

Mining Claims 71264 and  
71265, Windhoek Rural,  
Khomas Region

# Environmental Management Plan

2022

Environam Consultants Trading

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# Environmental Management Plan

FOR MINING CLAIMS 71264 AND 71265

## PROJECT DETAILS

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- Appendix B: Existing Environmental Clearance Certificate
- Appendix C: Water Quality Guidelines

## ABBREVIATIONS

AIDS	Acquired Immuno-Deficiency Syndrome
DR	<b>Developer’s Representative</b>
EA	Environmental Assessment
ECC	Environmental Clearance Certificate
ECO	Environmental Control Officer

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EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EMP	Environmental Management Plan
GG	Government Gazette
GIS	Geographic Information System
GN	Government Notice
GPS	Global Positioning System
HIV	Human Immuno-deficiency Virus
I&APs	Interested and Affected Parties
NHC	National Heritage Council
Reg.	Regulation
S	Section
TB	Tuberculosis

## 1 INTRODUCTION

The Sib copper oxide deposit is located 170km southeast of Windhoek in central Namibia. On surface at the Sib copper prospect, the copper flower (*helichrysum leptolepis*) is widespread forming an extensive geobotanical anomaly. This may have given rise to the initial discovery of copper at Sib.

In the late 1960s Gamma Mining and Prospecting (AngloVaal) initially conducted soil sampling, followed up by pitting, trenching, wagon drilling, diamond drilling and biochemistry. Secondary copper minerals, predominantly malachite and chrysocolla in a greenish-grey fine-grained sandstone are exposed in a number of piles of rubble, which are scattered on surface after trenches were refilled. During 2012 to 2014, Craton conducted extensive soil sampling, ground magnetics, RC drilling, pitting, resource assessment, external metallurgical tests, an order-of-magnitude assessment and a scoping study for a 2,100 tonnes per month operation. Both AngloVaal and Craton considered the potential at Sib to be too small to develop.

The application for transfer of EPL4055, to Karl Hartmann, the proponent, was approved on 15 May 2017. Karl Hartmann received NEPL7915 and applied for Mining Claims 71264 and 71265.

In terms of section 27 of the Environmental Management Act, 2007 (Act 7 of 2007) certain activities, including mining and quarrying, may not be undertaken without an Environmental Clearance Certificate (ECC).

The proponent has applied for and was issued with an approved Environmental Clearance Certificate in 2019, this ECC will lapse in November 2022. The ECC contains conditions that have to be adhered to during the period of its validity; in particular, it calls for regular environmental monitoring and evaluations on environmental performance to be conducted, as well as the setting and monitoring of targets for improvement. As part of this exercise bi-annual reports have to be submitted to the Office of the Environmental Commissioner for the duration of the ECC. The proponent has met this condition by submitting the required reports to the Office of the Environmental Commissioner. Copies of these are attached together with the existing ECC as Appendix A and B respectively. It has to be mentioned that at this point mining activities have not commenced on the site as yet, and that is linked to the complexity of finalising funding to enable the operations. The proponent has however, indicated that the process of securing these funds is advanced and it is highly likely that the mining activities will start during the validity period of the renewed ECC.

The proponent appointed Environam Consultants Trading cc (ECT) to undertake the process of applying for the renewal of the ECC for the activity from the Office of the Environmental Commissioner in the Ministry of Environment, Forestry and Tourism (MEFT).

The process will be undertaken in terms of the gazetted Namibian Government Notice No. 30 Environmental Impact Assessment Regulations (herein referred to as EIA Regulations) of the Environmental Management Act (No 7 of 2007) (herein referred to as the EMA). An Environmental Management Plan (EMP) is required to accompany the application for the renewal. This assignment will thus include a review and update of the initial EMP prepared for the proponent when the Environmental Impact Assessment was carried out.

An EMP is one of the most important outputs of the EA process as it synthesises all of the proposed mitigation and monitoring actions, set to a timeline and with specific assigned responsibilities. This EMP details the mitigation and monitoring actions to be implemented during the following phases of this development:

- Planning and Design - the period, prior to construction, during which preliminary legislative and administrative arrangements, necessary for the preparation of the land, are made and engineering designs are carried out. The preparation of construction tender documents forms part of this phase;
- Construction - the period during which the proponent, having dealt with the necessary legislative and administrative arrangements, appoints a contractor for the construction of infrastructure, buildings as well as any other construction process(s) within the development area;
- Operation and Maintenance - the period during which the development will be fully functional, operational and maintained.
- Closure and Rehabilitation phase - The critical phase at the decommissioning stage of the development.

## 1.1 PROJECT LOCALITY

The proposed mining site is located approximately 170km south-east of Windhoek. It is east of Rehoboth and south of Dordabis and is found in the Windhoek Rural Constituency of the Khomas Region. The deposit occurs on farm Sib, registered to Hakapamwe cc and owned by brothers Lucas and Ben Kotze. The farm can be accessed from the C15 road through the farm Beenbreck or alternatively from the C25 road and then through farm Den Haag. MC 71264 is positioned at coordinates: **23°27'36''S; 17°48'51''E** while **MC 71265 is at coordinates: 23°27'27''S; 17°49'04''E**. Refer to

Figure 1-1 below for the locality map of Windhoek, Figure 1-2 and Figure 1-3 for the locality maps.



Figure 1-1: Locality map of Windhoek

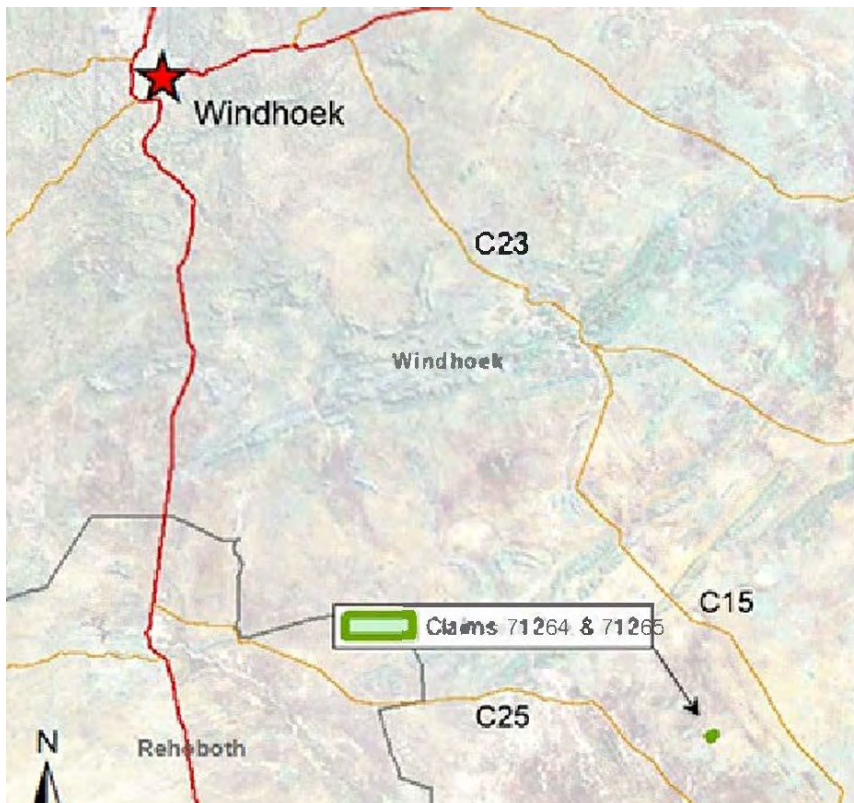


Figure 1-2: Locality map of the development site

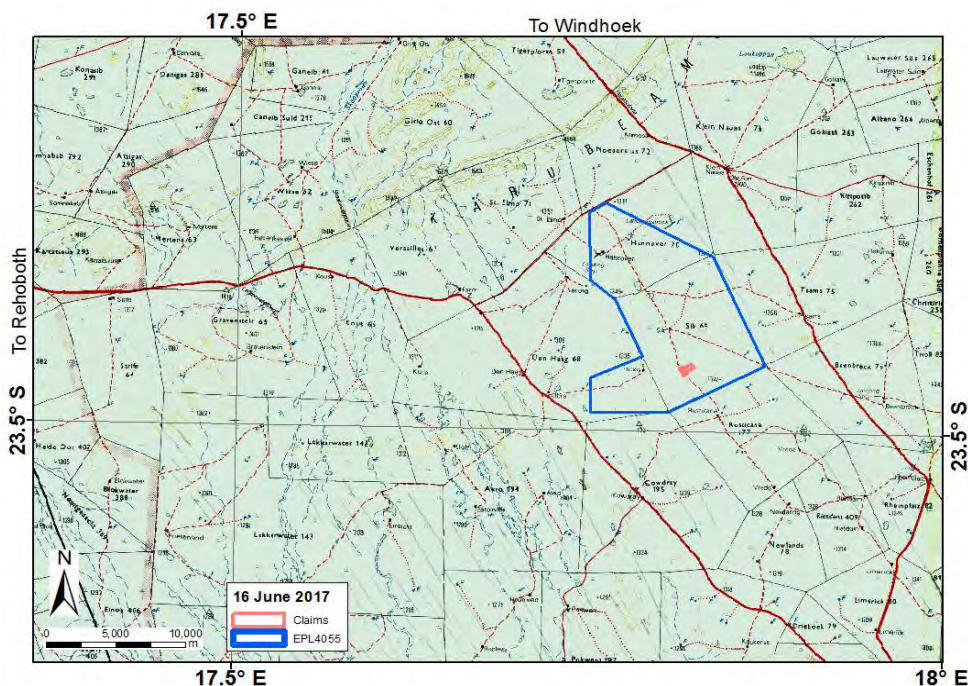


Figure 1-3: Locality map of claims (Farm view)

## 2 ROLES AND RESPONSIBILITIES

Hartmann Geoservices (the Developer) is ultimately responsible for the implementation of the EMP, from the planning and design phase to the closure and rehabilitation phase of this development. The developer will delegate this responsibility as the project progresses through its life cycle. The delegated responsibility for the effective implementation of this EMP will rest on the following key individuals:

- Developer’s Representative;
- Environmental Control Officer; and
- Contractor (Construction and Operations and Maintenance).

### 2.1 DEVELOPER’S REPRESENTATIVE

The Developer should assign the responsibility of managing all aspects of this development for all development phases (including all contracts for work outsourced) to a designated member of staff, referred to in this EMP as the **Developer’s Representative (DR)**. The Developer may decide to assign this role to one person for the full duration of the development, or may assign a different DR to each of the development phases - i.e. one for the planning and design phase, one for the construction phase and one for the operation and maintenance phase. The DR’s responsibilities are depicted in Table 2-1 as follows:



Table 2-1: DR's responsibilities

Responsibility	Project Phase
Making sure that the necessary approvals and permissions laid out in Table 4-1 are obtained/adhered to	Throughout the lifecycle of this development
Making sure that the relevant provisions detailed in Table 5-1 are addressed during planning and design phase.	Planning and design phase
Suspending/evicting individuals and/or equipment not complying with the EMP	<ul style="list-style-type: none"> <li>• Construction</li> <li>• Operation and maintenance</li> </ul>
Issuing fines for contravening EMP provisions	<ul style="list-style-type: none"> <li>• Construction</li> <li>• Operation and maintenance</li> </ul>

## 2.2 ENVIRONMENTAL CONTROL OFFICER

The DR should assign the responsibility of overseeing the implementation of the whole EMP on the ground during the construction and operation and maintenance phases to a designated member of staff, referred to in this EMP as the Environmental Control Officer (ECO). The DR/Developer may decide to assign this role to one person for both phases, or may assign a different ECO for each phase. The Developer may outsource the monitoring and evaluation of the EMP to an independent Environmental Consultant. The ECO will have the following responsibilities during the construction and operation and maintenance phases of these developments:

- Management and facilitation of communication between the Developer, DR, the contractors, and Interested and Affected Parties (I&APs) with regard to this EMP;
- Conducting site inspections (recommended minimum frequency is quarterly) of all construction and/or infrastructure maintenance areas with respect to the implementation of this EMP (monitor and audit the implementation of the EMP);
- Compiling Bi-annual reports to be submitted to the Environmental Commissioner.
- Assisting the Contractor in finding solutions with respect to matters pertaining to the implementation of this EMP;
- Advising the DR on the removal of person(s) and/or equipment not complying with the provisions of this EMP; and

- Making recommendations to the DR 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.

### 2.3 CONTRACTOR

Contractors appointed by the Developer are automatically responsible for implementing all provisions contained within the relevant chapters of this EMP. Contractors will be responsible for the implementation of this EMP applicable to any work outsourced to subcontractors. Table 5-2 applies to contractors appointed during the construction phase and Table 5-3 to those appointed during the operation and maintenance phase. In order to ensure effective environmental management the aforementioned chapters should be included in the applicable contracts for outsourced construction, operation and maintenance work.

The tables in Chapter 5 detail the management measures associated with the roles and responsibilities that have been laid out in this chapter.

## 3 ASSUMPTIONS AND LIMITATIONS

This EMP has been drafted based on the scoping-level Environmental Assessment (EA) conducted for the Mining Claims 71264 and 71265 as represented by the developer. ECT will not be held responsible for the potential consequences that may result from any alterations to the initial layout.

## 4 APPLICABLE LEGISLATION

Legal provisions that have relevance to various aspects of this development are listed in Table 4-1 below. The legal instrument, applicable corresponding provisions and contact details are provided.

Table 4-1: Legal provisions relevant to this development

LEGISLATION/POLICIES	RELEVANT PROVISIONS	RELEVANCE TO PROJECT
The Constitution of the Republic of Namibia as Amended	<p>Article 91 (c) provides for duty <b>to guard against “the degradation and destruction of ecosystems and failure to protect the beauty and character of Namibia.”</b></p> <p>Article 95(l) deals with the <b>“maintenance of ecosystems, essential ecological processes and biological diversity” and sustainable use of the country’s natural resources.</b></p>	Sustainable development should be at the forefront of this development.

LEGISLATION/POLICIES	RELEVANT PROVISIONS	RELEVANCE TO PROJECT
Environmental Management Act No. 7 of 2007 (EMA)	Section 2 outlines the objective of the Act and the means to achieve that. Section 3 details the principle of Environmental Management.	The development should be informed by the EMA.
EIA Regulations GN 28, 29, and 30 of EMA (2012)	GN 29 Identifies and lists certain activities that cannot be undertaken without an environmental clearance certificate. GN 30 provides the regulations governing the environmental assessment (EA) process.	Activity 3.1 The construction of facilities for any process or activities which requires a licence, right or other form of authorisation, and the renewal of a licence, right or other form of authorisation, in terms of the Minerals (Prospecting and Mining Act), 1992.  Activity 3.2 Other forms of mining or extraction of any natural resources whether regulated by law or not.  Activity 3.3 Resource extraction, manipulation, conservation and related activities
Convention on Biological Diversity (1992)	Article 1 lists the conservation of biological diversity amongst the objectives of the convention.	The project should consider the impact it will have on the biodiversity of the area.
Draft Procedures and Guidelines for conducting EIAs and compiling EMPs (2008)	Part 1, Stage 8 of the guidelines states that if a proposal is likely to affect people, certain guidelines should be considered by the proponent in the scoping process.	The EA process should incorporate the aspects outlined in the guidelines.
Namibia Vision 2030	Vision 2030 states that the solitude, silence and natural beauty that many areas in Namibia provide are becoming sought after commodities and must be regarded as valuable natural assets.	Care should be taken that the development does not lead to the degradation of the natural beauty of the area.
Water Act No. 54 of 1956	Section 23(1) deals with the prohibition of pollution of underground and surface water bodies.	The pollution of water resources should be avoided during construction and operation of the development.
The Ministry of Environment, Forestry and Tourism (MEFT) Policy on HIV & AIDS	MEFT has developed a policy on HIV and AIDS. In addition it has also initiated a programme aimed at mainstreaming HIV and gender issues into environmental impact assessments.	The proponent and its contractor have to adhere to the guidelines provided to manage the aspects of HIV/AIDS. Experience with construction projects has shown that a significant risk is created when

LEGISLATION/POLICIES	RELEVANT PROVISIONS	RELEVANCE TO PROJECT
		construction workers interact with local communities.
Minerals (Prospecting and Mining) Act 33 of 1992	This Act deals with the granting of access to mineral resources.	Compliance to this instrument is critical.
Labour Act no 11 of 2007	Chapter 2 details the fundamental rights and protections. Chapter 3 deals with the basic conditions of employment.	Given the employment opportunities presented by the development, compliance with the labour law is essential.
Public Health Act no 36 of 1919	Section 119 prohibits persons from causing nuisance.	Contractors and residents of the proposed extensions are to comply with these legal requirements.
Nature Conservation Ordinance no 4 of 1975	Chapter 6 provides for legislation regarding the protection of indigenous plants	Indigenous and protected plants have to be managed within the legal confines.
Atmospheric Pollution Prevention Ordinance (No. 11 of 1976).	The Ordinance objective is to provide for the prevention of the pollution of the atmosphere, and for matters incidental thereto.	All future activities on the sites will have to take due consideration of the provisions of this legislation.
Roads Ordinance 17 of 1972	This Ordinance consolidates the laws relating to roads.	The provisions of this legislation have to be taken into consideration in as far as access to the development site is concerned.
Roads Authority Act, 1999	Section 16(5) of this Act places a duty on the Roads Authority to ensure a safe road system.	Some functions of the Roads Ordinance 17 of 1972 have been assigned to the Roads Authority.

## 5 MANAGEMENT ACTIONS

The aim of the management actions in this chapter of the EMP is to avoid potential impacts where possible. Where impacts cannot be avoided, measures are provided to reduce the significance of these impacts.

The following tables provide the management actions recommended to manage the potential impacts rated in the scoping-level EA conducted for this development. These management actions have been organised temporally according to project phase:

- Applicable legislation (Table 4-1);
- Planning and design phase management actions (Table 5-1);
- Construction phase management actions (Table 5-2);

- Operation and maintenance phase management actions (Table 5-3); and
- Closure and rehabilitation phase management actions (Table 5-4)

**The responsible persons at the Developer's team have assessed these commitments in detail** and have committed to the specific management actions, where indicated, in the tables below.

5.1 PLANNING AND DESIGN PHASE

The DR should ensure that the management actions detailed below in Table 5-1 should be adhered to during the period before the construction of the infrastructure starts.

Table 5-1: Planning and design management actions

PLANNING AND DESIGN PHASE IMPACTS	
Impact	Mitigation Measures
Surface and ground water	<ul style="list-style-type: none"> <li>• Disposal of waste from the development should be properly managed.</li> <li>• No dumping of waste products of any kind in or in close proximity to any water bodies.</li> <li>• Ensure that surface water accumulating on-site are channelled and captured through a proper storm water management system to be treated in an appropriate manner before disposal into the environment.</li> <li>• Wastewater should not be discharged directly into the environment.</li> <li>• Ensure protection of all river courses in the development area.</li> <li>• Quantify, measure and continuously record water consumption.</li> <li>• Provide for monitoring wells to monitor and record the quality of the water.</li> <li>• Provide and equip wash-bays with impervious surfaces, hydrocarbon traps and containment to enable capturing and treatment of all effluent resulting from washing operations.</li> <li>• Maintain high heap leach standards in the designs and operations of the pads.</li> <li>• Provide appropriate size heavy duty plastic liner to minimise potential leakage into the environment.</li> <li>• Recycle water used in the operation back into the operations again.</li> <li>• Use wastewater from shower activities to flush toilets.</li> <li>• Use only industry standard dust suppressants for dust control.</li> <li>• Ensure a valid ground water abstraction permit from the MAWLR.</li> <li>• Ensure a valid permit for wastewater and effluent disposal permit from MAWLR.</li> </ul>
Fauna and flora	<ul style="list-style-type: none"> <li>• Adapt the proposed development to the local environment - e.g. small adjustments to the site layout to avoid potential features such as existing vegetation, etc.</li> <li>• Plant local indigenous species of flora as part of the landscaping as these species would require less maintenance than exotic species.</li> </ul>

PLANNING AND DESIGN PHASE IMPACTS	
Impact	Mitigation Measures
	<ul style="list-style-type: none"> <li>• Transplant the one tree identified for removal and/or plant additional indigenous tree in lieu.</li> <li>• Prevent the introduction of potentially invasive alien ornamental plant species such as; Lantana, Opuntia, Prosopis, Tecoma, etc.; as part of the landscaping as these species could infestate the area further over time.</li> <li>• Maintain control on movement of personnel.</li> <li>• Provide training to personell on importance of protecting fauna and flora.</li> <li>• Prevent the collecting of wood, veld food, hunting etc.</li> <li>• Implement fire breaks to contain spread of fires.</li> <li>• Take out insurance against losses of animals and infrastructure.</li> </ul>
Infrastructure	<ul style="list-style-type: none"> <li>• It is recommended that alternative and renewable source of energy be explored and introduced into the proposed development to reduce dependency on the grid.</li> <li>• Solar geysers and panels should be introduced to provide for general lighting and heating of water and buildings.</li> <li>• <b>Other 'green' technologies to reduce the proposed development's dependency on fossil fuel should be explored</b> where possible.</li> <li>• Designs and building materials should be as such to reduce dependency on artificial heating and cooling in order to limit the overall energy necessities.</li> <li>• <b>Water saving mechanisms should be incorporated within the proposed development's design and plans in order to</b> further reduce water demand.</li> <li>• Re-use of treated waste water should be considered wherever possible to reduce the consumption of potable water.</li> <li>• Adhere to water quality guidelines in terms of The Water Act, 1956.</li> </ul>
Access Road	<ul style="list-style-type: none"> <li>• All access roads, especially new ones to be negotiated and agreed with affected farm owners.</li> <li>• Ensure proper maintenance of roads.</li> </ul>
Traffic	<ul style="list-style-type: none"> <li>• Ensure that road junctions have good sightlines.</li> <li>• Adhere to the speed limit.</li> <li>• Implement traffic control measures where necessary.</li> </ul>
Landowners	<ul style="list-style-type: none"> <li>• Continue consultations with landowner on compensation.</li> <li>• Become an active member of the Uhlenhorst Farmers Association.</li> <li>• Use above platform for communication and input between proponent and farming community.</li> </ul>

PLANNING AND DESIGN PHASE IMPACTS	
Impact	Mitigation Measures
	<ul style="list-style-type: none"> <li>Appoint an Environmental Practitioner to carry out environmental monitoring and evaluation throughout the duration of the clearance certificate.</li> </ul>

## 5.2 CONSTRUCTION PHASE

The management actions listed in Table 5-2 apply during the construction phase. This table may be used as a guide when developing EMPs for other construction activities within this development area.

Table 5-2: Construction phase management actions

CONSTRUCTION PHASE IMPACTS	
Impact	Mitigation Measures
Fauna and flora	<ul style="list-style-type: none"> <li>Prevent contractors from collecting wood, veld food, etc. during the construction phase.</li> <li>Do not clear cut the entire development site, but rather keep the large individual trees and shrubs not directly affecting the development as part of the landscaping.</li> <li>Transplant removed vegetation where possible, or plant new trees in lieu of those that have been removed.</li> <li><b>The trees that are to be kept should be clearly marked with “danger tape” or similar marking tool to prevent accidental removal.</b></li> <li>Regular inspection of the marking tool should be carried out.</li> <li><b>The very important trees should be “camped off” to prevent the unintended removal or damage to these trees.</b></li> </ul>
Pressure on infrastructure	<ul style="list-style-type: none"> <li>Ensure that the workforce is provided with temporary toilets during the construction phase.</li> <li>These toilets should be emptied and maintained regularly.</li> <li>Waste from the toilets should be disposed of at the waterworks of Rehoboth or Windhoek.</li> <li>No open urination and defecation is allowed in the development area.</li> </ul>



CONSTRUCTION PHASE IMPACTS	
Impact	Mitigation Measures
Surface and ground water impacts	<ul style="list-style-type: none"> <li>• No dumping of waste products of any kind in or in close proximity to water bodies.</li> <li>• Heavy construction vehicles should be kept out of any surface water bodies and the movement of construction vehicles should be limited where possible to the existing roads and tracks.</li> <li>• Ensure that oil, fuel and lubricants spills from construction vehicles and machinery are prevented and that where these occur, that they are appropriately dealt with.</li> <li>• Drip trays must be placed underneath construction vehicles when not in use to contain all oil that might be leaking from these vehicles.</li> <li>• Contaminated runoff from the construction sites should be prevented from entering the surface and ground water bodies.</li> <li>• All materials on the construction site should be properly stored.</li> <li>• Disposal of waste from the site should be properly managed and taken to a municipal landfill site in Rehoboth or Windhoek.</li> <li>• Ablution facilities at the construction sites should be located at least 30 m away from any surface water.</li> <li>• Washing of personnel or any equipment should not be allowed on site. Should it be necessary to wash construction equipment these should be done at an area properly suited and prepared to receive and contain polluted waters.</li> </ul>
Health, safety and security	<ul style="list-style-type: none"> <li>• Ensure that all construction personnel are properly trained depending on the nature of their work.</li> <li>• Provide for a first aid kit and a properly trained person to apply first aid when necessary.</li> <li>• A wellness program should be initiated to raise awareness on health issues, especially the impact of sexually transmitted diseases.</li> <li>• Provide access to free condoms in the workplace throughout the construction phase.</li> <li>• Facilitate access to Antiretroviral medication for construction personnel.</li> <li>• Restrict unauthorised access to the site and implement access control measures.</li> <li>• Clearly demarcate the construction site boundaries along with signage of no unauthorised access.</li> <li>• Clearly demarcate dangerous areas and no go areas on site.</li> </ul>

CONSTRUCTION PHASE IMPACTS	
Impact	Mitigation Measures
	<ul style="list-style-type: none"> <li>• Staff and visitors to the site must be fully aware of all health and safety measures and emergency procedures.</li> <li>• The contractor must comply with all applicable occupational health and safety requirements.</li> <li>• The workforce should be provided with all necessary Personal Protective Equipment where appropriate.</li> </ul>
Air quality	<ul style="list-style-type: none"> <li>• All loose material should be kept on site for the shortest possible time.</li> <li>• It is recommended that dust suppressants such as Dustex be applied to all the construction clearing activities to minimise dust.</li> <li>• Construction vehicles to only use designated roads.</li> <li>• During high wind conditions the contractor must make the decision to cease works until the wind has calmed down.</li> <li>• Cover any stockpiles with plastic to minimise windblown dust.</li> <li>• Provide workers with dust masks.</li> <li>• Ensure construction vehicles are well maintained to prevent excessive emission of smoke.</li> </ul>
Noise	<ul style="list-style-type: none"> <li>• No amplified music should be allowed on site.</li> <li>• Inform immediate neighbours of construction activities to commence and provide for continuous communication between the neighbours and contractor/s.</li> <li>• Limit construction times to acceptable daylight hours.</li> <li>• Install technology such as silencers on construction machinery.</li> <li>• Do not allow the use of horns as a general communication tool, but use it only where necessary as a safety measure.</li> <li>• Provide protective equipment such as ear muffs and ear plugs to workers.</li> </ul>
Traffic	<ul style="list-style-type: none"> <li>• Limit and control the number of access points to the site.</li> <li>• Ensure that road junctions have good sightlines.</li> </ul>

CONSTRUCTION PHASE IMPACTS	
Impact	Mitigation Measures
	<ul style="list-style-type: none"> <li>• Construction vehicles need to be in a road worthy condition and maintained throughout the construction phase.</li> <li>• Transport the materials in the least amount of trips as possible.</li> <li>• Adhere to the speed limit.</li> <li>• Implement traffic control measures where necessary.</li> <li>• Minimise the movement of heavy vehicles during peak time.</li> </ul>
Waste management	<ul style="list-style-type: none"> <li>• It is recommended that waste from the temporary toilets be disposed of at the municipal Wastewater Treatment Works in Rehoboth or Windhoek.</li> <li>• A sufficient number of waste bins should be placed around the site for the soft refuse.</li> <li>• A sufficient number of skip containers for the heavy waste and rubble should be provided for around the site.</li> <li>• The waste containers should be able to be closed to prevent birds and other animals from scavenging.</li> <li>• Solid waste will be collected and disposed off at an approved local municipal landfill in Windhoek or Rehoboth, in consultation with that local authority.</li> </ul>
Hazardous substances	<ul style="list-style-type: none"> <li>• All chemicals and other hazardous substances must be stored and maintained in accordance with the Hazardous Substances Ordinance (No. 14 of 1974), with all relevant licences and permits to be obtained where applicable.</li> <li>• Given the potential harm to human health during handling and use of any of hazardous substances it is essential that all staff be trained with regards to the proper handling of these substances as well as First Aid in the case of spillage or intoxication.</li> <li>• Storage areas for all substances should be bunded and capable to hold 120% of the total volume of a given substance stored on site.</li> </ul>

CONSTRUCTION PHASE IMPACTS	
Impact	Mitigation Measures
Social	<ul style="list-style-type: none"> <li>• Control movement of construction workforce.</li> <li>• Ensure local procurement where commodities are available locally.</li> </ul>

### 5.3 OPERATION AND MAINTENANCE PHASE

The management actions included in Table 5-3 below apply during the operation and maintenance phase of this development.

Table 5-3: Operation and maintenance management actions

OPERATIONAL PHASE IMPACTS	
Impact	Mitigation Measures
Air quality	<ul style="list-style-type: none"> <li>• Ensure that personnel handling ore are made aware of the risk associated with the commodities so that they know the potential impact on them.</li> <li>• Ensure a personnel monitoring programme is set up in accordance with the guidelines of existing accepted practice and the Labour Act of Namibia.</li> <li>• Conduct regular air quality monitoring on site. The dust should be analysed for hazardous substances such as asbestos, radioactivity etc.</li> <li>• Air quality monitoring must be conducted at various locations around the site to monitor ore dust fallout.</li> <li>• Report any incidents immediately.</li> <li>• Minimise the duration of stockpiles.</li> </ul>

OPERATIONAL PHASE IMPACTS	
Impact	Mitigation Measures
	<ul style="list-style-type: none"> <li>• Use dust suppressant technologies to manage dispersal and pollution from handling.</li> <li>• Limit movement and number of vehicles and adhere to off road speed limit.</li> <li>• Ensure personnel wears correct PPE to prevent exposure to particulate matters.</li> <li>• Building interiors and surfaces should be cleaned regularly. Strict adherence to housekeeping practices will help reduce dust levels.</li> <li>• Ensure that forklift, front-end loaders and other machine operators are suitably trained.</li> <li>• All truck loads must be suitably covered to prevent the escape of dust from the load bin. This includes empty trucks that may still contain some dust.</li> <li>• Restrict operation in wind conditions above 40km/h wind speed.</li> <li>• Once dust plumes that cannot be contained becomes visible, all operations must cease with immediate effect and only restart once sufficient mitigation measures have been implemented or when the cause of dust subsides. Operational processes include activities such as handling and loading / offloading of ore at the storage facilities, transport through farms etc.</li> <li>• Ensure all machinery and vehicles are kept in good condition and maintained/ serviced regularly.</li> <li>• Landing place and conveyors are partially enclosed to minimise fugitive emissions.</li> <li>• Preventative and corrective maintenance should be done on equipment and machinery.</li> <li>• Dust suppression infrastructure should be in good working order.</li> <li>• Spills on conveyor routes must be cleaned up.</li> <li>• Plant improvements should be done to prevent recurring spills.</li> <li>• Any complaints received regarding ore dust along the transport routes and sites of handling of ore must be recorded, investigated and the problem rectified. Any incidents must be recorded with action taken to prevent future occurrences.</li> <li>• A report should be compiled every 6 months of all incidents reported and monitoring performed. The report should contain dates when safety equipment and structures were inspected and maintained.</li> <li>• The development needs to be controlled and managed as required by the Public Health Act (Act No. 36 of 1919) and Atmospheric Pollution Prevention Ordinance (No. 11 of 1976).</li> </ul>
Noise	<ul style="list-style-type: none"> <li>• Limit the types of activities that generate excessive noise.</li> </ul>

OPERATIONAL PHASE IMPACTS	
Impact	Mitigation Measures
	<ul style="list-style-type: none"> <li>• Provide protective equipment to the workforce.</li> </ul>
Waste management	<ul style="list-style-type: none"> <li>• A sufficient number of waste bins should be placed on the properties for the soft refuse.</li> <li>• A sufficient number of skip containers for the heavy waste and rubble should be provided for at appropriate sites.</li> <li>• The waste containers should be able to be closed to prevent birds and other animals from scavenging.</li> <li>• Solid waste will be collected and disposed off at an approved local municipal landfill in Rehoboth or Windhoek, this should be done in consultation with that local authority.</li> <li>• Organic waste will be composted on-site.</li> <li>• Normal refuse such as cans, glass, paper and plastic will be segregated at source and be transported to Windhoek or Rehoboth for recycling.</li> <li>• Oils, lubricants etc. will be collected and reused where feasible.</li> <li>• Metal waste will be accumulated and sent for recycling.</li> <li>• Building rubble will be added to the waste dump.</li> </ul>
Infrastructure development	<ul style="list-style-type: none"> <li>• It is recommended that alternative and renewable source of energy be explored and introduced into the proposed development to reduce dependency on the grid.</li> <li>• Solar geysers and panels should be considered to provide for general lighting and heating of water and buildings.</li> <li>• Designs and building materials should be as such to reduce dependency on artificial heating and cooling in order to limit the overall energy consumption.</li> <li>• Water saving mechanisms and education should be incorporated within the culture of <b>the mine's operations</b> and employees in order to further reduce water demand</li> </ul>
Quality of life	<ul style="list-style-type: none"> <li>• The development will serve as an important economic activity that provides jobs. This will have a positive impact on the quality of life of the workers in terms of household incomes, but also the contribution to the Gross Domestic Product of the country</li> </ul>

OPERATIONAL PHASE IMPACTS	
Impact	Mitigation Measures
Visual and Sense of Place	<ul style="list-style-type: none"> <li>• <b>It is recommended that more ‘green’ technologies be implemented within the designs and building materials of</b> the development where possible in order to minimise the visual prominence of such a development within the more natural surrounding landscape.</li> <li>• Natural colours and building materials such as wood and stone should be incorporated.</li> <li>• Visual pollutants can further be prevented through mitigations such as keeping existing vegetation, introducing indigenous trees; keeping structures unpainted and minimising large advertising billboards.</li> </ul>

#### 5.4 CLOSURE AND REHABILITATION PHASE

Numerous mines in the country have been abandoned after ceasing operations, leaving the government to take over liability for rehabilitation often after substantial environmental damage has been done. It is therefore critical that mines engage in closure planning as early as possible in their operational life (CMN, 2010).

The Chamber of Mines of Namibia has developed the Namibian Mine Closure Framework that provides minimum standards and guidance for mining companies to come up with relevant and practical closure plans. The framework addresses the need to:

- **conform to current legislative requirements**
  - **consult with a variety of stakeholders to derive a widely acceptable social, economic and environmental closure outcome**
  - **develop an optimal closure strategy based on envisaged and agreed final post-mining social and environmental conditions**
  - **develop a plan of practical closure actions, incorporating the optimal strategy**
  - **provide all the necessary financial, knowledge and skills resources at implementation of the closure plan**
  - **have a formal relinquishment process in place releasing the mining company from future obligations when closure outcomes have been accepted and achieved.**

A National Environment Restoration Fund is being proposed in the Amendments to the Environmental Management Act of 2007. The proponent is advised to contribute to such pre or post establishment.

The management actions included in Table 5-4 below apply during the closure and rehabilitation phase of this development.

Table 5-4: Closure and rehabilitation phase management actions

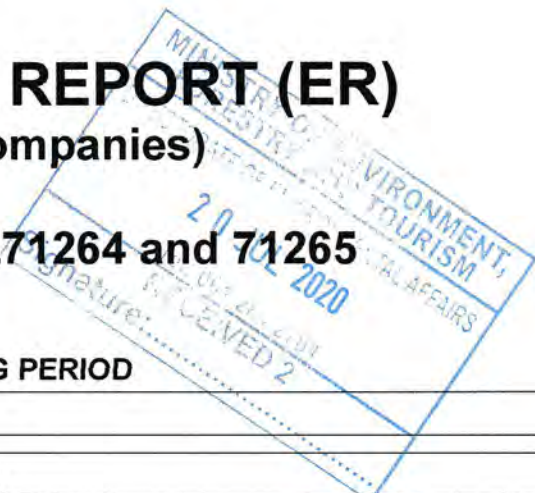
CLOSURE AND REHABILITATION PHASE IMPACTS	
Impact	Mitigation Measures
Closure Plan	<ul style="list-style-type: none"> <li>• Develop a closure plan within first 12 months of operation.</li> <li>• Closure plan to address issues as per the Namibian Mine Closure Framework (See 10.4 above)</li> <li>• Contribute to National Environment Restoration Fund pre and post establishment</li> </ul>



Appendix A: Bi-Annual Reports

# ENVIRONMENTAL REPORT (ER) (Prospecting Companies)

## Bi-annual report for CL71264 and 71265



### A. COMPANY DETAILS AND REPORTING PERIOD

Name of Company:	<b>Hartmann Geoservices</b>				
Address of Company:	<b>P.O. Box 81126, Windhoek</b>				
Telephone:	<b>081 253 8814</b>	Fax number:	<b>na</b>	E-mail:	<b>khartmann@mweb.com.na</b>
Name of person compiling report:	<b>K. Hartmann</b>				
Reference number(s) of prospecting area / block / license:	<b>CL 71264 and 71265</b>				
Geographical location of area / block / license:	<b>Windhoek/Khomas</b>				
This report is for the period of :	<b>JANUARY to JUNE 2020</b>				

### B. POLLUTION AND WASTE

Has all domestic refuse (e.g. Household waste, bottles, tins, paper, plastic, etc.) been removed from the prospecting area?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>		
If "yes" above, specify the site where such refuse has been deposited: <b>No on-site activities during the period.</b>				
How often is refuse removed to the site mentioned above?	every week <input type="checkbox"/>	every two weeks <input type="checkbox"/>	once a month <input type="checkbox"/>	at irregular intervals <input checked="" type="checkbox"/>
If refuse has not been removed, where has it been dumped?				
As far as litter is concerned, would you describe your prospecting area as:	very clean <input checked="" type="checkbox"/>	reasonably clean <input type="checkbox"/>	filthy <input type="checkbox"/>	
If your prospecting area is littered with refuse, please indicate how you intend cleaning it up:				
Are toilets provided for all staff employed by the prospecting company:	yes <input type="checkbox"/>	no <input checked="" type="checkbox"/>		
If "yes" above, are they: flush toilets <input type="checkbox"/> chemical toilets <input type="checkbox"/> pit latrines <input type="checkbox"/> others <input type="checkbox"/>				
If chemicals toilets are used, how are old chemicals disposed of:				
Deposited in evaporation ponds <input type="checkbox"/>	deposited in a municipal refuse dump <input type="checkbox"/>			
Buried on site <input type="checkbox"/>	others (specify) <input type="checkbox"/>			

# ENVIRONMENTAL REPORT (ER) (Prospecting Companies)

## Bi-annual report for CL 71264 and 71265

### A. COMPANY DETAILS AND REPORTING PERIOD

Name of Company: **Hartmann Geoservices**

Address of Company: **P.O. Box 81126, Windhoek**

Telephone: **081 253 8814** Fax number: **na** E-mail: **khartmann@mweb.com.na**

Name of person compiling report: **K. Hartmann**

Reference number(s) of prospecting area / block / license: **Claims 71264 and 71265**

Geographical location of area / block / license: **Windhoek/Khomas**

This report is for the period of: **January to June 2021**

### B. POLLUTION AND WASTE

Has all domestic refuse (e.g. Household waste, bottles, tins, paper, plastic, etc.) been removed from the prospecting area? Yes  No

If "yes" above, specify the site where such refuse has been deposited:  
**Kupferberg, Windhoek.**

How often is refuse removed to the site mentioned above? every week   
every two weeks   
once a month   
at irregular intervals

If refuse has not been removed, where has it been dumped?

As far as litter is concerned, would you describe your prospecting area as: very clean  reasonably clean  filthy

If your prospecting area is littered with refuse, please indicate how you intend cleaning it up:

Are toilets provided for all staff employed by the prospecting company: yes  no

If "yes" above, are they: flush toilets  chemical toilets  pit latrines  others

If chemicals toilets are used, how are old chemicals disposed of:  
Deposited in evaporation ponds  deposited in a municipal refuse dump   
Buried on site  others (specify)



# ENVIRONMENTAL REPORT (ER) (Prospecting Companies)

## Bi-annual report for CL 71264 and 71265



### A. COMPANY DETAILS AND REPORTING PERIOD

Name of Company:	<b>Hartmann Geoservices</b>				
Address of Company:	<b>P.O. Box 81126, Windhoek</b>				
Telephone:	<b>081 253 8814</b>	Fax number:	<b>na</b>	E-mail:	<b>khartmann@mweb.com.na</b>
Name of person compiling report:	<b>K. Hartmann</b>				
Reference number(s) of prospecting area / block / license:	<b>Claims 71264 and 71265</b>				
Geographical location of area / block / license:	<b>Windhoek/Khomas</b>				
This report is for the period of:	<b>July to December 2021</b>				

### B. POLLUTION AND WASTE

Has all domestic refuse (e.g. Household waste, bottles, tins, paper, plastic, etc.) been removed from the prospecting area?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>		
If "yes" above, specify the site where such refuse has been deposited: <b>Kupferberg, Windhoek.</b>				
How often is refuse removed to the site mentioned above?	every week <input type="checkbox"/>	every two weeks <input type="checkbox"/>	once a month <input type="checkbox"/>	at irregular intervals <input checked="" type="checkbox"/>
If refuse has not been removed, where has it been dumped?				
As far as litter is concerned, would you describe your prospecting area as:	very clean <input checked="" type="checkbox"/>	reasonably clean <input type="checkbox"/>	filthy <input type="checkbox"/>	
If your prospecting area is littered with refuse, please indicate how you intend cleaning it up:				
Are toilets provided for all staff employed by the prospecting company:	yes <input type="checkbox"/>	no <input checked="" type="checkbox"/>		
If "yes" above, are they:	flush toilets <input type="checkbox"/>	chemical toilets <input type="checkbox"/>	pit latrines <input type="checkbox"/>	others <input type="checkbox"/>
If chemicals toilets are used, how are old chemicals disposed of:				
Deposited in evaporation ponds <input type="checkbox"/>	deposited in a municipal refuse dump <input type="checkbox"/>			
Buried on site <input type="checkbox"/>	others (specify) <input type="checkbox"/>			

# ENVIRONMENTAL REPORT (ER)

## (Prospecting Companies)

Bi-annual report for CL 71264 and 71265 2022



### A. COMPANY DETAILS AND REPORTING PERIOD

Name of Company: **Hartmann Geoservices**

Address of Company: **P.O. Box 81126, Windhoek**

Telephone: **081 253 8814** Fax number: **na** E-mail: **khartmann@mweb.com.na**

Name of person compiling report: **K. Hartmann**

Reference number(s) of prospecting area / block / license: **Claims 71264 and 71265**

Geographical location of area / block / license: **Windhoek/Khomas**

This report is for the period of: **January to June 2022**

### B. POLLUTION AND WASTE

Has all domestic refuse (e.g. Household waste, bottles, tins, paper, plastic, etc.) been removed from the prospecting area? Yes  No

If "yes" above, specify the site where such refuse has been deposited:

**Kupferberg, Windhoek.**

How often is refuse removed to the site mentioned above? every week   
every two weeks   
once a month   
at irregular intervals

If refuse has not been removed, where has it been dumped?

As far as litter is concerned, would you describe your prospecting area as: very clean  reasonably clean  filthy

If your prospecting area is littered with refuse, please indicate how you intend cleaning it up:

Are toilets provided for all staff employed by the prospecting company: yes  no

If "yes" above, are they: flush toilets  chemical toilets  pit latrines  others

If chemicals toilets are used, how are old chemicals disposed of:

Deposited in evaporation ponds  deposited in a municipal refuse dump   
Buried on site  others (specify

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Appendix B: Existing Environmental Clearance Certificate



**REPUBLIC OF NAMIBIA**

**MINISTRY OF ENVIRONMENT AND TOURISM**

OFFICE OF THE ENVIRONMENTAL COMMISSIONER

**ENVIRONMENTAL CLEARANCE CERTIFICATE**

**ISSUED**

In accordance with Section 37(2) of the Environmental Management Act (Act No. 7 of 2007)

**TO**

Hartmann Geoservices  
P O Box 81126, 16 Valley Rd, Windhoek.

TO UNDERTAKE THE FOLLOWING LISTED ACTIVITY

Mining Claim NO. 71264 and 71265 at Windhoek Rural, Khomas Region.



DEPUTY ENVIRONMENTAL COMMISSIONER

Issued on the date: 2019-11-06

Expires on this date: 2022-11-06

(See conditions printed over leaf)

Reduce  
Reuse  
Recycle



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Appendix C: Water Quality Guidelines



# **THE WATER ACT, 1956 (ACT 54 OF 1956 ) AND ITS REQUIREMENTS IN TERMS OF WATER SUPPLIES FOR DRINKING WATER AND FOR WASTE WATER TREATMENT AND DISCHARGE INTO THE ENVIRONMENT**

## **1. INTRODUCTION**

The provisions of the Water Act are intended, amongst other things, to promote the maximum beneficial use of the country's water supplies and to safeguard water supplies from avoidable pollution.

The drinking water guidelines are not standards as no publication in the Government Gazette of Namibia exists to that effect. However the Cabinet of the Transitional Government for National Unity adopted the existing South African Guidelines (461/85) and the guidelines took effect from 1 April 1988 under the signature of the then Secretary for Water Affairs.

The sections of the Water Act that relate to the discharge of industrial effluents are:

- Section 21(1) which states that

-- The purification of waste water shall form an integral part of water usage and

-- that purified effluents shall comply with the General Standard Quality restrictions as laid out in Government Gazette R553 of 5 April 1962 and

- Section 21(2) which further stipulate that this purified effluent be returned as close as possible to the point of abstraction of the original water.

Where a local authority has undertaken the duty of disposing of all effluents from an industrial process the provisions of Section 21(1) and 21(2) apply to the local authority and not the producer of the effluents. If there is difficulty in complying with these provisions then the applicant may apply for an exemption from the conditions in terms of Section 21(5) and 22(2) of the Water Act. The Permanent Secretary after consultation with the Minister may grant the issuance of a Waste Water Discharge Permit under Sections 21(5) and 22(2) subject to such conditions as he may deem fit to impose.

After independence, the Government of the Republic of Namibia decided that for the interim the existing guidelines will continue to be valid and to remain in use until a proper study has been conducted and new standards have been formulated (Article 140 of Act 1 of 1990).

## **2. GUIDELINES FOR THE EVALUATION OF DRINKING-WATER QUALITY FOR HUMAN CONSUMPTION WITH REGARD TO CHEMICAL, PHYSICAL AND BACTERIOLOGICAL QUALITY**

Water supplied for human consumption must comply with the officially approved guidelines for drinking-water quality. For practical reasons the approved guidelines have been divided into three basic groups of determinants, namely:

- Determinants with aesthetic / physical implications: TABLE 1.
- Inorganic determinants: TABLE 2.
- Bacteriological determinants: TABLE 3.

### **2.1 CLASSIFICATION OF WATER QUALITY**

The concentration of and limits for the aesthetic, physical and inorganic determinants define the group into which water will be classified. See TABLES 1 and 2 for these limits. The water quality has been grouped into 4 quality classes:

- Group A: Water with an excellent quality
- Group B: Water with acceptable quality
- Group C: Water with low health risk
- Group D: Water with a high health risk, or water unsuitable for human consumption.

Water should ideally be of excellent quality (Group A) or acceptable quality (Group B), however in practice many of the determinants may fall outside the limits for these groups.

If water is classified as having a low health risk (Group C), attention should be given to this problem, although the situation is often not critical as yet.

If water is classified as having a higher health risk (Group D), urgent and immediate attention should be given to this matter.

Since the limits are defined on the basis of average lifelong consumption, short-term exposure to determinants exceeding their limits is not necessarily critical, but in the case of toxic substances, such as cyanide, remedial measures should immediately be taken.

The overall quality group, into which water is classified, is determined by the determinant that complies the least with the guidelines for the quality of drinking water.

**TABLE 1: DETERMINANTS WITH AESTHETIC / PHYSICAL IMPLICATIONS**

DETERMINANTS	UNITS*	LIMITS FOR GROUPS			
		A	B	C	D**
Colour	mg/l Pt***	20			
Conductivity	mS/m !at 25 °C	150	300	400	400
Total hardness	mg/l CaCO <sub>3</sub>	300	650	1300	1300
Turbidity	N.T.U****	1	5	10	10
Chloride	mg/l Cl	250	600	1200	1200
Chlorine (free)	mg/l Cl	0,1- 5,0	0,1 – 5,0	0,1 – 5,0	5,0
Fluoride	mg/l F	1,5	2,0	3,0	3,0
Sulphate	mg/l SO <sub>4</sub>	200	600	1200	1200
Copper	µg/l Cu	500	1000	2000	2000
Nitrate	mg/l N	10	20	40	40
Hydrogen Sulphide	µg/l H <sub>2</sub> S	100	300	600	600
Iron	µg/l Fe	100	1000	2000	2000
Manganese	µg/l Mn	50	1000	2000	2000
Zink	mg/l Zn	1	5	10	10
pH****	pH-unit	6,0 – 9,0	5,5 – 9,5	4,0 – 11,0	4,0 – 11,0

\* In this and all following tables "l" (lower case L in ARIAL) is used to denote dm<sup>3</sup> or litre

\*\* All values greater than the figure indicated.

\*\*\* Pt = Platinum Units

\*\*\*\* Nephelometric Turbidity Units

\*\*\*\*\* The pH limits of each group exclude the limits of the previous group

**TABLE 2: INORGANIC DETERMINANTS**

DETERMINANTS	UNITS	LIMITS FOR GROUPS			
		A	B	C	D*
Aluminium	µg/l Al	150	500	1000	1000
Ammonia	mg/l N	1	2	4	4
Antimonia	µg/l Sb	50	100	200	200
Arsenic	µg/l As	100	300	600	600
Barium	µg/l Ba	500	1000	2000	2000
Beryllium	µg/l Be	2	5	10	10
Bismuth	µg/l Bi	250	500	1000	1000
Boron	µg/l B	500	2000	4000	4000
Bromine	µg/l Br	1000	3000	6000	6000
Cadmium	µg/l Cd	10	20	40	40
Calcium	mg/l Ca	150	200	400	400
Calcium	mg/l CaCO <sub>3</sub>	375	500	1000	1000
Cerium	µg/l Ce	1000	2000	4000	4000
Chromium	µg/l Cr	100	200	400	400
Cobalt	µg/l Co	250	500	1000	1000
Cyanide (free)	µg/l CN	200	300	600	600
Gold	µg/l Au	2	5	10	10
Iodine	µg/l I	500	1000	2000	2000
Lead	µg/l Pb	50	100	200	200
Lithium	µg/l Li	2500	5000	10000	10000
Magnesium	mg/l Mg	70	100	200	200
Magnesium	mg/l CaCO <sub>3</sub>	290	420	840	840
Mercury	µg/l Hg	5	10	20	20
Molybdenum	µg/l Mo	50	100	200	200
Nickel	µg/l Ni	250	500	1000	1000
Phosphate	mg/l P	1	See note below	See note below	See note below
Potassium	mg/l K	200	400	800	800
Selenium	µg/l Se	20	50	100	100
Silver	µg/l Ag	20	50	100	100
Sodium	mg/l Na	100	400	800	800
Tellurium	µg/l Te	2	5	10	10
Thallium	µg/l Tl	5	10	20	20
Tin	µg/l Sn	100	200	400	400
Titanium	µg/l Ti	100	500	1000	1000
Tungsten	µg/l W	100	500	1000	1000
Uranium	µg/l U	1000	4000	8000	8000
Vanadium	µg/l V	250	500	1000	1000

\* All values greater than the figure indicated.

**Note FOR Table 2 on phosphate:** Phosphates are not toxic and essential for all life-forms. Natural water will, however, seldom contain phosphate; it is generally seen as an indicator of pollution and is usually accompanied by other pollutants. Wherever drinking water is combined with or consists wholly of reclaimed or recycled water, it may be expected to contain phosphate. The general guideline for a concentration level to be aimed at is 1 mg/l as P. But in many cases this may be difficult to achieve technically. For this reason the Department will allow a phosphate concentration level of up to 5 mg/l as P in water intended for human consumption. Please refer also to the “Note on Phosphate” under Section 3: General Standards for Waste/Effluent.

## 2.2 BACTERIOLOGICAL DETERMINANTS

The bacteriological quality of drinking water is also divided into four groups, namely:

- Group A: Water which is bacteriological very safe;
- Group B: Water which is bacteriological still suitable for human consumption;
- Group C: Water which is bacteriological risk for human consumption, which requires immediate action for rectification;
- Group D: Water, which is bacteriological unsuitable for human consumption.

**TABLE 3: BACTERIOLOGICAL DETERMINANTS**

DETERMINANTS	LIMITS FOR GROUPS			
	A**	B**	C	D*
Standard plate counts per 1 ml	100	1000	10000	10000
Total coliform counts per 100 ml	0	10	100	100
Faecal coliform counts per 100 ml	0	5	50	50
<i>E. coli</i> counts per 100 ml	0	0	10	10

\* All values greater than the figure indicated.

\*\* In 95% of the samples.

NB If the guidelines in group A are exceeded, a follow-up sample should be analysed as soon as possible.

## 2.3 FREQUENCY FOR BACTERIOLOGICAL ANALYSIS OF DRINKING-WATER SUPPLIES

The recommended frequency for bacteriological analysis of drinking water is given in Table 4.

**TABLE 4: FREQUENCY FOR BACTERIOLOGICAL ANALYSIS**

POPULATION SERVED	MINIMUM FREQUENCY OF SAMPLING
More than 100 000	Twice a week
50 000 – 100 000	Once a week
10 000 – 50 000	Once a month
Minimum analysis	Once every three months

### 3 GENERAL STANDARDS FOR WASTE / EFFLUENT WATER DISCHARGE INTO THE ENVIRONMENT

All applications in terms of Section 21(5) and 22(2), for compliance with the requirements of Section 21(1) and 21(2) of the Water Act (Act 54 of 1956) that purified water shall comply with the General Standard as laid out in Government Gazette Regulation R553 of 5 April 1962.

**TABLE 5 GENERAL STANDARDS FOR ARTICLE 21 PERMITS (EFFLUENTS)**

DETERMINANTS	MAXIMUM ALLOWABLE LEVELS
Arsenic	0,5 mg/l as As
Biological Oxygen Demand (BOD)	no value given
Boron	1,0 mg/l as B
Chemical Oxygen Demand (COD)	75 mg / l as O
Chlorine, residual	0,1 mg/l as Cl <sub>2</sub>
Chromium, hexavalent	50 µg/l as Cr(VI)
Chromium, total	500 µg/l as Cr
Copper	1,0 mg/l as Cu
Cyanide	500 µg/l as CN
Oxygen, Dissolved (DO)	at least 75% saturation**
Detergents, Surfactants, Tensides	0,5 mg/l as MBAS – See also Note 2
Fats, Oil & Grease (FOG)	2,5 mg/l (!gravimetric method)
Fluoride	1,0 mg/l as F
Free & Saline Ammonia	10 mg/l as N
Lead	1,0 mg/l as Pb
Oxygen, Absorbed (OA)	10 mg / l as O*
pH	5,5 – 9,5
Phenolic Compounds	100 µg/l as phenol
Phosphate	1,0 mg/l as P - See also Note 1
Sodium	not more than 90 mg/l Na more than influent
Sulphide	1,0 mg/l as S
Temperature	35°C
Total Dissolved Solids (TDS)	not more than 500 mg / l more than influent
Total Suspended Solids (TSS)	25 mg/l
Typical faecal Coli.	no typical coli should be counted per 100 ml
Zinc	5,0 mg/l as Zn

\* Also known as *Permanganate Value* (or *PV*).

\*\* In Windhoek the saturation level is at approx. 9 mg/l O<sub>2</sub>.

**Note (1) on phosphate:** Phosphates are not toxic and essential for all life forms. Natural water will seldom contain phosphate; it is generally seen as an indicator of pollution and is usually accompanied by other pollutants. Wherever drinking water is combined with or consists wholly of reclaimed or recycled water, it may be expected to contain phosphate. There is no general guideline for phosphate contained in the Regulation 553. But generally it is assumed that eutrophication or algal bloom in dams is promoted by nutrient concentrations as low as 0,01 mg/l as P; generally a phosphate concentration limit for dams of 0,1 mg/l is recommended. All water that is consumed and subsequently discharged, will eventually end up in rivers, dams or

groundwater – that is why for potable water, a concentration level of 1 mg/l as P is aimed at.

But, again, in many cases of waste and effluent treatment, this may be difficult to achieve technically, or the required waste and effluent treatment infrastructure is not available; as the required infrastructure is sophisticated and expensive. The current situation calls for a compromise and for this reason, this Department will judge each application individually on its merits and allow, in certain cases, a phosphate concentration level of up to 15 mg/l as P in any effluent or waste stream to be discharged into the environment. This regulation is subject to be reviewed every two years, calculated from the date of approval of this document.

**Note (2) on detergents, surfactants and ten sides:** The MBAS (or methylene blue active substances) – test does not encompass all surface active compounds currently, commercially available. The limit given is therefore only a guideline. Many of the cleaning agents are toxic to biological life-forms in rivers and dams.

It should be taken into consideration that some commercial products interfere with the effective removal of oil, fat and grease by grease and fat traps, by breaking up such long-chain molecules into shorter ones. These cleaning agents thus effectively allow such components to pass through the traps and land into sections of a treatment plant further down the line and interfere with the process there.

Many cleaning agents contain very powerful disinfectants, and/or biocides. Such substances may interact with biological treatment processes. They may reduce the effectiveness of such treatment or 'kill' it completely, if they land in septic tanks, biofilters or even activate-sludge plants. Their activity may be attenuated by dilution.

#### **4. AUTHORIZATION**

Herewith, the Guidelines for the Evaluation of Drinking Water for Human Consumption with regard to Chemical, Physical and Bacteriological Quality, as well as the General Standards for Article 21\* Permits, amended for detergents, surfactants, ten sides, as well as phosphates, are confirmed and remain in force until further notice.

Issued under my hand with the authority vested in my office, within the Ministry for Agriculture, Water and Rural Development,

**PERMANENT SECRETARY**  
**Dr V Shivute**

**WINDHOEK,**

**DATE STAMP**