should utilise professional consultants if necessary to supplement its training and monitoring programme capacity to ensure that employees are adequately prepared for their site responsibilities. The contractor must maintain records documenting that all onsite employees have received adequate training. Wherever feasible, SENET should aim to coordinate its training programmes with BMSC's own training regime.

#### 18.9.3.1 Health and Safety Training Programme

SENET must develop a health and safety training programme to address and reduce the hazards associated with site construction and development. At a minimum, the health and safety training programme should include:

- An initial orientation to identify the general work conditions and potential hazards of the work environment;
- Site-specific Project rules;
- A summary of the applicable legal, regulatory, and policy requirements applicable to the site;
- The use and need for proper personal protective equipment;
- Training to review occupational hazards, safety procedures, and information sources (e.g., Material Safety Data Sheets (MSDS) and appropriate labelling and warnings on all barrels and containers) ;
- Emergency evacuation plans and escape ways;
- Emergency Response and emergency reporting procedures;
- Fire fighting procedures;
- Health hazards associated with certain tasks or assignments;
- Water safety for personnel who work near the tailings facility or other water accumulation areas;
- First aid and CPR training for all employees; and
- Additional training and refresher courses as appropriate.

SENET is responsible for developing and implementing the health and safety training programme. All contractor employees must receive health and safety training before they commence work onsite. SENET must maintain records documenting which employees have received the appropriate training under the health and safety training programme, including refresher training programmes as appropriate. Health records as available and work-related accidents should be monitored to assess the performance of the health and safety training programme. Work-related accidents should be reviewed as part of the health and safety training programme in an effort to reduce the potential of the future occurrence of similar accidents. Statistics are also to be kept for man-hours worked, accidents, lost-time accidents, and near misses.

#### 18.9.4 Monitoring

SENET is responsible for ongoing monitoring of Bisha Project activities during the construction period, assessing the effectiveness of mitigation measures, and identifying any new significant issues that arise. Findings must be submitted to BMSC in the form of monthly reports with updates of significant findings given at weekly management meetings.

The measures that are particularly important for environmental protection during the construction phase:

- A standardised system of regular monitoring is to be developed and conducted.
- Baseline monitoring is to commence before construction activities.
- The results of the monitoring program will be used to measure the effectiveness of measures against the target.
- SENET will follow their EMPs as approved by the BMSC Environment Manager.

For all construction issues the following **specific requirements** will apply:



- Dust monitoring will be conducted at the site boundary during drilling, excavation, dredging, stockpiling and building activities.
- Noise monitoring will include noise from plant, machinery and heavy vehicles, truck movements to/from site and within site boundaries and vibration sources.
- All noise complaints shall be recorded by the Environment Manager and addressed as appropriate.
- Monitoring of habitats including management actions and changes in vegetation condition. Establishing consistent photo points is a simple method of monitoring changes in vegetation condition.
- Stormwater quality monitoring will be conducted for stockpiling activities.
- Monitoring will include waste volumes and appropriate waste tracking documentation.
- All sites of archaeological interest will be monitored.

#### 18.9.5 Reporting

A standardised reporting format will be developed and agreed with BMSC. SENET should maintain sufficient documentation to describe the core elements of the site construction plans. Those plans and documentation will likely be integrated with other systems implemented by the contractor and will not necessarily be located in a single manual. Such documentation will include:

- Process information;
- Training records;
- Accidents and injuries;
- Environmental spills and issues;
- Permit and authorisation database;
- Organisational charts; and
- Various management plans.

Reporting will be consistent with the continuous improvement goals for environmental management of the Project.

Regular reporting shall be undertaken via the monthly SEMS Report that shall be prepared and submitted to the Bisha General Manager. Reporting shall include:

- A summary of activities undertaken during the reporting period;
- Any material deviations or non-compliances to this Management Plan;
- Planned activities during the next reporting period;
- A summary of health, safety, social and environmental issues that have occurred;
- Any other issues of concern.

Further information on environmental monitoring and reporting requirements and procedures is set out in each specific Social and Environmental Management Plan and the Monitoring Plan.

##### 18.9.5.1 Document Control

The EPCM contractor should establish and maintain procedures for controlling all documents to ensure that:

- Documents can be located;
- Documents are periodically reviewed, revised, and accepted by appropriate management personnel;
- Current versions of relevant documents are available at appropriate locations (i.e. MSDS located in close proximity to the end use or emergency response contact information located near site communication systems);



- Obsolete documents are removed from all points of use or otherwise ensured against unintended use; and
- Any obsolete documents retained for legal and/or knowledge preservation purposes are suitably identified.

All documentation should be legible, dated (with correct revision dates), readily identifiable, organised in an orderly manner, and archived for a specified period of time. Procedures and responsibilities should be established and maintained concerning the creation and modification of the various types of documents.

#### **18.9.5.2 Data Management**

Data generated from the required monitoring programmes must be collected, stored, updated, and maintained in an orderly and useful manner. These data sets should include geographical data as well as tabular data. The Project database should undergo regular maintenance procedures for updates, backups, and programming. All data must be submitted to BMSC in a timely manner.

SENET is responsible for the adequacy and accuracy of all data generated under the monitoring programme during the construction period and also for any relevant additions or updates to the database. This includes ensuring that various types of data are converted properly and correctly entered into the overall database as appropriate.

Database maintenance should include regularly scheduled backups of all Bisha Project data sets to guard against hardware failure, software problems, or user mistakes. Few spatial database tools have internal backup procedures, so manual backups may be required at the file system level. A copy of the system backup file should be sent offsite to SENET's home office at least quarterly for safe storage. This should protect the records from catastrophic accidents or incidents that could destroy the site records.

#### **18.9.5.3 Key Performance Indicators and Targets**

In addition to the Project-specific objectives and goals, BMSC and SENET should develop a series of safety, environmental and social key performance indicators and related targets that address the mitigation of impacts. For the construction phase, the majority of these indicators relates to mitigation activities and falls under the domain of the contractor. The contractor is responsible for ensuring that these performance indicators are measured and reported by them and their construction subcontractors. Performance against the indicators should be measured on a regular basis as agreed for each specific measure.

#### **18.9.5.4 Performance Assessment and Reporting**

The performance assessment process is applicable to activities conducted onsite by all SENET employees, subcontractors, suppliers, and visitors. Performance results must be reported to BMSC management. Where deviations in performance are observed, corrective actions should be identified and implemented.

SENET should develop mechanisms for appropriate external reporting on programme performance, both routinely and in emergency situations. Standard reporting should include, but may not be limited to:

- Timely reports for emergency and crisis situations including, but not limited to, accidents and occupational illnesses, spills, fires, and other incidents;
- Immediate verbal notification to BMSC management, as appropriate, if there has been a lost-time accident, fire, spill, etc., with a written report to be submitted within 24 hours;
- Weekly reports highlighting deviations from accepted standards and other issues pertaining to performance;
- A summary of corrective actions to specific circumstances; and
- Summary reports to BMSC on construction activities and performance in general.

Monitoring reports should be completed by SENET for submission to BMSC on a monthly basis and more frequently if construction activities warrant. These reports will reconcile the site activities and accomplishments; characterise the health, safety, environmental, and social programme performance during the reporting period; and anticipate what will happen with these programmes during the forthcoming reporting period. Such reports may include:



- Certification of the validity and representation of the information provided in the report and of the data upon which the summaries are based;
- Description of all environmental, health and safety, and social incidents that occurred during the reporting period;
- Performance monitoring data summaries;
- Explanation of upset conditions or violations of laws or regulations (if any) that have occurred, the cause of the violation, and the corresponding corrective measures planned or underway to prevent reoccurrence;
- Identification and qualifications of individuals responsible for safety, health, environmental, and social programme management; and
- A description of changes, if any, in applicable safety, health, and environmental regulations.

Reports should include copies of documents containing significant information on environmental matters including, for example, chemical spills or accident investigation results.