Environmental Impact Assessment

for

Service provision at Goreangab Extension 4, Windhoek, Khomas Region

NOVEMBER 2015

CITY OF WINDHOEK

2015

EXECUTIVE SUMMARY

Background

Goreangab Extension 4 (Ext 4), in Windhoek, Khomas Region has been identified as one of the sites for the pilot project of Massive Urban Land Servicing Project. This national project seeks to service about 200 000 plots country wide.

Goreangab Ext 4 has been declared to be an approved Township in 2002 as per Government Gazette No 2738, Notice No 74 dated 15 May 2002. No Environmental Impact Assessment was required legally, during those times, thus no EIA study was undertaken then.

However, development of a township in a greenfield area includes activities such as clearance of vegetation, provision of service infrastructure of roads, storm water, water reticulation, sewerage lines and electricity. These activities are listed in accordance with Government Notice No 29 of 6 February 2012, which requires that an Environmental Clearance Certificate (**ECC**).

Location Of Site

The proposed site is located between the existing Goreangab Extension 3 and the Goreangab Dam. The area covers approximately 15.8 ha and is neighbor to Otjomuise and Gammams Wastewater Treatment plants, Old Goreangab and WINGOG Water Reclamation Plants.

Current Land Use

The land is a green field which is not occupied. The land use activities provides for an integration of zonings ranging from 'residential', 'business', 'public open space', 'undetermined' and 'institutional', which can enable a quality of life in an urban area. Full municipal services will be provided.

Aproach To Study

The study is mainly based on desk top study and field visits.

Included is a public participation process which provides opportunities for stakeholders and the public at large to engage in the process and to make comment or express their concerns regarding the proposed project.

Public Participation

The Public were invited through newspaper adverts, stakeholders through e-mails and the draft report was placed on the City's Website.

Issues and Concerns Raised

Two I&AP's submitted their comments for the project. A newspaper article appeared in the New Era Newspaper which gives an indication that the draft report was accessed from the website.

CONSTRUCTION RELATED IMPACTS

- **NOISE AND VIBRATIONS**

  Noise and vibrations will also have an impact on animals such as birds and reptiles. Birds are known to abandon their nests if subjected to continuous noise.

- **LOSS OF BIODIVERSITY AND HABITAT DESTRUCTION**

  Various protected plant species were observed onsite and this might be destroyed/disturbed during the construction of services to the township. The clearing of vegetation to make way for the installation of services might also destroy the habitat that support the various forms of biodiversity in this area.

- **POLLUTION FROM CONSTRUCTION ACTIVITIES**

  There are various types of pollution associated with construction. The most important one is probably chemical pollution from oil spills resulting from the handling of various machineries used during the construction phase.

- **DUST**

  Dust might arise during the excavation of trenches were services will be layed. Activities such as the clearing of vegetation and levelling of land where the services such as roads, water and electricity will be constructed will also result in dust. This will especially be an issue during windy days.

- **EMPLOYMENT OPPORTUNITIES**

  The project will require manpower during the construction of services the township and will provide employment opportunities to the residents

- **SPREAD OF HIV/AIDS**

  The likely influx of labour to Goreangab Extension 4 area during the construction of services at the township may influence the spread of HIV / AIDS in the surrounding communities.

- **Solid Waste And Sewage**

  Failure to management waste properly will result in pollution and this might have a detrimental impact on the people's well-being and the quality of the environment, especially the nearby Goreangab Dam.

Environmental Management Plan

This EMP focuses on the mitigatory measures to improve future provision of sanitation services (water and ablution facilities) to residents of informal settlements in Windhoek.

Conclusions

All known environmental and social risks can be minimised and managed through implementing preventative measures and sound management systems.

Conservation of Goreangab Dam and environmental awareness programmes should be designed and undertaken with the residents at this site. The EMP should be used as an onsite tool during construction and operational phases and should be upgraded on a regular basis.

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BID	Background Information Document
CoW	City of Windhoek Municipality
DEA	Department of Environmental Affairs
EAPAN	Environmental Assessment Practitioners Namibia
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
EMD	Environmental Management Division
EMP	Environmental Management Plan
IAIAsa	International Association of Impact Assessment South Africa
I&APs	Interested and Affected Parties
MET: DEA	Ministry of Environment and Tourism's Directorate of Environmental Affairs
MULS	Massive Urban Land Servicing
ToR	Terms of Reference
UNFCCC	United Nations Framework Convention on Climate Change

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1. INTRODUCTION

1.1 Background

Goreangab Extension 4 (Ext 4), in Windhoek, Khomas Region has been identified as one of the sites for the pilot project of Massive Urban Land Servicing (**MULS**) Project. This national project seeks to service about 200 000 plots country wide.

The urgency and the importance of the MULS as a national initiative to address the pressing housing issue cannot be emphasised more than what has been stated by the head of state, hence the effort by national government to service this area under the MULS as a pilot project. This urgency necessitates the need to expedite all statutory procedures, including Environmental Clearance Certificate to ensure delivery of serviced erven by the set times.

Goreangab Ext 4 has been subdivided into portion 23 and remainder in the 1997 and Established as a Township in 1998. It has been declared to be an approved Township in 2002 as per Government Gazette No 2738, Notice No 74 dated 15 May 2002. Copies of the certificate and gazette, is attached as Annexure A. However, layout plan that has been amended by extending the Independence Avenue to improve the overall traffic conditions, will not need Township Board approval.

No Environmental Impact Assessment was required legally, during those times, thus no EIA study was undertaken then.

However, development of a township in a greenfield area includes activities such as clearance of vegetation, provision of service infrastructure of roads, storm water, water reticulation, sewerage lines and electricity. These activities are listed in accordance with Government Notice No 29 of 6 February 2012, which requires that an Environmental Clearance Certificate (**ECC**) be obtained from Department of Environmental Affairs (**DEA**), hence requiring an Environmental Impact Assessment (**EIA**) to be conducted.

This project has been registered with DEA on 20/08/2015. Proof of this documents is attached to in Annexure E.

1.2 Purpose of EIA

The EIA study serves to determine, analyse and present the environmental impacts (positive and negative) of a proposed development project and associated infrastructure, formulate remedial measures to mitigate the negative impacts and plan in such a way that enables a rational decision to be made regarding the implementation and management of the proposed project. The EIA further

contributes to the reduction or mitigation of adverse impacts by generating a number of project alternatives for the proposed developments. In general, the purpose of the EIA is to anticipate and prevent, minimise and/or manage, potential significant negative impacts on development that may:

- Cost too much money to rectify in future,
- Pose risk to lives, livelihood or health or current and future generations,
- Help to seek opportunities to optimise potential benefits of development.

The CoW, as a Local Authority is committed to enhance positive biophysical and social environmental impacts of the project while mitigating negative impacts of the project.

Therefore, this EIA Report has been prepared with a view to comply with Namibia's Environmental Assessment Policy of 1995, the Environmental Management Act No 7 of 2007 (Section 27(2)(a), Government Notice No 29 of 2012 for Listed Activities and EIA Regulations.

The EIA is being undertaken by the CoW officials within the Environment Management Division (EMD).

1.3 Terms of Reference

The terms of reference are inferred from the requirements of the Environment Impact Assessment Regulations (Government Notice No 30 of 2012), to enable an application for ECC with the Environmental Commissioner, as required by Section 27(3) of the Environment Management Act (No 7 of 2007).

The objectives of this study is to apply for an ECC as per the requirements of the Environmental Management Act (Act No 7 of 2007).

1.4 Limitations

As mentioned before, Goreangab Ext 4 has been proclaimed in 2002 as a Township as per Government Gazette No 2738. This study looks only at the assessment of service provision infrastructure of roads, water reticulation, sewerage system and electricity. The EIA is mainly based on desktop studies.

1.5 Structure of the Report

The outline of this report is presented below:

Executive Summary : Provides an overview of the main findings of the study.

Section 1 : Provides the introduction which includes background to study, terms of reference, purpose of EIA, limitations of the study and structure of the report.

Section 2 : Gives an overview of the study area.

Section 3 : Provides an overview of the key legislation having an implication of activities associated with the proposed development.

Section 4 : Describe the type of project, the layout plan and activities that will be undertaken to provide the services on site.

Section 5 : This summarises the framework for environmental management in Namibia, the EIA process and methodology followed as part of the Scoping Study.

Section 6 : Provides a description of the environment.

Section 7 : Describe the public consultation process followed as part of the study.

Section 8 : This section describes and assesses the potential impacts of the proposed development and mitigation measures relevant to construction and operation.

Section 9 : Provides management plan for the impacts the project will have; Roles and responsibilities of stakeholders involved in the implementation of the environmental plan during construction and operation is also described.

Section 10 : Conclusions are provided here.

Section 11 : provides a list of documents reviewed.

2. LOCATION OF SITE

The proposed site is located between the existing Goreangab Extension 3 and the Goreangab Dam. The area covers approximately 15.8 ha. The residential area drains away from the dam in the direction of the New Otjomuise Reclamation Works.

Its Southern border runs through the dam's centre line. The Western section of the township comprise of a number of land uses. All are existing activities presently accommodated on portions of townlands, including the Otjomuise and Gammams Wastewater Treatment plants, Old Goreangab and WINGOG Water Reclamation Plants and various portions leased to youth groups and NGO's.

Figure 1. Google map indicating location of Goreangab Ext 4, Township.

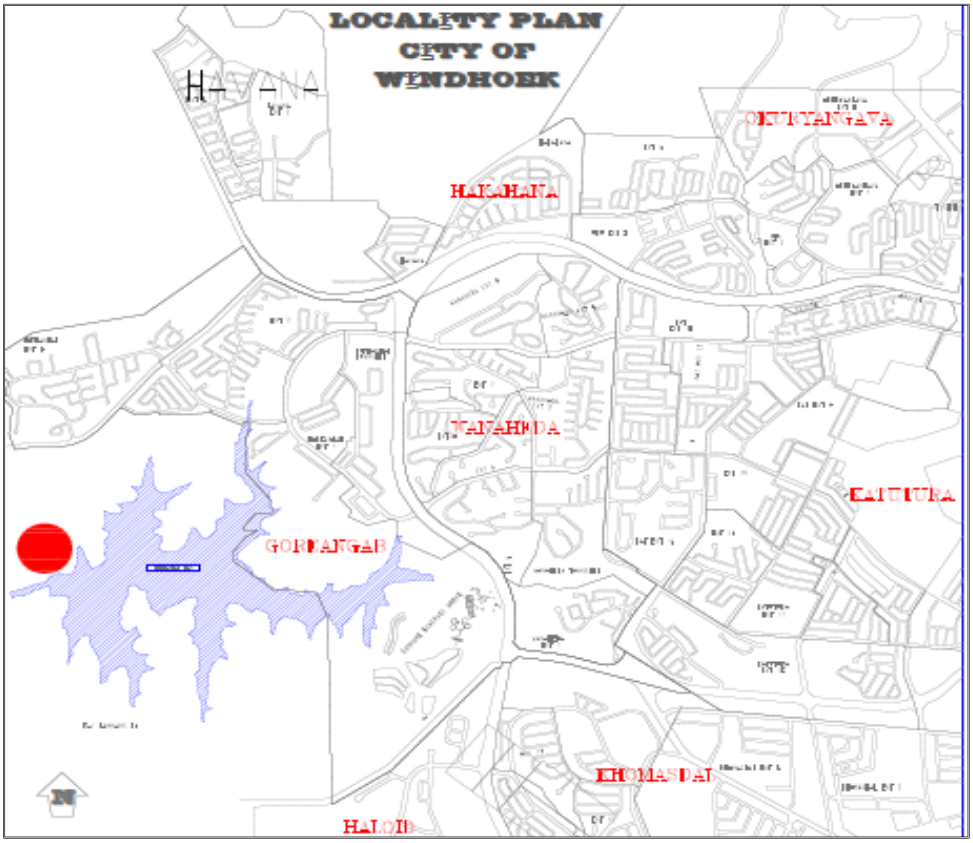

Figure 2. Locality Map indicating Location of Goreangab Ext 4, Township.

3. LEGAL FRAMEWORK

3.1 Required Legislation

Table1. Legal environmental Framework of the Project.

LEGISLATION	PROVISIONS	PROJECT IMPLICATION
NATIONAL LEGISLATION		
The Constitution of the Republic of Namibia (1990)	The articles 91(c) and 95(i) commits the state to actively promote and sustain environmental welfare of the nation by formulating and institutionalising policies to accomplish the sustainable objectives which include: - Guarding against overutilization of biological natural resources, - Limiting over-exploitation of non-renewable resources, - Ensuring ecosystem functionality, - Maintain biological diversity.	Through implementation of the environment management plan, the proponent shall be advocating for sound environmental management as set out in the Constitution.
Environmental Management Act (No 7 of 2007) and Namibia's Environmental Assessment Policy (1995)	Schedule 1: Screening list of policies/ plans/programme/ project subject to full Environmental Assessment. "The rezoning of land from use for nature conservation or zoned open space to any other land use". (Ministry of Environment and Tourism (MET), Directorate of Environmental)	An Environmental Impact Assessment is compulsory.
Pollution Control and Waste Management Bill	This Bill serves to regulate and prevent the discharge of pollutants to air and water as well as providing for general waste management. This Bill will license discharge into watercourses and emissions into the air. The Bill also provides for noise, dust or odour control that may be	

	considered a nuisance.	
Forest Act, 2001 (Act No. 12 of 2001)	Provision of the protection of various plant species (Ministry of Agriculture, Water and Forestry (MAWF), Directorate of Forestry).	A Harvesting Permit needs to be acquired from the Directorate of Forestry for the removal of indigenous certain tree species from the site
Townships and Division of Land Amendment Act, 1992 (Act 28 of 1992)	"(I) Whenever any area of land constitutes, by reason of its situation, a portion of an approved township, or adjoins an approved township, the Executive Committee may, by proclamation notice in the Gazette and after consultation with the Board, extend the boundaries of that township to include such area". (Minister of Regional and Local Government).	A new township needs to be created for approval by the Namibian Planning Advisory Board and the Township Board.
Water Resources Management Act, 2013 (Act No. 11 of 2013)	This Act provides for the management, protection, development, use and conservation of water resources and the regulation and monitoring of water services and to provide for incidental matters. (Department of Water Affairs).	Developers need to develop a satisfactory plan for sewerage disposal and water demand management.
LEGISLATION	**PROVISIONS**	**PROJECT IMPLICATION**
Soil Conservation Act 76 of 1969	Prevention and combating of soil erosion, conservation, improvement and manner of use of soil and vegetation, and protection of water sources. (Ministry of Environment and Tourism).	Removal of vegetation cover is to be avoided and minimized at all costs.
National Heritage Act 27 of 2004	Heritage resources to be conserved in development. (National Heritage Council of Namibia).	Immediately inform the National Heritage Council of Namibia should any archaeological material e.g. graves be found during the

		construction phase. The site should be cleared for archaeological potential before construction may commence.
LEGISLATION	**PROVISIONS**	**PROJECT IMPLICATION**
Labour Act (No 11 of 2007)	135 (f): "the steps to be taken by the owners of premises used or intended for use as factories or places where machinery is used, or by occupiers of such premises or by users of machinery in connection with the structure of such buildings of otherwise in order to prevent or extinguish fires, and to ensure the safety in the event of fire, of persons in such building;" (Ministry of Labour and Social Welfare).	The Act specifies the measures to be taken to secure the safety and the preservation of the health and welfare of employees at work.
Convection on Biological Diversity (CBD)	Namibia is obliged under international law to conserve its biodiversity.	Projects should refrain from causing any damage to the country's biodiversity.
Convection to combat Desertification	Namibia is bound to prevent excessive land degradation that may threaten livelihoods.	This is a general requirement to be considered in all projects.
LEGISLATION	**PROVISIONS**	**PROJECT IMPLICATION**
LOCAL AUTHORITY BY-LAWS		
Sewerage and Drainage Regulations (amendments) Local authorities Act, section 23, 1992	Affords the prevention of pollution and environmental damage caused by the improper construction of sewerage and water pipelines in drainage lines. (City of Windhoek).	Provides guidelines for the proper construction of pipelines in drainage lines.

Waste Management Regulations for Windhoek Municipality (16 of 2011)	The Act stipulates measures that must be taken by builders in respect of builders waste. Builders waste is defined as waste generated during the building, construction, repair, alteration, renovation, excavation or demolition of any road, surface, structure, building or premises, including builders rubble, earth, vegetation and rock displaced during such building, construction, repair, alteration, renovation, exaction and demolition. The provisions relate to the collection, depositing, storage and transport of such waste.	The proponent should ensure that building contractors adhere with all the requirements of the Act.
Windhoek Environmental Structure Plan (2004)	It indicates all sensitive and environmentally fragile zones that should be conserved and protected. These areas should be considered with great care and when planning for any development project. The document is mainly helping in applying sound environment planning and management (Section 3.3.1, page 60). (City of Windhoek)	Only strategic service developments should be allowed after environmental impact assessment.
Windhoek Town Planning Scheme (2005)	Allowed activities under "Residential Building" and "Residential Unit".	"Any person intending to erect a building in any use zone may be required by Council to furnish an environmental assessment report having regard to the promotion of health, safety, order, amenity, convenience and general welfare and the impact the new buildings and the operations are likely to have

		on the amenity of the locality".
Noise Control Regulations	It is essential to ensure that before any development project is approved and undertaken, an assessment or evaluation of expected noise level is done and it should be done in accordance with the City of Windhoek Noise Control Regulations.	
Groundwater Protection Regulations	The draft Ground Water Resources Management 24 of 2004 provides more specific procedures for water abstraction permitting that are much more tailored to Namibias Climate and geo-hydrology that the Water Act of 1956.	

3.2 Listed Activities in terms of NEMA

The Environmental Management Act 7 of 2007 is the primary custodian of the environment and therefore focusses on the management of environmental resources and accordingly, identifies activities that require authorisation prior to commencement. The proposed facility entails a number of listed activities as listed in Table 2.

Table 2. Environmental Requirements of the Project Activities.

Activity	Description of Activity	Activity Triggers
Section 4. Clearance of vegetation	- Clearing of bushes to pave way for development .	- Bushes and trees would be cleared to pave way for installation of municipal service infrastructure.
Section 10.2 Construction of roads	- Construction of access roads.	- Construction of roads forms part of municipal services infrastructure.
Section 10.1 (a),	- Construction of water reticulation and	- Construction of storm water system which forms part of

storm water	sewerage pipelines.	roads constructions forms part municipal services infrastructure.
Section 10.1 (a), water reticulation	- Construction of water reticulation and sewerage pipelines.	- Construction of water reticulation forms part of municipal services infrastructure.
Section 10.1 (a), sewerage lines	- Construction of water reticulation and sewerage pipelines.	- Construction of sewerage lines forms part of municipal services infrastructure.
Section 1 (b), Electricity	- Electricity supply to the development.	- Installation of electricity system, forms part of municipal services infrastructure.

4. DESCRIPTION OF PROJECT

4.1 Ownership and Status of Land

Goreangab Extension 4 has been established and proclaimed as a Township in 1998 and 2002 respectfully. This land is owned by Windhoek Municipal Council.

As mentioned before, assessment will look at the impacts of the construction and operations of the service infrastructure. The area is not inhabited by anyone. However vegetation clearance of land is evident.

Picture 1. Cleared vegetation at Goreangab Ext 4, Township. (Picture by CoW, 10/2015)

4.2 Project Rationale

The urgency and the importance of the MULS as a national initiative to address the pressing housing issue cannot be emphasized more than what has been stated by the Head of State, hence the effort by national government to service this area under the MULS as a pilot project.

It is believed that the need and desirability to service land to enable provision of housing is clear and evident. The line Ministry as the custodian of this national initiative communicated clear directives to all relevant parties to contribute towards the successful implementation of this project within the set times. Environmental Clearance Certificate for service provision being one of them.

Amendments to the existing cadastral plans is required to suit with the proposed development interventions, this not only to ensure successful implementation of the project but to contribute to improving the quality of life for the residents of Windhoek.

The extension of Independence Avenue will improve the overall traffic flow conditions in this part of the City as well as enhance economic opportunities to the proposed developments. Making provision for the alignment requires

changes to be made on Goreangab Extension 4 layout (MULS project area) to further improve accessibility and the general harmonious setting of the layout.

The principal importance of safety and compliance to the general norms of partitioning the interfacing of pedestrian access off roads of this particular hierarchy was given priority.

The alignment of Independence Avenue and the consequent cadastral changes will create coordination with the Waterfront development south of the MULS project as well as other existing developments and future growth in the north western direction.

The redesign of the layout also makes provision for an integration of high density housing opportunity to meet with the existing high demand of housing. It should however be noted that more intervention should be encouraged with the housing structure to accommodate space sharing and high density housing.

Full services will be installed, including a water borne sewerage system to drain in the direction of the New Otjomuise Wastewater Treatment Plant.

4.3 Land Use

4.3.1 Surrounding Land Use

The proposed site is located between the existing Goreangab Extension 3 to the north and the Goreangab Dam to the south. The area covers approximately 15.8 ha.

Ground has been left open near the dam for recreational and conservation purposes. The border of the conservation area runs along a clear ridge and water shed. The residential area drains from the dam in the direction of the new Otjomuise reclamation works.

The western section of the township comprises a number of land uses. All are existing activities presently accommodated on portions of townlands, including the Otjomuise Wastewater Treatment Works, Old and New Windhoek Goreangab Reclamation Plants and various portions leased to youth groups and NGO's.

To the eastern section is the Goreangab Waterfront Township, that proposed mixed use of low income housing, institutions, business and recreational area.

This site is surrounded by formal and informal settlements to the north west.

Picture 2. Informal Settlements to the North West of Gorenagab Ext 4, Township. (Picture by CoW, 10/2015).

4.3.2 Current Land Use

The land is a green field which is not occupied.

Picture 2. Unoccupied Greenfield at Goreangab Ext 4, Township. (Picture by CoW, 10/2015).

4.3.3 Proposed Land Use as per Notice No 74

The proposed land use as per Government Gazette No 2738, Notice No 74 dated 15 May 2002 includes a total of 338 residential erven with provision for business, institutional and recreational facilities and service provision.

4.3.3.1 Erven

The following new land uses are proposed:

- More or less 338 residential erven will be created, with the provision for business, institutional (a school and crèche on site) and recreational facilities.

- Open space near the dam will be used for recreational and conservation purpose.
- A buffer conservation area between the dam and the residential area will remain undeveloped and left for recreational and sustainable income generating opportunities.
- However, small scale business opportunities such as home shops and home occupation will be allowed and supported through relevant council policies.

4.3.3.2 Proposed Service Infrastructure

i) Water

A water reticulation system with accordance to City Policies and guidelines will be constructed. All erven will be provided with individual water connection points.

ii) Sewer

A sewerage system will be provided on a Municipal zoned erf to accommodate the line accordingly. Extensions of the sewer network to enable individual connections will also be made. Residential erven have been kept 500m away from Otjomuise Water Care Works. This is to avoid possible smells and flies in residential area.

iii) *Streets*

Access to the planned Goreangab Extension 4 may be obtained from Matshitshi Street. Matshitshi Street is an existing major access road which runs between the existing Goreangab Extension 3 and the planned Extension 4.

iv) Electrical services

An electrical system will be constructed to accommodate individual connections.

v) The Layout Plan

The proposed Layout Plan No P/GORA-/S for Goreangab Ext 4, Township is attached in Annexure D.

4.3.4 Proposed Amended Land Use

The proposed route of independence starts off at the intersection of Otjomuise Road and Eveline Street and runs through the waterfront developments across the township area of Goreangab Extension 4 including the portion which was allocated for servicing via the MULS project.

The road alignment across affects the exiting cadastral plan of the established township hence necessitates the redesign of the area as outlined as follows and depicted on the amended layout No P/GG/S as attached in Annexure D.

- Reservation of a 30 metre road reserve connecting directly to Matshitshi Street over a stretch of ± 200 metre and totals to 6 124 m² in extent; and

- A total of five (5) streets, namely Omuse, Ohama, Omukuku Streets, a portion of Muhato Street and a portion of Kharos Street (± 450 metre in length, totaling 4 700 m² in extent).

The closure of street portions necessitates the need to amend the layout design to allow for sufficient access and harmonious layout design.

Erven affected by the proposed road alignment which need to be amended on the approved General Plan of Goreangab Extension 4 are as follows:

- A total of one hundred and nine (109) single residential erven ranging from Erven 2888 to 3008; and Erven 3156 to 3182. The erven are 36 955m² in extent, which is about one third of the total area identified for the MULS development.

5. APROACH TO STUDY

The EIA process will comply with Environmental Management Act 7 of 2007. Diagram 1, below sets out the impact assessment process that will be followed. The EIA will review the potential impacts and benefits associated with the development.

The objectives of the EIA study are to:

- Identify the key environmental issues associated with the project concept of the proposed development.

- Put forward mitigation measures of key environmental issues identified that need to be considered during the intended development.

The study is mainly based on desk top study and field visits.

Included is a public participation process which provides opportunities for stakeholders and the public at large to engage in the process and to make comment or express their concerns regarding the proposed project. This public participation process component is fundamental to the impact assessment process and is an important informant to decision-making. An EMP, which will address environmental management statements for all the phases of the project, will form an integral part of the EIA Report.

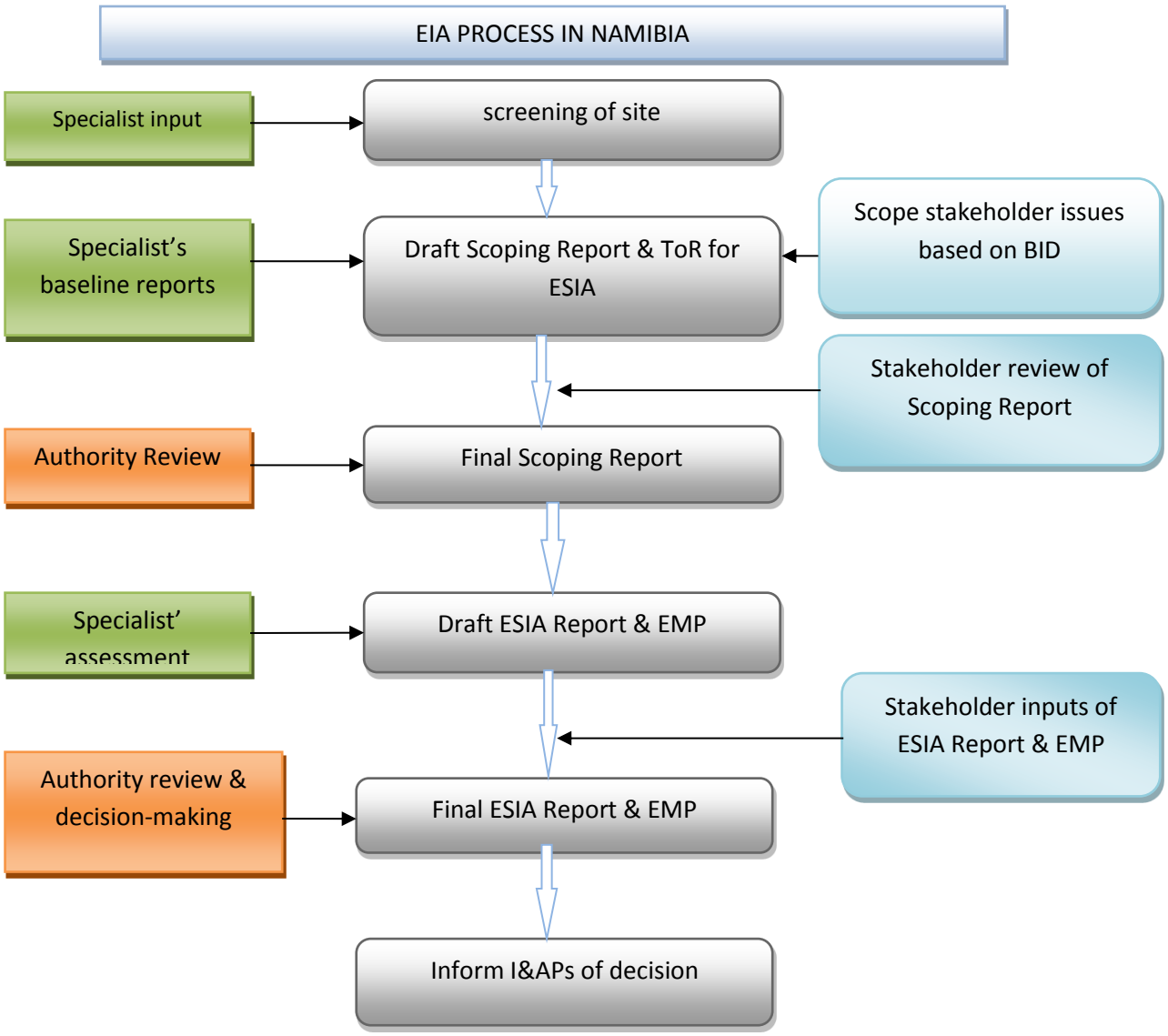

Diagram 1: EIA process

6. THE AFFECTED ENVIRONMENT

6.1 Physical Environment

6.1.1 Climate

Classification of climate Semi-arid highland savannah (0.2 0.5 p/pet). Climate is classified as subtropical stepper (low latitude dry) with a subtropical thorn woodland biozane.

Average rainfall 300-350 mm per year

Average Evaporation: Evaporation in the area is averaged 3000 to 3200 mm.

Precipitation Sporadic and unpredictable, high intensity, highly localised storm events between October and April.

Temperature During the hottest month of the year, which is mainly December, the average maximum temperature is about 30-32 °C. During July which is the coldest month the average minimum temperature is 4-6 °C.

Humidity The relative humidity during the least humid months of the year (i.e. September and October) is around 10-20% and the most humid month is March with 70-80% humidity. Namibia has a 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 increases the rate of evaporation.

Wind direction Predominantly south easterly. Southerly, easterly and northerly airflow is common. The Goreangab Catchment is subject to erratic winds and considerable discrepancies in spite of short distances, due to the hilly terrain (Holm, 1996).

6.1.2 Topography

The landscape in the area is classified as being in the Khomas Hochland Plateau, which is characterised by rolling hills. The site is located within the catchment of the Goreangab dam. The site itself is hilly.

Picture 4. The Hilly Goreangab Ext 4. (Picture by CoW 10/2015)

Proper drainage systems should be developed at the site to control the flow of surface water, in order to avoid flooding. Storm water management should form part of the engineering.

The Goreangab Dam catchment is described as hilly, particularly around the southern catchment borders. The catchment runs in a north-south direction. The Auasberg range is the highest and most distant portion of the catchment (2 330 m.a.s.l), and Goreangab Dam is the lowest section at 1572 m.a.s.l. The Gammams River is the main river, which dissects the catchment. The highest contour point is 1639 at the last row erven, while the contour just next to dam is 1591. This indicate that there is a steep hill between the last row of erven and the dam.

Picture 5. Goreangab Dam Catchment (Google Map)

This picture shows the rivers that feed the dam and those that exit the dam.

6.1.3 Geology and Soils

The geology of the central Namibian region is dominated by the Damara Sequence. The site is underlain by pre-cambrian aged meta-sedimentary strata of the Kuiseb

Formation of the Damara Sequence. The Kuiseb Formation comprises of a more than 6000m thick succession of mica schist, graphitic schist, marble and quartzite. The main rock type is identified as biotite schist, but with minor strata of micaceous quartzite, feldspathic schist and amphibole schist (Labuschagne, 2004, and Mendelsohn, et al, 2002).

Picture 6. Rocks at Goreangab Ext 4, Township (Picture by CoW, 10/2015)

Picture 7. Dominating Rock on Goreangab Ext 4 Township (Pic by CoW, 10/2015)

The soil cover in the study area is largely shallow and has been derived from the underlying lithologies and is classified as 'leptosol' (Mendelsohn, et al 2002) referring to shallow soil cover over hard rocks. 'Leptosol' dominate the entire project area.

Along the larger drainages, such as the ephemeral Gammams and Aretaragas rivers, alluvial deposits have developed.

6.1.4 Surface Water

Goreangab dam with the capacity of 3.6 Mm3, was constructed in the Gammams River in 1958, with the purpose of supplementing the supply of water to the City. The production from this source was very reliable due to the fact that the dam has a very large catchment and the run-off in the catchment area is good.

With the mushrooming of informal settlements with poor sanitation of which most are situated at the source of runoff, storm water system connecting the catchment and the leaking sewerage system that is constructed within the river systems that connects to the catchment, Goreangab water has deteriorated to a point where it can no longer be utilised for human consumption. The areas downstream of Goreangab Dam have shown sign of pollution.

The dam water is polluted with untreated sewerage and show faecal and metal pollution.

The use of the dam for recreational purpose e.g. swimming can lead to health problems on direct swallowing because of the presence of infectious microorganism.

Polluted water quality indicates that the fish and other aquatic organisms are likely to be contaminated with pollutants and consumption of any fish or other organisms from this dam should be avoided.

6.1.5 Ground Water

Goreangab Ext 4 lies mainly to the North of Goreangab Dam within the Goreangab Catchment. Groundwater potential is unknown in the area of Goreangab dam. There are no boreholes around Goreangab dam according to CoW. Groundwater information is based on the geology.

Elsewhere, such as in the Brakwater area, boreholes in the fractures Kuiseb Schist have low yield and often saline. Hence the area does not fall within the Windhoek aquifer which is towards the South and forms part of the brittle formation quartzite.

The underlying fractured Kuiseb Formation schist is recharged through leakage from saturated alluviam or directly from the dam and is therefore also presumably polluted in the area (Humphrey, 2010). Futhermore, it can be postulated that the water soluble constituents infiltrate into the river alluvium and mix with groundwater in the mica schist.

6.2 Biophysical Environment

6.2.1 Flora

In the central highlands the vegetation is classified as highland savanna and comprises a number of Acacia species and numerous species of perennial thorn trees in the valleys and shrubs and grass on the steep slopes (Lawrence, 1971).

According to Giess (1971), highland savanna vegetation type, is mainly characterised by trees such as *Combretum apiculatum* and Acacia species (such as *Acacia reficiens, A. hereroensis, and A. erubenscens*). The grass in this vegetation type mainly comprises of the climax grasses such as *Anthephora pubescens, Brachiaria nigropedata, Digitaria eriantha* and many other species.

Picture 8. *Acacia reficiense* and *Acacia hebaclante* observed on Goreangab Ext 4 (Pic by CoW, 10/2015)

Picture 9. *Acacia karroo* observed on Goreangab Ext 4 (Pic by CoW, 10/2015)

The following table indicates the trees and shrubs known and/or expected to occur in the project area. Their protection status is indicated (As listed in the Forestry Act).

Table 3 : Common plant species expected to occur in the study area and the ones observed.

Species	Common name	Status	Observed
Acacia erioloba	Camel thorn	Protected	√
Acacia mellifera	Black thorn		√
Acacia reficiens	False umbrella thorn		√
Acacia haematoxylon	Grey camel thorn	Protected	
Acacia erubescens	Blue thorn		√
Acacia karroo	Sweet thorn		√
Acacia tortolis	Umbrella thorn		√
Acacia hereroensis	False hook-thorn		
Commiphora tenuipetiolata	White-stem corkwood		
Aloe littoralis		(Protected: nature conservation ordinance)	
Ozoroa crassinervia	Namibian resin tree	Near endemic, protected	
Boscia albitrunca	Shepherd's tree	Protected	
Albizia anthelmintica	Worm-bark false-thorn	Protected	√
Ziziphus mucronata	Buffalo-thorn	Protected	
Catophractes alexandri	Trumpet thorn		√

Species	Common name	Status	Observed
Combretum apiculatum	Red bush willow		
Commiphora dinteri		Endemic	
Commiphora glandulosa	Tall common corkwood		
Commiphora glaucescens	Blue-leaved corkwood	Near-endemic	
Croton gratissimus	Lavender fever-berry		
Cyphostemma bainesii		Endemic, protected	
Dichrostachys cinerea	Sickle bush		√
Diospyros lycioides	Blue bush		
Dombeya rotundifolia	Common wild pear	Endemic	
Ehretia alba			
Elephantorrhiza suffruticosa			
Euclea pseudebenus	Ebony tree	Protected	
Euclea undulata	Common guarri		
Euphorbia guerichiana	Western woody milk bush		
Euphorbia virosa			
Ficus cordata	Namaqua fig	Protected	
Ficus ilicina	Laurel fig		
Ficus sycomorus	Common cluster fig	Protected	
Grewia bicolor	White raisin		
Grewia flava	Velvet raisin		
Grewia flavescens	Sand paper raisin		

Species	Common name	Status	Observed
Gymnosporia senegalensis	Red spike-thorn		
Ipomoea adenioides			
Lycium bosciifolium			
Lycium cinereum			
Lycium eenii			
Lycium hirsutum			
Lycium villosum			
Maerua juncea			
Maerua schinzii	Ringwood tree	Protected	
Manuleopsis dinteri		Endemic	
Melianthus comosus			
Obetia carruthersiana		Near endemic	
Pechuel-Loeschea leubnitziae			√
Sterculia africana	African star-chestnut	Protected	
Tarchonanthus camphoratus			
Tetragonia schenckii			
Vernonia cinerascens			
Searsia (Rhus) ciliata			
Searsia (Rhus) lancea	Karree	Protected	
Searsia (Rhus) marlothii			

The following are the protected tree and shrub species listed in the Forestry Act known and/or expected to occur in the general area of the project area.

- Albizia anthelmintica (Worm-bark false-thorn)
- Acacia haematoxylon (Grey camel thorn)
- Euclea pseudebenus (Ebony tree)
- Maerua schinzii (Ringwood tree)
- Sterculia Africana (African star-chestnut)
- Ficus cordata (Namaqua fig)
- Ficus sycomorus (Common cluster fig)
- Boscia albitrunca (Shepherd's tree)
- Ozoroa crassinervia (Namibian resin tree)
- Searsia (Rhus) lancea (Karree)
- Ziziphus mucronata (Buffalo-thorn)
- Acacia erioloba (Camel thorn)

Vegetation density around the dam is higher than in other parts of the catchment, due to the availability of water. Many of the trees and have been cut down and the most parts of the site towards Matsisti street has been cleared of vegetation.

Picture 10. Dense Vegetation (reeds and grasses) around Goreangab Dam (Picture by CoW, 10/2015)

6.2.2 Fauna

Mammals

There is at least 250 species of mammals in Namibia. Currently 14 mammal species are considered endemic to Namibia of which 11 species are rodents and small carnivores of which very little is known. The most common endemic mammals include the rodent family Petromuridae (Dassie rat) and the rodent genera Gerbillurus and Petromyscus.

The following table indicates mammal species were known and/or are expected to occur in the general area surrounding the project area.

Table 4. Known and expected mammal species in the project area (CoW, 2014)

Scientific name	Common name
Atelerix frontalis angolae	Southern African Hedgehog
Manis temminckii	Ground Pangolin
Proteles cristatus	Aardwolf
Lepus capensis	Cape Hare Secure
Lepus saxatilis	Scrub Hare
Parahyaena (Hyaena) brunnea	Brown Hyena
Crocuta crocuta	Spotted Hyena

Scientific name	Common name
Acinonyx jubatus	Cheetah
Panthera pardus	Leopard
Caracal caracal	Caracal
Felis silvestris/lybica	African Wild Cat
Felis nigripes	Black-footed Cat
Genetta genetta	Small Spotted Genet
Suricata suricatta marjoriae	Suricate
Cynictis penicillata	Yellow Mongoose
Galerella sanguinea	Slender Mongoose
Otocyon megalotis	Bat-eared Fox
Vulpes chama	Cape Fox
Canis mesomelas	Black-backed Jackal
Mellivora capensis	Honey Badger/Ratel
Ictonyx striatus	Striped Polecat
Equus zebra hartmannae	Hartmann's Mountain Zebra
Phacochoerus africanus	Common Warthog
Tragelaphus strepsiceros	Greater Kudu
Alcelaphus buselaphus	Red Hartebeest
Oryx gazella	Gemsbok
Sylvicapra grimmia	Common Duiker
Antidorcas marsupialis	Springbok
Raphicerus campestris	Steenbok
Oreotragus oreotragus	Klipspringer

Birds

Namibia has about 658 species of birds (Barnard, 1998). High diversity of bird species in the study are is expected to occur in river courses. The highland savanna in which the study area is, have relatively high diversity of birds. This is probably because of the fact that the highland savanna vegetation type is at the interface of the Kalahari to the east, Karoo to the south, thorn bush savanna to the north and escarpment to the west. Birds from all these biomes and vegetation types occur around the highland savanna. More than 230 species of birds are expected to occur in the study area (Barnard, 1998).

Bird species of conservation importance expected to occur in the area include the following species which are endemic to Namibia:

- *Pternistis hartlaubi* (Hartlaub's Spurfowl)
- *Tockus monteiri* (Monteiro's Hornbill)
- *Tockus damarensis* (Damara Hornbil)
- *Phoeniculus damarensis* (Violet Wood-Hoopoe)
- *Poicephalus rueppellii* (Rüppell's Parrot)
- *Agapornis roseicollis* (Rosy-faced Lovebird)
- *Eupodotis rueppellii* (Rüppell's Korhaan)
- *Lanioturdus torquatus* (White-tailed Shrike)
- *Parus carpi* (Carp's Tit)
- *Achaetps pycnopygius* (Rockrunner)

Amphibians

According to Griffin (1998) only anuran amphibians (frogs and toads) are found in Namibia. Namibia has about 50 frog species on record. The dependence of frogs to surface water for breeding limits most species of frog in Namibia to the five perennial rivers and more reliable seasonal sources. Despite this many species in Namibia are arid-adapted and occur throughout the country. About 9-12 species of frogs is expected to occur in the study area (Griffin, 1998).

Amphibian species expected to occur in this area include the following species of conservation importnce:

Poyntonophrynus (Bufo) hoeschi Hoesch's (Pygmy Toad) -Endemic

Phrynomantis annectens (Marbled Rubber Frog)- Endemic

Pyxicephalus adspersus (Giant Bullfrog)- Near threatened

Reptiles

There are about 261 species (56% of the Southern African region's species diversity) of reptile expected to occur in Namibia (Barnard, 1998). 71-80 species of reptiles are expected to occur in the project area (Barnard, 1998).

6.3 Socio-Economic Environment

6.3.1 Demographics

The total population in Khomas Region is estimated to be 342 141 with 172 469 females and 169 672 males (NPC, 2011). Ninety five percent (95%) of population 325 858 people lives in Windhoek.

The estimated unemployment rate in Khomas Region is 27.7% (NSA, 2013). The population density in the Khomas Region is 6.8 persons per km^2. The life expectancy in Khomas Region is 50 years for females and 48 years in males (NPC, 2005).

Windhoek is experiencing the highest rural-urban migration rate in Namibia. The harsh reality is that the population in informal settlements has grown from 28,000 to 48,183 amounting to 9.46% growth in the informal settlements since Namibia's independence in 1990 until the year 2001 (CoW 2005).

The increase in present Windhoek population can be attributes to a number of factors such as job opportunities, better healthcare facilities, better primary and secondary education.

6.3.2 Housing

Housing structures within Khomas region and in particular the surroundings of Goreangab Ext 4, consist of both permanent and non-permanent infrastructure.

In Windhoek, the elite suburbs with large residential houses lie within the east; to the south and southwest, one mainly finds the middle-income group; while to the north the low income group.

The north western area of greater Windhoek is where the majority of informal housing is located and much of the growth is taking place (Nakanyete, 2009). The annual growth rate in this area is approximated to be in excess of 9 % with an average household size of 4.6 (1995 – 2006) for the Goreangab area (Table 1) (CoW, 2006). During the period of 1991 – 1999 Windhoek developed a number of formal

low cost housing schemes (World Bank & AFTU, 2002). However, the serviced plots provided were unaffordable to the vast majority of the city's poor (Nakanyete, 2009).

In the independent household survey (Informal Settlement EIA, 2014) researched by the Greenwell Matongo C community, which resides west of Goreangab Extention 4 revealed the population demographic results shown in Table 5.

Table 5. Household survey results from Greenwell Matango C west of Goreangab Ext 4 (CoW, 2014)

Household Information	Figures
Total Population	1377
Average household size	4.6
Average Income (N$)	1240.62
Average affordable municipal expenses (N$)	285
No. of Shack dwellers	93.31%
Monthly income bracket	
N$ 1-600	22.41%
N$ 601 -1200.00	47.83%
N$ 1, 201.00	29.77%
No of Shacks	93.31%
Rented Rooms	6.69%
Development Needs	
Water	22.07%
Better housing	71.24%
Require Own land	6.69%
Electricity	49.16%
Sanitation (toilets)	32.11%
Occupation	
Domestic	7.55%
Formal Sector	9.51%
Self Employed	8.13%
Unemployed	43.28%
Pensioner	0.44%
Children (less than 18 yrs old)	13.14%
Students (over 18 yrs old)	17.94%

6.3.3 Employment, Economic Activities and Expenditure

Windhoek, the capital city of Namibia is situated in the Khomas region. In addition Khomas region is the strongest of all fourteen regions in terms of finance, non-tradeable, manufacturing, transport and government services located in one region. Seventy percent (70%) of the economically active are employed while the remaining 30% are unemployed (NPC, 2011). The main source of income for over half 73% of the population living in Khomas region is most commonly derived from salaries and wages. Non agri-bussiness is the second highest source of income of 14%, whereas the remaining population rely on Cash Remittance (5%), Old Age Pension (4%) and other 1% (Namibia Statistics Agency, 2013).

In the Greenwell Matango Settlement which is the nearest settlement, the main source of income is formal sector (9.51%). Self-employment (8.13%) is the second largest followed by domestic (7.55%) and old age (0.44), whereas 43.28% is unemployed.
According to the household survey of CoW (2014), the average total number of dollars that a community member can afford on a monthly basis is N$ 284.77. Of the survey participants, 44 (14.72%) use firewood, 37 (12.37% use gas and 218 (72.91%) use paraffin for cooking purposes. Five of the members produce clothing, 40 produce local food and 32 sell arts and crafts at the Katutura market (CoW, 2014).

6.3.4 Tourism and Recreation

Windhoek is the capital City of Namibia, thus attracts multiple tourists to the town. The tall colourful building and historical monuments such as Alte Feste, new Sam Nujoma Statue, the Christ Church and Hearoes Acre as well as Katutra Suburb forms part of the tourist destination.

Goreangab Dam is a famous destination used by local people as a recreational area, where braai facilities has been provided for.

Excessive waste, dust, noise and vibrations can have negative impacts on the tourism industry, as it can become a nuisance to tourism. Mitigation measures at the site must be put in place to reduce this impacts.

6.3.5 HIV/AIDS

Namibia is one of the 10 worst countries in terms of HIV/AIDS epidemic. HIV prevalence rate for the age group 15 – 49 is estimated ar 21.3% for Namibia (UNDP, 2005).

Spending powers of locals working on this development are likely to increase, and might be perfect opportunities for sex workers to explore. Migrant labourers from other regions and expatriates are normally vulnerable and may use the services rendered by sex workers.

The following issues arise with increase of HIV prevalence:

- Diversion of income expenditure to medical care,
- Increase in number of persons per doctor,
- Increase in orphans and households headed by children.
-

7 PUBLIC PARTICITATION

7.1 Public Participation Process

Public participation process enables the Interested and Affected (I&AP), to comment on the potential environmental impacts associated with the proposed development.

Public Participation process is a component of the EIA process and is required as per Section 43 in the Environmental Assessment Regulations of Environment Management Act 7 of 2007.

Its objective is to inform the I&AP and stakeholders about the proposed development and to provide information to enable informed decision making.

7.2 Methodology

7.2.1 Identified Stakeholders

The identified I&AP and key Stakeholders are listed in the table below.

Table 6. The identified I&AP and key Stakeholders

Public	Stakeholders	Others
Public in general	- CoW: Urban Planning and Properties Department. - CoW: Infrastructure, Water & Technical Services Department - CoW: Economic Development and Environment Department. - CoW: Community Services Department. - NamWater - MWAF: Directorate Forestry - MWAF: Directorate Resources Management.	- Penduka, - National Heritage Council, - CoW: Bulk and Wastewater Division.

7.2.2 Invitation and Notification

Newspaper Adverts for Public: The public in general were invited to register as I&APs via newspaper adverts placed in the Namibian and Republikein Newspaper on 23 October 2015 and 2 November 2015 respectively. Registered I&AP's were notified places where to obtain the draft report for comments that was due on 9 November 2015. Copies of adverts as they

appeared in the newspaper and the circulated e-mail to I&AP's is attached under Annexure C.

Electronic Notifications for key stakeholders: E-mail were forwarded to the identified key stakeholders, for notifications and where the document can be obtained for their comments. The detailed list of the stakeholders is attached in Annexure C.

City of Windhoek Website: The report was placed on the City's website, for the public review.

7.3 Issues and Concerns Raised

Newspaper Adverts: Only three I&AP's registered for the project of which only one gave comments. Copies of the registration and a table indicating their details are attached in Annexure 3. The respond is tabled in the table below.

Electronic Notifications: Only NamWater and CoW: Urban Planning and Properties Department responded.

CoW Website: A newspaper article appeared in the New Era Newspaper which gives an indication that the draft report was accessed from the website. The article is attached on the table below.

Table 7. Responses from the I&AP's and the key Stakeholders

	Name	**Respond**
Registered I&AP	Sheldon Husselmann	My main comment on the scoping report: - The extent of the flooding risk/impact is not adequately addressed - insufficient information is available in the report to understand this risk/impact and make an informed decision. I would recommend: - A map displaying the main drainage channels/rivers and/or contour lines (if available) should be created to display how these rivers have been incorporated into the layout.
Stakeholders	du Plessis Nicolaas (NamWater)	Attached please find our comments: 1. Availability of water to supply in demand. Water sources are under pressure due to low rainfall. Several other developments are being undertaken and will

		increase pressure on water sources and supply. 2. Impact on Swakoppoort Dam. Pollution will travel downstream in the tributaries to Swakop River and will eventually end up in the Dam. The dam will be further enriched with nutrients. 3. Page 16 of the report mentions how the Goreangab Dam will be used for recreational purpose, this will not only pose a health risk to the users , but it will lead to further pollution of the Dam. The report on page 22 mentions that the Goreangab Dam cannot be used for recreational purposes i.e. fishing as swimming as this can have a detrimental health effect. Therefore, contradicting statements. 4. Extension 4 is not indicated in Figure 1. 5. Fig 2 not included in the report. 6. Paragraph 4.3.4.1 No mentioning of water meters? 7. Paragraph 4.3.4.4 No mentioning of electrical meters? 8. Proposed layout plan in Fig 3 not included. 9. Para 6.3.4 Climate – evaporation figures should be per annum. 10. Please include a specie name for Picture 2. 11. Scientific names should be in Italics. 12. The data used for the Socio-economic description is from a report from 2005. Are there not more up to date data? 13. Your impact identification is rather limited and your EMP is also not comprehensive. I am concerned about the quality of your report and it is my opinion that huge improvements are required before it could be submitted to MET.
Website		Article attached in Annexure C

Most of the comments were addressed in this final report before submission to DEA at MET.

8. IMPACTS ASSESSMENT

8.1 Method of Assessment

The significance of the identified impacts of the proposed development of services at Goreangab Extension 4 was assessed using the criteria discussed on the table 7 below.

Table 8. Criteria used to determine the significance of impacts and their definitions.

CRITERIA	DESCRIPTION
NATURE	This criteria indicates whether the proposed activity has a **positive** or **negative** impact on the environment (environment comprises both socio-economic and biophysical aspects).
EXTENT	This criteria measures whether the impact will be site specific; local (limited to within 15 km of the area); regional (limited to about 100 km radius); national (limited to within the borders of Namibia) or international (beyond Namibia's borders).
DURATION	This criteria looks at the lifetime of the impact, as being short (days, less than a month), medium (months, less than a year), long (years, less than 10 years), or permanent (more than 10 years).
INTENSITY	This criteria is used to determine whether the magnitude of the impact is destructive and whether it exceeds set standards, and is described as none (no impact); low (where the environmental functions are negligible 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).
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 happen regardless of prevention measures).
DEGREE OF CONFIDENCE IN PREDICTION	This is based on the availability of information and knowledge used to assess the impacts.

The significance of the potential impacts identified for this project is determined using a combination of the criteria discussed on the above table. The significance of impacts is described on the table below.

Table 9**:** Definition of the various significance ratings

SIGNIFICANCE RATING	CRITERIA
Low	Where the impact will have a negligible influence on the environment and no mitigations are required.
Medium	Where the impact could have an influence on the environment, which require some modifications on the proposed project design and/or alternative mitigation.
High	Where the impact could have a significant influence on the environment and, in the case of a negative impact, the activity causing it, should not be permitted.

8.2 POTENTIAL IMPACTS IDENTIFIED AND ASSESSED

8.2.1 CONSTRUCTION RELATED IMPACTS

- **NOISE AND VIBRATIONS**

Construction vehicles and equipment such as drillers, compactors and other machineries used to install services during the services construction phase can be a nuisance and disturbance. Noise and vibrations will also have an impact on animals such as birds and reptiles. Birds are known to abandon their nests if subjected to continuous noise.

Table 10**:** Assessment of impacts associated with noise and vibrations.

IMPACT	NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE MITIGATION	PRESCRIBED MITIGATION	POST MITIGATION
Increased noise levels	Negative effect on construction workers,	Local	Medium	Low	Probable	Medium	Medium	• All workers on site must be equipped with ear	Low

	animals and nearby residents						Medium	plugs to be used when the noise becomes unbearable. •Switch off machines that are not used.	Low

- **LOSS OF BIODIVERSITY AND HABITAT DESTRUCTION**

Various protected plant species were observed onsite and this might be destroyed/disturbed during the construction of services to the township. The clearing of vegetation to make way for the installation of services might also destroy the habitat that support the various forms of biodiversity in this area. However with the recommeded mitigation measures such as preserving protected plants species, the impact significance can be minimised to low. The impact will also be low due to the fact that there is no plant species that is endemic to the area. All plant species found here also occur in other areas.

Table 11**:** Assessment of impacts associated with the loss of biodiversity.

IMPACT	NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE MITIGATION	PRESCRIBED MITIGATION	POST MITIGATION
Loss of biodiversity	The clearing of land to construct services will result in the destruction of plants and other forms of biodiversity.	Local	Medium	Low	Highly Probable	High	Medium	Preserve some plants in the yards of erven. Only remove plants that are in the path were services will be constructed. A permit must be obtained from the Directorate of Forestry before any protected species is removed.	Low

- **POLLUTION FROM CONSTRUCTION ACTIVITIES**

  There are various types of pollution associated with construction. The most important one is probably chemical pollution from oil spills resulting from the handling of various machineries used during the construction phase. Other sources of pollution include building rubble and empty bags and containers. Construction workers can also pollute the surrounding environs if they are not provided with adequate toilet facilities.

Table 12**:** Assessment of impacts associated with pollution.

IMPACT	NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE MITIGATION	PRESCRIBED MITIGATION	POST MITIGATION
Pollution	Negative effect on the ecosystem when waste emanating from construction activities is not managed.	Local	Medium	Low	Probable	Medium	Medium	• Ensure that all waste from construction activities is stored and contained in designated containers and transported to Kupferberg Waste Disposal Site for proper disposal. • Adequate mobile toilets must be provided at the construction camps for the use of the workers.	Low

- **DUST**

  Dust might arise during the excavation of trenches were services will be layed. Activities such as the clearing of vegetation and levelling of land where the services such as roads, water and electricity will be constructed will also result in dust. This will especially be an issue during windy days. However, this impact will be mostly limited to construction phase, hence temporary impact before mitigation and reduced impact after mitigation.

Table 13: Assessment of impacts associated with dust emission.

IMPACT	NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE MITIGATION	PRESCRIBED MITIGATION	POST MITIGATION
Health effect of dust the construction workers	Respiratory sicknesses can result from prolonged exposure to dust	Local	Medium	Low	Probable	Medium	Medium	• Equip all the workers exposed to dust with dust masks • Spray the areas that are most affected to minimize dust.	Low
Effect of dust on the ecosystem and nearby residents.	Dust can negative affect the ecosystem in general and the nearby residents.	Local	Medium	Low	Probable	Medium	Medium	• Minimize activities that can generate dust during windy days. • Limit the speed within the whole construction area to a maximum of 40 km/h • Dust will significantly be reduced if excavation and land clearing is carried out after it has rained and the soil is wet.	Low

- **EMPLOYMENT OPPORTUNITIES**

The project will require manpower during the construction of services the township. This will provide employment opportunities to the residents of existing townships located near the Goreangab Extension 4 and Windhoek as a whole.

Table 14**:** Assessment of impacts associated with employment opportunities.

IMPACT	NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE MITIGATION	PRESCRIBED MITIGATION	POST MITIGATION
Employment opportunities during the construction of the development	The construction of the services will create a few job opportunities and this will have a positive economic impact on surrounding communities	Local	Medium	Low	Highly Probable	High	Low	To further enhance the socio-economic benefits of the surrounding communities from the development, the Project Manager should make it mandatory to all contractors that all unskilled work should be given to the locals.	Low

- **SPREAD OF HIV/AIDS**

The likely influx of labour to Goreangab Extension 4 area during the construction of services at the township may influence the spread of HIV / AIDS in the surrounding communities.

Table 15**:** Assessment of impacts associated with HIV/AIDS.

IMPACT	NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE MITIGATION	PRESCRIBED MITIGATION	POST MITIGATION
The spread of HIV/AIDS during the construction phase of the project.	The influx of labourers can result in the spread of HIV/AIDS	Local	Medium	Low	Highly Probable	High	Low	Awareness at workplace and provision of condoms	Low

8.2.2 OPERATION RELATED IMPACTS

- **SOLID WASTE AND SEWAGE**

Both solid waste and sewage will be generated by the residents who will settle in this area. It is therefore very important to construct appropriate infrastructure to management thus waste types. Failure to management waste properly will result in pollution and this might have a detrimental impact on the people's well-being and the quality of the environment, especially the nearby Goreangab Dam.

Table 16**:** Assessment of impacts associated with solid waste and sewage.

IMPACT	NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE MITIGATION	PRESCRIBED MITIGATION	POST MITIGATION
Pollution from solid waste and sewage	Failure to manage waste properly will result in pollution and this might have a detrimental impact on the people's well-being and the quality of the environment.	Local	Long	Low	Highly Probable	High	Medium	Sewer drainage system should be constructed as part of the infrastructure to be developed at the township All structures to be developed at the erven must be connected to the sewer system The sewer lines should be inspected regularly to check for any leakages. All erven must be provided with waste bins that must be emptied by the City of Windhoek on a regular basis. Clean up program	Low

								should be implemented to ensure waste is removed from open areas and along streets. Bylaws should be promulgated to punish anyone who is guilty of littering and the improper disposal of waste.	

- **SOCIO-ECONOMIC DEVELOPMENT**

The proposed township will support the socio-economic development of Windhoek by providing a range of serviced residential sites for prospective new residents and this will significantly contribute to the alleviation of the current shortage of serviced land experienced country wide. The development of services to this township is part of the mass land servicing program, which is government's program to fast track the provision of serviced land aimed at reducing the huge backlog estimated at around 200,000 units.

9. ENVIRONMENTAL MANAGEMENT PLAN

An Environmental Management Plan (EMP) describes the processes that an organization will follow to maximize its compliance and minimize harm to the environment. This EMP focuses on the mitigatory measures to improve future provision of sanitation services (water and ablution facilities) to residents of informal settlements in Windhoek.

The main objectives of this EMP are:

- Enhance avenues for wider community participation in the development of settlements/ townships;
- Increase opportunities for improving public health;
- Minimise disturbance to the natural environment.

The EMP which is attached as Annexure B, provides management plan for the impacts the project will have. Furthermore, it describes the roles and

responsibilities of stakeholders involved in the implementation of the environmental plan during construction and operation.

10. CONCLUSSIONS

All known and environmental and social risks can be minimised and managed through implementing preventative measures and sound management systems.

It is recommended that environmental performance be monitored regularly to ensure compliance and that corrective measures be taken if necessary.

The prevalent unavoidable environmental nuisance that include sewage odour and noise from the operation of surrounding wastewater treatment plants should be communicated to the new property owners. Conservation of Goreangab Dam and environmental awareness programmes should be designed and undertaken with the residents at this site.

The EMP should be used as an on site tool during construction and operational phases and should be upgraded on a regular basis.

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ANNEXURE A

ENVIRONMENTAL MANAGEMENT PLAN

ENVIRONMENTAL MANAGEMENT PLAN (EMP)

FOR SERVICE PROVISION FOR GOREANGAB EXTENSION 4, WINDHOEK, NAMIBIA

OCTOBER 2015

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1. INTRODUCTION AND BACKGROUND

Goreangab Extension 4 (Ext 4), in Windhoek, Khomas Region has been identified as one of the sites for the pilot project of Massive Urban Land Servicing Project. This national project seeks to service about 200 000 plots country wide.

Goreangab Ext 4 has been subdivided into portion 23 and remainder in the 1997 and Established as a Township in 1998. It has been declared to be an approved Township in 2002 as per Government Gazette No 2738, Notice No 74 dated 15 May 2002.

The proposed site is located between the existing Goreangab Extension 3 and the Goreangab Dam. The area covers approximately 15.8 ha. The residential area drains away from the dam in the direction of the New Otjomuise Reclamation Works.

Its Southern border runs through the dam's centre line. The Western section of the township comprise of a number of land uses. All are existing activities presently accommodated on portions of townlands, including the Otjomuise and Gammams Wastewater Treatment plants, Old Goreangab and WINGOG Water Reclamation Plants and various portions leased to youth groups and NGO's.

The development of an EMP is a requirement for any EIA project as per Namibia's *Environmental Management Act No.7 of 2007*. Therefore this EMP is a legal document that must accompany the EIA Report before an Environmental Clearance is issued.

The main purpose of this EMP is to:

- Minimize adverse impacts on the environment;
- Protect the environmental quality of the site;
- Meet the requirements of all national and local legislations;
- Outline guidelines for construction of services and operational phase of the project.

- Provide detailed specifications for the management and mitigation of activities that have the potential to impact negatively on the environment.

2. THE PROPOSED PROJECT ACTIVITIES

A total of 338 residential erven will be created with provision for business, institutional and recreational facilities.

- **The following new land uses are proposed**:
  - More or less 338 residential erven will be created, with the provision for business, institutional (a school and crèche on site) and recreational facilities.
  - Open space near the dam will be used for recreational and conservation purpose.
  - A buffer conservation area between the dam and the residential area will remain undeveloped and left for recreational and sustainable income generating opportunities.
  - However, small scale business opportunities such as home shops and home occupation will be allowed and supported through relevant council policies.

- **INFRASTRUCTURE AND SERVICES**

Bulk infrastructure and services to the proposed townships will be provided as follow:

Water

A water reticulation system with accordance to City Policies and guidelines will be constructed. All erven will be provided with individual water connection points. Construction of water reticulation will require digging of trenches, laying of pipelines and covering trenches.

Sewer

A sewerage system will be provided on a Municipal zoned erf to accommodate the line accordingly. Extensions of the sewer network to enable individual connections will also be made. Residential erven have been kept 500m away from Otjomuise Water Care Works. This is to avoid possible smells and flies in residential area. Construction of water reticulation will require digging of trenches, laying of pipelines and covering trenches

Streets

Access to the planned Goreangab Extension 4 may be obtained from Matshitshi Street and Independence Avenue. Matshitshi Street being an existing major access road which runs between the existing Goreangab Extension 3 and the planned Extension 4. Construction of roads requires, clearing of vegetation, removal of top soil and tarring the site.

Electrical services

An electrical system will be constructed to accommodate individual connections. Electricity infrastructure will also be connected to the municipal grid and managed accordingly. Construction of electrical system will require digging of trenches and holes for pipes and cables and covering it after completion.

3. LEGISLATIVE FRAMEWORK

This section provides an analysis of the policies and legislations that are relevant to the proposed development of services at the Goreangab Extension 4 Township.

Table 1: Legal Framework of the proposed project

LEGISLATION	PROVISIONS	PROJECT IMPLICATION
	NATIONAL LEGISLATION	
The Constitution of the Republic of Namibia (1990)	The articles 91(c) and 95(i) commits the state to actively promote and sustain environmental welfare of the nation by formulating and institutionalising policies to accomplish the sustainable objectives which include: - Guarding against overutilization of biological natural resources, - Limiting over-exploitation of non-renewable resources, - Ensuring ecosystem functionality, - Maintain biological diversity.	Through implementation of the environment management plan, the proponent shall be advocating for sound environmental management as set out in the Constitution.
Environmental Management Act (No 7 of 2007) and Namibia's Environmental Assessment Policy (1995)	Schedule 1: Screening list of policies/ plans/programme/ project subject to full Environmental Assessment. "The rezoning of land from use for nature conservation or zoned open space to any other land use". (Ministry of Environment and Tourism (MET), Directorate of Environmental)	An Environmental Impact Assessment is compulsory.
Pollution Control and Waste Management Bill	This Bill serves to regulate and prevent the discharge of pollutants to air and water as well as providing for general waste management. This Bill will license discharge into watercourses and emissions into the air. The Bill also provides for noise, dust or odour control that may be considered a nuisance.	

LEGISLATION	PROVISIONS	PROJECT IMPLICATION
Forest Act, 2001 (Act No. 12 of 2001)	Provision of the protection of various plant species (Ministry of Agriculture, Water and Forestry (MAWF), Directorate of Forestry).	A Harvesting Permit needs to be acquired from the Directorate of Forestry for the removal of indigenous certain tree species from the site
Townships and Division of Land Amendment Act, 1992 (Act 28 of 1992)	"(I) Whenever any area of land constitutes, by reason of its situation, a portion of an approved township, or adjoins an approved township, the Executive Committee may, by proclamation notice in the Gazette and after consultation with the Board, extend the boundaries of that township to include such area". (Minister of Regional and Local Government).	A new township needs to be created for approval by the Namibian Planning Advisory Board and the Township Board.
Water Resources Management Act, 2013 (Act No. 11 of 2013)	This Act provides for the management, protection, development, use and conservation of water resources and the regulation and monitoring of water services and to provide for incidental matters. (Department of Water Affairs).	Developers need to develop a satisfactory plan for sewerage disposal and water demand management.
LEGISLATION	**PROVISIONS**	**PROJECT IMPLICATION**
Soil Conservation Act 76 of 1969	Prevention and combating of soil erosion, conservation, improvement and manner of use of soil and vegetation, and protection of water sources. (Ministry of Environment and Tourism).	Removal of vegetation cover is to be avoided and minimized at all costs.
National Heritage Act 27 of 2004	Heritage resources to be conserved in development. (National Heritage Council of Namibia).	Immediately inform the National Heritage Council of Namibia should any archaeological material e.g. graves be found during the construction phase. The site should be cleared for archaeological potential before construction may commence.

LEGISLATION	PROVISIONS	PROJECT IMPLICATION
Labour Act (No 11 of 2007)	135 (f): "the steps to be taken by the owners of premises used or intended for use as factories or places where machinery is used, or by occupiers of such premises or by users of machinery in connection with the structure of such buildings of otherwise in order to prevent or extinguish fires, and to ensure the safety in the event of fire, of persons in such building;" (Ministry of Labour and Social Welfare).	The Act specifies the measures to be taken to secure the safety and the preservation of the health and welfare of employees at work.
Convection on Biological Diversity (CBD)	Namibia is obliged under international law to conserve its biodiversity.	Projects should refrain from causing any damage to the country's biodiversity.
Convection to combat Desertification	Namibia is bound to prevent excessive land degradation that may threaten livelihoods.	This is a general requirement to be considered in all projects.
LEGISLATION	**PROVISIONS**	**PROJECT IMPLICATION**
LOCAL AUTHORITY BY-LAWS		
Sewerage and Drainage Regulations (amendments) Local authorities Act, section 23, 1992	Affords the prevention of pollution and environmental damage caused by the improper construction of sewerage and water pipelines in drainage lines. (City of Windhoek).	Provides guidelines for the proper construction of pipelines in drainage lines.
Waste Management Regulations for Windhoek Municipality (16 of 2011)	The Act stipulates measures that must be taken by builders in respect of builders waste. Builders waste is defined as waste generated during the building, construction, repair, alteration, renovation, excavation or demolition of any road, surface, structure, building or premises, including builders rubble, earth, vegetation and rock displaced during such building, construction, repair, alteration, renovation, exaction and demolition. The provisions relate to the	The proponent should ensure that building contractors adhere with all the requirements of the Act.

	collection, depositing, storage and transport of such waste.	
Windhoek Environmental Structure Plan (2004)	It indicates all sensitive and environmentally fragile zones that should be conserved and protected. These areas should be considered with great care and when planning for any development project. The document is mainly helping in applying sound environment planning and management (Section 3.3.1, page 60). (City of Windhoek)	Only strategic service developments should be allowed after environmental impact assessment.
Windhoek Town Planning Scheme (2005)	Allowed activities under "Residential Building" and "Residential Unit".	"Any person intending to erect a building in any use zone may be required by Council to furnish an environmental assessment report having regard to the promotion of health, safety, order, amenity, convenience and general welfare and the impact the new buildings and the operations are likely to have on the amenity of the locality".
Noise Control Regulations	It is essential to ensure that before any development project is approved and undertaken, an assessment or evaluation of expected noise level is done and it should be done in accordance with the City of Windhoek Noise Control Regulations.	
Groundwater Protection Regulations	The draft Ground Water Resources Management 24 of 2004 provides more specific procedures for water abstraction permitting that are much more tailored to Namibias Climate and geo-hydrology that the Water Act of 1956.	

4. ROLES AND RESPONSIBILITIES

The EMP requires the involvement of multiple stakeholders: the client which City of Windhoek (Project Co-ordinator and Environmental Management Division), Project Engineer or Contractor, Environmental Control Officer (ECO).

For the purpose of this section the following are defined:

Contractor: The person or company including al subcontractors, undertaking the construction of the development as appointed by the Project Engineer/Manager.

Environmental Control Officer: a suitable qualified official who implement the EMP and oversees environmental responsibilities of the Project Engineer/Manager.

Project Engineer/Manager: the persons who represent the Developer and are responsible for the technical and contractual implementation of the works to be undertaken.

CoW Client: Refer to the project co-ordinator and Division within the CoW that represent the custodian of the project.

CoW EMD: Refers to Environmentalists within the Environmental Management Division representing the City of Windhoek.

The following are the responsibilities of the various stakeholders:

4.1 Client and EMD (City of Windhoek)

- Review reports regarding the implementation of EMP and make payments to the Contractor if the EMP is being implemented in satisfactory manner.
- Give warnings and imposes fines and penalties on the Contractor if the Contractor neglects to implement the EMP satisfactorily.
- Inspect and monitor the implementation of EMP and request auditing reports if the need arise.

4.2 Project Engineer or Contactor and Environmental Control Officer

The Project Engineer or Contractor will be appointed by the client. The Project Engineer will be responsible for providing an ECO for the duration of construction activities.

The Environmental Control Officer (ECO) needs to be someone who has a basic understanding of EMP administration. Under the management actions, each action is allocated to a responsible entity to ensure that the specific action is managed and documented properly.

Following are the roles of Project Manager/Engineer

- Be familiar with all aspects of Scopng Report and EMP
- Oversee implementation of the EMP
- Review and approve method statements in consultation with the ECO.
- Appoint the ECO to implement the EMP and oversee environmental responsibilities of Developer throughout the construction phase.
- Inform all key role players who will be involved during the construction of the services about the contents of this EMP and activities to be undertaken to mitigate the potential impacts identified.

Roles of the ECO

- Providing a environmental register at the site to be filled in by any person reporting and environmental incident, issue or concern and inspected by ECO on a regular basis to check for issues raised and actions taken.
- Ensuring that the EMP conditions are adhered to at all times and taking actions.
- Ensure that environmental impacts are kept to minimum,
- Reporting to CoW and Project Manager/Engineer on a regular basis and advising of any major environmental impacts. Attending to site meetings (when necessary).
- Inspecting the site and surrounding areas regularly, and monitoring an ongoing environmental awareness program in conjunction with the Project Manager/Engineer.
- Requesting the removal of people and/or equipment not complying with the specifications of EMP.
- Keeping both a written and photographic record of progress on site from an environmental perspective, and ad hoc recording of all environmental incidents.
- Undertake continual review of the EMP and submitting a report to the relevant stakeholders.
- Submit all written instructions and verbal requests to CoW via Project Manager.

5. ENVIRONMENTAL MANAGEMENT PLAN

5.1 ENVIRONMENTAL MANAGEMENT PLAN ADMINISTRATION

Copies of this EMP shall be kept at the site office and should be distributed to all senior staff members, including those of the contractors.

5.2 TRAINING

All key role players such as the contractors who will be involved during the construction of the services must be informed about the contents of this EMP through structured training programs, this can form part of the regular site meetings.

5.3 ENVIRONMENTAL INCIDENT REPORTING

All environmental incidents occurring at the proposed site will be recorded. The incident report will have to include time, date, location and nature of the incident, ectent of the incident, actions taken and personnel involved.

All complaints received from the neighbouring community should be directed to CoW: EMD. City of Windhoek should be able to respond to the complaint within a week (even if pending further investigations).

5.4 ENVIRONMENTAL MONITORING

Periodic environmental monitoring must be taken on a regular basis. Monitoring should be done in order to ensure compliance with all aspects of the EMP. Findings should be liased with tho all responsible offices as chain command.

5.5 EMP AMENDMENTS

The EMP amendments can only be made with approval of the ECO officer and ultimately the DEA. Amendments to the EMP should be liaised to all employees and contractors.

5.6 NON COMPLIANCE OF EMP

Problems may occur in carrying out mitigation measures or monitoring procedures that could result in non-compliance of EMP. The responsible personnel should encourage staff to comply with EMP, and address acts of non-compliance and penalties.

City of Windhoek is therefore responsible for reporting non-conformance with EMP, to the ECO and Project Engineer/Manager during their monitoring and

inspections. The following activities should be undertaken by ECO in consultation with Project Manager/Engineer, in the event of non- compliance:

- Investigate and identify the cause of non-conformance.
- Report matters of non-confirmance to the CoW:EMD (depending on the severity of incident).
- Implement suitable corrective action as well as prevent recurrence of the incident.
- Assign responsibility for corrective and preventative action.
- Any corrective action taken to eliminate the causes of non-conformance shall be appropriate to the magnitude of the problems and commensurate with the environmental impact encountered.

5.7 SITE MANAGEMENT

Areas outside this designated working zone shall be considered "no go" areas. The offloading zones must be clearly demarcated when offloading goods to enhance safety around the project location.

5.7.1 Access Routes and Work Sites

During construction phase, road transport trucks will access the project location via Independence Avenue or Matshitshi Street. Work sites shall be demarcated and road signs erected were needed. The general public should not have unauthorised/uncontrolled access to the project location during this phase.

Vehicle access will be limited to one or two entrances to facilitate control. Access must be of high standard to prevent unauthorised access from entering the site.

The entrance should be manned during the operations hours and access routes will be close to prevent unauthorised entry. A notice board, in two lnguages, must be ereted at the entrance and must state entrance requirements and operating hours of the site, the operator responsible person and emergency telephone numbers.

Roads must be regularly graded and wetted to control dust, where necessary.

5.7.2 Fire and Safety Management

Proper handling, storage, use and disposal of any hazardous waste (e.g hydrocarbons, pain, batteries, radioactive waste) should be conducted.

Hydrocarbons are volatile under certain conditions and their vapours in specific concentrations are flammable. If precautions are not taken to prevent their ignition, fire and subsequent safety risks may arise.

No uncontrolled fire, whether for cooking or any other purpose, is to be made at the project location during both construction and operation phases. The contractor shall take all reasonable measures and active steps to avoid increasing the risk of fire; and shall ensure that there is sufficient fire-fighting equipment on site at all times. This equipment shall include fire extinguishers.

5.7.3 Staff Management

The Contractors must ensure that their employees have suitable personal protective equipment and properly trained in fire fightings and first aid. Training records must be kept for future references.

5.7.4 Waste and Wastewater Management

Waste will be generated in the form of rubble, cement bags, pipe and electrical wire cuttings. Contaminated soil due to oil leakages, lubricant and grease from the construction equipment and machinery may also be generated during the construction phase.

The oil leakages, lubricants and grease must be addressed. Contaminated soil must be removed and disposed of at the hazardous waste disposal site at Kupferberg Land fill. The contractor must provide containers on-site, to store any hazardous waste produced. Regular inspection and housekeeping procedure monitoring should be maintained by the contractor.

Waste in the form of solid waste from households, businesses and institutions will also be generated during operational phase. Waste will be removed and disposed of at Kupferberg Landfill by the City of Windhoek from residents, while the businesses and other should appoint the private sold waste removers to remove their solid waste.

Domestic wastewater will be generated during construction and operational phase. Mobile toilets should be provided for employers during construction phase. During operational phase all houses and buildings will be required to connect to municipal sewerage system.

Waste skips should be provided during operational phase just like the rest of the townships in Windhoek.

5.7.5 Conservation of Goreangab Dam

Any type of solid waste and wastewater should be avoided to be disposed into the dam. Although the water quality of the water is deteriorated, disposal in this

water body should be avoided at all times during construction and operational phase.

Any type of water use which include bathing, washing of clothes, swimming and fishing from this dam should be avoided at all cost. This should form part of the training for the labourers.

Sign boards that shows that this activities are not allowed should be placed during construction by the developer and by CoW during operation phase. Furthermore, conservation of this area should be encouraged during operational phase.

5.7.6 Cement and Concrete batching

Concrete mixing directly on the ground shall not be allowed and shall take place on an impermeable surface. All run-off from batching areas shall be strictly controlled, and cement contaminated water shall be collected, stored and disposed of at suitable waste disposal facility.

5.7.7 Hydrocarbons Management

If any spillage occurs, contaminated soil shall be collected in a holding tray which will then be disposed at hazardous landfill site, Kupeferberg. Any spillage of more than 200 litres must be reported to the Ministry of Mines and Energy as per the Petroleum Products Act.

5.7.8 Information Board

Information boards should be erected on site during construction phase. The number and locations of these boards shall be agreed upon by ECO.

The contents of the information board shall be provided by the Project Manager/Engineer and will essentially be to advise the public of the construction activity and the prohibition on entering certain areas. The information board shall also provide the contact number of the ECO, to ensure that the public can access relevant information and lodge any complaints during construction phase of the township development.

5.7.9 Flood Management

The township development will be designed in such a way that surface water run-off is well developed. Storm water management of the township development should be a key aspect of flood management at the township. All culverts should be kept clean to allow storm water to flow directly.

5.7.10 Progressive Rehabilitation

Rehabilitation must commence as soon as possible on areas where construction has taken place or no further development is to take place, i.e. on completed excavations, soil/rock cutting hips, slopes etc.

5.8 MANAGEMENT ACTIONS OF ENVIRONMENTAL ASPECTS – CONSTRUCTION PHASE

- **GROUNDWATER**

DESCRIPTION	Possible groundwater quality could be impacted through leachate of oil leakages, diesel, lubricants and grease from the heavy duty equipment and machinery utilised during construction phase. Care must be taken to avoid contamination of soil and groundwater. Drip trays must be used when removing oil from machinery.
MITIGATION MEASURES	• Prevent spillages of any chemical or fuel. • Use drip trays when doing maintenance on machinery. • Maintenance should be done on dedicated areas with linings or concrete floor. • No maintenance of machinery may be done at the project location • Implementation of sound and proper management practices.
MONITORING	Regular monitoring of oil spills from vehicles and fuel storage area.
RESPONSIBLE PARTY	Project Manager/Engineer & ECO

- **SURFACE WATER**

DESCRIPTION	Goreangab Dam which is the nearest water body at the lower level is at a threat of pollution. Contamination of surface water may occur through oil leakages, diesel, lubricants and grease from the heavy duty equipment and machinery during construction phase. Surface runoff emanating from overflowing and/or leakages from chemical and sewage storage and reticulation pipeline systems might reach surface Goreangab Water Dam. Potential problems caused by viruses, bacteria

	and parasites found in the effluent would be the main concern from this pathways. Potential health impact on surface water users and on the natural environment associated with the nearby streams and rivers.
MITIGATION MEASURES	• Prevent spillages of any chemical or fuel. • Disposal of any solid or liquid to the water body should be avoided. • No maintenance of machinery should be done at the project location. • All spills should be cleaned as soon as possible. Clothing or equipments should not be washed at the water body or the stream passing through the township. • No swimming or fishing should be allowed in the Goreangab Water dam or the stream cutting through the township. • No bathing or washing by labourers should be allowed in the Goreangab Water dam or the stream cutting through the township. • Implementation of sound and proper management practices.
MONITORING	Regular monitoring of oil spills from vehicles and fuel storage area should be done. Regular visual insepection. Surface water quality monitoring in cases of evident pollution.
RESPONSIBLE PARTY	Project Manager/Engineer & ECO

- **ODOUR**

DESCRIPTION	Odour from the surrounding wastewater treatment plants is prevalent on the site. Odour strength will vary during the day, but is expected to be worse during the afternoons and mornings. It is also expected to be worse during windy days. Odour at this site of Windhoek is generally regarded as nuisance as it is associated with flies. Also odour may affect human health.
MITIGATION MEASURES	• Equip all the workers with dust masks, to control odour during times when it is worse. • Spray the areas that are mostly affected with water to minimize dust (due to water shortages in Windhoek, consider pumping water

	from Goreangab Dam to be used for this purpose).
MONITORING	Regular visual inspection
RESPONSIBLE PARTY	Project Manager/Engineer & ECO

- **NOISE AND VIBRATIONS**

DESCRIPTION	Construction activities are associated with noise and vibrations generated by the construction machineries and vehicles.
MITIGATION MEASURES	• All workers on site must be equipped with ear plugs to be used when the noise becomes unbearable. • Switch off machines that are not used. • construction activities which known to generate vibration should be scheduled for day periods and not at night. • Duration of vibration should be kept as short as possible. • Proper maintanance including routine servicing of equipments
MONITORING	Monitoring and measurement of noise and vibration impacts in the surrounding areas as per law or best available standards
RESPONSIBLE PARTY	Project Manager/Engineer & ECO

- **DUST**

DESCRIPTION	Dust can result from construction activities having an impact on the nearby residential areas. Activities such as the levelling of land where the services will be constructed will slightly affect the air quality. This will especially be an issue during windy days. Dust can affect the health of the construction workers and nearby residential areas.
MITIGATION MEASURES	• Equip all the workers exposed to dust with dust masks • Spray the areas that are mostly affected with water to minimize dust (due to water shortages in Windhoek, consider pumping water

	from Goreangab Dam to be used for this purpose). • Minimize activities that can generate dust during windy days. • Limit the speed within the whole construction area to a maximum of 40 km/h. • Dust will significantly be reduced if excavation and land clearing is carried out after it has rained and the soil is wet.
MONITORING	Regular visual inspection
RESPONSIBLE PARTY	Project Manager/Engineer & ECO

- **LOSS OF BIODIVERSITY AND HABITAT DESTRUCTION**

DESCRIPTION	Various protected plant species were observed onsite and this might be destroyed/disturbed during the construction of services to the township. The clearing of vegetation to make way for the installation of services might also destroy the habitat that support the various forms of biodiversity in this area.
MITIGATION MEASURES	• Preserve some plants in the yards of erven. • Only remove plants that are in the path were services will be constructed. • A permit must be obtained from the Directorate of Forestry before any protected species is removed. • Mark all protected plant species on site with a visible mark to assist the construction team to avoid them. • The construction team should inform the Environmental Control Officer before any marked plants are removed to ensure that the valid permits are obtained.
MONITORING	• Monitor and count all marked plant species to ensure they are not removed without a valid permit. • Appropriate punitive measures must be instituted against noncompliance.
RESPONSIBLE PARTY	Project Manager/Engineer & ECO

- **POLLUTION FROM CONSTRUCTION ACTIVITIES**

DESCRIPTION	Chemical pollution from oil spills resulting from the handling of various machineries used during the construction phase might emanate from the construction activities if not handled properly. Other sources of pollution include building rubble and empty bags and containers. Construction workers can also pollute the surrounding environs if they are not provided with adequate toilet facilities.
MITIGATION MEASURES	• Ensure that all waste from construction activities is stored and contained in designated containers and transported to the Kupferberg Waste Disposal Site for proper disposal. • Bulky waste such as building rubble must be collected and disposed of at any of the various municipal satellite sites. • Adequate mobile toilets must be provided at the construction camps for the use of the workers.
MONITORING	Regular visual inspection
RESPONSIBLE PARTY	Project Manager/Engineer & ECO

- **EMPLOYMENT OPPORTUNITIES**

DESCRIPTION	The project will require manpower during the construction of services at the township. This will provide employment opportunities to the residents of Goreangab area and Windhoek as a whole.
MITIGATION MEASURES	• Establish recruitment policy that gives first priority to the locals (residents of the City of Windhoek). • To further enhance the socio-economic benefits of the surrounding communities from the development, the Project Manager should

	make it mandatory to all contractors that all unskilled work should be given to the locals.
MONITORING	Ensure adherence to recruitment policy.
RESPONSIBLE PARTY	Site Manager.

- **SPREAD OF HIV/AIDS**

DESCRIPTION	The likely influx of labour to Goreangab Extension 4 area during the construction of services at the township may influence the spread of HIV / AIDS.
MITIGATION MEASURES	• Establishing awareness raising programme at workplace. • Provision of protective measures including distribution of condoms to workers.
MONITORING	• Stock take of the quantity of condoms left behind in the distribution box. • Routine refresher discussion with workers about views of HIV/AIDS and feedback on the existing programme.
RESPONSIBLE PARTY	Safety Officer / Wellness officer.

5.9 MANAGEMENT ACTIONS OF ENVIRONMENTAL ASPECTS – OPERATIONAL PHASE

- **GROUNDWATER**

DESCRIPTION	Spillages and leakages of various possible contaminants might occur due to failure of reticulation pipelines or storage tanks. Contaminated soil might pose a risk to surface water.
MITIGATION MEASURES	• The risk can be minimised through the use of suitable and adequate approved SANS piping material. • All surface spillages and leakages must be cleaned up immediately. • The presence of an emergency response plan and suitable equipment is advised, so as to react to any spillage or leakages

	properly and efficiently.
MONITORING	A monitoring borehole is needed for groundawater monitoring sampling for pollutin.
RESPONSIBLE PARTY	City of Windhoek

- **SURFACE WATER**

DESCRIPTION	Goreangab Dam which is the nearest water body at the lower level is at a threat of pollution. Contaminated soil of surface water may occur through oil leakages, diesel, lubricants and grease from households. Concrete slabs from construction of individual houses by individual new erf owners may be a source of pollution. Disposals of individual households may also occur. Spillages and leakages of various possible contaminants might occur due to failure of reticulation pipelines or storage tanks. Surface runoff emanating from overflowing and/or leakages from chemical and sewage storage and reticulation pipeline systems might reach surface Goreangab Water Dam. Potential problems caused by viruses, bacteria and parasites found in the effluent would be the main concern from this pathways. Potential health impact on surface water users and on the natural environment associated with the nearby streams and rivers.

MITIGATION MEASURES	• Regular awareness programs should be held at this site for the residents that focuses on
	  • Any type of disposal on Goreangab Water Body.
	  • Prevention of spillages of any chemical or fuel.
	  • The poor water quality and the dangers of its consumption.
	  • No swimming or fishing should be allowed in the Goreangab Water dam or the stream cutting through the township
	  • No bathing or washing by labourers should be allowed in the Goreangab Water dam or the stream cutting through the township.
	• Notice boards that indicate that no swimming, drinking, bathing, washing, fishing of Goreangab Water body is allowed should be erected and maintained on site.

	• The number of this notice boards should be determined by the City of Windhoek, Economic Development and Environment Division. • Implementation of sound and proper management practices.
MONITORING	Regular monitoring of disposal on the dam should be done. Regular visual insepection. Regular public awareness. Surface water quality sampling, monitoring and assessment.
RESPONSIBLE PARTY	Project Manager/Engineer & ECO

- **ODOUR**

DESCRIPTION	Odour from the surrounding wastewater treatment plants is prevalent on the site. Odour is expected to be worse during the afternoons and mornings. It is also expected to be worse during windy days. Odour at this site of Windhoek is generally regarded as nuisance as it is associated with flies. Also odour may affect human health.

MITIGATION MEASURES	• New erf or house owners should be
	  • informed about the prevalent odour issue with the sale of the erven (so that those to be affected make an informed decision when purchasing).
	  • advised to place the windows and kitchen doors way from the odour direction.
	  • Equip their windows and doors with measures to prevent flies.
	• City of Windhoek should regularly inform and advise new residents how to mitigate the fly pest.
	• City of Windhoek should also keep on exploring on ways how to reduce odour from the Wastewater Treatment Plants.

MONITORING	Regular visual inspection and awareness programs
RESPONSIBLE PARTY	City of Windhoek

- **NOISE AND VIBRATIONS**

DESCRIPTION	Noise and possibly vibrations generated from the wastewater treatment plants is already in existence. Since noise that is not a nuisance to one person, may be a nuisance to the next one, noise from the inlet work at the treatment facilities may be heard, especially at night. Other noise generation may be from home business, generators or pumps or road maintenance. Replacing inlet works and machinery with may be costly and may put up a lot of pressure on municipal tax payers.
MITIGATION MEASURES	• Proper maintanance including routine servicing of equipments should be done on a regular basis.
MONITORING	Monitoring and measurement of noise and vibration impacts in the surrounding areas as per law or best available standards
RESPONSIBLE PARTY	City of Windhoek

- **DUST**

DESCRIPTION	Vehicles that will access the site will contribute to the release of hydrocarbon vapours, carbon monoxide and sulphur oxide into the air. All maintenance of bulk services have to be designed such to enable environmental protection.
MITIGATION MEASURES	• Vehicle idling time shall be minimised by putting up educative signs.
MONITORING	Regular visual inspection
RESPONSIBLE PARTY	City of Windhoek

- **LOSS OF BIODIVERSITY AND HABITAT DESTRUCTION**

DESCRIPTION	Various protected plant species would be lost during construction needs to be replaced. Conservation of vegetation around the dam needs to be conserved and not destrouyed as it might also destroy the habitat that support the various forms of biodiversity in this area.
MITIGATION MEASURES	• Tree planting should be encouraged. • Preserve and conserve trees around the dam.

	• Encourage conservation of biodiversity around and at the Goreangab Dam.
MONITORING	• Regular monitoring and inspection. • Appropriate punitive measures must be instituted against noncompliance.
RESPONSIBLE PARTY	City of Windhoek

- **SOLID WASTE AND SEWAGE**

DESCRIPTION	Both solid waste and sewage will be generated by the residents who will settle in this area. It is therefore very important to construct appropriate infrastructure to management thus waste types.
MITIGATION MEASURES	• Sewer drainage system should be constructed as part of the infrastructure to be developed at the township. • All structures to be developed at the erven must be connected to the sewer system. • The sewer lines should be inspected regularly to check for any leakages. • All erven must be provided with waste bins that must be emptied by the Town Council on a regular basis. • Clean up program should be implemented to ensure waste is removed from open areas and along streets. • Bylaws should be promulgated to punish anyone who is guilty of littering and the improper disposal of waste. • Provisions of both the City's Waste Management Regulations and Drainage Regulations must be fully implemented in this township
MONITORING	Conduct regular visual inspections.
RESPONSIBLE PARTY	Solid Waste Management and Bulk and Stormwater Divisions

ANNEXURE B.

TOWNSHIP STATUS DOCUMENTS

ANNEXURE C.

PUBLIC PARTICIPATION PROCESS

ANNEXURE D.

Layout Plans for Goreangab Extension 4 Township

ANNEXURE E

Proof of Registration for the Environmental Clearance Certificate for Service Provision of Goreangab Extension 4 Township