



Environmental Scoping Assessment (ESA) for the Construction and Operation of a 30m Tall Lattice Telecommunication Tower at Grootfontein Extension 9 in Grootfontein, Otjozondjupa Region

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EXECUTIVE SUMMARY

Introduction

PowerCom (Pty) Ltd (hereinafter referred to The Proponent) proposes to erect and operate a 20 m tall lattice network tower in Extension 9, Grootfontein, in the Otjozondjupa Region. The tower would be located within the Extension 9 Township of Grootfontein, near Puma Service Station. The proposed tower will be a three-legged lattice network tower, with an outdoor cabinet next to it. The total surface area of the site dedicated to tower footprint is approximately 80m² (8m x 10m).

The rapid expansion of urban development and land use in Grootfontein has led to a heavy reliance on telecommunications amongst locals, from the use of telephones, mobile phones and other electronic devices for information sharing and connections. This has brought about demand for increase in telecommunications infrastructure and services. In order to ensure that mobile connection services run smoothly and conveniently, the services infrastructure need to be of good standard in order to provide better and quality coverage to the mobile users.

The Proponent has recognised a shortfall in mobile network access (poor network signal) in this part of Grootfontein. This planned activity will provide additional capacity, reducing the congestion problems and improve the network coverage in the Extension 9 area. This will also ensure improved quality of the service provided to the mobile users in the area.

Project Description

The current network shortfalls experienced and anticipated network shortfalls to mobile users in the area led to this project site selection. Project activity include establishment (construction), and eventual operations and maintenance of the network tower.

Construction Phase:

There will be minimal earthworks to prepare the site for tower construction. The construction works are expected to last for at least one month. The tower structure will be mounted to a concrete foundation and will not require any supporting cables. The physical assembling of the network structure and the construction of the foundations will take place on the site. The network structure will be earthed to protect it from lightning. For safety reasons, the tower site will be fenced off with palisade fencing to ensure that access is limited to authorised personnel and to prevent vandalism.

A local contractor will be hired to carry out the construction. Works will be carried out during weekdays only, and between 08h00 and 17h00. The appointed contractor will be required to provide appropriate Personal Protective Equipment (PPE) to all their employees while carrying out the construction works on site.

Operational and Maintenance Phase:

This is the phase during which the tower and its associated infrastructure are operational, providing network signal to the residents of the Grootfontein Extension 9 area. Maintenance of the tower will be done by the Proponent's Maintenance Department, when required. The Proponent should ensure that all employees carrying out maintenance works on site are provided with appropriate PPE.

Services and Infrastructure

Power supply: No electricity is required during the construction of the tower. However, it will be required during the operational and maintenance phase of the tower. The operation of the tower will require an alternative current (AC) power, that will be connected to the Grootfontein municipal grid via a metered connection.

Water supply: Minimal amount of water will be required during construction. The water is necessary for in-situ foundation works and for drinking. The water required for construction and related activity will be sourced from the Grootfontein municipality water supply schemes.

The appointed local construction contractor will be responsible for the sourcing of water.

Site Access: The site is located on the north-eastern section of the Extension 9 Township, within a residential area in the vicinity of the Puma Service Station. There are access routes leading directly to the site within the residential area, where the site is located

Waste Management: The waste generated on site during construction and maintenance phases will be stored and transported to the appropriate (waste type) landfill sites in Grootfontein. The Proponent will enforce the availability of portable toilets for the construction team (contractors) while on site.

Decommissioning Phase

Decommissioning of the network tower is not anticipated, as long as there is need for use of mobile communications and associated services in the town.

Impacts Identification

The potential impacts of the proposed project have been identified as they relate to the project activities in terms of a source-pathway-receptor risk based methodology and in consultation with interested and affected parties. By considering the potential risk areas associated with the receiving biophysical and social environment, the following key impacts have been highlighted for consideration:

POSITIVE IMPACTS

- **Telecommunications convenience:** Current and future local residents (mobile users) will have an improved infrastructure and would not experience network coverage inconveniences.
- **Employment creation:** Creation of temporary jobs during the construction of the tower.
- **General contribution to local economic development** through reliable communications services.

NEGATIVE IMPACTS

- **Physical Land/Soil Disturbance:** During the tower construction, the presence of the construction team may disturb the immediate neighbours to the site.
- **Noise:** *During tower construction, the presence of the construction team and movement of heavy vehicles and machinery may disturb the immediate neighbours to the site.*
- **Potential occupational health and safety risks** *associated with mishandling of tower construction and operations equipment.*
- **Waste Generation** *from improper disposal of waste generated during construction and maintenance.*
- **Dust Generation** *from construction works and vehicular traffic*
- **Loss of Avifaunal Biodiversity**
- **Impacts to Human Health:** Electromagnetic Radiation emitted from the tower of cellular structures may affect human health.
- **Civil Aviation concerns:** The proposed site designs and location need to be verified to ensure that it meets the approval of the Directorate of Civil Aviation regarding the height of the masts and the position and stability of transmitters.

- **Visual impact:** The presence of the tower in the neighbourhood may be a nuisance to locals.
- **Vehicular traffic safety** from increased number of vehicles moving around the project site and slow-moving trucks transporting project structures during construction, and
- **Archaeological or cultural heritage impact** through unintentional uncovering of unknown archaeological objects or sites by certain project activities such as excavation (the minimal site works)

Conclusions

The potential positive and negative impacts stemming from the proposed network tower establishment and associated activities were identified, assessed and mitigation measures made thereof. The mitigation measures and recommendations provided in this ESA report and management action plans provided in the draft EMP can be deemed sufficient to avoid and/or reduce (where impact avoidance impossible) the risks to acceptable levels.

The Consultant is, therefore, confident that these measures are sufficient and issuance of an Environmental Clearance Certificate to enable the construction and operation of a 30 m lattice telecommunication tower at Grootfontein Extension 9, would be appropriate under the suggested mitigation and monitoring measures. However, the ECC should be issued on condition that the provided management measures and action plans are effectively implemented and monitored on site. Monitoring of the environmental components described in the impact assessment is to be conducted by the Proponent and/or applicable Competent Authority. This is to ensure that all potential impacts identified in this study and other impacts that might arise during the proposed program implementation are properly identified and addressed. Lastly, should the ECC be issued, the Proponent will be expected to be compliant with the ECC conditions as well as legal requirements governing the construction and operation of telecommunication towers.

Limitations

EDS warrants that the findings and conclusions contained herein were accomplished in accordance with the methodologies set forth in the Scope of Work and EMA, 2007. These methodologies are described as representing good customary practice for conducting an Environmental Impact Assessment of a property for the purpose of identifying recognized environmental conditions. There is a possibility that even with the proper application of these methodologies there may still exist, on the subject property, conditions that could not be identified within the scope of the assessment or which were not reasonably identifiable from the available information. EDS believes that the information obtained from the record review and during the public consultation process concerning the subject property is reliable.

Disclaimer

However, EDS cannot and does not warrant or guarantee that the information provided by these other sources is accurate or complete. The conclusions and findings set forth in this report are strictly limited in time and scope to the date of the evaluations. No other warranties are implied or expressed.

Some of the information provided in this report is based upon personal interviews, and research of available documents, records, and maps held by the appropriate government and private agencies. This report is subject to the limitations of historical documentation, availability, and accuracy of pertinent records and the personal recollections of those persons contacted.

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Appendix I: Municipal Lease Agreement

Appendix J: Non-ionising Radiation Regulations, 2019: Atomic Energy and Radiation Protection Act, 2005

LIST OF ABBREVIATIONS

Abbreviation	Meaning
BID	Background Information Document
CRAN	Communications Regulatory Authority of Namibia
CV	Curriculum Vitae
DEA	Department of Environmental Affairs
EA	Environmental Assessment
EAP	Environmental Assessment Practitioner
ECC	Environmental Clearance Certificate
EDS	Excel Dynamic Solutions
EMA	Environmental Management Act
EMF	Electromagnetic field
EMP	Environmental Management Plan
EMR	Electromagnetic radiation
GG	Government Gazette
GN	Government Notice
I&APs	Interested and Affected Parties
ICAO	International Civil Aviation Organisation
ICNIRP	International Commission on Non-Ionizing Radiation Protection
MEFT	Ministry of Environment, Forestry and Tourism
NCAA	Namibian Civil Aviation Authority
NRPA	The National Radiation Protection Authority (of Namibia)
Reg	Regulation
S	Section
TOR	Terms of Reference

1 INTRODUCTION

1.1 Project Background

Namibia is experiencing a rapid increase in the use of mobile communication services, which has led to a rise in local pressure for efforts to expand on telecommunications infrastructure, in order to promote and facilitate local access to mobile communication services. PowerCom (Pty) Ltd (hereinafter referred to as The Proponent) has identified the need for a 30m high lattice telecommunication tower in Grootfontein Extension 9, Grootfontein, which will reduce current congestion issues and improve coverage in the Grootfontein extension 9 area. This proposed development will ensure that the quality of service provided to telecommunication service users in the area is enhanced.

The Proponent proposes to erect and operate a 30m high 3-legged free-standing lattice telecommunication (network) tower with an outdoor cabinet next to it in the Grootfontein Extension 9 area in Grootfontein, Otjozondjupa Region. The proposed tower is a three-legged lattice network tower, with main antennae frequencies at 900, 1800 and 2100 MHz. The antennae are designed to operate in a 900MHz (for 2G/3G), 1800MHz (for 2G/4G) and a 2100MHz (for 3G) frequencies. The total surface area of the site dedicated to tower footprint is approximately 80m² (8m x 10m). The remainder of the site area is for storing the operational and maintenance equipment. The location of the proposed network tower construction project is shown in **Figure 1**.

Section 27 of the Environmental Management Act (EMA), (No.7 of 2007), provides a list of activities that may not be carried out without an Environmental Impact Assessment (EIA) undertaken and an Environmental Clearance Certificate (ECC) obtained. Telecommunications (network) tower establishment is one of the listed activities that requires an EIA study under the following Section of the EIA Regulations:

- *10.1 (g) The construction of masts of any material or type and of any height, including those used for telecommunication, broadcasting, and radio transmission*

Individuals or organizations may, therefore, not carry out any construction activity such as that listed above, without an ECC. The Proponent has appointed thereupon, Excel Dynamic Solutions (Pty) Ltd (EDS, Consultant or Environmental Assessment Practitioner (EAP) hereinafter), to conduct the required Environmental Scoping Assessment (ESA) process and submit the ECC application to the Department of Environmental Affairs and Forestry (DEAF), on their (Proponent's) behalf.

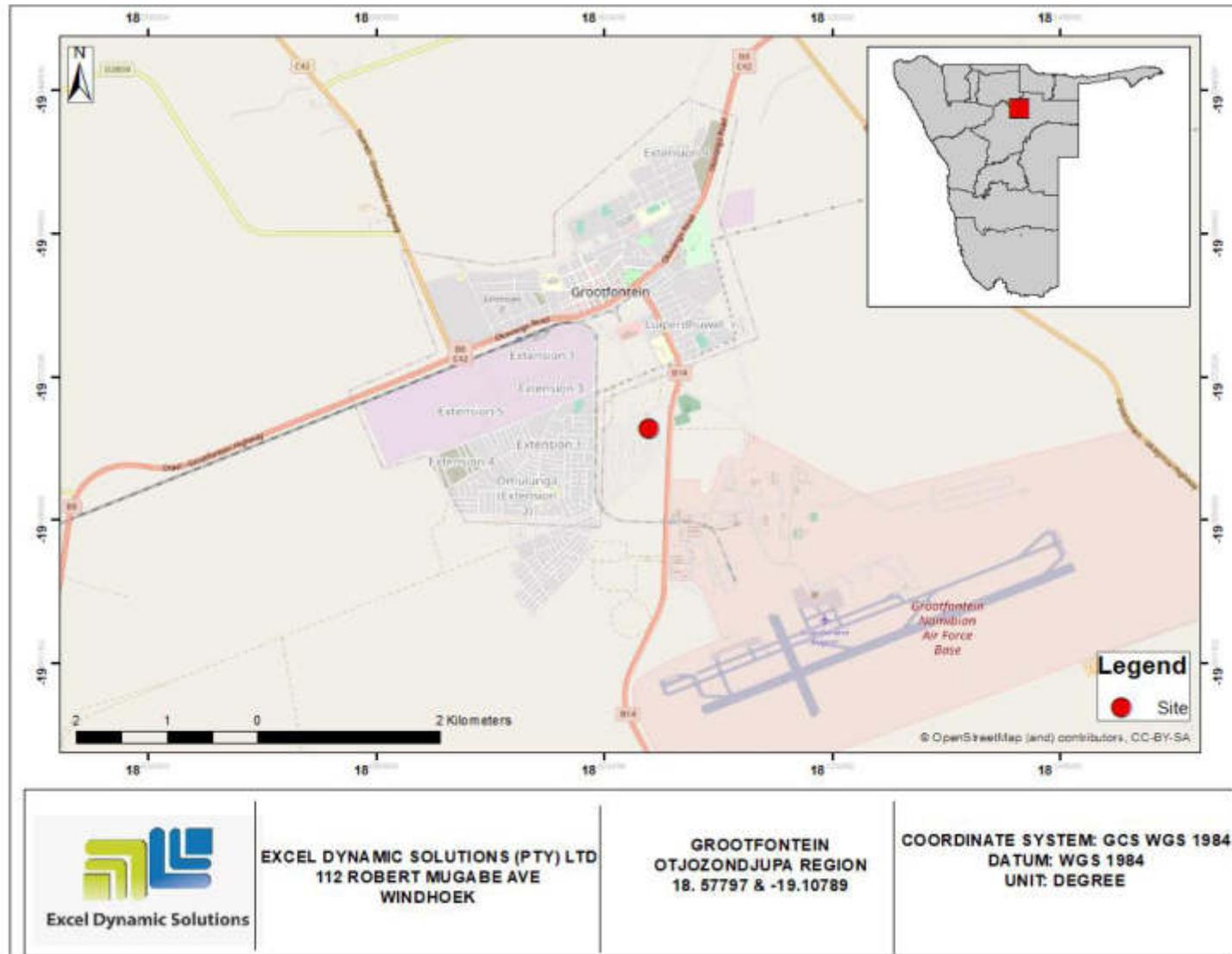


Figure 1: Location of the proposed network tower site in Grootfontein, Otjozondjupa Region

1.2 Terms of Reference and Scope of Works

This ESA has been conducted according to the Environmental Management Act (EMA) (No. 7 of 2007), and its 2012 Environmental Impact Assessment (EIA) Regulations. In line with the Terms of Reference provided for this project, the scope of works for this project (EA) entails the following:

- Confirm the suitability of the proposed site for the tower construction and suggest alternative site, if required;
- Conduct the required Environmental Scoping Assessment (ESA);
- Consult all potential interested and affected parties (I&APs);
- Compile an ESA report and draft Environmental Management Plan (EMP); and
- Obtain an Environmental Clearance Certificate for the proposed tower.

The main aim of the ESA is to:

- Identify, analyze and assess the bio-physical, socio-economic impacts associated with the proposed activity; and
- compile management action plans (in the form of the draft EMP that will need be implemented by the Proponent and/or their contractor(s) to minimize these impacts, if they cannot be avoided altogether, while maximizing positive impacts.

1.3 Appointed Environmental Assessment Practitioner

In order to satisfy the requirements of the EMA and its 2012 EIA Regulations, the Proponent appointed Excel Dynamic Solutions Pty Ltd (“EDS”/Consultant/Environmental Assessment Practitioner hereafter), an independent consulting company to conduct the required EIA process on their (Proponent's) behalf. The findings of the EA process are incorporated into this report, together with the draft Environmental Management Plan (EMP) - (**Appendix B**), and will be submitted as part of an application for an ECC to the Environmental Commissioner at the Department of Environmental Affairs (DEA), Ministry of Environment, Forestry and Tourism (MET).

The EA project is headed by Mr. Nerson Tjelos, a qualified and experienced Geoscientist and experienced EAP. The consultation process and reporting are conducted by Ms. Rose Mtuleni, with support from Ms. Althea Brandt. The CV's for Mr. Tjelos is presented in **Appendix C**.

1.4 Details of the Project Proponent

The details of the Proponent are presented in **Table 1** below.

Table 1: Proponent contact details and purpose of the required ECC

Full name of Proponent	Physical Address & Contact number	Postal Address	ECC Application for:
PowerCom (Pty Ltd)	140 NPTH Building No. 4 Julius K. Nyerere Street Erf 8161 Southern Industrial Area Tel: +264 (0) 61 201 2090	P.O Box 40799 Windhoek Namibia	Construction and Operation of a 30m tall lattice network tower in Extension 9, Grootfontein, Otjozondjupa Region

1.5 The Need for the Proposed Project

Due to the rapidly occurring urban development and related expansion of land use in the town of Grootfontein, the demand for access to adequate infrastructure and services increases. Telecommunication services are essential for general communication and access to information. The increase in the use of mobile communication services in Namibia has resulted in pressure exerted on local telecommunication services providers to expand the communications network. The Proponent has foreseen a shortfall in adequate access to mobile networks in the Extension 9 area of Grootfontein (poor network signal), and has intentions to make provision for telecommunication infrastructure for current and future residents of this part of Grootfontein. This planned activity will provide additional capacity, reducing the congestion problems and improve the network coverage in this particular area. This will also ensure improved quality of the service provided to mobile users.

2 PROJECT DESCRIPTION: PROPOSED NETWORK TOWER

The description of project activity to be undertaken for the establishment (construction) and eventual operations and maintenance of the network tower are presented as follows:

2.1 Proposed Network Tower Location

The Communications Act (No. 8 of 2009), requires that service providers consider sharing existing infrastructure in the area first, before constructing new structures.

There are criteria that are usually employed to optimize the positions of new structures in the telecommunication industry. These include; coverage of existing network infrastructure, surrounding topography & built-up environment, established and future urban area, required footprint and the most appropriate design of the facility (GCS Water & Environmental Consultants, 2017). The site is located in Grootfontein Extension 9, on the north-eastern section of the Extension 9 Township near Extension 9 Puma Service Station 9 (**Figure 2**).

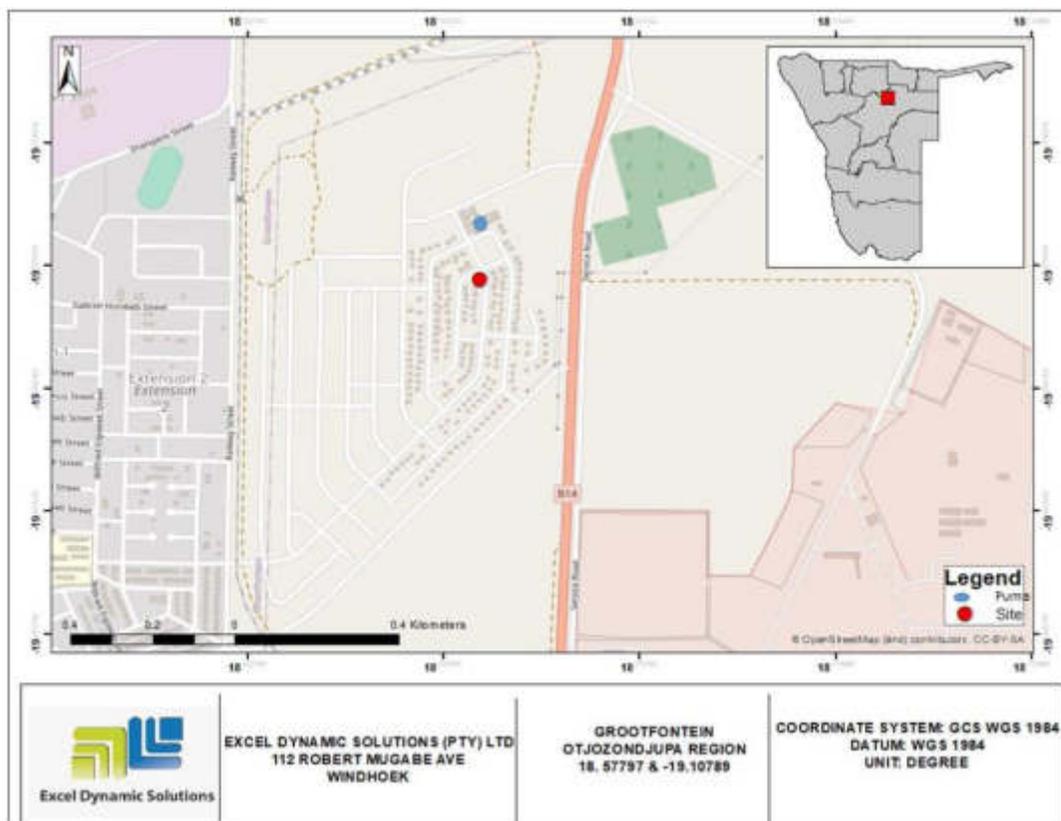


Figure 2: Location of the proposed network tower site in Extension 9, Grootfontein

The current network shortfalls experienced and anticipated network shortfalls to mobile users in the area triggered this site selection. Furthermore, the outcome of the selection criteria used

provided the best potential position of the tower. The site is within the boundaries of the Grootfontein Municipality and, therefore, falls under the jurisdiction of the Grootfontein Municipality.

The site details are presented in **Table 2** below.

Table 2: Proposed site locality details

Location:	Extension 9, Grootfontein
GPS Coordinates	19°34'40.7"S 18°06'28.4"E
Local Authority:	Grootfontein Municipality
Region Administration & Town / City:	Otjovondjupa Regional Council, Otjiwarongo
Regional Constituency:	Grootfontein

2.2 Construction Phase

Tower construction works are expected to last for at least one month, and there will be minimal earthworks to prepare the site for construction. The total surface area of the site occupied by the tower will be approximately 80 m², with an 8m x 10m size dedicated to tower footprint. The tower structure will be mounted to a concrete foundation. The rest of the site area will be used for storing the operational and maintenance equipment. For safety reasons, the tower site will be fenced off with palisade fencing. This will also be done to ensure that access to the tower is only limited to authorised personnel and to prevent vandalism of the tower and its associated accessories. The tower structure will be earthed to protect it from lightning.

The physical assembling of the network structure and the construction of the foundations will take place on the site by using manual labour as far as possible. The Proponent will appoint a contractor to carry out the construction. Construction works will be carried during weekdays only, between 08h00 and 17h00. The number of workers expected for this work will depend on the local contractors appointed and their standard human capacity for development of the project. Preference for the construction works will be given to locals, i.e. contractors from Grootfontein. All non-skilled labour will also be given to local residents (from Grootfontein).

If necessary, the appointed construction contractor will need to make arrangements for their workers to be housed in Grootfontein or nearby places, but not on site. The appointed contractor will be required to provide appropriate Personal Protective Equipment (PPE) to all their employees while carrying out the construction works on site.

2.3 Operational and Maintenance Phase

This is the phase during which the tower and its associated infrastructure will be operational and providing telecommunication signal to the residents of Extension 9 and other future land users in this part of the township. Maintenance of the tower is to be carried out by the Proponent's Maintenance Department, as and when required. No onsite accommodation will be required during this phase, as the maintenance works are not expected to last for more than a day. In the event that maintenance works are lasting more than one day, accommodation in other parts of Grootfontein will be arranged by the Proponent for their maintenance team.

The Proponent is to ensure that all employees carrying out maintenance works on site are provided with appropriate Personal Protective Equipment (PPE).

2.4 Services infrastructure

Power supply: No electricity is required during the construction of the tower. However, it will be required during the operational and maintenance phase of the tower. The operation of the tower will require an AC power, therefore, it will be connected to the Grootfontein municipal grid via a metered connection.

Water supply: Minimal amount of water will be required during construction. The water is necessary for in-situ foundation works and for drinking. The water required for construction and related activity will be sourced from municipal sources. The appointed local construction contractor will be responsible for the sourcing of water.

Site Access: The site is located on the north-eastern section of the Extension 9 Township, within a residential area in the vicinity of the Puma Service Station. There are access routes leading directly to the site within the residential area, where the site is located.

2.5 Waste Management

Any waste generated on site during construction and maintenance phases will be stored and transported to the appropriate (waste type) garbage skips or landfill sites.

In management during the construction phase, The Proponent will enforce the availability of portable toilets for the construction team (contractors) while on site during the construction phase, for sewage waste management. Chemical toilets and/or sealed septic tanks will be used as ablution facilities and the sewage waste handled according to the manufacturer's instructions of the facility provided.

2.6 Decommissioning Phase

As long as the use of mobile communications and other associated services is on the increase and the need for better services in Grootfontein, the decommissioning of the network tower is not anticipated. Regardless, recommendations will be provided in the impact assessment chapter and EMP, in the event that the network tower needs to be decommissioned.

3 PROJECT ALTERNATIVES

Alternatives are defined as: “*different means of meeting the general purpose and requirements of the activity*” (EMA (2007). This section will highlight the different ways in which the project can be undertaken and how the alternative that will be the most practical but least damaging to the environment is identified.

Once the alternatives have been established, these are examined by asking the following three questions:

- What alternatives are technically and economically feasible?
- What are the environmental effects associated with the feasible alternatives?
- What is the rationale for selecting the preferred alternative?

3.1 Types of Alternatives Considered

3.1.1 The "No-go" Alternative

The “No-go” alternative is the option of not proceeding with the activity, which typically implies a continuation of the status quo. The No-Go alternative may also be considered as the option of not proceeding with the activity or on selected parts of the project area, which may be deemed environmentally unsuitable for the proposed activity. Should the proposed works of the construction and operation plan not be implemented, none of the potential impacts (positive and negative) identified (as outlined in Section 7.1 of this report) would occur, and the current land use for the proposed site remains unchanged.

3.1.2 Network Tower Location

The location is strategically chosen to address the poor network coverage in this part of Grootfontein and provide improved network coverage in the area.

3.1.3 Tower Sharing

In accordance with the Communications Act No. 8 of 2009, service providers should consider using other existing structures first before constructing new ones. This is done to avoid cumulative impact. However, the Proponent intends to construct a multi-user tower for telecommunication service providers to be able to mount their antennae in the future.

4 LEGAL FRAMEWORK: LEGISLATION, POLICIES AND GUIDELINES

The proposed network tower developments are governed by certain legislation that the Proponent needs to comply with from the construction phase, and throughout the lifetime of the project. A review of applicable and relevant Namibian legislation, policies and guidelines to the proposed development are given in this section. This review serves to inform the project Proponent, Interested and Affected Parties and the decision makers at the DEAF of the requirements and expectations, as laid out in terms of these instruments, to be fulfilled in order to undertake the project's construction and operational activities.

4.1 The Environmental Management Act (No. 7 of 2007)

This EA was carried out according to the Environmental Management Act (EMA) and its Environmental Impact Assessment (EIA) Regulations (GG No. 4878 GN No. 30). The EMA has stipulated requirements to complete the required documentation in order to obtain an ECC for permission to undertake certain listed activities. These activities are listed under the following Regulations:

- *10.1 (g) The construction of masts of any material or type and of any height, including those used for telecommunication, broadcasting, and radio transmission.*

The legal obligations that are relevant to the proposed network tower and related activities are presented in **Table 3**.

Table 3 : Applicable local, national and international standards, policies and guidelines governing the proposed development

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this project
The Constitution of the Republic of Namibia, 1990 as amended	Article 91(c) defines the functions of the Ombudsman to include:	By implementing the environmental management plan, the establishment will be in conformant to the constitution in terms of environmental management and sustainability.

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this project
	<p><i>"...the duty to investigate complaints concerning the over-utilisation of living natural resources, the irrational exploitation of non-renewable resources, the degradation and destruction of ecosystems and failure to protect the beauty and character of Namibia..."</i></p> <p><i>Article 95(l) commits the state to actively promoting and maintaining the welfare of the people by adopting policies aimed at the:</i></p> <p><i>"...Natural resources situated in the soil and on the subsoil, the internal waters, in the sea, in the continental shelf, and in the exclusive economic zone are property of the State."</i></p>	<p>Ecological sustainability will be main priority for the proposed development.</p>
Communications Act (No. 8 of 2009)	Provides for the regulation of telecommunications services and networks, broadcasting, postal services and the use and allocation of radio spectrum	Provides the standards for setting up cellular, wireless and satellite services.
The Regional Councils Act (No. 22 of 1992)	The main objective of this Act is to initiate, supervise, manage and evaluate regional development. This Act sets out the conditions under which Regional Councils must be elected and administer each delineated region. Their duties include, as described in section 28 "to undertake the planning of the development of the region for which it has been established with a view to physical, social and economic characteristics, urbanisation patterns, natural resources, economic development potential, infrastructure, land utilisation pattern and sensitivity of the natural environment."	The relevant Regional Councils are considered to be I&APs and must be consulted during the Environmental Assessment (EA) process. The project site falls under the Otjozondjupa Regional Council, therefore they should be consulted.

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this project
Local Authorities Act No. 23 of 1992	To provide for the determination, for purposes of local government, of local authority councils; the establishment of such local authority councils; and to define the powers, duties and functions of local authority councils; and to provide for incidental matters.	The Grootfontein Municipality is the Local Authority responsible for the project site. Therefore, the Municipality should ensure that the network tower establishment activities are in compliance with the Act and its Regulations, as relevant to the proposed project.
The Atomic Energy and Radiation Protection Act, Act 5 of 2005	Provides for the adequate protection of the environment and of people against the harmful effects of radiation by controlling and regulating the production, processing, handling, use, holding, storage, transport and disposal of radiation sources and radioactive material, and controlling and regulating prescribed non-ionising radiation sources according to the standards set out by the ICNIRP.	To determine the "safe distance" around the site.
"Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300GHz)" (April 1998 developed by the International Commission on Non-Ionizing Radiation Protection (ICNIRP))	Provides international standards and guidelines for limiting the adverse effects of non-ionising radiation on human health and well-being, and, where appropriate, provides scientifically based advice on non- ionising radiation protection including the provision of guidelines on limiting exposure. ICNIRP exposure limits for non-ionizing radiation is 4.5W/m ² .	Justifies the need for assessing the impact of electromagnetic radiation from the tower, on the nearby residents.
The Aviation Act, Act 74 of 1962	Gives effect to certain International Aviation Conventions and makes provision for the control, regulation and encouragement of flying within the Republic of Namibia and for other matters incidental thereto	Provides the regulations for setting up cellular structures in Namibia.

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this project
Convention on International Civil Aviation, Annex 14	<ul style="list-style-type: none"> • Annex 14 to the Convention on International Civil Aviation. • Chapter 4: Obstacle restrictions and removal • Chapter 6: Visual aids and donating of obstacles 	The proposed new structures may be obstacles to some aerodromes in Namibia. Those that are close to existing aerodromes need to be assessed in accordance with the document. Visual aids to the new structures to make them visible to aircraft need to be applied in accordance with this Convention.
Soil Conservation Act (No 76 of 1969)	The Act makes provision for the prevention and control of soil erosion and the protection, improvement and conservation of soil, vegetation and water supply sources and resources, through directives declared by the Minister.	Duty of care must be applied to soil conservation and management measures must be included in the EMP.
Forestry Act 12 of 2001	The Act provides for the management and use of forests and related products / resources. It offers protection to any living tree, bush or shrub growing within 100 metres of a river, stream or watercourse on land that is not a surveyed erven of a local authority area. In such instances, a licence would be required to cut and remove any such vegetation. These provisions are only guidelines.	This could only be applicable if the site was located outside the jurisdiction of the local authorities and trees that might be impacted on are in close proximity to watercourses. However, there are several trees and grass covering the area. The proponent should notify the Municipality of the number and/or type of trees to be removed to allow construction and apply for permit (from the nearest Forestry Office).
Public Health Act (No. 36 of 1919)	Section 119 states that “no person shall cause a nuisance or shall suffer to exist on any land or premises owned or occupied by him or of which he is in charge any nuisance or other condition liable to be injurious or dangerous to health.”	The Proponent and all its employees should ensure compliance with the provisions of these legal instruments.
Health and Safety Regulations GN 156/1997 (GG 1617)	Details various requirements regarding health and safety of labourers.	

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this project
Labour Act (No. 6 of 1992)	Ministry of Labour (MOL) is aimed at ensuring harmonious labour relations through promoting social justice, occupational health and safety and enhanced labour market services for the benefit of all Namibians. This ministry insures effective implementation of the Labour Act no. 6 of 1992.	The Proponent should ensure that the network tower construction and operations and maintenance, do not compromise the safety and welfare of workers.

5 ENVIRONMENTAL BASELINE

The proposed project will be undertaken in specific environmental and social conditions. Understanding the pre-project conditions of the environment will aid in laying down background "information" of the status quo and future projections of environmental conditions after the proposed works on the site. This also helps the EAP in identifying the sensitive environmental features that may need protection through the recommendations and effective implementation of mitigation measures provided. The summary of selected biophysical and social baseline information pertaining to the network tower area is given below.

The baseline information presented below is sourced from different reports of studies conducted in the Otjozondjupa Region (at large) as well those done for the town of Grootfontein. The rest of the information has been obtained by the Environmental Consultant upon site visit conducted on 06 October 2021. The site visit was aimed at undertaking an environmental inspection of the site and obtaining the contact details of and providing background information to neighbouring property owners so that they could be added to the project's Interested and Affected Parties (I&APs) list.

5.1 Climate

The climate in the Grootfontein area is considered to be the low-latitude dry climate, influenced by **Subtropical Dry Semiarid Steppe** climate. The Grootfontein area experiences a typical summer rainfall, occurring mostly as thunderstorms, with average rainfall records at approximately 701 mm per year. Rainfall in the area is characterized by localised storm events between October and April. Annual temperature records average at 21.2 °C with October being the hottest month and July the coldest. During the hottest month of the year (October) the average maximum temperatures are at about 27 - 34 °C. During the coldest month (July) the average minimum temperature is 8 - 15 °C. Namibia is characterized by low humidity in general, and the lack of moisture in the air has a major impact on its climate by reducing cloud cover and rain and increasing the rates of evaporation. In the Grootfontein area, evaporation exceeds precipitation on average but is less than potential evaporation (Climate Data, 2021).

Wind direction is predominantly south-westerly. South-easterly, and northerly airflow is also common (SASSCAL, 2021).

5.2 Topography

Grootfontein is located on the Karstveld landscape on the northern edge of the Otavi Mountains. The Otavi Mountains make up the northern section of the central Namibian Plateau, covering the southern and eastern edges of Grootfontein. The town is relatively flat, at 1200 – 1400 metres above mean sea level. The proposed site is located on land that has been serviced for urban/housing development, and is flat (**figure 3**).



Figure 3 : The local landscape of the proposed tower site

5.3 Geology and Soils

The most dominant soils in the Grootfontein area are Leptosols with a mollic horizon of thicknesses between 10 and 25 cm directly overlying material with calcium carbonate.

The project area is underlain by the Damara Supergroup with some Damaraland Igneous Province Intrusions. The area is particularly characterised by the Otavi group of the Damara Supergroup. The Otavi Group formations can be traced to the period 900-950Ma that was marked by extensive continental fragmentation with geosynclinal deposition in a major Late Proterozoic tectono-thermal event referred as Pan-African event (Master, 1991). It comprises mafic intrusive rock. The Damaraland Igneous Province Intrusions in the general area of the project include the Grootfontein Metamorphic Complex, which comprises ortho-gneiss metasedimentary rocks, granite and metabasite dykes.

5.4 Flora

Due to the climatic differences within the country, Namibia has a broad variety of plant species from desert and semi-desert vegetation to evergreen subtropical plants. About 70% of Namibia is savannah. In Central to Northern Namibia, the Tree-and-shrub Savannah Biome is dominant with mixed woodlands such as Acacia Shrublands and Broadleaved woodlands of the Kalahari Sandveld (Mendelsohn et al, 2003). The vegetation within the town of Grootfontein and the proposed site is limited due to the fact that the location of the site surrounded by urban development. A few sparsely distributed shrubs are found on the proposed site (**Figure 4**).



Figure 4: Vegetation found at the proposed site

5.5 Socio-economic Status

Population: The town of Grootfontein falls under the Grootfontein Constituency of the Otjozondjupa Region. Grootfontein's population was recorded at approximately 24 000 during the 2011 Housing and Population Census.

Farming: Grootfontein forms part of the Otavi Triangle, which is the area around the Otavi, Tsumeb and Grootfontein towns. This area receives relatively higher rainfall than most parts of the country, forming an essential stretch of commercial farmland for cattle farming and agriculture in Namibia.

Tourism: The most popular tourist attraction site within the vicinity of Grootfontein is the Hoba meteorite. The Hoba Meteorite is the biggest meteorite found on earth, and is located about 20 km west of Grootfontein. Other popular tourist attractions in the town include a museum and a craft centre, as well as several tourist accommodation establishments.

Mining: The Otjozondjupa Region hosts mineral-rich rock formations, that have accommodated the development and operation of mining activity by profitable mines over the years. Base and Rare metals are a popular commodity in the region, and copper has a popular mining commodity in the Tsumeb-Grootfontein area.

Surrounding Land Uses: The site proposed for network tower erection is located within a residential area, and the land use of its immediate surroundings is housing.

Services Infrastructure: The Otjozondjupa Region has the basic infrastructure necessary for transportation and telecommunication, while water and electricity are sufficiently supplied to the urban areas. Grootfontein is located along an important route (the B8 Highway), which leads to other parts of the country, and connects Namibia to other countries such as Angola, Zambia, Zimbabwe and Botswana. The Grootfontein Air Force base is located within the Grootfontein Municipal boundaries, and is situated about 3km southeast of the site proposed for a network tower.

5.5.1 Telecommunications

It is priority for the Government to maintain and upgrade the telecommunication systems in an optimised way. For historical reasons, physical infrastructure in Namibia has been unequally distributed, to the disadvantage of indigenous Namibians. Significant improvement in infrastructure distribution has taken place around the country, however, a large proportion of low-income urban residents continue to live without access to basic services such as water supply, adequate sanitation, electricity supply, and telecommunication services.

The country generally has wide coverage of telecommunication service provision by various service providers. However, some citizens such as the residents of Extension 9 still experience network access issues, which indicate the need for new and enhanced telecommunication infrastructure.

6 PUBLIC CONSULTATION PROCESS

Public consultation forms an important component of an Environmental Assessment (EA) process. Public consultation provides potential Interested and Affected Parties (I&APs) with an opportunity to comment on and raise any issues relevant to the project for consideration as part of the assessment process. Public consultation has been done in accordance with the EMA and EIA Regulations.

The public consultation process assists the Environmental Assessment Practitioner (EAP) in identifying all potential impacts and to what extent further investigations are needed. Public consultation can also aid in the process of identifying possible mitigation measures.

6.1 Pre-identified and Registered Interested and Affected Parties (I&APs)

Relevant and applicable national, regional and local authorities, local institutions and other interested members of the public were identified as stakeholders. The pre-identified I&APs were contacted directly, while other parties who contacted the Consultant after project advertisement notices were placed in newspapers, were registered as I&APs upon their request. Newspaper advertisements of the proposed exploration activities were placed in two widely-read national newspapers in the region (*The Namibian* and *New Era* newspapers). The project advertisement/announcement ran for two consecutive weeks inviting members of the public to register as I&APs, submit their comments or concerns and/or attend the public consultation meeting as notified through the advertisements. The list of pre-identified and registered I&APs is listed in **Table 4** below and the complete list including registered I&APs is provided in **Appendix E**.

Table 4: Summary of pre-identified Interested and Affected Parties (I&APs)

National (Ministries and State Owned Enterprises)
Ministry of Environment and Tourism
Ministry of Information and Communication Technology
Ministry of Urban and Rural Development

Ministry of Works and Transport
Ministry of Health and Social Services
Ministry of Agriculture, Water and Land Reform
National Radiation Protection Authority
Roads Authority
Namibia Civil Aviation Authority
CRAN
Regional & Local
Otjozondjupa Regional Council
Grootfontein Constituency
Grootfontein Municipality
General Public
Interested members of the public / Neighbours

6.2 Communication with I&APs

Regulation 21 of the EIA Regulations details steps to be taken during a public consultation process and these have been used in guiding this process. Communication with I&APs about the proposed development was facilitated through the following means and in this order:

- A Background Information Document (BID) containing brief information about the proposed facility was compiled (**Appendix D**) and sent out to all pre-identified affected parties and upon request to all new registered Interested and Affected parties (I&APs);
- Project Environmental Assessment notices were placed in *The Namibian and New Era* newspapers (**Appendix F**) dated **21 September 2021** and **28 September 2021** briefly explaining the activity and its locality, inviting members of the public to register as I&APs and submit comment;

- Public notices were placed at Grootfontein Municipality, Omulunga Community Hall, Puma Service Station in Extension 9, and at the site (**Figure 5**) to inform members of the public of the ESA process and to register as I&APs as well as submit comments; and
- A public meeting was scheduled and held on **06 October 2021** in Grootfontein at Omulunga Community Hall. The meeting was only attended by two individuals, and thereafter, a house-to-house consultation and handing out of BIDs to residents of the houses neighbouring the site (**Figure 6**).

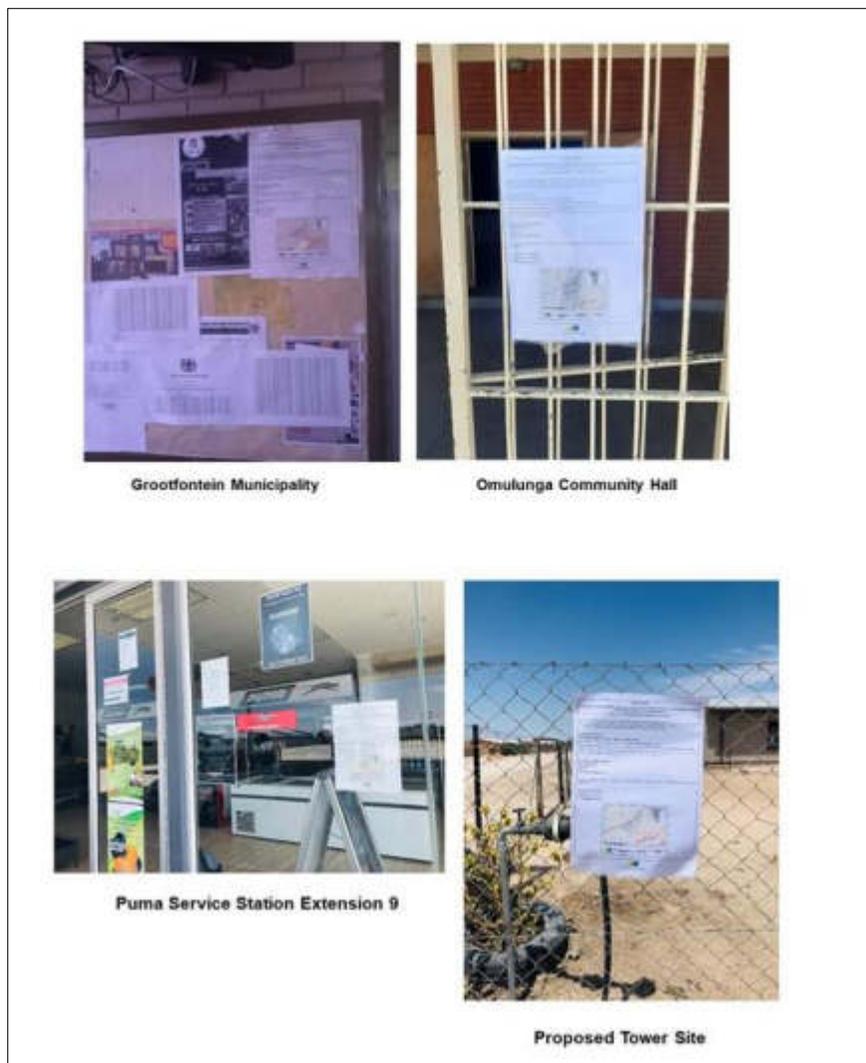


Figure 5: Public Site Notices



Figure 6: Public meeting and Neighbour consultations

6.3 Public Feedback

Public consultation was carried out according to the Environmental Management Act's EIA Regulations. There were no comments or inputs received by EDS via email or any other mode of communication after the ESA advertisement in the newspapers, placement of public notices in Grootfontein

The Draft Scoping Report and its appendices are circulated to all I&APs for review for a period of not less than 7 days. Should there be any comments, these will be documented in a Comments and Response Trail Document (**Appendix G**) and incorporated into the Final Report, which will be submitted to the Department of Environmental Affairs and Forestry (DEAF) for evaluation and consideration for an ECC.

7 IMPACT IDENTIFICATION, ASSESSMENT AND MITIGATION MEASURES

7.1 Impact Identification

Proposed development/activities are usually associated with potential impacts that may be positive or negative. For an environmental assessment, the focus is placed mainly on the negative impacts. This is to ensure that negative impacts are addressed by providing adequate mitigation measures that bring negative impacts' significance under control, while maximizing the positive impacts of the development. The potential positive and negative impacts that have been identified from the network tower establishment activities are listed as follow:

POSITIVE IMPACTS

- **Telecommunications convenience:** Current and future local residents (mobile users) will have an improved infrastructure and would not experience network coverage inconveniences.
- **Employment creation:** Creation of temporary jobs during the construction of the tower.
- **General contribution to local economic development** through reliable communications services.

NEGATIVE IMPACTS

- **Physical Land/Soil Disturbance:** During the tower construction, the presence of the construction team may disturb the immediate neighbours to the site.
- **Noise:** *During tower construction, the presence of the construction team and movement of heavy vehicles and machinery may disturb the immediate neighbours to the site.*
- **Potential occupational health and safety risks** *associated with mishandling of tower construction and operations equipment.*
- **Waste Generation** *from improper disposal of waste generated during construction and maintenance.*
- **Dust Generation** *from construction works and vehicular traffic*
- **Loss of Avifaunal Biodiversity**

- **Impacts to Human Health:** Electromagnetic Radiation emitted from the tower of cellular structures may affect human health.
- **Civil Aviation concerns:** The proposed site designs and location need to be verified to ensure that it meets the approval of the Directorate of Civil Aviation and the Ministry of Defence and Veteran Affairs regarding the height of the masts and the position and stability of transmitters.
- **Visual impact:** The presence of the tower in the neighbourhood may be a nuisance to locals.
- **Vehicular traffic safety** *from increased number of vehicles moving around the project site and slow-moving trucks transporting project structures during construction, and*
- **Archaeological or cultural heritage impact** *through unintentional uncovering of unknown archaeological objects or sites by certain project activities such as excavation (the minimal site works)*

7.2 Impact Assessment Methodology

An Environmental Assessment is primarily a process used to make sure that possible potential impacts that may occur from project activity, are identified, and addressed through environmentally cautious approaches and legal compliance. The impact assessment method used for this project is in accordance with the Environmental Management Act (Act No. 7 of 2007) and its Regulations of 2012.

7.2.1 Impact Assessment Criteria

The identified impacts were assessed in terms of probability (likelihood of occurring), scale/extent (spatial scale), magnitude (severity) and duration (temporal scale) as presented in **Table 5**. To enable a scientific approach to the determination of the environmental significance, a numerical value is linked to each rating scale. This methodology ensures uniformity and that potential impacts can be addressed in a standard manner so that a wide range of impacts are comparable. It is assumed that an assessment of the significance of a potential impact is a good indicator of the risk associated with such an impact. The following process will be applied to each potential impact:

- Provision of a brief explanation of the impact;
- Assessment of the pre-mitigation significance of the impact; and
- Description of recommended mitigation measures.

The recommended mitigation measures prescribed for each of the potential impacts contribute towards the attainment of environmentally sustainable operational conditions of the project for various features of the biophysical and social environment. The following criteria were applied in this impact assessment:

Table 5: Impact Assessment Criteria employed to assess the potential significance of impacts

Nature	Description	Rating
Extent (Spatial scale)	An indication of the physical and spatial scale of the impact.	<p>Low (1): Impact is localized within the site boundary: Site only.</p> <p>Low/Medium (2): Impact is beyond the site boundary: Local.</p> <p>Medium (3): Impacts felt within adjacent biophysical and social environments: Regional.</p> <p>Medium/High (4): Impact widespread far beyond site boundary: Regional</p> <p>High (5): Impact extend National or over international boundaries.</p>
Duration	The timeframe, over which the impact is expected to occur, measured in relation to the lifetime of the project.	<p>Low (1): Immediate mitigating measures, immediate progress</p> <p>Low/Medium (2): Impact is quickly reversible, short-term impacts (0-5 years)</p> <p>Medium (3): Reversible over time; medium term (5-15 years).</p> <p>Medium/High (4): Impact is long-term.</p>

Nature	Description	Rating
		High (5): Long term; beyond closure; permanent; irreplaceable or irretrievable commitment of resources
Intensity, Magnitude / Severity (Qualitative criteria)	The degree or magnitude to which the impact alters the functioning of an element of the environment. The magnitude of alteration can either be positive or negative	Medium/low (4): Low deterioration, slight noticeable alteration in habitat and biodiversity. Little loss in species numbers. Low (2): Minor deterioration, nuisance or irritation, minor change in species / habitat / diversity or resource, no or very little quality deterioration.
Probability of occurrence	Probability describes the likelihood of the impacts occurring. This determination is based on previous experience with similar projects and/or based on professional judgment	Low (1): Improbable; low likelihood; seldom. No known risk or vulnerability to natural or induced hazards. Medium/low (2): Likely to occur from time to time. Low risk or vulnerability to natural or induced hazards. Medium (3): Possible, distinct possibility, frequent. Low to medium risk or vulnerability to natural or induced hazards. Medium/High (4): Probable if mitigating measures are not implemented. Medium risk of vulnerability to natural or induced hazards. High (5): Definite (regardless of preventative measures), highly likely, continuous. High risk or vulnerability to natural or induced hazards.

7.2.1 Impact Significance

After the impact has been assessed, its significance is then determined. The impact significance is determined through a synthesis of the above impact characteristics (in Table 5 above). The significance of the impact “without mitigation” is the main determinant of the nature and degree of mitigation required. Once the above factors (**Table 5**) have been ranked for each potential impact, the impact significance of each is assessed using the following formula:

$$\text{SP} = (\text{magnitude} + \text{duration} + \text{scale}) \times \text{probability}$$

The maximum value per potential impact is 100 significance points (SP). Potential impacts were rated as high, moderate or low significance, based on the following significance rating scale (**Table 6**).

Table 6: Significance rating scale

<i>Significance</i>	<i>Environmental Significance Points</i>	<i>Colour Code</i>
High (positive)	>60	H
Medium (positive)	30 to 60	M
Low (positive)	<30	L
Neutral	0	N
Low (negative)	>-30	L
Medium (negative)	-30 to -60	M
High (negative)	>-60	H

Positive (+) – Beneficial impact

Negative (-) – Deleterious/ adverse Impact

Neutral – Impacts are neither beneficial nor adverse.

For an impact with a significance rating of High (-ve), mitigation measures are recommended to reduce the impact to a Medium (-ve) or Low (-ve) Significance rating, provided that the impact with a Medium Significance rating can be sufficiently controlled with the recommended mitigation measures. To maintain a Low or Medium Significance rating, monitoring is recommended for a period of time to enable the confirmation of the significance of the impact as low or medium and under control.

The assessment of the construction and operational phases is done for both pre-mitigation and post-mitigation.

The risk/impact assessment is driven by three factors:

Source: *The cause or source of the contamination.*

Pathway: *The route taken by the source to reach a given receptor*

Receptor: *A person, animal, plant, eco-system, property or a controlled water source. If contamination is to cause harm or impact, it must reach a receptor.*

Potential negative impacts stemming from the proposed activities are described and assessed, and management/mitigation measures provided thereof. Further mitigation measures in the form of management action plans are provided in the draft EMP.

7.3 Assessment of Potential Negative Impacts: Construction and Operations

The main potential negative impacts associated with construction, operation, and maintenance phases of the tower are identified and assessed below:

7.3.1 Soil Disturbance (Land Degradation) and Pollution

The excavations and land clearing to enable erection of project structures and installation of services will potentially result in soil disturbance which will leave the site soils exposed and vulnerable to erosion. This impact would be probable at site areas with no to little vegetation cover to hold the soils in place. The movement of heavy vehicles and equipment may lead to compaction of the soils during construction phase. This will however be short-term and localized impact.

There is also a potential of soil pollution from accidental spills or leaks of fuel from project vehicles and machinery.

The potential impact can be rated as medium if no mitigation measures are implemented. However, with the effective implementation of mitigation measures and monitoring, the impact significance will be reduced to low. The impact is assessed in **Table 7**.

Table 7: Assessment of the impacts of the network tower on socio-economic environment

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	M - 3	M/H - 4	L/M - 4	M/H - 4	M - 44
Post mitigation	L/M - 2	L/M - 2	L - 2	L/M - 2	L - 12

Mitigations and recommendation to minimise soil disturbance and pollution

- The topsoil that was stripped from certain site areas to enable construction works and can be returned to its initial position, should be returned. This is to avoid unnecessary stockpiling of site soils which would leave them prone to erosion.
- All possible trenches excavated for construction on site should be rehabilitated and returned to their pre-excavation state as far as possible.
- Soils that are not within the intended footprints of the site areas should be left undisturbed and soil conservation implemented as far as possible.
- Project vehicles/machinery should stick to temporary access roads provided and or meant for the project works but not to unnecessarily create further tracks on and around the site by driving everywhere which would result in compaction of site' and surrounding soils.
- In an event that any of the substances mentioned above, spill on the soil, the contaminated soil should be cleaned up immediately and dispose of in a designated hazardous waste bin and transported to the nearest approved landfill site. The contaminated and removed soil should be replaced with clean soil.

7.3.2 Noise

Noise generated by project related vehicles and equipment during construction and operational phase can be a nuisance to the neighbours. This impact is regarded as of minimal significance given the fact that even construction work will only be limited to certain days of the week (Monday – Friday) for the duration of the construction period. Construction related noise will be limited to the working hours between 8am and 5pm. Therefore, the noise level is bound to be limited to the site, affecting the immediate neighbours to the site. The impact can be rated as low to medium significant if no mitigation measures are implemented, but upon implementation, the impact will be of low significance. This impact is assessed in **Table 8** below.

Table 8: Assessment of noise impact

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	L/M - 2	L/M - 2	M – 6	M - 3	M – 30
Post mitigation	L - 1	L/M - 2	L – 2	L/M - 2	L - 10

Mitigations and recommendation to disturbance

- Noise from vehicles and equipment on site should be reduced to acceptable levels.
- Construction and operational hours should be restricted to between 08h00 and 17h00 to avoid noise by vehicles and equipment before working or after hours to avoid noise generated by equipment and the movement of heavy vehicles, thus affecting neighbours.
- When operating excavators and other noise generating machinery on site, workers should be equipped with personal protective equipment (PPE) such as earplugs to reduce exposure to excessive noise.
- Construction workers should respect the tranquillity and way of living of the neighbouring residents (property owners) by not making unnecessary noise while on site.

7.3.3 Occupational Health and Safety

The planned project construction and operational activities can be associated with some health and safety risks. This is possible when workers involved in the project activities are exposed to health and safety risks during operations, which may lead to incidents that cause injury or fatalities. Incidents may include accidents leading to minor injuries (i.e., superficial physical injury) or major injuries (i.e., involving heavy machinery, equipment or vehicles). Construction workers will be working at height during construction of the network tower. The lack of safety measures may potentially lead to injuries. Improper handling of construction material and equipment may cause injury.

The use of heavy equipment, especially during excavation, and erection of the tower structures may result in accidental tripping and falling of such structures. This could pose a safety risk to the project personnel, equipment, and vehicles. If machinery and equipment are not properly stored and packed, there would be risks of falling equipment and injury to workers or site visitors. The impact can be rated as medium significant if no mitigation measures are implemented, but upon implementation, the impact will be of low significance. This impact is assessed in **Table 9** below and mitigation measures provided thereof.

Table 9: Assessment of the impacts of the network tower on potential health and safety

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	M - 3	M/H - 3	M - 6	M/H - 4	M - 48
Post mitigation	L/M - 2	L/M - 2	L - 2	L/M - 2	L - 12

Mitigations and recommendation to health and safety

- Ensure that all personnel are provided with the correct personal protective equipment (PPE) for the job at all times during construction hours on site.
- As part of their induction, the workers should be provided with an awareness training of the risks of mishandling equipment and materials on site.
- Ensure that all personnel involved in operating machinery and equipment are adequately trained and experienced with properly and correctly using the equipment and machinery.

- All personnel should be trained in/sensitised to the potential health and safety risks associated with their respective jobs, especially with regards to mishandling of equipment on site.
- No employee should be allowed to consume alcohol or other intoxicants prior to and during working hours as this may lead to mishandling of equipment which results into injuries and other health and safety risks
- The heavy vehicle, equipment and fuel storage area should be properly secured to prevent any harm or injury to the workers and surrounding residents.

7.3.4 Waste Generation / Environmental Pollution

The two significant project phases (construction and operations and maintenance) will be associated with the generation of different waste, ranging from domestic, sewage, general waste to hazardous. If the generated waste is not disposed of in a responsible way, land pollution may occur not only within the site boundary but also the surroundings. Improper handling, storage and disposal of hydrocarbon products and hazardous materials for instance may lead to soil and groundwater contamination, in the case of spills and leakages

Without any mitigation measures, the general impact of waste generation has a medium significance. After the implementation of the mitigation measures, the impact will be reduced to low significance. The assessment of this impact is presented in **Table 10** below.

Table 10: Assessment of the impact of waste generation

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	L/M - 2	L/M - 2	M – 6	M - 3	M – 30
Post mitigation	L - 1	L - 1	L – 2	L - 1	L - 4

Mitigations and recommendation to waste generation

- Biodegradable and non-biodegradable wastes must be stored in separate containers and collected regularly for disposal at a recognized landfill/dump site (in Grootfontein upon reaching an agreement with the Grootfontein Municipality).

- Any hazardous waste that may have an impact on the physical and social environment should be handled cautiously and disposed of carefully at the nearest approved waste management facilities of the Town.
- Workers should be sensitized to dispose of waste in a responsible manner and not litter.
- After each daily works, the Proponent should ensure that there is no waste left on the site.
- No waste may be buried or burned on site or anywhere else in the environment, apart from authorized and approved waste management sites.
- There should be separate waste bins for hazardous and general/domestic waste in both construction as well as the operational and maintenance phases until such that time it will be transported to designated waste sites.
- Sewage waste should be managed as per the portable chemical toilets' manufacturer's instructions and regularly disposed of at the nearest treatment facility.

7.3.5 Dust Generation

Dust emanating from site access roads when transporting project equipment, materials, and supply to and from site (time-to-time) may compromise the air quality in the area. Vehicular movements create dust even although it is not always so severe. Not only dust but also the possible emissions of gases from heavy vehicles and machinery. These sources of dust and emissions may lead to air pollution, thus decreasing the air quality in the local project area. This could contribute to short-term decrease in air quality around the working site areas.

The tower site is relatively small and localised, and the period for construction works, short. Therefore, given the relatively limited footprint size and short construction timeframe, dust, and gas emissions during the tower construction would be minimal and short-term in nature. Therefore, can be rated as low to slightly medium (significance) if no mitigation measures are implemented. However, once this is done, the impact significance can be reduced to low - please refer to the assessment below (**Table 11**)

Table 11: Assessment of the impacts of construction activities on air quality

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	M - 3	M/H - 4	M - 6	M - 3	M - 39
Post mitigation	L - 1	L - 1	L - 2	L/M - 2	L - 8

Mitigations and recommendation to minimize dust generation.

- Construction and delivery vehicles should not drive at a speed more than 40 km/h on unpaved/untarred roads to avoid dust generation around and within the site areas.
- The Proponent should ensure that the construction work schedule is limited to the given number of days of the week to keep the vehicle-related dust level minimal in the area.
- Dust control measures such as reasonable amount of water spray should be used on gravel roads and near specific exposed areas of work on site to suppress the dust that may be emanating from certain project activities on site.
- Dust masks, eye protective glasses and other respiratory personal protective equipment (PPE) such as face masks should be provided to the workers carrying out potential dust generating activities such as excavation, where they are exposed to dust.

7.3.6 Loss of Biodiversity

The most potentially affected fauna in tower erection projects is birds. According to Partners in Flight (2020), each year, approximately 7 million birds collide with communication towers in North America. Migrating songbirds are attracted to and disoriented by non-flashing obstruction warning lights on towers, especially on foggy and cloudy nights. Birds attracted to lights fly close to towers and often suffer collisions with guy wires or tower structures. However, birds are much less attracted to flashing tower lights and elimination of the non-flashing tower lights reduces the numbers of bird collisions by as much as 70%.

The location of tower sites in the vicinity of open water systems such as the iishana and the water canal within meters of sites would mean night-migratory birds flying over the area from time to time in search for water and breeding/nesting grounds. The proposed tower site in Grootfontein Extension 9 is located in an already developed area with a lot of human activity and no major open water sources where birds would fly over, in the near vicinity of the site. Therefore, the impact is minimal. However, this does not rule out the possibility of the Town and its surrounding being a migratory route for birds. In that case, the presence of the tower may impact such birds.

Before consideration of mitigation measures, the existence of a tower could lead to potential collision of birds, causing mortality among affected bird species. This impact has a Medium Significance rating, but if care is taken in handling equipment around vegetation on site, the impact will significantly be reduced to a low rating. The assessment of this impact is presented in **Table 12**. The recommended mitigation measures are presented below.

Table 12: Assessment of the impacts of network tower construction on avifauna

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	L/M - 2	L/M - 2	M - 6	M - 3	M - 30
Post mitigation	L - 1	L - 1	L - 2	L - 1	L - 4

Mitigations and recommendation to minimize the impact on avifauna

- Although there are already other structures in the Town that could already be contributing to the impact (such as existing towers and powerlines), the cumulative impacts of the new tower in relation to the existing powerlines and associated structures in the area are an important consideration to minimize the impact on birds.
- Migratory bird attraction and energy costs can be further minimized by eliminating continuously burning security lights under towers. Many tower operators use down-shielded, motion sensor-triggered security lighting, which promotes tower safety, reduces energy costs, and reduces the possibility of attracting migratory birds.
- Flashing lights would not only minimize migratory bird collisions but also maintain aircraft safety while decreasing tower lighting costs and maintenance costs.
- Other proper measures on minimizing bird mortalities by the telecommunication towers should be developed and implemented.

7.3.7 Potential Impact on Human Health: Radiation

Health concerns related to the exposure to radiation emitted by telecommunication towers may arise, especially amongst the residents neighbouring the site. Electromagnetic radiation is emitted from electrical appliances commonly used in most homes today, such as TV's, radios, cell phones, microwave ovens, electrical blankets, and computers. Studies have shown that transceiver base stations emit weaker electromagnetic radiation than most household daily appliances i.e. microwave or cell phone used close to your body (Carstens and Kuliwoye, 2012).

The International Commission on Non-Ionizing Radiation Protection (ICNRP) provides guidance on protection against the adverse health effects associated with electromagnetic fields (EMF). These guidelines are based on short-term, immediate health effects such as stimulation of peripheral nerve muscles, shocks and burn caused by touching conducting objects, and elevated tissue temperatures resulting from absorption of energy during exposure to EMF. The National Radiation Protection Authority of Namibia (NRPA), under the Ministry of Health and Social Services (MoHSS) is responsible for the administration of the Atomic Energy and Radiation Protection Act (Act 5 of 2005) that specifically requires that account be taken of any guidelines published by ICNIRP regarding radiation risks associated with Base Transceiver Stations structures (National Radiation Protection Authority, Unknown date).

The short- and long-term health impacts of radiation are explained in the Energy Board of Namibia Directive. The impacts have been summarised and assessed below:

7.3.5.1 Short-term Radiation (Health) Effects

The basic restrictions on the effects of exposure are based on established health effects. Different scientific bases were used in the development of basic exposure restrictions for various frequency ranges. Depending on the frequency, the physical quantities used to specify the basic restrictions on exposure to EMF are current density, SAR (Specific Energy Absorption Rate), and power density.

The significance of this impact is rated as Medium, and can be reduced to Low significance rating by ensuring that the sufficient mitigations measures governed by the national and international legal standards such as International Commission on Non-Ionizing Radiation Protection (ICNIRP) on infrastructure EMR emissions are adequately implemented. The impact is assessed in **Table 13**.

Table 13: Assessment of the impacts of the network tower on health and safety

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	M – 3	M/H – 4	M/H – 8	M – 3	M – 45
Post mitigation	L/M – 2	L/M – 2	L/M – 4	L/M – 2	L - 16

7.3.7.1 Mitigations and recommendation on health and safety: Short-term Radiation

- The Proponent should ensure that network tower construction and its EMR are within the international standards of The Atomic Energy and Radiation Protection Act, Act 5 of 2005 and Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (April 1998 developed by the International Commission on ICNIRP).
- The design standards to be applied for the network tower should comply with the internationally accepted public exposure guidelines.
- The National Radiation Protection Agency should be involved during this phase (operational) to assess the possible emissions from tower.

7.3.5.2 Long-term Radiation (Health) Effects

In the case of potential long-term health effects of exposure, such as an increased risk of cancer, ICNIRP conducted that the available data are insufficient to provide a basis for this setting exposure restriction. Thus the ICNIRP guidelines alone should not be used as a basis for protection against non-thermal effects or long-term biological effects.

The significance of this impact is considered medium to high, because the long term effect is unknown. In the context of the above, a cautionary approach is adopted, and in particular the Precautionary Principle, which states that if an action or policy has a suspected risk of causing harm to the public or to the environment, in the absence of scientific consensus that the action or policy is harmful, the burden of proof that it is not harmful falls on those taking the action. Therefore, ICNIRP uses a reduction factor of 10 to derive at occupational limits for workers and a factor of about 50 to arrive at exposure limits for the public. This factor serves as a precautionary buffer to compensate for uncertainties in the research. By adhering to the threshold levels of ICNIRP, the precautionary measures should be sufficient to adequately address this impact. However, the risk will not be abolished and it is recommended that the Proponent keep up to date with regards to any new literature published by ICNIRP. The impact is assessed in **Table 14**.

It is also very crucial that the Proponent familiarizes themselves with the soon to be gazetted Non-ionising Radiation Regulations, 2019: Atomic Energy and Radiation Protection Act, 2005 attached under Appendix I of this Report.

Table 14: Assessment of impacts of long term radiation effects (health and safety)

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	M - 3	H - 5	M/H - 8	M/H - 4	M - 64
Post mitigation	L/M - 2	L/M - 2	L/M - 4	L/M - 2	L - 16

7.3.7.2 Mitigations and recommendation on health and safety: Long-Term Radiation

- The Proponent should ensure that network tower construction and its EMR are within the international standards of The Atomic Energy and Radiation Protection Act, Act 5 of 2005 and Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (April 1998 developed by the International Commission on Non-ionizing Radiation Protection (ICNIRP)).
- The design standards to be applied for the tower should comply with the internationally accepted public exposure guidelines.
- The National Radiation Protection Authority should be involved during this phase (operational) to assess the possible emissions from tower.

7.3.8 Potential Impact on Civil Aviation

Potential impact of the project on civil aviation is due to the height and location of the site. Generally, the effective utilisation of an aerodrome can significantly be influenced by natural features and man-made constructions inside and outside its boundary. These features may result in limitations on the distance available for take-off and landing and on the range of meteorological conditions in which take-off and landing can be undertaken. For these reasons certain areas of the local airspace are regarded as integral parts of the aerodrome environment (Carstens & Kuliwoye, 2012).

A decrease in aviation safety could have severe impacts on third parties due to the potential for injury, death or damage/loss of third party property associated with aviation accidents. The consequences of potential incidents would, therefore, affect communities beyond the project boundary and lifespan. The Civil Aviation Standards of the ICAO dictate that all obstructions to be erected within 8 km from an airport need to be approved by the applicable Civil Aviation Authority.

The proposed tower is 30 m high and the project site lies about 2.91 km northwest of the Grootfontein Air Force Base. Therefore, the approval from the NCAA will be required. Additionally, the Civil Aviation Authority will need to be consulted throughout the project lifetime.

Without the implementation of any mitigation measures, the impact will receive a Medium Significance rating, and upon implementing the measures, this significance will be reduced to low. This impact is assessed in **Table 15** below.

Table 15: Assessment of the presence of the tower on civil aviation

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	M - 3	M/H - 3	L/M - 4	M/H - 4	M – 44
Post mitigation	L/M - 2	L/M - 2	L/M - 4	L/M - 2	L - 16

Mitigations and recommendation to minimize the impact on civil aviation safety

- The proposed tower design and location should be verified to ensure that they meet the approval of the Namibia Civil Aviation Authority regarding the tower height and the position in the area.

- Civil Aviation Standards of the International Civil Aviation Organisation (ICAO) pertaining to the network tower structure should be adhered to.
- The Regulations of Namibian Aviation Act No. 74 of 1962 for setting up cellular towers in Namibia should be complied with.
- The Proponent **should apply for the approval or permit to erect the tower, especially that it is less than 8 km distance from the Grootfontein Air Force Base** located on the northwestern side of the Town (as per ICAO requirements).

7.3.9 Visual Impact

Telecommunication towers usually cause a visual impact on the social environment. If not planned properly, the network tower presence will contrast the surrounding landscape and thus potentially become a visual nuisance, if not camouflaged to suit the surrounding environment. The Proponent intends to camouflage the tower in order to ensure that it is less of a nuisance. Currently and with no measures implemented, the visual impact can be rated as of Low Significance. However, upon effectively implementing the measures, it will be significantly reduced to a much lower rating of significance. The impact is assessed in **Table 16**.

Table 16: Assessment of the visual impacts of the network tower

	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	L/M - 2	L/M - 2	M/L - 4	M - 3	L - 24
Post mitigation	L - 1	L - 1	L - 2	L/M - 2	L - 8

Mitigations and recommendation to minimize visual impact

- The Proponent should camouflage the tower to cause less of a visual nuisance.
- All the necessary options to improve the aesthetic of the site should be considered so that it blends in with the surrounding area or at least enhance it for a better appeal to the public.

7.3.10 Vehicular Traffic Use and Safety

The project works will involve the movement of one or two heavy trucks during construction of the tower and this may potentially cause short-term increase in traffic in the area. However, the tower

construction period is short-term with infrequent transportation of material and equipment to site. It should be noted that the site is located along busy streets in the Town and the movement of project related vehicles for a limited time period of works would not have a significant impact on the roads.

Pre-mitigation, the impact can be rated medium and with the implementation of mitigation measures, the significance will be low as assessed in Error! Reference source not found. below.

Table 17: Assessment of the impacts of project activities on road use (vehicular traffic)

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	M - 3	M/H - 4	L/M - 4	M/H - 4	M - 44
Post mitigation	L/M - 2	L/M - 2	L - 2	L/M - 2	L - 12

Mitigations and recommendation to minimize impact on road safety and related vehicular traffic issues.

- The transportation of construction materials, equipment and machinery should be limited to once or twice a week only, but not every day to reduce the pressure on local roads.
- The heavy truck loads should comply with the maximum allowed limit while transporting materials and equipment/machinery on the public and access roads.
- Vehicle drivers during all project phases should be in possession of valid and appropriate driving licenses and should adhere to the road safety rules.
- Drivers should be on the lookout for residents, especially children within proximity of the site.
- The Proponent should ensure that the site access roads are well equipped with temporary road signs condition to cater for vehicles travelling to and from site throughout construction.
- Project vehicles should be in a road worthy condition and serviced regularly to avoid accidents owing to mechanical faults.
- Vehicle drivers should only make use of designated site access roads provided and as agreed.
- Vehicle drivers should not be allowed to operate vehicles while under the influence of alcohol or any other intoxicants
- Sufficient parking area for all project vehicles should be provided for and clearly demarcated on site.

- The Proponent should make provision for safe loading and offloading areas on site.
- To control traffic movement on site, deliveries from and to site should be carefully scheduled. This should optimally be during weekdays and between the hours of 8am and 5pm.
- The site access roads should be equipped with road safety signs.

7.3.11 Heritage/Archaeological resources

During construction works, historical resources may be impacted through inadvertent destruction or damage. This may include the excavation of subsurface graves or other archaeological objects when preparing the site for tower foundation laying and erection. There was no information provided about known heritage sites or sites of significant cultural values within or near the proposed site. Therefore, the project activities will not have an impact of great significance on these and potentially other archaeological remains, at least on surface and visible resources if any. However, this does not mean rule out the possibility of finding some of these objects during the construction phase. With that said, the potential impact significance is slightly medium if no mitigation measures, are implemented. However, after the implementation of the measures provided below, this impact significance will be low. The assessment of the impact is shown in Error! Reference source not found. below.

Table 18: Assessment of the impacts of project activities on archaeological resources

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	M - 3	M - 3	M - 6	M - 3	M – 36
Post mitigation	L/M - 2	L/M - 2	L/M - 4	L/M -2	L - 16

Mitigations and recommendation to minimize impact on archaeological resources

- Contractors working on the three sites during construction should be made aware of items protected under the National Heritage Act, 2004 (Act No. 27 of 2004). Therefore, caution should be exercised when carrying out excavations/earthworks associated with the construction activities if archaeological/heritage remains are discovered.

- Any items protected under the definition of heritage found during unearthing for construction works should be reported to the National Heritage Council.
- Identification of any archaeological significant objects or sites (such as graves) on the site should not be disturbed but are to be reported to the project Environmental/Safety officer or National Heritage Council office for further instructions and actions.
- The Proponent and construction contractors should familiarise themselves with the National Heritage Council's Chance Finds Procedure (attached to the EMP) and if uncertain about the procedure should receive training by a suitably qualified archaeologist with respect to the identification of archaeological/heritage remains and the procedures to follow if such remains are discovered particularly during construction.

8 CONCLUSIONS AND RECOMMENDATIONS

The potential impacts (both positive, and negative) that are anticipated from the proposed construction of the telecommunication tower and related activities were identified, described, and assessed. Most of the identified potential negative impacts are rated as of Medium Significance. Therefore, in order to reduce the significance from medium to low, it is recommended that the Proponent effectively implement mitigation measures. In order to maintain a low significance, the implementation of measures will need to be continuously monitored in order to reduce to impact to low and bring the impact under control.

It is, therefore, recommended that in the event of an ECC issuance, the following conditions may be appropriate to ensure minimal environmental impact for this project:

- All required permits, licenses and approvals for the proposed activities should be obtained as required.
- The Proponent complies with the legal requirements governing this type of project and its associated activities.
- All mitigations provided in this Report and the management action plans in the Draft EMP should be implemented and monitoring conducted as recommended.

- All the necessary environmental and social (occupational health and safety) precautions provided should be adhered to.
- Excavated/trenched and other project related disturbed areas on the site where construction activities have been completed should be rehabilitated, as far as practicable, to their original state.
- The monitoring of the implementation of mitigation measures should be conducted, applicable impact's actions taken, reporting done and recorded.
- Environmental (EMP) Compliance Monitoring should be conducted on a weekly basis during the construction phase by the project Safety, Health and Environmental Officer or an independent Environmental Consultant and bi-annually during the operational phase. Environmental Compliance monitoring reports should be compiled and submitted to the DEAF as per provision made on the MEFT/DEAF's Portal.

These recommendations are primarily aimed at improving environmental management, ensuring sustainability and promote harmonious co-existence of the project activities and the host biophysical and social environment.

REFERENCES

- Carstens, E. and Kuliwoye, E. (editors). (2012). Environmental Scoping Report and Management Plan for the proposed construction of a MTC Base Transceiver Station in Goreangab Ext. 3, Windhoek. Windhoek: Unpublished.
- Christelis, G. and Struckmeier, F. (editors). (2001). Groundwater in Namibia: An Explanation to the Hydrogeological Map. Windhoek: Ministry of Agriculture, Water and Forestry.
- Climate Data organisation (2021) website: <https://en.climate-data.org/africa/namibia/otjonzondjupa-region/grootfontein-2769/>
- Dierks, K. (2019). Namibia Telecommunications - Link to Africa: www.namibweb.com/namtel.htm
- Enviro Dynamics. (2015). Environmental Scoping Report for the Proposed Construction of a macro BTS site in Wanaheda, Windhoek.
- GCS Water & Environmental Consultants. (2017a). Environmental Scoping Assessment for the Proposed Construction of MTC Antennae in Rehoboth, Hardap Region. Windhoek.
- Integrated Environmental Consultants Namibia. (2011). Dealing with Climate Change: A community information toolkit on adaptation. Windhoek: Ministry of Environment and Tourism.
- International Commission on Non-Ionizing Radiation Protection (ICNIRP). (unknown date). Retrieved from: <https://www.icnirp.org/en/about-icnirp/aim-status-history/index.html>
- Kanchwala, H. (2018). Retrieved from Science ABC: scienceabc.com/innovation/cell-tower-work.html
- Legal Assistance Centre. (Unknown Date). A Publication of the AIDS Law Unit, Legal Assistance Centre. Windhoek: Legal Assistance Centre.
- Mendelsohn, J., Jarvis, A., Roberts, C. & Robertson, T., (2003). Atlas of Namibia. 2nd ed. Cape Town: David Philip Publishers
- Ministry of Agriculture, Water and Forestry. (2003). Characteristics of Namibian Soils in a Nutshell. Windhoek: Directorate of Agricultural Research and Training.
- Namibia Statistics Agency. (2011). Namibia 2011: Population and Housing Census Main Report. Windhoek: Namibia Statistics Agency.
- Namibia Travel Guide. (2010). Plants and Vegetation in Namibia. Cape Town, Western Cape Province, South Africa.
- National Radiation Protection Authority. (Unknown date). Atomic Energy Board of Namibia: Directive Issued Under Section 33 (3) of the Atomic Energy & Radiation Protection Act (No 5 of 2005) Relating to the Regulation of Sources of Non-Ionizing Radiation. Windhoek: National Radiation Protection Authority.