



APP-001322

**PROJECT DETAILS**

<b>Title</b>	ENVIRONMENTAL MANAGEMENT PLAN FOR THE ESTABLISHMENT AND MINING OF GRANITE ON MINING CLAIM 71620 AT FARM KOMPANENO 104, OMARURU CONSTITUENCY, ERONGO REGION.		
<b>HEEC Reference</b>	HEEC052020		
<b>Proponent</b>	Mr Otniel Koujo Contact Number: +264 81249 1104		
<b>Report date</b>	March 2020		
	<b>Name</b>	<b>Signature</b>	<b>Date</b>
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**ABBREVIATIONS**

AIDS	Acquired Immuno-Deficiency Syndrome
PR	Proponent'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
OC	Omaruru Constituency
Reg.	Regulation
S	Section
TB	Tuberculosis

## 1 INTRODUCTION

Granite mining is dependent on market demand for specific colours that can change within a relative short period of time. This proposed mining operation was preceded by prospecting, bulk-sampling (trail mining) and small-scale mining carried out to determine the economic viability and feasibility of mining the granite deposits. Mining is an important sector in the Namibian economy. The sector contributes significantly to GDP, commercial revenues and government tax receipts. The expansion and development of this sector is however constrained by mainly insufficient investment in mineral exploration. Globalisation has impacted on the market for international investments by increasing the levels of competition for financial resources.

The Government of Namibia recognises that the exploration and development of its mineral wealth could best be undertaken by the private sector. Government therefore focuses on creating an enabling environment through appropriate competitive policy and regulatory frameworks for the promotion of private sector investment coupled with the provision of national geo-scientific data bases essential for attracting competitive exploration and mining (Draft Minerals Policy of Namibia, MME).

It is with this background that Mr Otniel Koujo has decided to mine Granite for commercial purposes to China via the Walvis Bay Port and derive the monetary benefits associated with these natural resources after following all the necessary procedures to satisfy the relevant Authorities enabling them to mine the granite from the allocated portions on the Etendero Mountains.

However uncontrolled natural resource mining/ excavation has resulted in negative environmental effects in the respective areas. This has been largely attributed to the fact that people were under no obligation to rehabilitate the affected areas and thus left behind large open pits/quarries which pose a danger to both humans and animals.

Mr Otniel Koujo, hereinafter referred to as the proponent intends to carry out the following activity:

- **Environmental Impact Assessment (EIA) for the establishment and mining of granite on mining claim 71620 at Farm Kompaneno 104, Omaruru Constituency, Erongo Region.**

The objective of the intended Environmental Assessment is thus needed in order to assess the potential social and environmental impacts associated with the establishment and mining of granite on mining claim 71620 at Farm Kompaneno 104, Omaruru Constituency, Erongo Region and also to formulate methods of rehabilitation of the open quarry pits at the sites.

The above is a listed activity in terms of the Environmental Management Act (No. 7 of 2007) and Environmental Impact Assessment Regulations (Government Notice No. 30 of 2012).

In terms of the Environmental Management Act (No. 7 of 2007) and Environmental Impact Assessment Regulations (Government Notice No. 30 of 2012), the following listed activities in **Table 1** were triggered by the proposed project:

**Table 1:** List of triggered activities identified in the EIA Regulations which apply to the proposed project

Activity description and No(s):	Description of relevant Activity	The portion of the development as per the project description that relates to the applicable listed activity
Activity 3.1 (Mining and Quarrying Activities)	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.	The proposed project includes the mining of granite for commercial purposes.
Activity 3.2 (Mining and Quarrying Activities)	Other forms of mining or extraction of any natural resources whether regulated by law or not.	The proposed project entails the extraction of granite for commercial purposes.
Activity 3.3 (Mining and Quarrying Activities)	Resource extraction, manipulation, conservation and related activities.	The proposed project entails the extraction of granite for commercial purposes.

## 1.1 The Scope of the Proposed Activities

### 1.1.1 *Surface Excavation of Granite*

Dimension stone is a collective term for various natural stones used for structural or decorative purposes in construction and monumental applications. The defining feature of dimension stone is that unlike other mineral commodities which have value mainly as a result of their physical properties, the physical properties of a rock are merely the minimum qualification in determining whether it is fit for use in dimension stone applications. The ultimate success in marketing a natural stone as a dimension stone lies firstly in its appearance, and secondly in the possibility of producing rectangular blocks of suitable dimensions (hence the term dimension stone) to allow for successful production of the final product in the required sizes.

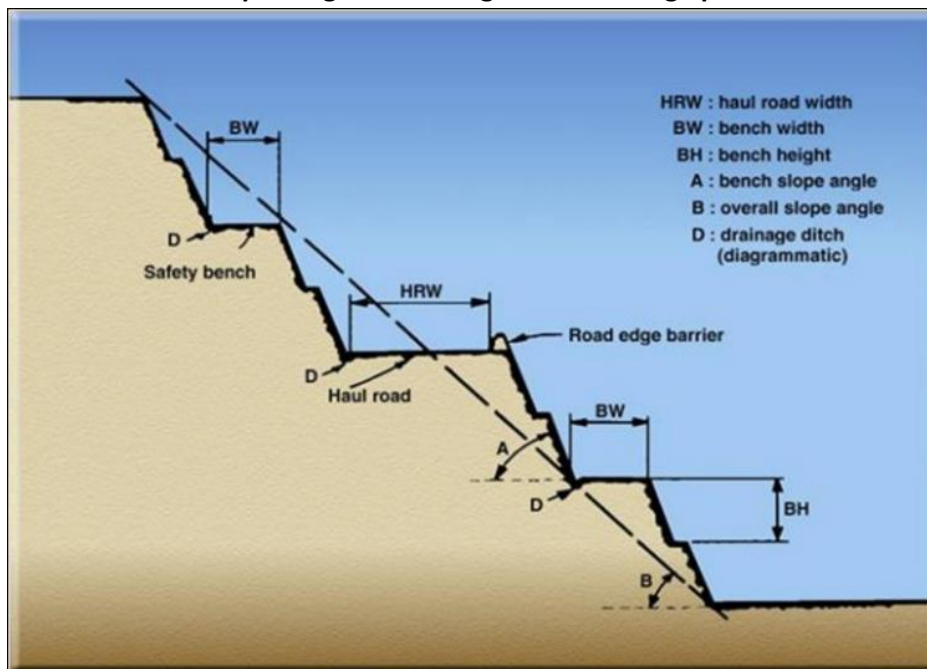
Dimension stone can be defined as “naturally occurring rock material cut, shaped or selected for use in blocks, slabs, sheets or other construction units of specialised shapes and sizes”. A dimension stone block thus has value as a result of its dimensions and appearance, underlain by a set of minimum physical properties (among these are various strength parameters, workability, ability to take a polish, and resistance to physical and chemical weathering) (Ashmole I, Motloun M, 2008).

This defining feature, together with the set of minimum physical properties required has important implications in terms of the environmental impacts of dimension stone mining, as well as the management thereof. When it is the intention to merely blast and remove stone for its physical properties (such as in crushed aggregate or ore mining), recovery can be almost 100% of the volume removed, while when the same stone is quarried with the intention of producing dimension stone blocks, recovery of saleable blocks is typically between 3% and 60%. This results in large quantities of waste rock which need to be disposed of, with resulting environmental implications.

The physical properties required of a successful dimension stone also have significant environmental implications – due to the requirement for inert materials which are not affected by weathering (and in today's context, the effect of severe chemically polluted atmospheric environments), dimension stone residues are typically benign from a pollution point of view. Like natural aggregates, dimension stone is used in its natural state, and does not require concentration and extraction from an ore. It is these latter two processes that usually results in significant environmental impacts such as acid mines drainage and other toxic effects associated with many of the metal extraction industries, and are therefore not applicable to this type of mining.

This mining operation can be classified as quarrying the open or surface excavation of granite. Quarrying starts from the earth's surface and maintains exposure to the surface throughout the extraction period. For both access and safety, the excavation usually has stepped or benched side slopes as shown in Illustration 1 below.

**Illustration 1: A simple diagram showing different design parameters**



Quarrying methods depend mainly on the desired size and shape of the stone and its physical characteristics and the main equipment used are diamond saws (Rotary saws). Diamond saws are large diamond-impregnated circular blades up to 2 m in diameter that are used to form vertical cuts in the rock by moving the machine along a guideline or rail. Extremely accurate cuts can be made in this way.

- Wire saws are also used. These consist of several pulleys over which pass an endless carborundum or diamond-impregnated steel wire.

It must be noted that the market requires solid blocks of a specific minimum dimension and any blocks smaller than such or exhibiting any cracks or blemishes are not exported but are destined for the local market for a variety of decorative uses by stone artists/carvers. It is perhaps worth noting that the mining method using circular diamond saws employed here maximises recovery. Wire saw sites have recovery rate in the range of only 10%.

Mining will take advantage of previously developed floors and faces for immediate production. However, at some of the quarries the mining model requires an absolutely flat floor upon which rails are placed for use by the rotary blades. In order to achieve the flat floor, the rock may initially be hewn by diamond wire saws.

The efficiency in respect of a dimension stone mine is related to the actual mining of the material and is a result of many factors such as:

- Structural integrity of the material
- Efficiency of the mining method
- Operator experience
- Dressing success.

Material will thus be excavated in layers in the benches of various depths. Mining will be done by Rotary saws, Hydraulic excavators, Jack Hammer Drill, Compressors and loaders for loading of mineral into trucks, trippers and tractor/ trolleys. Mining machineries and transporting vehicles are deployed on contractual basis. There is no processing plant at this site. There is only the dressing of the cut blocks to make them square. The production (extraction) rate for the different quarries depends on their state of development. The first 5 years provides for production build up or development of the new quarry and thereafter production stays constant per annum.

An Environmental Management Plan (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. Regular monitoring of environmental parameters is of immense importance to assess the status of environment during project operation. The knowledge of baseline conditions comes through monitoring of environmental parameters; the monitoring program will serve as an indicator for environmental conditions due to operation of the project. Monitoring is an important tool for the management, environmentalist and policy makers to make changes in pollution control equipment, environmental policy to reduce the environmental impact of the mining operations. It is a decision making tool for the state of environment carried out through periodic monitoring. Regular monitoring program of the environmental parameters is essential to take into account the changes in the environmental quality over the period of time to comply environmental conditions necessary to save environment. The environmental consultant (HEEC) will carry out biannual environmental audits during the lifespan of this granite mine. This EMP details the mitigation and monitoring actions to be implemented during the following phases of these developments:

- Granite mining Phase – the period during which the proponent, having dealt with the necessary legislative and administrative arrangements, appoints a contractor to engage in the extraction of Granite from the project site to be transported to the Walvis Bay Port for commercial purposes;
- Transportation Phase- the period during which the proponent transports the Granite from the quarry to Walvis Bay port for commercial.
- Dressing Phase- the period during which the proponent processes the excavated granite, by cutting them into the required dimensions so that they can be used as building/decorative materials by the customers will be done in China and therefore is not in the scope of this EMP.

The rehabilitation of the quarries at the granite mining site once activities have ceased is highly recommended so as to ensure that the subject area assumes economically viable alternative land uses and not pose a drowning threat/injury to the livestock and locals making use of these farm lands; when the event occurs then some recommendations have been outlined in **Table 4 & 5**.



## 2 ROLES AND RESPONSIBILITIES

The proponent (Mr Otniel Koujo) is ultimately responsible for the implementation of the EMP, at the granite mining phase to the quarry rehabilitation phase of the granite mining on mining claim 71620 at Farm Kompaneno 104, Omaruru Constituency, Erongo Region. The proponent 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:

- Proponent's Representative;
- Environmental Control Officer; and
- Contractor (Mr Otniel Koujo).

### 2.1 PROPONENT'S REPRESENTATIVE

Mr Otniel Koujo, the proponent, 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 Proponent's Representative (PR). The proponent may decide to assign this role to one person for the full duration of these developments, or may assign a different PR to each of the development phases – i.e. one for the Granite mining & one for the quarry rehabilitation phase. The PR's responsibilities are as follows:

Responsibility	Project Phase
Making sure that the necessary approvals and permissions laid out in <b>Table 2</b> are obtained/adhered to	Throughout the lifecycle of this project
Suspending/evicting individuals and/or equipment not complying with the EMP	<ul style="list-style-type: none"> <li>• Granite mining</li> <li>• Transportation of Granite</li> <li>• Quarry rehabilitation.</li> </ul>
Issuing fines for contravening EMP provisions	<ul style="list-style-type: none"> <li>• Granite mining</li> <li>• Transportation of Granite</li> <li>• Quarry rehabilitation.</li> </ul>

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## 2.2 ENVIRONMENTAL CONTROL OFFICER

The PR should assign the responsibility of overseeing the implementation of the whole EMP on the ground during the granite mining & quarry rehabilitation phases to a designated member of staff, referred to in this EMP as the Environmental Control Officer (ECO). The PR/ Mr Otniel Koujo may decide to assign this role to one person for all three activities, or may assign a different ECO for each activity. The ECO will have the following responsibilities during the mining, operation and rehabilitation phases of these developments:

- Management and facilitation of communication between the Proponent, PR, the contractors, and Interested and Affected Parties (I&APs) with regard to this EMP;
- Conducting regular inspections (recommended minimum frequency is once every six months) with respect to the implementation of this EMP (monitor and audit the implementation of the EMP);
- Assisting the Contractor in finding solutions with respect to matters pertaining to the implementation of this EMP;
- Advising the PR on the removal of person(s) and/or equipment not complying with the provisions of this EMP;
- Making recommendations to the PR with respect to the issuing of fines for contraventions of the EMP; and
- Undertaking an annual review of the EMP and recommending additions and/or changes to this document.

### **2.3 GRANITE MINING & QUARRY REHABILITATION CONTRACTOR**

A contractor, in this case being the proponent, conducts the granite mining & quarry rehabilitation activities on mining claim 71620 at Farm Kompaneno 104, Omaruru Constituency, Erongo Region. and is therefore automatically responsible for implementing all provisions contained within the relevant chapters of this EMP. The granite mining & quarry rehabilitation contractor will be responsible for the implementation of this EMP applicable to any work outsourced to subcontractors. **Table 3** applies to contractors appointed during the Granite mining phase and **Table 4** to those appointed during the continuous quarry rehabilitation phase. In order to ensure effective environmental management the aforementioned chapters should be included in the applicable contracts for outsourced work relating to the intended activities.

The tables in the following chapter (**Chapter 3**) detail the management measures associated with the roles and responsibilities that have been laid out in this chapter.

### 3 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 these activities. These management actions have been organised temporally according to project phase:

- Applicable legislation (**Table 2**);
- Granite mining Actions (**Table 3**);
- Quarry rehabilitation Management Actions (**Table 4**); and
- Decommissioning phase management actions (**Table 5**).

The responsible persons from the proponents' team have assessed these commitments in detail and have committed to the specific management actions where indicated in the tables below.

#### 3.1 ASSUMPTIONS AND LIMITATIONS

This EMP has been drafted based on the scoping-level Environmental Assessment (EA) conducted on Saturday 8 February 2020, for the operation and management of the intended granite mining & quarry rehabilitation activities as represented in **Figure 2**. HEEC will not be held responsible for the potential consequences that may result from any alterations to the agreed course of action in terms of the intended activities on the Farm Kompaneno 104 and the surrounding area.

It is assumed that labourers will be sourced mostly from the Omaruru Constituency area and that migrant labourers (if applicable) will be housed within established pre-fabricated accommodation facilities at the Farm Kompaneno 104.

### 3.2 APPLICABLE LEGISLATION

There are multiple legal instruments that regulate and have a bearing on good environmental management in Namibia. **Table 2** below provides a summary of the legal instruments considered to be relevant to the Granite mining & quarry rehabilitation activities and the environmental assessment process.

**Table 2: Legal provisions relevant to these activities**

LEGISLATION/POLICIES	RELEVANT PROVISIONS	RELEVANCE TO PROJECT
The Constitution of the Republic of Namibia as Amended	<p>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.”</p> <p>Article 95(l) deals with the “maintenance of ecosystems, essential ecological processes and biological diversity” and sustainable use of the country’s natural resources.</p>	Sustainable development should be at the forefront of management of the intended mining activities.
Environmental Management Act No. 7 of 2007 (EMA)	<p>Section 2 outlines the objective of the Act and the means to achieve that.</p> <p>Section 3 details the principles of Environmental Management</p>	The management of this project must be informed by the EMA.
EIA Regulations GN 28, 29, and 30 of EMA (2012)	<p>GN 29 Identifies and lists certain activities that cannot be undertaken without an environmental clearance certificate.</p> <p>GN 30 provides the regulations governing the environmental assessment (EA) process.</p>	<p><b>Activity 3.1 (Mining and Quarrying Activities)</b> 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.</p> <p><b>Activity 3.2 (Mining and Quarrying Activities)</b> Other forms of mining or extraction of any natural resources whether regulated by law or not.</p>

LEGISLATION/POLICIES	RELEVANT PROVISIONS	RELEVANCE TO PROJECT
		<b>Activity 3.3 (Mining and Quarrying Activities)</b> 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 granite mining & quarry rehabilitation activities 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 granite mining & quarry rehabilitation activities do not lead to the degradation of the natural beauty of the surrounding farmland 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 granite mining & quarry rehabilitation activities.
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 proponent and its contractor have to adhere to the guidelines provided to manage the aspects of HIV/AIDS. Experience with similar projects has shown that a significant health risk is created when migrant construction workers/labourers interact with local communities.
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 Town or Municipal Council. Sections 34-47 make provision for the aspects of water and sewerage.	Granite mining & quarry rehabilitation activities have to comply with provisions of the Local Authorities Act.
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 Granite mining & quarry rehabilitation activities, compliance with the law is essential.

LEGISLATION/POLICIES	RELEVANT PROVISIONS	RELEVANCE TO PROJECT
Public and Environmental Health Act of 2015	This Act (GG 5740) provides a framework for a structured uniform public and environmental health system in Namibia. It covers notification, prevention and control of diseases and sexually-transmitted infections; maternal, ante-natal and neo-natal care; water and food supplies; infant nutrition; waste management; health nuisances; public and environmental health planning and reporting. It repeals the Public Health Act 36 of 1919 (SA GG 979).	Granite mining & quarry rehabilitation activities 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.
Environmental Assessment Policy of Namibia (1995)	The Policy seeks to ensure that the environmental consequences of development projects and policies are considered, understood and incorporated into the planning process, and that the term ENVIRONMENT is broadly interpreted to include biophysical, social, economic, cultural, historical and political components.	This EIA considers this term of Environment.
Minerals (Prospecting and Mining) Act, 1992 (Act 33 1 of 1992)	To provide for the reconnaissance, prospecting and mining for, and disposal of, and the exercise of control over, minerals in Namibia; and to provide for matters incidental thereto. “mineral” means any substance, whether in solid, liquid or gaseous form, occurring naturally in, on or	The intended activity involves the mining of granite for commercial purposes.

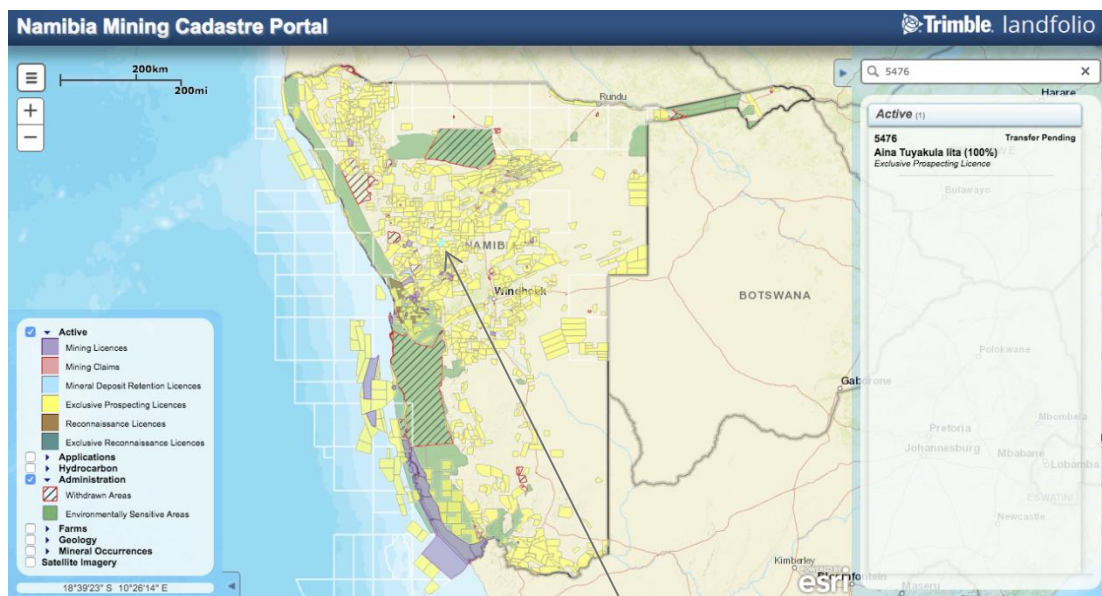
LEGISLATION/POLICIES	RELEVANT PROVISIONS	RELEVANCE TO PROJECT
	<p>under any land and having been formed by, or subjected to, a geological process, excluding -(c) subject to the provisions of subsection (2), soil, sand, clay, gravel or stone (other than rock material specified in Part 2 of Schedule 1) if they are bona fide required for purposes of –</p> <p>(i) agriculture, building works, fencing or road making;</p> <p>(ii) the manufacture of bricks and tiles;</p>	
<p>Soil Conservation Act 6 of 1969 Ministry of Agriculture, Water and Forestry</p>	<p>This Act covers the prevention and combating of soil erosion; the conservation, improvement and manner of use of the soil and vegetation; and the protection of water sources</p>	<p>Soils should not be polluted or left un-rehabilitated.</p>

**This EMP was formulated and compiled in accordance with the EIA Regulations.**

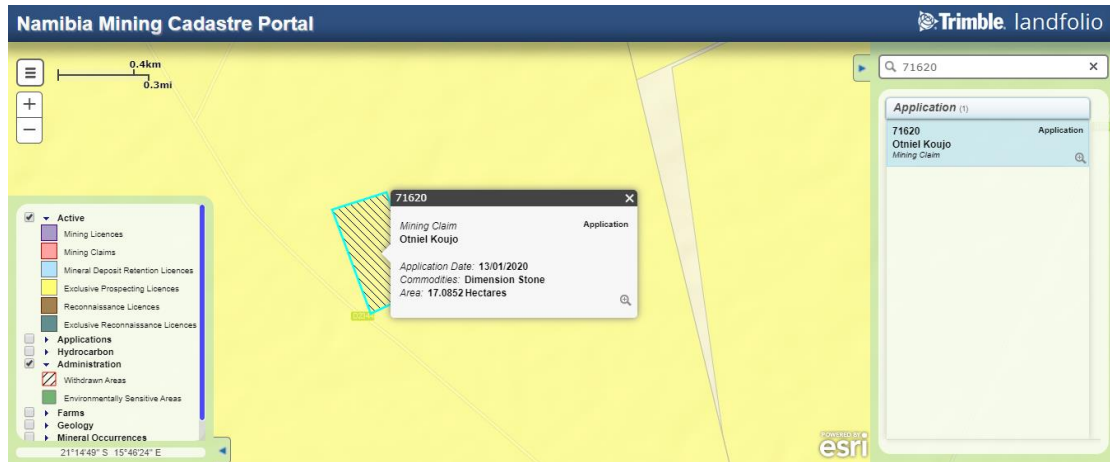


### 3.3 PROJECT LOCATION

The proponent intends to mine granite rocks as cubes on the mining site on mining claim 71620 at Farm Kompaneno 104, Omaruru Constituency, Erongo Region, located about 23 km off the C36 road onto the D2344 road from Omaruru to Omatjete. Refer to the locality map of Farm Kompaneno 104 in **Figure 1** and **Figure 2** for the locality of the mining site for the granite.



**Figure 1:** Locality map of Farm Kompaneno 104, (blue dot) Omaruru Constituency in the Erongo Region (MME Portal, 2020).



**Figure 2:** Locality map of showing the mining site on mining claim 71620 at Farm Kompaneno 104, Omaruru Constituency (MME Portal, 2020).

### 3.4 GRANITE MINING PHASE

The PR should ensure that the management actions detailed in **Table 3** below should be adhered to during the operation of the Granite mining activities and should be undertaken together with the mitigation measures in **Table 8** of the FESR.

**Table 3: Granite Mining Phase Management Actions**

Aspect	Management Actions	Responsibility	Monitoring Agent (s)
Environmental Incidents	<ul style="list-style-type: none"> <li>• The ECO on site shall maintain a register of all environmental incidents occurring as a result of the activities associated with the project. Environmental incidents that shall be recorded include (but are not limited to):               <ul style="list-style-type: none"> <li>➤ Fires;</li> <li>➤ Drowning;</li> <li>➤ Accidents (e.g. traffic);</li> <li>➤ Spills of hazardous materials, contaminating soil or water resources;</li> <li>➤ Non-compliances with applicable legislation; and</li> <li>➤ Non-compliances with this EMP.</li> </ul> </li> <li>• Environmental incident reports shall include (as a minimum) a description of the incident, the actions taken to contain any damage to the environment, personnel, or the public, and the actions taken to repair / remediate any such damage.</li> <li>• Additional measures shall be prescribed that may be required to remediate damage resulting from the incident and / or to prevent similar incidents occurring in the future.</li> </ul>	-ECO	-ECO -MET, -MAWF -MHSS

Aspect	Management Actions	Responsibility	Monitoring Agent (s)
Traffic	<ul style="list-style-type: none"> <li>• Ensure that road junctions have good sightlines.</li> <li>• Limit the type of vehicle (heavy trucks) allowed on site.</li> <li>• Adhere to the speed limit. If permissible, caution signs and 40 km/hr signs shall be placed at regulation distance from heavy vehicle crossing signs at the intersections of the access tracks and the D2344 road.</li> <li>• Designate no-drive zones.</li> <li>• Implement traffic control measures where necessary by keeping a number plate register of all vehicles transporting granite at the site and restricting access to authorised contractors.</li> </ul>	CONTRACTOR -ECO	-Roads Authority
Quarries/Granite mining site area at Farm Kompaneno 104 on mining claim 71620	<ul style="list-style-type: none"> <li>• Granite should be sourced from quarries with a valid ECC.</li> <li>• The granite mining sites must be clearly demarcated by means of a perimeter stock-proof fence with a lockable gated entrance.</li> <li>• Granite mining and resultant operations shall only take place within this demarcated area.</li> <li>• A detailed photographic record of the demarcated mining areas, prior to any mining activities, shall be taken. These records are to be kept by the Proponent and PR for reference purposes during the rehabilitation of the site.</li> <li>• There will be <b>'No unauthorised access'</b> signs at the mining site gates until to</li> </ul>	- CONTRACTOR -ECO	-MME -MET, -MAWF

Aspect	Management Actions	Responsibility	Monitoring Agent (s)
	restrict entry and/or harm to people not involved in the granite mining operations.		
EMP training	<p>All workers at the site are to undergo EMP training that should include as a minimum the following:</p> <ul style="list-style-type: none"> <li>• Explanation of the importance of complying with the EMP.</li> <li>• Discussion of the potential environmental impacts of the intended Granite mining and quarry rehabilitation activities.</li> <li>• Employees' roles and responsibilities, including emergency preparedness and response requirements.</li> <li>• Explanation of the mitigation measures that must be implemented when particular work groups carry out their respective activities.</li> <li>• The potential consequences of departure from specified operating procedures; and rewards for enhancing mitigation measures or avoiding negative environmental effects.</li> </ul>	<p>- CONTRACTOR -ECO</p>	<p>-MME -MET, -MAWF -MHSS</p>
Fauna and Flora	<ul style="list-style-type: none"> <li>• Prevent the destruction of protected tree species.</li> <li>• Encourage the regrowth and regeneration of trees with exposed roots at the site.</li> <li>• The excavation of the Granite should incorporate existing trees<sup>1</sup>.</li> <li>• The Contractor should compile a Tree Management Plan which should include the following as a minimum: <ul style="list-style-type: none"> <li>○ Trees if not already accounted for in an</li> </ul> </li> </ul>	<p>CONTRACTOR -ECO</p>	<p>-MME -MET, -MAWF</p>

<sup>1</sup>a "tree" is defined as an indigenous woody perennial plant with a trunk diameter  $\geq 150$  mm

Aspect	Management Actions	Responsibility	Monitoring Agent (s)
	<p>existing Geographic Information System (GIS), should be surveyed, co-ordinates/location incorporated into the Contractor's GIS, marked with paint (or other means so as to be readily visible) and protected;</p> <ul style="list-style-type: none"> <li>○ Trees, which are impossible to conserve, need to be identified and their location recorded on a map;</li> <li>○ The Contractor should apply to the relevant authority (Ministry of Agriculture, Water &amp; Forestry) for a permit to remove these trees.</li> <li>○ A list should be compiled of all trees to be removed detailing the location of the tree, the species as well as which trees will be planted to replace these. The nursery where these trees will be sourced from should also be included;</li> <li>○ Each tree that is removed needs to be replaced with an indigenous tree species;</li> <li>○ Some of these trees can be obtained at the nearest forestry office or at a commercial nursery such as the Forestry office in Karibib. Assistance can be sought from the nearest forestry office regarding nearby nurseries where additional trees may be bought and advice sought.</li> <li>● Only a limited width +/- 5 m on the side of the access roads may be partially cleared of vegetation.</li> <li>● Workers are prohibited from collecting wood or other plant products on or near the site.</li> </ul>		

Aspect	Management Actions	Responsibility	Monitoring Agent (s)
	<ul style="list-style-type: none"> <li>• No alien species may be planted on or within the existing site.</li> <li>• Prevent contractors from collecting wood and veld food such as amphibians, migrating birds, etc. during the Granite mining phase.</li> <li>• Prevent contractors from fishing in the nearby ephemeral rivers or catching aquatic species.</li> </ul>		
Lay-down areas and materials camp	<p>Suitable locations for the contractors lay-down areas and materials camp should be identified with the assistance of the PR and the following should be considered in selecting these sites:</p> <ul style="list-style-type: none"> <li>• The areas designated for the services infrastructure should be used as far as possible.</li> <li>• Second option should be degraded land.</li> <li>• Avoid sensitive areas (e.g. wetlands/rivers/drainage lines)</li> </ul>	CONTRACTOR  -ECO	-MME  -MET,
Hazardous waste	<ul style="list-style-type: none"> <li>• All heavy duty vehicles and equipment on site should be provided with a drip tray.</li> <li>• All heavy duty delivery vehicles should be maintained regularly to prevent oil leakages.</li> <li>• Maintenance and washing of vehicles should take place only at a designated workshop area.</li> <li>• Workshops may be prone to hydrocarbon spillages that change the soil chemistry and may affect groundwater quality (only in severe cases). If fuel is stored on site, there is a possibility of spontaneous combustion that may lead to uncontrollable fires, groundwater and soil contamination.</li> <li>• All hazardous substances (e.g. fuel etc.) or chemicals should be stored in a specific location on an impermeable surface that is bunded -</li> </ul>	CONTRACTOR  -ECO	-MME -MET, -MAWF -MHSS

Aspect	Management Actions	Responsibility	Monitoring Agent (s)
	<p>with a volume of 120 % of the largest single storage container or 25 % of the total storage containers, whichever is greater.</p>		
<p>Surface and Ground Water Impacts</p>	<p>No perennial water body is present in the close proximity to the mine</p> <ul style="list-style-type: none"> <li>• It is recommended that Granite mining takes place outside of the rainy season in order to limit erosion &amp; flooding on site and surface water pollution.</li> <li>• No dumping of waste products of any kind in or in close proximity to surface water bodies.</li> <li>• Heavy duty vehicles should be kept out of any surface water bodies and the movement of vehicles should be limited where possible to the existing access roads and tracks. The stationary plant must be fitted with drip trays to avoid groundwater contamination.</li> <li>• Contaminated runoff from the sites should be prevented from entering the surface water bodies.</li> <li>• Workers should be given ablution facilities at the sites that are located at least <b>30 m</b> away from any surface water and regularly serviced.</li> <li>• Washing of personnel or any equipment should not be allowed on site.</li> </ul>	<p>CONTRACTOR -ECO</p>	<p>-MME -MET, -MAWF -MHSS</p>
<p>Topsoil</p>	<ul style="list-style-type: none"> <li>• When excavations are carried out, topsoil<sup>2</sup> should be stockpiled in a demarcated area and used in profiling and rehabilitating of the depleted, open quarries at the mining</li> </ul>	<p>CONTRACTOR -ECO</p>	<p>-MME -MET, -MAWF</p>

<sup>2</sup> Topsoil is defined here as the top 150mm of surface material, which accounts for the seedbank.



Aspect	Management Actions	Responsibility	Monitoring Agent (s)
	<p>sites at the farm.</p> <ul style="list-style-type: none"> <li>Stockpiled topsoil should be used to rehabilitate post-harvesting degraded areas and/or other nearby degraded areas within the Omaruru Constituency in consultation with the Farm owner.</li> </ul>		
Soil Erosion	<ul style="list-style-type: none"> <li>Clear the vegetation of the project area in phases during the granite mining period in order to keep the soil more compacted as well as to limit overall disturbance to the area over time.</li> <li>It is recommended that most granite mining takes place outside of the rainy season in order to limit potential flooding and the run off of loose soil causing further erosion.</li> <li>Appropriate erosion control structures must be put in place where soil may be prone to erosion.</li> <li>Checks must be carried out at regular intervals to identify areas within the mining site where erosion is occurring. Appropriate remedial actions are to be undertaken wherever erosion is evident.</li> </ul>	CONTRACTOR -ECO	-MME -MET, -MAWF -MHSS
Rehabilitation	<ul style="list-style-type: none"> <li>Upon completion of the dimension stone mining phase consultations should be held with the local community/property owner(s) regarding the post-dimension stone mining use of remaining excavated areas (if applicable) and to identify priority areas.</li> <li>Sand/waste rock at the site should be levelled so it can be reclaimed for other</li> </ul>	CONTRACTOR -ECO	-MME -MET, -MAWF -MHSS

Aspect	Management Actions	Responsibility	Monitoring Agent (s)
	<p>purposes once the granite mining has ceased and rather than leaving the quarries open which will pose a threat to people and animals in the area.</p> <ul style="list-style-type: none"> <li>• In the event that no post-operation uses are requested, all excavated/degraded areas need to be rehabilitated as follows: <ul style="list-style-type: none"> <li>○ Excavated areas may only be backfilled with clean or inert fill. No material of hazardous nature (e.g. sand removed with an oil spill) may be dumped as backfill.</li> <li>○ Rehabilitated excavated areas need to match the contours of the existing landscape.</li> <li>○ The rehabilitated area should not be higher (or lower) than nearby drainage channels. This ensures the efficiency of re-vegetation and reduces the chances of potential erosion.</li> <li>○ Topsoil is to be spread across excavated areas evenly.</li> <li>○ Deep ripping of areas to be rehabilitated is required, not just simple scarification, so as to enable rip lines to hold water after heavy rainfall.</li> <li>○ Ripping should be done along slopes, not up and down a slope, which could lead to enhanced erosion.</li> </ul> </li> </ul>		
HIV/AIDS and TB awareness	<ul style="list-style-type: none"> <li>• The Contractor should approach the Ministry of Health and Social Services to co-opt a health officer to facilitate HIV/AIDS and TB education programmes periodically on site during the project</li> </ul>	CONTRACTOR	-ECO -MME -MET, -MAWF -MHSS

Aspect	Management Actions	Responsibility	Monitoring Agent (s)
	<p>operation.</p> <ul style="list-style-type: none"> <li>• A wellness program should be initiated to raise awareness on health issues, especially the impact of sexually transmitted diseases.</li> <li>• Provide free condoms in the workplace and to local community throughout project operation.</li> <li>• Facilitate access to Antiretroviral medication</li> <li>• Personnel should not overnight at the granite mining sites, but only the security personnel.</li> </ul>		
Road safety	<ul style="list-style-type: none"> <li>• Demarcate roads clearly.</li> <li>• Off-road driving should not be allowed.</li> <li>• All vehicles that transport materials to and from the site must be roadworthy.</li> <li>• Drivers that transport materials should have a valid driver's license and should adhere to all traffic rules.</li> <li>• Loads upon vehicles should be properly secured to avoid items falling off the vehicle.</li> <li>• Limit and control the number of access points to the mining site.</li> <li>• The road leading to the mining sites should be properly maintained so as to reduce dust emissions when heavy vehicles travel on them.</li> </ul>	CONTRACTOR -ECO	-RA -MME -MET, -MAWF -MHSS
Safety around work sites	<ul style="list-style-type: none"> <li>• <b>All rotary saws that are not being actively used for the Granite cutting must be tightly secured to rails to avoid injury to</b></li> </ul>	CONTRACTOR -ECO	-MME -MET, -MAWF -MHSS

Aspect	Management Actions	Responsibility	Monitoring Agent (s)
	<p><b>mine personnel if they accidentally fall due to wind or any other factors.</b></p> <ul style="list-style-type: none"> <li>• Excavations/quarries should be left open for the shortest time possible.</li> <li>• Excavate short lengths of trenches and box areas for services or foundations in a manner that will not leave the trench unattended for more than 24 hours.</li> <li>• Demarcate excavated areas and topsoil stockpiles with danger tape.</li> <li>• Provide additional warning signage in areas of movement and in “no personnel” areas where workers are not active.</li> <li>• Quarries are to be fenced-off with stock-proof perimeter fencing.</li> <li>• Work areas must be set out and isolated with danger tape on a daily basis.</li> <li>• All materials and equipment are to be stored only within set out and demarcated work areas.</li> <li>• Only granite mining personnel will be allowed within these work areas.</li> <li>• 2 fire extinguishers or more should be available at fuel storage areas.</li> <li>• Comply with all waste related management actions stated above in this table.</li> </ul>		
Ablutions	<ul style="list-style-type: none"> <li>• Separate toilets should be available for men and women and should clearly be indicated as such.</li> <li>• Portable toilets (i.e. easily transportable) should be available at the quarry site:</li> </ul>	CONTRACTOR	-ECO -MME -MET, -MAWF -MHSS

Aspect	Management Actions	Responsibility	Monitoring Agent (s)
	<ul style="list-style-type: none"> <li>○ 1 toilet for every 15 females.</li> <li>○ 1 toilet for every 30 males.</li> <li>○ Sewage needs to be removed on a regular basis to an approved (municipal) sewage disposal site in Omaruru. Alternatively, sewage may be pumped into sealable containers and stored until it can be removed, alternatively</li> <li>○ Septic tanks and soak pits will be provided for the disposal of domestic/ washrooms effluents.</li> <li>○ Workers responsible for cleaning the toilets should be provided with latex gloves and masks.</li> </ul>		
Open fires	No open fires may be made anywhere on the mining site.	CONTRACTOR	-ECO -MME -MET, -MAWF -MHSS
General health and safety	<ul style="list-style-type: none"> <li>● A fully stocked first aid kit (with unexpired medicines, include a snake bite kit) should permanently be available on-site as well as an adequately trained member of staff capable of administering first aid.</li> <li>● All workers should have access to the relevant personal protective equipment (overalls, hard toe boots, goggles, dust masks, sun hats heavy duty gloves etc.).</li> <li>● Sufficient potable water reserves should be available to workers at all times.</li> <li>● No person should be allowed to smoke close to fuel storage facilities or portable toilets (if toilets are chemical toilets – the chemicals are flammable).</li> <li>● No workers should be allowed to drink</li> </ul>	CONTRACTOR	-ECO -MME -MET, -MAWF -MHSS -SSC

Aspect	Management Actions	Responsibility	Monitoring Agent (s)
	<p>alcohol during work hours.</p> <ul style="list-style-type: none"> <li>No workers should be allowed on the mining sites/quarries if under the influence of alcohol.</li> </ul>		
Dust	<ul style="list-style-type: none"> <li>A watering truck should be used on gravel roads with the most heavy vehicle movement especially during dry and windy conditions. However, due consideration should be given to water restrictions during times of drought.</li> <li>The use of waterless dust suppression means (e.g. lignosulphonate products such as Dustex) should be considered.</li> <li>Cover any stockpiles with plastic to minimise windblown dust.</li> <li>Dust protection masks should be provided to workers if they complain about dust.</li> <li>During high wind conditions the contractor must make the decision to cease works until the wind has calmed down.</li> </ul>	CONTRACTOR	-ECO -MME -MET, -MAWF -MHSS
Noise	<p>Work hours should be restricted to between <b>08h00 and 17h00</b> where excavation involving the use of heavy equipment, power tools and the movement of heavy vehicles is less than 500 m from residential areas. If an exception to this provision is required, all residents and business owners within the <b>500 m</b> radius should be given 1 week's written notice.</p> <p>➤ If workers are to be exposed to noise levels above 85dB for continuous extended periods of more than two hours, they are to be provided with ear muffs and allowed to take 10-15 minute breaks away from the</p>	CONTRACTOR	-ECO -MME -MET, -MAWF -MHSS

Aspect	Management Actions	Responsibility	Monitoring Agent (s)
	<p>noise source.</p> <ul style="list-style-type: none"> <li>• Optimum placement of waste dumps, location of haul roads, location of fixed plant loading hoppers. Waste dumps, stockpiles can be used to shield fixed items of plant which generate noise.</li> </ul>		
Vibration Management	<p>Vibrations caused during drilling or blasting operations may be managed by:</p> <ul style="list-style-type: none"> <li>• Reducing the maximum instantaneous charge (MIC) by using delays, reduced hole diameter and/or deck loading</li> <li>• Drilling &amp; blasting will be carried out in small scale only to develop cracks in the parent rock mass.</li> <li>• Changing the burden and spacing by: altering the drilling pattern, and/or delay layout, or altering the hole inclination.</li> <li>• Exercising strict control over spacing and orienting all blast drill holes.</li> <li>• Establish times of blasting to suit local conditions.</li> </ul>	CONTRACTOR	-ECO -MME -MET, -MHSS
Recruitment of labourers	<p>The Contractor should compile a formal recruitment process including the following provisions as a minimum:</p> <ul style="list-style-type: none"> <li>• Adhere to the legal provisions in the Labour Act No. 11 of 2007 for the recruitment of labour (target percentages for gender balance, optimal use of local labour and SME's, etc.).</li> <li>• Recruitment should not take place at the granite mining site.</li> <li>• Ensure that all sub-contractors are aware of recommended recruitment procedures</li> </ul>	CONTRACTOR	-ECO -MME -MET, -MAWF -MHSS -SSC

Aspect	Management Actions	Responsibility	Monitoring Agent (s)
	<p>and discourage any recruitment of labour outside these agreed upon procedures.</p> <ul style="list-style-type: none"> <li>All contractors should give preference in terms of recruitment of sub-contractors and individual labourers to those who are qualified and from the project area and only then look to surrounding towns.</li> <li>Clearly explain to all job-seekers the terms and conditions of their respective employment contracts (e.g. period of employment etc.) – make use of interpreters where necessary.</li> </ul>		
Communication plan	<p>The Contractor or PR should draft a Communication Plan, which should outline as a minimum the following:</p> <ul style="list-style-type: none"> <li>How Interested and Affected Parties (I&amp;APs), who require on-going communication for the duration of the operation period, will be identified and recorded and who will manage and update these records;</li> <li>How these I&amp;APs will be consulted on an on-going basis;</li> <li>Make provision for grievance mechanisms – i.e. how concerns can be lodged/ recorded and how feedback will be delivered as well as further steps of arbitration in the event that feedback is deemed unsatisfactory.</li> </ul>	CONTRACTOR -ECO	-MME -MET, -MAWF -MHSS -SSC
General communication	<ul style="list-style-type: none"> <li>The PR must appoint an ECO to liaise between the Contractor, I&amp;APs and Mr Otniel Koujo's management.</li> </ul>	CONTRACTOR	-ECO -MME -MET, -MAWF -MHSS



Aspect	Management Actions	Responsibility	Monitoring Agent (s)
	<ul style="list-style-type: none"> <li>• The Contractor shall at every bi-monthly site meeting report on the status of the implementation of all provisions of the EMP.</li> <li>• The Contractor should implement the EMP awareness training as stipulated above in this table.</li> <li>• The Contractor must list the I&amp;APs of the project and their contact details with whom on-going communication would be required for the duration of the contract. This list, together with the Communication Plan must be agreed upon and given to the PR before operation commences/resumes.</li> <li>• The Communication Plan, once agreed upon by the Developer, shall be legally binding.</li> <li>• A copy of the EMP must be available at the site office and should be accessible to all I&amp;APs.</li> <li>• Key representatives from the above mentioned list need to be invited to attend monthly site meetings to raise any concerns and issues regarding progress to rehabilitate the excavated areas and surrounding quarries.</li> <li>• The Contractor should liaise with the proponent regarding all issues related to community consultation and negotiation before operation commences/resumes.</li> <li>• A procedure should be put in place to ensure that concerns raised have been followed-up and addressed.</li> </ul>		

Aspect	Management Actions	Responsibility	Monitoring Agent (s)
	<ul style="list-style-type: none"> <li>• All people on the I&amp;APs list should be informed about the availability of the complaints register and associated grievance mechanisms in writing by the PR prior to the commencement of site activities.</li> </ul>		
Archaeology	<ul style="list-style-type: none"> <li>• Should a heritage site or archaeological site be uncovered or discovered during the dimension stone mining phase of the project, a “chance find” procedure should be applied in the order they appear below:               <ul style="list-style-type: none"> <li>○ If operating machinery or equipment stop work;</li> <li>○ Demarcate the site with danger tape;</li> <li>○ Determine GPS position if possible;</li> <li>○ Report findings to the site foreman;</li> <li>○ Report findings, site location and actions taken to superintendent;</li> <li>○ Cease any works in immediate vicinity;</li> <li>○ Visit find site and determine whether work can proceed without damage to findings;</li> <li>○ Determine and demarcate exclusion boundary;</li> <li>○ Site location and details to be added to a Geographic Information System (GIS) for field confirmation by archaeologist;</li> <li>○ Inspect site and confirm addition to dimension stone mining site GIS;</li> <li>○ Advise the National Heritage Council (NHC) and request written permission to remove findings from work area; and</li> <li>○ Recovery, packaging and labelling of</li> </ul> </li> </ul>	CONTRACTOR	-ECO -NHC -MET, -MAWF -MHSS

Aspect	Management Actions	Responsibility	Monitoring Agent (s)
	<p>findings for transfer to National Museum.</p> <ul style="list-style-type: none"> <li>• Should human remains be found, the following actions will be required: <ul style="list-style-type: none"> <li>○ Apply the chance find procedure as described above;</li> <li>○ Schedule a field inspection with an archaeologist to confirm that remains are human;</li> <li>○ Advise and liaise with the NHC and Police; and</li> <li>○ Remains will be recovered and removed either to the National Museum or the National Forensic Laboratory.</li> </ul> </li> </ul>		

### 3.5 QUARRY REHABILITATION PHASE (Continuous)

The management actions included in **Table 4** below applies during the continuous quarry rehabilitation phase of the mining operations and should be undertaken together with the mitigation measures in **Table 3** above.

**Table 4: Quarry Rehabilitation Phase Management actions**

Environmental Feature	Management Actions	Responsibility	Monitoring Agent
EMP training	All contractors appointed for the transportation of the granite on mining site on mining claim 71620 at Farm Kompaneno 104 must ensure that all personnel are aware of necessary health, safety and environmental considerations applicable to their respective work.	CONTRACTOR	-ECO -MET, -MME, -SSC.
Monitoring	The ECO should monitor the implementation of the EMP:	CONTRACTOR	-ECO

Environmental Feature	Management Actions	Responsibility	Monitoring Agent
	<ul style="list-style-type: none"> <li>• The ECO should regularly inspect the conditions around the granite cutting mining site before work starts; and</li> <li>• The ECO should inspect the mining site at the end of each extraction period.</li> </ul>		
Water and waste management	<ul style="list-style-type: none"> <li>• Ensure that the infrastructure at the granite cutting/dressing site is connected to the mining site drainage and wastewater reticulation.</li> <li>• Regular preventative maintenance should be carried out on the infrastructure to ensure that risks of overflows/leakages are minimised.</li> <li>• A no-go buffer area of at least <b>30 m</b> should be allocated to any water bodies in the area.</li> <li>• No dumping of waste products of any kind in or in close proximity to any surface water bodies.</li> <li>• Sufficient weather and</li> </ul>	CONTRACTOR	-ECO -MET, -MAWF -MHSS

Environmental Feature	Management Actions	Responsibility	Monitoring Agent
	<p>scavenger-proof bins (with lids, to prevent the escape of litter) shall be provided, and be easily accessible at all points where wastes are generated.</p> <ul style="list-style-type: none"> <li>• The site shall be kept clean and free of litter and no litter from the site shall be allowed to disperse to surrounding areas.</li> <li>• All personnel shall be instructed to dispose of all waste in the proper manner.</li> <li>• The Contractor shall identify and separate materials that can be reused or recycled to minimise waste e.g. metals, packaging and plastics, and provide separate marked bins for these items.</li> <li>• All materials (e.g. explosive cartridges) must be suitably stored and protected, so that they do not become damaged and unusable.</li> <li>• The Contractor shall be responsible for the regular disposal (at suitable and</li> </ul>		

Environmental Feature	Management Actions	Responsibility	Monitoring Agent
	<p>licensed municipal waste disposal facilities) of all waste generated as a result of the granite cutting/mining.</p> <ul style="list-style-type: none"> <li>• Contaminated runoff from the various operational activities should be prevented from entering any surface 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>• Disposal of waste from the properties should be properly managed.</li> <li>• No waste may be burned on site.</li> <li>• General waste is to be collected either by the local Municipality or removed by the proponent.</li> <li>• The frequency of collections will be such that waste containment</li> </ul>		

Environmental Feature	Management Actions	Responsibility	Monitoring Agent
	receptacles do not unduly accumulate or overflow.		
Energy efficiency	<ul style="list-style-type: none"> <li>• The use of solar energy should be encouraged to provide for general lighting and heating of water and buildings.</li> <li>• The use of water saving initiatives should be incorporated within the workers' pre-fabricated housing design in order to reduce water demand.</li> </ul>	CONTRACTOR	-ECO -MET, -MAWF

### 3.6 DECOMMISSIONING PHASE

Mine closures can be planned for and should form part of an integrated land use strategy that involves the community and farm owner. The decommissioning of the granite mining at the site is envisaged in the future. Planned closure, in consultation with the community/farm owner, provides the opportunity to develop alternative land uses through rehabilitation, and to use the remaining infrastructure for other economic purposes such as livestock farming. When the event occurs some recommendations have been outlined in **Table 5**.

**Table 5** is a guideline to the decommissioning plan, whereby an active care mine closure is going to be implemented.

**Table 5: Decommissioning plan**

<b>Decommissioning Phase</b>			
<b>Possible Impact</b>	<b>Mitigation</b>	<b>Responsibility</b>	<b>Monitoring Agent</b>
<b>Physical/Biological</b> -Land degradation& loss of aesthetic value	-Establish a vegetation cover as soon as possible (stabilization) -Vegetate cleared area with indigenous trees -Fencing of the dangerous areas	CONTRACTOR	-ECO -MET, -MAWF
-Injury to people and livestock	-Complete filling up of the trenches -Barricade the old workings with concrete -Fencing of the dangerous areas	CONTRACTOR	-ECO -MET, -MAWF
-Contaminated surface and underground water. -Soil pollution. -Acid water drainage	-clean up spills (chemicals, diesel and oil) -Water quality analysis. -Monitor soil and water quality for a specified time after closure.	CONTRACTOR	-ECO -MET, -MAWF
Resurgence of hazardous chemicals	-Treatment of hazardous chemicals (if any) -Neutralization -Precipitation, oxidation, reduction and acid/alkali hydrolysis	CONTRACTOR	-ECO -MET, -MAWF -MHSS
Accumulated solid waste	-Disposal of solid waste through source sorting, recycling, aerobic decomposition (composition), incineration or depositing in land fill and covering of land fill	CONTRACTOR	-ECO -MET, -MAWF -MHSS
Loss of biodiversity	-Eliminate environmental damage through reclamation. -Site restoration through regeneration of woodland. -Restore chemical, biological and physical stability of site. -Allow productive land use.	CONTRACTOR	-ECO -MET, -MAWF



Compacted soil	-Rehabilitate areas affected by excessive soil compaction and oil spillage	CONTRACTOR	-ECO -MET, -MAWF -MME
<b>Social/Economic</b> -Laying off workers -Loss of income -Drop in the standard of living	-Catering of welfare of laid off workers -Pension schemes -Creation of income generating projects for laid off workers -Secure alternative employment for workers	CONTRACTOR	-ECO -SSC
-Infrastructure may become derelict -Derelict building may detract from the value of surrounding properties	-Return of community access to infrastructure -Educate locals on the utilization of the infrastructure -Considering promoting water reservoir for fishing	CONTRACTOR	Ministry of Works and Transport
-Possible outbreaks of diseases	Educate communities on dangers of STIs and waterborne diseases	CONTRACTOR	Ministry of Health & Social Services(MHSS)
Damaged roads	Repair damaged roads	CONTRACTOR	-Roads Authority

In addition to the plan above, decommissioning should also be carried out as per the following guidelines:

- The Proponent/Owners and Managers of the mines should be capable of implementing responsible environmental management practices. The preparation of environmental management plans will facilitate this process and is strongly encouraged.
- All mined sites should be rehabilitated either progressively or at the end of mining. Each mining site should be left in a safe well drained and maintenance-free state, blending in as much as possible with the surrounding landscape.
- Mine operators should ensure that funds are available for progressive and final site (closure) rehabilitation.
- Unless otherwise approved (by an Inspector of mines) at mining closure, all machinery structures and buildings should be removed from the site and concentrate slabs broken up and buried. The site should be ripped; top soiled (if available), fertilized and re-vegetated using indigenous plant species. Alternatively, if approved, certain structures can remain for the benefit of the next land user.
- Surface and ground waters should be effectively managed to prevent contamination of mining operations.

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- Effluent from mining and milling operations should be effectively contained and only released into river systems if the water quality satisfies the standards of the **Water Quality Guidelines (Annexure B)**.
  - Measures to be taken to control noise and dust from mining/milling/hauling operations to ensure a comfortable and health working environment as specified in the **Labour Act No. 11 of 2007**.
  - Measures should be taken to minimise excessive ground vibrations and air-blasts over pressure due to blasting. Peak particle velocities of 5 mm/sec and air-blasts over pressures of 120 dB (peak) should not be exceeded at the boundaries of the mining area.
  - Mine operators should ensure that refuse is deposited in proper containers and disposed of responsibly. Fuel and oil spills should be effectively contained.
  - Where practical, buildings, processing plant, stockpiles and waste dumps should be designed and located to reduce visual impact. Advantage should be taken of natural topography and existing vegetation and if this not a practical option, a screen of trees should be established.
  - Measures should be taken to prevent or minimise soil erosion.
  - As far as is practical, top soil should be stripped from all areas to be distributed by mining operations/milling and used immediately if possible or preserved for later rehabilitation.
  - Areas disturbed by mining should be re-vegetated as far as is practical using indigenous grass or tree species. However, on sites such as tailings/waste dumps, where it is important to establish a vegetative cover as soon as possible on difficult growing mediums, the use of fast growing exotic species is acceptable. Care should be taken to prevent the entry and spread of noxious plants.
  - Explosives, hydrocarbon fuels and other toxic materials should be transported stored and handled in a safe and acceptable manner. They should be stored in safe place, fenced to prevent entry of unauthorised persons. The owner /manager should ensure that toxic materials do not escape into the surrounding rivers/ground waters.
  - Mine operators should strive to conserve local flora and fauna species and avoid unnecessary destruction of both.
  - Unique archaeological, historical, geological and scenic features should be protected at all mining and exploration sites.
  - Residents in the vicinity of a mine should not be subjected to excessive airborne emissions (including dust, gases and smokes), liquid effluent, noise, ground vibrations and air blast from mining /haulage operations.

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- Mine tailings and slimes should be disposed of/stored in impoundments constructed in accordance with sound engineering principles. The dams should be sited to avoid the encountering of permeable sub-soil and/or fracture systems and an adequate drainage system should be incorporated in the design. They should be sited so that their catchments are minimal and should be designed to withstand significant rainfall events.
  - Unless otherwise approved, at the cessation of mining, or earlier if practical, waste rock dumps should be stabilized by reducing the slope angle and re-vegetated. Topsoil should be used if practicable.
  - All shafts not being used should be securely capped/otherwise made safe to prevent the entry of persons/livestock.
  - The final land use of open cast mine /quarry should be determined prior to the cessation of mining. For example, if the site is to be used for water storage, then at the end of the mine life, drainage could be directed into the pit. If the pit/quarry is to be used for any other purpose then drainage should not be diverted around the site.
  - The final land use will dictate the amount of reshaping required on the pit faces. Where practical the slope of the steep faces should be reduced and benches top soiled (if available) to facilitate re-vegetation and blending with the surrounding landscape.
  - If practical quarry faces should be oriented to minimise their visual impact from public areas.
  - Dangerous excavations should be made safe to prevent entry of persons/livestock.
  - In strip mining operations, overburden material, which is adverse to plant growth, should be buried and every effort should be made to recover and store top soil from mining path for later rehabilitation.
  - Heap leach operations should be designed to ensure that there is zero discharge of process fluid on surface waters or ground waters.
  - Unless otherwise approved, heap leach pads should be rehabilitated after leaching by detoxification, re-contouring, re-top soiling and re-vegetation so that they will be in stable maintenance free condition. Alternatively the heaps could be used to backfill nearby pits.
  - Mine rehabilitation should be carried out progressively to ensure that a minimum of ground is disturbed at any one time. A maximum of 2 hectares shall be un-rehabilitated at any one time unless otherwise approved.
  - The mining and rehabilitation method should ensure each layer disturbed should be replaced to its original sequence at topsoil as its final layer. All disturbed areas should be progressively rehabilitated.

- Tailings and Slimes from wasting plants should be expounded in properly constructed dams unless otherwise approved.
- All exploration drill holes should be capped, plugged/filled in, either progressively or at the end of the program.
- All drilling sites, trenches and pits should be rehabilitated (i.e. backfilled and re-vegetated) after the cessation of exploration.
- Each site should be left in a clean and tidy condition with all refuse removed.

Mine closures can be planned for and should form part of an integrated land use strategy that involves the community and surrounding farm owners. The decommissioning of the granite mining at the sites is envisaged in the future. Planned closure, in consultation with the farm owner, Usakos Municipality and the community, provides the opportunity to develop alternative land uses through rehabilitation, and to use the remaining infrastructure for other economic purposes such as livestock farming or charcoal production. When the event occurs some recommendations have been outlined in **Table 6**.

**Table 6: Decommissioning phase management actions**

Environmental Feature	Management Actions
Deconstruction activity	Many of the mitigation measures prescribed for the granite mining & quarry rehabilitation activities ( <b>Table 3-5</b> above) would be applicable to some of the decommissioning activities. These should be adhered to where applicable.
Rehabilitation	In the event that decommissioning is deemed necessary, excavations need to be rehabilitated according to the management actions laid out in <b>Table 3-5</b> above.