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**ENVIRONMENTAL MANAGEMENT PLAN FOR VIRGO RESOURCES LIMITED
EXPLORATION ACTIVITIES ON EPL 5796 LOCATED IN THE NAMIB NAUKLUFT
NATIONAL PARK**

MARCH 2019

Compiled for:

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1 INTRODUCTION AND BACKGROUND

Hope and Gorob Mining Pty Ltd. (subsidiary of Virgo Resources Limited) (referred to in the text as VIRGO) holds the mineral rights for base and rare metals on the Exclusive Prospecting Licence (EPL) 5769. The supervision of the drilling activities on EPL 5769 will be carried out by Virgo. A. Speiser Environmental Consultants cc (ASEC) was appointed by VIRGO to compile an Environmental Management Plan (EMP) for the proposed exploration activities and to audit the implementation and environmental performance of the project. ASEC will conduct bi-annual monitoring audits as stipulated in the Environmental Clearance Certificate.

2 PURPOSE OF THE ENVIRONMENTAL MANAGEMENT PLAN (EMP)

The scope and objectives of the EMP were discussed with Mr. Q. Hills of VIRGO. The purpose of the EMP is:

- To summarise the project activities that have the potential for adverse environmental impacts.
- To identify and outline the aspects of the environment which require management.
- To compile Project Environmental Specifications for inclusion in contract documents and enforcement on site.
- To set out the roles and responsibilities of all role-players with regard to environmental management.
- To specify rehabilitation requirements.
- To establish monitoring requirements to ensure that all workers on site comply with the Environmental Specifications. The Project Manager/Senior Geologist on site will be designated by VIRGO to perform this function on a day-to-day basis.

As the EPL lies within the Namib Naukluft National Park, the Parks Rules (**Appendix 1**) set out by MET need to be adhered to at all times.

3 ROLES AND RESPONSIBILITIES

The roles and responsibilities between VIRGO, the helicopter crew, geologist, geophysicists and the drilling company shall clearly be defined.

Open communication between all parties is important to establish a strong Environmental Awareness Protocol from the beginning of the programme. Only with open communication can a proactive approach be achieved. This approach should ensure that environmental impacts are anticipated and prevented, or minimised, rather than adopting a negative “policing” approach after negative impacts have already occurred.

3.1 VIRGO

VIRGO will allocate a Project Manager/Senior Geologist who will have the following duties and responsibilities:

- Ensure that drill contractors are aware of the EMP.
- Maintain a photographic record of areas before and during exploration activities and after rehabilitation.
- Communication with the landowner (MET) and the Topnaar Community. The Project Manager/Senior Geologist will inform VIRGO immediately about any disputes/problems to ensure that these can be addressed with the landowner (MET) and the Topnaar Community immediately.
- The Project Manager/Senior Geologist is responsible to record any non-compliance with the EMP, and rectifying action are discussed with VIRGO and ASEC.

3.2 A. Speiser Environmental Consultants (ASEC)

The duties of ASEC are to conduct the duties of the Environmental Officer (EO), which includes the following:

- Advise the Project Manager/Senior Geologist regarding implementation and management aspects of the EMP.
- Inspect the drill sites after complaints that the mitigation measures of the EMP are not obeyed or any non-compliance occurred.
- Provide input into access roads to the drill sites, if necessary.
- Inspect the rehabilitation areas after completion of rehabilitation activities. Advise the contractors during rehabilitation.
- Maintain a photographic record of activities relevant to environmental management. This will be carried out on a day-to-day basis by the Project Manager/Senior Geologist.
- Conduct bi-annual audits and compile Bi-annual Environmental Reports, which needs to be submitted to MME and MET.

3.3 Drilling Contractor

The duties of drilling contractor are as follows, should drilling resume:

- Be familiar with the contents of the EMP.
- Ensure that **all** staff and sub-contractors have the EMP explained to him / her to avoid any misunderstandings, e.g. induction session.
- Comply with the EMP.
- Activities not covered in the EMP which may lead to negative environmental impacts shall be discussed with the Project Manager/Senior Geologist prior to commencement.

3.4 Monitoring

The Project Manager/Senior Geologist shall be responsible for monitoring and enforcement of the EMP on a day-to-day basis. Any violation of the EMP shall be recorded and the agreed on measurements are taken, e.g. penalties. The violations are reported to VIRGO and ASEC.

Contractor's queries to avoid / mitigate negative environmental impacts not covered in the EMP will be addressed by ASEC without unreasonable delay.

Bi-annual environmental audit reports to be submitted to MME and MET

4 ENVIRONMENTAL MANAGEMENT PLAN FOR EXPLORATION ACTIVITIES

The **Table** below sets out the general aspects, which should be addressed prior to any drilling activities to ensure that all exploration team members are aware of the aims set out in the EMP.

General Aspects

Activity	Aspect	Affected environment	Potential impact	Mitigation measure/recommendations/explanation
Initiation of exploration programme	To establish a strong Environmental Awareness Protocol from the beginning of the programme in order to ensure the least possible damage to the environment.	General EPL area	General behavior of exploration team in the EPL area.	<ul style="list-style-type: none"> Provision in the budget is made for Environmental Awareness and training and for internal and external Environmental Monitoring/Auditing costs as well as for rehabilitation costs. Responsibilities as set out in Chapter 3 are explained and adhered to. All individuals who work on, or visit, the sites are aware of the contents of the EMP and the NNNP Park rules. The EMP should be included in all Tender Documents.
Implementation of the EMP	<p>To define roles and responsibilities in terms of the EMP. To make all persons aware of these roles and responsibilities to ensure that exploration activities are conducted in compliance with the EMP.</p> <p>To implement environmental</p>	General EPL area	General behavior of exploration team in the EPL area.	<ul style="list-style-type: none"> Senior exploration staff and all senior contractors are aware of, and implementing, EMP requirements. All persons shall be expected to know and understand the objectives of the EMP and will, by example, encourage suitable environmentally aware behavior to be adopted on all sites. Immediate recognition should be given to appropriate environmentally acceptable behavior. Any inappropriate behavior should be immediately corrected. An explanation as to why the behavior is unacceptable must be given, and, if necessary, the person could be disciplined, e.g. fees set out, for different non-environmental compliance or not allowed to work on the project anymore.

Activity	Aspect	Affected environment	Potential impact	Mitigation measure/recommendations/explanation
	management that is preventative and proactive. To establish the resources, skills, etc. required for effective environmental management.			
Environmental awareness briefing / training	To implement environmental awareness briefing / training for all individuals who visit, or work, on site.	General EPL area	General behavior of exploration team in the EPL area.	<ul style="list-style-type: none"> • Every senior/supervisory member of the team is to familiarise themselves with the contents of the EMP and to understand their roles and responsibilities in 'walking the talk' and ensuring compliance with the EMP and the NNNP park rules. • Either the Environmental Consultant or the owner of the project will hold an Environmental Awareness Briefing meeting which has to be attended by all exploration and drill contractors before the start of the drilling operation. The meeting should discuss the potential dangers to the environment of the following activities: littering, off-road driving, waste disposal, hydrocarbon spillages, poaching & plant theft, damage to sensitive biodiversity habitats and archaeological sites, etc. The need to conserve water and implement water saving measures should also be presented. • Individuals can be questioned on the content of the EMP and can recall contents.
Public relations	To maintain sound relationships with the landowners and communities impacted by the work			<ul style="list-style-type: none"> • All required permits are in place, e.g. airborne survey, water abstraction from boreholes. • No littering occurs. • Communicate and environmental incidences/accidents) (i.e. injury or death of animals) with MET.

Activity	Aspect	Affected environment	Potential impact	Mitigation measure/recommendations/explanation
				<ul style="list-style-type: none"> • Ongoing liaison with the Gobabeb Research Team to keep them informed of the planned activities, to ensure there are no interference with their activities. Notify them in advance of planned exploration activities. • Liaise with the Topnaar Community regarding job opportunities, water abstraction from Homeb and other possible activities where the local community could indirectly provide services to the Exploration Team. Notify them in advance of planned exploration activities. • Staff will be provided with visible identification and proof that they are working on the Exploration Team.
Accommodation				<ul style="list-style-type: none"> • Accommodation is either taken at the Gobabeb Research and Training Center or at the Homeb campsite. With the exception of one (or two people for safety reasons) security personnel to secure the drill site at night. A permit will be obtained from MET for the security personal staying on site.
Appointment of semi- skilled / unskilled workers and skills development	To create jobs for locals and develop their skills	Local Community (i.e. Topnaars)	Provide short term job opportunities to the local community	<ul style="list-style-type: none"> • Use locals for the semi-skilled / unskilled work. • Liaise with the Topnaars' spokesperson / Council regarding these appointments. • Provide opportunities during the drilling programme for the semi-skilled / unskilled workers to develop skills, i.e. drilling, etc., without compromising their safety.
Waste management	To maintain a clean and tidy site / area.	Fauna, general environment, visual impact	Disturbance to fauna. Visual impact (i.e. impacting Tourists)	<ul style="list-style-type: none"> • <u>The following waste management procedures shall be implemented:</u> <ul style="list-style-type: none"> ▪ Contractors and contractors will be shown the importance of correct waste disposal and minimization through appropriate training; ▪ Minimisation of waste production; ▪ Where possible, compact waste to reduce its bulk; ▪ What is taken in has to be taken out and disposed of at an official waste site;

Activity	Aspect	Affected environment	Potential impact	Mitigation measure/recommendations/explanation
				<ul style="list-style-type: none"> ▪ Hazardous waste (including hydrocarbon contaminated material/soil) is disposed of at a licenced hazardous waste disposal facility (i.e. Walvis Bay hazardous waste site). ▪ Waste containers with suitable lids are provided on site; ▪ Illegal dumping and littering is not to be tolerated. ▪ Assist with cleaning waste that remained on site from the historic exploration activities. Any recyclable waste are kept separate. (Liaise with the Topnaars for collection, or take to recycling company in Walvis Bay).
Development of Access Roads and Tracks	Disturbance of general environment	General environment	Disturbance of flora Visual impact	<ul style="list-style-type: none"> • Drill sites and other exploration activities should be sited / conducted on existing or previously established tracks. Survey and demarcate roads and tracks that will be needed for activities. • All newly created tracks shall be rehabilitated after the drill hole has been finalized, e.g. raking the middle 'berm', loosen the compacted ground by manual raking and sweeping. • No off-road driving by any vehicle
Management of drill sites	To undertake the respective drilling programmes in such a manner that it will be difficult to determine where these activities took place in 3 years time.	Disturbance of natural environment	Loss of indigenous vegetation Disturbance of fauna	<ul style="list-style-type: none"> • Impervious rubber / plastic sheeting or oil absorbent mats are to be used to prevent pollution by diesel, oil and other related sources of pollution. • All litter is placed in a container with a lid that is secured against wind. The rubbish is taken to an official waste site. • Soil contaminated by oil or diesel is removed and dumped on an approved dumpsite and the area treated to neutralize hydrocarbon contamination. • The drill sites are clearly demarcated to minimise the disturbed areas around boreholes. • Holes / site are rehabilitated before moving to the next site to minimise vehicle movement to the area. This includes capping of the borehole and ensure that no gaps between the collar and the substrate left behind. • Open water should be fenced off and preferably covered during night to

Activity	Aspect	Affected environment	Potential impact	Mitigation measure/recommendations/explanation
				<p>avoid attraction of bees, livestock and wildlife.</p> <ul style="list-style-type: none"> • Sumps are lined. It is preferred that portable water reservoirs are used and no sumps are dug. • If sumps are used, these need to be fenced in while drying out before rehabilitation. • Drilling can only be conducted from sunrise to sunset, as stipulated in the Parks Rules. • Smoking (when handling samples or core only after washing hands) may be permitted. An ashtray, e.g. bucket filled with sand at drill sites or small water bottles with some water should be provided to all smokers. This will minimize the littering of cigarette butts and minimize veld fires.

Activity	Aspect	Affected environment	Potential impact	Mitigation measure/recommendations/explanation
Management of hazardous substances	<p>To minimise the risk of pollution through the implementation of all reasonable measures to prevent leakage, spillage or inappropriate disposal of hazardous substances.</p> <p>To minimise the risk of hazardous substances affecting the health of all individuals and plant and animal life.</p> <p>To use biodegradable products as far as is reasonably possible.</p>	General environment		<ul style="list-style-type: none"> • The Project Manager/Senior Geologist and Contractor have identified all activities that involve the handling of potentially hazardous substances and protocols for the handling of these substances have been put in place and their implementation is supervised. Hazardous substances are handled in accordance with the manufacturer's specifications and existing legal requirements. • The Project Manager/Senior Geologist will encourage the use of the least polluting, most rapidly biodegradable cleaning product, solvent, drill lubricants, etc. • In all areas where there is storage of hazardous substances (i.e. hydrocarbons), there will be containment of possible spillages on impermeable floors and bunded trays that can contain 110% of the volume of the hazardous substances. • All refuelling and any maintenance of vehicles will take place with protective measures to ensure no contamination of the surface. • Pollution will be prevented through basic infrastructure design and through maintenance of equipment. • Spill kits will be readily available on site. Employees and/or contractors will be shown to use the spill kits to enable containment and remediation of pollution incidents. • The Project Manager/Senior Geologist and Contractor will ensure that all individuals, who could be exposed to hazardous substances, are adequately protected (PPE) and educated about the safe and proper methods for handling of these substances. • Procedures for the containment and clean-up of accidental hazardous accidents are developed by the Project Manager/Senior Geologist in accordance to the manufacturer's specifications. • The Project Manager/Senior Geologist or Contractor should immediately implement actions to stop or reduce and contain any spills. • The Project Manager/Senior Geologist arrange and supervise the

Activity	Aspect	Affected environment	Potential impact	Mitigation measure/recommendations/explanation
				<p>implementation of the necessary clean-up procedures and proper disposal of contaminated soil, water and other materials at an approved facility.</p> <ul style="list-style-type: none"> • Clean-up, and dispose of contaminated soil at an official hazardous waste site (i.e. Walvis Bay Hazardous waste site). • Any hydrocarbon spills involving 200l and more are reported to the Ministry of Mines and Energy (stipulated in the Petroleum Product Regulations, 2000, Section 49(1)(4)).
Surface & groundwater management	<p>To conserve water.</p> <p>To avoid the pollution of any water and prevent polluted water from entering stream channels or underground aquifers.</p> <p>To monitor the rest water levels and quality of production boreholes, if water is encountered.</p>	General environment	Visual Groundwater / stream pollution	<ul style="list-style-type: none"> • Working areas, where hazardous substances are handled or stored, are designed to collect and contain hazardous substances. Impervious materials are provided, e.g. drip trays, or sumps to collect and contain liquid pollutants. (see “management of hazardous substances”) • Provide appropriate toilet facilities (long drop with chloride or lime) for the drilling team on the site. • Water use licenses in terms of the Water Resource Management Act (Act No. 11 of 2013) will be obtained for any new boreholes. • A compensation agreement will be discussed with the Topnaar Council for utilizing the existing borehole at Homeb • Groundwater levels will be measured prior to abstraction, during abstraction (daily) and after completion. Levels will be reported to the Topnaars and part of the Bi-annual Report to MME and MET.
Noise	To minimize noise impacts from vehicles, drilling equipment and helicopter.	Third parties (Tourists) Fauna	Noise disturbance	<ul style="list-style-type: none"> • Adhere to the speed limits in the park. • Use well maintained drilling equipment. • Keep helicopter flight times as short as possible. • Keep flight height to 75-85 m. Only fly low when it cannot be avoided (for safety reasons). • Liaise with the Gobabeb Team to ensure flights are scheduled at times where noise sensitive research activities are not being undertaken.

Activity	Aspect	Affected environment	Potential impact	Mitigation measure/recommendations/explanation
Land use	To minimize the loss of sense of place to tourists	Third parties (Tourists)	Visual impact – loss of sense of place	<ul style="list-style-type: none"> • Refer to “Site Rehabilitation” below. • Refer to “Waste Management”
Third party safety	To avoid injury or death to third parties (i.e. tourists).	Third parties (Tourists)	Injury / death to 3 rd parties	<ul style="list-style-type: none"> • The working area of the drill site will only be accessed by Virgo and their contractors / workers. • Warning signs will be erected and maintained at the strategic location to warn third parties of dangers associated with the drilling activities. • Put ‘no entry’ signs at tracks turning off the official tourist routes. • Any person entering the drill sites will only be allowed after formal induction.
Site rehabilitation	To rehabilitate the drill sites and trenches to as close an approximation of the pristine state as is technically, financially and reasonably possible.	General environment	Visual impact Tourism activities	<p>The following rehabilitation actions are to be carried out:</p> <ul style="list-style-type: none"> ▪ All litter from the site i.e. bottles, tins, piping, etc. are taken to an appropriate disposal site. ▪ All debris, scrap metal, etc. is removed before moving to a new drill site. ▪ All sumps have been dried and be filled in, if not portable water reservoirs are used. ▪ Tracks on the plains must be restored by fine raking and sweeping when exploration activities are complete. It is important that each tyre track be individually swept. If the entire area over the double track is swept it increases the area of impact. ▪ Ensure that no heaps of soil, rocks and material remain – sweep and rake manually before moving to the next drill pad so that the site looks as close to ‘pre-operation’ as possible. ▪ Re-cover levelled land with the soil that has been removed. ▪ Clean previous drill sites, trenches, pits from old waste, such as wire, plastic tags, etc. ▪ 5 years after rehabilitation the drill and trench sites are not visible from 500m.

Activity	Aspect	Affected environment	Potential impact	Mitigation measure/recommendations/explanation
Management of the natural habitat, fauna and flora	To avoid, or reduce, the potential negative impact on the bio-physical environment, including the scenic value thereof.	General environment	Loss of habitat General disturbance / destruction of Fauna and Flora	<ul style="list-style-type: none"> Disturbed areas are kept to a minimum. No incidents of poaching or illegal plant, bird eggs or reptile collection are reported. (No collection of any plant or parts of a plant are allowed). Offenders will be handed over to the authorities. Employees and contractors will be shown the value of biodiversity and the need to conserve the species and systems that occur within the project area. Adhere to the speed limits in the park so as to prevent road kills. Domestic or other animals are not brought into the National Park. No damage to, or destruction of, <i>Commiphora saxicola</i> should occur. If any are found at drill sites, then the sites should be adjusted to avoid them. See Appendix 2 for images to assist identification of this species. Should exploration drilling at Hope be undertaken then any <i>Welwitschia mirabilis</i> or <i>Commiphora saxicola</i> plants should be clearly marked and should be avoided. This may require prior mapping. Some of the <i>Welwitschia</i> at Hope have already been marked by Gobabeb research staff. Appendix 2 depicts <i>Welwitschia mirabilis</i> for identification purposes. Avoid drilling activities in the medium to larger washes. Any person who causes willful or malicious damage to the environment will be held responsible for repairing the damage immediately and handed over to the authorities. No excavations will be left open overnight unless fenced off. Identify bird nest sites, demarcate them and avoid them.
Managing natural heritage sites & artifacts	To avoid disturbance of known archaeological / palaeontological sites. To record accurately			<p>The likelihood that a new site will be found is minimal. However the following measures are to be implemented in case of any new found:</p> <ul style="list-style-type: none"> Documented consultation with an archaeologist, and/or local expertise when in doubt. All individuals are aware of which areas are sensitive.

Activity	Aspect	Affected environment	Potential impact	Mitigation measure/recommendations/explanation
	any new sites found and report to the responsible authority.			<ul style="list-style-type: none"> • Every pile (not waste or ore material dumps) of stones is treated as a possible archaeological site. Do not use them, as the rocks could be a burial cairn or hunting blind. In this regard no disturbance / damage to the old buildings and drill cores; or the “Topnaar circles” are tolerated. No exploration activities allowed in close proximity (i.e. 100 m buffer zone) to these areas. • No heritage objects are moved without a permit from the National Monuments Council and any permitted removal of heritage objects is done under the supervision of a qualified archaeologist, palaeontologist or historian. • Any archaeological sites that are found are not be disturbed, but be carefully photographed, the exact location recorded and the finding reported to the National Monuments Council. • Consult with “Archaeological Guidelines for Exploration & Mining in the Namib Desert” by Dr. John Kinahan (Appendix 3).

Appendix 1: Parks Rules from the Ministry of Environment and Tourism.

It is against the law to:

- a) Be in possession of an unsealed or loaded firearm;
- b) Bring into the Park any pets, domestic or otherwise;
- c) Leave a rest camp before sunrise or reach it after sunset, or cross the borders of the Park between sunset and sunrise;
- d) Make fires at places other than the officially designated fire-places or make excessively large fires;
- e) Stay overnight at any place other than a rest camp;
- f) Throw away burning or smouldering objects or leave them at places where they may ignite something;
- g) Drive at places other than roads marked by official road signs;
- h) Kill, injure or needlessly disturb any wild animal;
- i) Pick, collect, uproot or disturb any flower, shrub, herb or any other plant;
- j) Damage or spoil any object in the park;
- k) Leave the rest camp in any other way than in a vehicle, or leave or hang out from the vehicle in any other place than in a rest camp or an assigned camping site;
- l) Throw away refuse or rubbish, except at places or in the receptacles provided for the purpose;
- m) Make a noise which may disturb other people;
- n) Drive or park in the Park in such a way that it may constitute a nuisance, disturbance or inconvenience to other people, or drive faster than the official speed limit;
- o) Enter the Park in an open vehicle or on a deck of a motor truck not fitted with a grid cage or other effective protection;
- p) Ignore the lawful instructions of MET Park officials;
- q) To hitch-hike;
- r) To use the tourists' facilities, i.e. swimming pool, etc. Park warden/ official need to be notified for any new drilling activities.

The visit/work to this Park is at your own risk and the Ministry of Environment and Tourism will not be held liable for any injuries, damage or losses you or your possessions may sustain.

All other park rules and regulations must be adhered to.

Appendix 2: Images to help to identify *Commiphora saxicola* or *Welwitschia mirabilis*.

Description of *Commiphora saxicola*:

Deciduous, **low-growing shrub with short, swollen stem** up to 2.5 m high and about 2 m in diameter, **or small single-stemmed tree**, 1.5–4 m high; confined to the rocky hill slopes and gravel plains of the Namib Desert and escarpment. BARK **grey, finely speckled, smooth, not flaking**; young branchlets red, hairless. LEAVES unevenly compound, clustered near branch tips, leaflets elliptic to obovate to **practically circular**; **often folded upward along the midrib**; margin scalloped to **deeply toothed**. FLOWERS small, pale green to cream-coloured, appearing in small sprays before the leaves; October to May, depending on the rain. FRUIT an ovoid berry.



Description of *Welwitschia mirabilis*:

Spreading, evergreen, woody plant up to 2 m high and more than 4 m in diameter; found almost exclusively in the central and northern Namib Desert in disjunct populations. STEM flattened on top, initially saucer-shaped but becoming **hollow and V-shaped** as it ages and fragments. BARK GREYISH, knobbly and deeply fissured. LEAVES **two simple, opposite, long (can be longer than 3 m), thick, leathery**, parallel strips that eventually split, creating the impression that the plant bears more than two leaves. INFLORESCENCE male and female **cones** on separate plants; September to May. SEEDS with membranous wing.



Female *Welwitschia mirabilis*



Male *Welwitschia mirabilis*



Appendix 3: “Archaeological Guidelines for Exploration & Mining in the Namib Desert” by Dr. John Kinahan.