

Environmental Management Plan

Existing Consumer Fuel Installation at Usakos
Wollastonite Mine in Karibib, Erongo Region



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ABBREVIATIONS

AIDS	Acquired Immuno-Deficiency Syndrome
ER	Owner's Representative
EA	Environmental Assessment
ECC	Environmental Clearance Certificate
ECO	Environmental Control Officer
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

Usakos Wollastonite Mine is a mine in the Erongo Region, involved in the mining of wollastonite. Wollastonite is a naturally occurring mineral with many unique characteristics. Through advanced processing, it has become one of the most versatile functional fillers in the marketplace. Wollastonite increases the performance of many products including plastics, paints and coatings, construction materials, friction, ceramic and metallurgical applications to name a few. Dolomite and Marble are also commodities found and exploited on the site.

The site is located at the coordinates: Lat -21.968902°; Lon 15.887240° approximately 5km south-west of the town of Karibib in the Erongo Region (See **Figure 1** below for the locality map of the site).



Figure 1: Locality map of the mine (Google Earth, 2020)

The mine is within the townlands of Karibib. For its operational machinery the mine owns a number of machines such as excavators, front-end loaders and tipper trucks, which requires fuel. Diesel is the fuel mainly used and is sourced from Engen Namibia (Pty) Ltd and stored in above-ground tanks of various sizes i.e. 9m³ and 2.2m³ with a combined capacity of approximately 15,600 litres.

In terms of the Environmental Management Act 7 of 2007 (Government Notice No. 29), certain activities may not be undertaken without an Environmental Clearance Certificate (ECC). This activity is included in the above-mentioned list, with

particular reference to the following activity of the gazetted Namibian Government Notice No. 30 Environmental Impact Assessment Regulations: **Activity 9.5** Construction of filling stations or any other facility for the underground and aboveground storage of dangerous goods, including petrol, diesel, liquid, petroleum, gas or paraffin.

It is against this background that Engen Namibia (Pty) Ltd as the supplier and owner of the diesel installations has appointed Environam Consultants Trading (ECT) to undertake the process of applying for the ECC on their behalf.

Key to the issuance of an Environmental Clearance Certificate is the submission of an Environmental Management Plan (EMP) which provides for a description of how an activity might impact on the natural environment in which it occurs and clearly sets out commitments from the proponent on how identified impacts will be avoided, minimised and managed so that they are environmentally acceptable.

An EMP is one of the most important outputs of the Environmental Assessment process as it synthesises all of the proposed mitigation and monitoring actions, set to a timeline and with specific assigned responsibilities. As part of the application for a renewal of the ECC, Environam Consultants Trading has developed an EMP that will outline the appropriate actions.

An EMP will generally detail the mitigation and monitoring actions to be implemented during the following phases of a development:

- Planning and Design - the period, prior to construction, during which preliminary legislative and administrative arrangements, 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 owner, having dealt with the necessary legislative and administrative arrangements, appoints a contractor for the development of services infrastructure as well as any other construction process(es) within the development area;
- Operation and Maintenance - the period during which the services infrastructure and other structures will be fully functional and maintained.

The consumer installations at the site are already existing and in use therefore the EMP will cover the operation and maintenance aspects, and also include the decommissioning phase.

2 ROLES AND RESPONSIBILITIES

Engen Namibia (Pty) Ltd is ultimately responsible for the implementation of the EMP. The proponent may delegate this responsibility as the project progresses through its life cycle. In this case the delegated responsibility for the effective implementation of this EMP will rest on the following key individuals:

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

2.1 OWNER’S REPRESENTATIVE

The owner may assign the responsibility of managing all aspects of this development to a designated member of staff, referred to in this EMP as the Employer’ Representative (ER). The owner may decide to assign this role to one person for the full duration of this development, or may assign a different ER to each of the development phases. The ER’s responsibilities are as follows:

Table 2-1 Responsibilities of ER

Responsibility	Project Phase
Making sure that the necessary approvals and permissions laid out in Table 3-1 are obtained/adhered to.	Throughout the lifecycle of this development
Suspending/evicting individuals and/or equipment not complying with the EMP	<ul style="list-style-type: none"> • Operation and maintenance
Issuing fines for contravening EMP provisions	<ul style="list-style-type: none"> • Construction • Operation and maintenance

2.2 ENVIRONMENTAL CONTROL OFFICER

The ER may assign the responsibility of overseeing the implementation of the whole EMP on the ground during the operation and maintenance phase to a designated member of staff, referred to in this EMP as the Environmental Control Officer (ECO). The PR /Proponent may also decide to assign this role to an independent environmental consultant. The ECO will have the following responsibilities during this development:

- Management and facilitation of communication between the Owner, ER, the contractors, and Interested and Affected Parties (I&APs) with regard to this EMP;
- Conducting site inspections (recommended minimum frequency is bi-monthly) of all infrastructure maintenance areas with respect to the implementation of this EMP (monitor and audit the implementation of the EMP);
- Submitting bi-annual reports to the office of the Environmental Commissioner;
- Assisting the Contractor in finding solutions with respect to matters pertaining to the implementation of this EMP;
- Advising the ER on the removal of person(s) and/or equipment not complying with the provisions of this EMP;
- Making recommendations to the ER with respect to the issuing of fines for contraventions of the EMP; and
- Undertaking an annual review of the EMP and recommending additions and/or changes to this document.

2.3 CONTRACTOR

Contractors appointed by the owner 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 4-1** applies to contractors 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 operation and maintenance work.

2.4 ASSUMPTIONS AND LIMITATIONS

This EMP has been drafted with the acknowledgment of the following assumptions and limitations:

- This EMP has been drafted based on the information presented by the proponent. ECT will not be held responsible for the potential consequences that may result from any alterations to the existing infrastructure.

3 APPLICABLE LEGISLATION

Legal provisions that have relevance to various aspects of these development is listed in **Table 3-1** below. The legal instrument, applicable corresponding provisions and project relevance details are provided.

Table 3-1: Legal provisions relevant to the proposed development

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

LEGISLATION/POLICIES	RELEVANT PROVISIONS	RELEVANCE TO THE PROJECT
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 9.5 Construction of filling stations or any other facility for the underground and aboveground storage of dangerous goods, including petrol, diesel, liquid, petroleum, gas or paraffin.
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 owner 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 the operation of the development.
The Ministry of Environment and Tourism (MET) Policy on HIV & AIDS	MET has recently 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 owner and its contractor have to adhere to the guidelines provided to manage the aspects of HIV/AIDS.
Local Authorities Act No. 23 of 1992	The Local Authorities Act prescribes the manner in which a town or municipality should be managed by the Village, Town or Municipal Council	The development has to comply to provisions of the Local Authorities Act
Karibib Town Planning Scheme	The Town Planning Scheme provides for the co-ordinated and harmonious development of the local authority area.	The development has to conform to the requirements of the Karibib Town Planning Scheme.
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.

LEGISLATION/POLICIES	RELEVANT PROVISIONS	RELEVANCE TO THE PROJECT
National Heritage Act No. 27 of 2004	The Act is aimed at protecting, conserving and registering places and objects of heritage significance.	All protected heritage resources (e.g. human remains etc.) discovered, need to be reported immediately to the National Heritage Council (NHC) and require a permit from the NHC before they may be relocated
Public Health Act no 36 of 1919	Section 119 prohibits persons from causing nuisance.	Contractors and users of the facility are to comply with these legal requirements.
Petroleum Products And Energy Act, 1990 Petroleum Products Regulations (2000)	These legislations provides for the application of a consumer licence	The facility should have a consumer licence from the Ministry of Mines and Energy
Water Quality Guidelines for Drinking Water and Waste Water Treatment	Details specific quantities in terms of water quality determinants, which waste water, should be treated to before being discharged into the environment (see Appendix A).	These guidelines are to be applied when dealing with water and waste water treatment.

4 MANAGEMENT ACTIONS

The tables in this chapter detail the management measures associated with the roles and responsibilities that have been laid out in **Chapter 2**. The aim of the management actions in this chapter 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 associated this development:

- Operation and maintenance phase management actions (Table 4-1); and
- Decommissioning phase management actions (Table 4-2).

The owner should assess these commitments in detail and should acknowledge their commitment to the specific management actions detailed in the tables below.

4.1 OPERATION AND MAINTENANCE PHASE

The management actions included in **Table 4-1** below apply during the operation and maintenance phase of this development.

Table 4-1: Operation and maintenance management actions

Impact	Management Actions
Education and Training	<ul style="list-style-type: none"> • All employees including all contractors appointed for maintenance work on the respective infrastructure and their employees must be made aware of necessary health, safety and environmental considerations applicable to their respective work. • Records of environmental training and incidents should be maintained. • Post instructional/ informational signs regarding storm water pollution around the facility for customers and employees. • Place signs on faucet (hose bibbs) reminding employees and customers to conserve water and not to use water to clean up spills. • Label drains within the facility boundary by paint/ stencil (or equivalent), to indicate whether they flow to an on-site treatment system, directly to the sanitary sewer, or to an alternative drain.
Monitoring	<ul style="list-style-type: none"> • An Environmental Practitioner should monitor the implementation of the EMP, and recommend any changes to this document. • The Environmental Practitioner should inspect the site on a regular basis (preferably monthly or bi-monthly). • Biannual reports are to be submitted to the Ministry of Environment, Forestry and Tourism. • Biannual reports to the Ministry of Environment, Forestry and Tourism are to be shared with the Karibib Town Council
General Facility	<ul style="list-style-type: none"> • Ensure the Premises have obtained a fitness registration form the Karibib Town Council and is kept current. • Spot clean leaks and drips routinely. • Maintain a spill response plan and keep it current. • The above to take into consideration air, surface and groundwater, and soil quality, as well as the transportation of products to and from the facility. • Inspect and clean drain inlets and catch basins within the facility boundary at least once each year.
Fuel Dispensing Area	<ul style="list-style-type: none"> • Ensure paving of the land within the confines of the property, priority to be given to concrete slabs as opposed to interlocks especially at the fuel dispensing areas.

Impact	Management Actions
	<ul style="list-style-type: none"> • Maintained fuel dispensing areas using dry clean-up methods such as sweeping for removal of litter and debris, or use of rags and absorbents for leaks and spills, and never wash down unless the wash water is collected and disposed of properly. • Fit fuel dispensing nozzles with “hold-open latches” (automatic shutoffs). • Post signs at the fuel dispenser or fuel island warning vehicle owners/operators against “topping off” of vehicle fuel tanks. • Ensure metering of incoming and outgoing fuel and maintain records. • Ensure metering equipment are calibrated as per industry standards. • Maintain all equipments, such as tanks, pumps, meters, hoses etc. in a clean state (regular inspections to be carried out).
Hazardous Substances	<ul style="list-style-type: none"> • 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. • 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. • Storage areas for all substances, in particular fuel, should be bunded and capable to hold 120% of the total volume of a given substance stored on site. • Ensure fuel tanks do not leak (regular inspections to be carried out).
Outdoor Waste Receptacle Area	<ul style="list-style-type: none"> • Spot clean leaks and drips routinely. • Minimise storm water pollution from outside waste receptacles by doing at least one of the following: <ul style="list-style-type: none"> a) Use of only watertight waste receptacle(s) and keep the lid(s) closed; b) Grading and paving the waste receptacle area to prevent run-off of storm water; c) Installing a roof over the waste receptacle area; d) Installing a low containment berm around the waste receptacle area; e) Using and maintaining drip pans under waste receptacles.

Impact	Management Actions
Air/ Water Supply Area	<ul style="list-style-type: none"> • Minimise storm water pollution from air/water supply areas by doing at least one of the following: <ul style="list-style-type: none"> a) Spot cleaning leaks and drips routinely to prevent runoff of spillage b) Grading and paving the air/water supply area to prevent run-off of storm water c) Installing a roof over the air/water supply area d) Installing a low containment berm around the air/water supply area.
Housekeeping	<p>Equipment Cleaning</p> <ul style="list-style-type: none"> • Indoor Cleaning: Clean equipment in a designated area, such as a mop sink, pot sink, or floor area with a drain connected to the sanitary sewer. • Make sure floor drains are connected to or discharge to the sanitary sewer system. • Outdoor Cleaning: Clean equipment in a designated covered, bermed area with a drain connected to the sanitary sewer. • Do not clean equipment cleaned outdoors in any area where water may flow to a street, gutter, or stream. • Use floor mats that are small enough to be cleaned inside in a mop sink or near a floor drain. • Take floor mats that are too big to be cleaned indoors, to a self-service car wash to clean? <p>Grease Handling and Disposal</p> <ul style="list-style-type: none"> • Prevent oil, grease, sauce, salad dressings, or waste from being poured down the sanitary sewer, or into a skip container. • Ensure waste grease from grease interceptors and traps are being properly disposed of by a responsible/ recognised disposal company. • Waste is to be disposed off in terms of the Karibib Town Council’s Solid and Hazardous Waste Management Regulations. • A waste water discharge permit has to be obtained from the Karibib Town Council before any waste water is discharged into the sanitary sewer. <p>Spill Clean-up and Surface Cleaning</p> <p>Spill Prevention</p> <ul style="list-style-type: none"> • Maintain the Spill Response Plan and keep it current.

Impact	Management Actions
	<ul style="list-style-type: none"> • The Spill Response Plan is to be shared with the Karibib Town Council. • Minimise the distance between waste collection points and storage areas. • Contain and cover all solid and liquid wastes. • Ensure absorbent materials and other spill response equipment are maintained in accordance with local regulations and procedures for containment and cleanup of different spills, and that they are easily accessible from anywhere in the facility. • Spot clean leaks and drips routinely. <p>Spill Clean-up</p> <ul style="list-style-type: none"> • Stop spills at the source. • Prevent wash water from spill cleanup from flowing to a gutter or sanitary sewer. • Use granular absorbents (e.g. cat litter) to absorb spills. • Promptly inform the Town Council of Karibib of major spills.
Cooling and Refrigeration Equipment Maintenance	<ul style="list-style-type: none"> • Ensure all discharges from cooling and refrigeration equipment are going to the sanitary sewer and not to the street.
Washing Cars and other Vehicles	<p>Regular Activity</p> <ul style="list-style-type: none"> • If car washing is a central activity of the business, consider the treatment and recycling of wash water . • Designate a vehicle washing area, and ensure cars and trucks are washed only in that area. • Ensure the “wash pad” is bermed and that it discharges to the sanitary sewer drains after adequate treatment and approval of the local authority. (Note: An outside wash pad should be covered, or its area minimized to reduce the amount of rainwater reaching the sanitary sewer. Consult the local authority for guidance) • Prohibit acid-based wheel cleaners and other specialized cleaners, or if not, ensure they are provided proper treatment before discharge to the sewer. (Note: Consult the local authority for guidance) <p>Occasional Activity</p> <ul style="list-style-type: none"> • If soap is used in washing, ensure the wash water collected is discharged, preferably with treatment, to the sanitary sewer.

Impact	Management Actions
	<ul style="list-style-type: none"> • Ensure rinse water from spray-on acid-based wheel cleaners are prevented from flowing to a street or gutter. <p>Washing New Vehicles Solvents used to remove protective coatings from new cars. (Note: Discharges of these solvents to the sanitary sewer must receive adequate treatment and approval of the local authority).</p>
Access	<ul style="list-style-type: none"> • Provide for painted guidelines in terms of access and exit points. • Consider the construction of raised islands to prevent vehicles from entering and accessing through the wrong lane. • It is highly recommended that the premises, especially the area housing the tanks and pumps be paved.
Water	<ul style="list-style-type: none"> • No dumping of waste products of any kind in or in close proximity to any surface water bodies. • Contaminated runoff from the various operational activities such as greases, fuels, oils etc. should be prevented from entering any surface or ground water bodies. • Ensure that surface water accumulating on-site are channeled and captured through a proper storm water management system to be treated in an appropriate manner before disposal into the environment. • Treat oily water through an oil/water separator before it is drained to the sewer or collected by a licensed contractor. • Prevent fuel spills: look at work practices, staff training, equipment and storage. • Consider the use of environmentally friendly degreasers for washing and cleaning. • In the instance of an accidental spill, the effluent should be contained as far as possible in a separator pit. • Water to be treated in accordance with the national Water Quality Guidelines.
Fire prevention and control	<ul style="list-style-type: none"> • A Fire/ Emergency plan conforming to approved Municipal standards should be in place. • Smoking should not be allowed on the premises. • Ensure availability of sufficient fire hydrants. • Ensure sufficient supply of water for fire hydrants. • Ensure availability of sufficient fire extinguishers. • Control high fire risk activities that have to be carried out such as welding on the premises. • Train employees in the use of fire-fighting equipment. • Store flammable inventory in a secure area with proper firefighting equipment and signage.

Impact	Management Actions
Energy efficiency and water management	<p>The owner should consult the relevant national and/or international development guidelines which addresses the following:</p> <ul style="list-style-type: none"> • The use of solar geysers and solar panels for the general lighting and heating of water for buildings. • The incorporation of water saving initiatives and technology within the development in order to reduce water demand. • Ensure sufficient metering systems are in place to monitor the energy and water use. • Train employees on the importance of water and energy savings.
Noise	<ul style="list-style-type: none"> • Do not allow activities that generate excessive noise levels. • Continuous monitoring of noise levels should be conducted to make sure the noise levels do not exceed acceptable limits. • Maintain equipment used during the operation and keep them in a good state such that they do not emit excessive noise.
Emissions	<ul style="list-style-type: none"> • Manage activities that generate emissions. • Use vapour recovery equipment and techniques to avoid air pollution and minimise fuel loss. • Position vent pipes at points that are far from buildings and adjacent properties. • Train fuel area staff in vapour recovery procedures. • Conduct regular air quality monitoring.
Waste management	<ul style="list-style-type: none"> • Explore recycling solutions for waste. • Provide for adequate number of refuse bins at all pumps as well as around the site. • Use recognized waste management service providers to handle solid waste. • Solid waste to be disposed of at the designated Karibib landfill. • All hazardous waste to be collected and disposed of as per industry standards. • Provide suitable on-site ablution facilities to cater for all personnel and customers using the facilities. • Keep skip container lids closed to keep out the rainwater. • Keep skip container or the skip container enclosures locked to prevent illegal dumping.

Impact	Management Actions
	<ul style="list-style-type: none"> Do not dispose liquid waste or leaky garbage bags in the skip containers. Ensure leaking skip containers and compactors, and skip containers that need to be cleaned out are serviced by the skip container leasing company or contractor. Keep spill cleanup materials handy near the skip container and loading dock areas.
Air quality	<ul style="list-style-type: none"> Manage activities that generate excessive dust emissions. Consider the relocation of the facilities from excessive exposure of dust.
Visual Impact	<ul style="list-style-type: none"> Consider the planting of indigenous trees as part of landscaping and dust control. Use colours that blend in with the natural environment for the painting of buildings.

4.2 DECOMMISSIONING PHASE

The decommissioning of this development is not foreseen. In the event that this development is decommissioned the following management actions should apply.

Table 4-2: Decommissioning phase management actions

Environmental Feature	Management Actions
Decommissioning Plan	<ul style="list-style-type: none"> A Decommissioning Plan should be developed within 12 months after the ECC has been issued. The Decommissioning Plan should, as a minimum, contain the actions outlined below.
Rehabilitation	<ul style="list-style-type: none"> Steam clean contaminated metal before disposal. After cleaning, metal with economic or future value may be disposed of at scrap metal dealers. Ensure the presence of professionals (engineer, environmental practitioner, contractor) during excavation. Remove all fuel inside the tanks and degas the tanks. All pipes and vents connected to the tank should be disconnected and sealed before removal of the tank.

	<ul style="list-style-type: none">• In the instance that a leak is suspected, soil and water samples must be taken. If confirmed contaminated soil must be removed and water pumped out.• Contaminated soil should be stockpiled separately and remediated onsite or removed to an appropriate landfill site.
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Appendix A - 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 ₃	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 ₄	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 ₂ 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 dm³ 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 ₃	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 ₃	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 ₂
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 O₂.

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