ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT FOR CONSTRUCTION AND OPERATION OF A COPPER SMELTER PLANT AT WITVLEI –OMAHEKE REGION

ENVIRONMENTAL MANAGEMENT PLAN (EMP)

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NEW HORIZON INVESTMENT GROUP
NAMIBIA

CUVELPALM CONSULTING CC

CUVEPALM CONSULTING
' sustainability driven '

DOCUMENT DATA SHEET

DOCUMENT VERSION **001**

PROJECT NAME	**THE PROPOSED CONSTRUCTION AND OPERATION OF A COPPER SMELTER PLANT AT WITVLEI –OMAHEKE REGION**
REPORT TITLE	**ENVIRONMENTAL MANAGEMENT PLAN (EMP)**
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ACRONYMS

TERMS	DEFINITION
BID	Background Information Document
CPC	Cuvepalm Consulting cc
EAP	Environmental Assessment Practitioners
ECC	Environmental Clearance Certificate
ECO	Environmental Control Officer
EIA (R)	Environmental Impact Assessment (Report)
ESIA	Environmental and Social Impact Assessment
EMP	Environmental Management Plan
EMPr	Environmental Management Plan Report
GHGs	Greenhouse Gasses
ISO	International Organization for Standardization
I&Aps	Interested and Affected Parties
MAWF	Ministry of Agriculture Water and Forestry
MEFT: DEA	Ministry of Environment Forestry and Tourism's Directorate of Environmental Affairs
NHC	National Heritage Council
NHIG	New horizon Investment Group
ToR	Terms of Reference
UNFCCC	United Nations Framework Convention on Climate Change

DEFINITION OF TERMS

The **'Consultant'** – this refers to the team that is conducting the ESIA and the preparation of the EMP for the development

The **'Proponent** – this refers to the institutions/departments that are directly involved in the implementation of the project, i.e. NHIG/Global Smelters.

The **'Stakeholders'** – this refers to the people, organisations, NGOs that are directly or indirectly affected and interested by the project.

The **'Environment'** – this refers to the ecology, economy, society and politics.

i. Purpose of this Environmental Management Plan (EMP)

This document has been compiled in line with Regulation 8 of the Environmental Management Act (EMA) No. 7 of 2007 and its Environmental Assessment Regulations (2012) that requires that a draft Environmental Management Plan (EMP) be included as part of the Scoping Assessment process. A 'management plan' is defined as:
"*…a plan that describes how activities that may have significant environments effects on the environment are to be mitigated, controlled and monitored*."

An EMP is one of the most important outputs of the Environmental Assessment (EA) process as it synthesises all of the proposed mitigation and monitoring actions, set to a timeline and with specific assigned responsibilities. It provides a link between the impacts identified in the EIA Process and the required environmental management on the ground during project implementation and operation.

It is important to note that an EMP is a legally binding document and a person who contravenes the provisions of this EMP may face imprisonment and/or a fine. This EMP is a living document and should be amended to adapt to address project changes and/or environmental conditions and feedback from compliance monitoring.

The purpose of this document is therefore to guide environmental management throughout the different phases of the proposed Witvlei Copper Smelter, namely; planning and design, construction, operational and maintenance phases. This EMP will have to be effectively implemented by the Proponent, Facility Operator, their engineers and contractors, to ensure that adverse environmental impacts are properly managed. The management of these impacts will be done by effective implementation of the management measures and subsequent implementation monitoring.

NB: This document has been developed in conjunction with the project feasibility study and environmental scoping report (ESR). Therefore, it is highly recommended that this EMP is studied or used together with these two documents, but especially the project ESR for further information that may be required to fully understand the EMP, if needed.

1. CHAPTER ONE: INTRODUCTION AND BACKGROUND

1.1. Projec Backround and Location

The proponent, New Horizon Investment Group (NHIG) is an indigenous Namibian enterprise that is involved in the mining sector since 2010. The company has identified potential copper deposits in Witvlei area. In this respect NHIG is in the process of planning bulk mineral exploration activities and potential copper mining activities. In this respect, a copper smelting plant is required for testing and smelting in proximity to the resource base.

In this respect, NHIG identified a need to establish and operate a copper smelting plant in the Witvlei area. The Witvlei Village Council allotted (Annexure) an industrial zoned erf subject to NHIG meeting relevant statutory requirements. However, It is standard procedure and pre-requisite under the Environmental Management Act No.7 of 2007 and the Environmental Impact Assessment Regulations (GN 30 in GG 4878 of 6 February 2012 that the proponent (in this case NHIG) to first undertake an Environmental Impact Assessment, which is submitted to the Ministry of Mines And Energy (MME) and the Ministry of environment, Forestry and Tourism: Department of environmental Affairs (MEFT: DEA) for review.

Furthermore, as per the requirements of the Environmental Management Act No. 7 of 2007, Cuvepalm Consulting cc (CPC) were appointed by NHIG on 18 February 2021 to conduct an Environmental and Social Impact Assessment (ESIA) and develop an Environmental & Social Management Plan (ESMP) for the proposed project.

This has been followed by an application for Environmental Clearance Certificate (ECC) to the Ministry of Environment and Tourism (MET): Directorate of Environmental Affairs (DEA).

Subsequently, this document forms part of the application to be made to the DEA's office for an Environmental Clearance certificate for the proposed construction and operation of a copper smelting plant, in accordance with the guidelines an statutes of the Environmental Management Act No.7 of 2007 and the environmental impacts assessment regulations (GN 30 in GG 4878 of 6 February 2012).

1.2. Project Location

The smelter will be sited on Portion A of Farm Okatjirute No. 155, Witvlei. The site can be accessed by a 2 km road turn off from the National Road No. B 6 linking Windhoek and Gobabis.
Adjacent to project is the Witvlei Meat Abattoir, and the Namchar Charcoal Processing Plant. The site is zoned industrial and there are no household residents in immediate proximity to the site. The map below (Fig 1) and illustrate the a locality of the project area:

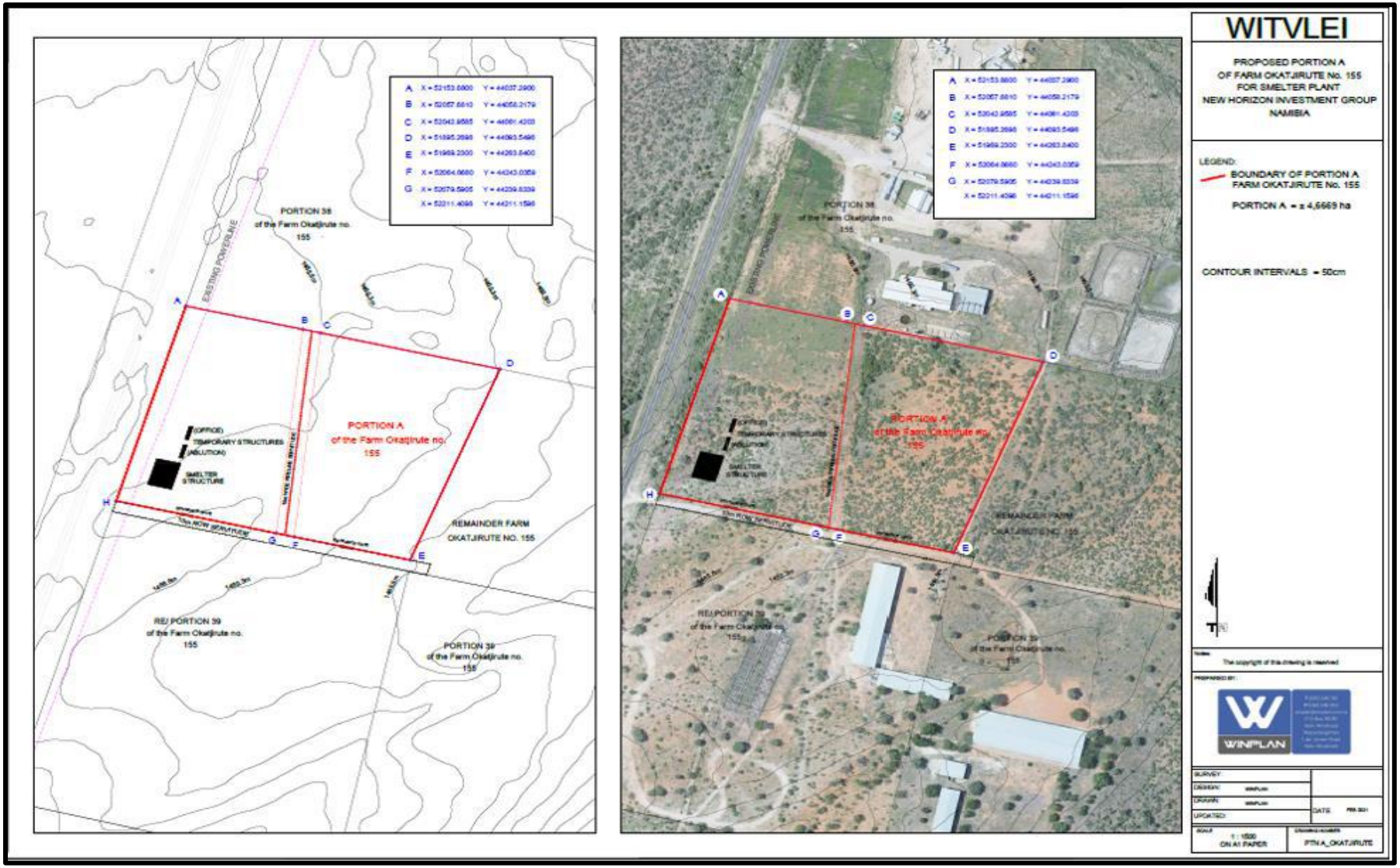

Figure 1: Overview of project area on Portion A of Farm Okatjirute No. 155, Witvlei.

1.3. Project Components

1.4. Overview

The copper smelting project will be composed of different components that will make up the complete copper smelting plant. For the purpose of this EIA, the components have been categorized to enable impact assessment and analysis. The different project sections are as follows:

a) Ore storage area
b) Crushing and separator plant
c) Shaft furnace and host building
d) Copper storage area
e) Slag storage area
f) Wastewater treatment and storage
g) Standby- Generator
h) Administration and ablution area

1.5. Process flow

1.5.1. Ore Supply

The predominate oxide copper minerals include: Malachite, Cuprite, Chrysocolla and Azurite. The ore containing 12-14% Cu is accomplished at the mine sites via crushing, grinding, and flotation. The ore processing plant is designed for 10 000 t/month run of mine (ROM) ore recovery. The ore recovered contains 1.35% Cu with a size distribution less than 300 mm. The ROM low grade ore is loaded by means of a Front-end Loader (FEL) and the low-grade ore is stockpiled.

The ore splitting ratio is 10%, resulting in 9000 t/month low grade ore to the low-grade stockpile. The 1000 t/month ore for smelting purposes by the cupola smelter, Figure 2 give an illustrative layout of the processing flow layout.

Crushing: A tertiary crusher unit and an ore screen will be installed on site and directly connected to the smelter building. Pre-crushed mineral ore will with be further crushed to obtain a product of -150 mm and + 50mm to liberate the high-grade ore from the ROM.

Screening: After crushing, the ore is screened to obtain the desired size range. Rocks between 50 and 120 mm is transferred to the Belt Picking Lines for further processing whilst rocks less than 50 mm will be sent for low grade stockpile leaching / future electrowinning plant. An estimated 9000 t/month is sent to stockpiling for future leaching. The leach pile contains approximately 0.5% Cu. The resulting "concentrate" is processed in a smelting furnaces to yield "matte" of as much as 65 percent copper content.

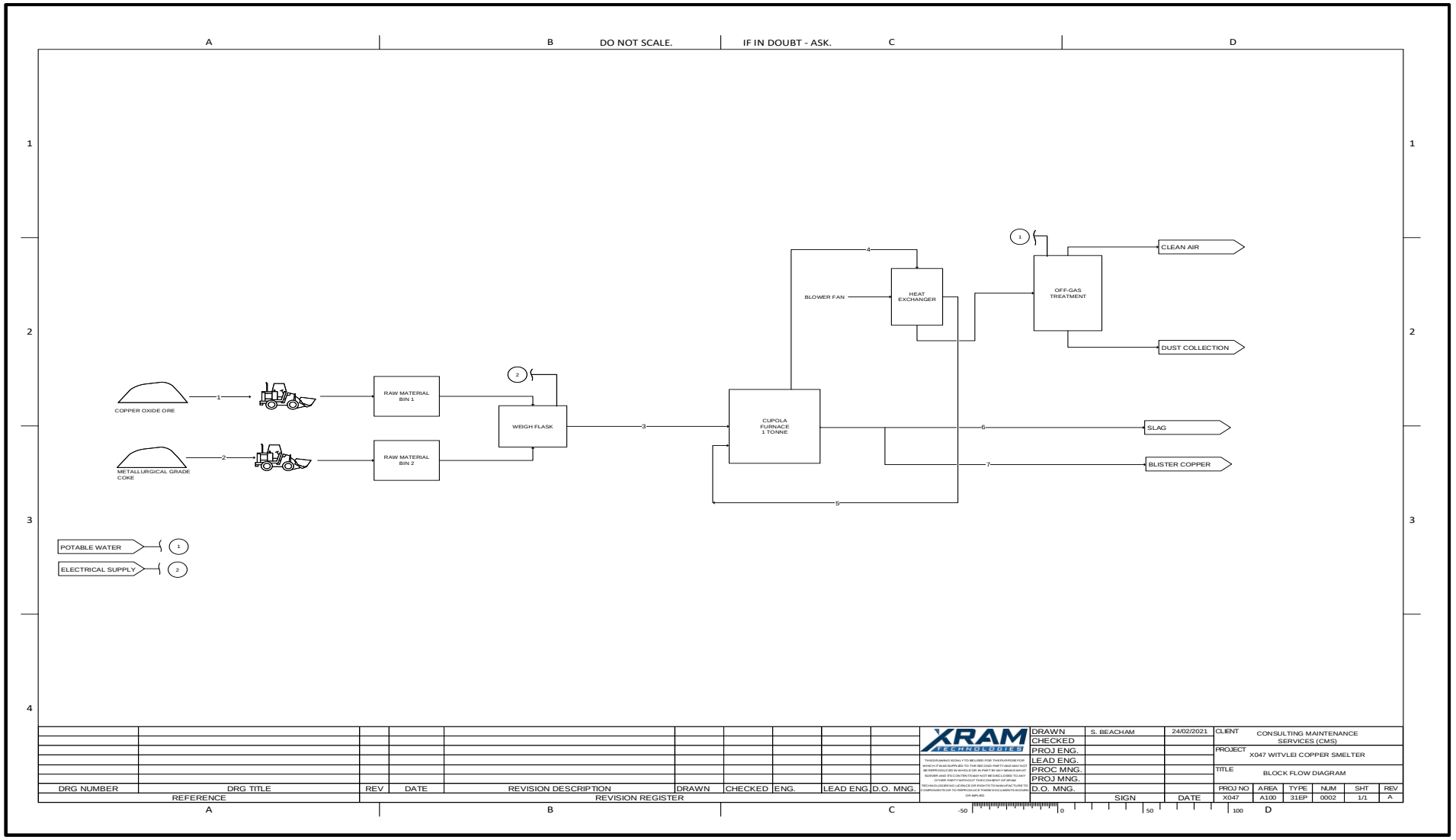

Figure 2: Ore Supply Flow Diagram

1.2 Technology and Process Flow

Housing of Plant

The Cupola or shaft furnace smelter plant building will house the furnace and other smelter components that are critical to the smelting process.

The Shaft furnace is characterized by three major components:

1. Hot blast tuyers, four spaced around the furnace, through which pre-heated ambient temperature are are blown into the furnace;
2. a central gas off-take through which the offgas is withdrawn for delivery to the boost combustion chamber for dust removal, and SO2 fixation systems if required; and
3. metal and slag tapholes through which the liquid products are periodically removed from the furnace.

The plant layout is illustrated below.

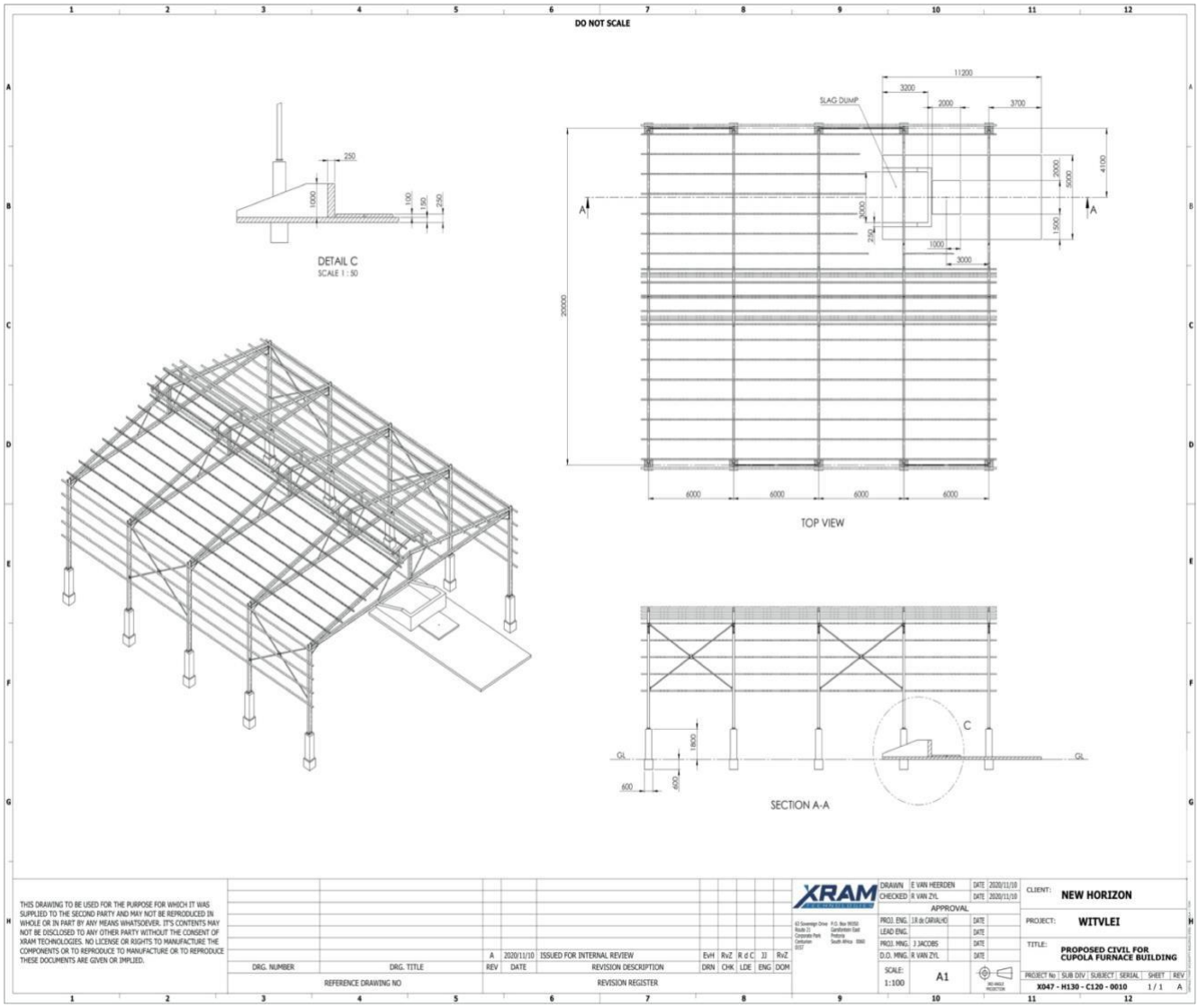

Figure 3: Smelter Plant Building

The principal smelting reactions are as follows:

- Malachite: $Cu_2(OH)_2CO_3 + 3C = 2Cu + H_2O_{(g)} + 4CO_{(g)}$

- Cuprite: $Cu_2O + C = 2Cu + CO_{(g)}$
- Azurite: $Cu_3(CO_3)_{2(}OH)_2 + 2C = 3CuO + H_2O_{(g)} + 4CO(g)$
- Chrysocolla: $Cu_2H_2Si_2O_5(OH)_4 + 2C = 2Cu + 2SiO_2 + 3H_2O(g) + 2CO(g)$
- Boudouard reaction: $C(s) + CO_2(g) \leftrightarrow 2CO(g)$

1. Raw Material Feed & Batching

Ore concentrate will be transferred from mining site by haulage trucks and offloaded at the storage area. Feed materials (copper oxide ore and metallurgical grade coke nuts) will be stockpiled on site to allow for a 1-month buffer capacity as follows:

- Screened and sorted lumpy ore from mine - 576 ton (10% Cu grade)
- Metallurgical coke nuts - 200 ton

The concentrate is stored in a surge bin, with a holding capacity for more than one shift. Copper oxide ore and metallurgical grade coke nuts are stockpiled to sustain a continuous smelting process. First, the coke nuts are batched and charged into the Shaft to form a coke bed. The coke nuts and copper oxide ore are then batched to the correct predetermined recipe and sequentially layered into the Shaft furnace.

2. Start-up & Preheating

Before the first start-up, as well as for start-ups after long shutdowns, the fluid bed furnace has to be preheated. The necessary combustion air is taken from an air blower. Start-up gases are withdrawn by a start-up fan and vented to the atmosphere provided after gas cleaning section.

3.Smelting

The batched concentrate (copper oxide and coke) are charged into the furnace. In the furnace, the lumpy ore is exposed to the pre-heated air (hot blast into furnace maintained at approximately 1200 degrees Celsius. Entry of these materials into the hot furnace causes the oxide copper minerals to react rapidly with the coke and CO gasses. This leads to the controlled carbothermic reduction of the copper oxides and the melting of the solids.

Heat required for the melting process comes from the burning of fuel (coke). Impurities in the charge oxidize with the flux to form a layer of "slag," which floats on top of the molten blister copper.

4. Skimming & Tapping

The slag and blister copper is periodically tapped from furnace. The blister copper is tapped in batches to fill the ingots. The slag typically contains less than 0.5% copper and can be used as building aggregate, as feed to cement kilns and if milled as cement extenders. The shaft furnace off-gas contains predominantly N2, CO2 (g), O2 (g) and H2O (Steam).

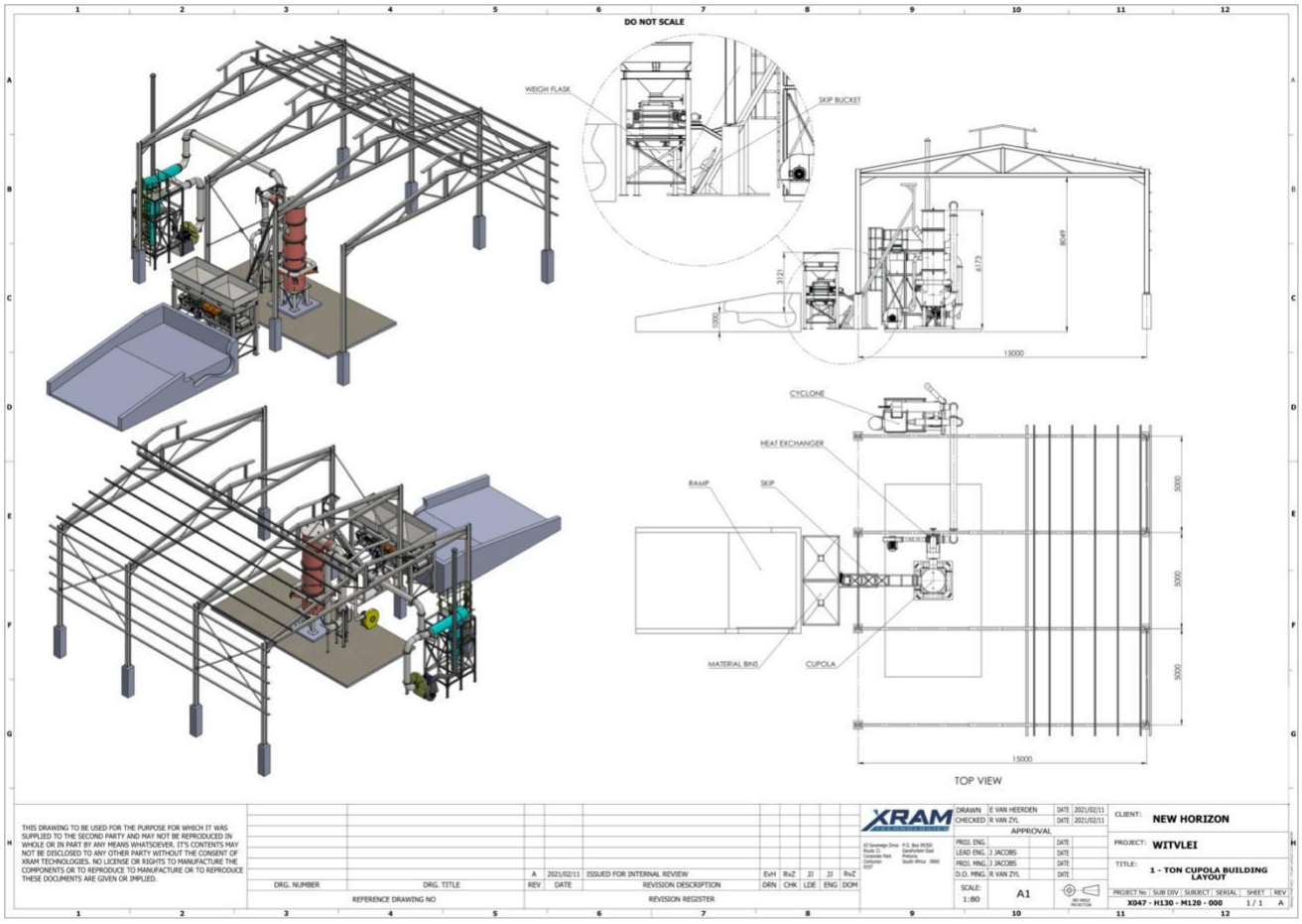

Figure 4: Cupola furnace layout

1.5.2. Production Estimates-Final Product

The production capacity of the 1-ton shaft furnace will be 56 ton per month of copper blister ingots. The blister copper is delivered to refineries for final processing. Impurities in blister copper may include gold, silver, antimony, arsenic, bismuth, iron, lead, nickel, selenium, sulfur, tellurium, tin, and zinc.

1.6. Construction Work and Activities

Construction works will be outsourced to an appointed and experienced construction contractor(s).

The following activities are anticipated for the construction of the copper smelter plant:

1.6.1. Earthworks and Site clearing

Prior to construction works, bulk earthworks will be required on certain areas of the project site in order to erect the buildings foundations for offices and amenities, staff rooms and ablution facilities, bunding and drainage structures, drains, materials loading and offloading zones, roads, and holding ponds. All of these will require soil excavation within the construction site. Earthworks and overall construction works will also mean the presence of heavy construction vehicles and equipment moving around the site.

Based on site observation during site visits, the site is low to moderate vegetated, therefore vegetation that will be encountered in the footprints of the earthworks will be removed. With that said, minimal disturbance to vegetation is expected and advocated during this phase.

1.6.2. Construction Equipment, Materials and Services

Construction equipment will be sourced from the building material suppliers proximate to the project site and if necessary, and as required, equipment will need to be sourced from elsewhere in the country and/or abroad as per the required and approved operating standards.

In terms of construction materials such as sand and aggregate for concrete and site surfacing will be obtained from commercial sources, as approved by the Construction Engineer

1.7. Project Phases Covered in the EMP

The following phases are addressed in this EMP:

- **Planning and Design Phase**: the period, prior to the construction phase, during which preliminary legislative, technical designs and administrative arrangements are carried out in preparation of construction activities. This is also the phase during which engineering drawings are carried out and finalized.
- **Construction Phase**: the phase during which earth works and site preparation works will be carried out on certain areas of the project site in order to erect the buildings, related structures and for the installation of the necessary services infrastructure required for the smelter plant operations.
- **Operational and maintenance phase:** the phase during which the copper smelter and its related activities will be operated, managed and by the NHIG's appointed Operator.
- **Decommissioning phase**: the phase during which the NHIG may decide to cease the Facility's operations, i.e. closure of the smelter plant and its operations.

1.8. Environmental Assessment Practitioner (EAP)

The proposed project by NHIG triggered the need for an Environmental Impact Assessment (EIA), Environmental Management Plan (EMP) and application for an Environmental Clearance Certificate (ECC) as the project falls under the listed activities, highlighted as follows:

- **-Section 27 (2)**

  (a) land use and transformation;

  (c) resource removal, including natural living resources;

  (e) agricultural processes;

- **Regulation 3.1:** The construction of facilities for any process or activities which requires a licence, right or other form of authorization, and the renewal of a licence, right or other form of authorization, in terms of the Minerals (Prospecting and Mining Act), 1992.
- Regulation 3.3: Resource extraction, manipulation, conservation and related activities.
- **Regulation 9.2** Any process or activity which requires a permit, license or other form of authorization, or the modification of or changes to existing facilities for any process or activity which requires an amendment of an existing permit, license or authorization or which requires a new permit, license or authorization in terms of a law governing the generation or release of emissions, pollution, effluent or waste.

In order to comply with the EMA and its 2012 EIA Regulations, the NHIG appointed Cuvepalm Consulting cc (hereinafter referred to as the *Environmental Consultant*) to undertake the required EA process and submit the Environmental Clearance Certificate (ECC) application to the Competent Authority on their behalf. Different components of the proposed project activities are subjected to different legal requirements. The legal implications or applicability to these activities and details, in terms of permitting and licensing are presented under the following chapter.

2. CHAPTER TWO: ENVIRONMENTAL LEGAL REQUIREMENT (PERMITS AND LICENSES)

This chapter presents the information and detailed information on the legal obligations that governs certain project activities that will require permitting and/or licensing from different applicable regulatory authorities. **The detailed list of all legislations, policies and guidelines are presented in the environmental scoping document (report).**

Table 1: Licenses and Permits for Witvlei Copper Smelter

LEGISLATION/POLICY	RELEVANT PROVISION/ PROJECT APPLICABILITY	REQUIRED PERMIT/CLEARANCE OR LICENSE
Environmental Management Act No. 07 of 2007 Environmental Impact Assessment (EIA) Regulations GN 28-30 (GG 4878)	Requires that projects with significant environmental impacts are subject to an environmental assessment process (Section 27). Details principles which are to guide all EAs. The EMA and its Regulations should inform and guide this EA process.	Should the ECC be issued to the Proponent, it should be renewed every 3 years. Bi-Annual reports should be informed by Monthly compliance inspections and submitted for review to MEFT Contact details at the Department of Environmental Affairs (DEA): Tel.: **+264 61 284 2701** OR Environmental Assessment Unit Mr. Damian Nchindo, Tel: +**264 61 284 2717**, Email: damian.nchindo@met.gov.na
The Water Act 54 of 1956 Water Resources Management Act No. 11 of 2013	The Witvlei copper smelter will potentially use significant amount of water. The activities directly affect water conservation, management and use therefore, requires the implementation of water conservation techniques and obtaining relevant operational permits. The protection (both quality and quantity/abstraction) of water resources should be a priority throughout the project life cycle.	Given the fact that the project will fall under commercial type of industry, a water abstraction and use permit (WAUP) should be applied for and obtained from the Department of Water Affairs & Forestry (DWA): Directorate of Water Resources Management: Water Policy and Water Law Administration Contact: **Mr. F. Witbooi (Deputy Director)** Tel: +264 208 7158

LEGISLATION/POLICY	RELEVANT PROVISION/ PROJECT APPLICABILITY	REQUIRED PERMIT/CLEARANCE OR LICENSE
		Email: Franciskus.Witbooi@mawf.gov.na It is likely that effluent/wastewater will be produced on site, therefore a discharge permit should be applied for from the Department of Water Affairs & Forestry (Water Environment Division at the Ministry of Agriculture and Forestry) Contact: **Ms. Elise Mbandeka** Tel: +264 61 208 7167 Email: Elise.Mbandeka@mawf.gov.na
Road Traffic and Transport Act, No. 22 of 1999	The Act provides for the establishment of the Transportation Commission of Namibia; for the control of traffic on public roads, the licensing of drivers, the registration and licensing of vehicles, the control and regulation of road transport across Namibia's borders; and for matters incidental thereto.	Should the Proponent wish to undertake activities involving road transportation or access onto existing roads, the relevant permits will be required from the Ministry of Works and Transport's Roads Authority. Contact: **Mr. Eugene de Paauw (Specialist Road Legislation, Advice & Compliance)** Tel: +264 61 284 7027 Email: dePaauwe@ra.org.na
National Heritage Act (No. 27 of 2004)	Discovered heritage resources should be reported to the National Heritage Council.	**Contact: Dr A. M. Nankela (Chief Archaeologist & Rock Art Specialist)** National Heritage Council: Archaeology Unit Tel: +264 61 301 903, Email: archeology@nhc-nam.org

3. CHAPTER THREE: EMP ROLES AND RESPONSIBILITIES

3.1. Overview

The chapter gives a presentation of the roles of different parties involved in the project cycle (from planning to operations and their respective responsibilities towards the implementation of the EMP.

This EMP informs all relevant parties listed below and other staff employed at the site as to their duties in the fulfilment of the legal requirements for the construction and operation of the copper smelter. This is done with particular reference to the prevention and mitigation of anticipated potential negative environmental impacts. All parties should note that obligations imposed by the EMP are legally binding in terms of the Environmental Clearance granted by the relevant environmental permitting authority, in order to:

- Ensure compliance with regulatory authority stipulations and guidelines which may be local, provincial, national and/or international;
- Verify environmental performance through information on impacts as they occur;
- Provide feedback for continual improvement in environmental performance
- Identify a range of mitigation measures which could reduce and mitigate the potential impacts to minimal or insignificant levels;
- Detail specific actions deemed necessary to assist in mitigating the environmental impact of the project;
- Create management structures that addresses the concerns and complaints of I&APs with regards to the development;
- Establish a method of monitoring and auditing environmental management practices during all phases of the activity.

3.2. Proponent (NHIG) or Representative

The Proponent is ultimately responsible for the implementation of the EMP. Alternatively, if the Proponent does not manage all aspects of the planning and design, construction and operation and maintenance phase activities referred to in this EMP, they should assign this responsibility to a suitably qualified individual referred to in this plan as the Proponent's Representative (PR).

The delegated responsibility for the effective implementation of this EMP will rest on the following key individual which may be fulfilled by the same person referred to as the Proponent Representative (PR). The PR's responsibilities include:

- Managing the implementation of this EMP and updating and maintaining it when necessary.
- Management and monitoring of individuals and/or equipment on-site in terms of compliance with this EMP.
- Issuing fines for contravening EMP provisions.

Alternatively, the Proponent may delegate an external ECO to ensure EMP compliance throughout the project life cycle.

3.3. Declaration of Commitment and Legal Compliance

The Witvlei copper Smelter Plant will potentially result in environmental impacts as identified in the Environmental Assessment Report. This Environmental Management Plan, ensures that all the identified impacts are minimised and or avoided, as such, it becomes the sole responsibility of New Horizon Investment group to comply with the provisions of the EMP set herewith. The declaration of Commitment for the implementation of this EMP is as follows:

New Horizon Investments group hereby declares its full commitment to the full implementation of this EMP and to ensure that its management systems are fully abided to. New horizon investment Group also commits to the appointment of an independent Environmental control officer to ensure that compliance is sufficiently dealt with.

Signed:

_____

Mr. Berend vd Berg

New Horizon Investment group

3.1. Environmental Control Officer (ECO)

The Proponent should assign the responsibility of overseeing the implementation of the whole EMP on the ground from the construction to operation and maintenance to a designated member of staff or external qualified and experienced person, referred to in this EMP as the Environmental Control Officer (ECO)/ Safety, Health and Environmental (SHE) Officer. The ECO will have the following responsibilities:

- Eensuring that the provisions of the EMP as well as the environmental authorization are complied with during the construction and operational phases. The ECO must be fully conversant with the Environmental Impact Assessment, Environmental Management Plan/Programme.
- Issuing of instructions to the contractor where environmental considerations call for action to be taken.
- Submit monthly written reports, ensuring that activities onsite comply with all relevant environmental legislation, monitoring and verifying that adverse environmental impacts are kept to a minimum.
- Management and facilitation of communication between the Proponent, PR and Interested and Affected Parties (I&APs) with regard to this EMP.
- Conducting fortnight site inspections (recommended frequency is fortnight during the construction phase and monthly for the operation and maintenance) of all areas with respect to the implementation of this EMP (monitor and audit the implementation of the EMP).
- Advising the PR on the removal of person(s) and/or equipment not complying with the provisions of this EMP.
- Making recommendations to the PR with respect to the issuing of fines for contraventions of the EMP.
- Undertaking an annual review of the EMP and recommending additions and/or changes to this document.

3.2. Project Manager

The project engineers and contractors referred to herein are the planning, design and operation specialists (NHIG) and Construction Contractor(s) (to be appointed). As appropriate for the EMP requirements the two will:

- Ensure the relevant commitments contained in the EMP Action Plans are adhered to;
- Compile relevant procedures and method statements for approval by the applicable phase site manager prior to initiation of activities;
- Ensure relevant staff are trained in procedures; and
- Maintain records of all relevant environmental documentation.

3.3. Smelter operator

Overall responsibility for all activities that take place on the project site will reside with the applicable phase site manager. In this regard the following roles and responsibilities are applicable:

- The implementation of and compliance with the environmental management measures proposed in this document.

- Ensuring compliance with relevant environmental and related authorizations and license conditions.
- Identifying and appointing of appropriately qualified specialists (were necessary) to undertake the programs in a timeous manner and to acceptable standards.

3.4. Specialists

Specialized skills that may be required on an ad-hoc basis or in terms of environmental support services and independent compliance monitoring and auditing or maintenance, the Proponent will need to contract or appoint suitable/relevant professionals, as and when required. These specialists include:

4. CHAPTER FOUR:ENVIRONMENTAL AND SOCIAL MANAGMENT PLAN

4.1. Identified Potential Environmental Impacts

The following potential negative impact were identified and the mitigation measures or management action plans covered under this chapter are aimed at addressing these impacts. The impacts to be managed are as follows:

- Potential of water resources and soil contamination (mainly during operational phase)
- Waste generation and management in both phases
- Dust generation and pollution
- Noise (both phases)
- Odour (during operations)
- Health and safety (both phases)
- Vehicular traffic safety (both phases)
- Visual (during operations) and archaeological impact
- Social nuisance: Influx of people into the area (both phases).

4.2. Environmental and Social Management Actions (Measures)

The aim of the management actions of the EMP is to avoid potential negative impacts where possible. Where impacts cannot be avoided, measures are provided to reduce the significance of these impacts. Management actions recommended for the potential impacts rated in the EA carried out for the proposed copper smelter establishment and operations were based on the three project phases under section 4.2.1, 4.2.2 and 4.2.3.

It should be noted some impacts are expected to occur in both construction and operational phases. In order to avoid repetition of points on such impacts, once-off management measures will be provided under the construction phase and reference made to it in the operational phase.

The management action measures are clearly set out with the responsible implementation parties assigned to these as well as the timeframes for each action. This is done to ensure that the EMP implementation responsibilities are clearly given and each implementation party involved in the project is aware of their respective responsibilities from the beginning and remain accountable.

Table 2:Planning and Design Phase Management Action Plans

Environmental Aspect	Impact	Management Actions	Responsible person(s) / Implementation responsibility	When?
EMP training EMP Implementation	Lack of EMP awareness and the implications thereof	• Employees appointed for construction work on respective infrastructure must ensure that all personnel are aware of necessary health, safety and environmental considerations applicable to their respective work.	Proponent: ECO	Construction
Smelter plant	Machinery and equipment	• The planning for construction and operation of the proposed development must take into account and consider the best practice guidelines for operating a copper smelter plant and its associated activities. • All manufactured materials should meet certain industry standards and site specific conditions. • The Proponent should ensure that the plant structures, machinery and equipment are designed in such a way mechanical failure are minimal to none.	Planning and Design Engineer	Construction
Smelter Plant	Structure Siting and Separation Distance	• Appropriate storm water routing and attenuation must be implemented to avoid onsite erosion and downstream sedimentation. • The project layout must be planned to ensure that a buffer zone of 50 meters is maintained and that no development activities occur within watercourses, public road 50 meter and surrounding properties 20 meters. • If any construction footprint takes place inside or within 50 meters of any water body, authorization must be obtained.	Planning and Design Engineer	Construction

Environmental Aspect	Impact	Management Actions	Responsible person(s) / Implementation responsibility	When?
	Waste Generation	• The design of the waste storage and disposal site should ensure that recommended lining materials are considered. • Waste site designs need to be designed carefully with attention paid to the climate parameter such as wind prevail and temperature for that particular area.		
Water	Water Use	• A Water abstraction and use permit should be applied for from the DWA at MAWF	Proponent	Operational phase
	Wastewater / Effluent discharge	• An effluent/wastewater permit should be applied for and obtained from the Department Water Affairs and Forestry (Water Environment Division).		
	Water pollution control	• A Storm water Management Plan should be designed and implemented on site. The plan must also include management mitigation measures for water pollution, drainage waste water management and the management of surface erosion e.g. by considering the applicability of contouring, etc. • The storm water drainage network must be designed such that it is separate from the sewage effluent system. • The project layout must be planned to ensure that a buffer zone of 50 meters is maintained and that no development activities occur within 200 meters of watercourses.	Planning / Design Engineer	Construction

Environmental Aspect	Impact	Management Actions	Responsible person(s) / Implementation responsibility	When?
Vegetation	Site clearing	• Should the Proponent need to remove certain protected tree species on and/or around the site, a relevant permit should be applied for and obtained from the Directorate of Forestry.	Proponent: ECO	Removal of the vegetation
Labour recruitment	Local employment	• Priority for casual work to be done during the construction and operational phases should be given to locals • If they have the required skills to undertake the work in both phases, preference should be given to those locals. • Employment of out-of-area people should only be considered if the local community does not have the required skills or they are less in number to take up the work. • Employment should be conducted through the Witvlei Settlement office. • Employment of women, marginalised people and people with disability in the area should be encouraged. • Equal opportunities should be provided for both men and women.	Construction Contractor / Engineer	Construction (for construction works) Pre-operational phase (for operations works)
Construction schedule	Schedule	• A convenient construction work/schedule should be prepared and be shared with the area, so that they can inform the local communities of when to expect the construction works in the area, given frequent heavy vehicles and possibility of new people in the area.	Proponent (Planning Unit) Construction Engineers (Contractor)	Construction

Environmental Aspect	Impact	Management Actions	Responsible person(s) / Implementation responsibility	When?
		• Construction signs containing expected duration of construction should be designed and prepared for the site.		
Roads	Vehicular traffic safety	• If required by Roads Authority, a site road access should be applied for and obtained. • The smelter plant design should include parking bays as well as offloading and loading zones.	Proponent	Construction
Aesthetics	Visual	• The smelter plant and its associated structures should be designed in such a way that visual intrusion is minimized. • The colour selection and tone must be carefully considered to mitigate visual impacts of the smelter plant.	Planning Engineer	Construction

Table 3: Construction Phase Management Action Plans

Environmental Feature	Impact	Management Actions	Responsible person(s) / Implementation responsibility	Timeframe (When?)
Monitoring	EMP non-compliance	• The ECO should monitor the implementation of this EMP. • The ECO should inspect the site operation throughout the construction period on a **Fortnight basis (2 times a month)**. • An EMP non-compliance penalty system should be implemented on site.	Proponent: ECO	Ongoing

Environmental Feature	Impact	Management Actions	Responsible person(s) / Implementation responsibility	Timeframe (When?)
Site Preparation	Site Earmarking	• The construction contractor should mark out (e.g. on the ground or with danger tape) the areas of all smelter plant buildings before any workers, equipment or building materials are brought on site. A 2-metre buffer can be allowed around the perimeter of buildings to allow construction activities. • The marked-out area should be inspected and approved by the Site Manager. Thereafter, all site staff should be clearly informed that they may not move or disturb any areas beyond those limits. • The only land area that may be cleared on site is the roads, the areas where buildings will be erected and necessary site infrastructure. • As far as possible, project materials should not be stockpiled in surrounding areas beyond the actual final Facility footprint and 2 metre buffer distance.	Proponent: ECO Construction Contractor	Construction
	Site establishment	• The construction area must have all the necessary ablution facilities with chemical toilets at commencement of construction activities, ablution facilities shall be within 100m from workplaces but not closer than 100m from any natural water bodies or boreholes. There should be enough toilets available to accommodate the workforce. • The Contractor must supply waste collection bins where such is not available and all solid waste collected must be disposed of at the nearest approved landfill site. Under no circumstances may solid waste be burnt or buried onsite.	Construction Contractor	

Environmental Feature	Impact	Management Actions	Responsible person(s) / Implementation responsibility	Timeframe (When?)
Sourcing of materials	Construction materials	• Sand required for construction and other locally-derived building materials should only be procured from sites that are environmentally cleared, i.e. sand mining sites that have been issued with Environmental Clearance Certificates (ECCs), if needed a site can be identified by the Environmental Consultant.	Proponent: ECO Construction Contractor	Construction
Biodiversity	Loss of fauna and flora	• Workers should refrain from killing animal species (big or small) that may be found on and around the site. • Workers should refrain from disturbing, killing or stealing locals' animals found on or around the project site. • Environmental awareness on the importance of biodiversity preservation should be provided to the site contractors and workers. With regards to the vegetation on or within proximity of site, the following mitigation measures should be implemented: • Even if certain vegetation is found within actual site footprint, this does not mean that it should be removed. Therefore, care should be taken when preparing the site without destroying the vegetation, unnecessarily. • Vegetation found on the sites, but not on the site infrastructure footprint should not be removed or disturbed in any way, but should be left to preserve biodiversity on the site.	Proponent: ECO All project workers involved in this phase and operational phase	Ongoing

Environmental Feature	Impact	Management Actions	Responsible person(s) / Implementation responsibility	Timeframe (When?)
		• Environmental awareness on the importance of biodiversity preservation should be raised to all project workers.		
Soils	Physical disturbance	• Re-vegetation of disturbed surfaces must occur immediately after the construction activities are completed.	Construction Contractor	
	Pollution	• Spill control preventative measures should be put in place to manage soil contamination, no matter how small the amount of pollution (spill) is. • Spill clean-up kits should be made available on site at all times. • Potential contaminants such as hydrocarbons, and wastewater should be contained on site and disposed of in accordance to municipal wastewater discharge standards so that they do not contaminate surrounding soils. • An emergency plan should be available for both major and minor spills on site in both project phases. • Where hydrocarbons and other chemicals are used during the project's phases on site, impermeable liners should be laid on such sites to capture possible spills, and prevent these substances from reaching the site soils.	Proponent: ECO	Ongoing

Environmental Feature	Impact	Management Actions	Responsible person(s) / Implementation responsibility	Timeframe (When?)
		• Drip trays should be made available for project vehicles, especially heavy trucks to contain possible fuel leaks and spills while parked on site. • In an event that any of the substances mentioned above, spill on the soil, the contaminated soil should be cleaned up immediately and dispose of in a designated hazardous waste bin and transported to the nearest approved landfill site. The contaminated and removed soil should be replaced with clean soil.		
Air Quality	Dust generation	• The Proponent should ensure that the construction schedule is limited to the given number of days of the week, but not every day. This will keep the vehicle-related dust level minimal in the area, especially when it is windy. • In extremely windy days, a reasonable amount of water should be used to suppress the dust that may be emanating from certain site areas (limited to the site only) or certain parts of the local utilized gravel roads that is generating a significant amount of dust. • Excavations and other clearing activities must only be conducted during agreed working times and permitting weather conditions to avoid drifting of sand and dust into neighbouring areas.	Proponent: ECO	Ongoing

Environmental Feature	Impact	Management Actions	Responsible person(s) / Implementation responsibility	Timeframe (When?)
		• The Contractor must be responsible for dust control onsite to ensure no nuisance is caused to the residents of Witvlei. • Project vehicles and heavy machines should not be left idling when not in use, such that they emit air polluting gases.		
Water Resources	Pollution	• Potential contaminants such as hydrocarbons (diesel) should be contained on site and disposed of in accordance to the nearest municipal wastewater discharge standards so that they do not contaminate surrounding soils and eventually groundwater. • All run off materials such as hydrocarbons, wastewater and other potential contaminants should be contained on site in designated containers and disposed of in accordance to municipal waste water discharge standards, so that they do not reach to water systems. • Stormwater management plans (discharge points) should be constructed on site to prevent the potentially contaminated run-off from reaching water resources, especially during rainy seasons. • The effluent / wastewater containers or ponds should be lined in order to prevent dissolving waste from leaching into the ground, and potentially into groundwater.	Proponent: ECO Workers involved in this phases and subsequent phases Proponent: Planning/Construction Engineers	Ongoing and as when required

Environmental Feature	Impact	Management Actions	Responsible person(s) / Implementation responsibility	Timeframe (When?)
		• Contaminated wastewater must be managed by the Contractor to ensure existing water resources on the site are not contaminated. • All wastewater from general activities must be collected and removed from the site for appropriate disposal at a licensed commercial facility. • Site staff must not be permitted to use any other open water body or natural water source adjacent to or within the designated site for the purposes of bathing, washing of clothing or for any construction related activities.		
	Water availability (impact on over abstraction of water resources on construction demands)	• Although water is needed for many aspects of construction, it should be used sparingly at all times. • Water reuse/recycling methods should be implemented as far as practicable for the construction works. • All water pipes and tanks must be managed and maintained so that they do not leak and waste water in such manner. • The requirements of the applicable water and wastewater legislations should be adhere to any licence/permit. • The amount of water supplied from the existing supply line should be used to inform the abstraction rate and water consumption practices during construction of the proposed plant.	Proponent: ECO Construction Engineers/ Contractor	Ongoing

Environmental Feature	Impact	Management Actions	Responsible person(s) / Implementation responsibility	Timeframe (When?)
		• As per the preceding point, the water management awareness will aid in ensuring that the construction works are not affecting other existing users that rely on the same water supply line. This will also lead to an effective water use and management.		
Health and Safety	Health and safety of the workers	• As part of their induction, the workers should be provided with awareness training on how to use site equipment as well as the risks of mishandling equipment and materials. • When working on site, employees (for both phases) should be properly equipped with appropriate personal protective equipment (PPE) such as coveralls, gloves, safety boots, earplugs, safety glasses, etc. depending on the type of work being done. • No employee should be allowed to drink alcohol prior to and during working hours as this may lead to mishandling of equipment which results into injuries and other health and safety risks. • Employees should not be allowed on site if under the influence of alcohol. • The Proponent should ensure that site is equipped with "danger" or "cautionary" signs for any potential danger or risk area identified on site.	Proponent: ECO Workers involved in this phases and subsequent phases	Ongoing

Environmental Feature	Impact	Management Actions	Responsible person(s) / Implementation responsibility	Timeframe (When?)
		• During construction phase, a temporary enclosed fence should be constructed around the site. This is done to control access to the site, in such a way that the public, especially children do not access the site and play with equipment and machinery on days when no work is done. • The site should be equipped with security control gate, once in operation. This is to limit restrict access to authorized personnel only.		
	Health, safety and security of the locals	• A security boundary wall, most probably using corrugated iron sheets should be erected to provide access control to the construction site and avoid potential health risks to local children that may be wandering around the site. They may try to play machinery and equipment that may pose a big risk to them (injuries). • A boundary fence also known as the line of separation (LOS) should be constructed around the sit, this will restrict unauthorized personnel such as local children or uninformed elders from accessing the facility site. • The site must be secured in order to reduce possibility of criminal activity and or vandalism of site property.	Construction contractor	
Noise	Nuisance	• The construction times should be set such that, no work is carried out during the night or very early in the mornings.	Proponent: ECO	Ongoing

Environmental Feature	Impact	Management Actions	Responsible person(s) / Implementation responsibility	Timeframe (When?)
		• Construction hours should be restricted to between 08h00 and 17h00 to avoid noise generated by construction equipment and the movement of vehicles before or after hours. • When operating excavation machinery onsite, workers should be equipped with personal protective equipment (PPE) such as earplugs to reduce noise exposure. • A noise zone shall be clearly demarcated and identified by notice indicating that relevant area is a noise zone • Where the movement of heavy vehicles is within 500 m of sensitive receptors (such as residential areas), the affected community need to be consulted well in advance to agree on a mutually acceptable working schedule • No worker in any part of the site should be exposed to a daily noise dose or peak noise level in excess of the standard laid down by the competent authority unless wearing an approved hearing protection device. • Heavy vehicle traffic must be routed away from noise sensitive areas, where possible.		
Vehicular Traffic	Traffic Safety	• Drivers of the construction and operational vehicles should be in possession of valid and appropriate driving licenses. • Vehicle drivers should adhere to the road safety rules.	Proponent: ECO Workers involved in this phases and operational phase	Ongoing

Environmental Feature	Impact	Management Actions	Responsible person(s) / Implementation responsibility	Timeframe (When?)
		• The Proponent should ensure that the site access road is well upgraded and in a good condition to cater for vehicles travelling to and from site throughout the facilities existence. • Project vehicles should be in a road worthy condition and serviced regularly in order to avoid accidents as a result of mechanical faults of vehicles. • Vehicle drivers should only make use of designated site access roads provided. • Vehicles drivers should not be allowed to operate vehicles while under the influence of alcohol. • Sufficient parking bays for all project vehicles and safe offloading and loading zones should be constructed on site. • No heavy trucks or project related vehicles should be parked outside the project site boundary. • Truck movements, frequency, times and routes should be carefully planned and scheduled – please refer to the next point. • In order to control traffic movement on site, deliveries from and to site should be carefully scheduled. This should optimally be during weekdays and between the hours of 08h00 and 17h00.	Construction Contractor	

Environmental Feature	Impact	Management Actions	Responsible person(s) / Implementation responsibility	Timeframe (When?)
		• Construction vehicles should have a scheduled time for loading and offloading materials at the site so that they do not interfere with daily traffic in the area whenever. • Site access and on-site parking and manoeuvring should be constructed in such ways that they do not interfere with other traffic on site and/or compromise traffic safety.		
Waste	Environmental Pollution (General waste)	• Construction and operational workers should be sensitized to dispose of waste in a responsible manner and not to litter. • After each daily works, no waste should be left scattered on site, but rather be disposed of in allocated site waste bins. • No waste may be buried or burned on site or anywhere else throughout the project lifecycle. • All domestic and general construction waste produced on a daily basis should be contained until such that time it will be transported to designated waste sites on a bi-weekly basis during construction and on a weekly basis during operations. • The sites should be equipped with separate waste bins for hazardous and general waste/domestic. • A penalty system for irresponsible disposal of waste on site and anywhere in the area should be implemented. • No waste should be improperly disposed of on site or in the surroundings, i.e. unapproved waste sites.	Proponent: ECO Workers involved in this phase	Ongoing

Environmental Feature	Impact	Management Actions	Responsible person(s) / Implementation responsibility	Timeframe (When?)
	Human Health	• Sufficient portable toilets should be provided on site for workers and appropriately emptied according to their manufacturer's operational standards recommendations. • Operational ablution facilities including toilets and washrooms should be constructed in preparation for the operational phase. • Hazardous waste, including emptied chemical containers used during this phase should be safely stored on site where they cannot be reached and used by the unsuspecting and uniformed locals for personal use. No waste should be improperly disposed of on site or its surroundings, i.e. unapproved waste sites. • As an emphasis on the preceding point, empty hazardous substance containers should not be disposed of anywhere on the project site or its surrounding, but instead they should be kept at a designated storing place on site until such time that they can be safely taken and disposed of at the nearest approved hazardous waste sites.	Proponent: ECO	
	Clinical, Domestic and Manure	• A waste management plan for handling onsite waste must be developed and implemented. • Waste should be stored at the appropriate areas designated for this type of waste. • Floors of the animals must be slated to allow excrement, spilled food and other waste products to be easily washed through a lower level drainage trench.	Proponent: ECO	Ongoing and as required

Environmental Feature	Impact	Management Actions	Responsible person(s) / Implementation responsibility	Timeframe (When?)
	Hazardous waste	• All hazardous substances such as paints, diesel and cement must be stored in a bunded area with an impermeable surface beneath them. • The developer must designate appropriate areas for the storage of hazardous substances. • Hazardous waste and other chemicals should be safely stored on site and later (as required) transported to the nearby approved hazardous waste sites for safe disposal. • Hazardous waste shall be transported by licenced hazardous waste contractors and vehicles. • Empty hazardous substance containers should not be disposed of anywhere on the project site or it's surrounding, but should be stored on site and safely taken to the nearest approved hazardous waste sites.		
Archaeological	Impact on unknown cultural or heritage sites/objects	• The Proponent should consider having a qualified and experienced archaeologist/ECO on standby during the construction phase. This measure will be to assist on the possible of uncovering of sub-surface graves or other cultural/heritage objects during site preparation (earthworks) and advice the Proponent accordingly. • Identified of any archaeological significant objects on the site should not be disturbed, but are to be reported to the project Environmental officer or National Heritage Council offices for further instructions and actions.	Proponent: ECO	As and when required

Environmental Feature	Impact	Management Actions	Responsible person(s) / Implementation responsibility	Timeframe (When?)
		• Workers should be educated to not destroy or throw away but report (to the environmental officer) of any unknown object found/discovered on site during earthworks during the construction or even during operations.		
Demographic change	Influx of outsiders into the area	• The Proponent and its project contractors should prioritize the employment of local people, and only if necessary and due to lack of skills in the area, out-of-area people can be given some of the work. This is to avoid the influx of outsiders into the area. • The locals to be employed during the project phases should be provided with the necessary training of skills required for the project to minimize the number of out-of-area employees. • The workers should be engaged in health talks and training about the dangers of engaging in unprotected sexual relations which results in contracting HIV/AIDS and other sexual related infections. • Out-of-area workers that may be employed (due to their unique work skills) on site should be sensitized on the importance of respecting the local values and norms, so that they can co-live in harmony with the local community. • Construction workers or any project related worker should be prohibited from getting involved in sexual relations and/or engage in sexual activities with under-age girl children.	Proponent and Contractor(s): Human Resources Unit	Pre-construction and/or Operational Phase

Environmental Feature	Impact	Management Actions	Responsible person(s) / Implementation responsibility	Timeframe (When?)
		• Any construction worker who will be found or seen engaging in sexual relations with a school learner shall be reported to the site manager and necessary actions taken against that worker according to the Contractor's code of conduct.		
	Potential damage or disturbance to private properties	• The Proponent and its project contractors should inform their workers on the importance of respecting the locals' properties by not intruding or damage their homes, fences or killing their livestock. • Any workers or site employees that will be found guilty of intruding peoples 'privately owned properties should be called in for disciplinary hearing and/or dealt with as per their employer's code of employment conduct • Site workers should be advised to respect the community and local's private properties, values and norms. • No worker should be allowed to walk around in people's private yards or fences without permission. • Site workers are not allowed to kill or in any way disturb local livestock. • No worker should be allowed to, without permission cut down or damage trees belonging either to the community, neighbouring homesteads or in the community forests.		

Environmental Feature	Impact	Management Actions	Responsible person(s) / Implementation responsibility	Timeframe (When?)
Construction workers accommodation	decommission	• All construction related structures, including campsite must be removed from site. • The area that previously used for the construction campsite must be checked for spills of substances such as oil, paint, etc., and these shall be cleaned up and contaminants disposed of appropriately. • The Contractor must repair any damage that the construction works may have caused to neighbouring properties, specifically, but not limited to damage caused by poor storm water management. • All hardened surfaces within the construction area must be ripped, all imported materials removed, and the area shall be top soiled and regressed. • All building rubbles (materials) must be removed from the site. • Final inspection must be undertaken in order to ensure adherence to EMP guidelines, completion of localized/ remaining areas of impact, monitoring of rehabilitation success, etc.	Contractor Proponent: ECO	After completion of construction works and before evacuating the site

Table 4: Operational and Maintenance Phase Management Action Plans

Environmental Feature	Impact	Management Actions	Responsible person(s) / Implementation responsibility	Timeframe (When?)
EMP training	Lack of EMP awareness and the implications thereof	All personnel and visiting groups to undergo EMP induction (training) for all project phases, which should include as a minimum the following: • Explanation of the importance of complying with the EMP • Employees' roles and responsibilities, including emergency preparedness • Description of mitigation measures that must be implemented when carrying out respective activities • Description of specific mitigation measures within this EMP • Training shall be provided by ECO or someone who is competent to provide it and has theoretical and practical knowledge that relate to all aspects of EMP • Introduce visitor health and safety induction sessions • Conduct detailed review of the current EMP to familiarize personnel with requirements	Proponent: ECO	Ongoing
Monitoring	EMP non-compliance	• The ECO or the Proponent should monitor the implementation of this EMP. • The ECO should inspect the site operation on a monthly basis.	Proponent: ECO	Ongoing
Employee Heath and Safety	Employee OHS	Establish an Occupational Health and Safety programme that should address at a minimum occupational hygiene and the mitigation measures included below: • Medical surveillance of employees should be conducted for the protection of the health of employees prior and post-employment • Lighting systems: A lighting survey to be conducted prior to commencement of operations.	Proponent: ECO	Ongoing

Environmental Feature	Impact	Management Actions	Responsible person(s) / Implementation responsibility	Timeframe (When?)
		• Ventilation Systems: Ensure that work areas are sufficiently ventilated. Conduct ventilation study prior commencement of operations. • Employ dust extraction fans at concentrated work places. • Conduct regular occupational exposure surveys in accordance with statutory standards • Correct Personal Protective Equipment (PPE) must be worn at all times by the personnel on site. Personnel must be trained on the use of PPE. • No unauthorised ignition sources will be permitted on site and debris/waste shall not be burnt under any circumstances. • Erect suitable warning and information signage near any hazardous storage facility. Handling of hazardous chemicals must only be done by trained personnel. • All provisions of the Labour Act Nr 11 of 2007 in conjunction with Regulation 156, 'Regulations Relating to the Health and Safety of Employees at work' must be complied with. • Safety Data Sheets (SDSs) must be readily available on site for hazardous substances. • In the event of an emergency relating to hazardous substances, procedures detailed in the SDS shall be implemented. • Comply with occupational exposure limits set by law		

Environmental Feature	Impact	Management Actions	Responsible person(s) / Implementation responsibility	Timeframe (When?)
Soil	Sterilisation of soils as a result of hydrocarbon / chemical / waste contamination.	• No foreign matter such as rubble, waste or hazardous material will be mixed with the topsoil or used to backfill excavation. • Spills will be cleaned up immediately after the incident. Contaminated soil will be disposed of as hazardous waste at a licensed hazardous landfill facility. • Drip trays or a Polyvinyl chloride (PVC) lining shall be provided for equipment utilising hydrocarbons. • No waste will be buried or burned on site. • Dust fallout contamination monitoring will be conducted every month in relation to soil quality.	Proponent: ECO	Ongoing
Air Quality	Dust generation	**In addition to some relevant management measures given under the Construction Phase, the following are further recommended for the operational phase:** **Stack emissions expected from the project, and monitoring and management guidelines are in the Air quality specialist report.** • Emissions monitoring is to be conducted every month. • Fallout dust monitoring will also be conducted every month on a 28-day monitoring cycle. • Ambient air quality will also be conducted prior to project operation, to allow for baseline comparison. • At times of high winds, periodic dust suppression techniques will be employed on cleared areas generating dust.	Proponent: ECO	Ongoing

Environmental Feature	Impact	Management Actions	Responsible person(s) / Implementation responsibility	Timeframe (When?)
		• -During tertiary crushing, all dust suppression measures will be employed to dust fallout affecting neighbours. • Ambient dust measurement will be conducted on site (inside the plant shell and outside dust PPM). • A weather monitoring station will be installed on site for wind observation and dust control modelling.		
Odour	Smell from the Copper Smelter	• The first step in solving any odour problem is identifying the source. Since this could be caused by a number of different things, it is best to pinpoint the source of odours with the help of a professional/specialist in wastewater treatment. • If offensive odours arise, the source must be investigated immediately and appropriate corrective measures must be taken.	Proponent: ECO	Ongoing
Biodiversity	Loss of fauna and flora	**Management action plans provided under the Construction Phase apply to this phase**	Proponent: ECO Workers involved this phase	Ongoing
Soils	Physical disturbance and Pollution	**Management action plans provided under the Construction Phase apply to this phase**	Proponent: ECO	Ongoing

Environmental Feature	Impact	Management Actions	Responsible person(s) / Implementation responsibility	Timeframe (When?)
Water Resources	Pollution	• Potential contaminants such as hydrocarbons (diesel) should be contained on site and disposed of in accordance to the nearest municipal wastewater discharge standards so that they do not contaminate surrounding soils and eventually groundwater. • An emergency plan should be available for major / minor hydrocarbon spills during construction activities and during the transportation of the product(s) to the site. • The Storm water Management Plan must be implemented. • Storm water from the plant must be channelled to an onsite holding pond. • The site must be managed in a manner that prevents pollution of drains, downstream watercourses or groundwater, due to suspended solids, silt or chemical pollutants. • The proposed smelter wastewater ponds should be lined and adequately maintained to prevent surface and groundwater contamination of any form. • Provide shade around bunded waste storage areas to prevent accumulation of water • No alterations to banks or beds of watercourses is allowed (a dry gully is also recognized as a water course);	Proponent: ECO Workers involved this phase	Ongoing

Environmental Feature	Impact	Management Actions	Responsible person(s) / Implementation responsibility	Timeframe (When?)
		• An inventory of all chemicals on site must be kept together with the respective SDS. • Cleaning/repair of equipment/vehicles should be done in a designated area to prevent soil and water pollution and the workshop area should be bunded and fitted with an oil separation system. • Storage areas containing hazardous substances/materials are to be clearly demarcated and labelled. • Remediation of spillages must be conducted as far as practically reasonable. • Stockpile will be shaped to divert storm water around the site to minimise soil erosion of the site as well as to prevent the contaminated water runoff. • The storm water drainage system must be adequately designed based on site conditions in order to ensure the free flow of surface run-off. • Sewage facilities will be maintained and kept in a good order to prevent any sewage spills. -The septic tanks will always be maintained and emptied when required. All sewerage waste is under the Management of the Town Council.		

Environmental Feature	Impact	Management Actions	Responsible person(s) / Implementation responsibility	Timeframe (When?)
	Water Use and Availability	• Water re-use and recycling within the site operations should be encouraged. • The water volumes allocated in the water abstraction and use permit should be adhered to and if possible, this amount can be reduced, by abstracting and using only the actual water needed for certain sit operations. • Water use and management awareness should be raised among all site personnel as a way to promote water conservation on site.	Facility operator	Ongoing
Vehicular Traffic	Traffic Safety	• Drivers of the construction and operational vehicles should be in possession of valid and appropriate driving licenses. • Vehicle drivers should adhere to the road safety rules. • Project vehicles and machinery should be serviced regularly in order to avoid accidents as a result of mechanical faults of vehicles and machines.	Proponent: ECO	Ongoing

Environmental Feature	Impact	Management Actions	Responsible person(s) / Implementation responsibility	Timeframe (When?)
Noise	nuisance	• Any site activities that may potentially create noise should be conducted between 08h00 and 17h00 on weekdays. These activities include ore off-loading, crushing. • A noise assessment should be conducted during operation, to ensure that noise generation thresholds are not exceeded. **For the rest of the management action plans, please refer to management action plans provided under the Construction Phase**	Proponent: ECO	Ongoing
Waste management	Animal waste	• A designated waste storage site will be identified on site, • All hazardous waste will be disposed of by an accredited hazardous waste handling contractor/carrier. • Waste will not be stored for a period exceeding 90 days Or volumes exceeding 100 cubic metres. • Waste to be stored on bunded and hard standing floors • Waste generated on the proposed site should be collected by authorised waste contractors and frequently disposed of at a licensed landfill site as the last resort. Recycling/reuse of waste should be enforced where feasible. • Non-mineral waste site should be identified separately from the hazardous waste disposal area. • Authorisation from Witvlei Council for the disposal of waste at their disposal site should be obtained prior to operations.	Proponent: ECO	Ongoing

Environmental Feature	Impact	Management Actions	Responsible person(s) / Implementation responsibility	Timeframe (When?)
	Environmental Pollution	**Management action plans provided under the Construction Phase apply to this phase**	Proponent: ECO	Ongoing
	Human health	• Carcinogenic emissions and fumes from the copper smelting process may be dangerous to human health, as such employee medical examination before employment should be conducted. • In order to discourage the unsuspecting and uniformed local community from eyeing the empty hazardous containers, if possible, holes should be drilled in these containers while kept on site (before transporting the containers to the waste site). This is also where the fencing of the site is vital throughout the two project phases to restrict unauthorized public/local site access. • Avoid the discharge of any type of waste into the general environment or private properties or into the surface water bodies or ground (and eventual infiltration into groundwater)	Proponent: ECO	
Archaeological	Impact on unknown cultural or heritage sites/objects	**Management action plans provided under the Construction Phase apply to this phase**	Proponent: ECO	As required
Community relations & Social Cohesion	Social tension	• Information regarding activities to be communicated through community communication channels • Develop a communication strategy and establishment of a community complaints and resolution committee	Proponent	On-goin

Environmental Feature	Impact	Management Actions	Responsible person(s) / Implementation responsibility	Timeframe (When?)
		• Ensure that contracts with subcontractors incorporate environmental management and occupational hygiene and safety requirements • Keep constant updated records of all concerns and issues logged during the course of the smelting operations • Monitor the speed and effectiveness of remedial actions taken upon concerns and issues raised by the public • Establish guidelines for communicating pertinent OH&S, Emergency Preparedness and Response information to community representatives and social services providers(Police , Medical providers, Local fire department, Ambulance Service) • Emergency response procedures should be documented for all anticipated hazards associated with smelting operations		

5. CHAPTER FIVE: ENVIRONMENTAL MONITORING ACTION

In order to reduce the "medium" and maintain the "low" significance ratings of impacts identified and assessed in the EA report, some monitoring activities are recommended for Witvlei Copper.

Cuvepalm Consulting hereby recommends for the granting of the Witvlei Copper Smelter Environmental Clearance Certificate on condition that a monitoring programme will be implemented:

5.1. Monitoring of Selected Environemntal Components

- **During the Construction period**: Weekly monitoring during the first month of construction where after Monthly audits will be conducted by the Environmental Control Officer for the remainder of the construction phase to ensure compliance to the EMP conditions, and where necessary make recommendations for corrective action.
- **Audit Reporting (during the Construction period):** Compilation of an audit report with a rating of compliance with the EMP. The ECO shall keep a photographic record of any damage to areas outside the demarcated site and construction area. The Contractor shall be held liable for all unnecessary damage to the environment. A register shall be kept of all complaints from the Landowner or community. All complaints/ claims shall be handled immediately to ensure timeous rectification /payment by the responsible party.
- **Environmental (during the validity period of the ECC):** Monthly Environmental inspections and EMP implementation and compliance monitoring should be undertaken throughout the project cycle. The monthly inspection reports will also be used for the compilation of the first bi-annual report, to be conducted 6 months from the date of ECC issuance. Environmental monitoring reports are to be compiled and submitted to the Department of Environmental Affairs (DEA) for archiving. This practice will make the ECC renewal easy when it is about to expire. Therefore, the Proponent should effectively monitor and submit the reports to the DEA. The submission is not only done for record keeping purposes, but also in compliance with the environmental legislation.
- **Environmental (Checklist):** In order to make impact monitoring and EMP compliance easy, the Proponent will implement an Impact-Indicator Checklist that can be used by the ECO every month**.**
- **Groundwater:** the risk of groundwater contamination from the proposed project is moderately high,, given the planned pollution measures, the Environmental Consultant recommends that the Proponent consider establishing a baseline and monitoring points as part of the Witvlei copper smelter. This can be done by sampling water from monitoring boreholes drilled before the Copper Smelter is operational (baseline information/pre-copper smelter environmental influence). As a minimum one (1) boreholes is to be drilled downstream of the Witvlei Copper smelter to the depth between 50 and 100 m (the common groundwater borehole depth range in the region) Existing boreholes with 3km radius from the smelter will also be monitored.
  Water level monitoring will be done every month, whilst water quality monitoring **will** then be done on a quarterly basis from the operational time of the smelter plant to monitor groundwater quality.

  Surface water quality will be monitored from any nearby surface water source, and surface water quality is collected every month.

  The following parameters would be monitored:
  - pH, electrical conductivity (EC), total dissolved solids (TDS), Biological oxygen demand (BOD), sulphates, total organic nitrogen, calcium phosphorus, magnesium, potassium,

sodium, ammonium nitrogen, chloride, nitrate-nitrogen, nitrite-nitrogen, potassium, total dissolved phosphorus, bicarbonate, dissolved organic carbon, an ion balance

- Screening (presence/absence) for *E. Coli,*

The section below provide for general monitoring requirements for parameters and shall be implemented in conjunction with dust fall out monitoring and all other parameters specified above and in air quality study.

Table: Monitoring Parameters

	Particulars	Monitoring Frequency	Method of Sampling	Parameters
A	**Industrial Water Quality**			
	Industrial Waste Water	Daily	SANS 5667-10	Parameters specified under Water Act 54 of 1954 -Guidelines
B	**Ambient Air Quality (off-site)**			
	All sensitive receptors	Quarterly	manual procedure	PM10, PM2.5, SO2
	Sensitive receptors (monitoring points)	Quarterly	manual procedure	PM10, PM2.5, SO2
C	**Industrial Noise**			
	Cyclone	Quarterly	8 hr continuous with 1 hr interval, SANS10083	Noise levels in dB(A)
	Office Unit	Quarterly	8 hr continuous with 1 hr interval, SANS10083	Noise levels in dB(A)
	Smelter	Quarterly	8 hr continuous with 1 hr interval, SANS10083	Noise levels in dB(A)
D	**Ambient Noise**			
	Property boundary	Monthly	8 hr continuous with 1 hr interval, SANS10083	Noise levels in dB(A)
E	**Ambient Water Quality**			
	Monitoring Boreholes – (Adjacent- 1km radius) Monitoring Boreholes – (Distant- 5 km radius upstream)	Monthly	SANS 5667-11	Parameters specified under Water Act 54 of 1954
F	**Ambient Air Quality (on-site)**			
	Off-gas stack	Monthly	ISO-Kinetic Test sampling or manual procedure	SO2,PM10, PM2.5,
	Offloading , Screening and Mixing Area	Monthly	ISO-Kinetic or manual procedure	SO2,PM10, PM2.5, C0
	Coke Storage Area	Monthly	manual procedure	PM10, PM2.5
	Soil around slag storage area ,Standing Water	Monthly	Soil sampling -manual procedure, Flame Atomic Absorption Spectrophotometer(FAAS) , SANS-241	Arsenic, lead, copper, zinc, chlorine,nickel

Fallout Dust: Air quality is monitored to measure the amount of dust fall out. This is to see how air quality is affected by activities of smelting operations , and the possible impact on neighbouring sensitive receptors.

The dust monitoring stations conform to the ASTM International standard (ASTM D1739-98), designed primarily to study long-term trends and obtain particulate matter for chemical analysis from sampling points to be established during the baseline audit inspection. Due to a lack of guidelines on ambient air quality standards in Namibia, the consultant recommends depositional dust monitoring results will be compared to the dust fallout limits as provided by the South African National Standard (SANS) limit of 600 mg/m²/day as an average value over a 28 – 32-day period being the limit value for residential and human habited areas within a 2km radius area.

SANS (1929:2011) AMBIENT AIR QUALITY EVALUATION CRITERIA FOR DUST DEPOSITION

LEVEL	DUST FALL RATE (mg/m²/day)	AVERAGING PERIOD	PERMITTED FREQUENCY OF EXCEEDING DUST FALL RATE
Action Residential	D < 600	30 days	Three within any year, no two sequential months
Action Industrial	D < 1200	30 days	Three within any year, not sequential months
Alert Threshold	D < 2400	30 days	None. First incidence of dust fall rate exceeded requires remediation and compulsory report to relevant authorities

THE TARGET, ACTION AND ALERT THRESHOLD VALUES FROM THE SANS 1929: 2011 AMBIENT AIR QUALITY MONITORING STANDARD

Band Number	Band Description	Dust rate (D) mg/m²/day	Comment
1	Residential	D < 600	Permissible for residential and light commercial.
2	Industrial	600 < D < 2400	Permissible for heavy commercial and industrial.
3	Action	1200 < D < 2400	Requires investigation and remediation if two sequential months lie in this band, or more than three occur in a year.
4	Alert	2400 < D	Immediate action and remediation required following the first incidence of dust fallout rate being exceeded. Incident report to be submitted to the relevant authority.

5.2. Environmental awareness

Contractors shall ensure that its employees and any third party who carries out all or part of the Contractor's obligations are adequately trained with regard to the implementation of the EMP, as well as regarding environmental legal requirements and obligations. Training shall be conducted by the ECO where necessary.

Environment and health awareness training programmes should be targeted at three distinct levels of employment, i.e. the executive, middle management and labour. Environmental awareness training programmes shall contain the following information:

- The names, positions and responsibilities of personnel to be trained.
- The framework for appropriate training plans.
- The summarized content of each training course.
- A schedule for the presentation of the training courses.
- The ECO shall ensure that records of all training interventions are kept in accordance with record keeping and documentation control requirements as set out in this EMP. The training records shall verify each of the targeted personnel's training experience.

6. CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

Cuvepalm Consulting are confident that the potential negative impacts associated with the proposed copper smelter activities, can be adequately mitigated by the effective implementation and monitoring of recommended management action plans contained in this document. Therefore, it is recommended that the proposed copper smelter construction and operations be granted an Environmental Clearance Certificate, provided that:

- All mitigations provided in this EMP should are implemented as stipulated;
- All required permits, licenses and approvals for the proposed copper smelter are obtained as required (please refer to the Permitting and Licensing in Table 2 of this EMP);
- The Proponent and all their engineers and contractors comply with the legal requirements governing this type of project and its associated activities;
- A Monthly Environmental Compliance inspection should be conducted;
- Water quality monitoring should be conducted to prevent pollution.
- Environmental monitoring requirements recommended are adhered to; and
- All the necessary environmental and social (occupational health and safety) precautions provided are adhered to.