ENVIRONMENTAL MANAGEMENT PLAN (EMP) FOR A SATELLITE STATION IN OKAHANDJA AREA, OTJOZONDJUPA REGION.

Concordia Space Science and Technology

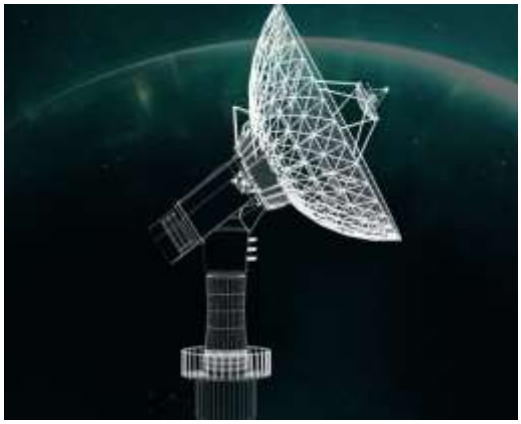

Figure 1: Photo for illustration purposes

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A. THE METHODOLOGY USED OR ADOPTED FOR THE IMPACT ASSESSMENT

The assessment process that was developed by Tamil Environmental Health and Safety Consultancy and was formulated based on the collection and interpretation of the available literature pertaining to the dimension stone quarry. The process included the review of previous EIA's and EMP's done in the surrounding areas and those about ground satellite in Namibia. Other relevant documents were identified and collected, including:

- Environmental regulations covering the environment, water, energy, health, and safety as well as all the related policies and guidelines;
- Topographic maps, information, and data sets about the location and characteristics of the area.
- Information and data sets about environmental regulation, biodiversity and the natural environment around the area obtained from the Directorate of Environmental Affairs in the Ministry of Environment, Forestry and Tourism portals;

Information and data sets about the regional and local geology, geological maps and all the related data sets, published materials and open file documents have all been located in the Directorate of the Geological Survey in the Ministry of Mines and Energy.

Table 1: Definition of criteria for assessing the significant impact

Criteria	Description
Nature	Reviews the type of effect that the proposed activity will have on the relevant component of the environment and includes "what will be affected and how?"
Extent	Indicates whether the impact will be site-specific; local (limited to within 15 Km of the area); regional (limited to ~100 Km of the area); national (limited to the coastline of Namibia); or international (extending beyond Namibia's borders).
Duration	Reviews the lifetime of the impact, as being short (days, <1 month), medium (months, <1 year), long (years, <10 years), or permanent (generations, or >10 years).
Intensity	Establishes whether the magnitude of the impact is destructive or innocuous and whether or not it exceeds set standards, and is described as none (no impact); low (where natural/ social environmental functions and processes are negligibly affected); medium (where the environment continues to function but in a noticeably modified manner); or high (where environmental functions and processes are altered such that they temporarily or permanently cease and/or exceed legal standards/requirements).

Probability	Considers the likelihood of the impact occurring and is described as improbable (low likelihood), probable (distinct possibility), highly probable (most likely) or definite (impact will occur regardless of prevention measures).
Degree of Confidence in Predictions	Is based on the availability of specialist knowledge and other information.

The application of the above criteria to determine the significance of potential impacts uses a balanced combination of nature, extent, duration, and intensity/magnitude, modified by probability, cumulative effects, and confidence. Significance is described as follows, as shown in Table 2:

Table 2: Definitions of various significant rating

SIGNIFICANCE RATING	CRITERIA
Low	Where the impact will have a negligible influence on the environment and no modifications or mitigations are necessary for the given development description. This would be allocated to impacts of any severity/ magnitude, if at a local scale/ extent and of temporary duration/time.
Medium	Where the impact could have an influence on the environment, which will require modification of the development design and/or alternative mitigation. This would be allocated to impacts of moderate severity/magnitude, locally to regionally, and in the short term.
High	Where the impact could have a significant influence on the environment and, in the event of a negative impact the activity(i.e.) causing it, should not be permitted (i.e. there could be a 'no-go' implication for the development, regardless of any possible mitigation). This would be allocated to impacts of high magnitude, locally for longer than a month, and/or of high magnitude regionally and beyond.

1. Identification of key issues

Potentially significant impact identified from the baseline conditions, legal requirement, and public participation process was screened to obtain issues that require further investigation or assessment and those that don't required further investigation. The method shown in the flow chart below was used for the screening of potential issues.

Table 3: Potential significant impact screening process

Issues/Impact	Proponent Responsibility	Sufficient Info Yes/No	Mitigation Available	Full assessment required	Issues covered in:
Employment creation	Yes	Yes	Yes	No	Addressed in the EMP
Support for local retail shops	No	Yes	Yes	No	Addressed in the EMP
Export taxes and VAT payment	Yes	Yes	Yes	No	Addressed in the EMP
Liquid waste: used oil and wastewater	Yes	Yes	Yes	No	Addressed in the EMP
Solid waste: wires, drill bits, and human waste	Yes	Yes	Yes	No	Addressed in the EMP
Land and soil disturbance: on-site and the proposed 8km stretch of road	Yes	Yes	Yes	No	Addressed in the EMP
Impact on Biodiversity: fauna and flora	Yes	Yes	Yes	No	Addressed in the EMP

2. Social-economic implications

2.1. Background to the problem

Unemployment is not only a responsibility of the Government, but it is also incumbent on citizens to create jobs for fellow Namibians. The proponent is aiming to recruit 15 to +30 Namibians and potentially more during the all phases, contingent upon the construction process.

3. The potential effect of the project

During the construction, 15 to +30 employees will be recruited by the proponent. Upon completion of the project, more local Namibians within the vicinity of the project will be employed. In order to ensure positive economic impacts, supporting local retailers will be recommended. Furthermore, export taxes and VAT payments will also have a positive effect on the National Economy.

4. Significance

By implementing the exploration study, the socioeconomic significance of the project can be summarized as follows:

Table 4: The expected significance of the project on social-economic implications

Criteria	Social economics implications
Extent	*local*
Duration	*short*
Intensity	*low*
Probability	*definite*
Significance before mitigation	*low*
Significance after mitigation	*low*
Degree of confidence in predictions	*high*

5. Mitigation and enhancement measures

The proponent will ensure that locals will be employed in all casual labour and the process of employment will be gender sensitive. While not every local is ensured to be employed, the proponent will conduct pre- consultation with the locals to ensure that the elements of equity and transparency are included or taken into account when hiring and recruiting.

6. Monitoring

It is recommended that the proponent should employ workers from the potentially affected communities, in particular, Okahandja Town. The proponent, in consultation with the Okahandja constituency Councillors, the town councillors will then be responsible for supervising the employment process when implementing this 'locals first' recommendation.

B. LIQUID WASTE: USED OIL OR OIL SPILLAGE AND WASTEWATER

1. Background to the problem

There are various waste disposal methods used worldwide in the construction industry. Management of used oil at a large scale is reported to be a challenge as more significant maintenance is required to minimize the losses of the oil into the environment (Richards, 2009). Once used oil it spills, it causes a detrimental effect on both living and nonliving things because its chemical constituents are poisonous—the oil coats and clings to every rock and grain of sand. Sometimes, if the oil washes into coastal marshes, mangrove forests or other wetlands, fibrous plants and grasses absorb the oil, which can damage the plants and make the whole area unsuitable as a wildlife habitat. Water is used mainly for cooling in large or small mining activities. The wastewater that is generated is, in most cases, recycled. But the management of this wastewater sometimes poses a challenge as it requires effective maintenance of

facilities holding the wastewater. Incidents of wastewater pollution have been reported worldwide, caused by a lack of a wastewater management program.

2. Potential effect of liquid waste

The spill of oil or used oil is associated with detrimental environmental effects. Potential spillages of machine fluid, lubrication, etc., from exploration machine can contaminate groundwater in a sense that machines could penetrate the groundwater table, and machine fluid could potentially enter the underground aquifer, therefore causing pollution. There will be no storage of oils and fuel on site; however, there is a risk of spillage of hydrocarbons from vehicles and machines, which may result in environmental contamination. The amount of used oil that will be generated on-site for this project during the exploration process will be minimal. However, regardless of the quantity, management measures will be implemented to prevent any oil spill incidents.

Wastewater that will be generated during the construction process will be minimal, less than 25 litres a day. Therefore, it is assumed that most of this water will evaporate faster than it will infiltrate. The likelihood of surface and groundwater contamination happening is unlikely if the mitigation measures proposed in the EMP are implemented.

3. Significance

The significance of the identified problem of the study can be summarized as follows:

Table 5: The expected significance of the project on liquid waste

Criteria	Liquid waste :
Extent	*local*
Duration	*short*
Intensity	*low*
Probability	*definite*
Significance before mitigation	*Medium for used oil and low for wastewater*
Significance after mitigation	*Low for both*
Degree of confidence in predictions	*high*

4. Mitigation measures

- Storage of oils and fuel on site shall not be allowed.
- Implement a maintenance programme to ensure all vehicles, machinery and equipment remain in proper working condition, and maintenance should be conducted in designated areas only, preferably off-site.
- Waste oils and fuels from drip trays on stationery vehicles and machinery should be disposed of as hazardous waste at a licensed facility by a specialist

hazardous waste handler.

5. Monitoring

- SHEW officer should conduct regular inspections of vehicles and machinery to ensure that there is no oil leakages
- Weekly Inspection by SHEW officer to ensure that operating machinery and vehicles are regularly maintained.

C. SOLID WASTE: WIRES, BITS, AND HUMAN WASTE

1. Background to the problem

Solid waste management is a national problem worldwide, and sometimes this problem extends beyond the construction industry scale. In the construction industries, various types of solid waste are generated, and some of these wastes contain toxic substances that can affect both living and non-living things. Therefore, proper handling and management of these wastes are critical for the protection of the environment.

2. Potential effects from solid wastes

Solid waste generated from this project, if not managed, will have a negative impact on the environment. The effect will mainly be at the project site. Human waste generated during the exploration process, if not managed, will have a small-scale effect on the environment.

3. Significance

The significance of the identified problem of the study can be summarized as follows:

Table 6: The expected significance of the project on solid waste

Criteria	Solid waste :
Extent	*local*
Duration	*short*
Intensity	*low*
Probability	*definite*
Significance before mitigation	*Medium*
Significance after mitigation	*Low f*
Degree of confidence in predictions	*high*

4. Mitigation measures

- Contaminated wastes in the form of soil, litter and other material must be disposed of at an appropriate disposal site.
- Strictly, no burning of waste on the site or at the disposal site is allowed as it poses environmental and public health impacts

- Waste disposal sites should be established on-site where paper, plastic and wire should be kept during the exploration and operation period.
- The collected solid waste should be disposed of at either the Okahandja Town Council solid waste disposal sites.
- For human waste, during the construction phase, the mobile toilet should be made available on-site for workers and once these facilities are full, the collected human waste should be disposed at the Okahandja Town Council human waste disposal site.
- After completion of exploration activities such as trenching, the removed soil layers and rocks must be replaced, and levelling must be done so that the original condition is restored.

5. Monitoring

- Daily site inspection by SHEW officer, including housekeeping.
- Weekly site inspection by SHEW officer to ensure regular collection of waste.

D. LAND OR SOIL DISTURBANCE

1. Background to the problem

The topography of the study area is flatland. During the construction process, land or soil will be disturbed both on-site and off-site. The soil will be removed from the surface rocks during excavation.

2. The potential effect of land or soil disturbance

The soil removed during excavation, if not properly managed, can affect vegetation growth and biodiversity development, including hiding or resting spots.

3. Significance

The significance of the identified problem of the study can be summarized as follows:

Table 7: The expected significance of the project on soil or land disturbance

Criteria	Soil or land disturbance:
Extent	*local*
Duration	*short*
Intensity	*low*

Criteria	Soil or land disturbance:
Probability	*definite*
Significance before mitigation	*Medium*
Significance after mitigation	*Low*
Degree of confidence in predictions	*high*

4. Mitigations and recommendations

The topsoil from 0 to 30cm is to be removed and stockpiled and used during the rehabilitation process. The stockpile will be seeded with seeds of grasses and shrubs to keep organic activity alive, as well as ensure a fertile seed bank in the topsoil when it is finally used. It is recommended that topsoil be removed down to the subsoil, where it is significantly thicker than 0.5m, as topsoil is always a scarce resource, and even if this lower material does not contain seed and is poorer in soil organisms, it has been found to be useful in reclamation. Where topsoil is less than 150mm thick, the unconsolidated material beneath should also be removed and treated as topsoil.

5. Monitoring

- Daily inspection by SHEW officer to ensure that topsoil is removed and stockpiled on site.
- Inspection by SHEW officer on a quarterly basis to monitor the moisture content & texture of soil

E. IMPACT ON BIODIVERSITY: FAUNA AND FLORA

1. Background to the problem

Biodiversity (i.e. fauna and flora) is likely to be affected by the project during the exploration process. However, due to the project's size and duration, the impact is manageable.

2. The potential effect of biodiversity impact

The vegetation types that are found in this area are classified in the non-value category. In addition to vegetation, various invertebrates may also inhabit the area. Regardless of the low value of the existing vegetation on-site and along the road, activities that will be undertaken during the exploration process is likely to have an effect on the vegetation and the invertebrates. Therefore, management measures will be considered to minimize the above impacts.

3. Significance

The significance of the identified problem of the study can be summarized as follows:

Table 8: The expected significance of the project on Biodiversity: fauna and flora

Criteria	Soil or land disturbance:
Extent	*local*
Duration	*short*

Criteria	Soil or land disturbance:
Intensity	*low*
Probability	*definite*

Significance before mitigation	*Medium*
Significance after mitigation	*Low*
Degree of confidence in predictions	*high*

4. Mitigations and recommendations

- Plant species should not be removed but preserved, and the activities should fit into the environment without affecting the protected trees.
- Massive clearing shall not be allowed
- Barriers/barricades confining driving trucks must be erected to avoid stray driving and trampling on the habitat
- Rules pertaining to safeguarding against poaching and the collection of plant and plant products must be established and enforced.
- Monitor the condition of the track before, during, and after use.
- Do not needlessly remove vegetation from site.

5. Monitoring

Regular inspections and monitoring are encouraged and should be conducted by SHEW officer throughout the Period of trenching and excavation.

F. AIR QUALITY ONSITE

1. Background to the problem

During the construction process, minimal dust will be generated onsite by earth-moving equipment and also on the road by trucks and vehicles.

2. The potential effect of impact on air quality

Epidemiological studies indicate that workers exposed to dust stand an increased risk of suffering from asthma symptoms, chronic bronchitis, nasal inflammation and impairment of lung function (Camici et al., 1978; Angotzi et al., 2005; Leikin et al., 2009). It is globally known that the generated dust during construction may affect human, plant and animal growth in the surrounding environment (Kirjoitettu, 2014). Exposure between 10 and 15 years is associated with the long-term complication, while the short-term complication can cause difficulty in breathing" (Kirjoitettu, 2014). The reaction depends on the particle inhaled, as the lung is too exposed to expel particles beyond 10 micrometres (Haruna, 2014). With the inherent natural mechanism of its defence, the lung is supposed to be able to expel such a number of particles but sizes below one to 10 millimetres (mm) can go down to the terminal end of the lung and the macrophages may not be able to expel that (Haruna, 2014). To avoid respiratory or other problems caused by exposure to dust, engineering control methods such as those highlighted in the mitigation measures below and the use of tools that minimise the generation of dust should be introduced.

3. Significance

The significance of the identified problem of the study can be summarized as follows:

Table 9: Expected significance of the project on the dust generated on site

Criteria	Soil or land disturbance:
Extent	*local*
Duration	*long to permanent*
Intensity	*medium*
Probability	*definite*
Significance before mitigation	*high*
Significance after mitigation	*medium*
Degree of confidence in predictions	*high*

4. Mitigations and recommendations

- Measures such as the use of wet processes enclosure of dust-producing processes under negative air pressure (slight vacuum compared to the air pressure outside the enclosure),
- Exhausting air containing dust through a collection system before emission to the atmosphere, and exhaust ventilation should be used in the workplace.
- Use of personal protective equipment for proper dust control for respiratory protection and should be used only where dust control methods are not yet effective or are inadequate.
- Direct skin contact should be prevented by gloves, and respiratory protection during cleanup.
- Educational awareness programs for workers should be instituted about the hazards of exposure to dust, particularly related to dimension stones, and on the use and maintenance of exhaust ventilation systems, and the use and maintenance of personal protective equipment to avoid the risk of dust and noise.
- All roads in the areas should have a speed limit of 60km/h for light vehicles and 30km/h for heavy vehicles in order to minimize the amount of dust generated by vehicles.
- In addition, where available water allows, roads should be sprayed with water on a regular basis in order to prevent dust creation.

5. Monitoring

- Daily inspection by the SHEW officer of the roads and site for possible dust creation that requires attention.
- Daily inspection on site by the SHEW officer to ensure that all workers are wearing their protective clothes at all times during the construction process, and dry skin contact with gloves is prevented.

G. NOISE ON SITE

1. Background to the problem

Noise pollution on site is most likely to be generated by machines, earthmoving equipment, breaking, crushing, and transport of equipment during the activities.

Excessive noise can be a nuisance to people, also potentially causing hearing problems to workers on the site.

2. Potential effects of noise

Noise generated might affect employees working at the site, hence posing a risk of ear damage. The normal levels of 55 decibels recommended by the World Health Organisation (WHO) might be surpassed during the construction phase. Noise generated might affect animals and result in some animals changing their habitat. Prolonged noise might cause annoyance to passers-by.

3. .Significance

The significance of the identified problem of the study can summarize as follows:

Table 11: Significance of the project's impact on noise

Criteria	Soil or land disturbance:
Extent	*local*
Duration	*Short*
Intensity	*medium*
Probability	*definite*

Criteria	Soil or land disturbance:
Significance before mitigation	*Medium*
Significance after mitigation	*low*
Degree of confidence in predictions	*high*

4. Mitigations and recommendations

- Noise from operations vehicles and equipment on site should be reduced to acceptable levels.
- The operational times should be set such that, no activity is carried out during the night or very early in the mornings.
- Construction hours should be restricted to between 08h00 and 17h00 to avoid noise generated by exploration equipment and the movement of vehicles before or after hours.
- When operating the drilling machinery onsite, workers should be equipped with personal protective equipment (PPE) such as earplugs to reduce noise exposure.
- Installation of proper sound barriers and (or) noise containments, with enclosures and curtains at or near the source equipment.
- Use of rubber-lined or soundproof surfaces on processing equipment (e.g. screens, chutes, transfer points, and buckets);
- Use of rubber-belt transport and conveyors;

- Installation of natural barriers at facility boundaries (e.g. Vegetation curtains or soil berms).
- Optimization of internal-traffic routing, particularly to minimize vehicle-reversing needs (reducing noise from reversing alarms) and to maximize distances to the closest sensitive receptors.

5. Monitoring

SHEW officer should constantly conduct daily noise monitoring and ensure that employees are complying with measures recommended for the reduction of noise impacts.

H. DECOMMISSIONING PHASE

1. Background

Impacts pertaining to the closure of the operation program have been identified. The impacts are; loss of employment by workers at the exploration site and contribution to the national economy (revenue and royalties' payments). Another concern that stems from construction program closure is the rehabilitation of the sites.

2. Impact on Employment Opportunities and Economic Contribution

Should the Construction program come to an end, construction workers will lose their jobs and source of income. This will also mean that there will be no more revenue and royalties paid to the government. This impact can be rated as of medium significance, and given that the program has a defined timeframe, only so much can be done by the Proponent to assist the workers in this regard. Regarding the national revenue and royalties' payment, unfortunately, there will be nothing that the Proponent would do to mitigate this. The impact significance of unemployment can be reduced from medium to low, by implementing mitigation measures.

3. Mitigations and recommendations to minimize joblessness

The Proponent should inform the employees in a timely manner of its intentions to cease the works and the expected date of such closure. This will provide the employees with enough time to search for work elsewhere.
The Proponent should raise awareness of the possibilities for work in industrial sectors.

4. Impact on site

In the context of the proposed project, rehabilitation refers to the process of returning disturbed land and soil to some degree of its pristine state. The scope of the proponent site rehabilitation emphasizes the backfilling of open excavation and covering with topsoil in areas that will be disturbed by construction activities. These will be but not limited to the access road, vehicle tracks around the site, removal, and restoration of areas covered by stockpile and rock piles. Furthermore, this section outlines rehabilitation objectives and proposes rehabilitation commitments which the proponent shall adhere to.

5. Mitigations and recommendations

- A site inspection will be held after completion of the construction process to determine the nature and scope of the rehabilitation work to be undertaken. The rehabilitation will be done to the satisfaction of both the proponent and MEFT.

- The rehabilitation work should commence soon after the end of the active construction period.
- The access road and all vehicle tracks should be rehabilitated by raking or dragging with tyres or tree branches (other suitable methods) behind a vehicle.
- With regard to both biological productivity and erosion, topsoil is arguably the most important resource in the project area, for that reason, the recovered to topsoil and subsoil should be utilized to reconstruct the original soil profile.
- All waste shall be removed, and potential hazards particularly pits closed and left in a safe disposition.

I. CONCLUDING REMARK ON THIS SECTION

In the above section, the identified impact was screened and assessed. The mitigation measures of the identified impact were addressed in the Environmental Management Plan (EMP) report. The EIA Consultant reserve the right to enforce any portion of this report with consultation of MEFT.