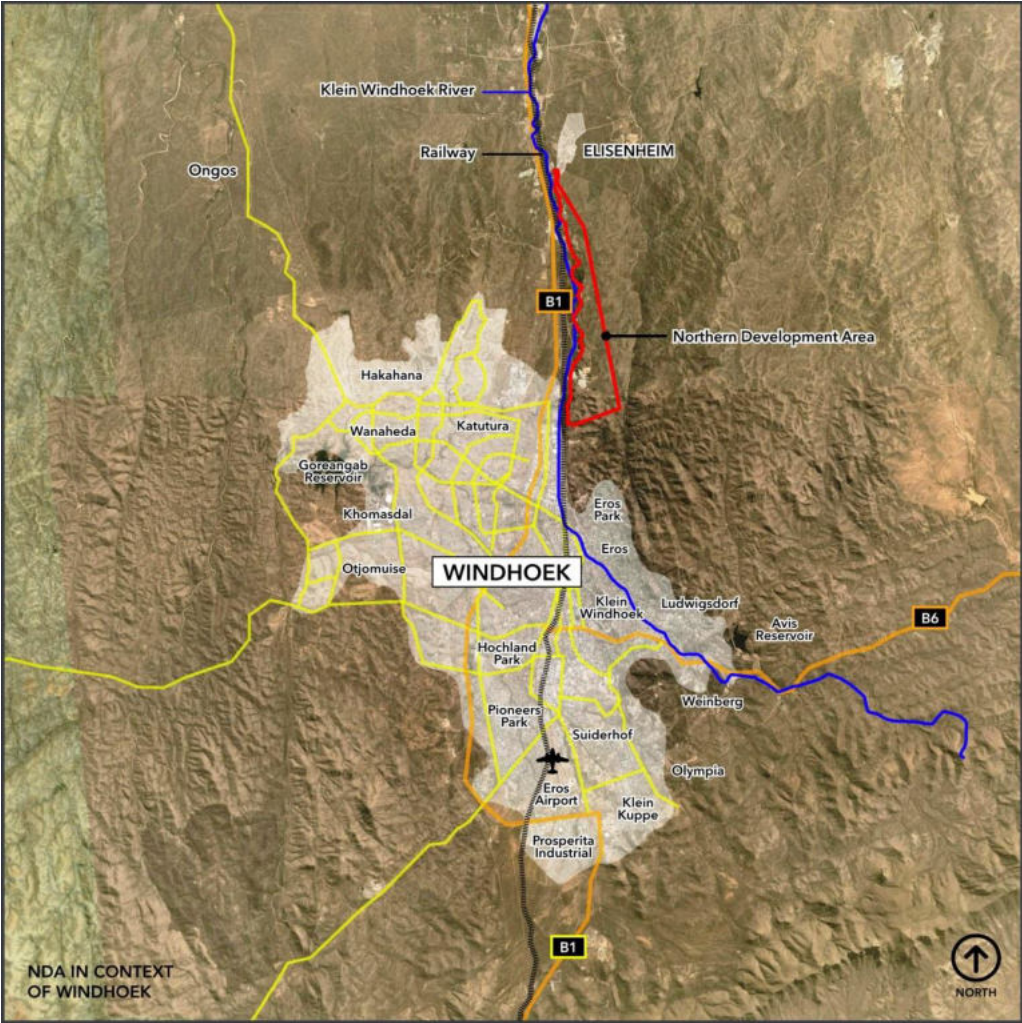


**ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT PLAN FOR  
THE PROPOSED ESTABLISHMENT OF INDUSTRIAL/BUSINESS AND  
RESIDENTIAL/BUSINESS TOWNSHIPS IN THE *NORTHERN DEVELOPMENT  
AREA*, WINDHOEK, KHOMAS REGION, NAMIBIA**



11 December 2013

Prepared by:



Prepared for:

**African Precast Concrete  
Industries (Pty) Ltd**

## CONTACT DETAILS

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### **African Precast Concrete Industries (Pty) Ltd**

Dr Jacko Koen  
African Precast Concrete Industries (Pty) Ltd

P.O. Box 1575  
Windhoek  
Namibia  
Tel: +264 61 300327  
Fax: +264 61 300328  
E-mail: jacko@jc.com.na



Dr Lima Maartens  
LM Environmental Consulting

P.O. Box 1284  
Windhoek  
Namibia  
Tel: +264 61 255750  
Cell: +264 81 2458790  
E-mail: lima@iway.na

## EXECUTIVE SUMMARY

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In accordance with the Environmental Impact Assessment Regulations: Environmental Management Act 7 of 2007, African Precast Concrete Industries (Pty) Ltd appointed LM Environmental Consulting to conduct an Environmental Impact Assessment and prepare an Environmental Management Plan for the proposed development of an Industrial/Business Township (Development Area A; 118 hectares), as well as a Residential/Business Township (Development Area B; 108 hectares) on the remainder of Farm Elisenheim No. 680 (referred to as the Northern Development Area; 475 hectares), Windhoek, Khomas Region, Namibia.

It is foreseen that the Development will consist of 154 erven plus remainder and including two core areas, i.e. one Industrial (42 erven plus street) and one Residential/Business (85 erven plus street). Depending on market forces and servicing economics, either Development Area A will be developed first (in six (6) phases), followed by Development Area B, or two core areas (i.e. one Industrial and one Residential/Business) will be developed within each of the Development Areas. An overall construction period of between seven to ten years is expected.

Engineering services, i.e. access and internal roads, stormwater infrastructure, water supply, sewer drainage and treatment, and electrical infrastructure will be developed in close consultation with the City of Windhoek, the Namibian Water Corporation, the Namibian Power Corporation, and TransNamib Holdings Limited.

As part of the EIA process, comprehensive physical, biophysical and socio-economic baselines were compiled. An Archaeological, a Hydrogeological, and a Vertebrate Fauna and Flora (including a Vegetation and Habitat Assessment) Specialist Studies were carried out.

An overview of the most pertinent legislation pertaining to the proposed Development, and with the aim of informing African Precast Concrete Industries of the legal requirements pertaining to the Project during the planning and construction/operational phases, is provided.

A Public Consultation Programme was also conducted. Stakeholder consultation to date has not identified any issues or concerns that cannot be successfully addressed or mitigated.

The Rapid Impact Assessment Matrix Software Package was used for the assessment of the potential impacts. Scoring takes place within a matrix, the latter that was designed to allow subjective judgments to be quantitatively recorded. The system thus provides an impact evaluation, as well as a record that can be re-assessed in the future (e.g. should more information become available).

The Environmental Impact Assessment and the preparation of Environmental Management Plans for the planning and construction/operational phases of the proposed Development have been completed.

The ultimate goal of an Environmental Management Plan is to ensure that the physical, biophysical and socio-economic objectives are met to such an extent that the overall product of the activity will not result in a net negative impact.

The proposed Development will have potential impacts on the environment and these will be of a positive, as well as a negative nature. The provision of temporary employment (and the associated economic benefits) during the construction phase will result in a significant positive change. Major positive impacts include the provision of additional housing, as well as industrial and business facilities, and the provision of permanent employment and the associated economic benefits during the operational phase.

The moderate negative, negative, and slight negative impacts would be, either temporary in nature, or could be relatively easily and effectively mitigated through the implementation of certain management measures.

Should the proposed Industrial/Business and Residential/Business Townships not be developed, no new temporary and/or permanent jobs will be created and there will be no economic benefits.

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## ACRONYMS AND GLOSSARY

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The following is a list of the abbreviations, acronyms, technical terms, and definitions used in this Report:

ADMDs	Average Daily Maximum Demands
AIDS	Acquired Immunodeficiency Syndrome
APCI	African Precast Concrete Industries (Pty) Ltd
BMP	Best Management Practises
CBS	Central Bureau of Statistics
CEO	Chief Executive Officer
CITES	Convention on International Trade in Endangered Species
CoM	Chamber of Mines of Namibia
CoW	City of Windhoek
DEA	Directorate of Environmental Affairs
DWAF	Department of Water Affairs and Forestry
EA	Environmental Assessment
EAP	Environmental Assessment Practitioner
EAPAN	Environmental Assessment Professionals of Namibia
EHS	Environment, Health, and Safety
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
FAO	Food and Agriculture Organization
GIIP	Good International Industry Practice
GM	General Manager
GG	Government Gazette
GN	Government Notice
GRN	Government of the Republic of Namibia
HFCs	Hydrofluorocarbons
HIV	Human Immunodeficiency Virus
HOA	Home Owners Association
I&APs	Interested and Affected Parties
IBA	Important Bird Area
IEC	Independent Electrical Contractor
IEMA	Institute of Environmental Management and Assessment
IFC	International Finance Corporation
IPPC	International Plant Protection Convention
ISO	International Organization for Standardization
IUCN	International Union for the Conservation of Nature
IWM	Integrated Waste Management
LAC	Legal Assistance Centre
LFPR	Labour Force Participation Rate
MAWF	Ministry of Agriculture, Water and Forestry
MET	Ministry of Environment and Tourism
MME	Ministry of Mines and Energy
MSDS	Material Safety Data Sheet
NAMPAB	Namibian Planning Advisory Board
NamPower	Namibian Power Corporation
NamWater	Namibian Water Corporation
NBRI	National Botanical Research Institute
NDP	National Development Plan
NHIES	Namibia Household Income and Expenditure Survey

NLFS	Namibia Labour Force Survey
NPC	National Planning Commission
NSA	Namibia Statistics Agency
OIS	Oxygen Isotope Stages
PEA	Potentially Economically Active
PFCs	Perfluorocarbons
PIC	Prior Informed Consent
PM	Particulate Matter
POPs	Persistent Organic Pollutants
PPA	Participatory Poverty Assessment(s)
PPE	Personal Protective Equipment
PPP	Public Participation Process
QRS	Quaternary Research Services
REACH	Registration, Evaluation, Authorization and Restriction of Chemicals
RIAM	Rapid Impact Assessment Matrix
SA	South Africa
SADC	Southern African Development Community
SAIE-ES	Southern African Institute of Ecologists and Environmental Scientists
SANS	South African National Standards
SARDB	South African Red Data Book
SEA	Strategic Environmental Assessment
STIs	Sexually Transmitted Infections
SWA	Southern Windhoek Aquifer
TFR	Total Fertility Rate
TransNamib	TransNamib Holdings Ltd
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
UNESCO	United Nations Educational, Scientific and Cultural Organization
US	United States
USA	United States of America
VOC	Volatile Organic Compound(s)
WCE	Windhoek Consulting Engineers
WWTP	Waste Water Treatment Plant

cm	centimetre
°C	degrees centigrade
ha	hectare
km	kilometre
km <sup>2</sup>	square kilometre
km/h	kilometre per hour
kV	kilo Volt
kVA	kilo Volt-Ampere
MVA	mega Volt-Ampere
m <sup>3</sup>	cubic metres
m <sup>3</sup> /day	cubic metres per day
Mm <sup>3</sup>	Million cubic meters
Mm <sup>3</sup> /annum	Million cubic metres per annum
m/s	metre per second
mm	millimetre

Aspect	Element of an organization's activities or products or services that can interact with the environment (International Organization for Standardization (ISO), 2004).
Disposal	The discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid or hazardous waste on or in the land or water (United States (US)), Environmental Protection Agency (EPA).
Environment	Surroundings in which an organization operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation (ISO, 2004).
Environmental Assessment (EA)	The process of identifying, predicting and evaluating the effects of proposed activities on the environment. It should include information about the risks and consequences of activities, possible alternatives, and steps which can be taken to mitigate (minimize or off-set) any negative impacts. It should also discuss steps to increase positive impacts and to promote compliance with the principles of environmental management. Both Government bodies and private persons or groups (such as private companies) can be required to carry out environmental assessments (Ministry of Environment and Tourism (MET), 2008).
Environmental Clearance Certificate	A certificate which allows a listed activity to go ahead. The certificate means that the Ministry of Environment and Tourism is satisfied that the activity in question will not have an unduly negative impact on the environment. It may set conditions for the activity to prevent or to minimize harmful impacts on the environment (MET, 2008).
Environmental Management Plan (EMP)	A key document that should consist of the set of measures to be taken during implementation and operation to eliminate, offset, or reduce adverse environmental impacts to acceptable levels. Also included in the plan are the actions needed to implement them (Directorate of Environmental Affairs (DEA), 2008).
Erosion	The breaking down and subsequent removal of either rock or surface material by wind, rain, wave action, freezing and thawing and other processes (The Northern Miner, 2007).
Grey water	Wastewater generated from domestic activities such as laundry, dishwashing, and bathing, which can be recycled on-site for uses such as landscape irrigation (Wikipedia).
Good International Industry Practice (GIIP)	The exercise of professional skill, diligence, prudence, and foresight that would reasonably be expected from skilled and experienced professionals engaged in the same type of undertaking under the same or similar circumstances globally or regionally. The outcome of such exercise should be that the project employs the most appropriate technologies in the project-specific circumstances (International Finance Corporation (IFC), 2007).
(Grouped) Hazardous Substance	Any substance, mixture of substances, product or material declared in terms of section 3 (1) to be a hazardous substance of any kind (Hazardous Substances Ordinance No. 14 of 1974).
Hazardous Waste	<p>Waste that poses substantial or potential threats to public health or the environment. There are four factors that determine whether or not a substance is hazardous: i) ignitability (i.e. flammable); ii) reactivity; iii) corrosivity; and iv) toxicity (Wikipedia).</p> <p>(a) any waste containing, or contaminated by, poison; (b) any corrosive agent; (c) any flammable substance having an open flash-point of less than 90 degrees Celsius; (d) an explosive or radioactive material and substance; (e) any chemical or any other waste that has the potential even in low concentrations to have a significant adverse effect on public health or the environment because of its inherent toxicological, chemical, ignitable, corrosive, carcinogenic, injurious and physical characteristics; (f) any waste consisting of a liquid, sludge or solid substance, resulting from any manufacturing process, industrial treatment or the pre-treatment for disposal purposes of any industrial or mining liquid waste, which in terms of any law,</p>

	order or directive relating to drainage and plumbing may not be discharged into any drain or sewer; (g) the carcass of a dead animal; and (h) any other waste which may be declared as such by Council or in terms of any other applicable law but excludes household hazardous waste (City of Windhoek (CoW), Solid Waste Management Policy).
Heavy/Noxious Industrial	<p>Processes which use primary raw natural resources for production, such as textiles, brewery, abattoirs and tanneries (Africon Environment &amp; Sustainability Consulting, 2004).</p> <p>Land used for the purpose of carrying on any noxious or offensive trade or occupation and, without prejudice to the generality of the foregoing, includes the following: chemical works, paint works, breweries and distilleries, sugar mills and sugar refineries, manure, superphosphate or fertilizer works; or premises used for the storing or mixing of manure, superphosphates or fertilizers or premises for the storing, drying, preserving or other treatment of bones, horns or hoofs, premises used for the storing, sorting or treatment of hides and skins, other than in a dry and inoffensive condition, abattoirs, glue or size factories, entrails scraping and tripe boiling works; soap or candle works, fat and dripping works and any other similar works where meat, bones, blood, offal or other animal organic matter is handled, wool scouring or wool washing works, rock-lobster or fish processing works, fish pickling or rock-lobster and fish canning trades, whaling stations, premises or trades used for the storing or handling and processing of material originating from fish, whales and seals, paper mills or paper factories, wattle bark grinding or extract factories, destructors, depositing sites or other sites for the disposal or processing of domestic refuse, trade refuse, street refuse, sewage or night soil, lead melting works, oil refineries and other trades in connection with the processing of by products or petroleum refining, paint and varnish works, quarries, asbestos cement, bricks and lime works, metallurgical works, reduction and reprocessing works (Windhoek Town Planning Scheme, 2006; see GCS and Stubenrauch Planning Consultants, 2011).</p>
Industrial Waste	Any waste generated as a result of business, commerce, trade, wholesale, retail, professional, manufacturing, maintenance, repair, fabricating, processing or dismantling activities, but does not include general waste, garden or bulky waste, builder's waste, business waste, hazardous waste or health care risk waste (CoW, Solid Waste Management Policy).
Invasive Alien Species	The intentional or accidental introduction of alien, or non-native, species of flora and fauna into areas where they are not normally found can be a significant threat to biodiversity, since some alien species can become invasive, spreading rapidly and out-competing native species (IFC, 2012).
Impact	Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects (ISO, 2004).
Integrated Waste Management (IWM)	Concept of employing several waste control and disposal methods such as source reduction, recycling, reuse, incineration, and land filling, to minimize the environmental impact of commercial and industrial waste streams (Business Dictionary).
Leachate	Any liquid, including any suspended components in the liquid, which has percolated through or drained from waste ((US) EPA).
Light Industrial Activities	<p>Including depots and warehousing facilities, clean secondary and tertiary processing facilities with low waste load and support facilities for primary and secondary industries, such as packaging, servicing and cleaning.</p> <p>Land use where work is performed in connection with any business, undertaking or institution, whether as an employer or employee, pupil or inmate of an institution, or otherwise, in any one or more of the following activities: (a) the making of any article or part of any article; (b) the altering, repairing, renovating, testing, ornamenting, painting, spraying, polishing, finishing, cleaning, dyeing, washing, or breaking up of any article; (c) the adaption for sale or use of any article; (d) the sorting, assembling or packing (including</p>

	washing or filling bottles or other containers) of any articles; (e) the construction, reconstruction, assembling, repairing or breaking up of vehicles or parts thereof (but excluding premises used for the purpose of housing vehicles where only minor adjustments are carried out); (f) printing by letterpress, lithography, photogravure or other similar process, including any activity associated with the printing industry; (g) the production and storage of gas in a holder of more than five hundred cubic metre (500 m <sup>3</sup> ) storage capacity; (h) photographic work; (i) any other activity added in terms of the Labour Act (Act 23 of 1992); (j) any activity that is necessarily or ordinarily incidental to any activity referred to in subparagraphs (i) to (x), inclusive, if the premises on which it is carried on form part of or are adjacent to the premises on which the activity to which it is so incidental is carried on (GCS and Stubenrauch Planning Consultants, 2011).
Mitigation	Any action intended to either reduce or avert exposure or the likelihood of exposure to sources that are not part of a controlled practice, or which are out of control as a consequence of an accident (DEA, 2008).
Mitigation Hierarchy	Adoption of a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, or compensate/offset for risks and impacts to workers, Affected Communities, and the environment is widely regarded as a Good International Industry Practice (GIIP) approach to managing environmental and social risks and impacts: <u>Avoidance</u> requires the client to identify and, where available and technically and financially feasible, make changes to the project's design (or potential location) to avoid adverse risks and impacts on social and/or environmental features. Avoidance is considered to be the most acceptable form of mitigation. <u>Minimization</u> : where avoidance is not possible, adverse impacts and risks can be minimized through environmental and social measures/treatments/design. Acceptable options to minimize will vary and include: abate, rectify, repair, and/or restore impacts, as appropriate. <u>Compensation/Offset</u> : where avoidance or minimization measures are not available, it may be appropriate to design and implement measures that compensate/offset for residual risks and impacts. It should be noted that these measures do not eliminate the identified adverse risks and impacts, but they seek to offset it with an (at least) comparable positive one (IFC, 2012).
Monitoring	The repetitive and continued observation, measurement and evaluation of environmental data to follow changes over a period of time to assess the efficiency of control measures (DEA, 2008).
Permeable Paving	Pervious paving systems are paved areas that produce less stormwater runoff than areas paved with conventional paving. This reduction is achieved primarily through the infiltration of a greater portion of the rain falling on the area than would occur with conventional paving. This increased infiltration occurs either through the paving material itself or through void spaces between individual paving blocks known as pavers. Pervious paving systems are divided into three general types: i) porous paving (porous asphalt or concrete paving constructed over runoff storage bed of uniformly graded broken stone); ii) permeable pavers with storage bed (impervious concrete pavers with surface voids constructed over runoff storage bed of uniformly graded broken stone); and iii) permeable pavers without storage bed (impervious concrete pavers with surface voids constructed over structural bed of sand and crushed stone) (New Jersey Stormwater Best Management Practises (BMP) Manual, 2004).
Pollution	The direct or indirect introduction of something which is harmful to people, property, or the environment into the air, land, or water. Pollution can be caused by substances, vibrations, heat, radiation or noise. One of the key ideas behind the law is that the polluter must pay the costs of pollution (MET, 2008).
Polluter Pays Principle	Principle to be used for allocating costs of pollution prevention and control measures to encourage rational use of scarce environmental resources and to avoid distortions in international trade and investment (DEA, 2008).

Renewable energy	Energy that comes from natural resources, such as sunlight or wind, and that are renewable (Wikipedia).
Sewerage	The subset of wastewater that is contaminated with faeces and/or urine; it includes domestic, municipal, or industrial liquid waste products disposed of, usually via a pipe or sewer or similar structure (Wikipedia).
Significant Effect	Having, or likely to have, a consequential qualitative or quantitative impact on the environment, including changes in ecological, aesthetic, cultural, historic, economic and social factors, whether directly or indirectly, individually or collectively (Environmental Management Act (EMA) 7 of 2007).
Stormwater	Water that originates during precipitation (rainfall) events. Stormwater that does not soak into the ground becomes surface runoff. Stormwater is of concern for the following two reasons: one is related to the volume and timing of runoff water (for flood control and the supply of water) and the other is related to the potential contaminants that the water may be carrying and subsequent water pollution (Wikipedia).
Sustainable Use	Using natural resources in a way and at a rate that does not lead to a long-term decline, so that the environment will be able to meet the needs of future generations, i.e. the natural resources of the earth must be shared fairly between present and future generations (MET, 2008).
Waste	An unwanted or undesired material or substance. It is also referred to as rubbish, trash, refuse, garbage, or junk, depending on the type of material. Litter is waste that has been carelessly disposed of in plain sight. Waste is “dumped” in order to avoid paying waste disposal fees (Wikipedia).
Waste Management	The collection, transport, processing, recycling or disposal, and monitoring of waste materials (Wikipedia).
Wastewater	Any water that has been adversely affected in quality by anthropogenic (human) influences, i.e. liquid waste discharged by domestic residences, commercial properties, industry, and/or agriculture and can encompass a wide range of potential contaminants and concentrations (Wikipedia).

# 1 Introduction

## 1.1 Background

African Precast Concrete Industries (Pty) Ltd (hereinafter referred to as African Precast Concrete Industries or APCI), a part of the Jimmey Group of Companies, is proposing to establish two new townships (hereinafter referred to as the Development) on the remainder of Farm Elisenheim No. 680 (hereinafter referred to as the Northern Development Area).

The Northern Development Area, around 475 hectares (ha) in size, is located between the Elisenheim Residential Development / Nature Estate (to the north), the B1 National highway, the TransNamib Holdings Limited (TransNamib) Railway Line, and the Klein Windhoek River (to the west), the Van Eck Power Station (to the south) and farm land (to the east) (see Figure 1).

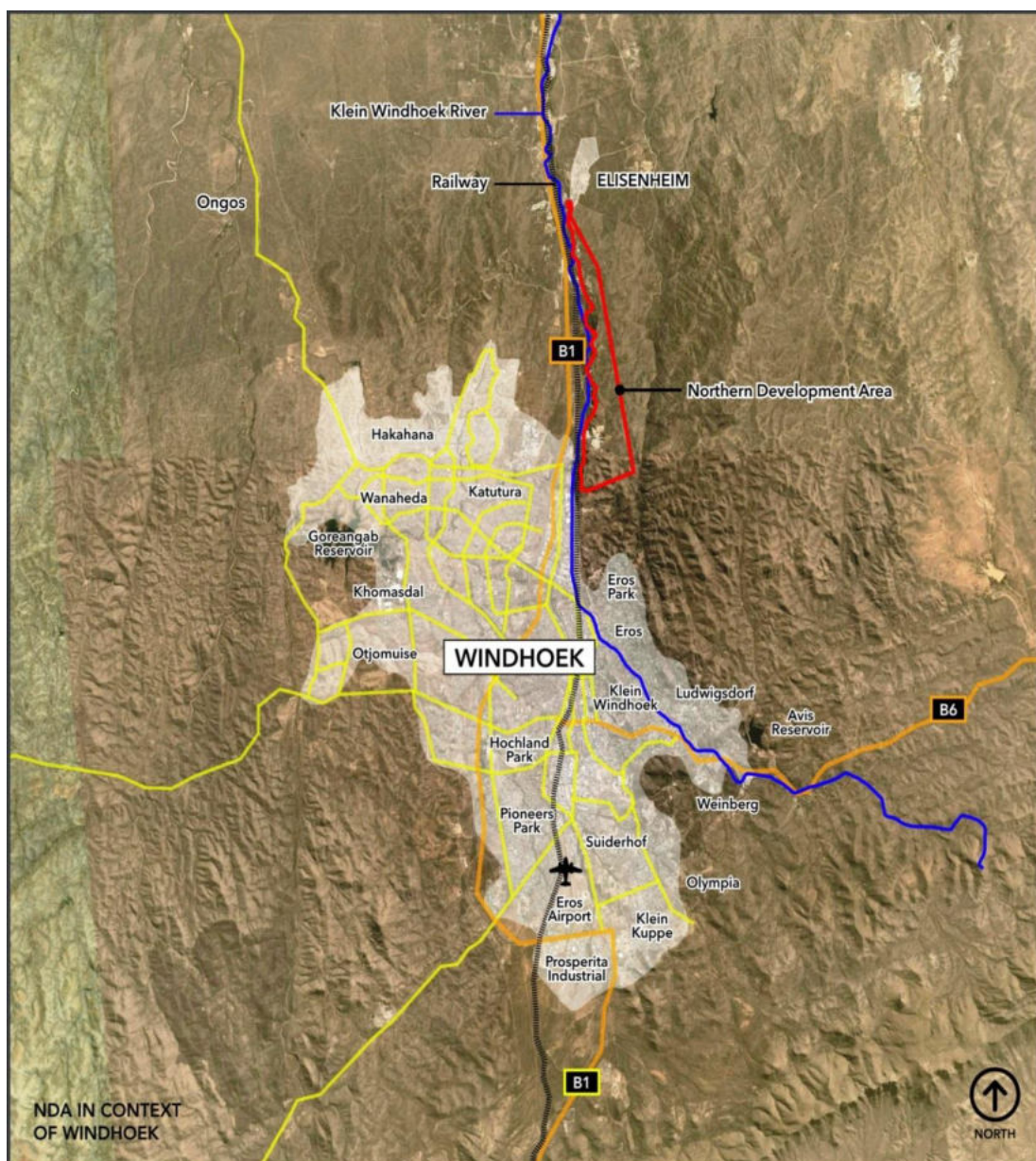


Figure 1: Image showing the locality of the Northern Development Area, Windhoek, Khomas Region, Namibia (Source: Dennis Moss Partnership, September 2013).

Due to natural constraints (i.e. especially slopes and water courses), less than half (226 ha) of the 475 ha is suitable for property development. The remainder (249 ha) may be used for tourism-related development and conservation (Dennis Moss Partnership, 2013a; b; see Figure 2).

The Northern Development Area was divided into two areas (see Figures 2 and 3), i.e. Development Area A (Southern Sector; 118 ha) and Development Area B (Northern Sector; 108 ha).

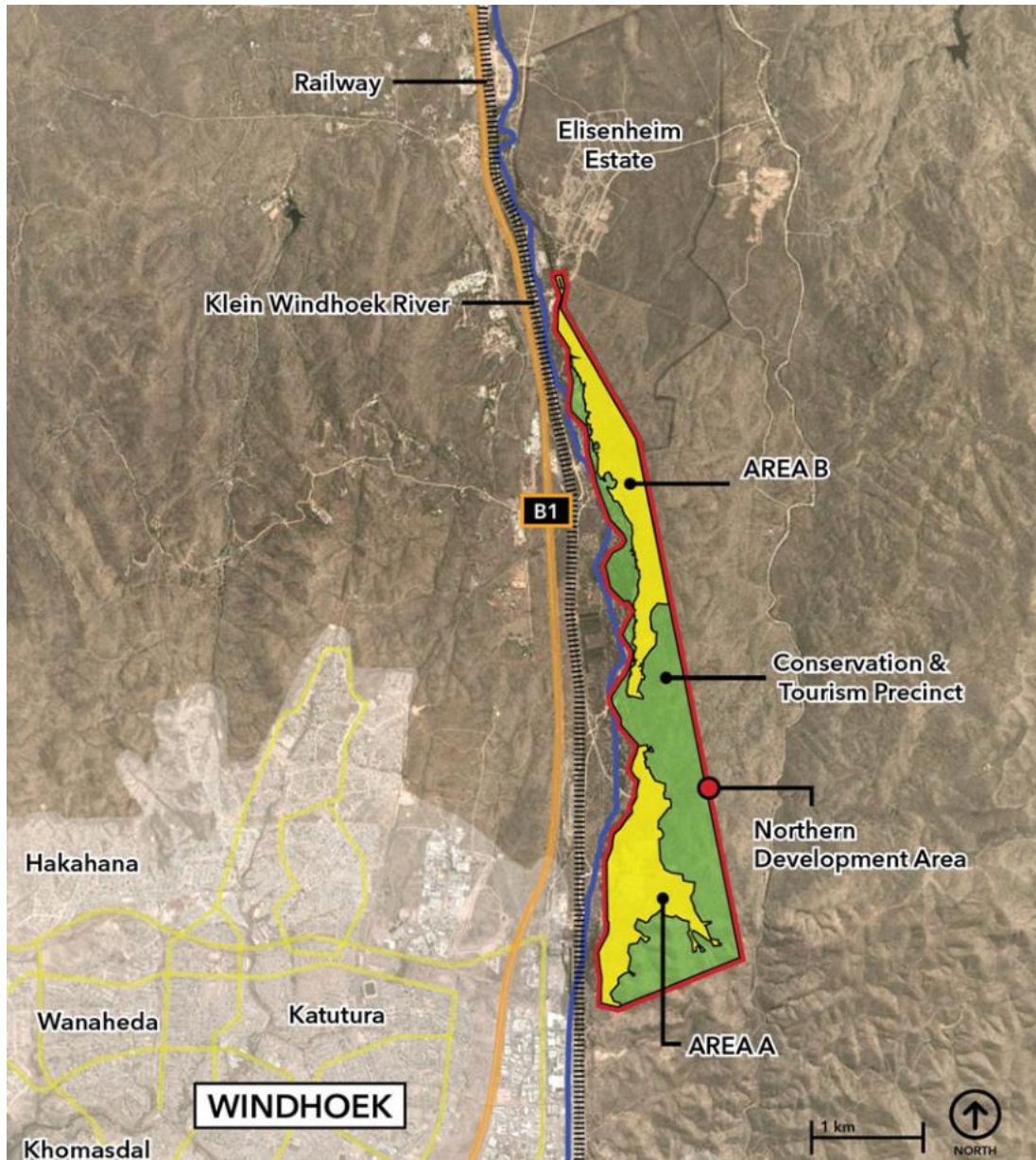


Figure 2: Image showing the areas suitable for property development (Development Areas A and B; highlighted in yellow), as well as the area that may be used for tourism-related development and conservation (highlighted in green), Northern Development Area, Windhoek (Source: Dennis Moss Partnership, November 2013).

It is proposed to develop an Industrial/Business Township in Development Area A and a Residential/Business Township in Development Area B. Thirty nine (39) ha of Development Area A is currently zoned “Industrial” (see Figure 3); the remainder of the Northern Development Area is zoned “Agricultural”.





Figure 3: Image showing Development Area A (including the area currently zoned “Industrial” (outlined in red)) and Development Area B, Northern Development Area, Windhoek (Source: Dennis Moss Partnership, Base Plan, 30 October 2013).

It is foreseen that the Northern Development Area will be developed over a period of between seven (7) and ten (10) years. Depending on market forces and servicing economics, either Development Area A will be developed first (in six (6) phases), followed by Development Area B, or two core areas (i.e. one Industrial and one Residential/Business) will be developed within each of the Development Areas (Dr J. Koen, General Manager (GM): Strategic Planning & Development, African Precast Concrete Industries (Pty) Ltd, pers. comm.).

In order to establish two new townships, and create zonings for industrial, business, residential and possibly “mixed-use”, African Precast Concrete Industries would first need to apply to the Minister of Regional and Local Government, Housing and Rural Development, via the Namibian Planning Advisory Board (NAMPAB), for: i) the subdivision of the remainder of Farm Elisenheim No. 680 into two Portions plus remainder; and ii) for permission to apply for the establishment of new townships (“need and desirability”) on each of the newly created portions. Second, African Precast Concrete Industries would need to apply to the Minister of Regional and Local Government, Housing and Rural Development, via the Townships Board, for iii) approval of the layout plans for both townships, as well as the final establishment of new townships on the newly created portions. Prior to the submission of the above to NAMPAB and the Townships Board, applications for i), ii) and iii) must first be submitted to the City of Windhoek (CoW) who must recommend approval via Council Resolution.

On 6 February 2012, the *Commencement of the Environmental Management Act (EMA), 2007* was published in the Government Gazette (GG) No. 4878, thereby becoming law (Government Notice (GN) No. 28). The Minister of Environment and Tourism listed activities that may not be undertaken without an Environmental Clearance Certificate (GN No. 29), and Under section 56 of EMA No. 7 of 2007, made the regulations set out in the Schedule (Environmental Impact Assessment (EIA) Regulations; GN No. 30) (GRN, 2012).

Certain “*land use and development activities*”, i.e. the “*rezoning of land from agricultural use to industrial use*” may not be undertaken without an Environmental Clearance Certificate. Also, the CoW and NAMPAB requires an Environmental Clearance Certificate before the proposed establishment of new township(s) will be approved. African Precast Concrete Industries thus applied for Environmental Clearance to the Environmental Commissioner on 11 September 2013.

## 1.2 Terms of Reference

LM Environmental Consulting was appointed by African Precast Concrete Industries to conduct an Environmental Impact Assessment (EIA) and prepare an Environmental Management Plan (EMP) for the proposed Development.

This Report set out to provide information on: i) the proposed Development; ii) the natural environment, including the physical, bio-physical and socio-economic environments; iii) the regulatory framework; iv) the Public Participation Process (PPP); v) an assessment of the potential impacts that certain aspects of the proposed Development may have on the environment, as well as the potential impact should the Development not go ahead; and vi) the mitigation measures for the potential negative impacts of the proposed Development/Activities in the form of EMPs for the planning and construction/operational phases of the Development.

## 1.3 Environmental Assessment Practitioner

The Author of this Environmental Impact Assessment and Management Plan Report is Dr Lima Maartens who has 20 years' experience in natural resource management (she gained her doctorate in Fisheries Science from Rhodes University, South Africa in 2000 while working for the Namibian Ministry of Fisheries and Marine Resources), lecturing (University of Namibia), environmental science and management (De Beers Marine Namibia and the Canadian Forsys Metals Corp), and consulting. Dr Maartens is registered as a lead practitioner with the Environmental Assessment Professionals of Namibia (EAPAN), an associate member of the Namibian Chamber of Mines (CoM), a member of the Southern African Institute of Ecologists and Environmental Scientists (SAIE-ES), and a registered associate environmental auditor with the Institute of Environmental Management and Assessment (IEMA) in the United Kingdom. LM Environmental Consulting was established by Dr Maartens in October 2009 (see Annexure A for a Curriculum Vita).

Specialist input to the Report was obtained from Dr John Kinahan (Archaeology), Mr Pierre Botha (Hydrogeology and Pollution) and Mr Peter Cunningham (Vertebrate Fauna and Flora).

Dr John Kinahan is an archaeologist with more than 30 years in the field. He has a broad range of interests and has carried out original research and contract investigations on nearly all components of the regional archaeological record. He is particularly interested in the archaeology of human adaptation to arid environments and has published widely on the subject of desert hunter-gatherer and nomadic pastoralist economies. Dr Kinahan has worked widely in Africa carrying out archaeological investigations required for environmental compliance of mining, infrastructure and related developments. He has worked as an international consultant to UNESCO (ICOMOS) on several occasions, and has served as visiting researcher/lecturer, and postgraduate research advisor at universities in Africa, Europe and Australia. He maintains strong collaborative research interests and regularly contributes to the published literature in his field.

Pierre Botha is the Managing Director of Geo Pollution Technologies (Pty) Ltd, Namibia. Mr Botha has excellent experience and knowledge in hydrocarbon pollution mapping, remediation and monitoring, environmental impact assessments, groundwater exploration, resource evaluation, urban and rural water supply, groundwater management, monitoring and hydrochemistry. He gained most of his experience in Namibia and is involved in the Namibian environmental industry since 1992. Mr Botha's experience in the environmental field has been gained from various projects ranging from environmental impact assessments, fuel installation closures, pollution mapping and rehabilitation to health risk evaluations. The majority of these studies were conducted on behalf of the oil and mining industry.

Mr Peter Cunningham is a local, private environmental consultant focusing mainly on specialist terrestrial vertebrate fauna and flora work and with applicable experience since the early 1990s. He has been involved in various environmental consultancies mainly from Namibia, but has also conducted work in Angola, Saudi Arabia, Tanzania and the United Arab Emirates. His qualifications include a M.Sc. in Nature Conservation from the University of Stellenbosch, South Africa. He has extensive natural resource and parks management experience, including monitoring issues and has been involved with the training of rangers and wardens for the Ministry of Environment and Tourism, and various other organisations, whilst teaching conservation at tertiary level at the Polytechnic of Namibia.

## 2 Description of the Project

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### 2.1 Project Location and Land Use

The Northern Development Area (remainder of Farm Elisenheim No. 680) is around 475 ha in size. The Area, 7.5 kilometres (km) in length, is located between the Elisenheim Residential Development / Nature Estate (to the north), the B1 National highway, the TransNamib Railway Line, and the Klein Windhoek River (to the west), the Van Eck Power Station (to the south) and farm land (to the east) (see Figures 1, 2 and 4).



Figure 4: Image showing the Northern Development Area, Windhoek (*Source: after Dennis Moss Partnership, October 2013*).

Due to natural constraints (i.e. especially slopes and water courses) less than half of the Northern Development Area is suitable for property development (see Figures 2 and 5). Aspects and studies that informed the determination of the areas suitable for the various proposed activities and development include: i) existing land use characteristics and zoning; ii) servitudes and the proposed infrastructural development; iii) slope analysis; iv) flood line analysis (the upgrading of the existing river bed and the construction of a channel with the aim of minimizing the flood plain and maximizing the amount of available land was taken into consideration (Windhoek Consulting Engineers (WCE), 2013a)) (see Section 3.1.4 and Annexure D); v) archaeological assessment (see Section 3.1.3); and vi) biophysical assessment (see Section 3.2.3) (Dennis Moss Partnership, 2013a).

Note that more than half the area of the proposed Development is disturbed, i.e. due to road construction, power lines, cultivation, wood and grass harvesting, commercial-scale sand winning, the BCI Cement Factory, tracks, and various dumping sites (see Section 3.2).

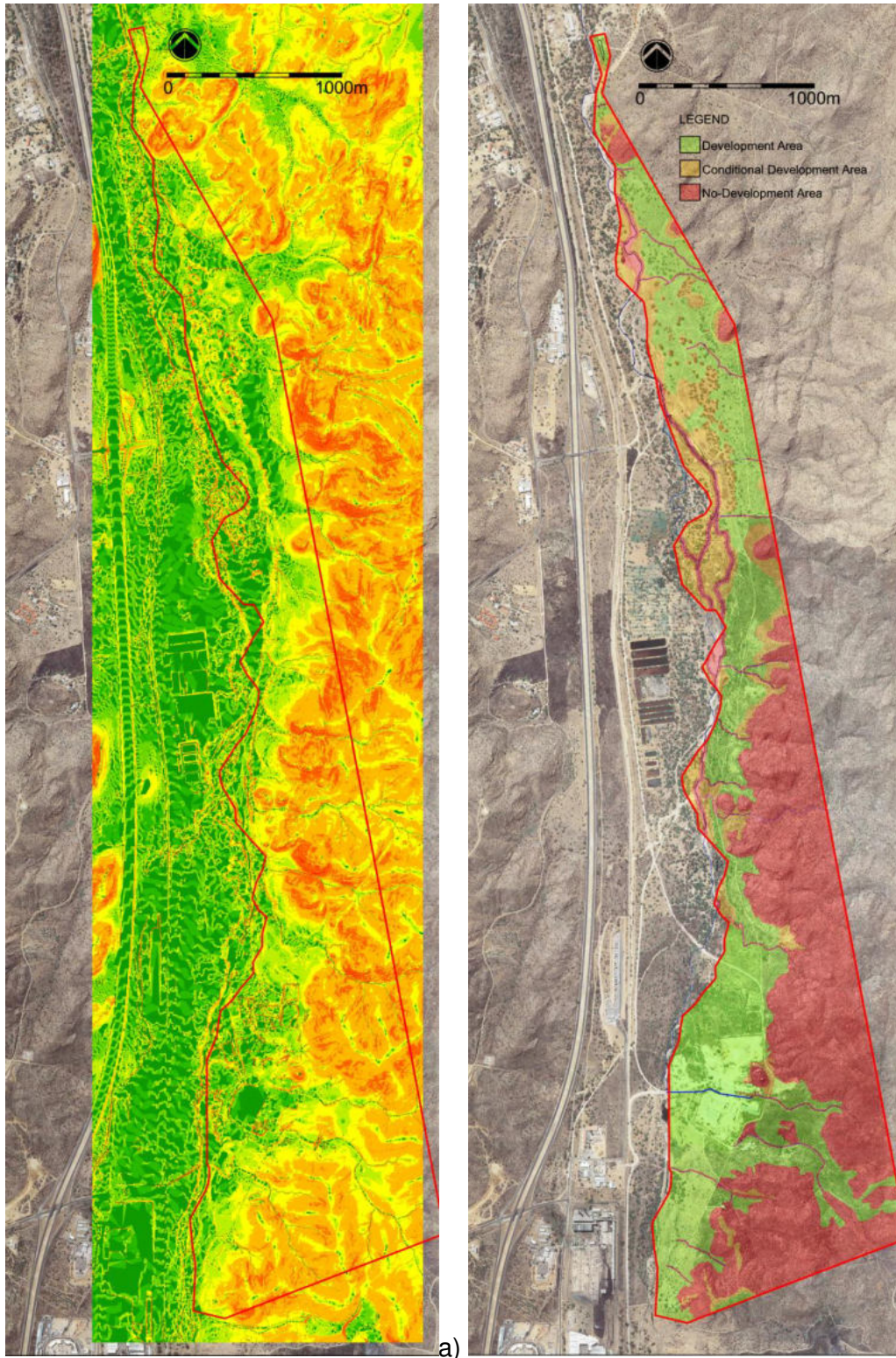


Figure 5: Northern Development Area: a) slope analysis (the red areas indicate areas with slopes steeper than 1:5, i.e. areas unsuitable for urban development); and b) development suitability categories (red = no-development zone; green = development zone; and orange = conditional development zone) (Source: Dennis Moss Partnership, October 2013).

Note that the location of the (protected) tree species (also see Sections 3.2.3 and 3.2.4) has been a key informant in the status classification of the subject land in accordance with the criteria of no-development, conditional development and development.

The urban design plan was informed by the location of individual large trees and tree clusters as identified from high-resolution ortho-rectified aerial photography, ground-truthing of the locations by means of various site inspections, and study prepared by Cunningham (2013).

It is recognized that individual trees (especially the large trees) and large clusters of trees play an important role in ecological systems and that these can contribute to the quality of the envisaged urban environment. The trees and tree clusters located within the development area will be incorporated into the design and ongoing use of the area in a number of ways namely:

- Trees included into the open spaces and stream buffer zones within the urban area: these will be retained and be included into park landscapes to the extent possible;
- Trees included into public spaces such as road reserves and sidewalks: the majority of these trees will be retained to enhance the aesthetic quality of the site, and provide shading, focus points, etc.;
- Trees included into open spaces in larger general residential or commercial/business erven: the preliminary urban design plan and framework illustrates how the buildings within these erven were adapted to accommodate the trees on these sites; these trees also play an important role in the improvement of open space and park landscapes on these sites; and
- Trees included into single residential erven: smaller and medium size trees occur on residential erven; these will be incorporated into the design and construction process to the extent practically and economically possible (D. Moss, Dennis Moss Partnership, pers. comm.).

## 2.2 Proposed Activities

The areas within the Northern Development Area that are suitable for property development (226 ha of the 475 ha) was divided into two areas, i.e. Development Area A (Southern Sector; 118 ha) and Development Area B (Northern Sector; 108 ha) (see Figures 2, 3, 6 and 7).

Thirty nine (39) ha of Development Area A is currently zoned “Industrial”. It is proposed to develop a Business Park, including commercial and retail, on the remainder (79 ha) of Development Area A, i.e. the areas to the north, south and east of the existing “Industrial” zone (see Figure 6).



Figure 6: Development Area A (Southern Sector): Base Plan (the area currently zoned “Industrial” is outlined in red) (Source: Dennis Moss Partnership, 30 October 2013).

Approximately 108 ha of Development Area B (see Figure 7) is situated above the 1:50 year flood line and is thus suitable for property development, i.e. conventional residential development incorporating community facilities and amenities, as well as limited business/commercial land uses. The potential roads and open space linkages with the Elisenheim Residential Development / Nature Estate were incorporated into the design (Dennis Moss Partnership, 2013a).



Figure 7: Development Area B (Northern Sector): Base Plan (Source: Dennis Moss Partnership, 30 October 2013).

The proposed urban structure, its form and nature for each of the Development Areas (A and B), Northern Development Area, is shown in Figures 8 and 9.

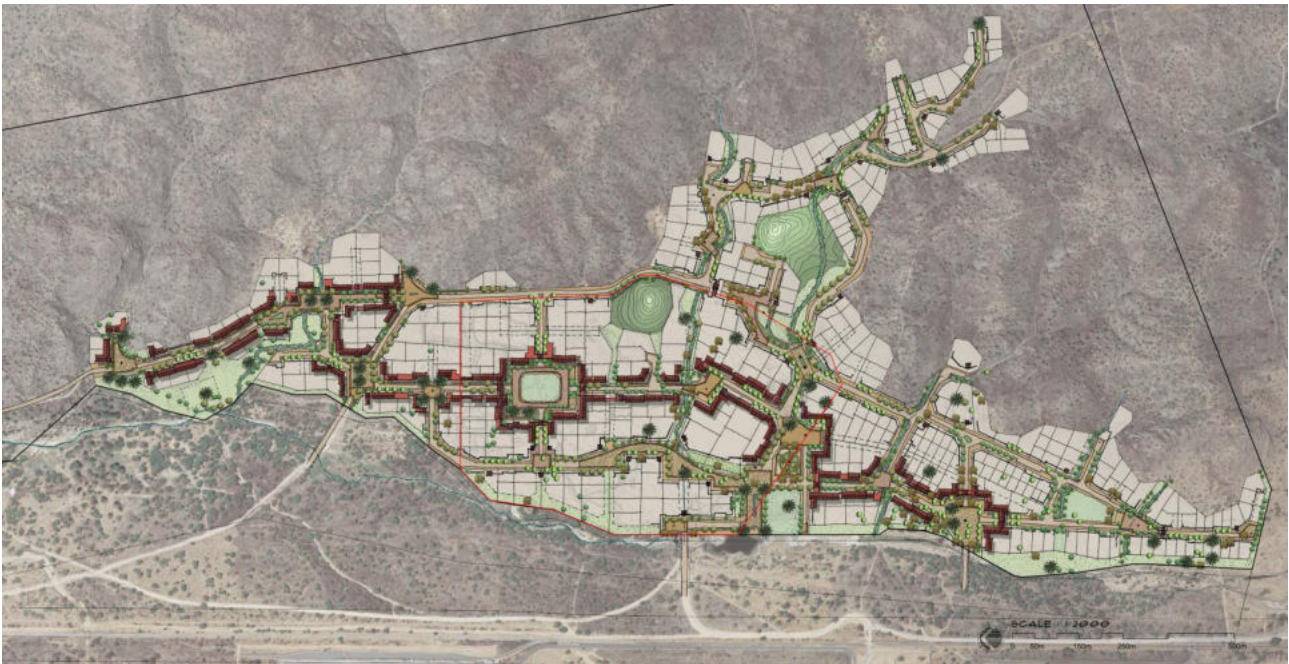


Figure 8: Development Area A (Southern Sector): *Draft Urban Structure Plan* (Source: *Dennis Moss Partnership, 30 October 2013*).



Figure 9: Development Area B (Northern Sector): *Draft Urban Structure Plan* (Source: *Dennis Moss Partnership, 30 October 2013*).

The proposed urban design master plans for each of the Development Areas (A and B), Northern Development Area, is shown in Figures 10 and 11.





Figure 10: Development Area A (Southern Sector): *Draft Urban Design Master Plan* (Source: *Dennis Moss Partnership*, 30 October 2013).



Figure 11: Development Area B (Northern Sector): *Draft Urban Design Master Plan (Source: Dennis Moss Partnership, 30 October 2013).*

The proposed subdivision and land use plans for Development Areas A and B, Northern Development Area, is summarised in Table 1 and depicted in Figures 12 and 13.

The final layout for the Northern Development Area (Development Areas A and B) has not been completed, but it is foreseen that it will consist of 154 erven plus remainder and including two (2) core areas, i.e. one Industrial (42 erven plus street) and one Residential/Business (85 erven plus street). Depending on market forces and servicing economics, either Development Area A will be developed first (in six (6) phases), followed by Development Area B, or two core areas (i.e. one Industrial and one Residential/Business) will be developed within each of the Development Areas. An overall construction period of between seven (7) to ten (10) years is expected (Dr J. Koen, General Manager (GM): Strategic Planning & Development, African Precast Concrete Industries (Pty) Ltd, pers. comm.; T. Rudd, Director, Urban Dynamics, pers. comm.).

Table 1: The proposed land use breakdown for Development Areas A and B, Northern Development Area, Windhoek (Source: Dennis Moss Partnership, 11 November 2013).

Description	Area (ha)	Percentage (%) of Total Area	No. of Erven
<b>Development Area A (Southern Sector)</b>			
Industrial Erven	25.8	21.8	111
Mixed-Use Erven	46.6	39.3	310
Open Space	16.4	13.9	26
Streets	29.5	25	2
<b>Total</b>	<b>118</b>	<b>100</b>	<b>449</b>
<b>Development Area B (Northern Sector)</b>			
Residential Erven	28	26	582
Apartment Erven	13.9	13	16
Institutional Erf	0.5	1	1
Open Space	35.1	32	35
Streets	30.5	28	2
<b>Total</b>	<b>108</b>	<b>100</b>	<b>636</b>

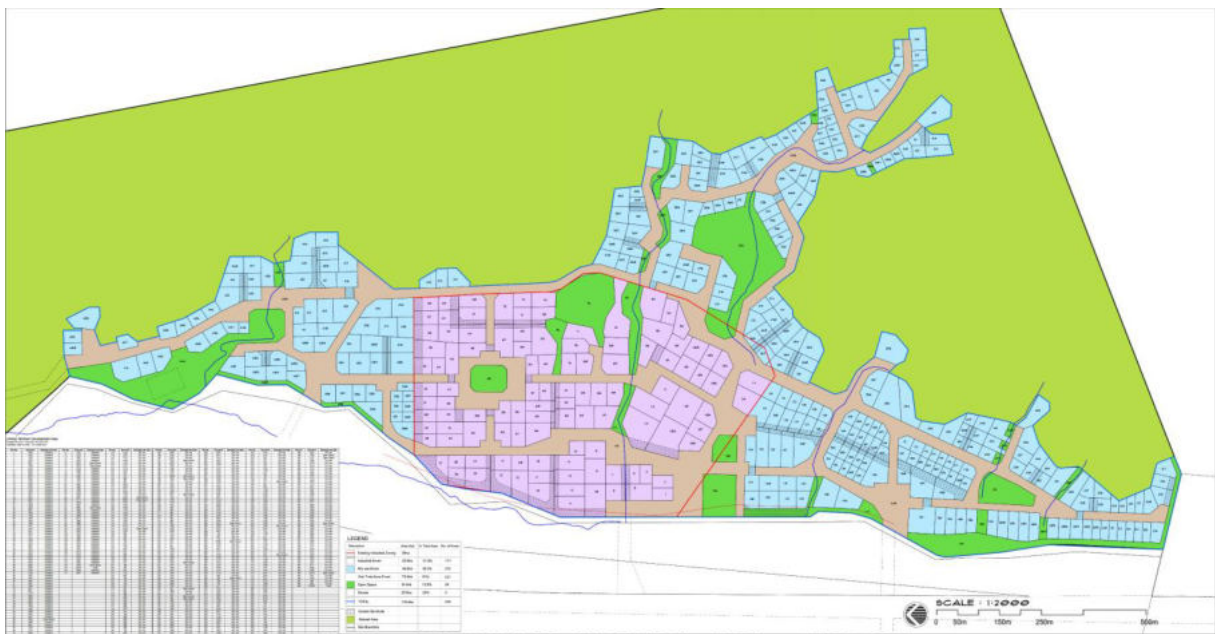


Figure 12: Development Area A (Southern Sector): Draft Land Use and Subdivision Plan (Source: Dennis Moss Partnership, 30 October 2013).



Figure 13: Development Area B (Northern Sector): Draft Land Use and Subdivision Plan (Source: Dennis Moss Partnership, 30 October 2013).

## 2.3 Engineering Services

Windhoek Consulting Engineers (Pty) Ltd (WCE) conducted a preliminary investigation for the development of bulk and internal services that would be required for the development of the two proposed townships. In order to ensure a sustainable Development, special consideration was given to the provision of bulk services to Development Areas A and B; this was achieved through discussions with all the relevant role players, i.e. the City of Windhoek (CoW), the Namibian Water Corporation (NamWater), the Namibian Power Corporation (NamPower), and TransNamib (WCE, 2013a).

### 2.3.1 Access and Internal Road Network

Primary access to the Northern Development Area will be attainable via: i) the extension of Monte Christo Road in an easterly direction and passing over the TransNamib Railway Line and the Klein Windhoek River (to Development Area A); and ii) the existing 1:50 year flood line bridge structure providing access to the Eisenheim Residential Development (see Figure 14: Points 1 and 5).

During the initial phases of the Development, the existing low water river crossing at the current point of access to the site (i.e. along the existing gravel road to the area zoned "Industrial") will be upgraded to make provision for a 1:10 year flood (see Figure 14: Point 2). The low water river crossings at two additional access roads may also be upgraded (to make provision for a 1:10 year flood) (see Figure 14: Points 3 and 4).

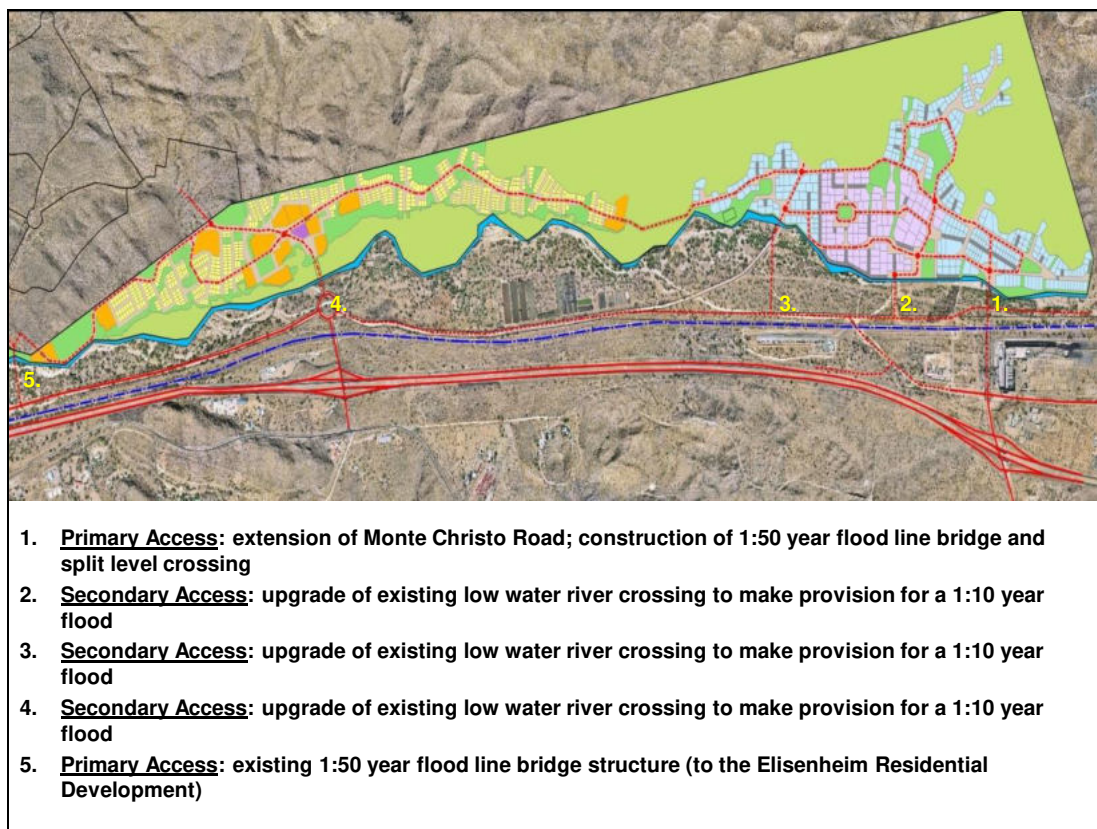


Figure 14: Points of access to the Northern Development Area (Source: after Urban Dynamics, November 2013).

The CoW requires the construction of an 1:50 year flood line bridge(to Development Area A); TransNamib requires that the Railway Line crossing be upgraded to a split level crossing once

traffic in the area increases to such an extent that it is necessitated. The new bridge will be constructed in conjunction with the extension of Monte Christo Road and the associated rail bridge and other infrastructure.

The internal road network will consist of a combination of dual carriage ways (Development Area A) and single carriage way roads (Development Area B). Ample provision was made for on-street parking and additional public parking within Development Area A; special consideration was also given for the provision of access to the public open spaces within Development Areas A and B (see Table 1 and Figures 12 and 13) (WCE, 2013a).

### 2.3.2 Stormwater Infrastructure

All internal stormwater will be accommodated, either in open channels within the public open spaces, or in underground drainage structures. During the detail design phase, care will be taken to maximize groundwater recharge, i.e. through retention ponds, permeable paving, etc. (WCE, 2013a).

### 2.3.3 Water Demand and Supply

The Central Area of Namibia (i.e. an area that includes the towns of Windhoek and Okahandja (in the south), Karibib (to the west), Osire (central), and Grootfontein, Kombat, Ongongoro (to the north)) receives its water from: i) surface sources (Omatako, Von Bach and Swakoppoort Dams; the yield is ~20.0 million cubic metres per annum ( $\text{Mm}^3/\text{annum}$ )); ii) groundwater sources (Berg Aukas Mine and Boreholes, Kombat Mine (to be installed), Goblenz, Windhoek and Seeis Boreholes; the yield is ~8.4  $\text{Mm}^3/\text{annum}$ ; and iii) the Goreangab Reclamation Plant (recycled water; the yield is ~7.5  $\text{Mm}^3/\text{annum}$ ). During 2012, the annual water demand for the central area was 34.4  $\text{Mm}^3/\text{annum}$  (vs the approximate yield of 35.9  $\text{Mm}^3/\text{annum}$ ) (Venter, 2013).

During the period 1999 to 2011, Windhoek received ~22  $\text{Mm}^3$  of water per annum from three sources: i) the NamWater three-dam system (76%); ii) reclaimed water (16%); and iii) boreholes in the Windhoek Aquifer (8%) (Louw, 2013). In 2012, Windhoek's water demand was ~26.1  $\text{Mm}^3/\text{annum}$  (Venter, 2013). Louw (2013) indicates that the current peak demand (>75,000 cubic metres per day ( $\text{m}^3/\text{day}$ )) exceeds the total supply (71,000  $\text{m}^3/\text{day}$ : 55,000  $\text{m}^3/\text{day}$  (from NamWater) and 16,000  $\text{m}^3/\text{day}$  (reclaimed water)) and water is then abstracted from the boreholes to augment the water supply to the City.

Due to the current drought conditions experienced in Namibia, the City of Windhoek (CoW) imposed limitations on the type of industrial developments that will be allowed, i.e. industries with a high water demand ("wet industries") will not be permitted. During initial discussions with staff from the CoW, no critical objections with regards to the proposed Development were raised (WCE, 2013a).

Water for Development Area A will be obtained from the distribution network, connected to the Abattoir Reservoirs further south, and situated on the western side of the Klein Windhoek River. In order to ensure sufficient water supply and pressure to Development Area B, a new reservoir would need to be constructed.

WCE (2013a) estimated the potable water demand for the Development at:

- Average annual daily potable water demand: 2,705  $\text{m}^3/\text{day}$ ;
- Instantaneous peak demand (peak factor of 4): 10,820  $\text{m}^3/\text{day}$ ; and
- Design supply demand for supply main (based on 1.5 times the average annual daily demand): 4,050  $\text{m}^3/\text{day}$ .

It is proposed to use semi-purified effluent from the new Waste Water Treatment Plant (WWTP) for the irrigation of parks, as well as for private irrigation purposes. The latter proposal will, however, have to be discussed and agreed upon between the CoW and APCI (WCE, 2013a). Note that care should be taken that the treated sewerage water is free from helminth eggs (the eggs can survive on plants and soil for many months) and other parasites and pollutants before it is used for irrigation purposes (also see Section 7: EMP).

Botha (2013; Annexure C) indicates that "...available water is one of the city's most scarce resources and represents a constraint for sustainable development in future" and concludes that "Water supply to the Central Namibia Area, including the Windhoek–Okahandja area, relies on the same water source. Continued development and expansion in this area is putting the water supply sources under increased strain and a point will be reached where alternative water sources will need to be developed. This will have associated cost implications to all water users in the area and will potentially cause environmental impacts on the newly developed water sources. It is therefore advised that water saving methods be encouraged as part of this development and that the developer considers to only allow industries that does not have a high water demand."

#### 2.3.4 Sewer Drainage and Treatment

Options for the treatment of sewerage include: a gravity sewer network, a pump station, or on-site treatment. The CoW indicated that a gravity sewer network would be preferred.

WCE (2013a) propose that the Development be serviced with an enclosed (gravity) sewer network; effluent will be conveyed to, either strategically placed pump stations, or to pipe bridges crossing the Klein Windhoek River. Upon crossing the River, the network will be connected to the existing CoW infrastructure that drains towards to Ujams Oxidation Ponds; the latter ponds will soon (2014) be replaced by the new Ujams WWTP further north (see Figure 15).

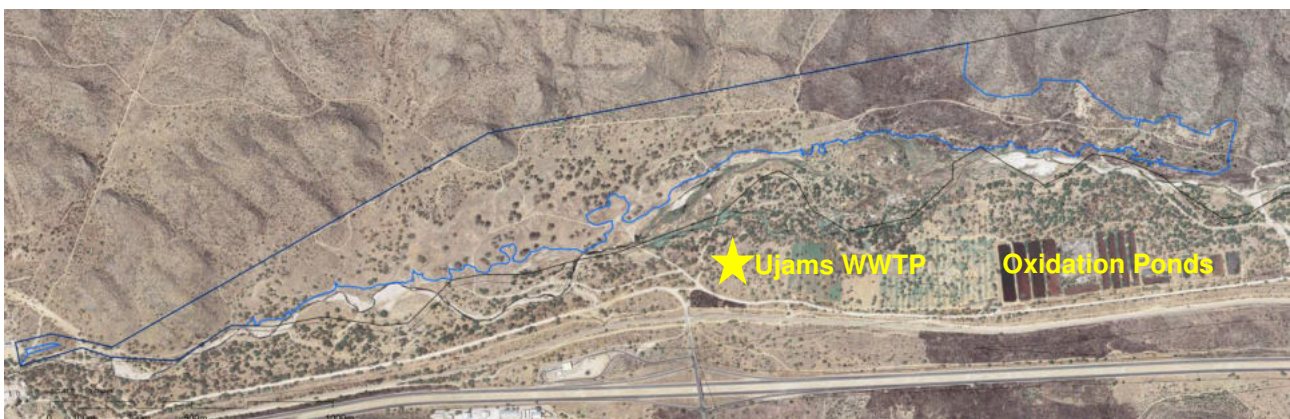


Figure 15: Image showing the location of the Ujams Oxidation Ponds and new Ujams Waste Water Treatment Plant (WWTP) (in relation to Development Area B) (Source: after Dennis Moss Partnership, 30 October 2013).

Based on the topography of the Northern Development Area, three to four distinct catchment areas were identified. Each of these areas will be serviced by a sewerage drainage network consisting of 160 and 110 millimetre (mm) diameter sewer lines; a small portion of the lines will be 200 and 250 mm in diameter in order to compensate for heavy flows.

#### 2.3.5 Solid Waste Management

The CoW will be responsible for the removal of solid waste (also see CoW Solid Waste Management Policy). Hazardous and Industrial Waste would need to be treated as per the CoW's

requirements; the latter is based on the South African Department of Water Affairs and Forestry's Waste Management Series: Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste (1998) and subsequent updates of this document.

### *2.3.6 Electrical Infrastructure*

WCE (2013a), taking into account diversity, Average Daily Maximum Demands (ADMDs) and Load Factors, estimate the total electricity demand of the proposed Development to be approximately 13.5 mega Volt-Ampere (MVA).

A supply will be required from the CoW Electricity Network. Bulk supply is available from the Elisenheim 66/11 kilo Volt (kV) Load Centre, located directly south of the Van Eck Power Station.

There is currently no formal network contribution towards bulk electrical supply, but the CoW is working on a policy for a bulk electrical network contribution charge. The latter will include the required electrical equipment at the Elisenheim Load Centre, two supply cables to the proposed Development and an 11 kV Distribution Substation on the southern side of the Development (i.e. Development Area A). For Development Area B, a second 11 kV Distribution will be required with a possible strengthening of the first 11 kV Distribution Substation to four supply cables.

As far as the internal network is concerned, an underground 11 kV electrical ring network will supply 11 kV/415V 315 kilo Volt-Ampere (kVA), 500 kVA, 630 kVA and 800 kVA Miniature Substations from the 11 kV Distribution Substations. The latter will be located on public open space plots in the Development area. Underground service connections will be via electrical metering kiosks fed from the Miniature Substations.

## 2.4 Need and Desirability

In order to provide input to and guide future spatial development and planning for the City of Windhoek, a Strategic Environmental Assessment (SEA) was carried out (GCS and Stubenrauch Planning Consultants, 2011).

It was found that, similar to the findings of Africon Environment & Sustainability Consulting (2004; Windhoek Environmental Structure Plan & Environmental Policy), the areas best suited for future development are: i) the Brakwater area to the north; ii) the area to the west and south-west of Windhoek, specifically the area located adjacent to the Western Bypass; and iii) the area to the north-west of the Goreangab Dam.

A number of land use challenges for the CoW were also identified as a result of the SEA. These include, amongst others, the provision of housing and basic services for the growing low income sector of the population, specifically in the northern areas of the City, and the development and/or expansion of industrial areas. As far as the latter is concerned, it was noted that the potential threat posed to groundwater and the accessibility of these areas for the lower income groups must be taken into account.

Existing industrial areas include: Lafrenz and the Northern Industrial and the Southern and Prosperita Industrial Areas. GCS and Stubenrauch Planning Consultants (2011) noted that the proximity of Lafrenz and the Northern Industrial Area to the lower income suburbs made these two areas ideally suited for future growth and expansion. The Prosperita Industrial Area, compared to the Lafrenz, Northern and Southern Industrial Area, is not as accessible for workers who rely on public transport. Also, expansion of the Southern and Prosperita Industrial Area appears to be limited by the existing surrounding land uses in the area.

Due to the potential pollution of the Windhoek Aquifer (by industrial activities in the area), expansion of the Prosperita Industrial Area and the potential establishment of new industrial areas to the Southern Area, are not recommended. Instead, GCS and Stubenrauch Planning Consultants (2011) indicate that the most suitable area for the establishment of new industrial areas appears to be located in the area to the north of the City.

Jimme Construction CC Property Developers' vision is *"to promote and give practical effect to sustainable development in the interest of both the public good and the financial sustainability of the Jimme Group of Companies"* (African Precast Concrete Industries (Pty) Ltd is part of the Jimme Group of Companies). Jimme has adopted Namibia's Vision 2030 as an overarching framework and its business plans and operations are aligned with Namibia's National Development Plan (NDP); the Fourth NDP (NDP\_4) is considered as a key planning and strategic informant. Jimme's vision is to be given effect to sustainable development through the implementation of property related development such as the Development proposed for the Northern Development Area, Windhoek (Dennis Moss Partnership, 2013a).

Joubert and Van der Vyver (Urban-Econ Development Economists; 2013) conducted a study on behalf of Jimme Construction CC to determine whether the development of an Industrial/Business Township is appropriate in relation to the economic performance, demand and site suitability findings. It was found that the agglomeration benefits, as well as arguments supporting the appropriateness of the proposed Development (i.e. Industrial/Business Township) in Development Area A would potentially include the following:

- **"Establishment of the industrial value chain and reduction in local proximity** enhance the diffusion of technology and the exchange of information. Upstream and downstream industries which are located in close proximity of each other will lead to a reduction in variable costs.
- **Commodity transport safety and efficiency** would increase as fewer shipment handlings would be necessary in the distribution process between industries. This would also have an effect on minimised transport costs, fewer logistics planning and higher profitability margins.
- Industries would be able to benefit from **economies of scale** where the agglomerated industries would enhance product output at lower cost through minimised variable costs. The variable costs which could be minimised may include labour transport costs, freight transport costs, property tax, service tax, etc. This would only be achieved by clustering linked industries of the same business entity.
- **Increased competitiveness** between the agglomerated industries would enhance innovative production methods of manufacturing industries.
- The development concept of the industrial park provides for innovative sustainable energy methods which would create **competitive advantage** over the current market competitors. The development aim is to make a meaningful difference to both human well-being and environmental integrity. Natural resources are limited which leads to the investigation of various technologies and smart designs which include utilizing solar energy, the conservation of energy, harvesting rain water, etc. The park will be an eco-friendly environment that will be the first of its kind in Namibia. The sustainable energy approach would impact reductions of carbon tax and operational expenses which could increase industry revenues."

The following key performance indicators and supporting arguments in favour of the proposed Industrial/Business Township Development (Development Area A) were identified:

- It is ideally suited for the development of industries such as manufacturing (e.g. of basic foods and agricultural processing; beverages; basic metal (non-noxious); furniture; and jewellery) and warehousing (e.g. for the storage and distribution of: transport equipment,



machinery and other equipment; chemical and rubber and plastic products; refined petroleum products; diverse metal products; food storage (including cold storage); and the warehousing of textiles, clothing, leather products and footwear);

- It is well situated in terms of national road networks providing strong linkages as well as local accessibility for the distribution of manufactured and stored products;
- It is ideally located in terms of labour supply, manufacturing resources, transportation networks, and potential target markets;
- The surrounding land-uses fulfil a complementary role to the proposed Industrial/Business Development;
- High levels of accessibility to employment opportunities are perceived where the site is surrounded by employment areas;
- The surrounding low income areas may provide high levels of unskilled employment opportunities;
- It is ideally located in terms of surrounding land uses and forms part of the municipal objective to increase private industrial development;
- There are adequate service infrastructure to feed tenant industries;
- High levels of exposure could potentially arise through the Development and this would benefit the attractiveness of the Industrial/Business Park;
- The local industrial sector is performing well with indications of expansion of the existing industries which will result in additional demand;
- There is no capacity for industrial expansion on existing industrial land and industries would thus have to relocate or start new remote industrial operations; and
- Civil service capacities are in favour of the proposed Development and bulk service installation and upgrades are planned for the area (Joubert and Van der Vyver, 2013).

## 3 Natural Environment

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### 3.1 Physical Environment

#### 3.1.1 Regional Setting

The Khomas Region is the most central of the fourteen regions of Namibia. It covers an area of 36,861 square kilometres (km<sup>2</sup>), or 4.5% of the total surface area of the Country. The Region is bordered by the Otjozondjupa Region (north), the Erongo Region (north-west and west), the Hardap Region (south), and the Omaheke Region (east).

In 2007, around ninety four percent (94.2%) of land in the Khomas Region was owned by private individuals and companies. The remaining land was owned by Local Authorities (i.e. the City of Windhoek (CoW); 4.4%) and by Central Government (1.4%) (i.e. predominantly the Daan Viljoen Game Park; note that Sun Karros Lifestyle Safaris took ownership of the Game Reserve Tourism Development and re-developed the utilities and services). In 2011, however, the Minister of Regional and Local Government, Housing and Rural Development altered the boundaries of the Local Authority Area of Windhoek, to include, amongst others, the Aris and Kappsfarm Settlement Areas, as well as Brakwater, Nubuamis and Elisenheim.

The Region is subdivided into ten political constituencies: Tobias Hainyeko, Katutura Central, Katutura East, Khomasdal North, Soweto, Samora Machel, Windhoek East, Windhoek Rural, Windhoek West, and Moses //Garoëb.

Windhoek is the administrative, legislative and judicial centre of the Country. The city is also the most important business, educational and transport (rail, road, air) centre of Namibia and most of Namibia's supply (manufacturing) industries are based there. Most people live an urban life, with their livelihood based on cash income from regular salaries while in the service of the state, related agencies and commerce. As Windhoek is Namibia's most important metropolitan area, many rural dwellers come to the region in search of work opportunities.

The southern border of the Region includes part of the former Rehoboth Gebiet; it also forms the border between the central cattle farming and southern small stock production areas of Namibia (National Planning Commission (NPC), 2007; Ministry of Regional and Local Government, Housing and Rural Development, 2010; Government of the Republic of Namibia (GRN), 2011; De Bruyn, 2013).

#### 3.1.2 Climate

Meteorological data for Windhoek for the period 1 January 2005 to 30 June 2010 were obtained from the Namibia Meteorological Service and analysed by Airshed Planning Professionals (Pty) Ltd.:

Local wind field: the prevailing wind field for Windhoek is easterly and to a lesser extent, westerly. Infrequent, but strong winds occur from the east-northeast and north. During the day, easterly and westerly winds prevail with infrequent winds from the northeast to northwest. At night, conditions indicate a shift to the east with almost no winds from the westerly sector; as expected, wind speeds are lower and there is an increase in calm conditions. Easterly and east-northeasterly winds prevail during the summer time. During autumn, the easterly and westerly flow increases. Even more frequent easterly winds occur during the winter months. Airflow during spring is similar to the autumn months, but with more dominant westerly winds. Wind speeds range between 0 and 16 metres per second (m/s), with an average of 2.9 m/s.

Surface temperature: the average temperature in Namibia is 19.3 degrees centigrade (°C) with a range of 10.5°C. Temperatures recorded at Windhoek over the past 20 years (1990-2009) ranged between 0°C and 34°C.

Precipitation (Louw (City of Windhoek), 2013): total rainfall recorded for Windhoek for the period 1890 to 2003 was 39,868 millimetres (mm) (average of 353 mm). For the period between 2003 and 2013, a total of 5,104 mm (average of 510 mm) was recorded. Total rainfall recorded for Windhoek between 1890 and 2013 was 44,972 mm (average of 366 mm) (also see Figure 16).

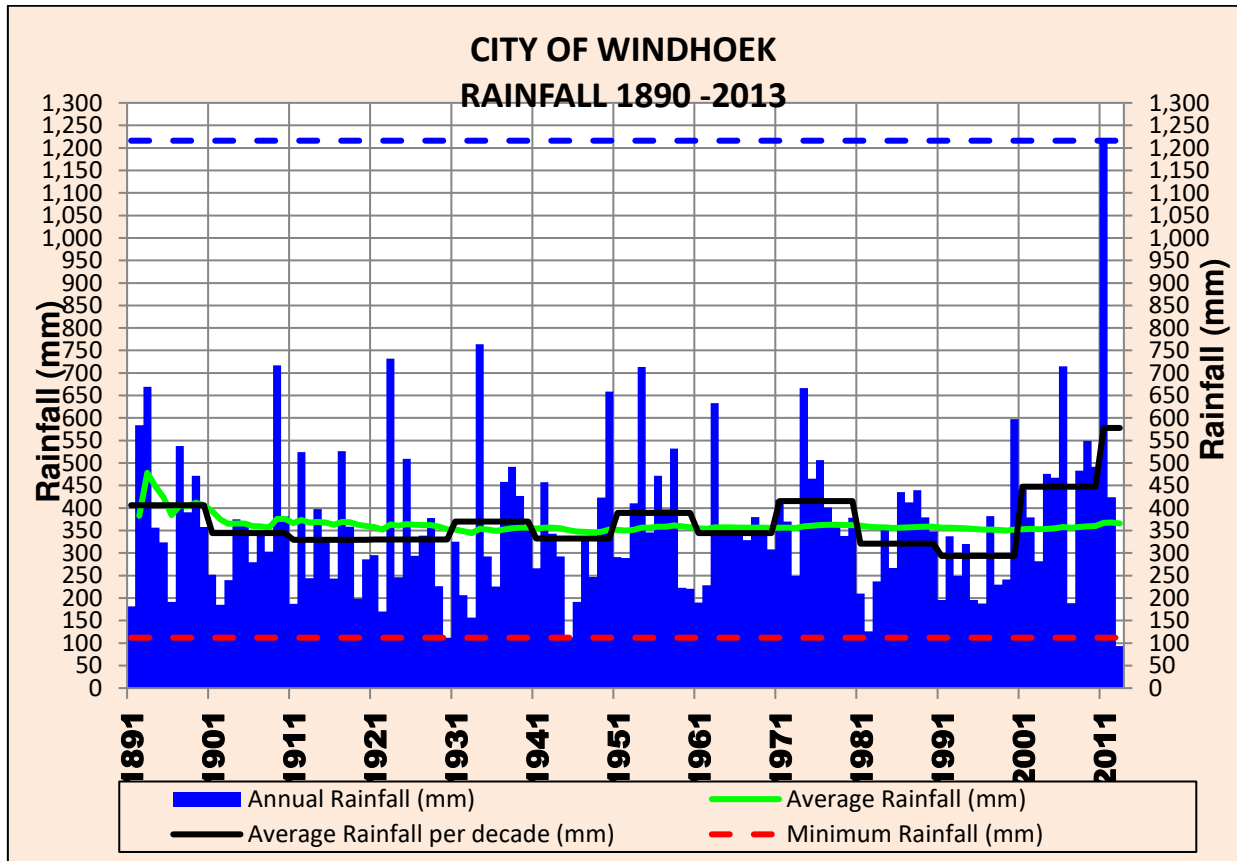


Figure 16: Rainfall figures for the City of Windhoek for the period between 1890 and 2013 (Source: Louw, 2013).

### 3.1.3 Archaeology

During July 2013, Dr John Kinahan of Quaternary Research Services (QRS) carried out an archaeological assessment of the area to be affected by the proposed Development (see Kinahan, 2013; Annexure B).

A summary of the findings is provided below:

Data collected from the archaeological accessions register of the National Museum in Windhoek indicate a local archaeological sequence with two main elements: i) late Pleistocene to late Holocene (dating to within the last 400,000 years (0.040 my/million years) equivalent to Oxygen Isotope Stages (OIS) 1 and 2) (represented by: increasingly dense and highly diverse evidence of settlement; subsistence practices and ritual art; and grave sites and other remains); and ii) Historical (the last ca. 250 years) (represented by: remains of crude buildings, livestock enclosures, wagon routes and watering points; and some evidence of trade with indigenous communities, including metals, ceramics and glass beads).

In the Windhoek area, archaeological sites are strongly associated with low rocky ridges and isolated outcrops where rock overhangs provide a degree of shelter from the prevailing winds. At these archaeological sites, evidence of small-scale activities (e.g. artefact raw material quarrying), the use of hunting blinds, the positioning of burial sites on outwash fans and colluvial deposits, and rock shelters can be found. Overall, around 80% of the archaeological sites are associated with low rocky hills and outcrops, and approximately 12% with outwash fans and colluvial deposits.

During the field survey, four archaeological sites were found at and in close proximity to the area of the proposed Development (see Figure 17).

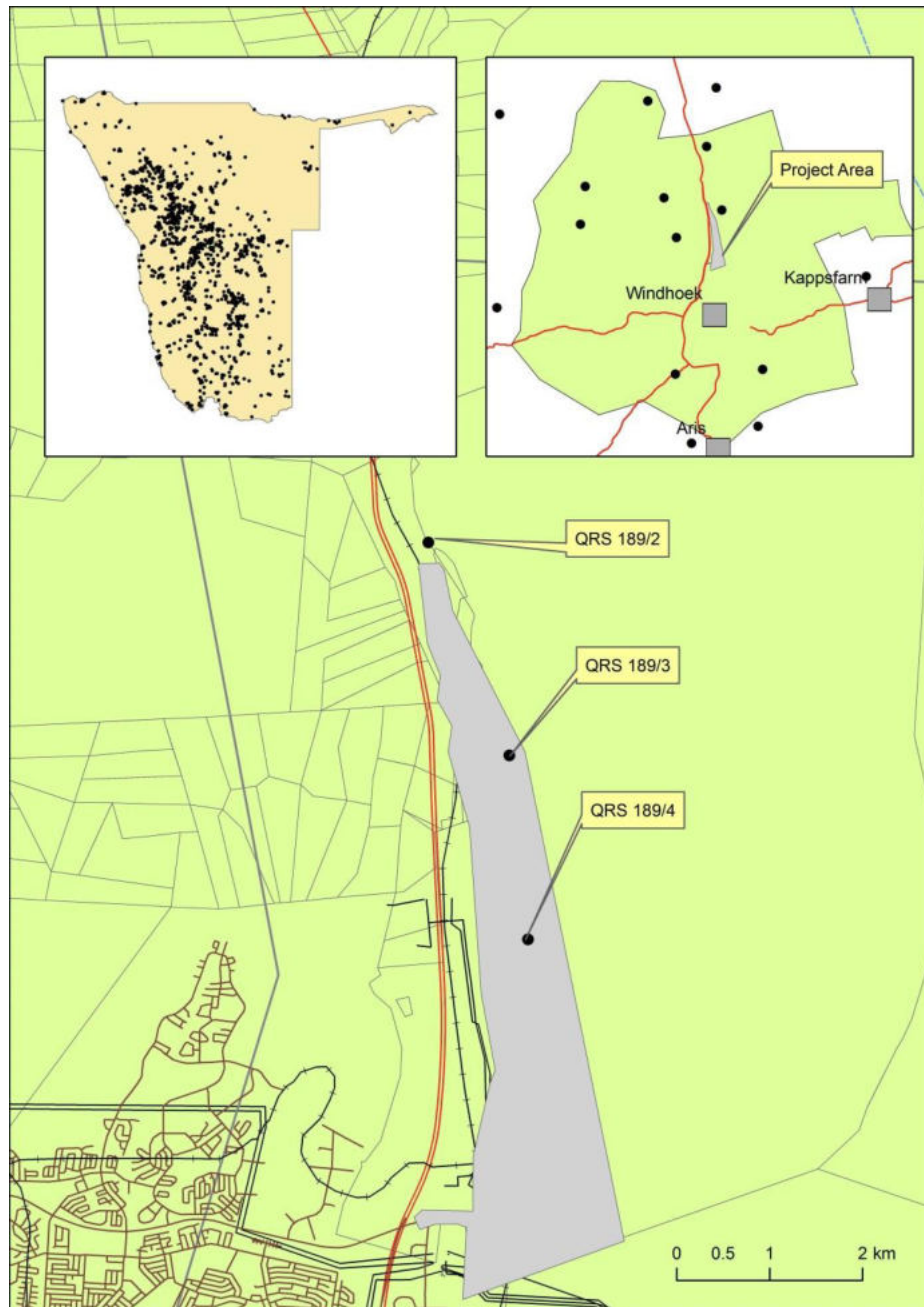


Figure 17: Map showing the area of the proposed Development and the positions of the three archaeological sites; the inset maps indicate the relative density of archaeological sites in the Windhoek District, as well as in Namibia as a whole (Source: Kinahan, 2013).

Two of the four sites, i.e. a group of four roughly constructed defensive positions (sangars) and a south-facing rock shelter overlooking the Klein Windhoek River (see Figures 18a and b; an engraved //hūs (mancala) game board can be found at the floor of the shelter), lie outside the area of the proposed Development.

The other two sites, i.e. drystone walling (4m in length, 1m wide and between 0.8 and 1.0m in height) (see Figure 18c) and a stone-lined well with stone drinking trough (see Figure 18d) are located within the proposed Development area.



Figure 18: Photos showing: a) QRS 189/2 rock shelter, viewed from the south-east; b) engraved //hūs (mancala) game board at QRS 189/2 (Source: Kinahan, 2013); c) QRS 189/3 drystone walling (Source: Peter Cunningham); d) early colonial era stone-lined well at QRS 189/4 (Source: Kinahan, 2013).

As most of the proposed Development area was previously covered by camelthorn *Vachellia erioloba* (previously *Acacia erioloba*) parkland, and it thus would have been a prime area of pre-colonial pastoral settlement, there is a high likelihood that pre-colonial graves may be located during the construction phase. It is thus recommended that construction workers are made aware of the provisions of the National Heritage Act 27 of 2004 (Kinahan, 2013) (see Sections 4, 7.2 and 7.4).

### 3.1.4 Geology and Hydrogeology

Geo Pollution Technologies (Pty) Ltd carried out a desktop hydrogeological assessment of the area to be affected by the proposed Development (see Botha, 2013; Annexure C).

A summary of the findings is provided below:

Topography and Drainage

The area is classified as being part of the Khomas Hochland Plateau Region. The site of the proposed Development is located on a relatively steep valley side, sloping to the west. The Windhoek Graben that strikes in a northerly direction is primarily responsible for forming the valley side. Drainage takes place to the west of the site and into the Klein Windhoek River, a tributary of the Swakop River. A water divide is present to the east of the area of the proposed Development, causing some flow to the east and thereby reducing flow through the proposed site (see Figure 19).

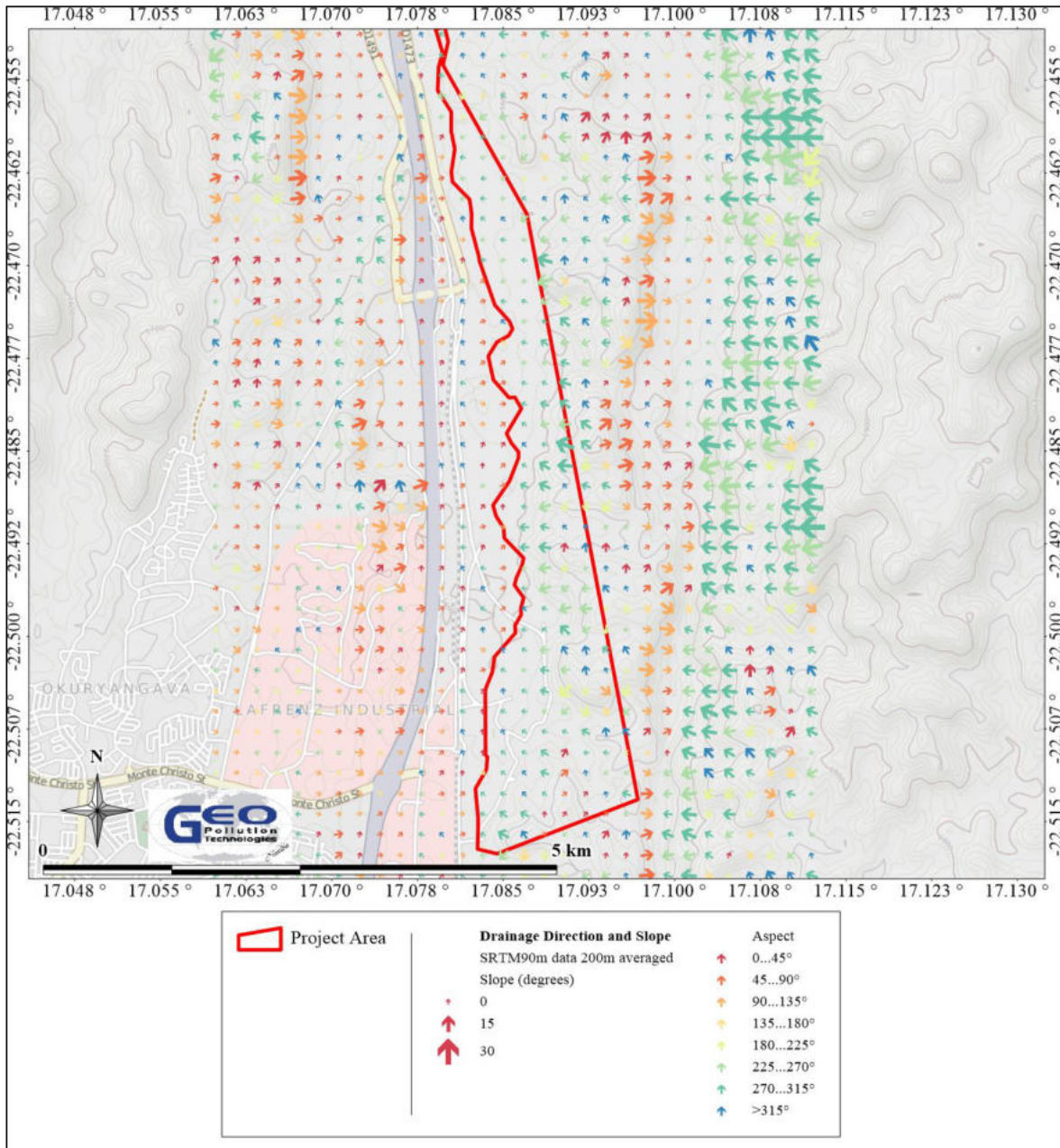


Figure 19: Map showing the surface flow (Source: Botha, 2013).

Geology and Hydrogeology

“Surface geology consists mainly of a surficial soil cover (Qa) of Quaternary age, consisting mainly of weathered mica schist and sand, with areas having large amounts of quartz pebbles and large boulders. Mica schist from the Kuiseb Formation (Nks) underlies this surface cover of unknown thickness and crops out to the east (see Figure 20).

**Jimmey Northern Industrial**

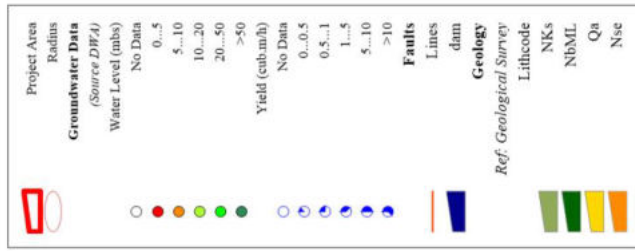
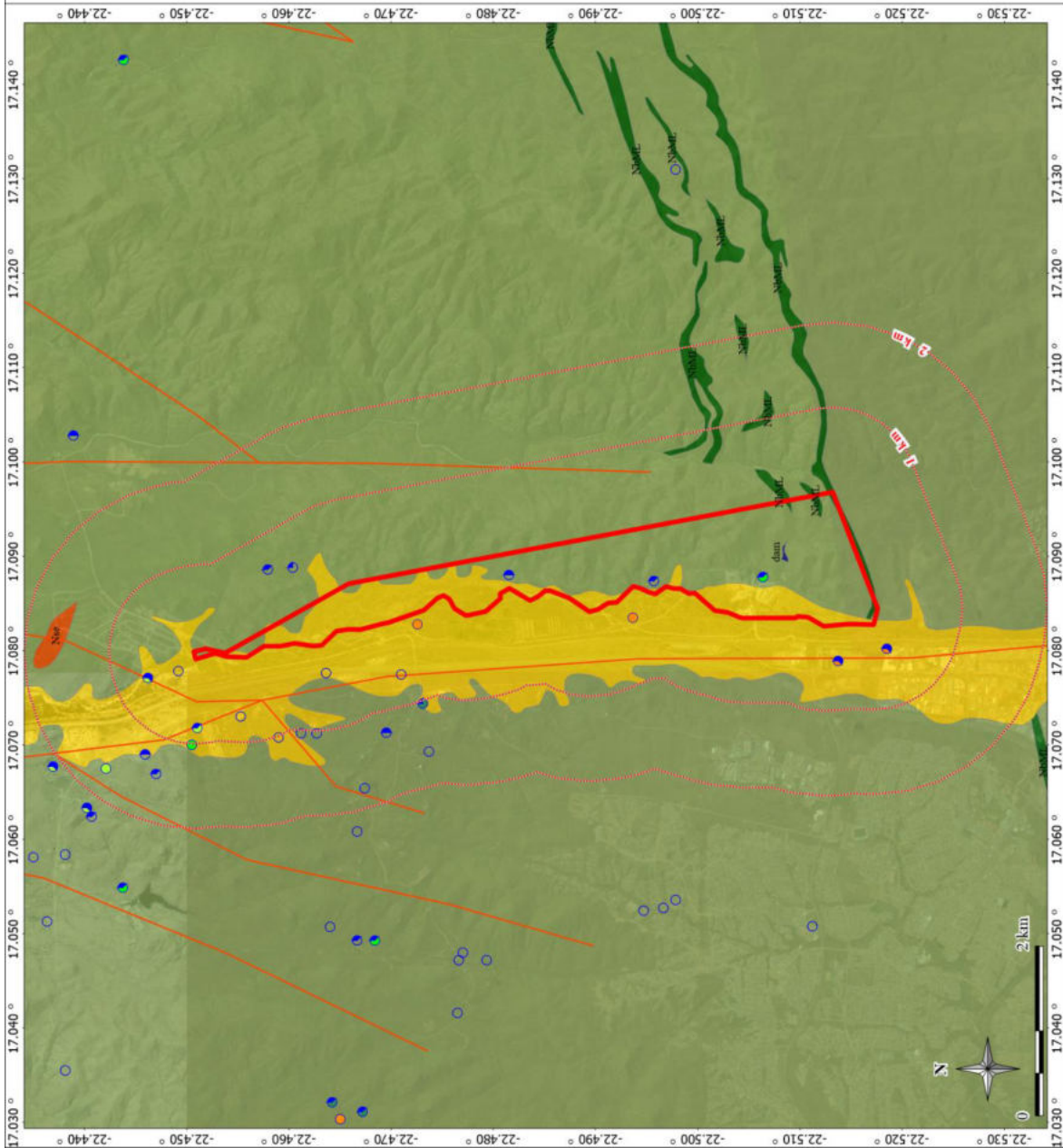


Figure 20: Map showing the hydrogeology of the area (Source: Botha, 2013).

The complex geology of the Windhoek area is a result of numerous folding and faulting episodes, including thrusting and rifting, to which the area has been subjected. Metasedimentary rocks of the Swakop Group, which is part of the Damara Sequence, constitute the Windhoek Aquifer. A number of north- to north-westerly striking faults and joints found in Windhoek form the major underground water conduits and hence determine the conditions of the aquifer. Secondary porosity giving rise to high aquifer transmissivity is best developed in faults with post-hydrothermal alteration brecciation in quartzitic environments. Moreover host rock fracturing along fault planes results in better development of secondary porosity in quartzite compared to schistose terrain such that the aquifer reaches its maximum potential in this type of setting. The metasedimentary formations of the study area strike in an east-north-easterly direction and dip 15-35° to the north-northwest. The more competent quartzite is subject to brittle deformation and thus exhibits relatively high secondary porosity and permeability due to jointing. The joints of the quartzite show evidence of fluid flow by carbonate and quartz infill and iron staining. Micaceous schist on the other hand, which is prone to plastic deformation rather than brittle fracturing, exhibits significantly lower secondary porosity and permeability.”

Two main aquifer types are found in the area, i.e. secondary (fractured rock) aquifers hosted in the mica schist of the Kuiseb Formation, and primary (unconsolidated sediment) aquifers formed in the Klein Windhoek River valley alluvial (Qa). Windhoek has a regional groundwater flow from south to north; groundwater flow is expected to take place through primary porosity in the surface cover and along fractures, faults (secondary porosity) and other geological structures present within the underlying formations (hard rock formations). It is expected that groundwater flow from the site will take place in a northerly direction.

Local flow patterns may vary as a result of groundwater abstraction. Water is utilised in the area; 13 boreholes could be located within a radius of 2 kilometres (km) from the site of the proposed Development. Water quality data for the boreholes are available (from the Department of Water Affairs and Forestry’s (DWA’s) database; note that this database is generally outdated and more boreholes may be present in the area) (see Botha, 2013; Annexure C: Table 2).

Botha (2013) indicates that there are no Municipal production boreholes situated within 2 km from the site. Specific details re water usage from private boreholes is not clear/is unknown; however, should pollution of the aquifer take place, the water from these boreholes should be considered to be at risk. In the greater Brakwater area, groundwater is mainly used for domestic and small-scale farming activities.

The area of the proposed Development falls within the Windhoek-Gobabis Subterranean Water Control Area and Government thus controls the usage of groundwater in the area (Government Notice 189 of 6 February 1970).

#### Potential Site Specific Impacts and Assessment

Botha (2013) assessed the potential surface- and groundwater-related impacts from typical industrial developments for different sections/portions of the proposed Development area (see Annexure C). Note that the Klein Windhoek River, an ephemeral river, runs to the west of the proposed Development area:

*Mountainous (Eastern) Portion:* The gradually to steep sloping ground would ensure good drainage, as long as there are no blockages in/of the drainage lines.

However, the slope puts the area at greater risk of surface runoff and erosion. As natural vegetation enhances infiltration (and thus limits erosion and surface runoff), it is advised that the natural vegetation around the drainage lines be left intact.



Restricting the exit of water from the (mountainous) area, may result in the flooding of the lower line of industrial/business premises. Care should thus be taken to prevent the damming of water in the higher laying areas.

There is an earth dam in southern section (Phase 1/Southern Sector: Industrial/Business Township) of the proposed Development area (see Figure 20). It is recommended that the integrity of the dam be evaluated and that a proper spillway be installed if not present.

*River Valley (Western) Portion:* The majority of the area is flat with a low gradient towards the north flowing Klein Windhoek River. The river drains through Windhoek, which has a significant surface cover that may enhance runoff, and flooding of this area can thus be expected. Apart from not constructing within the flood areas, damming of water along this area through restricted flow should also be avoided (Botha, 2013).

Note that two flood line investigations were carried out: i) for the Southern Sector (Development Area A) (see Hotchkiss, 2013; Annexure D); and ii) the 1 in 50 years natural conditions flood line (along Development Areas A and B; 7.5 km in length) (see WCE, 2013b; Annexure D).

Botha (2013) notes that Windhoek is well known for its sewer lines running along the river beds; the Klein Windhoek River is no exception. These sewer lines often overflow, especially during the rainy season, causing the release of raw sewage directly into the rivers (and thus contaminating the soil, surface and groundwater). Direct groundwater pollution, as well as through surface runoff into the Klein Windhoek River, can also be expected due to the various industrial developments that are located upstream of the proposed Development area.

Industrial activities in the area may include the manufacturing and storage of hazardous chemicals. Spillages and the seepage of liquid waste should not be allowed to enter into the groundwater system. Also note that flooding may cause the release of chemicals stored in the proposed Phase 1/Southern Sector Development area.

### Conclusion and Recommendations

Botha (2013) concludes that the risk of soil and groundwater pollution is high, but indicates that through the implementation of certain mitigation measures, the risk can be reduced to manageable proportions.

The soil in the area may have been polluted by previous activities upstream. It is thus advised that each “development”: i) identifies chemicals of concern (related to that “development’s” activities); and ii) has the soil analysed for these specific chemicals of concern prior to the development’s operational phase. The latter will serve as a baseline against which the results of future sampling/monitoring can be compared to.

The following mitigation measures are provided (also see Section 7: EMP):

- Ensure that green open spaces are created along the drainage lines and that flatter, low-lying areas are not impinged upon (this will prevent excessive runoff, maximise infiltration of precipitation, and ensure groundwater recharge);
- Runoff of pollutants should be prevented from reaching the Klein Windhoek River; the River provides recharge to groundwater sources and this could pose a risk to groundwater-related receptors further downstream;
- Runoff from areas where surface water might have become contaminated should be captured and treated to sewerage effluent standards; uncontaminated runoff should be diverted around areas where such water might become contaminated.
- Any waste that could potentially pollute the water sources should be collected and disposed of in licensed landfills;

- Construction waste should not be disposed of/stored near any surface water source in the area;
- All chemicals must be properly labelled and stored in a specific location; the area where chemicals are stored and handled must be constructed with an impermeable surface;
- Regularly maintain sewerage pipelines and monitor for potential leakages;
- Use spill control measures in areas where spillages are likely to occur (e.g. where pipelines are disconnected); and
- Adequately drain pipelines and tanks prior to decommissioning.

### 3.2 Biophysical Environment

During July 2013, a desktop study was carried out on the vertebrate fauna and flora expected to occur in the general Elisenheim area. In addition to the desktop study, fieldwork was conducted on 19-20 July and 2-3 August 2013 to assess the vegetation and habitat to be affected by the proposed Development (see Cunningham, 2013; Annexure E).

A summary of the findings is provided below:

The area where it is proposed to develop the two new townships is commonly referred to as the Thornbush Savannah (Giess, 1971: see Cunningham, 2013) or the Thornbush Shrubland (Mendelsohn *et al.*, 2002: see Cunningham, 2013).

Although it seems as if the area is part of the Highland Savannah vegetation type around Windhoek, the Elisenheim (Brakwater) area actually falls within a narrow, flat, riparian strip leading northwards into the greater Thornbush savannah area.

The vegetation structure is classified as dense *Acacia* shrublands (Mendelsohn *et al.*, 2002: see Cunningham, 2013) and although the Thornbush Savannah is not classified as an area of special ecological importance, certain features (e.g. mountains, inselbergs and ephemeral drainage lines) throughout this vegetation type may be of importance (Curtis and Barnard, 1998: see Cunningham, 2013).

Overall (all terrestrial species) diversity and terrestrial endemism in the general Elisenheim area is regarded as “average to high” and “high”, respectively (Mendelsohn *et al.*, 2002: see Cunningham, 2013).

The average plant production is regarded as “high to very high”; the variation in green vegetation biomass is considered “medium” and estimated at 10-15%. Grazing and browse in the general area is considered “good”; the risk of farming is regarded as “low” and the tourism potential of the general area is regarded as “high” (Mendelsohn *et al.*, 2002: see Cunningham, 2013).

An estimated 78 species of reptiles, nine (9) species of amphibians, 83 species of mammals, 209 species of birds (breeding residents), between 79 and 110 species of larger trees and shrubs, and 111 species of grasses are known and/or are expected to occur in the general Elisenheim area. A high proportion of these species are endemic (Cunningham, 2013).

Note that more than half the area of the proposed Development is disturbed, i.e. due to road construction, power lines, cultivation, wood and grass harvesting, commercial-scale sand winning, the BCI Cement Factory, tracks, and various dumping sites (see Figures 21a to f) (Cunningham, 2013; Kinahan, 2013).



Figure 21: Pictures showing existing disturbance in the area of the proposed Development: a) entrance to the BCI Cement Factory; b) concrete dumped in the area; c) household rubbish dumped in the area; d) sand/gravel mining pits with numerous invasive alien *Prosopis* species trees/shrubs dominating the vegetation structure on these disturbed soils; e) grass harvesting taking place for sale along the B1 Highway between Windhoek and Okahandja; and f) trees are felled for wood collection (Source: Cunningham, 2013).

### 3.2.1 Fauna

**Reptiles:** at least 78 species of reptiles are expected to occur in the general Elisenheim area; 28 (35.9%) of the 78 species are endemic.

The 78 species consist of at least: 35 snakes (three Blind snakes, two Thread snakes, two Python, one Burrowing Asp, two Quill Snouted, and 25 typical snakes) (ten (28.6%) of the snake species are endemic and one species, the Southern African Python *Python natalensis*, is regarded as

vulnerable/protected game); two tortoises (100% vulnerable and protected game); one terrapin; two worm lizards; 18 lizards (six species (33.3%) are classified as endemic); two plated lizards; two girdled lizards (both endemic); one monitor, the Rock or White-throated Monitor *Varanus albigularis* (vulnerable/protected game); three agamas (one species is endemic); two chameleons; and ten geckos (eight species (80%) are classified as endemic) (see Cunningham, 2013: Annexure E: Table 1).

The reptiles of greatest concern, even though not exclusively associated with the area of the proposed Development, include: the two tortoises *Stigmochelys pardalis* and *Psammobates oculiferus*; the snakes *Python anchietae* and *P. natalensis* and *Varanus albigularis*; and the various *Pachydactylus* species of geckos. Other important species are the three Blind snakes (*Rhinotyphlops* species) and the two Thread snakes (*Leptotyphlops* species) which could be associated with the sandier soils in the area.

Amphibians: at least nine species of amphibians (two toads and one species each for kassina, rubber, puddle, caco, bullfrog, sand and platanna) are expected to occur in suitable habitat in the general Elisenheim area.

Of the nine species, three species have conservation value, two species are endemic (Hoesch's Pygmy Toad *Poyntonophrynus hoeschi* and Marbled Rubber Frog *Phrynomantis annectens*), and one species (Giant Bullfrog *Pyxicephalus adspersus*) is viewed as near threatened (see Cunningham, 2013: Annexure E: Table 2). None of the amphibian species are exclusively associated with area of the proposed Development.

In the general area, the Avis, Goreangab, Von Bach and Swakoppoort Dams, as well as the Gross Barmen Hot Springs and ephemeral Otjihavera, Dobra and Klein Windhoek Rivers and their tributaries are viewed as important amphibian habitat. In the area of the proposed Development, farm reservoirs, earth dams, and the Klein Windhoek River (although severely polluted), could serve as potential amphibian habitat.

Mammals: an estimated 83 species of mammals are known and/or are expected to occur in the general Elisenheim area. Six (7.2%) of the 83 species are classified as endemic and 30 species (36.1%) are classified under international conservation legislation (i.e. Convention on International Trade in Endangered Species (CITES); International Union for the Conservation of Nature (IUCN); and the South African Red Data Book (SARDB)) (see Cunningham, 2013: Annexure E: Table 3).

The most important species are those classified as near threatened (Commersons Roundleaf Bat *Hipposideros commersoni*, Striped Leaf-nosed Bat *Hipposideros vittatus*, Brown Hyena *Hyaena brunnea* and Leopard *Panthera pardus*) and vulnerable (Cheetah *Acinonyx jubatus*, Black-footed Cat *Felis nigripes* and Hartmann's Mountain Zebra *Equus zebra hartmannae*) under international legislation (IUCN, 2012: see Cunningham, 2013) and rare (Namibian Wing-gland Bat *Cistugo seabrae*, Southern African Hedgehog *Atelerix frontalis angolae* and Black-footed Cat *Felis nigripes*) under Namibian legislation. Neither of the species are exclusively associated with the area of the proposed Development and due to anthropomorphic influences, many of the species are not expected to occur in the area any longer (e.g. Cheetah, Mountain Zebra, etc.).

### 3.2.2 Avifauna

An estimated 209 species of birds (breeding residents; excluding aquatic and migrant species), and including ten of the 14 Namibian endemic species occur and/or could occur in the general Elisenheim area at any time.

Sixty one species (29.2% of all the birds expected to occur in the general area) have a southern African conservation rating with 13 species classified as endemic (21.3% of the southern African

endemics, or 6.2% of all the birds expected) and 48 species classified as near-endemic (78.7% of southern African endemics, or 23% of all the birds expected) (Hockey *et al.*, 2006: see Cunningham, 2013).

The most important species known and/or expected to occur, although not exclusively associated with the general Elisenheim area are: Monteiro's Tockus *Tockus monteiri* and Damara Hornbills *Tockus damarensis*, Rüppell's Parrot *Poicephalus rueppellii*, Rosy-faced Lovebird *Agapornis roseicollis* and Rockrunner *Achaetps pycnopygius*, all of which breed in the general area. Some of the larger and important raptors include: Tawny *Aquila rapax*, Martial *Polemaetus bellicosus*, Verreaux's *Aquila verreauxii* Eagles and vultures (see Cunningham, 2013: Annexure E: Table 4); most are not expected to occur permanently in the area due to the various anthropomorphic disturbances.

The area is not classified as an Important Bird Area (IBA) (Simmons 1998a: see Cunningham, 2013). However, the Von Bach and Swakoppoort Dams are viewed as important breeding, feeding and roosting sites for a variety of aquatic birds (Brown *et al.*, 2006: see Cunningham, 2013).

### 3.2.3 Flora

Cunningham (2013) indicates that between 79 and 110 species of larger trees and shrubs, and 111 species of grasses are known and/or are expected to occur in the general Elisenheim area.

Forty species of the larger trees and shrubs expected to occur in the general Elisenheim area have some kind of protected status: five species are endemic; four species are near-endemic; 11 species are protected under the Preservation of Trees and Forests Ordinance No. 37 of 1952 (see Table 2); 11 species are protected by Forestry laws (Curtis and Mannheimer, 2005; Mannheimer and Curtis, 2009: see Cunningham, 2013); five species are protected by the Nature Conservation Ordinance No. 4 of 1975; and four species are classified as CITES Appendix II species (see Cunningham, 2013: Annexure E: Table 5).

During the fieldwork, the occurrence of 23 species of the larger trees/shrubs was confirmed (22 species plus *Searsia pendulina* not expected to occur in the Windhoek area). Of these species, only three species are protected under the Preservation of Trees and Forests Ordinance No. 37 of 1952. These are: Camelthorn *Acacia erioloba*; the Shepherd's Tree *Boscia albitrunca*; and the Anna Tree *Faidherbia albida* (see Figure 22a, b and c). These species, however, occur widespread throughout Namibia and are not exclusively associated with the proposed Development area. No endemic larger tree and/or shrub species were observed in the area.

In the area of the proposed Development, the protected tree species i.e. *Acacia erioloba* and *Boscia albitrunca* made up 6% of the total tree/shrubs; invasive alien species i.e. *Eucalyptus* and *Prosopis* species made up 32.7% of the total tree/shrubs (see Cunningham, 2013: Annexure E: Figure 10).

One hundred and eleven (111) species of grasses are expected to occur in the general Elisenheim area of which four species are endemic: *Eragrostis omahekensis* (associated with disturbed soils), *Eragrostis scopelophila* (associated with mountainous areas under trees and shrubs), *Pennisetum foermeranum* (associated with rocky mountainous terrain) and *Setaria finite* (associated with drainage lines) (see Cunningham, 2013: Annexure E: Table 6).

During the fieldwork, only 18 (of the 111) species of grasses were encountered throughout the area of the proposed Development. No endemic grass species were observed. Straight line transects ("step point" technique) were used to determine grass species composition; only 12 grass species were encountered along the various transects and the dominant grasses are: *Eragrostis trichophora* (28%), *Stipagrostis uniplumis* (21.7%), and *Enneapogon cenchroides* (18.7%).

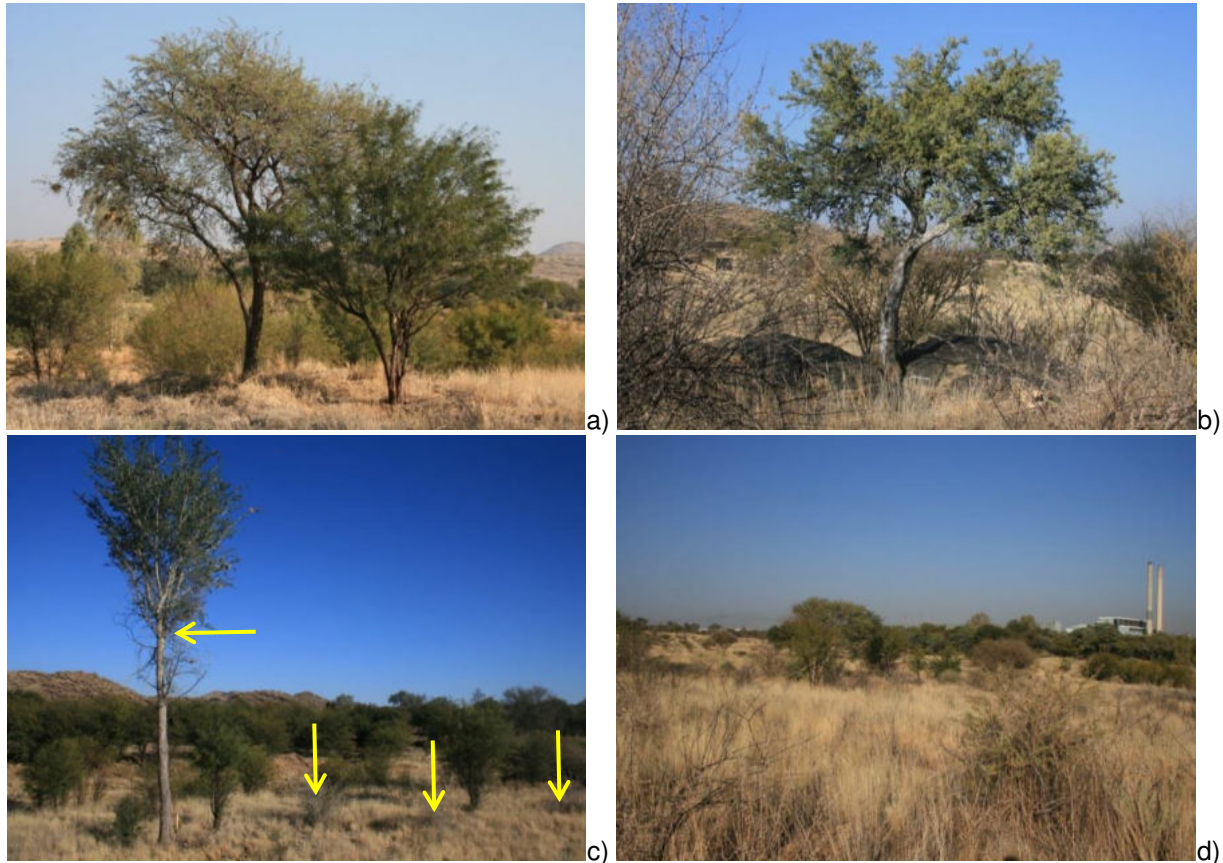


Figure 22: Pictures showing: a) Camelthorn *Acacia erioloba* individual (left) and an invasive alien *Prosopis* species individual (right); b) Shepherd's Tree *Boscia albitrunca*; c) Anna Tree *Faidherbia albida* (one large adult and three smaller juvenile trees); and d) the dense grass sward (due to a lack of grazers in the area) (Source: Cunningham, 2013).

Other species that were not observed during the fieldwork, but that could occur in the general Elisenheim area include: Aloes (protected under the Nature Conservation Ordinance No. 4 of 1975; especially *Aloe hereroensis* and *A. zebrine*); Commiphora species (especially *Commiphora crenato-serrata*); Devil's claw *Harpagophytum procumbens*; Tsamma melon *Citrullus lanatus*; fern species (fern species that occur in the general Windhoek include at least two endemic species (*Cheilanthes hirta* var. *brevipilosa* and *Marselia burchellii*) and 18 indigenous species (*Actiniopteris radiata*, *Adiantum capillus-veneris*, *Asplenium cordatum*, *Cheilanthes dinteri*, *C. eckloniana*, *C. marlothii*, *C. multifida*, *C. involuta*, *C. parviloba*, *Marselia aegyptiaca*, *M. coromandelina*, *M. ephippiocarpa*, *M. farinosa*, *M. macrocarpa*, *M. unicornis*, *M. vera*, *Ophioglossum polyphyllum* and *Pellaea calomelanos*) (Crouch et al. 2011: see Cunningham, 2013)); lichens; and herbs.

During the fieldwork, ten invasive alien species were observed, and especially in the Southern Sector (Development Area A) of the proposed Development. These include, amongst others: Mesquite *Prosopis* species (the dominant species in the area); Bluegum *Eucalyptus* species (mainly associated with the Klein Windhoek River channel); Jerusalem thorn *Parkinsonia aculeate*; Fountain grass *Pennisetum setaceum*; Australia Pepper Tree *Schinus molle*; and Prickly Pear *Opuntia* species (see Figures 23 and 24).



Figure 23: Pictures showing: a) Bluegum *Eucalyptus* species (left), Australia Pepper Tree *Schinus molle* (centre) and Mesquite *Prosopis* species (right); b) Wonder Tree *Leucaena leucocephala* individual; c) Wild Tobacco *Nicotiana glauca* flowers; d) Prickly Pear *Opuntia* species; e) Jerusalem thorn *Parkinsonia aculeata*; and f) Fountain grass *Pennisetum setaceum* (Source: Cunningham, 2013).

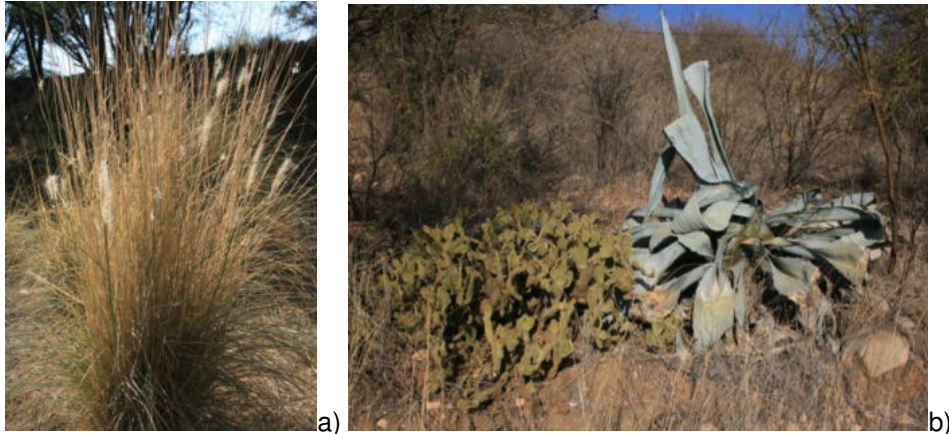


Figure 24: Pictures showing: a) *Pennisetum setaceum* inflorescens; and b) Prickly Pear *Opuntia* species (left) and *Sisal* species (right) (Source: Cunningham, 2013).

### 3.2.4 Sensitive Areas

Areas with unique habitat (and with a potential high biodiversity value) and patches with clumps of protected tree species (see Section 2.1 and Cunningham, 2013: Annexure E: Appendices 1 and 2) were identified throughout the area of the proposed Development (note that Cunningham (2013) incorrectly recorded some of the coordinates; the correct coordinates per Development Area are listed below):

#### Development Area A (Southern Sector):

- Rocky outcrop and Shepherd's Trees 22°29'25.4"S; 17°05'10.1"E;
- Drainage line and Camelthorn Trees 22°29'26.8"S; 17°05'09.4"E;
- Rocky outcrop 22°29'32.2"S; 17°05'12.3"E;
- Rocky outcrop 22°29'35.2"S; 17°05'11.8"E;
- Rocky ridge and Shepherd's Trees 22°30'27.8"S; 17°05'15.5"E (Figure 25a);
- Rocky ridge and Shepherd's Tree 22°30'34.8"S; 17°05'08.2"E;
- Ground dam 22°30'37.5"S; 17°05'10.1"E (Figure 25b); and
- Klein Windhoek River area.

#### Development Area B (Northern Sector):

- Rocky outcrop and Shepherd's Trees 22°27'59.9"S; 17°05'11.7"E;
- Camelthorn Tree patch (± 60 individuals) 22°28'42.1"S; 17°05'15.6"E (Figure 25c);
- Drainage line and Camelthorn Trees 22°29'13.3"S; 17°05'13.2"E;
- Drainage line, Rocky area, Protected Trees 22°29'39.6"S; 17°05'13.6"E;
- Camelthorn Tree forest Northern portion of the area; and
- Klein Windhoek River area.

Areas with dense stands of Camelthorn Trees (i.e. more than five individuals located close together) can be found at:

#### Development Area A (Southern Sector):

- 22°30'56.4"S; 17°04'58.9"E 10 individuals;
- 22°30'47.4"S; 17°05'01.2"E 5 individuals;



- 22°30'39.4"S; 17°05'03.0"E 6 individuals; and
- 22°30'32.7"S; 17°05'06.1"E 5 individuals.

Development Area B (Northern Sector):

- 22°29'13.1"S; 17°05'10.4"E 7 individuals;
- 22°28'29.3"S; 17°05'13.2"E 12 individuals;
- 22°28'24.7"S; 17°05'11.6"E 15 individuals;
- 22°28'23.9"S; 17°05'11.5"E 27 individuals;
- 22°28'20.2"S; 17°05'10.5"E 6 individuals;
- 22°28'18.2"S; 17°05'08.9"E 7 individuals; and
- 22°28'15.5"S; 17°05'08.0"E 7 individuals (P. Cunningham, Environment & Wildlife Consulting Namibia, pers. comm.).



Figure 25: Pictures showing: a) rocky ridge with Shepherd's Tree *Boscia albitrunca* (behind the BCI Cement Factory); b) ground dam (important habitat, especially after rains); and c) dense patch of Camelthorn *Acacia erioloba* trees (Source: Cunningham, 2013).

### 3.2.5 Recommendations

Cunningham (2013) provides the following recommendations (also see Section 7: EMP):

- Avoid development in the sensitive ("hotspot") areas;
- Incorporate the sensitive ("hotspot") areas into the green open spaces;

- Attempt to link the Klein Windhoek River (west) to the Otjihavera Hills (east) via the sensitive (“hotspot”) areas (this will serve as “green” corridors for the movement of wildlife and the riparian habitat will not be isolated (from the remainder of the area);
- Avoid the removal of the bigger trees, especially the protected species i.e. Camelthorn *Acacia erioloba*, Shepherd’s Tree *Boscia albitrunca* and Anna Tree *Faidherbia albida* during the construction phase (these trees serve as habitat for a myriad of fauna);
- Avoid, where feasible, the removal of interesting and unique species (e.g. *Aloe* species, etc.) should these be encountered during the construction phase;
- Incorporate the protected species, especially the larger protected tree species such as Camelthorn *Acacia erioloba*, Shepherd’s Tree *Boscia albitrunca* and Anna Tree *Faidherbia albida* individuals, in the overall final landscaping of the area;
- Identify and clearly mark (red and white tape) the protected flora species (so that bulldozer operators can easily see and avoid these specimens);
- Adapt a minimalistic damage and indigenous planting approach (replant two (2) indigenous tree species (preferably the same species) for every protected species that had to be removed; indigenous species can be acquired at the Forestry nurseries in Okahandja, the National Botanical Research Institute (NBRI) in Windhoek, and local nurseries in Windhoek;
- Actively remove all the invasive alien species occurring throughout the area of the proposed Development;
- Make the invasive alien trees removed during the construction phase available to the local community as firewood, or have a contractor remove and process the wood (e.g. for furniture, wood, charcoal, etc.);
- Avoid the planting of potentially alien invasive plant species for ornamental purposes as part of the landscaping (alien species often “escape” and become invasive causing further ecological damage as is currently evident throughout the proposed development area).
- A policy of “no kill” with regards to fauna (e.g. poaching for meat (snares); the collection of veld foods (e.g. tortoises); the capture/killing of birds; the killing of snakes, etc.) to be implemented, especially during the construction phase;
- Prevent or avoid any fires from spreading from the construction sites (as it could lead to e.g. loss of life, property and grazing for neighbouring landowners) (especially as the area currently has a good grass biomass due to the lack of stock farming activities in the area);
- Implement a suitable and appropriate refuse removal policy (littering could result in certain animals, e.g. Baboon and Black-backed Jackal to become accustomed to humans and the associated activity and result in typical problem animal scenarios);
- Avoid and/or limit the use of lights (i.e. focused or low energy lighting) during nocturnal construction and/or operations (it influences and/or could affect various nocturnal species e.g. bats and owls); and
- Avoid establishing an electric fence system (reaching down to ground level) around the proposed Development area (this would result in the death of many slow moving species e.g. reptiles (chameleons, tortoises, etc.).

### 3.3 Socio-Economic Environment

The data to compile this section were sourced from the following Government documents: the 2001 Population and Housing Census, Khomas Region, Basic Analysis with Highlights (NPC, 2004); the Khomas Regional Poverty Profile (NPC, 2007); the Khomas Regional Profile (Ministry of Regional and Local Government, Housing and Rural Development, 2010); the Namibia Household Income and Expenditure Survey (NHIES) 2009-2010 Provisional Figures (NPC, 2012); the Namibia Labour Force Survey 2012 Report (Namibia Statistics Agency (NSA), 2013a); and the 2011 Population and Housing Census (Revised 26 April 2013; NSA, 2013b).

### 3.3.1 Population Characteristics

During the 2011 Population and Housing Census, the population of the Khomas Region was estimated at 342,141 persons (250,262 persons in 2001) of which 169,672 are males and 172,469 females. The Khomas Region's population makes up 16.2% of the National population.

Khomas is the third most densely populated region (9.3 persons per km<sup>2</sup>) in Namibia. The most densely populated regions are the Ohangwena and Oshana Regions (22.9 and 20.4 persons per km<sup>2</sup>, respectively); the national average is 2.6 persons per km<sup>2</sup>.

Ninety five percent (95%; 325,858) of the population in the Region resides in Windhoek. There are 89,438 households (58,580 households in 2001) (4.2 vs 3.7 persons per household in 2001 and 2011, respectively) in the Khomas Region.

In 2011, the population consisted of an estimated 69% Potentially Economically Active (PEA) persons (15 to 59 years of age), a junior population (27%; < 15 years of age), and a senior population (4%; > 60 years of age).

Total Fertility Rate (TFR) in the Khomas Region declined from 4.9 (average children per woman) in 2001 to 2.8 (average children per woman) in 2011. Only 1.8% of all children under the age of 18 years were orphaned by both parents in the Khomas Region; 9.3% of all children under the age of 18 have, either lost their mother, or their father.

Four main languages are spoken in the Khomas Region and these are: Oshiwambo (41%), Afrikaans (19%), Nama/Damara (12%) and Otjiherero (10%).

The literacy rate in the Region (15+ years) was estimated at 97% (vs 96% in 2001). In 2011, around 5% of the population above the age of 15 had never attended school, around 19% was attending school, and about 73% had left school.

The annual growth rate (1991 to 2001) for the Region was calculated at 1.9% (vs the national average of 2.6%); for the period 2001 to 2011, the annual growth rate was 3.1% (vs the national average of 1.4%) (NSA, 2013b).

### 3.3.2 Economic Profile

The economic context of the Khomas Region is illustrated by means of economic indicators such as employment, source of income, and main working activities:

During 2001, approximately 76% of the population in the Khomas Region formed part of the potential labour force. Of these persons, about 70% had been absorbed by the economy and was actively working (vs the national average of ~69%); the remaining 30% was classified as unemployed (NPC, 2004).

Results from the 2012 Namibia Labour Force Survey (NLFS) indicate that the Labour Force Participation Rate (LFPR; the number of persons in the labour force given as a percentage of the working age population in that population group) for the Khomas Region is 70.2% (the LFPR for Namibia is 66%) (NSA, 2013a).

The broad unemployment rate (i.e. people being without work, or who are available for work, irrespective of whether they are actively seeking work) for the Khomas Region is 26.5% (vs 27.4% for all the Regions of Namibia); the strict unemployment rate (people being without work, or who are available for work, or are actively seeking work) for the Khomas Region is 20.3% (vs 16.7% for Namibia) (NSA, 2013a). According to the 2011 Census results, 30.0% of the labour force in the Khomas Region is unemployed (NSA, 2013b).

Key industries in the Khomas Region, in terms of employment, are: private and public service (72.1% of all persons employed during 2001); manufacturing, including mining and quarrying, electricity, gas, water supply and construction (17.9%); wholesale and retail (6.7%); agriculture, hunting, forestry, and fishing (2.3% of all persons employed during 2001); and not stated (1.0% of all persons employed during 2001) (NPC, 2004) (note that the 2011 figures have not yet been released).

The occupation profile for the Khomas Region was made up by the following: elementary occupations (labourers and other unskilled occupations; 19.0%); service, shop and market sales workers (16.7%); craft and related trade workers (16.7%); professionals (10.9%); clerks (10.7%); technicians and associate professionals (8.9%); plant and machine operators and assemblers (6.2%); legislators, senior officials and managers (5.6%); armed forces (2.3%); agriculture and fisheries (skilled workers; 2.0%); and not stated (1.0%) (NPC, 2004) (note that the 2011 figures have not yet been released).

The main source of income in the Khomas Region (2011 Census) was salaries and wages (73%). Income generated by other economic activities included: business, non-farming (14%); cash remittance (5%); pension (4%); and farming (1%) (NSA, 2013b).

### *3.3.3 Poverty Levels*

According to the 2009/10 NHIES, the Khomas Region has an average household income of N\$132,209 and income per capita of N\$32,499 (vs the Kavango Region with the lowest (N\$5,682) income per capita). Households in the Khomas Region spend most of their money on housing (27.41%), other (recreation, culture, accommodation services and miscellaneous goods and services; 22.67%), transport/communication (18.39%), food/beverages (12.63%), furnishing/equipment (7.75%), clothing/footwear (5.29%), education (3.29%), and health (1.94%).

Around 4% (national average of 20%) and 0.2% (national average of 2%) of households in the Khomas Region were rated as poor (where 60% or more of the household's total consumption is spent on food) and severely poor (where 80% or more of the household consumption is spent on food), respectively (NPC, 2012).

### *3.3.4 Housing*

According to the 2011 Population and Housing Census, 42.9% of households in the Khomas Region live in detached houses. Around 30.6% of households live in improvised housing (shacks), 13.0% in semi-detached/townhouses, 8.7% in apartments/flats, 1.7% in single quarters, 1.6% in guest flats, 0.6% in part commercial/industrial, and 0.3% each in mobile homes (caravan or tent), traditional dwellings, and in other (NSA, 2013b).

### *3.3.5 Access to Services*

#### Water

During 2011, 98.9% of households in the Khomas Region had access to safe drinking water. Approximately 48.2%, 19.0% and 29.5% of the households obtained their drinking water via piped water inside, piped water outside, and public pipe, respectively. Other sources of drinking water included: borehole with tank (2.0%); other (1.0%); river/dam/stream (0.3%); and protected well (0.2%) (NSA, 2013b).

#### Energy

In 2011, the majority of households in the Khomas Region (63.6%) prepared their food using electricity from the main grid; the remainder of the households made use of paraffin (14.0%), gas

(13.6%), wood, or charcoal (8.1%), electricity from a generator (0.3%), and coal (0.1%) to cook their food.

Around 54.4% of households used electricity from the main grid as the main source of energy for heating, followed by wood or charcoal (8.9%); thirty two percent (32.1%) of households did not use anything for heating.

Energy for lighting was mainly obtained through using electricity (67.8%) and candles (22.3%) (NSA, 2013b).

### Sanitation

In 2011, 19.9% of households in the Khomas Region had no toilet facility. Around forty nine percent (48.6%) of households had access to private flush toilets, 24.2% had access to shared flush toilets, and the remainder of the households made use of private and shared flush toilets connected to a septic/cesspool (3.4%), covered and uncovered pit latrines (3.1%), bucket toilets (0.6%), and other (0.4%) (NSA, 2013b).

### Health Care

There are two State (Windhoek Central and Katutura) and four Private (Rhino Park, Roman Catholic, Medi-Clinic, and Paramount) Hospitals in the Khomas Region. State Health Clinics in the Region total 11, i.e. Katutura, Khomasdal, Robert Mugabe, Okuryangava, Wanaheda, Hakahana, Donkerhoek, Otjomuise, Groot Aub, Dordabis, and Baumgartsdrunn (Me Philander, Private Secretary, Khomas Regional Directorate, Ministry of Health and Social Services, pers. comm.).

### Education

There are around 85 schools in the Khomas Region (GCS and Stubenrauch Planning Consultants, 2011). Educational institutions based in the Khomas Region include, amongst others, the University of Namibia; the Polytechnic of Namibia; the Institute for Open Learning (IOL); the International University of Management (IUM); the Namibian College for Open Learning (NAMCOL); Institute of Bankers (IOB) Namibia; Southern Business School of Excellence (SBSE); International Training College Lingua (ITCL); Monitronic Success College; and Triumphant College (Mr. James Kazonga, Higher Education Officer, National Council of Higher Education, pers. comm.).

### *3.3.6 Developmental Challenges*

The following challenges are experienced in the Khomas Region (according to the Participatory Poverty Assessments (PPAs) and the submissions of the Regional Council to the National Development Plan (NDP)):

- The population density and growth rate place a strain on available resources; only 39.2% (2001 Census) of the population was born in the Khomas Region (Ministry of Regional and Local Government, Housing and Rural Development, 2010);
- Major causes of poverty include: crime, alcohol abuse, and the prevalence of Human Immunodeficiency Virus (HIV)/Acquired Immunodeficiency Syndrome (AIDS); constraints to development include: lack of sufficient housing, provision of municipal services, and poor education;
- As the City of Windhoek is dependent on piped water from dams located outside the Region (i.e. especially from the Von Bach and Swakoppoort Dams), large-scale industrial development in Windhoek is restricted by the availability of water for industrial use;
- Infrastructure in the Khomas Region is well-developed, but it does not extend equally to all parts of the Region, i.e. especially the rural communities (NPC, 2007; Ministry of Regional and Local Government, Housing and Rural Development, 2010).

## 4 Regulatory Framework

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This section provides an overview of the most pertinent legislation with the aim of informing African Precast Concrete Industries of the legal requirements pertaining to the Project during the planning and construction/operational phases (also see Legal Assistance Centre (LAC), 2010; Ruppel, 2013).

The Ministry of Environment and Tourism (MET) is the lead Government agency responsible for Environmental Assessment, Management and Monitoring. Its principal role in natural resource/water-based industries is the approval of EAs as per Namibia's Environmental Management Act 7 of 2007 and the Environmental Impact Assessment Regulations: Environmental Management Act, 2007 (see Table 2).

The Directorate of Resource Management within the Department of Water Affairs and Forestry (DWAF) at the Ministry of Agriculture, Water and Forestry (MAWF) is the lead Government agency responsible for the management of surface and groundwater utilisation through the issuing of abstraction and waste water disposal permits. The DWAF is also the Government agency responsible for water pollution control.

Cognisance also needs to be taken of the following:

- Windhoek Town Planning Scheme (1976 as amended) (see Sections 35. *Drainage and stormwater*; 44. *Submission of drawings and particulars*; and 48. *Contravention of the Scheme*);
- Windhoek Structure Plan (City of Windhoek (CoW), 1996);
- Water Supply Regulations (1996) (Municipality of Windhoek, 1996);
- Water Demand Policy (1996; see GCS and Stubenrauch Planning Consultants, 2011);
- Solid Waste Management Policy (CoW; see [www.windhoekcc.org.na](http://www.windhoekcc.org.na));
- Windhoek Environmental Structure Plan & Environmental Policy (Africon Environment & Sustainability Consulting in association with DRFN, EnviroNomics Environmental Consultants, and Metro GIS, 2004);
- *Draft* Southern Windhoek Aquifer (SWA) Management Policy (Africon Environment & Sustainability Consulting in association with EnviroNomics Environmental Consultants, 2005); and
- *Final Draft* Strategic Environmental Assessment (SEA) Windhoek and Windhoek Townlands (GCS and Stubenrauch Planning Consultants, 2011).

A brief overview of the Namibian Legislation, upcoming Namibian legislation, Policies and Guidelines, Regional Agreements, International Conventions, and International Best Practice that may be relevant to the proposed Development is provided in Table 2.

Table 2: Summary of the most pertinent legislation pertaining to the proposed Development.

Legislation / Policy / Guideline	Purpose / Applicable Article / Section
<b>Namibian Legislation</b>	
<p>The Constitution of the Republic of Namibia 1990</p>	<p>The Namibian Constitution came into force on 21 March 1990 and it is the supreme law of the Country.</p> <p>Article 66 Customary and Common Law  <i>“Both the customary law and the common law of Namibia in force on the date of Independence shall remain valid to the extent to which such customary or common law does not conflict with this Constitution or any other statutory law.”</i></p> <p>Article 95 Promotion of the Welfare of the People  <i>“The State shall actively promote and maintain the welfare of the people by adopting, inter alia, policies aimed at the following: maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilization of living natural resources on a sustainable basis for the benefit of all Namibians, both present and future;”</i></p> <p>Article 100 Sovereign Ownership of Natural Resources  <i>“Land, water and natural resources below and above the surface of the land and in the continental shelf and within the territorial waters and the exclusive economic zone of Namibia shall belong to the State if they are not otherwise lawfully owned.”</i></p> <p>Article 144 International Law  <i>“Unless otherwise provided by this Constitution or Act of Parliament, the general rules of public international law and international agreements binding upon Namibia under this Constitution shall form part of the law of Namibia.”</i></p> <p>Some of the (relevant) International agreements (excluding the African and Southern African Development Community (SADC) agreements) signed or ratified by Namibia include:</p> <ul style="list-style-type: none"> <li>• International Plant Protection Convention, 1951;</li> <li>• Vienna Convention for the Protection of the Ozone Layer, 1985;</li> <li>• Montreal Protocol on Substances that Deplete the Ozone Layer, 1987; Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, Adopted at the Fourth Meeting of the Parties at Copenhagen on 25 November 1992; Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, Adopted by the Ninth Meeting of the Parties at Montreal on 17 September 1997; and Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, Beijing, 3 December 1999;</li> <li>• Convention on Biological Diversity, 1992;</li> <li>• United Nations (UN) Framework Convention on Climate Change, 1992 and Kyoto Protocol to the UN Framework Convention on Climate Change, 1997;</li> </ul>

	<ul style="list-style-type: none"> <li>• United Nations Convention to Combat Desertification (UNCCD) in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa, 1994;</li> <li>• Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, 1998;</li> <li>• Stockholm Convention of Persistent Organic Pollutants, 2001;</li> <li>• Convention for the Safeguarding of the Intangible Cultural Heritage, 2003; and</li> <li>• International Standards for Phytosanitary Measures, 2009.</li> </ul>
Public Health Act 36 of 1919 (as last amended by Act 21 of 1988)	<p>This Act makes provision for the prevention and control of infectious diseases, venereal diseases and epidemics; the Act also regulates sanitation, food and public water supplies.</p> <p>Section 119 provides: <i>“No person shall cause a nuisance or shall suffer to exist on any land or premises owned or occupied by him or of which he is in charge any nuisance or other condition liable to be injurious or dangerous to health.”</i></p>
Town Planning Ordinance 18 of 1954 (as amended by Ordinance 13 of 1968, Ordinance 13 of 1970, Ordinance 11 of 1973, Ordinance 23 of 1973, Ordinance 10 of 1977 and Ordinance 5 of 1979 as well as Act 27 of 1993 and Act 15 of 2000 (sections 2, 4, and 47))	The Ordinance makes provision for the preparation and carrying out of town planning schemes and for matters incidental thereto.
Water Act 54 of 1956	The purpose of the Act is <i>“to consolidate and amend the laws relating to the control, conservation and use of water for domestic, agricultural, urban and industrial purposes; to make provision for the control, in certain respects, of the use of sea water for certain purposes; for the control of certain activities on or in water in certain areas; for the control of activities which may alter the natural occurrence of certain types of atmospheric precipitation; for the control, in certain respects, of the establishment or the extension of townships in certain areas; and for incidental matters.”</i>
Townships and Division of Land Ordinance 11 of 1963 (as amended by Ordinance 36 of 1967, Ordinance 7 of 1969, Ordinance 2 of 1970, Ordinance 10 of 1973, Ordinance 17 of 1975, Ordinance 9 of 1977, as well as Act 3 of 1985, Act 28 of 1992, Act 21 of 1998 and Act 11 of 2000)	The purpose of the Ordinance is to <i>“consolidate and amend the laws relating to the establishment of townships and to provide for the regulation and control of the development and subdivision of land and for matters incidental thereto.”</i>
Burial Place Ordinance 27 of 1966	<p>The purpose of the Ordinance is <i>“to prohibit the desecration or disturbance of graves in burial places and to regulate matters relating to the removal or disposal of dead bodies.”</i></p> <p>A burial place is defined as <i>“any burial ground, whether public or private, or any place wherein one or more bodies are buried, cremated or otherwise disposed of or intended to be buried, cremated or otherwise disposed of.”</i></p>



	Section 3 provides: <i>“No person shall, except with the permission of the Administrator, in any way disturb, damage, remove or destroy a grave, monument, gravestone, cross, inscription, rail, enclosure, chain or erection of any kind whatever, or part thereof in any burial place.”</i>
Soil Conservation Act 76 of 1969 (as amended in South Africa (SA) to March 1978; section 13 is amended by the Forest Act 12 of 2001)	The purpose of this Act is <i>“to consolidate and amend the law relating to the combating and prevention of soil erosion, the conservation, improvement and manner of use of the soil and vegetation and the protection of the water sources in the Republic and the territory of South-West Africa; and to provide for matters incidental thereto.”</i>
Hazardous Substance Ordinance 14 of 1974	This Ordinance <i>“provide for the control of substances which may cause injury or ill-health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitizing or flammable nature or the generation of pressure thereby in certain circumstances, and for the control of certain electronic products; to provide for the division of such substances or products into groups in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, application, modification, disposal or dumping of such substances and products; and to provide for matters connected therewith.”</i>
Nature Conservation Ordinance 4 of 1975 (and the associated Regulations Government Notice (GN) 240/1976)	The purpose of the Ordinance is <i>“to consolidate and amend the laws relating to the conservation of nature; the establishment of game parks and nature reserves; the control of problem animals; and to provide for matters incidental thereto”.</i>
Atmospheric Pollution Prevention Ordinance 11 of 1976	The Ordinance <i>“provide for the prevention of pollution of the atmosphere, and for matters incidental thereto.”</i>  It covers all forms of atmospheric pollution, i.e. the control of noxious or offensive gases, smoke, dust, and gases emitted by vehicles. Scheduled processes can only be carried on/in controlled areas by certificate holders, and no person may erect or cause to be erected any building or plant, which is intended to be used for the purpose of carrying on any scheduled process, without a provisional registration certificate, which will have as a condition that all plant and apparatus used for the purpose of carrying on the scheduled process and all appliances for preventing or reducing to a minimum the escape into the atmosphere of noxious or offensive gases shall be properly maintained and operated.
Petroleum Products and Energy Act 13 of 1990 (as amended by the Petroleum Products and Energy Amendment Act 29 of 2004, Act 3 of 2000 and Act 16 of 2003; Petroleum Act Regulations were made in 1991 and 2000 under the Petroleum Products and Energy Act 13 of 1990 (“Petroleum Act Regulations”), to provide for the application of environmental standards and the avoidance of environmental harm caused by the keeping, handling, conveying, using and disposing of petroleum products)	The Act <i>“provide measures for the saving of petroleum products and an economy in the cost of the distribution thereof, and for the maintenance of a price therefor; for control of the furnishing of certain information regarding petroleum products; and for the rendering of services of a particular kind, or services of a particular standard, in connection with motor vehicles; for the establishment of the National Energy Fund and for the utilization thereof; for the establishment of the National Energy Council and the functions thereof; for the imposition of levies on fuel; and to provide for matters incidental thereto.”</i>
Local Authorities Act 23 of 1992 (and Local	The Act <i>“provide for the determination, for purposes of local government, of local authority councils; the</i>

<p>Authorities Amendment Act 3 of 1997 and Second Amendment Act 14 of 1997, and Local Authorities Amendment Acts 24 of 2000, 17 of 2002, 14 of 2004, 2 of 2009)</p>	<p><i>establishment of such local authority councils; and to define the powers, duties and functions of local authority councils; and to provide for incidental matters.</i></p> <p>Parts VI (Supply of Water), VII (Sewerage and Drainage), IX (Street and Public Places), and XVIII (General Provisions; especially Sections 90 (Responsibility of local authority councils in relation to public watercourses) and 94 (Regulations)) are relevant.</p>
<p>Nature Conservation Amendment Act 5 of 1996</p>	<p>The Nature Conservation Amendment Act 5 of 1996 amends the Nature Conservation Ordinance, 1975, <i>“so as to provide for an economically based system of sustainable management and utilization of game in communal areas; to delete references to representative authorities; and to provide for matters incidental thereto.”</i></p> <p>Section 73. 1) provides: <i>“No person other than the lawful holder of a permit granted by the local authority shall at any time pick (“pick”, as defined in Section 1 (xxxviii), includes to cut off, chop off, pick off, take, gather, uproot, damage or destroy) or transport any protected plant: Provided that – (a) the owner a nursery licensed under section 75 may without such permit pick and transport any protected plant cultivated on the premises of such nursery and cause such protected plant to be picked and transported; (b) the owner or lessee of land may on that land without such permit pick the flower of a protected plant for use as a decoration in his home; (c) the owner or lessee of land may without such permit pick a protected plant on that portion of such land – (i) which he needs for cultivated lands, the erection of a building, the construction of a road or airfield or any other development which necessitates the removal of vegetation; or (ii) on which such protected plant has been specially cultivated”</i> (Nature Conservation Ordinance 4 of 1975, Chapter VI INDIGENOUS PLANTS, Picking and transport of protected plants).</p>
<p>Namibia Water Corporation Act 12 of 1997 (and Namibia Water Corporation Amendment Act 17 of 2001)</p>	<p>The purpose of the Act is <i>“to establish the Namibia Water Corporation Limited; to regulate its powers, duties and functions; to provide for a more efficient use and control of water resources; and to provide for incidental matters.”</i></p> <p>Part III of the Act deals with the Objects, Functions and Powers of the Corporation and Part IV with the Duties of the Corporation (Sections 9-15; note Section 10: Right of the Corporation to interrupt or reduce water supply).</p>
<p>Road Traffic and Transport Act 22 of 1999 (as amended by the Road Traffic and Transport Amendment Act 6 of 2008)</p>	<p>The purpose of the Act is <i>“to provide for the establishment of the Transportation Commission of Namibia; for the control of traffic on public roads, the licensing of drivers, the registration and licensing of vehicles, the control and regulation of road transport across Namibia’s borders; and for matters incidental thereto.”</i></p>
<p>Electricity Act 2 of 2000 and Electricity Act 4 of 2007 (and the Electricity Regulations: Administrative Electricity Act 2 of 2000 and the Electricity Control Board: Namibian Electricity Safety Code, 2009: Electricity Act, 2007)</p>	<p>The purpose of the Act 2 of 2000 is <i>“to provide for the establishment and functions of the Electricity Control Board; and to provide for matters incidental thereto.”</i></p> <p>The purpose of the Act 4 of 2007 is to <i>“establish the Electricity Control Board and provide for its powers and functions; to provide for the requirements and conditions for obtaining licences for the provision of electricity; to provide for the powers and obligations of licensees; and to provide for incidental matters.”</i></p>

	<p>The Namibian Electricity Safety Code “governs the minimum safety standards for the operating, maintenance, construction and installation of power systems in Namibia.” The purpose of the Code is: i) to ensure the safety of all persons; ii) to safeguard apparatus; and ii) to provide continuity of supply. The Namibian Electricity Safety Code “is an extension of, and must be read in conjunction with, the provisions of the Electricity Act 4 of 2007, and the Labour Act 11 of 2007 (with particular emphasis on Health and Safety Regulations made thereunder), and all other applicable laws, and does not supersede, overrule or negate any provisions contained in the Electricity Act, the Labour Act or such other laws.”</p>
<p>Environmental Management Act 7 of 2007 (and the Environmental Impact Assessment Regulations: Environmental Management Act, 2007)</p>	<p>The purpose of the Environmental Management Act (EMA) is to “promote the sustainable management of the environment and the use of natural resources by establishing principles for decision making on matters affecting the environment; to establish the Sustainable Development Advisory Council; to provide for the appointment of the Environmental Commissioner and environmental officers; to provide for a process of assessment and control of activities which may have significant effects on the environment; and to provide for incidental matters.”</p> <p>On the 6<sup>th</sup> of February 2012 the <i>Commencement of the Environmental Management Act, 2007</i> was published in the Government Gazette, thereby becoming law. The Minister of Environment and Tourism, under Section 56 of EMA, made the regulations set out in the Schedule (GRN, 2012). The Minister also listed activities (each with sub-activities) that may not be undertaken without an environmental clearance certificate: Energy Generation, Transmission and Storage Activities; Waste Management, Treatment, Handling and Disposal Activities; Mining and Quarrying Activities; Forestry Activities; Land Use And Development Activities; Tourism Development Activities; Agriculture and Aquaculture Activities; Water Resource Developments; Hazardous Substance Treatment, Handling and Storage; Infrastructure; and Other Activities.</p>
<p>Labour Act 11 of 2007 (and the Labour Amendment Act 2 of 2012)</p>	<p>The purpose of the Act is to “consolidate and amend the labour law; to establish a comprehensive labour law for all employers and employees; to entrench fundamental labour rights and protections; to regulate basic terms and conditions of employment; to ensure the health, safety and welfare of employees; to protect employees from unfair labour practices; to regulate the registration of trade unions and employers’ organisations; to regulate collective labour relations; to provide for the systematic prevention and resolution of labour disputes; to establish the Labour Advisory Council, the Labour Court, the Wages Commission and the labour inspectorate; to provide for the appointment of the Labour Commissioner and the Deputy Labour Commissioner; and to provide for incidental matters.”</p> <p>The Act repeals the Labour Act 6 of 1992, as well as the Labour Act 15 of 2004. All of the Act, other than section 128 (prohibiting labour hire) came into force on 1 November 2008; section 128 of the Act came into force on 1 March 2009.</p> <p>The regulations, notices, declarations, registrations, collective agreements and exemptions from collective agreements made under the Labour Act 11 of 2007 generally remain in force.</p>

Upcoming Namibian Legislation	
<p>Forest Act 12 of 2001 (as amended by the Forest Amendment Act 13 of 2005)</p>	<p>The Act “provide for the establishment of a Forestry Council and the appointment of certain officials; to consolidate the laws relating to the management and use of forests and forest produce; to provide for the protection of the environment and the control and management of forest fires; to repeal the Preservation of Bees and Honey Proclamation, 1923 (Proclamation No.1 of 1923), Preservation of Trees and Forests Ordinance, 1952 (Ordinance No. 37 of 1952) and the Forest Act, 1968 (Act No. 72 of 1968); and to deal with incidental matters.”</p> <p>Section 22. (1) provides: “Unless otherwise authorised by this Act, or by a licence issued under subsection (3), no person shall on any land which is not part of a surveyed erven of a local authority area as defined in section 1 of the Local Authorities Act, 1992 (Act No. 23 of 1992) cut, destroy or remove - (a) vegetation which is on a sand dune or drifting sand or on a gully unless the cutting, destruction or removal is done for the purpose of stabilising the sand or gully; or (b) any living tree, bush or shrub growing within 100 metres of a river, stream or watercourse.”</p> <p><u>Note:</u> the Preservation of Trees and Forests Ordinance No. 37 of 1952 contains a list of “Reserved Trees, Plants or Forest Produce” (Second Schedule). However, the Forest Act 12 of 2001 (the Act has been promulgated, but not yet implemented as no regulations are in place) repealed the Preservation of Trees and Forests Ordinance No. 37 of 1952, as well as the Forest Act No. 72 of 1968. Developers/proponents are, however, encouraged to abide to the Preservation of Trees and Forests Ordinance No. 37 of 1952, as well as the Nature Conservation Ordinance No. 4 of 1975 (Schedule 9: List of Protected Plants) (J. Hailwa, Director: Directorate of Forestry and G. Maggs-Kölling, Deputy Director: Forestry Management, Ministry of Agriculture, Water and Forestry, pers. comm.).</p>
<p>Environment Investment Fund of Namibia Act 13 of 2001</p>	<p>The Act “provide for the establishment of an Environmental Investment Fund of Namibia in support of sustainable environmental and natural resources management in Namibia; to constitute the Board to manage and control the Fund, and to define its powers and functions; and to provide for incidental matters”.</p> <p>The State-owned Enterprises Governance Act 2 of 2006, brought into operation by Proclamation 13 of 2006, amends section 7, 9, 14 and 21 and deletes section 8.</p>
<p>Water Resources Management Act 24 of 2004</p>	<p>This Act, which was promulgated in 2004 but has not yet entered into force, provides for the management and conservation of all water resources of Namibia, including inland waters, the sea and meteoric water (e.g. water that occurs in or is delivered from the atmosphere). The Act regulates (through licensing) the abstraction, use and supply of water; prescribes rules for the prevention of water pollution (e.g. the discharge of effluent water and wastewater and their treatment); defines water rights; and sets up an administrative framework to implement the purposes of the Act. Section 3 of the Act sets out the fundamental principles of water resources management and conservation.</p>
<p>National Heritage Act 27 of 2004</p>	<p>The Act provides for “the protection and conservation of places and objects of heritage significance and the registration of such places and objects; to establish a National Heritage Council; to establish a</p>

	<p><i>National Heritage Register; and to provide for incidental matters.”</i></p> <p>Section 55 (3) provides: <i>“All archaeological and palaeontological objects and meteorites are the property of the State, except such an archaeological or palaeontological object the private possession and ownership of which - (a) was acquired not in contravention of section 12 of the National Monuments Act, 1969 (Act 28 of 1969) or a law repealed by that Act; or (b) is acquired by virtue of a consent issued under this section.”</i></p> <p>Section 55 (4) provides: <i>“A person who discovers any archaeological or palaeontological object or meteorite must as soon as practicable report the discovery to the Council.”</i></p> <p>Section 55 (7) provides: <i>“Unless authorised by a permit under section 52, a person must not, without a consent issued under subsection (8) - (a) use an archaeological or palaeontological object or meteorite for the purpose of study, conservation or presentation; (b) uncover or expose, or move from its original position, any archaeological or palaeontological object or meteorite; (c) carry out an investigation or survey of any land for the purpose of finding any archaeological or palaeontological object or meteorite; (d) alter or develop any land on or in which an archaeological or palaeontological site or a meteorite is believed to be located; (e) carry out an act likely to endanger an archaeological or palaeontological object or meteorite; (f) within the area of a registered archaeological site be in possession of any excavation equipment or equipment designed or used for the detection of metals or archaeological or palaeontological objects or meteorites; or (g) whether as principal or agent - (i) buy or sell; (ii) export or attempt to export from Namibia; (iii) have in his or her possession for the purpose of sale or export, any archaeological or palaeontological object or any meteorite.”</i></p>
Plant Quarantine Act 7 of 2008	<p>The Act provides for <i>“the preventing, monitoring, controlling and eradication of plant pests; to facilitate the movement of plants, plant products and other regulated articles within and into or out of Namibia; to provide for the certification of the phytosanitary standards of plants and plant products exported from Namibia; and to provide for incidental matters.”</i></p> <p>This Act affects compliance with the International Plant Protection Convention of 1951 and repeals the Locusts Suppression Proclamation 34 of 1923, the Agricultural Pests Ordinance 11 of 1927 and the Agricultural Pests Act 3 of 1973.</p>
Disaster Risk Management Act 10 of 2012	<p>The purpose of the Act is to <i>“provide for the establishment of institutions for disaster risk management in Namibia; to provide for an integrated and coordinated disaster management approach that focuses on preventing or reducing the risk of disasters, mitigating the severity of disasters, emergency preparedness, rapid and effective response to disasters and post-disaster recovery; to provide for declarations of national, regional and local disasters; to provide for the establishment of the National Disaster Management Risk Fund; and to provide for incidental matters.”</i></p> <p>Disaster is defined as: <i>“any serious disruption of the functioning of a community or society, posing a significant, widespread threat to human life, health, property or the environment, which exceeds the</i></p>

	<i>ability of the affected community or society to cope using its own resources resulting from – (a) natural disaster, major accident or other significant events howsoever caused; (b) destruction or pollution; (c) scarcity of essential supplies; (d) disruption of essential services; (e) influx of refugees; (f) plague or epidemic of diseases; or (g) economic failure;”</i>
<b>Namibian Policies</b>	
Conservation of Biotic Diversity and Habitat Protection 1994	The aim of the Policy is to ensure adequate protection of all species and subspecies, of ecosystems and of natural life-support processes. Stipulated in the Policy is that all development must be sustainable and must be evaluated at an appropriate level by means of environmental assessment procedures.
Environmental Assessment Policy for Sustainable Development and Environmental Conservation 1995	The purpose of the Policy is seen as: informing decision makers and promoting accountability; ensuring that options and alternatives and environmental costs and benefits are considered; striving for a high degree of public participation and involvement of all sectors; incorporating internationally accepted norms and standards; taking into account secondary and cumulative environmental impacts; promoting the user pays principle; and promoting sustainable development (note that the EMA became law on the 6 <sup>th</sup> of February 2012).
Draft White Paper on the Energy Policy of Namibia 1998	The draft White Paper on the Energy Policy of Namibia was developed by the Energy Policy Committee of the Ministry of Mines and Energy (MME). The goals, that serve as a framework for the energy policies in the White Paper include: effective governance; security of supply; social upliftment; investment and growth; economic competitiveness and efficiency; and sustainability.
Draft Southern Windhoek Aquifer (SWA) Management Policy 2005	The objective of the Policy is <i>“to provide the management guidance, principles and tools to ensure that the groundwater resource available to the CoW is protected, used, developed, conserved, managed and controlled in a sustainable manner, to meet the basic water needs of the CoW into the future”</i> (Africon Environment & Sustainability Consulting, 2005).
<b>Namibian Guidelines</b>	
The Water Act (Act 54 of 1956) and its requirements in terms of water supplies for drinking water and for waste water treatment and discharge 1998	The Department of Water Affairs and Forestry (DWAf) prepared Water Quality Guidelines and these were adopted in 1998. More recently, draft Water Quality Guidelines and Standards for Potable Water, as well as Water Quality Standards for Effluent (2008) were prepared to become Regulations under the Water Resources Management Act 24 of 2004. As the Act has been promulgated, but not yet implemented, the latter Guidelines/Standards may be used, but are not yet enforceable.
Petroleum Products Regulations, 2000 Guidelines for Consumer Installations	A consumer fuel installation certificate is required from the Ministry of Mines and Energy (MME) should someone wish to store more than 200 litres (l) of petrol or diesel in an urban area. The Information Guide contains details, amongst others, about the application process (section 7), the conditions applicable to a certificate (section 11), the information that needs to be supplied to the Minister, MME on an annual basis (section 15), general prohibitions and duties (section 19), specific duties and prohibitions relating to licence- and certificate-holders (section 20), specifications (section 21), fire precautions (section 23), petroleum product spills (section 24), the penalties for contravention of or failure to comply with the provision of the Petroleum Products and Energy Act or Regulations (section 26), and contact

	details (MME) (section 27).
<b>Regional Agreements</b>	
Southern African Development Community (SADC) Protocol on Energy 1998	For the purpose of this Protocol, Member States shall, amongst others: “1. Use energy to support economic growth and development, alleviation of poverty and the improvement of the standard and quality of life throughout the Region; 4. Encourage the development and transfer of science and technology related to energy through the promotion of research and development and the evolution and use of comparable methods and standards; 7. Promote and encourage the direct participation of citizens and communities in the development and use of energy; 8. Ensure that the development and use of energy is environmentally sound; 9. Create a conducive environment for the private sector to participate fully in energy development in the Region; 10. Ensure that sectoral and sub-sectoral regional energy policies and programmes shall be in harmony with the overall policies and programmes of SADC and with the strategies and programmes of other SADC sectors.”
<b>International Conventions</b>	
International Plant Protection Convention (IPPC) 1951 (as last amended in 1997)	The IPPC is “ <i>a multilateral treaty for international cooperation in plant protection. The Convention makes provision for the application of measures by governments to protect their plant resources from harmful pests (phytosanitary measures) which may be introduced through international trade.</i> ”  Namibia’s ratification of the IPPC was approved by Parliament on 20 October 2005.
Vienna Convention for the protection of the Ozone Layer 1985	Namibia acceded to the Vienna Convention on 20 September 1993 and the Convention became effective in the Country on 20 December 1993. Parties shall take appropriate measures “ <i>to protect human health and the environment against adverse effects resulting or likely to result from human activities which modify or are likely to modify the ozone layer.</i> ”
Montreal Protocol on Substances that Deplete the Ozone Layer 1987 (and Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, Adopted at the Fourth Meeting of the Parties at Copenhagen on 25 November 1992; Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, Adopted by the Ninth Meeting of the Parties at Montreal on 17 September 1997; and Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, Beijing, 3 December 1999)	Namibia acceded to Montreal Protocol on 20 September 1993 and it became effective on 20 December 1993. The Protocol lays down a timetable for the reduction of controlled substances that deplete the ozone layer and have adverse effects on health and the environment. Namibia ratified the 1992, 1997 and 1999 Amendments to the Protocol on 28 March 2003 (effective date 26 October 2003), 19 April 2006 (effective date 30 December 2007) and 19 April 2006 (effective date 30 December 2007), respectively.
Convention on Biological Diversity 1992	Namibia was one of the original Contracting Party signatories to the Convention of Biological Diversity in 1992 and ratified it in 1997. The objectives of this international treaty are: “ <i>i) the conservation of</i>

	<p><i>biological diversity; ii) the sustainable use of biological resources; and iii) the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding” (Article 1).</i></p>
<p>United Nations (UN) Framework Convention on Climate Change 1992 and Kyoto Protocol to the UN Framework Convention on Climate Change 1997</p>	<p>Namibia signed the UN Framework Convention on Climate Change on 12 June 1992 and ratified it on 16 May 1995. It became effective on 14 August 1995. <i>“The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.”</i></p> <p>Namibia ratified the Kyoto Protocol on 4 September 2003 and the agreement became binding on 16 February 2005. The objective of the protocol is for parties to individually or jointly ensure that the aggregate anthropogenic equivalent emissions of specified greenhouse gases such as carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF<sub>6</sub>), do not exceed their assigned amounts.</p>
<p>United Nations Convention to Combat Desertification (UNCCD) in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa 1994</p>	<p>Namibia signed this Convention on 24 October 1994 and ratified it on 16 May 1997. It became effective on 14 August 1997.</p> <p><i>“The objective of this Convention is to combat desertification and mitigate the effects of drought in countries experiencing serious drought and/or desertification, particularly in Africa, through effective action at all levels, supported by international cooperation and partnership arrangements, in the framework of an integrated approach which is consistent with Agenda 21, with a view to contributing to the achievement of sustainable development in affected areas.”</i></p>
<p>Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade 1998</p>	<p>The objective of the Rotterdam Convention is <i>“to promote shared responsibility and cooperative efforts among Parties in the international trade of certain hazardous chemicals in order to protect human health and the environment from potential harm and to contribute to their environmentally sound use, by facilitating information exchange about their characteristics, by providing for a national decision-making process on their import and export and by disseminating these decisions to Parties.”</i></p> <p>Namibia signed this Convention on 11 September 1998 and it became effective on 22 September 2005.</p>
<p>Stockholm Convention of Persistent Organic Pollutant (POPs) 2001 (as amended in 2009 and 2011)</p>	<p>The Stockholm Convention entered into force on 17 May 2004. The aims of the Convention are to eliminate or restrict the production and use of POPs.</p> <p>Namibia acceded to the Convention on 24 June 2005 and it became effective on 22 September 2005.</p>
<p>Convention for the Safeguarding of the Intangible Cultural Heritage 2003</p>	<p>Ratification by Namibia of this United Nations Educational, Scientific and Cultural Organization (UNESCO) Convention was approved by Parliament on 7 November 2006 and it became effective on 19</p>



	<p>December 2007.</p> <p>The purposes of the Convention are: “(a) to safeguard the intangible cultural heritage (defined as “the practices, representations, expressions, knowledge, skills – as well as the instruments, objects, artefacts and cultural spaces associated therewith – that communities, groups and, in some cases, individuals recognize as part of their cultural heritage”); (b) to ensure respect for the intangible cultural heritage of the communities, groups and individuals concerned; (c) to raise awareness at the local, national and international levels of the importance of the intangible cultural heritage, and of ensuring mutual appreciation thereof; and (d) to provide for international cooperation and assistance.”</p>
<p>International Standards for Phytosanitary Measures 2009</p>	<p>“This standard describes phytosanitary measures that reduce the risk of introduction and spread of quarantine pests associated with the movement in international trade of wood packaging material made from raw wood. Wood packaging material covered by this standard includes dunnage but excludes wood packaging made from wood processed in such a way that it is free from pests (e.g. plywood).”</p>
<p><b>International Best Practice</b></p>	
<p>The Vermillion Accord on Human Remains 1989</p>	<p>The Vermillion Accord, adopted in 1989 at the WAC Inter-Congress, South Dakota, United States of America (USA), is a professional ethics statement dealing with: 1. “Respect for the mortal remains of the dead shall be accorded to all, irrespective of origin, race, religion, nationality, custom and tradition. 2. Respect for the wishes of the dead concerning disposition shall be accorded whenever possible, reasonable and lawful, when they are known or can be reasonably inferred. 3. Respect for the wishes of the local community and of relatives or guardians of the dead shall be accorded whenever possible, reasonable and lawful. 4. Respect for the scientific research value of skeletal, mummified and other human remains (including fossil hominids) shall be accorded when such value is demonstrated to exist. 5. Agreement on the disposition of fossil, skeletal, mummified and other remains shall be reached by negotiation on the basis of mutual respect for the legitimate concerns of communities for the proper disposition of their ancestors, as well as the legitimate concerns of science and education. 6. The express recognition that the concerns of various ethnic groups, as well as those of science are legitimate and to be respected, will permit acceptable agreements to be reached and honoured.”</p>
<p>International Finance Corporation Performance Standards</p>	<p>The International Finance Corporation (IFC) applies eight Performance Standards (see <a href="http://www.ifc.org/ifcext/sustainability.nsf/Content/PerformanceStandards">http://www.ifc.org/ifcext/sustainability.nsf/Content/PerformanceStandards</a>) to manage social and environmental risks and impacts, as well as to enhance development opportunities in its private sector financing in its member countries eligible for financing.</p> <p>The eight Performance Standards include: 1: Social and Environmental Assessment and Management System; 2: Labour and Working Conditions; 3: Pollution Prevention and Abatement; 4: Community Health, Safety and Security; 5: Land Acquisition and Involuntary Resettlement; 6: Biodiversity Conservation and Sustainable Natural Resource Management; 7: Indigenous Peoples; and 8: Cultural Heritage.</p>

	<p>The IFC Performance Standards, developed in 2006, are supplemented by the July 2007 Guidance Notes and apply the Environment, Health, and Safety (EHS) Guidelines (see <a href="http://www.ifc.org/ifcext/sustainability.nsf/Content/GuidanceNotes">http://www.ifc.org/ifcext/sustainability.nsf/Content/GuidanceNotes</a>).</p> <p>Although the IFC Performance Standards and Guidelines apply to projects that are funded by the IFC, the principles they entrench are part of internationally accepted good practice. In order to incorporate valuable lessons learnt from the IFC's implementation experience, as well as feedback from its stakeholders and clients, the IFC's Sustainability Framework has since been reviewed and was updated in May 2011; changes effective as of 1 January 2012 (see <a href="http://www.ifc.org/sustainabilityframework">http://www.ifc.org/sustainabilityframework</a>).</p> <p>As of 30 April 2007, new versions of the "EHS Guidelines" are in use (see <a href="http://www.ifc.org/ifcext/sustainability.nsf/Content/EnvironmentalGuidelines">http://www.ifc.org/ifcext/sustainability.nsf/Content/EnvironmentalGuidelines</a>). The General EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). The Guidelines contain performance levels and measures normally acceptable to the IFC and are generally considered to be achievable in new facilities at reasonable costs by existing technology. The General EHS Guidelines: 1. Environmental: 1.1 Air Emissions and Ambient Air Quality, 1.2 Energy Conservation, 1.3 Wastewater and Ambient Water Quality, 1.4 Water Conservation, 1.5 Hazardous Materials Management, 1.6 Waste Management, 1.7 Noise, 1.8 Contaminated Land; 2. Occupational Health and Safety; 3. Community Health and Safety; and 4. Construction and Decommissioning (IFC, 2007) are designed and should be used together with the relevant Industry Sector Guideline(s).</p>
<p>The Registration, Evaluation, Authorization and Restriction of Chemicals (REACH)</p>	<p>This European Community regulation entered into force on 1 June 2007 (with provisions to be phased in over 11 years); the aim of REACH is to protect human health and the environment through the earlier identification of the intrinsic properties of chemical substances.</p> <p>Over 30,000 substances will be assessed under REACH and approximately 1,500 will be considered to be of "high concern" and subject to authorisation. This will ultimately result in restriction by a prescribed date. The list of chemicals is developed on an on-going basis and substances on the list will be phased in.</p> <p>European Member States are required to incorporate REACH into their national legislation and establish departments dedicated to REACH. Industry is made responsible for managing the risks from chemicals and to provide safety information on the substances. The primary responsibility is on manufacturers and importers in Europe who will be required to obtain information on the properties of their chemical substances, to facilitate safe handling, and to register the information in a central database. REACH also calls for the progressive substitution of the most dangerous chemicals when suitable alternatives have been identified (see <a href="http://ec.europa.eu/environment/chemicals/reach/reach_intro.htm">http://ec.europa.eu/environment/chemicals/reach/reach_intro.htm</a>).</p>

## 5 Stakeholder and Public Consultation

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### 5.1 Objectives

The purpose of Public Participation is to provide stakeholders, including the public, an opportunity to participate in the Environmental Assessment Process, in order to ensure that the intended development initiatives consider broad-based concerns. It further improves governance in that the intended development must consider a wide range of issues, e.g. the need to conserve the natural environment and the need to maintain a functioning ecology.

### 5.2 Consultation Process

Communication with stakeholders about the proposed Project was facilitated through the following methods:

- Key stakeholders were identified from contacts of the Project Team (see Annexure F: List of Interested and Affected Parties (I&APs) Consulted);
- Advertisements (Notice for Environmental Impact Assessment) were placed in two National newspapers, Republikein and Observer, on 18 and 25 October 2013 (see Annexure F: Advertisements);
- A laminated notice (with the Notice for Environmental Impact Assessment) was placed on the corner of Hosea Kutako Drive and Monte Christo Road (opposite the Van Eck Power Station) (see Annexure F: Notice Displayed);
- Written notice re the proposed Development was sent to the following I&APs by means of e-mail (17 October 2013):
  - the Chief Executive Officer (CEO), City of Windhoek;
  - the CEO, TransNamib Holdings Ltd;
  - the Project Manager, Elisenheim (see Annexure F: Letters);
  - note that the contact details for the surrounding land owners/companies i.e. Eros No. 69, Santiago Investments Twenty Eight cc, and Phike Eight Pty Ltd could not be obtained from, either the Directorate of Deeds, or the City of Windhoek;
- The advertisements, notice/poster and written notices provided details re the application; stated also was that the application was submitted to the Environmental Commissioner in terms of the EIA Regulations: EMA 7 of 2007, the nature and location of the proposed Project/Activity, and where, how and from whom additional information on the application/activity can be obtained;
- A register of I&APs was opened (see Annexure F: Register of I&APs; also see Annexure F: Correspondence with I&APs);
- Jimmey Construction (APCI) hosted a Business Breakfast for Technical Representatives from the COW on the 8<sup>th</sup> of November 2013; the purpose of the Meeting was to convey the planning and development approach that will give effect to sustainable development principles (see Figure 26 and Annexure F: Attendance List and PowerPoint Presentations);
- An electronic copy (link sent via e-mail) of the *Draft* Environmental Impact Assessment and Management Plan Report and Annexures were sent to I&APs (25 November 2013);
- The 10-day comment period ended on 9 December 2013; comments were received from one I&AP (see Annexure F: Correspondence with I&APs).



Figure 26: Attendance of City of Windhoek Technical Staff at the Business Breakfast that took place at Nice Restaurant, Windhoek on 8 November 2013.

### 5.3 Summary of Issues and/or Concerns

A summary of the issues/concerns raised during the Stakeholder and Public Consultation Process, as well as the measures taken to address these issues, is provided in Table 3.

Table 3: A summary of the issues/concerns and measures taken to address these issues during the Environmental Assessment Process.

Issue/Concern	Response
<b>Access to the Proposed Townships</b>	
Information is required with regards to the connections to the Elisenheim Residential Development.	See Section 2.3.1
Will the Developer contribute (financially) to the construction of a road through the Development?	<p>There will be no Main Road through the proposed Development (i.e. Development Areas A and B).</p> <p>The possibility of constructing a road between the Railway Line and the Klein Windhoek River will be investigated.</p> <p>Also see Section 2.3.1</p>
The three access points to the proposed Development must be fixed, i.e. the long-term township establishment guidelines/framework need to be developed and approved together with the establishment of the townships.	The comment is noted.
<b>New Ujams Waste Water Treatment Plant</b>	
Concern regarding the location of the WWTP in relation to the residential development in Development Area B; there should be a 500 m exclusion zone around the WWTP and the smell may be a nuisance to the residents.	See Section 2.3.4.
The plant is designed for industrial waste.	<p>During preliminary discussions, the CoW indicated that there would be no problem to connect to the new WWTP in terms of capacity and/or type of sewerage.</p> <p>Once the final layouts for the Townships are available, WCE will do the preliminary design for the bulk and internal services. Should there be any “challenges”, the layouts (of the Townships) would need to be adjusted.</p>
<b>Management of the Green and Public Spaces</b>	
Who will be responsible for the management of the green and public spaces?	The Developer will not be responsible for the sewer lines.

	<p>It is foreseen that there will be a Home Owners Association (HOA). (Prospective) Buyers may be required contractually to contribute financially to the management/maintenance of the green and public spaces; the Developer will then use the money for management/maintenance (so that the Development becomes “self-funded”).</p> <p>The Developer will be responsible for certain “key structures”; private sector will “fill in” the remainder.</p>
<p><b>Layout of the Proposed Townships</b></p>	
<p>Provision should be made for “informal economic spaces” (for e.g. street vendors selling arts and crafts).</p>	<p>The comment is noted.</p>
<p><b>Flora: Large Number of Protected Mature Tree Species</b></p>	
<p>Concern re. the summary of the report by Cunningham (2013), the mapping of sensitive areas, recommendations for before-and-after monitoring, and the Biodiversity Inventory that was done for Windhoek in 2009.</p>	<p>See Sections 2.1, 3.2.3, 3.2.4 and 7: EMP. Also see Annexure F: Correspondence with I&amp;APs.</p>

## 6 Environmental Impact Assessment

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### 6.1 Introduction

Certain aspects of the proposed Development may cause potential impacts to the environment. These impacts can occur under normal conditions, but also under abnormal and potential emergency conditions (e.g. fire (causing uncontrolled atmospheric emissions), flood and accidental physical damage (causing uncontrolled releases to air, water and land)). The impacts that are envisaged as a result of the proposed Development were identified from the desktop and specialist studies, as well as during consultation with various stakeholders.

*Aspect* is defined by the International Organization for Standardization ISO 14001:2004 as an “*element of an organization's activities or products or services that can interact with the environment*”; *environment* is defined as “*surroundings in which an organization operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation*” and *impact* is defined as “*any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects.*”

Management actions (i.e. the adoption of the “mitigation hierarchy”, and including monitoring), with the aim of avoiding, minimizing, or compensating/offset the potential negative impacts (and maximizing the potential positive impacts), are provided in the Environmental Management Plans (EMPs) (see Section 7).

### 6.2 Methodology

The Rapid Impact Assessment Matrix (RIAM) Software Package (Pastakia, 1998) was used for the assessment of the potential impacts. Scoring takes place within a matrix, the latter that was designed to allow subjective judgments to be quantitatively recorded. The system thus provides an impact evaluation, as well as a record that can be re-assessed in the future (e.g. should more information become available).

First, through the process of scoping, specific assessment/environmental components, falling into four categories, needs to be defined:

Physical/Chemical (PC)	<i>“all physical and chemical aspects of the environment, including finite (non-biological) natural resources, and degradation of the physical environment by pollution”</i>
Biological/Ecological (BE)	<i>“all biological aspects of the environment, including renewable natural resources, conservation of biodiversity, species interactions, and pollution of the biosphere”</i>
Sociological/Cultural (SC)	<i>“all human aspects of the environment, including social issues affecting individuals and communities; together with cultural aspects, including conservation of heritage, and human development”</i>
Economic/Operational (EO)	<i>“the economic consequences of environmental change, both temporary and permanent, as well as the complexities of project management within the context of the project activities”</i>

Second, the impacts are scored using certain assessment criteria and scales.

The assessment criteria fall into two groups:

- A These criteria are of importance to the condition
- B These criteria are of value to the situation

The assessment scales are as follows:

- Group A – Importance of condition (A1)
- 4 Important to national/international interests
  - 3 Important to regional/national interests
  - 2 Important to areas immediately outside the local condition
  - 1 Important only to the local condition
  - 0 No importance

- Group A - Magnitude of change/effect (A2)
- +3 Major positive benefit
  - +2 Significant improvement in status quo
  - +1 Improvement in status quo
  - 0 No change/status quo
  - 1 Negative change to status quo
  - 2 Significant negative dis-benefit or change
  - 3 Major dis-benefit or change

- Group B - Permanence (B1)
- 1 No change/not applicable
  - 2 Temporary
  - 3 Permanent

- Group B - Reversibility (B2)
- 1 No change/not applicable
  - 2 Reversible
  - 3 Irreversible

- Group C - Cumulative (B3)
- 1 No change/not applicable
  - 2 Non-cumulative/single
  - 3 Cumulative/synergistic

Third, by means of a series of formulae, a value is ascribed to each of the groups of criteria. The use of a multiplier for Group A is important for it ensures that the weight of each score is expressed. Scores for Group B are added together, ensuring that the individual value scores cannot influence the overall score, but that the collective importance of all values in Group B is fully taken into account. The sum of the Group B scores is then multiplied by the result of the Group A scores and a final environmental (assessment) score (ES) for the condition is obtained:

$$\begin{aligned}(a1) \times (a2) &= aT \\(b1) + (b2) + (b3) &= bT \\(aT) \times (bT) &= ES\end{aligned}$$

where

(a1) and (a2) are the individual criteria scores for Group A  
(b1) to (b3) are the individual criteria scores for Group B  
aT is the result of multiplication of all Group A scores  
bT is the result of summation of all Group B scores  
ES is the environmental score for the condition

Finally, a matrix is produced for each project option and individual ES scores calculated and recorded. These individual ES scores are then banded together into ranges (Range Values (RV)) (see Table 4). For ease of interpretation, significant and major positive impacts are indicated in green and significant and major negative impacts in red.

Table 4: The range bands used for the Rapid Impact Assessment Matrix (Source: Pastakia, 1998).

Environmental Score (ES)	Range Value (RV) (Alphabetic)	Range Value (RV) (Numeric)	Description of Range Band
72 - 108	E	5	Major positive change/impact
36 - 71	D	4	Significant positive change/impact
19 - 35	C	3	Moderate positive change/impact
10 - 18	B	2	Positive change/impact
1 - 9	A	1	Slight positive change/impact
0	N	0	No change/status quo/not applicable
-1 - -9	-A	-1	Slight negative change/impact
-10 - -18	-B	-2	Negative change/impact
-19 - -35	-C	-3	Moderate negative change/impact
-36 - -71	-D	-4	Significant negative change/impact
-72 - -108	-E	-5	Major negative change/impact

The lower limits of 'significant change', for example, can be taken as the point when a condition is outside local boundaries (A1 = 2), but is of major importance (A2 = 3), yet is temporary (B1 = 2) and reversible (B2 = 2), and non-cumulative (B3 = 2). A 'major change' can be taken as the point when the condition extends to a regional/national boundary (A1 = 3), is of major importance (A2 = 3), is permanent (B1 = 3) and irreversible (B2 = 3), and non-cumulative (B3 = 2) (Pastakia, 1998).

### 6.3 Proposed Establishment of Industrial/Business and Residential/Business Townships

The various aspects and the potential related impacts per environmental component (PC, BE, SC and EO) for the proposed Development are summarised in Table 5.

Note that the RIAM does not include an assessment scale for Probability of Occurrence; the following scale was used to rate (the probability of occurrence of) the various impacts and the results are included in Table 5.

	Probability of Occurrence
Definite	Impact will occur
Highly probable	Impact is most likely to occur
Probable	Distinct possibility that the impact will occur
Low	Possibility of impact occurring is low



Table 5: The potential impacts, and probability of occurrence, that certain aspects related to the proposed Development may have on the environment (*PC = Physical/chemical; BE = Biological/ecological; SC = Sociological/cultural; and EO = Economic/operational*).

Impact Code	Potential Impact	Aspect	Probability of Occurrence
PC 1	Contamination soil/groundwater	Sewerage lines (leakages/damage)	Highly Probable
PC 2	Contamination soil	Hazardous Materials Management (oil/grease/chemicals)	Highly Probable
PC 3	Contamination groundwater	Hazardous Materials Management (oil/grease/chemicals)	Highly Probable
PC 4	Contamination surface water	Disposal/storage of solid waste near open water sources	Probable
PC 5	Contamination surface water	Runoff during precipitation events	Probable
PC 6	High risk of infection for consumers, field workers and handlers	Use of semi-purified water (containing helminth eggs and other parasites) for irrigation purposes	Low (Abnormal Conditions)
BE 1	Loss of fauna	Construction activities (including noise)	Highly Probable
BE 2	Loss of flora	Construction activities (clearing of land)	Definite
BE 3	Loss of habitat for fauna	Construction activities (clearing of land)	Definite
BE 4	Loss of sensitive habitat	Construction activities (clearing of land)	Highly Probable
BE 5	Contribution to scientific knowledge	Vegetation and habitat assessment	Definite
BE 6	Erosion	Construction activities	Highly Probable
SC 1	Loss/damage to archaeological sites	Construction phase	Probable
SC 2	Loss/damage to archaeological sites	Operational phase	Probable
SC 3	Contribution to scientific knowledge	Archaeological assessment	Definite
SC 4	Visual impacts	Construction activities (presence of people/equipment/dust)	Definite
SC 5	Increased traffic on roads	Transport of construction teams and material	Definite
SC 6	Additional industrial and business facilities and housing	Establishment of Industrial/Business and Residential/Business Townships	Definite
SC 7	Safety and security (residents and staff)	Crime during the operational phase	Definite
EO 1	Employment (temporary)	Construction phase	Definite
EO 2	Economic benefits (temporary)	Construction phase	Definite
EO 3	Employment (permanent)	Operational phase	Definite
EO 4	Economic benefits (permanent)	Operational phase	Definite

The Rapid Impact Assessment Matrix is summarised in Table 6.

Two (2) potential slight negative impacts and four (4) potential negative impacts were identified under the physical/chemical component (see Table 6), all of which can be relatively easily mitigated through the implementation of certain management measures (see Section 7: EMP).

One (1) potential slight negative impact, four (4) potential negative impacts, and one (1) definite significant positive impact were identified under the biological/ecological component (see Table 6).

Table 6: Rapid Impact Assessment Matrix for the proposed Development.

Environmental Components		ES	RV	A1	A2	B1	B2	B3
<b>Physical and chemical components (PC)</b>								
PC 1	Contamination soil/groundwater (sewerage)	-14	-B	2	-1	2	2	3
PC 2	Contamination soil (hazardous materials)	-6	-A	1	-1	2	2	2
PC 3	Contamination groundwater (hazardous materials)	-14	-B	2	-1	2	2	3
PC 4	Contamination surface water (solid waste)	-6	-A	1	-1	2	2	2
PC 5	Contamination surface water (runoff)	-14	-B	2	-1	2	2	3
PC 6	High risk of infection for consumers, field workers and handlers (semi-purified water for irrigation)	-12	-B	1	-2	2	2	2
<b>Biological and ecological components (BE)</b>								
BE 1	Loss of fauna (construction)	-16	-B	1	-2	3	3	2
BE 2	Loss of flora (construction)	-16	-B	1	-2	3	3	2
BE 3	Loss of habitat for fauna (construction)	-16	-B	1	-2	3	3	2
BE 4	Loss of sensitive habitat (construction)	-16	-B	1	-2	3	3	2
BE 5	Contribution to scientific knowledge	48	D	3	2	3	3	2
BE 6	Erosion (construction)	-6	-A	1	-1	2	2	2
<b>Sociological and cultural components (SC)</b>								
SC 1	Loss/damage to archaeological sites (construction)	-16	-B	1	-2	3	3	2
SC 2	Loss/damage to archaeological sites (operational)	-16	-B	1	-2	3	3	2
SC 3	Contribution to scientific knowledge	48	D	3	2	3	3	2
SC 4	Visual impacts (construction)	-24	-C	2	-2	2	2	2
SC 5	Increased traffic on roads (construction)	-24	-C	2	-2	2	2	2
SC 6	Additional industrial and business facilities and housing	72	E	3	3	3	3	2
SC 7	Safety and security (residents and staff)	0	N	2	0	3	2	2
<b>Economical and operational components (EO)</b>								
EO 1	Employment (temporary; construction)	54	D	3	3	2	2	2
EO 2	Economic benefits (temporary; construction)	54	D	3	3	2	2	2
EO 3	Employment (permanent; operational)	72	E	3	3	3	3	2
EO 4	Economic benefits (permanent; operational)	72	E	3	3	3	3	2

As far as the sociological/cultural components are concerned, one (1) neutral impact (crime is widespread in the Windhoek-area), two (2) potential negative impacts (loss of or damage to archaeological sites during the construction and operational phases), two (2) definite moderate negative impacts (increased traffic on the roads and visual impact(s) during the construction phase), one (1) definite significant positive impact, and one (1) major positive impact (i.e. the provision of housing and additional industrial and business facilities) were identified (see Table 6).

The proposed Development will have two (2) significant positive impacts and two (2) major significant positive impacts on the environment (see economical/operational component; Table 6) through temporary and permanent job creation, as well as the associated economic benefits (whether *direct* (e.g. salaries, sales of erven/units by the Developer, and taxes), *indirect* (e.g. from inputs purchased by the construction companies, as well as inputs purchased by their suppliers to produce the inputs), or *induced* (e.g. products and services purchased by the employees and contractors as a result of their increased spending power stemming from their salaries and wages).

A summary of the scores is provided in Table 7. It is evident that four (4) potential significant positive impacts and three (3) potential major positive impacts were identified. No potential major negative or significant negative impacts were identified.

Table 7: Summary of scores for the proposed Development (PC = Physical/chemical; BE = Biological/ecological; SC = Sociological/cultural; and EO = Economic/operational).

Range	-108 -72	-71 -36	-35 -19	-18 -10	-9 -1	0 0	1 9	10 18	19 35	36 71	72 108
Class	-E	-D	-C	-B	-A	N	A	B	C	D	E
PC	0	0	0	4	2	0	0	0	0	0	0
BE	0	0	0	4	1	0	0	0	0	1	0
SC	0	0	2	2	0	1	0	0	0	1	1
EO	0	0	0	0	0	0	0	0	0	2	2
<b>Total</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>10</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>3</b>

The impact assessment histogram for the proposed Development (Option 1) is shown in Figure 27.

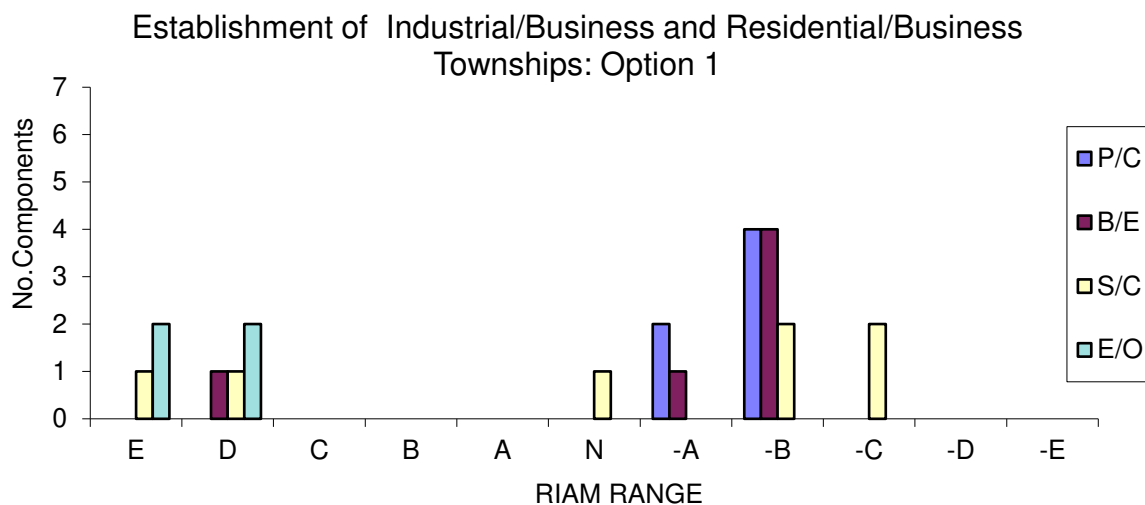


Figure 27: Impact assessment histogram for the proposed Development (PC = Physical/chemical; BE = Biological/ecological; SC = Sociological/cultural; and EO = Economic/operational).

#### 6.4 No Development

A second assessment was carried out for the “no development” option (Option 2) in order to illustrate what the impacts could be should the proposed Industrial/Business and Residential/Business Townships not be developed.

The Rapid Impact Assessment Matrix is summarised in Table 8 and a summary of the scores is provided in Table 9.

Apart from the contribution to scientific knowledge (BE 5 and SC 3; see Table 6) and the temporary and permanent provision of jobs and the associated economic benefits, there will be a status quo as far as the physical/chemical, biological/ecological, and sociological/cultural components are concerned (the latter is excluded in Table 8; see Table 6).

The “no development” option can be regarded as a negative scenario (moderate negative impact) in terms of the economical/operational component. No new temporary and/or permanent jobs will be created and there will be no temporary and/or permanent economic benefits (Table 8).

Table 8: Rapid Impact Assessment Matrix should the proposed two townships not be developed.

Environmental Components		ES	RV	A1	A2	B1	B2	B3
<b>Economical and operational components (EO)</b>								
EO 1	Employment (temporary; construction)	-27	-C	3	-3	1	1	1
EO 2	Economic benefits (temporary; construction)	-27	-C	3	-3	1	1	1
EO 3	Employment (permanent; operational)	-27	-C	3	-3	1	1	1
EO 4	Economic benefits (permanent; operational)	-27	-C	3	-3	1	1	1

Table 9: Summary of scores should the proposed two townships not be developed (PC = Physical/chemical; BE = Biological/ecological; SC = Sociological/cultural; and EO = Economic/operational).

Range	-108 -72	-71 -36	-35 -19	-18 -10	-9 -1	0 0	1 9	10 18	19 35	36 71	72 108
Class	-E	-D	-C	-B	-A	N	A	B	C	D	E
PC	0	0	0	0	0	6	0	0	0	0	0
BE	0	0	0	0	0	5	0	0	0	1	0
SC	0	0	1	0	0	5	0	0	0	1	0
EO	0	0	4	0	0	0	0	0	0	0	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>16</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>

The impact assessment histogram should the proposed Industrial/Business and Residential/Business Townships not be developed (Option 2) is shown in Figure 28.

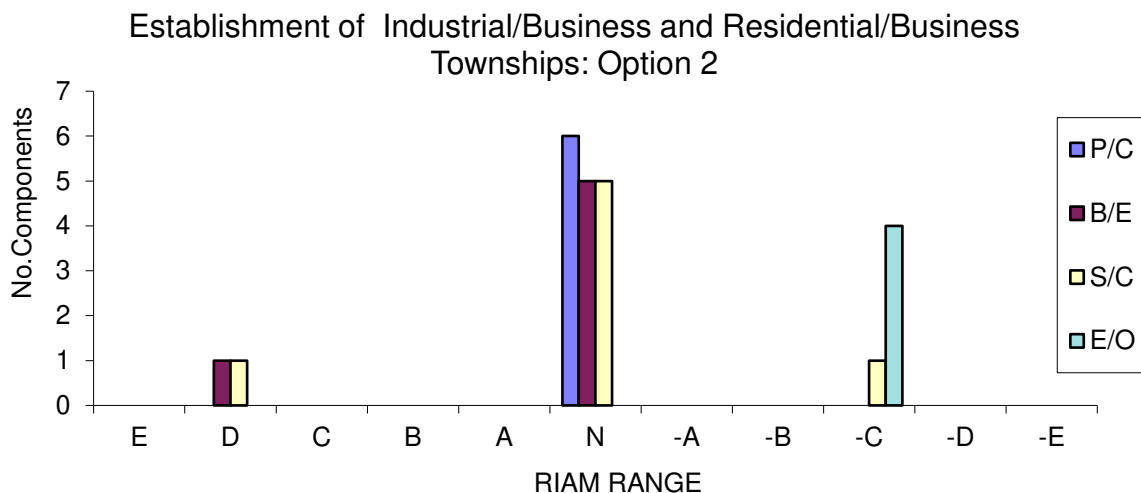


Figure 28: Impact assessment histogram should the proposed two townships not be developed (PC = Physical/chemical; BE = Biological/ecological; SC = Sociological/cultural; and EO = Economic/operational).

## 6.5 Conclusion

The proposed Development will have potential impacts on the environment and these will be of a positive, as well as a negative nature: two (2) moderate negative, ten (10) negative, three (3) slight negative, one (1) neutral, four (4) significant positive, and three (3) major positive impacts were identified (see Table 7 and Figure 27).

The potential moderate negative, negative and slight negative impacts would be, either temporary in nature, or could be relatively easily and effectively mitigated through the implementation of certain management measures (see Section 7).

Should the Development not go ahead, no new temporary and/or permanent jobs will be created and there will be no economic benefits (see Table 8 and Figure 28).

## 7 Environmental Management Plan

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### 7.1 Aim and Structure of the Environmental Management Plan

An Environmental Management Plan (EMP) is one of the most important outputs of the Environmental Assessment (EA) process as it is the synthesis of all the proposed mitigation and monitoring actions, set to a timeline and with specific assigned responsibilities.

The aim of the EMP is to assist African Precast Concrete Industries and their Contractor(s) to ensure that the day-to-day operations are carried out in an environmentally responsible manner, thereby preventing or minimizing the negative effects and maximizing the positive effects of the proposed Development.

Separate EMPs have been prepared for the proposed Development: an EMP for the planning phase, and an EMP for the construction/operational phase of the proposed Project/Activities.

Once approved by the Directorate of Environmental Affairs (DEA), Ministry of Environment and Tourism (MET), in the form of an Environmental Clearance Certificate, the EMPs will become legally binding document(s) and African Precast Concrete Industries, its Contractor(s), and their Sub-Contractor(s) are required to abide to the conditions stipulated in the EMPs.

The EMPs are presented as comprehensive matrices: for each Activity/Process and related Aspects and Impacts, Management Actions required to address the impacts arising directly and indirectly from the various aspects of the proposed Project, with Responsible Persons and Timing for each, are listed.

Copies of the EMPs should be made available at African Precast Concrete Industries' Offices during the planning and construction/operational phases of the proposed Development.

External auditing (and monitoring) should be carried out to ensure compliance with the EMPs. Parties responsible for transgression of the EMPs should be held responsible for any rehabilitation that needs to be undertaken.

Note that the EMPs are not static documents and that the documents should be updated as the Project progresses/more information re the proposed activities becomes available.

### 7.2 Permits and Approvals

An overview of the most pertinent legislation with the aim of informing African Precast Concrete Industries and their Contractor(s) of the legal requirements pertaining to the Development during the planning, and construction/operational phases can be found under Section 4 of this Report.

A summary of the relevant legislation and regulatory authorities (including contact details) as far as permits and/or approvals are concerned, is provided:

Legislation	Regulatory Authority	Permit/Approval	Contact Details
Preservation of Trees and Forests Ordinance No. 37 of 1952	Ministry of Agriculture, Water and Forestry (MAWF), Directorate of Forestry	A permit is required prior to the removal of any protected tree species i.e. Camelthorn <i>Acacia erioloba</i> , Shepherd's Tree <i>Boscia albitrunca</i> , and Anna Tree <i>Faidherbia albida</i> .	Khomas Region Windhoek District Forestry Office Tel. 061-2087327
Nature Conservation Ordinance No. 4 of 1975	Ministry of Environment and Tourism (MET)	A permit is required prior to the picking, cutting/chopping/picking off, taking, gathering, uprooting, damaging or destroying, or transporting any protected plant (e.g. all aloe species).	Mr Toivo Uahengo Directorate Scientific Services Tel. 061-2842506 tuahengo@met.na
National Heritage Act 27 of 2004	Ministry of Youth, National Service, Sport and Culture / National Heritage Council of Namibia	Inform the National Heritage Council of Namibia should any archaeological material be found during the construction/operational phase	Rev Salomon April Director National Heritage Council Tel. 061-244375 salomon@nhc-nam.org
Atomic Energy and Radiation Protection Act 5 of 2005	Ministry of Health and Social Services, National Radiation Protection Services	Troxler (soil density gauge containing a radioactive source) needs to be registered and a permit obtained from the Ministry.	Axel Tibinyane Radiation Programmes Manager Tel. 061-2302767 atibinyane@mhss.gov.na
Environmental Management Act 7 of 2007	Ministry of Environment and Tourism (MET)	Environmental Clearance Certificate.	Mr Teofilus Nghitila Environmental Commissioner Tel. 061-2842751 nghitila@met.na or tnghitila@yahoo.com
Labour Act 11 of 2007	Ministry of Labour and Social Welfare	Permission is needed to run 12-hour shifts (should it be required).	Mr Bro-Matthew Shingudja Labour Commissioner Tel. 061-214880 bro.matthew@mol.gov.na

### 7.3 Roles and Responsibilities

African Precast Concrete Industries (APCI) is responsible for fulfilling the requirements in the EMPs for the planning and construction/operational phases of the proposed Development.

**Should APCI sell erven to individual developers, the developers must be contractually bound to ensure that the building plans (from the individual developers) are consistent with: i) the design guidelines/codes (from the architect/landscape architect); ii) the site-specific plans (as submitted to the CoW); as well as iii) the overall urban design framework.**

In addition to the before-mentioned, the following actions are proposed:

1. The provision by African Precast Concrete Industries of, on an on-going basis, sufficient management sponsorship and human and financial resources for the implementation of the EMPs;
2. The development of a monitoring programme(s) (as needed) (see Section 7.5); and
3. External auditing (by an independent, external auditor) of the management actions as contained in the EMPs for the construction/operational phases of the proposed Development.

#### 7.4 Environmental Management Plans

This Section contains the Environmental Management Plans (EMPs) for the planning (Table 10), and construction/operational (Table 11) phases of the proposed Development (also see IFC, 2007).

Note that the civil works will be carried out in accordance with the South African National Standards (SANS) 1200; the electrical works is subject to several SANS specifications, as well as the Independent Electrical Contractor (IEC) codes.



Table 10: Environmental Management Plan for the Planning Phase of the proposed Development, Windhoek, Khomas Region, Namibia.

ASPECT	IMPACT	MANAGEMENT ACTIONS/OBJECTIVES	RESPONSIBLE PERSON(S)	TARGET DATE
<b>Social and Environmental Performance</b>				
Management and Monitoring	Social and Environmental Performance	<ul style="list-style-type: none"> <li>Ensure that all aspects related to the EMP are implemented during the planning phase.</li> </ul>	African Precast Concrete Industries (APCI)	Ongoing
Consultation and Disclosure	Social and Environmental Performance	<ul style="list-style-type: none"> <li>Maintain open and direct lines of communication between the Proponent (African Precast Concrete Industries), the City of Windhoek (CoW), and I&amp;APs with regards to environmental matters.</li> </ul>	APCI / CoW	Ongoing
		<ul style="list-style-type: none"> <li>Consult with I&amp;APs throughout the project process and adequately incorporate I&amp;APs' concerns.</li> </ul>	APCI	Ongoing
Grievance Mechanism	Social and Environmental Performance	<ul style="list-style-type: none"> <li>Implement a grievance mechanism for receiving and resolving any concerns and grievances related to the project's social and environmental performance throughout the project life cycle.</li> <li>Inform all I&amp;APs about the mechanism.</li> <li>Address concerns promptly and transparently and in a culturally appropriate manner.</li> <li>Keep a register of all concerns/issues received from I&amp;APs, as well as the measures taken to address these.</li> </ul>	APCI	Ongoing
Training, including awareness and inductions	Social and Environmental Performance	<ul style="list-style-type: none"> <li>Train employees and contractors in matters related to the project's social and environmental performance and Namibia's regulatory requirements.</li> <li>Ensure adequate environmental awareness training for all senior site personnel.</li> <li>Give environmental induction presentations to all site personnel prior to work commencement.</li> </ul>	APCI	Ongoing
<b>Employment and Procurement Opportunities</b>				
Employment and procurement opportunities	Social and Environmental Performance	<ul style="list-style-type: none"> <li>Include the EMPs in the tender documents so that tenderers can make provision for the implementation of the EMPs.</li> <li>Penalties for non-compliance with the stipulations of the EMPs should be agreed upon (and can be included in the tender documents).</li> <li>Source contracting companies and experts based</li> </ul>	APCI	Pre-construction

ASPECT	IMPACT	MANAGEMENT ACTIONS/OBJECTIVES	RESPONSIBLE PERSON(S)	TARGET DATE
		<p>on merit and expertise giving preference to local contractors on condition that the local contractors have the required experience and expertise.</p> <ul style="list-style-type: none"> <li>• Tender policy to give preference to medium and small construction companies from Namibia in order to ensure maximum local beneficiation.</li> <li>• Consider utilising local labour for unskilled work and to then provide training to workers in order to perform semi-skilled work; this should be done under the supervision of managers/specialists to ensure maximum local beneficiation.</li> <li>• Consider the use of labour intensive development and construction methods in order to maximize employment opportunities, but without reducing productivity and cost efficiency.</li> <li>• Ensure that tender proposals received are scrutinised to ensure that minimum wages have been adhered to in the costing.</li> <li>• Ensure that contractors adhere to the Namibian Labour, Social Security, Health and Safety, and Affirmative Action laws (by means of a contractual requirement for the submission of monthly proof re. the payment of minimum wages to workers, listing of the workers' Namibian Identification Numbers (IDs), and payment of Social Security).</li> <li>• Tender documents to stipulate that all contractors have an <b>HIV/AIDS Policy and Programme</b> in place (aspects to be addressed in/by the Policy/Programme include: promotion of a positive attitude regarding protected sex and other safe sex practices; enforcement of national legislation and regulations regarding the sex worker industry; raising HIV awareness by educating workers regarding HIV transmission and safe sex practices; ensuring the availability of condoms and contraceptives; providing medical care facilities for the sick; and improving attitudes towards HIV positive co-workers).</li> <li>• Source maximally from local resources to ensure</li> </ul>		

ASPECT	IMPACT	MANAGEMENT ACTIONS/OBJECTIVES	RESPONSIBLE PERSON(S)	TARGET DATE
		maximum economic beneficiation of local businesses in terms of new business sales.		
<b>Health, Safety and Security</b>				
Occupational Health and Safety	Social and Environmental Performance	<ul style="list-style-type: none"> <li>Prepare and submit a <b>Health and Safety Plan</b>.</li> <li>Adhere to all Namibia's Health and Safety Regulations.</li> <li>Occupational Health and Safety Training to be provided to all employees.</li> <li>Ensure that qualified first aid can be provided at all times.</li> <li>Provide and ensure the active use of Personal Protective Equipment (PPE).</li> </ul>	APCI / Contractor(s)	Pre-construction
Community Health and Safety	Social and Environmental Performance	<ul style="list-style-type: none"> <li>Notice or information boards relating public health and safety hazards and emergency contact details should be put up at the entrance(s) to the Northern Development Area.</li> </ul>	APCI	Pre-construction
<b>Layout and Design of the Industrial/Business and Residential/Business Townships on the Remainder of Farm Eisenheim No. 680</b>				
Layout and Design of the Industrial/Business and Residential/Business Townships	Potential loss of archaeological material	<ul style="list-style-type: none"> <li>Integrate the archaeological survey site location data with the project GIS.</li> <li>Treat the two archaeological sites as historical assets to the Development, and thus with sensitivity.</li> <li>Mark (using e.g. fluorescent plastic screen material) and temporarily enclose all sites adjacent to the areas of the proposed construction activities.</li> </ul>	APCI / Surveyor / Town Planner / Architect / Landscape Architect / Engineer	Pre-construction
	Negative impact on floral species	<ul style="list-style-type: none"> <li>Avoid development in the sensitive areas.</li> <li>Incorporate the sensitive areas into the green open spaces.</li> <li>Attempt to link the Klein Windhoek River (west) to the Otjihavera Hills (east) via the sensitive areas (this will serve as biological corridors for the movement of wildlife and the riparian habitat will not be isolated (from the remainder of the area)).</li> <li>Integrate the ecological survey protected trees location data with the project GIS / incorporate the protected species Camelthorn <i>Acacia erioloba</i>, Shepherd's Tree <i>Boscia albitrunca</i> and Anna Tree <i>Faidherbia albida</i> individuals, in the overall final</li> </ul>	APCI / Surveyor / Town Planner / Architect / Landscape Architect / Engineer	Pre-construction

ASPECT	IMPACT	MANAGEMENT ACTIONS/OBJECTIVES	RESPONSIBLE PERSON(S)	TARGET DATE
		landscaping of the area.		
	Pollution of biophysical environment (surface/runoff water)	<ul style="list-style-type: none"> <li>Ensure that green open spaces are created along the drainage lines and that flatter, low-lying areas are not impinged upon (this will prevent excessive runoff, maximise infiltration of precipitation, and ensure groundwater recharge).</li> <li>Any waste that could potentially pollute the water sources should be collected and disposed of in licensed landfills.</li> <li>Runoff of pollutants should be prevented from reaching the Klein Windhoek River; the River provides recharge to groundwater sources and this could pose a risk to groundwater-related receptors further downstream.</li> </ul>	APCI / Surveyor / Town Planner / Architect / Landscape Architect / Engineer	Pre-construction
<b>Resource Use</b>				
Building siting, design, construction	Resource use (e.g. coal) / depletion of natural resources	<ul style="list-style-type: none"> <li>Building designs to reduce energy use (maximum use of natural ventilation and sunlight; renewable energy use e.g. passive solar design, chilled beam air conditioning).</li> </ul>	APCI / Architect / Engineer	Pre- and during construction
Water Management / Water-efficient design features	Resource use (water) / depletion of natural resources	<ul style="list-style-type: none"> <li>Implement a water conservation program, promoting the continuous reduction in water consumption; treatment and disposal costs commensurate with the magnitude and cost of water use.</li> <li>Use, where feasible, water saving equipment including ultra-low-flush toilets, spray nozzles, urinals, faucet aerators, and low-flow showerheads, infrared and ultrasonic sensors, water spigots, and pressure-control valves.</li> </ul>	APCI / Engineer	Pre- and during construction
<b>Existing Damage – Northern Development Area</b>				
Dumped Refuse	Negative impact on fauna / pollution of the environment / visual impact	<ul style="list-style-type: none"> <li>All refuse to be removed and disposed of at the Windhoek Municipal Waste Site; control measures to be put in place to prevent the additional or further dumping of refuse.</li> </ul>	APCI	Pre-construction / Ongoing
Invasive Alien Species	Negative impact on flora / ecology of the Klein	<ul style="list-style-type: none"> <li>Actively remove all the invasive alien species occurring throughout the area of the proposed Development; make the removed invasive alien</li> </ul>	APCI	Pre-construction / Ongoing

ASPECT	IMPACT	MANAGEMENT ACTIONS/OBJECTIVES	RESPONSIBLE PERSON(S)	TARGET DATE
	Windhoek River	trees available to the local community as firewood, or have a contractor remove and process the wood (e.g. for furniture, wood, charcoal, etc.).		

Table 11: Environmental Management Plan for the Construction/Operational Phases of the proposed Development, Windhoek, Khomas Region, Namibia.

ASPECT	IMPACT	MANAGEMENT ACTIONS/OBJECTIVES	RESPONSIBLE PERSON(S)	TARGET DATE
<b>Social and Environmental Performance</b>				
Management and Monitoring	Social and Environmental Performance	<ul style="list-style-type: none"> <li>Ensure that all aspects related to the EMP are implemented during the construction/operational phases.</li> <li>Hold regular site meetings/inspections. Make provision in the minutes of the meetings for reporting on all aspects of the EMP related to the construction/operational phases.</li> </ul>	African Precast Concrete Industries (APCI) / Resident Engineer (RE) / Environmental Control Officer (ECO)	Ongoing
Consultation and Disclosure	Social and Environmental Performance	<ul style="list-style-type: none"> <li>Maintain open and direct lines of communication between the Proponent (African Precast Concrete Industries), the City of Windhoek (CoW), and I&amp;APs with regards to environmental matters.</li> <li>Consult with I&amp;APs throughout the project process and adequately incorporate I&amp;APs' concerns.</li> </ul>	APCI / CoW / RE / ECO	Ongoing
			APCI	Ongoing
Grievance Mechanism	Social and Environmental Performance	<ul style="list-style-type: none"> <li>Inform all I&amp;APs about the grievance mechanism for receiving and resolving any concerns and grievances related to the project's social and environmental performance throughout the project life cycle.</li> <li>Address concerns promptly and transparently and in a culturally appropriate manner.</li> <li>Keep a register of all concerns/issues received from I&amp;APs, as well as the measures taken to address these.</li> </ul>	APCI / RE / ECO	Ongoing
Training, including awareness and inductions	Social and Environmental Performance	<ul style="list-style-type: none"> <li>Train employees and contractors in matters related to the project's social and environmental performance and Namibia's regulatory requirements.</li> <li>Ensure adequate environmental awareness training for all senior site personnel.</li> <li>Give environmental induction presentations to all site personnel prior to work commencement; attendance list to be signed by all who attended the presentation.</li> </ul>	APCI	Ongoing
			Contractor(s) / RE / ECO	Pre- and during construction

ASPECT	IMPACT	MANAGEMENT ACTIONS/OBJECTIVES	RESPONSIBLE PERSON(S)	TARGET DATE
Labour and Working Conditions	Social and Environmental Performance	<ul style="list-style-type: none"> <li>Establish, maintain and improve the worker-management relationship. Base the employment relationship on equal opportunity and fair treatment and no discrimination to be allowed.</li> <li>Comply with Namibia's labour and employment laws and prevent unacceptable forms of labour, i.e. harmful child and forced labour.</li> <li>Promote safe and healthy working conditions and the protection and promotion of worker health.</li> <li>Document and communicate the Working Conditions and Terms of Employment.</li> <li>Respect Collective Agreements and the right of workers to organize and bargain collectively.</li> <li>Implement a Grievance Mechanism.</li> </ul>	APCI / Contractor(s)	Ongoing
Occupational Health and Safety	Social and Environmental Performance	<ul style="list-style-type: none"> <li>Adhere to all Namibia's Health and Safety Regulations.</li> <li>Occupational Health and Safety Training to be provided to all employees.</li> <li>Ensure that qualified first aid can be provided at all times.</li> <li>Provide and ensure the active use of Personal Protective Equipment (PPE).</li> </ul>	APCI / Contractor(s)	Ongoing
Community Health and Safety	Social and Environmental Performance	<ul style="list-style-type: none"> <li>Prevent communicable disease (e.g. Sexually Transmitted Infections (STIs) such as HIV transmission): provide surveillance and active screening and treatment of employees; prevent illness among employees (through health awareness and education initiatives); ensure ready access to medical treatment, confidentiality and appropriate care, particularly with respect to migrant workers; and promote immunization.</li> </ul>	APCI / Contractor(s)	Ongoing
<b>Construction of the Industrial/Business and Residential/Business Townships</b>				
Construction Activities	Loss of or damage to archaeological material	<ul style="list-style-type: none"> <li>Should any archaeological material, e.g. graves, be found during trenching or other excavation work, work should immediately cease and the relevant persons, i.e. the foreman, superintendent, archaeologist, and the National Heritage Council of Namibia and the Police in Windhoek, informed</li> </ul>	APCI / Contractor(s) / RE / ECO	Ongoing

ASPECT	IMPACT	MANAGEMENT ACTIONS/OBJECTIVES	RESPONSIBLE PERSON(S)	TARGET DATE
		(also see Annexure B: Appendix 1: Chance find procedure).		
	Negative impact on faunal species	<ul style="list-style-type: none"> <li>• Avoid the removal of the bigger trees, especially the protected species i.e. Camelthorn <i>Acacia erioloba</i>, Shepherd's Tree <i>Boscia albitrunca</i> and Anna Tree <i>Faidherbia albida</i> (these trees serve as habitat for a myriad of fauna).</li> <li>• Implement a policy of "no kill" with regards to fauna (e.g. poaching for meat (snares); the collection of veld foods (e.g. tortoises); the capture/killing of birds; the killing of snakes, etc.).</li> <li>• Prevent or avoid any fires from spreading from the construction sites (as it could lead to e.g. loss of life, property and grazing for neighbouring landowners) (especially as the area currently has a good grass biomass due to the lack of stock farming activities in the area).</li> <li>• Implement a suitable and appropriate refuse removal policy (littering could result in certain animals, e.g. Baboon and Black-backed Jackal to become accustomed to humans and the associated activity and result in typical problem animal scenarios).</li> <li>• Avoid and/or limit the use of lights (i.e. focused or low energy lighting) during nocturnal construction and/or operations (it influences and/or could affect various nocturnal species e.g. bats and owls).</li> <li>• Avoid establishing an electric fence system (reaching down to ground level) around the proposed Development area (this would result in the death of many slow moving species e.g. reptiles (chameleons, tortoises, etc.).</li> </ul>	APCI / Contractor(s) / RE / ECO	Ongoing
	Negative impact on floral species	<ul style="list-style-type: none"> <li>• Avoid the removal of the bigger trees, especially the protected species i.e. Camelthorn <i>Acacia erioloba</i>, Shepherd's Tree <i>Boscia albitrunca</i> and Anna Tree <i>Faidherbia albida</i>. Permit(s) to be obtained from the Directorate of Forestry, Ministry</li> </ul>	APCI / Contractor(s) / RE / ECO	Ongoing



ASPECT	IMPACT	MANAGEMENT ACTIONS/OBJECTIVES	RESPONSIBLE PERSON(S)	TARGET DATE
		<p>of Agriculture, Water and Forestry before the removal of any of the protected tree species.</p> <ul style="list-style-type: none"> <li>• Identify and clearly mark (red and white tape) the protected tree species i.e. Camelthorn <i>Acacia erioloba</i>, Shepherd's Tree <i>Boscia albitrunca</i> and Anna Tree <i>Faidherbia albida</i> (so that bulldozer operators can easily see and avoid these specimens).</li> <li>• Be on the lookout for and mark (red and white tape) any interesting and unique species (e.g. <i>Aloe</i> species, etc.) should these be encountered during the construction phase; Permit(s) to be obtained from the Directorate Scientific Services, Ministry of Environment and Tourism before any of these plants are removed (for relocation).</li> <li>• Adapt a minimalistic damage and indigenous planting approach (replant two (2) indigenous tree species (preferably the same species) for every protected species that had to be removed; indigenous species can be acquired at the Forestry nurseries in Okahandja, the National Botanical Research Institute (NBRI) in Windhoek, and local nurseries in Windhoek.</li> <li>• Prevent or avoid any fires from spreading from the construction sites (as it could lead to e.g. loss of life, property and grazing for neighbouring landowners) (especially as the area currently has a good grass biomass due to the lack of stock farming activities in the area).</li> <li>• Actively remove all the invasive alien species occurring throughout the area of the proposed Development; make the removed invasive alien trees available to the local community as firewood, or have a contractor remove and process the wood (e.g. for furniture, wood, charcoal, etc.).</li> <li>• Avoid the planting of potentially invasive alien plant species for ornamental purposes as part of the</li> </ul>		

ASPECT	IMPACT	MANAGEMENT ACTIONS/OBJECTIVES	RESPONSIBLE PERSON(S)	TARGET DATE
		landscaping.		
<b>Construction Camp (if applicable)</b>				
Construction camp	Disturbance of fauna and flora and habitat alteration	<ul style="list-style-type: none"> <li>No trees or natural vegetation may be removed for the making of fires.</li> <li>No animal may be injured, fed, trapped, hunted or harmed in any way.</li> <li>No off-road driving will be allowed.</li> <li>No trespassing on adjoining properties is allowed and no livestock/game/vegetation is to be interfered with.</li> </ul>	APCI / Contractor(s) / RE / ECO	Ongoing
	Pollution of biophysical environment (air, soil and water)	<ul style="list-style-type: none"> <li>No fires will be allowed, unless a specific area has been identified and set aside by the RE/ECO for the cooking of food.</li> <li>Vehicle maintenance/servicing/washing not to be allowed anywhere on site.</li> <li>Portable toilets to be provided and used at the camp.</li> <li>Sanitary wastewater to be released into a French drain system.</li> <li>Use bio-degradable detergents on site.</li> <li>Enforce proper waste (hazardous and non-hazardous) management practices (as per <b>Waste Management Plan</b> to be submitted by the Contractor) – waste and litter to be disposed of in scavenger and weatherproof bins and the refuse to be collected by the contractor and disposed of at least once a week.</li> </ul>	APCI / Contractor(s) / RE / ECO	Ongoing
	Occupational Health and Safety	<ul style="list-style-type: none"> <li>No fires will be allowed, unless a specific area has been identified and set aside by the RE/ECO for the cooking of food.</li> <li>Ensure that employees are trained in the use of appropriate fire fighting equipment and ensure that such equipment is on hand at all times.</li> <li>Comply with all safety regulations re. electricity supply.</li> <li>Supply potable water for human consumption and other domestic uses; conduct chemical testing of water samples on a monthly basis (if applicable).</li> </ul>	APCI / Contractor(s) / RE / ECO	Ongoing

ASPECT	IMPACT	MANAGEMENT ACTIONS/OBJECTIVES	RESPONSIBLE PERSON(S)	TARGET DATE
		<ul style="list-style-type: none"> <li>• Make suitable arrangements, as far as practicable, for the maintenance of health, the prevention and overcoming of outbreaks of disease and of adequate first aid services.</li> <li>• Ensure that security arrangements are in place.</li> </ul>		
<b>Change in Land Use</b>				
Construction of Industrial/Business and Residential/Business Townships	Change in land use	<ul style="list-style-type: none"> <li>• Restrict construction activities to demarcated areas; all other areas will be regarded as "no go" zones in order to minimize the impact on the surrounding land.</li> </ul>	APCI / Contractor(s) / RE / ECO	Ongoing
<b>Site Preparation</b>				
Site preparation - clearing of areas for construction activities	Disturbance of fauna and flora and habitat alteration	<ul style="list-style-type: none"> <li>• Restrict construction activities to previously demarcated areas (e.g. construction camp, access road, borrow pits, etc.); all other areas will be regarded as "no go" zones in order to minimize the impact on the surrounding land.</li> <li>• Minimize the removal of native plant species; no vegetation may be removed/damaged without direct instruction.</li> <li>• No off-road driving will be allowed.</li> <li>• No animal may be injured, fed, trapped, hunted or harmed in any way.</li> </ul>	APCI / Contractor(s) / RE / ECO	Pre- and during construction
	Soil erosion	<ul style="list-style-type: none"> <li>• <u>Sediment mobilization and transport</u>: reduce or prevent soil erosion (schedule activities to avoid heavy rainfall periods; contour and minimize length and steepness of slopes; mulching to stabilize exposed areas; re-vegetate areas promptly; and design channels and ditches for post-construction flow). Note that the area(s) towards and adjacent to the drainage line(s) are easily eroded and further development may exacerbate this problem.</li> <li>• <u>Road design</u>: limit access road gradients to reduce run-off induced erosion; provide adequate road drainage based on road width, surface material, compaction and maintenance.</li> <li>• <u>Structural (slope) stability</u>: provide effective short-term measures for slope stabilization, sediment and subsidence control until long-term measures</li> </ul>	APCI / Contractor(s) / RE / ECO	Pre- and during construction

ASPECT	IMPACT	MANAGEMENT ACTIONS/OBJECTIVES	RESPONSIBLE PERSON(S)	TARGET DATE
		(during operations) can be implemented; provide adequate drainage systems to minimize and control infiltration.		
	Possible loss of the seed bank in the topsoil	<ul style="list-style-type: none"> <li>The upper layer of soil (10-20 cm), where alluvial, to be stripped and stockpiled separately (1-2 m high piles to allow for proper aeration). Install drainage to protect the topsoil pile from (water) erosion and cover it to protect it from (wind) erosion.</li> </ul>	APCI / Contractor(s) / RE / ECO	Pre- and during construction
<b>Road Construction</b>				
Borrow pit siting	Visual, pollution (traffic, noise and air), and land use	<ul style="list-style-type: none"> <li>Consider, in addition to material quality and quantity, the visual impact, potential traffic, noise and air pollution, and the potential loss of arable land when borrow pits are sited.</li> </ul>	APCI / Contractor(s) / RE / ECO	Pre- and during construction
Borrow pit management	Disturbance of fauna and flora and habitat alteration	<ul style="list-style-type: none"> <li>Limit the number of borrow pits as far as possible.</li> <li>The progression of stripping and excavation to allow for rehabilitation once the areas have been fully utilized.</li> </ul>	APCI / Contractor(s) / RE / ECO	Pre- and during construction
	Possible loss of the seed bank in the topsoil	<ul style="list-style-type: none"> <li>The upper layer of soil (10-20 cm), where alluvial, to be stripped and stockpiled separately (1-2 m high piles to allow for proper aeration). Install drainage to protect the topsoil pile from (water) erosion and cover it to protect it from (wind) erosion.</li> </ul>	APCI / Contractor(s) / RE / ECO	Pre- and during construction
	Occupational and Community Safety	<ul style="list-style-type: none"> <li>Cut slopes not to be steeper than 30 degrees.</li> <li>No under-cutting of the sides to be allowed.</li> <li>Undertake excavations in a safe manner and in compliance with the relevant safety regulations.</li> </ul>	APCI / Contractor(s) / RE / ECO	Construction
	Social and Environmental Performance	<ul style="list-style-type: none"> <li>Cut slopes not to be steeper than 30 degrees.</li> <li>Use excess rock spoil to fill borrow pits; material to be neatly shaped and no loose material to be left inside the borrow pits.</li> <li>No waste are allowed to be dumped in borrow pits.</li> <li>Evenly spread top soil over the entire area to allow for the re-growth of vegetation.</li> <li>Replant previously removed native plant species in disturbed areas.</li> </ul>	APCI / Contractor(s) / RE / ECO	Construction and Rehabilitation
Use of a Troxler (soil density	Occupational	<ul style="list-style-type: none"> <li><b>Register the Troxler and apply for a permit from</b></li> </ul>	APCI /	Pre- and during road

ASPECT	IMPACT	MANAGEMENT ACTIONS/OBJECTIVES	RESPONSIBLE PERSON(S)	TARGET DATE
gauge containing a radioactive source)	Health and Safety	<p><b>the Ministry of Health and Social Services.</b></p> <ul style="list-style-type: none"> <li>Implement controls and monitoring requirements as per those prescribed by the Ministry of Health and Social Services for the safe handling, transportation and storage of the device.</li> </ul>	Contractor(s) / RE / ECO	construction
<b>Construction Activities</b>				
Increased traffic, presence and movement of machinery, and the establishment of soil stockpiles	Air quality (dust or Particulate Matter (PM) pollution) from dry and exposed surfaces	<ul style="list-style-type: none"> <li>Minimize the area in which the movement of construction machines will take place to reduce the effects of dust pollution.</li> <li>Minimize dust from material handling sources (e.g. conveyors and bins) by using covers and/or control equipment (e.g. water suppression).</li> <li>Minimize dust from open area sources, including storage piles, by using control measures (install enclosures and covers, and increase the moisture content).</li> <li>Avoid the excavation, handling and transport of erodible materials under high wind conditions or when a visible dust plume is present.</li> <li>Maintain the road surface to preserve surface characteristics (e.g. texture and roughness).</li> <li>Use dust control/suppression methods, such as applying water or non-toxic chemicals to minimize dust (oil and oil by-products is not a recommended measure to control road dust).</li> </ul>	APCI / Contractor(s) / RE / ECO	Ongoing
Presence of construction teams, increased traffic, presence and movement of machinery	Noise pollution	<ul style="list-style-type: none"> <li>Construction activities to cease at 18h00.</li> <li>Enforce a speed limit of 40km/h.</li> <li>Large construction vehicles to be fitted with silencers.</li> </ul>	APCI / Contractor(s) / RE / ECO	Ongoing
Increased traffic, presence and movement of machinery (gaseous emissions)	Air quality & Occupational and Community Health and Safety	<ul style="list-style-type: none"> <li>Fleet owners/operators to implement manufacturer recommended engine maintenance programs (to control vehicle emissions: Carbon Monoxide (CO), Nitrogen Oxide (NO<sub>x</sub>), Sulphur Dioxide (SO<sub>2</sub>), Particulate Matter (PM) and Volatile Organic Compounds (VOCs)).</li> </ul>	APCI / Contractor(s)	Ongoing
Increased traffic, movement of machinery	Occupational and Community Safety	<ul style="list-style-type: none"> <li>Adopt best transport safety practices by implementing the following measures: emphasize safety aspects among drivers; improve driving</li> </ul>	APCI / Contractor(s) / RE / ECO	Ongoing

ASPECT	IMPACT	MANAGEMENT ACTIONS/OBJECTIVES	RESPONSIBLE PERSON(S)	TARGET DATE
		<p>skills and require licensing of drivers; adopt limits for trip duration; avoid dangerous routes and times of day; and use speed control devices.</p> <ul style="list-style-type: none"> <li>Regularly maintain vehicles and use manufacturer approved parts.</li> <li>Use locally sourced materials (where possible) to minimize transport distances.</li> <li>Employ safe traffic control measures, including the use of traffic and safety warning signs and flag persons to warn of dangerous conditions.</li> </ul>		
Waste Management	Pollution of biophysical environment (soil and groundwater)	<ul style="list-style-type: none"> <li>Do not dispose of/store construction waste near any surface water source in the area.</li> </ul>	APCI / Contractor(s) / RE / ECO	Ongoing
<b>Safety and Security</b>				
Presence of construction teams and equipment	Occupational and Community Safety and Security	<ul style="list-style-type: none"> <li>Access controlled entrance(s) with 24-hour security.</li> <li>Notice or information boards relating public safety hazards to be put up at the entrance(s) and construction camp/site(s).</li> <li>Transport all workers to and from the site.</li> <li>Enforce a strict ban on the recruitment of construction workers at the entrance(s) and on visitors gaining entry to the construction workers on site.</li> </ul>	APCI / Contractor(s) / RE / ECO	Ongoing
<b>Resource Use</b>				
Water Management	Resource use / depletion of natural resources	<ul style="list-style-type: none"> <li>Implement a water conservation program, promoting the continuous reduction in water consumption; treatment and disposal costs commensurate with the magnitude and cost of water use.</li> </ul>	APCI / Contractor(s) / RE / ECO	Ongoing
Energy Management	Resource use (e.g. coal) / depletion of natural resources	<ul style="list-style-type: none"> <li>Promote the sustainable use of energy (that will result in the reduction of use and cost reductions) (e.g. energy efficient light sources).</li> <li>Raise awareness amongst the staff and contractors.</li> </ul>	APCI / Contractor(s) / RE / ECO	Ongoing
<b>Hazardous Materials Management</b>				
Hazardous materials	Social and	<ul style="list-style-type: none"> <li>Establish hazardous materials management</li> </ul>	APCI /	Ongoing

ASPECT	IMPACT	MANAGEMENT ACTIONS/OBJECTIVES	RESPONSIBLE PERSON(S)	TARGET DATE
management	Environmental Performance	<p>priorities (based on hazard analysis of risky operations).</p> <ul style="list-style-type: none"> <li>• Avoid, or minimize the use of hazardous materials.</li> <li>• Prevent uncontrolled releases of hazardous materials to the environment or uncontrolled reactions that may result in fire or explosion.</li> <li>• Make us of engineering controls (containment, automatic alarms and shut-off systems); implement management controls (procedures, inspections and training, communication and drills) to address residual risks not prevented or controlled through engineering controls.</li> </ul>	Contractor(s) / RE / ECO	
	Pollution of biophysical environment (soil and water)	<p>Implement prevention and control measures for the use, handling and storage of hazardous materials:</p> <ul style="list-style-type: none"> <li>• <u>Materials transfer</u>: regularly inspect, maintain and repair fittings/pipes/hoses; make use of drip trays/other drip containment measures at connection/possible overflow points;</li> <li>• <u>Overfill protection</u>: use trained filling operators; install gauges on tanks to measure the volume inside; make use of dripless hose connections (vehicle tanks) and fixed connections (storage tanks); use a catch basin/drip tray around the fill pipe to collect spills;</li> <li>• <u>Reaction, fire, and explosion prevention</u>: hazardous materials to be stored in marked containers and separate (from non-hazardous materials); incompatible hazardous materials (acids, bases, flammables, oxidizers, reactive chemicals) to be stored in separate areas and with containment facilities separating material storage; smoking or working with open flames not to be permitted in the presence of these substances; limit access to hazardous waste storage areas and clearly label and demarcate the area; conduct regular inspections of the areas and document the findings; prepare and implement spill response and emergency plans; train employees in the use of appropriate fire fighting equipment and ensure that</li> </ul>	APCI / Contractor(s) / RE / ECO	Ongoing

ASPECT	IMPACT	MANAGEMENT ACTIONS/OBJECTIVES	RESPONSIBLE PERSON(S)	TARGET DATE
		<p>such equipment is on hand at all times.</p> <ul style="list-style-type: none"> <li>• <u>Secondary containment</u>: use bunding (made of impervious, chemically resistant material) that can contain the larger of 110% of the largest tank or 25% of the combined tank volumes for above-ground tanks with a total storage volume equal or greater than 1,000 litres.</li> <li>• Train workers on the correct transfer and handling of fuels and chemicals and the response to spills.</li> <li>• Immediately report and clean up any accidental hydrocarbon spill: Spill-Sorb, Drizzat Pads, Enretech Powder or Peat Moss can be used to clean up small spills; in case of larger spills, the spill together with the polluted soil should be removed and disposed of at e.g. a biological remediation site.</li> </ul>		
	Occupational Health and Safety	<ul style="list-style-type: none"> <li>• Implement hazard communication and training programs (including information on Material Safety Data Sheets (MSDS)) to make employees aware of workplace chemical hazards and how to respond to these.</li> <li>• Provide and ensure the active use of PPE.</li> </ul>	APCI / Contractor(s) / RE / ECO	Ongoing
<b>Waste Management</b>				
Waste management: non-hazardous and hazardous	Pollution of biophysical environment	<ul style="list-style-type: none"> <li>• Prepare and submit a <b>Waste Management Plan</b> before construction/operation commences. The generation of waste should be avoided or minimized as far as practicable; where it cannot be avoided, but has been minimized, waste should be recovered and reused; where waste cannot be recovered/reused, it should be treated, destroyed and disposed of in an environmentally sound manner.</li> <li>• Institute and maintain good housekeeping and operating practices; littering is not allowed.</li> <li>• Non-hazardous and hazardous waste to be collected and stored separately.</li> <li>• Ensure that waste is not disposed of and/or stored near any surface water source.</li> </ul>	APCI / Contractor(s) / RE / ECO	Ongoing



ASPECT	IMPACT	MANAGEMENT ACTIONS/OBJECTIVES	RESPONSIBLE PERSON(S)	TARGET DATE
		<ul style="list-style-type: none"> <li>Any waste that could potentially pollute the water sources should be collected and disposed of in licensed landfills.</li> <li>Runoff of pollutants should be prevented from reaching the Klein Windhoek River; the River provides recharge to groundwater sources and this could pose a risk to groundwater-related receptors further downstream.</li> <li>Runoff from areas where surface water might have become contaminated should be captured and treated to sewerage effluent standards; uncontaminated runoff should be diverted around areas where such water might become contaminated.</li> <li>Non-hazardous waste to be transported by an approved contractor to and disposed of at the City of Windhoek Waste Site.</li> <li>Hazardous waste: recycle petroleum (fuels and lubricants) waste products and collect and recycle batteries and print cartridges (if relevant). The remainder to be transported by an approved contractor to a recognized hazardous waste disposal site (e.g. Kupferberg), with prior permission from the Windhoek Municipality.</li> </ul>		
Waste management: sanitary	Pollution of biophysical environment	<ul style="list-style-type: none"> <li>Portable chemical toilets (1 toilet per 30 employees; preferred 1:15) to be provided; spillages/leakages to be cleaned up immediately; contents to be collected by an approved contractor and disposed of at an approved sewage site (with prior permission from the Windhoek Municipality).</li> <li>Regularly maintain sewerage pipelines and monitor for potential leakages.</li> </ul>	<p>APCI / Contractor(s) / RE / ECO</p> <p>APCI / Home Owners Association (HOA)</p>	<p>Construction</p> <p>Operational Phase</p>
Wastewater management - wastewater treatment	Pollution of biophysical environment	<ul style="list-style-type: none"> <li>Ensure that the discharge of process wastewater and/or sanitary wastewater and/or wastewater from utility operations and/or stormwater to land conform</li> </ul>	APCI / Contractor(s) / RE / ECO / HOA	Ongoing

ASPECT	IMPACT	MANAGEMENT ACTIONS/OBJECTIVES	RESPONSIBLE PERSON(S)	TARGET DATE
		<p>to the regulatory requirements.</p> <ul style="list-style-type: none"> <li>Runoff from areas where surface water might have become contaminated should be captured and treated to sewerage effluent standards; uncontaminated runoff should be diverted around areas where such water might become contaminated.</li> </ul>		
Wastewater management - wastewater treatment	Occupational and Community Health and Safety / Pollution of biophysical environment	<ul style="list-style-type: none"> <li>Ensure that the treated sewerage water is free from helminth eggs (the eggs can survive on plants and soil for many months) and other parasites and pollutants before it is used for irrigation purposes: sand filtration (to remove fine suspended solids), ultraviolet (UV) disinfection, Granular Activated Carbon (GAC) filtration, and final disinfection with chlorination.</li> </ul>	APCI / HOA	Ongoing
Wastewater management - stormwater management	Soil erosion	<ul style="list-style-type: none"> <li>Regular inspection and maintenance of permanent erosion and runoff control features.</li> </ul>	APCI / Contractor(s) / RE/ECO / HOA	Ongoing
<b>Rehabilitation</b>				
Rehabilitation	Social and Environmental Performance	<ul style="list-style-type: none"> <li>Remove all equipment, waste, temporary structures, etc. from the camp and work sites.</li> <li>Adequately drain pipelines and tanks prior to decommissioning (to avoid pollution of the biophysical environment (soil and groundwater)).</li> <li>Reshape all disturbed areas (including stockpiles, borrow pits, and temporary detours and turnouts) to their original contours.</li> <li>Cover disturbed areas with previously collected topsoil and spread evenly.</li> <li>Manually rip disturbed areas, where compaction has taken place, and cover the areas with previously collected topsoil.</li> <li>Replant any previously removed native plant species in disturbed areas.</li> <li>Reintroduce two (flora) specimens for every one individual that had to be removed.</li> </ul>	APCI / Contractor(s) / RE/ECO	Ongoing and post-construction

## 7.5 Monitoring and Reporting

The following monitoring and reporting, at least but not limited to, need to be carried out during the planning, and construction/operational phases:

Type	Parameter	Frequency	Responsible Person
Sewerage pipelines	Maintenance, and monitor for damage to or leakages	Regular maintenance and weekly monitoring	Designated Person(s)
Hazardous materials management	Hydrocarbon spills of more than 200 litres	<i>Ad hoc</i> ; inform the Minister, Ministry of Mines and Energy by completing form PP/11 (Petroleum Products Regulations 2000)	Designated Person(s)
Storm water and soil erosion	Soil erosion rates	<i>Ad hoc</i> (after the rainy season)	Designated Person(s)
Invasive alien plant species	Identification and removal of any invasive alien species	Manual removal (using a sickle or "weed-eater and preferably during February/March) on a continuous basis (until the natural vegetation is again established)	Designated Person(s)
Environmental Management Plan	Environmental performance / corrective measures to be taken as or when required	Internal audits (monthly) External audits (bi-annual)	Designated Person(s)

## 8 Conclusions and Recommendations

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It is the opinion of LM Environmental Consulting that the remainder of Farm Elisenheim No. 680 (i.e. the Northern Development Area) is suitable for the development of an Industrial/Business Township (in Development Area A), as well as the development of a Residential/Business Township (in Development Area B).

Note that, as per Environmental Management Act 7 of 2007, certain activities may not be undertaken without an environmental clearance certificate and site-specific Environmental Impact Assessments (EIAs) may be required in future (for e.g. tourism development activities, etc.).

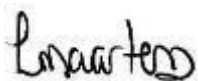
It is advised that the establishment of industries with a high water demand not be permitted. Also, that the EMPs for the planning, and construction/operational phases are implemented, that regular monitoring takes place, and that corrective measures are taken as or when required.

The proposed establishment of the two townships will have potential impacts on the environment and these will be of a positive, as well as a negative nature. two (2) moderate negative, ten (10) negative, three (3) slight negative, one (1) neutral, four (4) significant positive, and three (3) major positive impacts were identified.

Significant positive impacts include the contribution to scientific knowledge (vegetation/habitat and archaeological assessments) and temporary employment and the associated economic benefits during the construction phase. Major positive impacts include the provision of additional housing, as well as industrial and business facilities, and the provision of permanent employment and the associated economic benefits during the operational phase.

The potential moderate negative, negative and slight negative impacts would be, either temporary in nature, or could be relatively easily and effectively mitigated through the implementation of certain management measures proposed in the Environmental Management Plans (EMPs) for the planning and construction/operational phases of the proposed Development.

Should the Development not go ahead, no new temporary and/or permanent jobs will be created and there will be no temporary or permanent economic benefits.



Dr Lima Maartens  
LM Environmental Consulting

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