

APP-001821

**IRRIGATION ACTIVITIES ON THE FARM SPRINGVALE NO. 337,
OMAHEKE REGION**

ENVIRONMENTAL ASSESSMENT SCOPING REPORT




Assessed by:



Assessed for:

**Elize van Niekerk t/a Vision
Farming**

February 2021

Project:	IRRIGATION ACTIVITIES ON THE FARM SPRINGVALE NO. 337, OMAHEKE REGION: ENVIRONMENTAL ASSESSMENT SCOPING REPORT		
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Report Approval	 André Faul Conservation Ecologist		

I Elize van Niekerk, the Proponent, hereby confirm that the project description contained in this report is a true reflection of the information which the Proponent has provided to Geo Pollution Technologies. All material information in the possession of the Proponent that reasonably has or may have the potential of influencing any decision or the objectivity of this assessment is fairly represented in this report.

Signed at Windhoek on the 8th day of February 2021.

ELIZE VAN NIEKERK
Elize van Niekerk

80030200024
ID/Company Registration Number

EXECUTIVE SUMMARY

Elize van Niekerk, operating as Vision Farming, requested Geo Pollution Technologies (Pty) Ltd to undertake an environmental assessment for their existing agricultural activities on the Farm Springvale No. 337 in the Omaheke Region. Vision Farming has cleared 270 ha, of which 40 ha is under irrigation and the remainder divided between dryland maize production and grasslands. The Proponent plans to increase the irrigation area with 20 ha. Irrigation is from production boreholes, by means of centre pivot irrigation systems. The main produce are wheat, maize and oats. Additional activities performed on the farms include livestock farming. The main operational activities include:

- ◆ land preparation,
- ◆ planting,
- ◆ water abstraction and irrigation,
- ◆ fertilizer application and pest control, and
- ◆ harvesting, processing and transporting activities specific to each crop.

The environmental assessment determines all environmental, safety, health and socio-economic impacts associated with the continued agricultural activities on the farm. Relevant environmental data was compiled by making use of primary data (hydrogeological specialist study), secondary data and from a reconnaissance site visit. Potential environmental impacts and associated social impacts were identified and are addressed in this report.

The project location is amidst various other agricultural farms and developments. Due to the nature and location of Hinze Investment's agricultural activities, some impacts can be expected on the surrounding environment. These are summarised in the impacts table below. Regular environmental performance monitoring is thus recommended to ensure regulatory compliance and the implementation of corrective measures when necessary, especially with regards to water abstraction. Hinze Investments's operations play a role in contributing to the Namibian agricultural sector as well as employment for the region.

The main concerns related to the operations are potential groundwater, surface water and soil contamination, decreased groundwater availability, ecological and social impacts. A safety, health, environment and quality (SHEQ) policy will contribute to effective management procedures, to prevent and mitigate impacts. All regulations relating to agriculture, labour and health and safety legislation should be adhered to. Groundwater and soil pollution must be prevented at all times. All staff must be made aware of the importance of biodiversity and poaching or illegal harvesting of animal and plant products prohibited. Groundwater abstraction permits must be strictly adhered to. Any waste produced must be disposed of in a safe manner or re-used or recycled where possible. Hazardous waste must be stored in a safe location and periodically disposed of at an approved hazardous waste disposal site. By appointing local employees and by implementing monitoring and training programs, the positive socio-economic impacts can be maximised while mitigating any negative impacts.

The environmental management plan included in Section 10 of this document should be used as an on-site reference document during all phases (planning, operations (including maintenance) and decommissioning) of the development. All monitoring and records kept should be included in six monthly reports to ensure compliance with the environmental management plan and the Ministry of Environment, Forestry and Tourism's requirements. Parties responsible for transgression of the environmental management plan should be held responsible for any rehabilitation that may need to be undertaken. The SHEQ policy should be used in conjunction with the environmental management plan. Operators and responsible personnel must be taught the contents of these documents. Local or national regulations and guidelines must be adhered to and monitored regularly as outlined in the environmental management plan.

Impact Summary Class Values

Impact Category	Impact Type	Construction		Operations	
<i>Positive Rating Scale: Maximum Value</i>		5		5	
<i>Negative Rating Scale: Maximum Value</i>			-5		-5
EO	Skills and Development	2		2	
EO	Revenue Generation and Employment	2		2	
SC	Demographic Profile and Community Health		-1		-2
EO	Agricultural Produce and Economic Diversification		3	3	
SC	Health, Safety and Security		-2		-2
PC	Fire		-3		-3
PC	Noise		-1		-1
PC	Waste Production		-2		-2
BE	Ecosystem and Biodiversity Impact		-2		-2
PC	Groundwater, Surface Water and Soil Contamination		-2		-2
BE/EO	Groundwater Abstraction				-3
SC	Visual Impact		1		1
	Cumulative Impact		-2		-2

BE = Biological/Ecological

EO = Economical/Operational

PC = Physical/Chemical

SC = Sociological/Cultural

TABLE OF CONTENTS

1	BACKGROUND AND INTRODUCTION	1
2	SCOPE.....	2
3	METHODOLOGY	2
4	OPERATIONS AND RELATED ACTIVITIES	3
4.1	LAND CLEARING	3
4.2	CROP PRODUCTION.....	3
4.3	IRRIGATION SYSTEMS	6
4.4	WATER SUPPLY	7
4.5	LIVESTOCK	9
4.6	SUPPORT INFRASTRUCTURE	9
4.7	EMPLOYMENT	10
5	ALTERNATIVES	10
5.1	LOCATION ALTERNATIVES.....	10
5.2	PROJECT IMPLEMENTATION AND DESIGN ALTERNATIVES.....	11
5.2.1	<i>Irrigation Methods.....</i>	<i>11</i>
5.2.2	<i>Soil Preparation.....</i>	<i>11</i>
5.3	NO GO ALTERNATIVE.....	12
6	ADMINISTRATIVE, LEGAL AND POLICY REQUIREMENTS.....	13
7	ENVIRONMENTAL CHARACTERISTICS	17
7.1	LOCALITY AND SURROUNDING LAND USE.....	17
7.2	CLIMATE	18
7.3	TOPOGRAPHY, DRAINAGE AND SOILS	19
7.4	GEOLOGY AND HYDROGEOLOGY.....	21
7.5	PUBLIC WATER SUPPLY	26
7.6	ECOLOGY	26
7.7	DEMOGRAPHIC AND ECONOMIC CHARACTERISTICS.....	28
7.8	CULTURAL, HERITAGE AND ARCHAEOLOGICAL ASPECTS	29
8	PUBLIC CONSULTATION	29
9	MAJOR IDENTIFIED IMPACTS	29
9.1	SOIL AND GROUNDWATER CONTAMINATION.....	29
9.2	GROUNDWATER ABSTRACTION	29
9.3	FIRE.....	30
9.4	HEALTH AND SAFETY	31
9.5	ECOSYSTEM AND BIODIVERSITY IMPACT.....	31
9.6	SOCIO-ECONOMIC IMPACTS	31
10	ASSESSMENT AND MANAGEMENT OF IMPACTS.....	31
10.1	RISK ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PLAN	32
10.1.1	<i>Planning</i>	<i>34</i>
10.1.2	<i>Skills and Development.....</i>	<i>35</i>
10.1.3	<i>Revenue Generation and Employment.....</i>	<i>36</i>
10.1.4	<i>Demographic Profile and Community Health.....</i>	<i>37</i>
10.1.5	<i>Agricultural Produce.....</i>	<i>38</i>
10.1.6	<i>Health, Safety and Security.....</i>	<i>39</i>
10.1.7	<i>Fire</i>	<i>40</i>
10.1.8	<i>Noise.....</i>	<i>41</i>
10.1.9	<i>Waste Production.....</i>	<i>42</i>
10.1.10	<i>Ecosystem and Biodiversity Impact.....</i>	<i>43</i>
10.1.11	<i>Groundwater, Surface Water and Soil Contamination.....</i>	<i>45</i>
10.1.12	<i>Groundwater Abstraction.....</i>	<i>46</i>

10.1.13 Visual Impact	47
10.1.14 Cumulative Impact.....	48
10.2 DECOMMISSIONING AND REHABILITATION	49
10.3 ENVIRONMENTAL MANAGEMENT SYSTEM	49
11 CONCLUSION.....	49
12 BIBLIORGRAPHY.....	51

LIST OF APPENDICES

APPENDIX A: CORRESPONDENCE WITH THE MAWLR.....	52
APPENDIX B: HYDROGEOLOGICAL SPECIALIST STUDY.....	55
APPENDIX C: TREE INFORMATION	56
APPENDIX D: PROOF OF PUBLIC CONSULTATION	59
APPENDIX E: CONSULTANTS' CURRICULUM VITAE.....	74

LIST OF FIGURES

FIGURE 1-1. PROJECT LOCATION.....	2
FIGURE 4-1. CLEARED AREAS OF THE FARM	3
FIGURE 4-2. IRRIGATION AND INFRASTRUCTURE LAYOUT ON THE FARM SPRINGVALE.....	5
FIGURE 4-3. LOCATIONS OF BOREHOLES AND IRRIGATION AREAS ON FARM SPRINGVALE NO 337	8
FIGURE 7-1. PROPERTIES ADJACENT TO THE PROJECT AREA.....	17
FIGURE 7-2. DAILY AND SEASONAL RAINFALL (FUNK, ET.AL 2015)	19
FIGURE 7-3. TOPOGRAPHY, DRAINAGE AND AGRO-ECOLOGICAL ZONES.....	20
FIGURE 7-4. DOMINANT SOIL AND ROCK TYPES.....	21
FIGURE 7-5. REGIONAL GEOLOGY MAP (GSN, SCALE 1:1,000,000).....	22
FIGURE 7-6. GROUNDWATER CATCHMENTS, WATER CONTROL AREAS AND TRANSBOUNDARY AQUIFER.....	24
FIGURE 7-7. GROUNDWATER QUALITY.....	25
FIGURE 7-8. COMBINED HIGHER TAXA ENDEMISM IN NAMIBIA (DIGITAL ATLAS OF NAMIBIA, 2002)	27
FIGURE 9-1. CONCEPTUAL GROUNDWATER BALANCE WITH OVER ABSTRACTION SCENARIO	30

LIST OF TABLES

TABLE 4-1. SUMMARY OF BOREHOLE INFORMATION OBTAINED FROM CLIENT.....	7
TABLE 5-1. IRRIGATION SYSTEM EFFICIENCY (IWRM PLAN JOINT VENTURE NAMIBIA, 2010).....	11
TABLE 5-2. ADVANTAGES AND DISADVANTAGES OF LAND PREPARATION SYSTEMS (ADAPTED FROM HTTPS://CROPWATCH.UNL.EDU/TILLAGE/ADVDISADV)	12
TABLE 6-1. NAMIBIAN LAW APPLICABLE TO THE DEVELOPMENT.....	13
TABLE 6-2. RELEVANT MULTILATERAL ENVIRONMENTAL AGREEMENTS	15
TABLE 6-3. STANDARDS OR CODES OF PRACTISE.....	15
TABLE 7-1. ADJACENT PROPERTIES.....	17
TABLE 7-2. SUMMARY OF CLIMATE DATA FOR THE LARGER OTJINENE AREA (ATLAS OF NAMIBIA PROJECT, 2002)	18
TABLE 7-3. RAINFALL STATISTICS (FUNK, ET.AL 2015).....	18
TABLE 7-4. GROUNDWATER STATISTICS	23
TABLE 7-5. GENERAL ANIMAL DATA (DIGITAL ATLAS OF NAMIBIA, 2002).....	26
TABLE 7-6. TREES WITH CONSERVATION CONCERNS IN QUARTER DEGREE SQUARE 2118DA (CURTIS & MANNHEIMER 2005).....	27
TABLE 7-7. DEMOGRAPHIC CHARACTERISTICS OF THE OKORUKAMBE CONSTITUENCY, THE OMAHEKE REGION AND NATIONALLY (NAMIBIA STATISTICS AGENCY, 2011)	28
TABLE 7-8. MAIN INDUSTRY OF EMPLOYED POPULATION AGED 15 YEARS AND ABOVE FOR THE OKORUKAMBE CONSTITUENCY AND OMAHEKE REGION.....	28
TABLE 10-1. ASSESSMENT CRITERIA.....	31
TABLE 10-2. ENVIRONMENTAL CLASSIFICATION (PASTAKIA 1998)	32

TABLE 11-1. IMPACT SUMMARY CLASS VALUES	50
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LIST OF PHOTOS

PHOTO 4-1. HARVESTED DRYLAND MAIZE FIELD.....	4
PHOTO 4-2. COMBINATION OF IRRIGATION AND DRYLAND FIELD	4
PHOTO 4-3. FERTILIZER MIXING TANK	4
PHOTO 4-4. SECOND FERTILIZER MIXING TANK	4
PHOTO 4-5. FUEL STORAGE	5
PHOTO 4-6. MOBILE FUEL TRAILER	5
PHOTO 4-7. TYPICAL CENTREPIVOT SYSTEM WITH FIXED CENTRAL TOWER (PHOCAIDES (2007)	6
PHOTO 4-8. CENTRE PIVOT SYSTEM PIPELINE.....	6
PHOTO 4-9. CENTRE PIVOT SYSTEM EMPLOYED IN NAMIBIA	6
PHOTO 4-10. TYPICAL MICRO SPRINKLER IRRIGATION SYSTEM USED IN NAMIBIA.....	7
PHOTO 4-11. TYPICAL DRIP IRRIGATION SYSTEM USED IN NAMIBIA.....	7
PHOTO 4-12. TYPICAL IRRIGATION BOREHOLE	9
PHOTO 4-13. TYPICAL STOCK WATERING BOREHOLE AND WATERING POINT.....	9
PHOTO 4-14. GUARDED BOREHOLE INSTALLATION	9
PHOTO 4-15. BOREHOLE WITH FLOW METER AND FERTILISER MIXER TANK	9
PHOTO 4-16. MEDICAL SUPPLIES ON SITE	10
PHOTO 4-17. MAINTENANCE AND STORAGE AREA.....	10
PHOTO 4-18. STORAGE BUILDING.....	10
PHOTO 4-19. ABLUTION FACILITY	10

LIST OF ABBREVIATIONS

AEZ	Agro-Ecological Zone
AIDS	Acquired Immune Deficiency Syndrome
BE	Biological/Ecological
CHIRPS 2	Climate Hazards Group Infra-Red Precipitation with Station data
DWA	Department of Water Affairs
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EMA	Environmental Management Act No 7 of 2007
EMP	Environmental Management Plan
EMS	Environmental Management System
EO	Economic/Operational
ES	Environmental Classification
GPT	Geo Pollution Technologies
HIV	Human Immunodeficiency Virus
IAPs	Interested and Affected Parties
IUCN	International Union for Conservation of Nature
LNAPL	Light Non-Aqueous Phase Liquids
mamsl	Meters Above Mean Sea Level
m/s	Metre per second
mbs	Metres below surface
MEFT	Ministry of Environment, Forestry and Tourism
mm/a	Millimetres per annum
MSDS	Material Safety Data Sheet
PC	Physical/Chemical
PDSI	Palmer Drought Severity Index
PPE	Personal Protective Equipment
ppm	Parts per million
SANS	South African National Standards
SC	Sociological/Cultural
SHEQ	Safety, Health, Environment and Quality
UNFCCC	United Nations Framework Convention on Climate Change
WHO	World Health Organization

GLOSSARY OF TERMS

Alternatives - A possible course of action, in place of another, that would meet the same purpose and need but which would avoid or minimize negative impacts or enhance project benefits. These can include alternative locations/sites, routes, layouts, processes, designs, schedules and/or inputs. The “no-go” alternative constitutes the ‘without project’ option and provides a benchmark against which to evaluate changes; development should result in net benefit to society and should avoid undesirable negative impacts.

Assessment - The process of collecting, organising, analysing, interpreting and communicating information relevant to decision making.

Competent Authority - means a body or person empowered under the local authorities act or Environmental Management Act to enforce the rule of law.

Conservation Tillage - is a generic term that covers any tillage system that reduces loss of soil and water compared with conventional tillage.

Construction - means the building, erection or modification of a facility, structure or infrastructure that is necessary for the undertaking of an activity, including the modification, alteration, upgrading or decommissioning of such facility, structure or infrastructure.

Cumulative Impacts - in relation to an activity, means the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

Environment - As defined in the Environmental Assessment Policy and Environmental Management Act - “land, water and air; all organic and inorganic matter and living organisms as well as biological diversity; the interacting natural systems that include components referred to in sub-paragraphs, the human environment insofar as it represents archaeological, aesthetic, cultural, historic, economic, palaeontological or social values”.

Environmental Impact Assessment (EIA) - process of assessment of the effects of a development on the environment.

Environmental Management Plan (EMP) - A working document on environmental and socio-economic mitigation measures, which must be implemented by several responsible parties during all the phases of the proposed project.

Environmental Management System (EMS) - An Environment Management System, or EMS, is a comprehensive approach to managing environmental issues, integrating environment-oriented thinking into every aspect of business management. An EMS ensures environmental considerations are a priority, along with other concerns such as costs, product quality, investments, PR productivity and strategic planning. An EMS generally makes a positive impact on a company’s bottom line. It increases efficiency and focuses on customer needs and marketplace conditions, improving both the company’s financial and environmental performance. By using an EMS to convert environmental problems into commercial opportunities, companies usually become more competitive.

Evaluation –The process of ascertaining the relative importance or significance of information, the light of people’s values, preference and judgements in order to make a decision.

Green Scheme - The Green Scheme is an initiative conducted by the Ministry of Agriculture, Water and Forestry to encourage the development of irrigation based agronomic production in Namibia with the aim of increasing the contribution of agriculture to the country's Gross Domestic Product. Its aim is also to simultaneously achieve the social development and upliftment of communities located within suitable irrigation areas and to also promote the human resources and skills development within the irrigation sub-sector. Such initiative could possibly enhance cross-border investment and facilitate the exchange of relevant and limited resources with neighbouring countries in this regard.

Hazard - Anything that has the potential to cause damage to life, property and/or the environment. The hazard of a particular material or installation is constant; that is, it would present the same hazard wherever it was present.

Interested and Affected Party (IAP) - any person, group of persons or organisation interested in, or affected by an activity; and any organ of state that may have jurisdiction over any aspect of the activity.

Mitigate - The implementation of practical measures to reduce adverse impacts.

Proponent (Applicant) - Any person who has submitted or intends to submit an application for an authorisation, as legislated by the Environmental Management Act no. 7 of 2007, to undertake an activity or activities identified as a listed activity or listed activities; or in any other notice published by the Minister or Ministry of Environment & Tourism.

Public - Citizens who have diverse cultural, educational, political and socio-economic characteristics. The public is not a homogeneous and unified group of people with a set of agreed common interests and aims. There is no single public. There are a number of publics, some of whom may emerge at any time during the process depending on their particular concerns and the issues involved.

Scoping Process - process of identifying: issues that will be relevant for consideration of the application; the potential environmental impacts of the proposed activity; and alternatives to the proposed activity that are feasible and reasonable.

Significant Effect/Impact - means an impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect on one or more aspects of the environment.

Stakeholder Engagement - The process of engagement between stakeholders (the proponent, authorities and IAPs) during the planning, assessment, implementation and/or management of proposals or activities. The level of stakeholder engagement varies depending on the nature of the proposal or activity as well as the level of commitment by stakeholders to the process. Stakeholder engagement can therefore be described by a spectrum or continuum of increasing levels of engagement in the decision-making process. The term is considered to be more appropriate than the term “public participation”.

Stakeholders - A sub-group of the public whose interests may be positively or negatively affected by a proposal or activity and/or who are concerned with a proposal or activity and its consequences. The term therefore includes the proponent, authorities (both the lead authority and other authorities) and all interested and affected parties (IAPs). The principle that environmental consultants and stakeholder engagement practitioners should be independent and unbiased excludes these groups from being considered stakeholders.

Sustainable Development - “Development that meets the needs of the current generation without compromising the ability of future generations to meet their own needs and aspirations” – the definition of the World Commission on Environment and Development (1987). “Improving the quality of human life while living within the carrying capacity of supporting ecosystems” – the definition given in a publication called “Caring for the Earth: A Strategy for Sustainable Living” by the International Union for Conservation of Nature (IUCN), the United Nations Environment Programme and the World Wide Fund for Nature (1991).

Tillage - The agricultural preparation of soil by mechanical agitation of various types, such as digging, stirring, and overturning. Examples of human-powered tilling methods using hand tools include shoveling, picking, mattock work, hoeing, and raking.

1 BACKGROUND AND INTRODUCTION

Geo Pollution Technologies (Pty) Ltd was appointed by Elize van Niekerk t/a Vision Farming (the Proponent), to undertake an environmental assessment for the agricultural activities on Farm Springvale No. 337 in the Omaheke Region (Figure 1-1). The main commercial activities of the Proponent on the farm are crop cultivation and livestock farming. For purposes of crop cultivation, the Proponent has cleared 270 ha, of which 40 ha is under irrigation, and the remainder divided between dryland maize production and grasslands. The Proponent plans to increase the irrigation area with 20 ha. Irrigation is from production boreholes, by means of centre pivot irrigation systems, however augmented largely by rainwater. Additional irrigation may include sprinkler and drip irrigation. The main produce are wheat, maize and oats. The main operational activities include:

- ◆ land preparation,
- ◆ planting,
- ◆ water abstraction and irrigation,
- ◆ fertilizer application and pest control, and
- ◆ harvesting, processing and transporting activities specific to each crop.

A detailed project description is provided in section 4. The potential impacts of the project on the environment, resulting from various operational, maintenance and construction, and possible decommissioning activities, were determined through the risk assessment as presented in this report. The environment being defined in the Environmental Management Act as “land, water and air; all organic and inorganic matter and living organisms as well as biological diversity; the interacting natural systems that include components referred to in sub-paragraphs, the human environment insofar as it represents archaeological, aesthetic, cultural, historic, economic, paleontological or social values”. The environmental assessment was conducted to apply for an environmental clearance certificate in compliance with Namibia’s Environmental Management Act (Act No 7 of 2007) (EMA).

Project Justification – To realise agricultural related sustainability goals of the 5th National Development Plan of Namibia (NDP5), the then Ministry of Agriculture Water and Forestry (now Agriculture, Water and Land Reform) established a strategic plan 2017/18 -2021/22. As part of this plan the Ministry aims to, amongst others, increase the percentage of farmers conducting conservation agriculture while also setting targets for increased irrigation based agriculture. Both of these strategies are focussed on increasing sustainable food production and ensuring food security in Namibia. The Proponent has a well-established agriculture development, which sees an optimisation of crop production by means of irrigation, augmented by rainwater. In addition, the proponent employs several conservation agricultural techniques. Existing agricultural activities require employment, which is required to be maintained for continued operations. Pivot irrigation systems also requires significant investment costs and therefore the development of the irrigation areas has ensured a sizeable investment into the area and the Omaheke Region. Benefits of the agricultural activities conducted by the Proponent include:

- ◆ Food production and enhanced food security for local and potential international markets.
- ◆ Employment and supporting of livelihoods of both unskilled and skilled labourers.
- ◆ Generation of income that contributes to the national treasury.
- ◆ Support for economic resilience in the area through diversified business activities and opportunities.

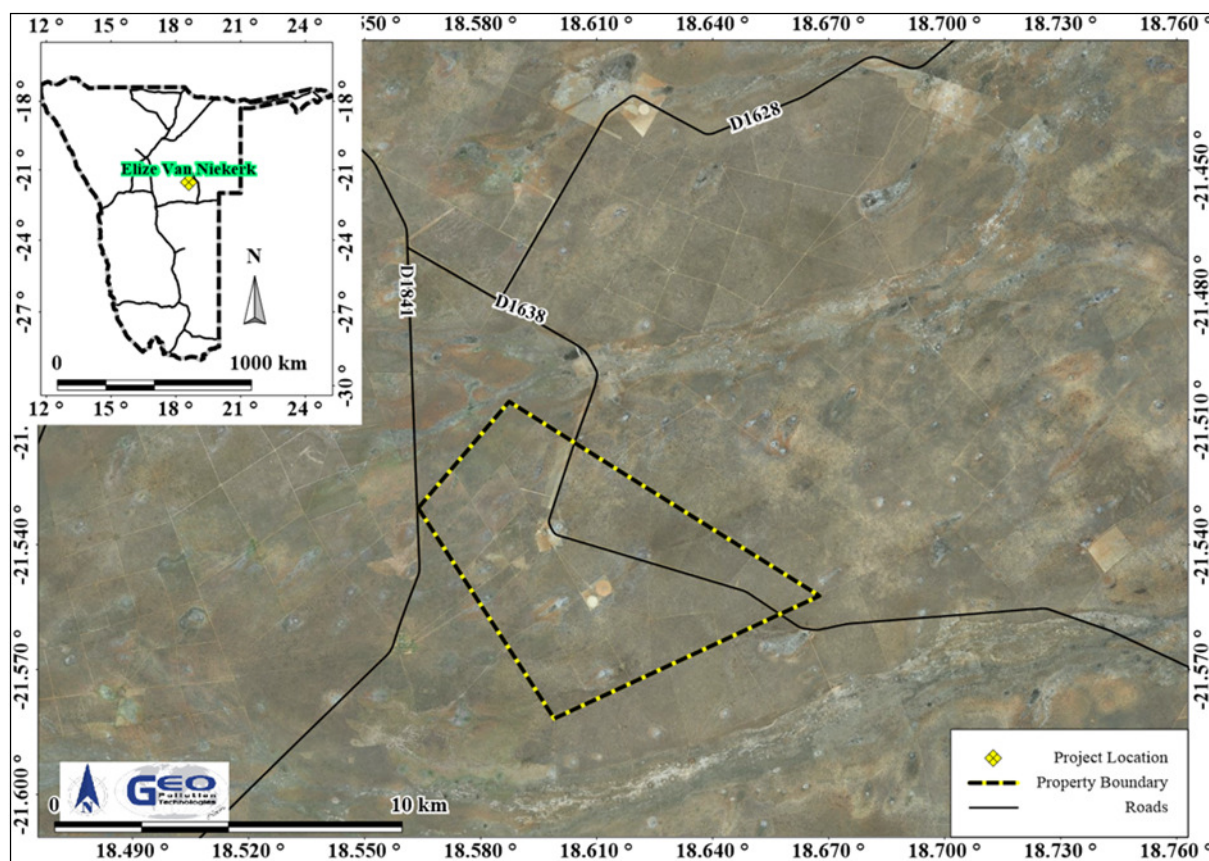


Figure 1-1. Project location

2 SCOPE

The scope of this report is to, in compliance with the requirements of the EMA:

1. Present a detailed project and environmental description related to the Proponent's operational activities.
2. Determine the potential environmental impacts emanating from the Proponent's operational activities and potential future decommissioning of such activities.
3. Identify a range of management actions to mitigate the potential adverse impacts to acceptable levels.
4. Provide sufficient information to the relevant competent authority and the Ministry of Environment, Forestry and Tourism (MEFT) to make an informed decision regarding the project and the issuing of an environmental clearance certificate.

3 METHODOLOGY

Methods employed to investigate and report on potential impacts of the Proponent's operational activities on the social and natural environment include:

1. Detailed infrastructure and operational procedures received from the client are presented in this report.
2. Baseline information about the site and its surroundings was obtained from primary information (hydrogeological assessment), existing secondary information as well as from a reconnaissance site visit.
3. As part of the scoping process to determine potential environmental impacts, interested and affected parties (IAPs) were consulted about their views, comments and opinions, all of which are presented in this report.

4. As per the findings of this environmental assessment, a scoping report with an environmental management plan (EMP) were prepared and this will be submitted to the MEFT.

4 OPERATIONS AND RELATED ACTIVITIES

The Proponent has been conducting agricultural activities on the farm Springvale for a number of years. Agriculture has always been the main economic activity conducted on the farm. Over recent years, agricultural practises were intensified and diversified through various agricultural initiatives on the property. Where traditional farming practices mainly involved livestock production, it is now supplemented with crop cultivation by means of irrigation and dryland cropping. The following sections provide a brief description of the infrastructure, operations and services supply on the farm.

4.1 LAND CLEARING

Mechanical clearing of rangeland for crop cultivation and infrastructure purposes was performed on suitable portions of the farm. Land clearing entailed the removal of trees and bushes. Grass is only removed when land preparation for crop cultivation is conducted. Some areas around crop fields are also cleared since there is greater competition for water resources when trees and bushes are too close to crop fields. Invader bush severely affect especially sheep farming. Therefore, clearing of areas from such invader bush increases sheep rangeland areas. The total existing area under irrigation is 40 ha while 230 is used for dryland cropping (Figure 4-1).

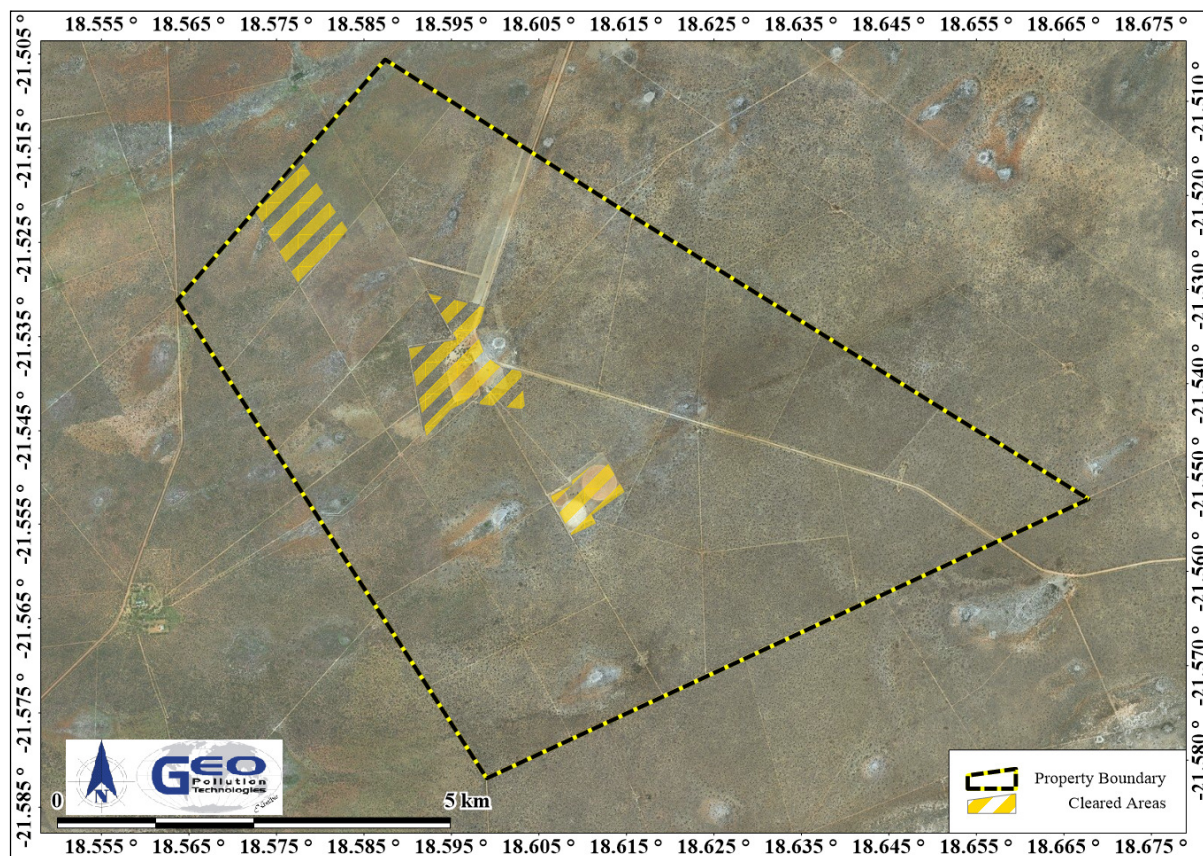


Figure 4-1. Cleared areas of the farm

4.2 CROP PRODUCTION

To optimise planting and harvesting processes, the Proponent erected their pivot within a dryland crop field. The entire field is seeded and the irrigated crops thus transitions into the surrounding dryland crops. The entire field can thus be prepared, planted and harvested as an uninterrupted unit. Apart from time saving, this method of operation further reduces possible water losses to competing plants or as a result of spray drift.

Irrigated land is cultivated in a rotational basis and is at times left fallow to allow the soil to rest and regenerate as well as for pest control purposes. This is repeated on a rotational basis, each successive year allowing a new area to remain fallow. Cover crops are planted in this time to enrich the soils with nutrients and reduce evaporation losses. The main crop under irrigation on the 40 ha is maize, which is sold to local Namibian mills.



Photo 4-1. Harvested dryland maize field

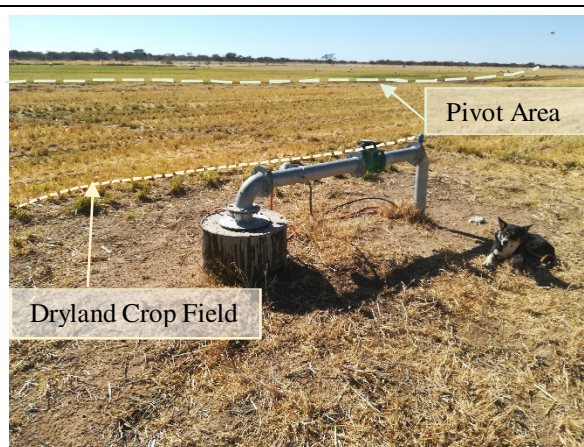


Photo 4-2. Combination of irrigation and dryland field

Preparation of the land and planting entails mechanical activities like ripping, tilling and seeding of the soil, with tractors and specialised implements. Harvesting is performed with maize harvester machines. The proponent conducts conservation agriculture on all crop fields. By utilising a semi-tillage approach, soil disturbance is kept to a minimum while the organic component of the soil is increased. The type of semi-tillage utilised ensures a significant reduction in the chemical (fertilizer and pesticides) management component of the cultivation process. The ecological and economic benefits of the approach are compared to other agricultural approaches in Section 5.

Fertilizers and pesticides are applied as required and according to the specifications for application. For irrigated fields, fertilisers are mixed with water in large mixing tanks (Photo 4 3 and Photo 4 4). Once the desired mixing ratio is achieved, the fertilisers are fed into the respective irrigation systems for administration onto the crops. The proponent utilises low-soluble-nutrient fertilizers which may be readily absorbed by crops and requires less water. Pesticides are administered as per the specified application procedures for the corresponding pest by means of tractor spraying. To ensure correct and safe application of pesticides, a pesticide plan is implemented and regularly updated. The proponent requires a minimum amount of pesticides as compared to conventional agricultural production. All pesticides are stored in a dedicated chemical store.



Photo 4-3. Fertilizer mixing tank



Photo 4-4. Second fertilizer mixing tank

The Proponent has seven pivots of varying size with a combined irrigation area of 40 ha (Figure 4-2). Pivots are located in two general areas on the farm. Irrigation related agriculture is supported by four irrigation boreholes. Additional irrigation over an area of 20 ha is planned to be conducted adjacent to the existing dryland areas. The farm further has all the main amenities supporting farming operations including the irrigation based crop production. These include fuel storage, chemical storage and a maintenance yard. The locations of these in relation to the cleared areas and pivots are indicated in Figure 4-2.

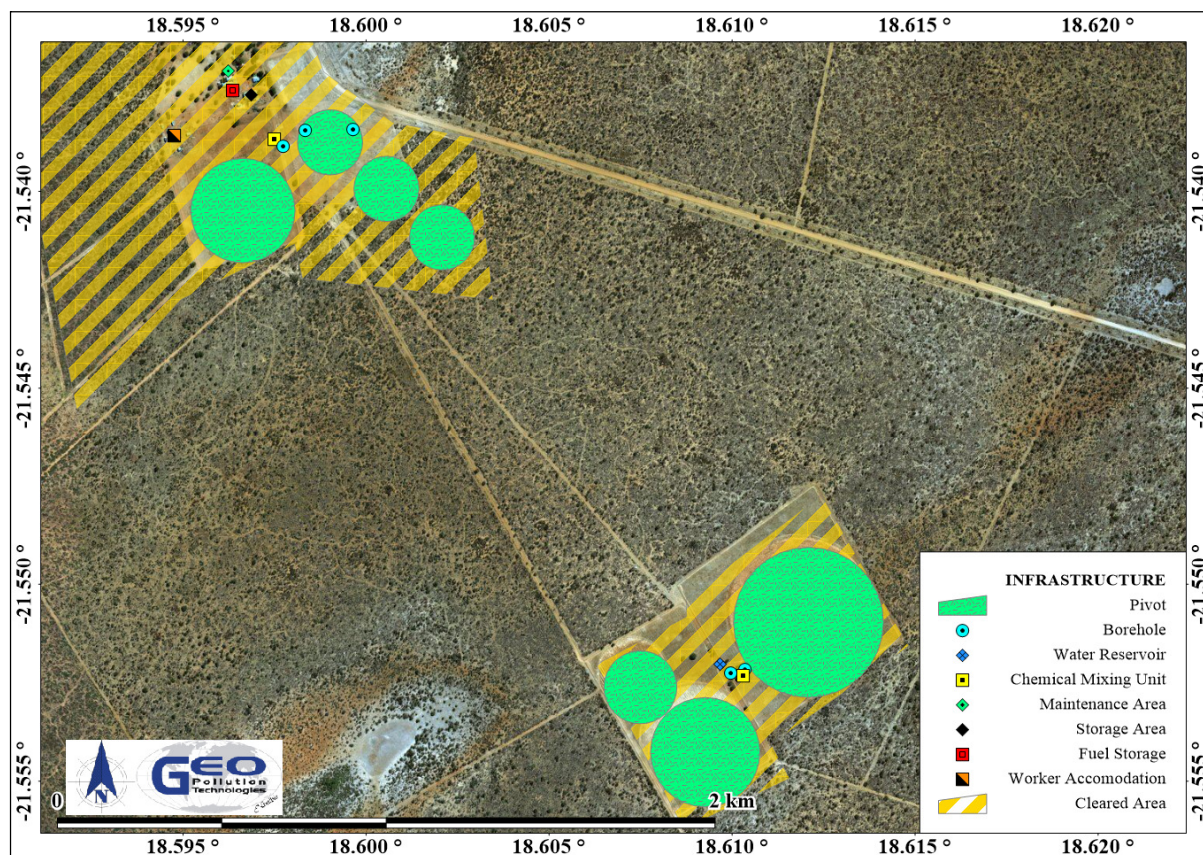


Figure 4-2. Irrigation and infrastructure layout on the Farm Springvale

Water pumping is enabled by electricity as supplied by NamPower while equipment used in cultivation (e.g. tractors) is powered by diesel stored on the farm (Photo 4-5). Diesel is also provided to in-field operations via a mobile diesel storage unit (Photo 4-6).



Photo 4-5. Fuel Storage



Photo 4-6. Mobile fuel trailer

As part of conservation agriculture, all organic material which remains on the fields after harvesting, are left on the field. Waste is sorted and where possible reused (such as using old oil to coat fencing posts) the remainder is burned in dedicated waste areas.

4.3 IRRIGATION SYSTEMS

Irrigation systems employed on the farm are centre pivots. A brief description of the system is provided below.

Phocaides (2007) provides a concise description of the center pivot, being a low to medium pressure fully mechanised, automated irrigation of permanent assembly. It basically comprise a sprinkler pipeline (usually of high tensile galvanized light steel or aluminium pipes) supported above ground by mobile A-frame towers, long spans, steel trusses and/or cables. The pipeline is connected to a central tower with the “pivot mechanism” and main control panel. The central tower is a fixed structure with a concrete base secured at a fixed water supply point, in the centre of the pivot (field). The entire system is self-propelled to slowly rotate around the central tower while dispensing water through sprinklers (emitters) connected to the pipeline. An automatic alignment systems ensures the irrigation pipeline remains straight while a drive system enables the system movement.

Mobile towers are typically approximately 3 m in height while being spaced about 30 m apart. The spans are therefore roughly 30 m in length. The entire length of the system may vary from design to design and therefore the size of the irrigated area will also vary. Longer systems will have a greater circumference and larger range. Photo 4-7 depicts a typical centre pivot system while Photo 4-8 and Photo 4-9 presents some of the pivots systems which are being employed in Namibia. The system depicted in Photo 4-8 and Photo 4-9 has a system length of 300 m with spans at a width of 50 m. The irrigated area therefore covered by these systems are 30 ha.



Photo 4-7. Typical Centre Pivot System with Fixed Central Tower (Phocaides (2007))

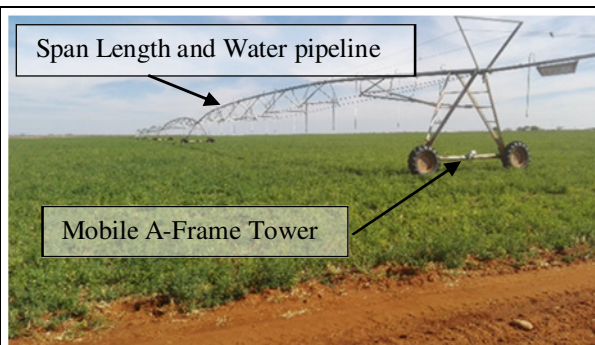


Photo 4-8. Centre Pivot System Pipeline

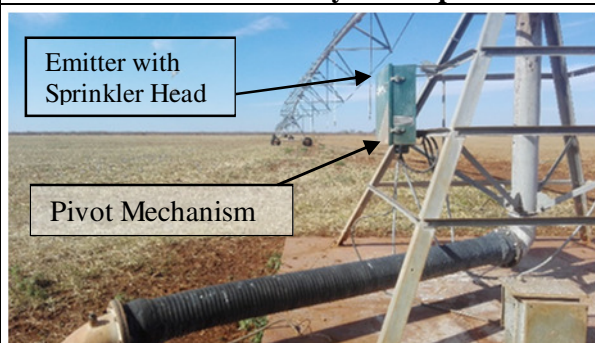


Photo 4-9. Centre Pivot System Employed in Namibia

The proponent is also considering implementing drip or sprinkler system systems as part of possible future irrigation development. Drip irrigation is a type of micro-irrigation system that has the potential to save water and nutrients by allowing water to drip slowly to the roots of plants, either from above the soil surface or buried below the surface. The objective is to place water directly into the root zone and minimize evaporation (Photo 4-11).

The third irrigation method comprise a sprinkling system fitted with “Gyro emitters”. The emitters are fitted onto sprinkler “risers” which are held in a vertical position via support structures (Photo 4-10). The risers are connected to the distributor tube. Micro-sprinklers are made of plastic materials which is resistant to agrochemicals and weather conditions. Emitters are designed to prevent insect penetration into the area of the sprinklers nozzle. Water is evenly disseminated through the sprinkler system to cover a larger root zone than that of a drip irrigation system.

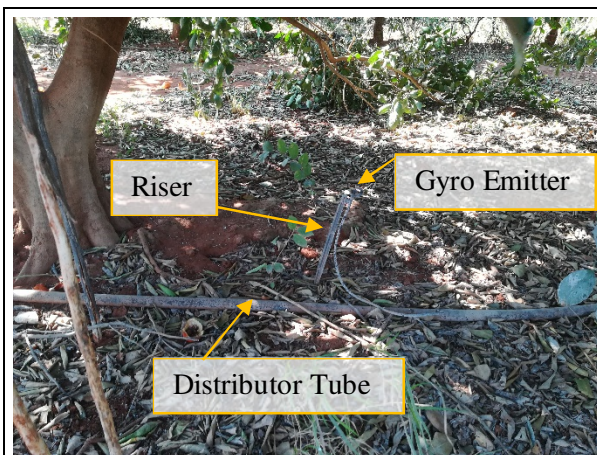


Photo 4-10. Typical micro sprinkler irrigation system used in Namibia



Photo 4-11. Typical drip irrigation system used in Namibia

4.4 WATER SUPPLY

The only available water supply for the project farms is groundwater. Groundwater remains the property of the Government of Namibia which permits and regulates water abstraction. The majority of farms surrounding the project area rely on boreholes installed on the respective farms for water supply. It should be noted that the project falls outside a water control area, thus an abstraction permit is not needed. However, it is in the interest of the Proponent to apply for an abstraction permit to utilise the water for commercial purposes (irrigation).

Ten (10) boreholes are present on farm Springvale no. 337 and operated by the Proponent. A summary of the available borehole data received from the client is provided in Table 4-1. All data could not be ascertained for some of the boreholes. The boreholes are used for purposes of potable water supply (domestic use), irrigation and stock watering. Two boreholes are currently not used. One borehole at the farm house is used for domestic purposes while two other boreholes are used for stock watering purposes on the farm.

The irrigation boreholes are installed with submersible pumps. Abstracted water is used to irrigate maize, oats and wheat fields via centre pivot irrigation systems. Water meters are installed at Borehole 1, Borehole 2 and Borehole 3 near the farm house. Historic water level data was supplied by the Proponent for Borehole 1, Borehole 2, Borehole 3, Borehole 4 and Borehole 5.

Figure 4-3 illustrates all the borehole data as received from the Proponent as well as contained in the DWA database on the farms and immediate vicinity. Note that some of the DWA boreholes is not in use any more.

Table 4-1. Summary of borehole information obtained from client

Map Ref.	Borehole Name	Other Borehole Name	Use	Borehole Depth (m)	Yield (m ³ /h)	Water Level (mbs)
1	Borehole 1	Toetsgat 1	Irrigation	97	19	18
2	Borehole 2	Toetsgat 2	Irrigation	80	22	17
3	Borehole 3	Toetsgat 3	Irrigation	60	20	
4	Borehole 4	Hartbeespos 2	Irrigation	80	78	

5	Borehole 5	Hartbees	Irrigation	50	19	
6	WW10687		Domestic		9.5	17.98
7		No. 28 (DWA)	Stock Watering		5.4	14
8		No. 29 (DWA)	Stock Watering		11.2	15
9		No. 30 (DWA)	Not Used		13.5	15.4
10		No. 27 (DWA)	Not Used		32	15

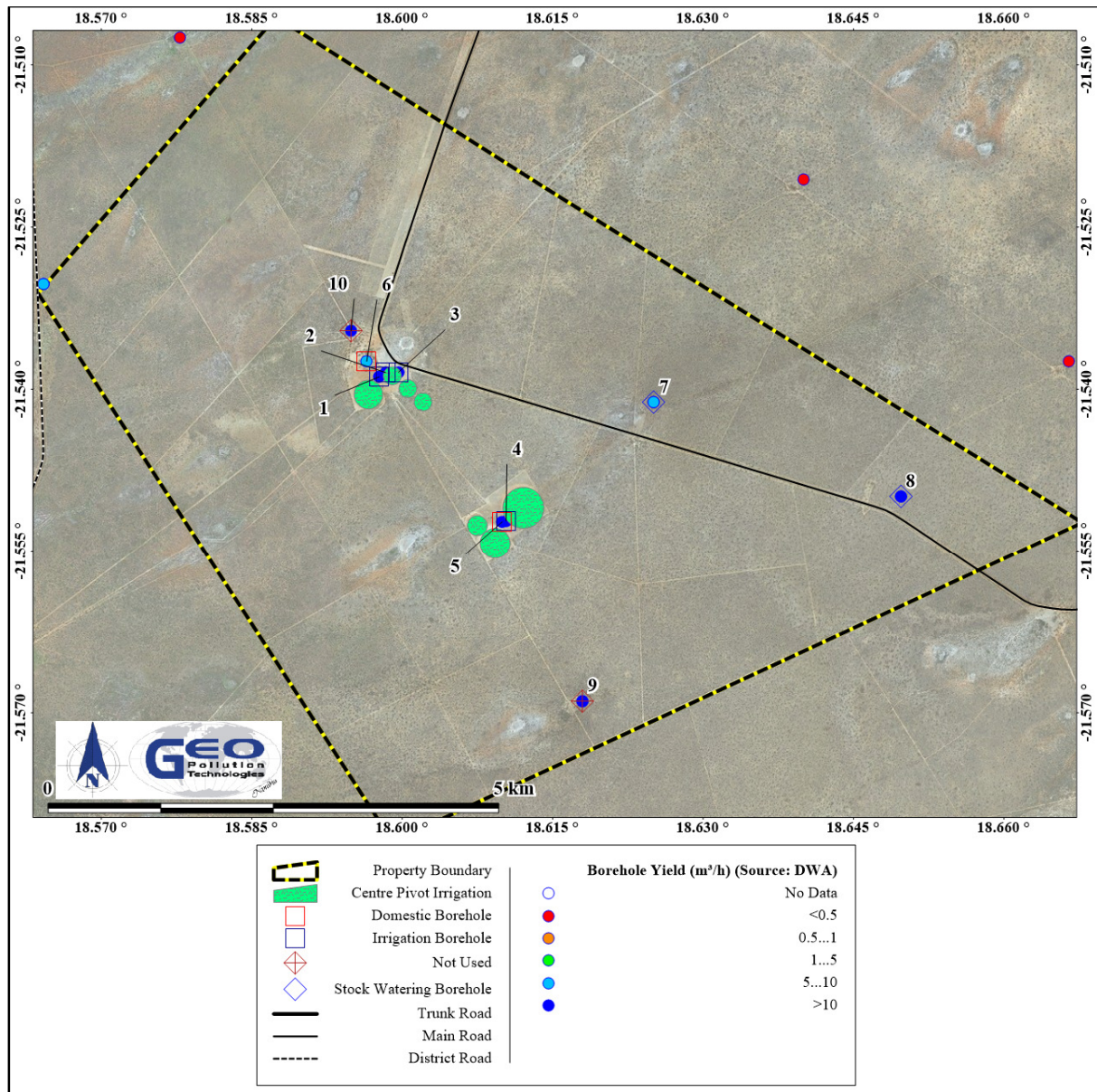




Photo 4-12. Typical irrigation borehole



Photo 4-13. Typical stock watering borehole and watering point



Photo 4-14. Guarded borehole installation



Photo 4-15. Borehole with flow meter and fertiliser mixer tank

4.5 LIVESTOCK

The main agricultural activity on the project area remains cattle ranching and sheep farming for commercial purposes. Livestock is accommodated in all areas of the farms except the pivot and crop cultivation areas when planted. Animals are however allowed to feed on the fields once harvesting is concluded. Livestock is transported to national markets when they are market ready. Bush clearing was previously conducted on the farm in an attempt to improve rangeland conditions.

4.6 SUPPORT INFRASTRUCTURE

Operations are enabled and supported by a variety of infrastructure on the farm. In many instances operations will not be possible without the support infrastructure. Figure 4-1 depicts the farm layout and indicates the location of the support infrastructure.

Fuel storage comprises of one 200 litter drum and a mobile bowser with a 1,000 litre capacity. (Photo 4-5 and Photo 4-6). Refuelling is conducted on/over an impermeable surface (cement floor or drip tray). Each unit is equipped with a fuel line and nozzle for dispensing of diesel into vehicles. Diesel is collected by the proponent from retail facilities if and when required.

Waste disposal is conducted in excavated pit where domestic waste is regularly burned. Due to a lack of any recyclers in the area, recycling of certain wastes are not possible. However, where possible, certain waste items are not discarded, but rather re-used for alternative purposes.

Electricity is provided by NamPower and supplemented through the use of solar geysers.

Employees are provided with **housing**. Employee houses are serviced with running hot water. All ablution facilities are connected to french drain systems for the treatment of **sewage**.

A **storage and maintenance area** is located on the property and comprise of sheds and storerooms where supplies, implements and other maintenance material are stored under roof (Photo 4-17). The farm has its own locked chemical store for pesticides and other hazardous chemicals. Maintenance and general repairs are conducted in a workshop.



Photo 4-16. Medical Supplies on site



Photo 4-17. Maintenance and storage area



Photo 4-18. Storage building



Photo 4-19. Ablution facility

4.7 EMPLOYMENT

Operations on the farm sustain 8 permanent employment opportunities. In addition, approximately 10 seasonal workers are employed. Permanent workers are provided with housing on the farm. Seasonal workers are sourced from the area.

5 ALTERNATIVES

Various alternatives related to the project are considered and each of these discussed. The alternatives can roughly be grouped into three main categories, namely:

- ◆ Location alternatives;
- ◆ Project implementation and design alternatives;
- ◆ No go alternative.

5.1 LOCATION ALTERNATIVES

The proposed location for irrigation is well suited for crop production due to the availability of water and suitability of soils. Boreholes are already in place and land clearing and field establishment have already been completed. No location alternatives are therefore considered feasible, as the proponent owns and the farm, on which operations are conducted.

5.2 PROJECT IMPLEMENTATION AND DESIGN ALTERNATIVES

Various alternatives are continually considered to optimise crop production. Boreholes are already in place and no surface water is available. Therefore, there are no alternative water sources for the proposed irrigation operations. However, there are a number of alternatives with regards to the application of the water used. The most pertinent relates to crop irrigation methods.

5.2.1 Irrigation Methods

When considering alternative irrigations systems, the most viable irrigation option is not only based on the irrigation system's design efficiency, but should include environmental constraints and operating costs. Some systems are simply not viable due to climatic and topographical features as well as cost implications. For example, flood irrigation is not viable on steeper gradients and are more expensive due to water pumping costs.

The type of produce cultivated also plays a determining role. It will not be feasible to install highly efficient yet expensive irrigation systems (such as drip irrigation) for crops with lower economic yields. In turn, some crops will not produce such high yields when cultivated under less efficient systems. Table 5-1 depicts different types of irrigation systems as per the South African Irrigation Institute's suggested efficiencies (IWRM Plan Joint Venture Namibia, 2010). The estimated average costs are based on 35 ha units. Although flood systems are not viable irrigation methods, these have been included for comparison with regards to capital cost and design efficiency.

Table 5-1. Irrigation system efficiency (IWRM Plan Joint Venture Namibia, 2010)

Irrigation System	Design Efficiency	Capital Costs (R /ha)
Flood: Furrow	65%	13,000
Flood: Border	60%	17,600
Flood: Basin	75%	18,800
Sprinkler: Dragline	75%	24,800
Sprinkler: Quick-coupling	75%	22,500
Sprinkler: Permanent	85%	34,500
Sprinkler: Travelling boom	80%	23,200
Sprinkler: Centre pivot	85%	43,300
Sprinkler: Linear	85%	69,400
Sprinkler: Micro sprinkler	85%	36,300
Micro: Spray	90%	53,200
Micro: Drip	95%	46,300

In the area, climatic and soil conditions necessitate an irrigation system with a high rate of water deposition (due to evaporation and soil salinization). For purposes of irrigation, centre pivot, sprinkler and drip systems are suitable

5.2.2 Soil Preparation

Traditionally, soil is prepared for planting by tilling and ploughing. These processes break the top layer of soil at varying depths and mix residual plant material into the soil. It also uproots weeds and provide for loose soil. There is nowadays however a shift in the approach to soil preparation that has some advantageous over traditional tilling. Conservation tillage practises aims at less disturbance of the soil and have advantages of less erosion, less evaporation and saves on time and costs of traditional tilling. Conservation tillage can either be just partial tillage as is the case with strip-tilling or no tilling at all. With strip-tillage, only narrow strips are tilled in the area where planting will take place. The areas, between planted rows, are left untilled and with residual plant material from the previous harvest. With no-tillage, seeds are planted on the field with no soil preparation at all.

Table 5-2. Advantages and disadvantages of land preparation systems (adapted from <https://cropwatch.unl.edu/tillage/advdisadv>)

System	Major advantages	Major disadvantages
Plow	Suited for poorly drained soils. Excellent incorporation (mixing of soil for easy combination with chemical and organic elements). Well-tilled seedbed.	Major soil erosion. High soil moisture loss. Timeliness considerations. Highest fuel and labour costs. Reducing soil organic matter (micro flora and fauna), reduced soil structural stability. Increased surface runoff and water or wind erosion.
Disk	Less erosion with more residue. Well adapted for well-drained soils. Good incorporation.	Little erosion control with more operations. High soil moisture loss. Destroys soil structure. Compacts wet soil.
Strip-till	Tilled residue-free strip warms quickly. Injection of nutrients into row area. Well suited for poorly drained soils. Less wear on machinery, less use of fuel or animal power, less time devoted to soil preparation by the farmer thus a possible overall improvement in gross returns for the farm. Heavy rain, is more likely to concentrate in the seeder slots and thereby penetrate directly to the crop's root zone. Improve general water use efficiency by the crop.	Cost of preplant operation. Strips may dry too much, crust, or erode without residue. Not suited for drilled crops (mechanised seeding). Timeliness in wet falls. It also disturbs the soil but limits that disturbance to rows or slots in which the crop seeds and fertilizer are placed.
No-till	Excellent erosion control. Soil moisture conservation. Minimum fuel and labour costs. Builds soil structure and health.	No incorporation. Increased dependence on herbicides. Slow soil warming on poorly drained soils. Problems of disease and residue handling. Herbicides have long-term impacts on the environment. Some weeds have developed resistance to some herbicides, leading to a need to rotate both crops and herbicide groups in order to keep crops weed-free, or to plant GMO crop.

The Proponent has adopted a semi-tillage (a variation on strip-tillage) method of cultivation with a specialist conversion application, which will allow for the optimal use of water and minimal use of pesticides. In addition, the proponent plants cover crops during the period between planting of maize. This allows for soil moisture retention while enriching the soil with nutrients. Sheep graze the cover crops for short periods of time. The livestock's excrement then also fertilises the soil. Once the cover crops are grazed, semi-tillage is conducted. The method of soil preparation increases moisture retention of the soil while reducing the pesticide regime. No alternative related to soil preparation is therefore suggested, as the proponent is employing the most advantageous system, in line with the national strategies on conservation agriculture.

5.3 NO GO ALTERNATIVE

Agriculture has been a core activity in the area for years. Maize is supplied to Namibian mills and the stover used for fodder. Livestock are sold to local markets. This reduces the need for importing of crops, meat and fodder. The proponent further employs most suited practises for conservation agriculture to increase the food security in Namibia. Should the project not receive an environmental clearance certificate, there would be a loss in capital investment and employment and also in the production of food. This will lead to a decrease in the spending power of the local to national community. Finally, less revenue will be generated for Namibia and more money will be required for importing of feed and food.

6 ADMINISTRATIVE, LEGAL AND POLICY REQUIREMENTS

All projects, plans, programmes and policies with potential adverse impacts on the environment require an environmental assessment, as per the Namibian legislation. This promotes protection of the environment as well as sustainable development. The legislation and standards provided in Table 6-1 to Table 6-3 govern the environmental assessment process in Namibia, and are relevant to the assessed development.

Table 6-1. Namibian law applicable to the development

Law	Key Aspects
The Namibian Constitution	<ul style="list-style-type: none"> ◆ Promote the welfare of people ◆ Incorporates a high level of environmental protection ◆ Incorporates international agreements as part of Namibian law
Environmental Management Act Act No. 7 of 2007, Government Notice No. 232 of 2007	<ul style="list-style-type: none"> ◆ Defines the environment ◆ Promotes sustainable management of the environment and the use of natural resources ◆ Provides a process of assessment and control of activities with possible significant effects on the environment
Environmental Management Act Regulations Government Notice No. 28-30 of 2012	<ul style="list-style-type: none"> ◆ Commencement of the Environmental Management Act ◆ List activities that requires an environmental clearance certificate ◆ Provide Environmental Impact Assessment Regulations
Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act Act No. 36 of 1947; Government Notice No. 1239 of 1947	<ul style="list-style-type: none"> ◆ Governs the registration, importation, sale and use of fertilizers, farm feeds, agricultural remedies and stock remedies ◆ Various amendments and regulations
Seed and Seed Varieties Act 23 of 2018 Act No. 23 of 2018, Government Notice No. 368 of 2018	<ul style="list-style-type: none"> ◆ Provides for restrictions on the importation of seed ◆ Not in force yet
The Water Act Act No. 54 of 1956	<ul style="list-style-type: none"> ◆ Remains in force until the new Water Resources Management Act comes into force ◆ Defines the interests of the state in protecting water resources ◆ Controls water abstraction and the disposal of effluent ◆ Numerous amendments
Water Resources Management Act Act No. 11 of 2013	<ul style="list-style-type: none"> ◆ Provides for management, protection, development, use and conservation of water resources ◆ Prevention of water pollution and assignment of liability ◆ Not in force yet
Forest Act (Act 12 of 2001, Government Notice No. 248 of 2001)	<ul style="list-style-type: none"> ◆ Makes provision for the protection of the environment and the control and management of forest fires ◆ Provides for the licencing and permit conditions for the removal of woody and other vegetation as well as the disturbance and removal of soil from forested areas.

Law	Key Aspects
Forest Regulations: Forest Act, 2001 Government Notice No. 170 of 2015	<ul style="list-style-type: none"> Declares protected trees or plants Issuing of permits to remove protected tree and plant species. Issuing of permits for harvesting of trees for wood and charcoal production and transport
Soil Conservation Act Act No. 76 of 1969	<ul style="list-style-type: none"> 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 Namibia
Biosafety Act Act No. 7 of 2006	<ul style="list-style-type: none"> Regulate activities involving the research, development, production, marketing, transport, application and other uses of genetically modified organisms and specified products derived from genetically modified organisms Prohibits planting of genetically modified organisms without registration
Petroleum Products and Energy Act Act No. 13 of 1990, Government Notice No. 45 of 1990	<ul style="list-style-type: none"> Regulates petroleum industry Makes provision for impact assessment Petroleum Products Regulations (Government Notice No. 155 of 2000) Prescribes South African National Standards (SANS) or equivalents for construction, operation and decommissioning of petroleum facilities (refer to Government Notice No. 21 of 2002)
Local Authorities Act Act No. 23 of 1992, Government Notice No. 116 of 1992	<ul style="list-style-type: none"> Defines the powers, duties and functions of local authority councils
Public Health Act Act No. 36 of 1919	<ul style="list-style-type: none"> Provides for the protection of health of all people
Public and Environmental Health Act Act No. 1 of 2015, Government Notice No. 86 of 2015	<ul style="list-style-type: none"> Provides a framework for a structured more uniform public and environmental health system, and for incidental matters Deals with Integrated Waste Management including waste collection disposal and recycling, waste generation and storage, and sanitation
Labour Act Act No 11 of 2007, Government Notice No. 236 of 2007	<ul style="list-style-type: none"> Provides for Labour Law and the protection and safety of employees Labour Act, 1992: Regulations relating to the health and safety of employees at work (Government Notice No. 156 of 1997)
Atmospheric Pollution Prevention Ordinance Ordinance No. 11 of 1976	<ul style="list-style-type: none"> Governs the control of noxious or offensive gases Prohibits scheduled process without a registration certificate in a controlled area Requires best practical means for preventing or reducing the escape into the atmosphere of noxious or offensive gases produced by the scheduled process
Hazardous Substances Ordinance Ordinance No. 14 of 1974	<ul style="list-style-type: none"> Applies to the manufacture, sale, use, disposal and dumping of hazardous substances as well as their import and export Aims to prevent hazardous substances from causing injury, ill-health or the death of human beings

Law	Key Aspects
Pollution Control and Waste Management Bill (draft document)	<ul style="list-style-type: none"> Not in force yet Provides for prevention and control of pollution and waste Provides for procedures to be followed for licence applications

Table 6-2. Relevant multilateral environmental agreements

Agreement	Key Aspects
Stockholm Declaration on the Human Environment, Stockholm 1972.	<ul style="list-style-type: none"> Recognizes the need for a common outlook and common principles to inspire and guide the people of the world in the preservation and enhancement of the human environment
United Nations Framework Convention on Climate Change (UNFCCC)	<ul style="list-style-type: none"> The Convention recognises that developing countries should be accorded appropriate assistance to enable them to fulfil the terms of the Convention
Convention on Biological Diversity, Rio de Janeiro, 1992	<ul style="list-style-type: none"> Under article 14 of The Convention, EIAs must be conducted for projects that may negatively affect biological diversity
International Treaty on Plant Genetic Resources for Food and Agriculture, 2001	<ul style="list-style-type: none"> Promote conservation, exploration, collection, characterization, evaluation and documentation of plant genetic resources for food and agriculture Promote the sustainable use of plant genetic resources for food and agriculture

Table 6-3. Standards or codes of practise

Standard or Code	Key Aspects
South African National Standards (SANS)	<ul style="list-style-type: none"> The Petroleum Products and Energy Act prescribes SANS standards for the construction, operations and demolition of petroleum facilities. SANS 10131 (2004) is aimed at above-ground storage tanks for petroleum products. <ul style="list-style-type: none"> Provide requirements for spill control infrastructure

The agricultural and related activities, listed in the Environmental Management Act Regulations (Government Notice No. 29 of 2012), as activities requiring an environmental clearance certificate, include the following:

Section 4: Forestry Activities

- 4. The clearance of forest areas, deforestation, afforestation, timber harvesting or any other related activity that requires authorisation in term of the Forest Act, 2001 (Act No. 12 of 2001) or any other law. The Proponent is not conducting any tree harvesting or charcoal production. Encroacher bush was cleared to improve livestock rangelands and to allow for dryland cropping. Additional de-bushing initiatives may be undertaken in the future.

Section 7: Agriculture and Aquaculture Activities

- 7.5 Pest control: The proponent will use conventional pest control products as approved by the Namibian government for some of the produce. These may include herbicides and pesticides.

Section 8 of Government Notice No. 29 of 2012: Water Resource Developments

- 8.1. The abstraction of ground or surface water for industrial or commercial purposes: Water is abstracted from boreholes for cultivation and sale of crops.
- 8.6 Construction of industrial and domestic wastewater treatment plants and related pipeline systems: The proponent has installed wastewater treatment facilities (french drain systems) on the properties to manage mainly black and grey water.

- ◆ 8.7 Irrigation schemes for agriculture excluding domestic irrigation: No *irrigation scheme* was developed, however, *irrigation systems* are used on the farm. Irrigation on the farm does not contribute to or is part of any irrigation scheme as proclaimed by the Namibian Government.

Section 9 of Government Notice No. 29 of 2012: Hazardous Substance Treatment, Handling and Storage

- ◆ 9.1 The manufacturing, storage, handling or processing of a hazardous substance defined in the Hazardous Substances Ordinance, 1974. The Proponent stores diesel on the farm in two containers with a combined capacity of 1,200 litres.
- ◆ 9.2 Any process or activity which requires a permit, licence or other form of authorisation, or the modification of or changes to existing facilities for any process or activity which requires an amendment of an existing permit, licence or authorisation or which requires a new permit, licence or authorisation in terms of a law governing the generation or release of emissions, pollution, effluent or waste: The Proponent stores diesel on the farm in two containers with a combined capacity of 1,200 litres.
- ◆ 9.3 Construction of filling stations or any other facility for the underground and aboveground storage of dangerous goods, including petrol, diesel, liquid petroleum gas or paraffin: The Proponent stores diesel on the farm in two containers with a combined capacity of 1,200 litres.

Additional national planning legislation considered include:

- ◆ Harambee Prosperity Plan.
- ◆ 5th National Development Plan (NDP5).
- ◆ Ministry of Agriculture, Water and Forestry: Strategic Plan 2017/18 – 2021/22.

The Harambee Prosperity Plan (HPP) is a targeted action plan to accelerate development in clearly defined priority areas, which lay the basis for attaining prosperity in Namibia. The Plan does not replace, but complements the long-term goal of the National Development Plans (NDPs) and Vision 2030. The rationale behind the HPP is to introduce an element of flexibility in the Namibian planning system by fast tracking development in areas where progress is insufficient. It also incorporates new development opportunities and aims to address challenges that have emerged after the formulation of NDPs. It is the purpose of NDP5 to set out a roadmap for achieving envisioned rapid industrialization while adhering to the four integrated pillars of sustainable development as identified in the plan. Irrigation activities contribute primarily to the “Economic Progression” pillar by increasing the volumes of locally produced goods.

One of the focus areas of the economic progression pillar of NDP5 is agriculture and food security. The NDP5 aims to decrease the amount of food insecure individuals, increase food production and increase the share of value addition in crop and livestock farming. Development and operations of irrigation activities on the farm are in line with all of these strategies as identified in the NDP5. The farm contribute to the amount of productive, irrigated land in Namibia, provide employment, produce crops for local and international markets, and produces fodder for livestock farming.

The strategic plan of the Ministry of Agriculture, Water and Land Reform, was designed to achieve the Namibia Harambee Prosperity Plan and NDP5’s desired outcomes. The formulation of the strategic plan followed an extensive stakeholder consultation process and will be the basis of annual work plans of various directorates and departments within the ministry. A key pillar of the strategy is sustainable food production.

Achieving sustainable food production is hinged on two strategic objectives. The first being the implementation of appropriate technologies e.g. comprehensive conservation agriculture and mechanization. The second being to strengthen the coordination between research and advisory services. The proponent not only adopted a specific and effective conservation agriculture regime, but also commissioned specialist investigations to advise on the feasibility of irrigation. Such information being made available to the governing bodies to support their information database. The proponent not only incorporated all legal requirements from the state, but also evidently implements and embraces policies and strategies in the related sector.

7 ENVIRONMENTAL CHARACTERISTICS

This section lists pertinent environmental characteristics of the study area and provides a statement on the potential environmental impacts on each.

7.1 LOCALITY AND SURROUNDING LAND USE

The farm is located approximately 15 km southeast of Summerdown, centred on 21.5418 °S and 18.6018 °E. The D1638 road leading to Summerdown passes through the eastern parts of the farm. All adjacent properties are commercial farms. The adjacent properties are listed in the table below and their locations are depicted in Figure 7-1.

Table 7-1. Adjacent properties

Number on Map	Farm Name and Number
1	FML/00334/00001
2	Evare FML/00265
3	Meyerville FML/00825
4	Lawriesdale 1 FML/00338/00REM
5	Welgedacht FML/00593
6	Prinsfort FML/01044/00REM
7	Keilands FML/00334/00REM

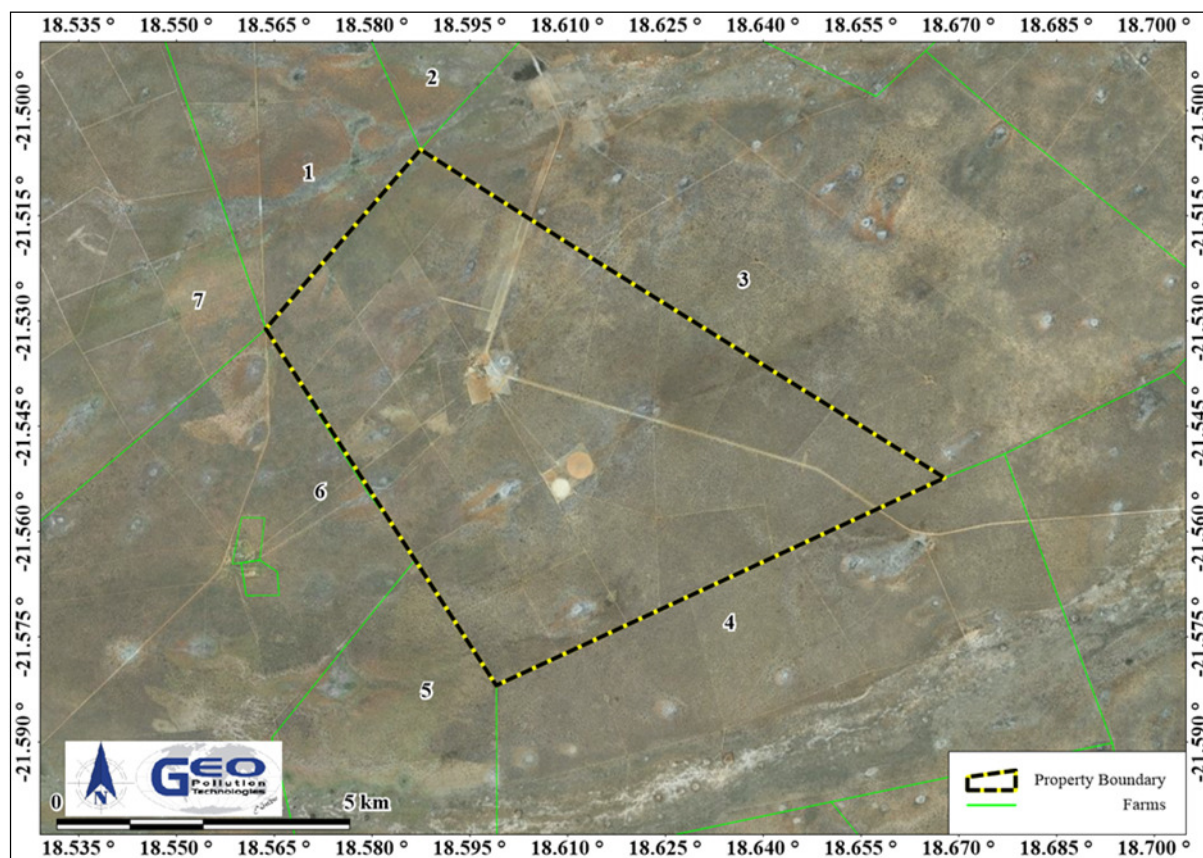


Figure 7-1. Properties adjacent to the project area

Implications and Impacts

The location is well suited for the agricultural activities. It is already zoned for agricultural use and is situated in an area suitable for irrigation. The farm is further surrounded by activities of similar nature. The farm will follow sustainable agricultural practices ensuring impacts on the surrounding land-users are minimised.

7.2 CLIMATE

The Omaheke Region, and thus the project location, is situated in the semi-arid Savanna Biome of Namibia. Due to a relatively uniform landscape, variation in climatic conditions in the Omaheke Region is limited. Long term climate data was obtained from Atlas of Namibia Project (2002) and the CHIRPS-2 database (Funk et al., 2015), see Table 7-2, Table 7-3 and Figure 7-2. Atlas of Namibia Project data was compiled from almost 300 rainfall stations across Namibia, the data was contoured in 50 mm intervals prior to 1999 for variable length data sets. The CHIRPS-2 dataset (Climate Hazards Group Infra-Red Precipitation with Station data version 2) consist of long term rainfall data (1981 to near-present) obtained from satellite imagery and in-situ station data.

Days are mostly warm with very hot days during the summer months, while nights are generally cool. The rain season normally starts in October and last until April, peaking in January and February. Heavier rainfall (single day events) occur between October and April, with a single event of 76 mm in April (last 39 years data) being the highest. This is an obvious anomaly with most of the single day maximums being less than 60 mm.

The average annual rainfall for the last 39 years was calculated as 388 mm/a, with a coefficient of variance of 30 % (Table 7-3). This coefficient of variance seem to correlate with Atlas of Namibia Project data (Table 7-2). Daily and seasonal rainfall data (Funk et al., 2015) is presented in Table 7-3. Seasonal (July to June) total rainfall, centred on the average line for the last 39 years, is presented, with the daily total rainfall and the seasonal cumulative rainfall.

From the figure it is clear that since 2010 to 2020 six seasons received above average rainfall, namely 2009-2010, 2010-2011, 2011-2012, 2013-2014, 2016-2017 and 2019-2020. The rest were all below average with the driest year (last 39 years data) being 2019, which is part of a dry period stretching from July 2017 until June 2019.

Table 7-2. Summary of climate data for the larger Otjinene area (Atlas of Namibia Project, 2002)

Precipitation	400-450
Variation in annual rainfall (%)	30-40
Average annual evaporation (mm/a)	2,800-3,000
Water deficit (mm/a)	1,501-1,700
Temperature (°C)	20-21

Table 7-3. Rainfall statistics (Funk et al., 2015)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minimum (mm)	15.9	22.9	17.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maximum (mm)	288.3	184.8	121.9	132.2	13.0	1.9	0.9	1.6	10.1	44.4	100.1	160.7
Average (mm)	86.9	82.3	66.2	34.3	1.7	0.1	0.0	0.1	1.8	12.1	37.4	65.0
Variability (%)	61.0	57.0	42.0	96.0	204.0	442.0	430.0	382.0	163.0	84.0	58.0	58.0
Daily maximum (mm)	41.2	34.0	51.1	76.1	10.3	1.1	0.9	1.6	5.1	10.4	19.7	37.9
Average rain days	10	9	6	2	0	0	0	0	1	3	6	8
Season July - June average: 388 mm				Season coefficient of variation: 30 %								
Data range	1981-Jul-01 to			2020-Jun-30				Lat: -21.5532°S Long: 18.6081°E				

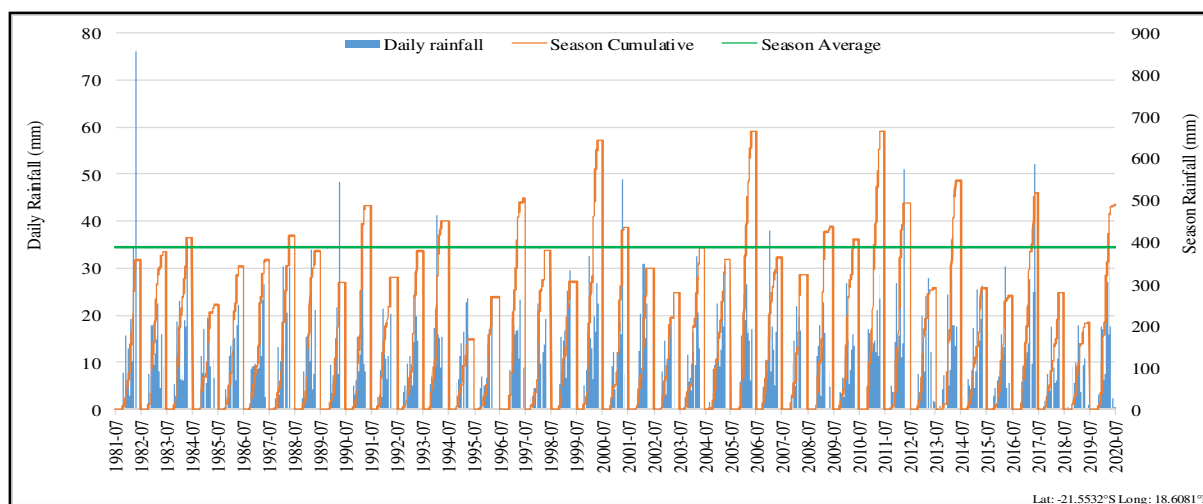


Figure 7-2. Daily and seasonal rainfall (Funk et al., 2015)

Implications and Impacts

Water is a scarce and valuable resource in Namibia. Rainfall events are often thunderstorms with heavy rainfall that can occur in short periods of time (“cloud bursts”). Rainfall in the area is above the Namibian average, but water remains a vulnerable resource. Heavy rainfall can lead to soil erosion when improper agricultural practises are employed.

The current drought conditions may impact on groundwater availability due to reduced aquifer recharge.

7.3 TOPOGRAPHY, DRAINAGE AND SOILS

The general topography of the project area can be described as relatively flat, with the elevation decreasing towards the east. Regional surface runoff is therefore generally directed toward the east. Due to the flat terrain, drainage is poorly developed in the area. Regionally, the project falls in the catchment of the Okavango River. Locally, surface runoff collects in the Alexest River, which is located about 7 km east of the project. Local drainage is therefore expected towards the east to the Alexest River. The Alexest River flows downstream into the Epukiro River which flows toward Lake Ngami south of the Okavango Delta.

A map showing inferred slope and surface drainage directions, as generated from Shuttle Radar Topography Mission (SRTM) 30 m data, can be seen in Figure 7-3. It should be noted that drainage are not as well developed as what the figure might present due to high infiltration rates and flat topography. The slope of the project area is mainly less than 5°. Topography and drainage is discussed in more detail within the hydrogeological specialist report.

The project area forms part of the Kalahari Sandveld landscape known for its palaeo dunes and pans, which can be observed in the larger study area. Longitudinal dunes typically orientated in a west to east direction may occur in the larger region.

The farm is situated within the Kal3-4 agro-ecological zone (AEZ) which is a Kalahari Sands Plateau characterised by stabilized sand drift with few pans (Figure 7-3). The average growing period is 61 to 90 days and it has a very short dependable growing period. The Kalk3-4 AEZ is ranked 4th in Namibia in terms of agricultural potential and is deemed most suitable for large stock grazing. The availability of groundwater and suitable soils does however allow for crop cultivation.

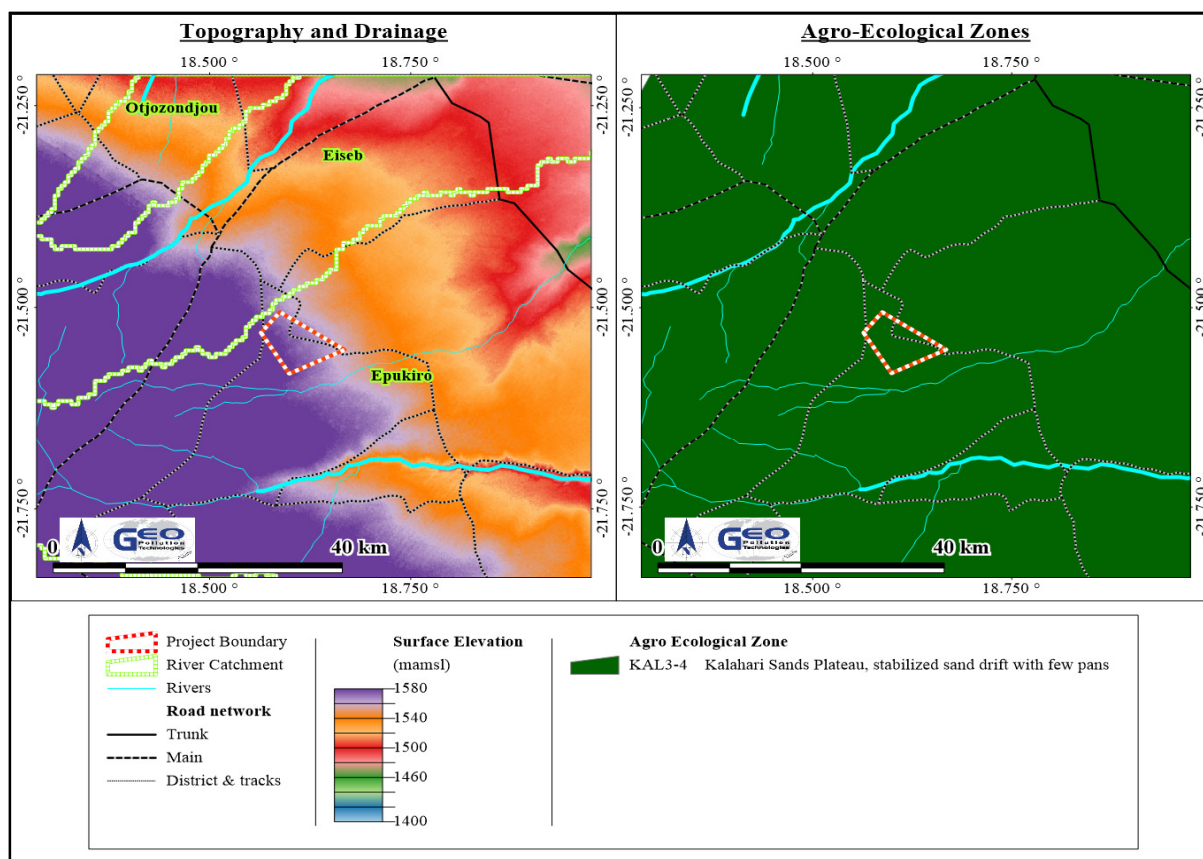


Figure 7-3. Topography, drainage and agro-ecological zones

The soils of the Kalahari Group can be locally classified as feralic Arenosols for the most of the area of the farm with only a small portion in the northern corner of the project comprising of eutric Fluvisols. Arenosols can be described as sandy soils with poor capacity to retain nutrients. These soils are common in arid and semi-arid environments and are associated with flat to undulating topography. Landforms associated with Arenosols are typically dunes, sand plains and sand ridges. Its parent material is aeolian sand.

Fluviosols are described as well drained fine to loamy sand. A Fluviosol is associated with flat to almost flat topography in drainage lines or valley bottoms. Its parent material is alluvial deposits. Figure 7-4 indicate the soil and surface geology of the project area. Surface geology is depicted as sand and calcrete.

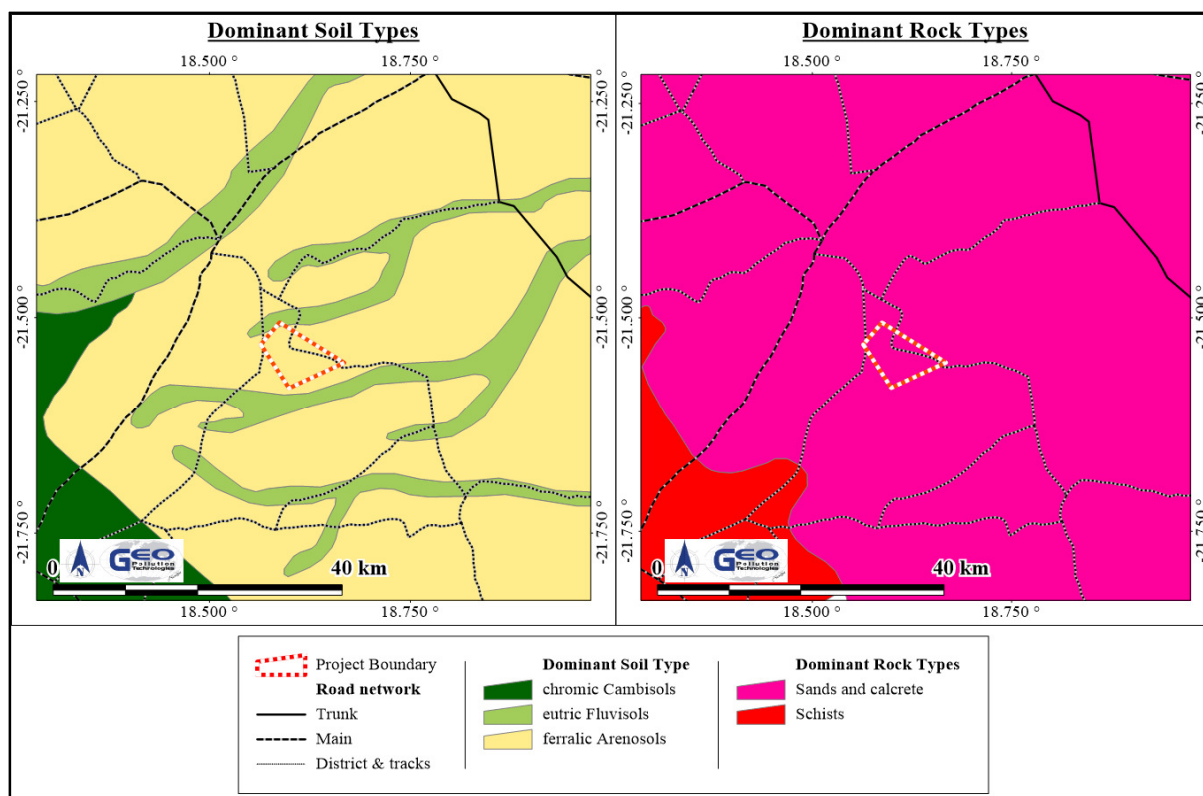


Figure 7-4. Dominant soil and rock types

Implications and Impacts

The lack of major surface runoff and drainage may lead to pooling and even flooding of plains during heavy rainfall events which may negatively impact soil quality and crop production.

Irrigation attempts outside of suitable areas may be less productive than alternatives such as livestock farming. This may lead to debushing and habitat destruction ultimately leading to desertification if farming on this land is ceased due to unproductivity. The production of wheat, maize and oats is ideal as a high value crop justifying the abstraction of groundwater for purposes of irrigation

7.4 GEOLOGY AND HYDROGEOLOGY

The regional stratigraphic succession of the project area can be divided into geology belonging to the Namibian Age (Damara Sequence), Cambrium Age and Late Cretaceous- to Quaternary Age (Kalahari Group). Kalahari Group surficial deposits occur as overburden of varying thickness over hard rock substrata. See Figure 7-5 for a map indicating the regional geology.

Although not indicated in Figure 7-5, Naudé (2012) inferred that a northern section of the project consist of pre-Damara geology as derived from derived from geophysical-, mapping- and drill-hole data. This geology typically comprise of gneiss, metagranite and granite.

However, it is inferred that rocks of the Damara Sequence predominantly make up the bedrock of the project. The Damara Sequence is divided into various tectonostratigraphic zones, the project area being within the Southern Zone. The Southern Zone is characterized as a low temperature-high pressure zone that locally contains formations comprising of schist, graphitic schist, quartzite, marble and calc-silicate of the undifferentiated Nosib and Swakop Group. Swakop Group granite intrusions also occur in the study area.

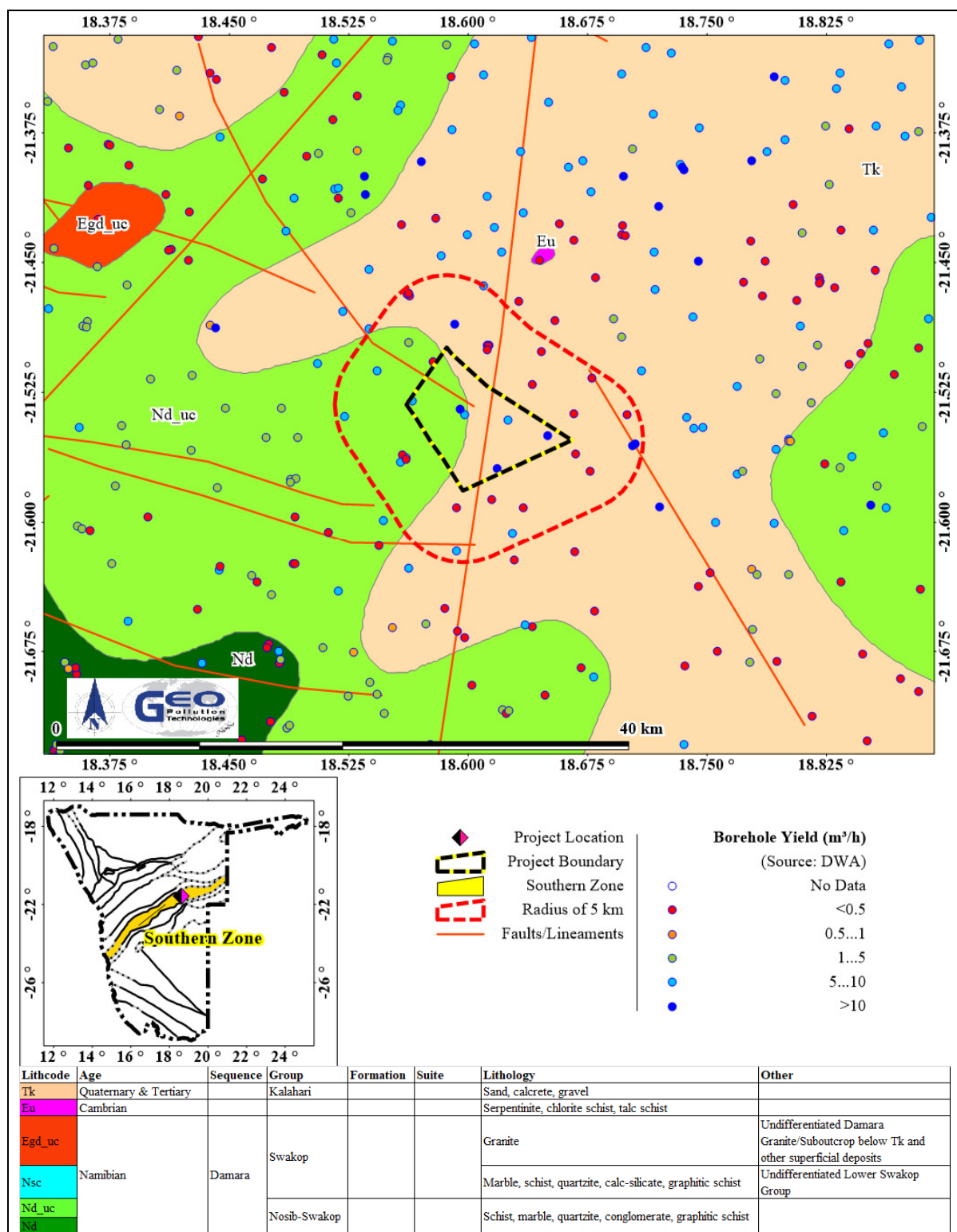


Figure 7-5. Regional geology map (GSN, scale 1:1,000,000)

Moderate folding of the Damara and Pre-Damara Sequence strata occurred during the Pan African Orogeny (680 - 450 Ma) and resulted in the formation of thrusts, synclines and anticlines. Rocks south of the Okahandja Lineament (about 60 km to the northwest) have isoclinal, overturned and thrust fold structures, which can be extended throughout the Southern Zone. Within the Southern Zone the foliation is mainly northwest-dipping, with a dip angle of 20° to 40° (Goscombe, et al. 2017). The development of joints and fractures in the rocks are associated with the folding, which have an impact on the hydrogeological parameters of the area.

A small extent of Cambrium Age geology comprising of serpentinite, chlorite schist and talc schist is mapped on farm Okasondana no. 264 about 10 km to the northeast of the project.

Late Cretaceous to Quaternary Age Kalahari Group deposits rest unconformably over older pre-Kalahari rock formations and consist of a wide range of terrestrial sediments. These sediments originate mainly from fluvial deposition with some reworking through aeolian processes. The expected thickness of the surficial deposits at the project farms is approximately 50 - 100 m (Klock, 2001).


For more detail on the geology refer to the hydrogeology specialist study conducted for this project.

Groundwater flow from the site can be expected from west to east. Local flow patterns may vary due to groundwater abstraction. Groundwater flow is expected to take place through primary porosity in the surface cover, while it is expected to flow along fractures, faults, dykes/mineralised faults or along contact zones (secondary porosity) and other geological structures present within the underlying formations (hard rock formations).

The farm occur in the Omaheke Groundwater Basin (Figure 7-6). It should be noted that this Groundwater Basin is a management basin and that the actual groundwater basins differ from these boundaries. The project area also falls in the Eiseb - Epukiro Catchment, see Figure 7-6. Groundwater in this catchment flow to the east toward the Northern Kalahari/Karoo Basin Transboundary Aquifer system stretching into Botswana.

According to the Ministry of Agriculture, Water and Forestry (MAWF, 2006) the project is located outside a water control area (Figure 7-6). Government therefore do not regulate groundwater usage in this area, e.g., drilling, cleaning or deepening of boreholes and rates of water abstraction. However all groundwater remains property of the government of Namibia.

Table 7-4. Groundwater statistics

Table 7-4: Groundwater Statistics												
Query Centre:		Springvale; -21.5532°S; 18.6081°E										
Query Box Radius: 5.0km												
		NUMBER OF KNOWN BOREHOLES	LATITUDE	LONGITUDE	DEPTH (m)	YIELD (m³/h)	WATER LEVEL (m)	WATER STRIKE (m)	TDS (ppm)	SULPHATE (ppm)	NITRATE (ppm)	FLUORIDE (ppm)
Data points		12			7	7	5	5	8	8	8	8
Minimum			-21.508204	18.559721	24	1	15	18	184	4	0	0
Average					52	12	16	18	345	12	6	0
Maximum			-21.598196	18.656479	129	32	18	20	771	50	38	1
Group A					71.43%	42.86%	0.00%	0.00%	100.00%	100.00%	87.50%	100.00%
Kamit					50	>10	10	10	1000	200	10	1.5
Group B					14.29%	42.86%	100.00%	100.00%	0.00%	0.00%	0.00%	0.00%
Kamit					100	>5	50	50	1500	600	20	2.0
Group C					14.29%	14.29%	0.00%	0.00%	0.00%	0.00%	12.50%	0.00%
Kamit					200	>0.5	100	100	2000	1200	40	3.0
Group D					0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Kamit					>200	<0.5	>100	>100	>2000	>1200	>40	>3

Statistical grouping of parameters is for ease of interpretation, except for the grouping used for sulphate, nitrate and fluoride, which follow the Namibian guidelines for the evaluation of drinking-water quality for human consumption, with regard to chemical, physical and bacteriological quality. In this case the groupings has the following meaning:

Group A: Water with an excellent quality

Group B: Water with acceptable quality

Group C: Water with low health risk

Group D: Water with a high health risk, or water unsuitable for human consumption.

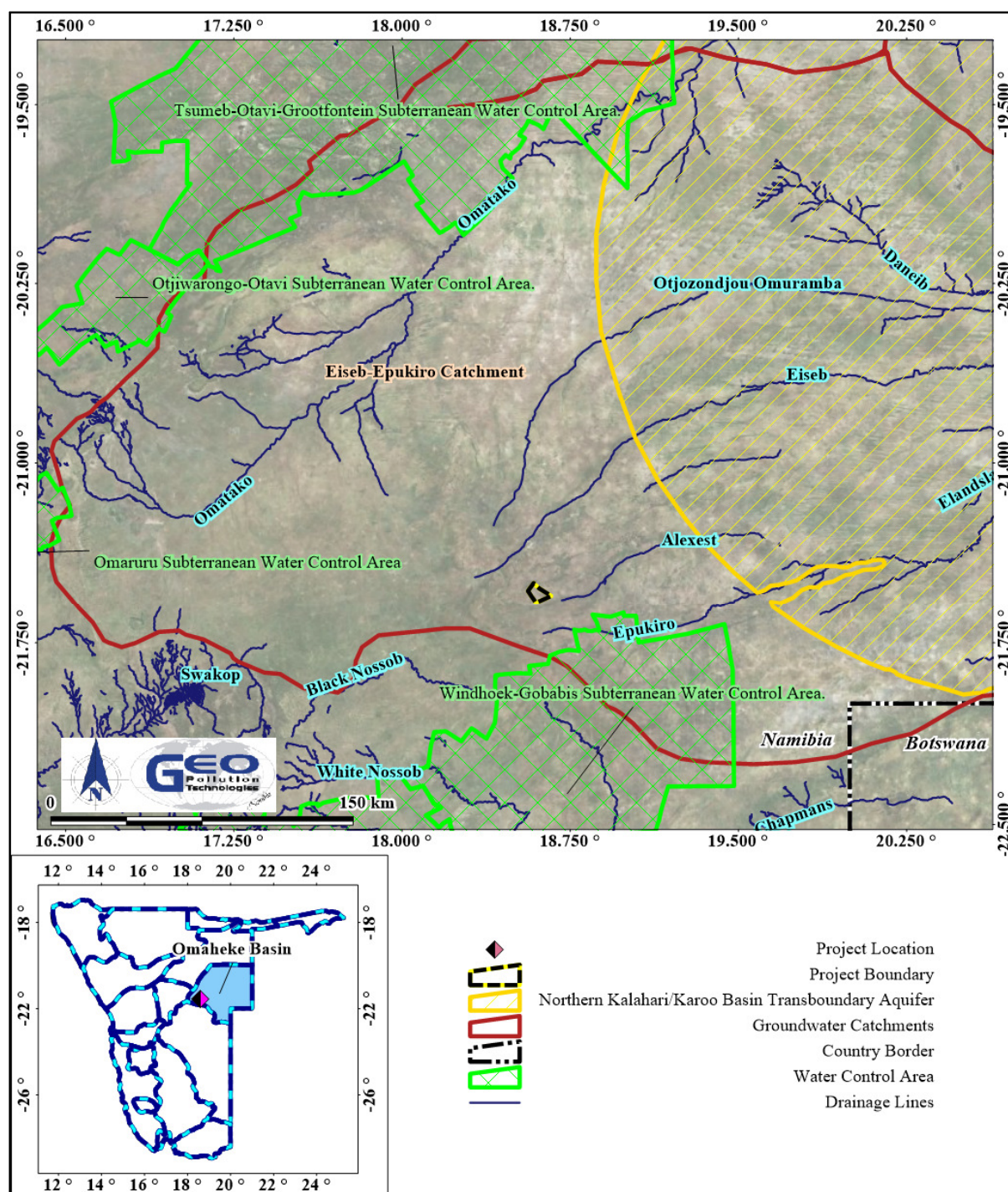


Figure 7-6. Groundwater catchments, water control areas and transboundary aquifer

Groundwater quality data is presented in Figure 7-7 as a Maucha Plot. From the figure it is clear that the groundwater of the project location is mostly of a calcium-magnesium-bicarbonate water type which suggest the water is recently recharged.

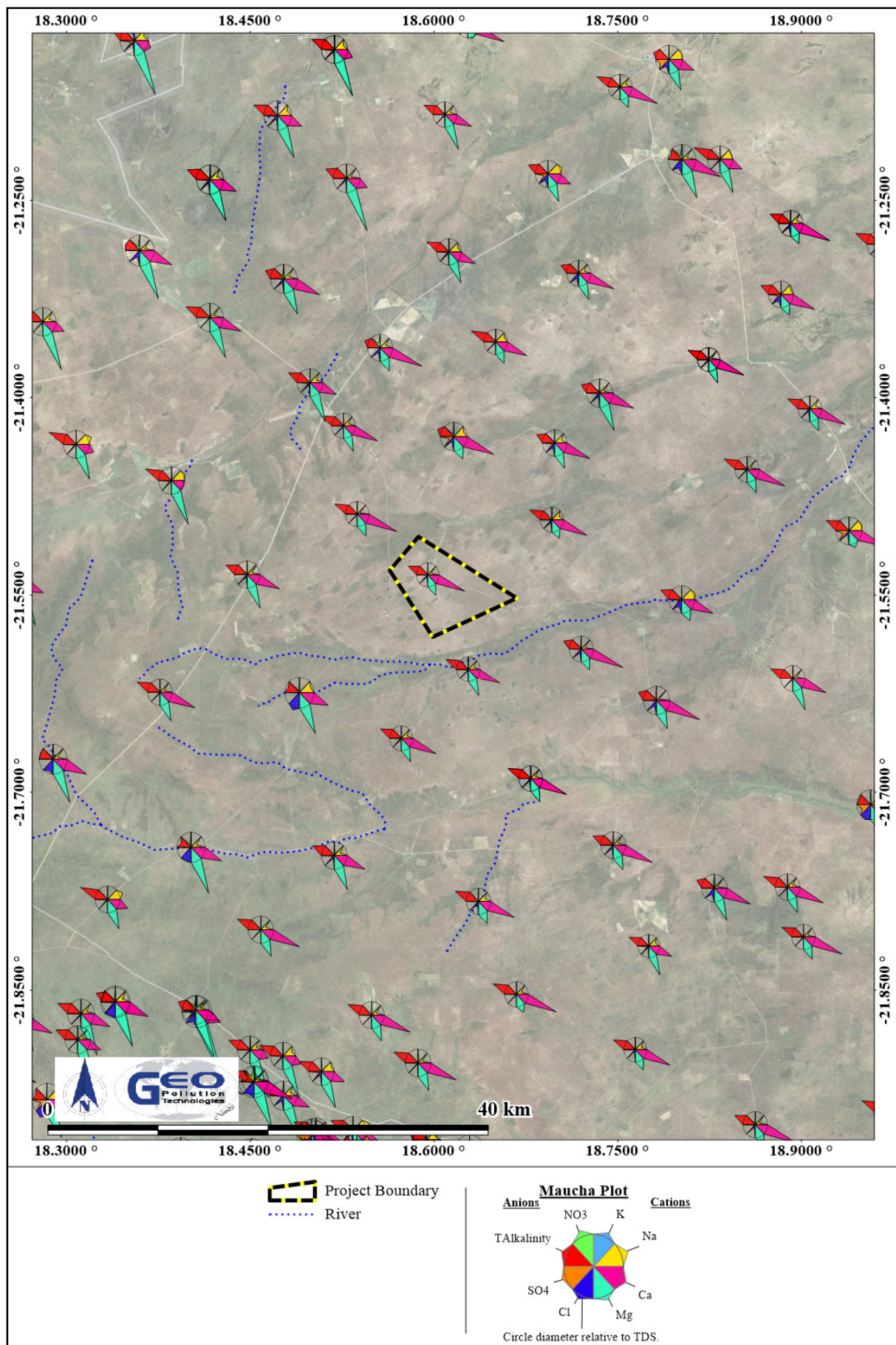


Figure 7-7. Groundwater quality

Implications and Impacts

A risk to groundwater pollution is expected due to the geological sensitivity of the area. Groundwater is utilized in the area and such users would be at risk if groundwater contamination occurs. Irresponsible irrigation methods like over-irrigation may result in higher demands for fertiliser, herbicides and pesticides, which in turn will increase nitrates, herbicide and pesticide concentration in the groundwater.

Over abstraction may also impact on other users of the aquifer.

7.5 PUBLIC WATER SUPPLY

Local communities are completely reliant on groundwater as a source of potable water supply. In the nearby settlement of Summerdown and surrounding farm owners supply their own water from various boreholes on their properties. These boreholes tap into the Omaheke groundwater basin, which falls outside of a water control area (permit area).

Implications and Impacts

Groundwater is a valuable resource in the area. Groundwater contamination may negatively impact surrounding boreholes, widely utilised for public water supply. No alternative water supply options exist if extensive contamination or deterioration of groundwater occur.

7.6 ECOLOGY

The project location is situated in the Savanna Biome with a Central Kalahari vegetation type and shrubland-woodland mosaic structure (Digital Atlas of Namibia, 2002). Vegetation diversity is medium to low with between 100 and 150 plant species (Digital Atlas of Namibia, 2002). The most common trees of the Central Kalahari vegetation type are *Acacia erioloba*, *Acacia mellifera*, *Tarchonanthus camphoratus*, *Grewia flava*, *Ozoroa paniculosa* and *Acacia hebeclada*. Low vegetation diversity is linked to lower animal diversity (Table 7-5), and for both the level of endemism is low. Based on the combined known endemism of selected higher taxa, not more than ten endemic species are expected (Figure 7-8). The farm falls within the 2118DA quarter degree square. An inventory of trees present in this quarter degree are presented in Appendix C and those with protected status or conservation concerns are presented in Table 7-6. Approximately 28 species of trees have been identified to occur in the area (number will vary depending on the presence of specific species of some alien genera) and three of these are specifically protected by forestry legislation. Four species have invasive tendencies typically associated with irresponsible land use practises such as overgrazing and two species are alien species that typically requires eradication where present.

Animal biodiversity inventories in Namibia are mostly focussed on vertebrates with stronger focus on mammals, reptiles and birds. Furthermore, inventories of animals are often associated with specific areas of interest or frequently travelled roads. Limited detailed information is available for the project area. Mammals of particular importance that may be encountered here include cheetah (*Acinonyx jubatus*), Aardwolf (*Proteles cristatus*), leopard (*Panthera pardus*) bat-eared fox (*Otocyon megalotis*) honey badger (*Mellivora capensis*) African wild dog (*Lycaon pictus*) and brown hyaena (*Hyaena brunnea*). Birds like the Lappet-faced vulture (*Torgos tracheliotus*), White-backed vulture (*Gyps africanus*), African spoonbill (*Platalea alba*), Pearl-spotted owl (*Glaucidium perlatum*), Wahlberg's eagle (*Aquila wahlbergi*) and Secretary bird (*Sagittarius serpentarius*) may be present in the area. A number of these mammals and birds are listed as threatened by extinction by the IUCN and include cheetahs, leopards and secretary birds (vulnerable), brown hyaena (near threatened), African wild dog, Lappet-faced vulture (endangered) and white-backed vulture (critically endangered) (IUCN 2020).

Table 7-5. General animal data (Digital Atlas of Namibia, 2002)

Plant Diversity	100-150 Species
Mammal Diversity	61 - 75 Species

Rodent Diversity	20 - 23 Species
Bird Diversity	111-140 Species
Reptile Diversity	61 - 70 Species
Snake Diversity	30 - 34 Species
Lizard Diversity	24 - 27 Species
Frog Diversity	8 - 11 Species
Termite Diversity	7 - 9 Genera
Scorpion Diversity	6 - 9 Species

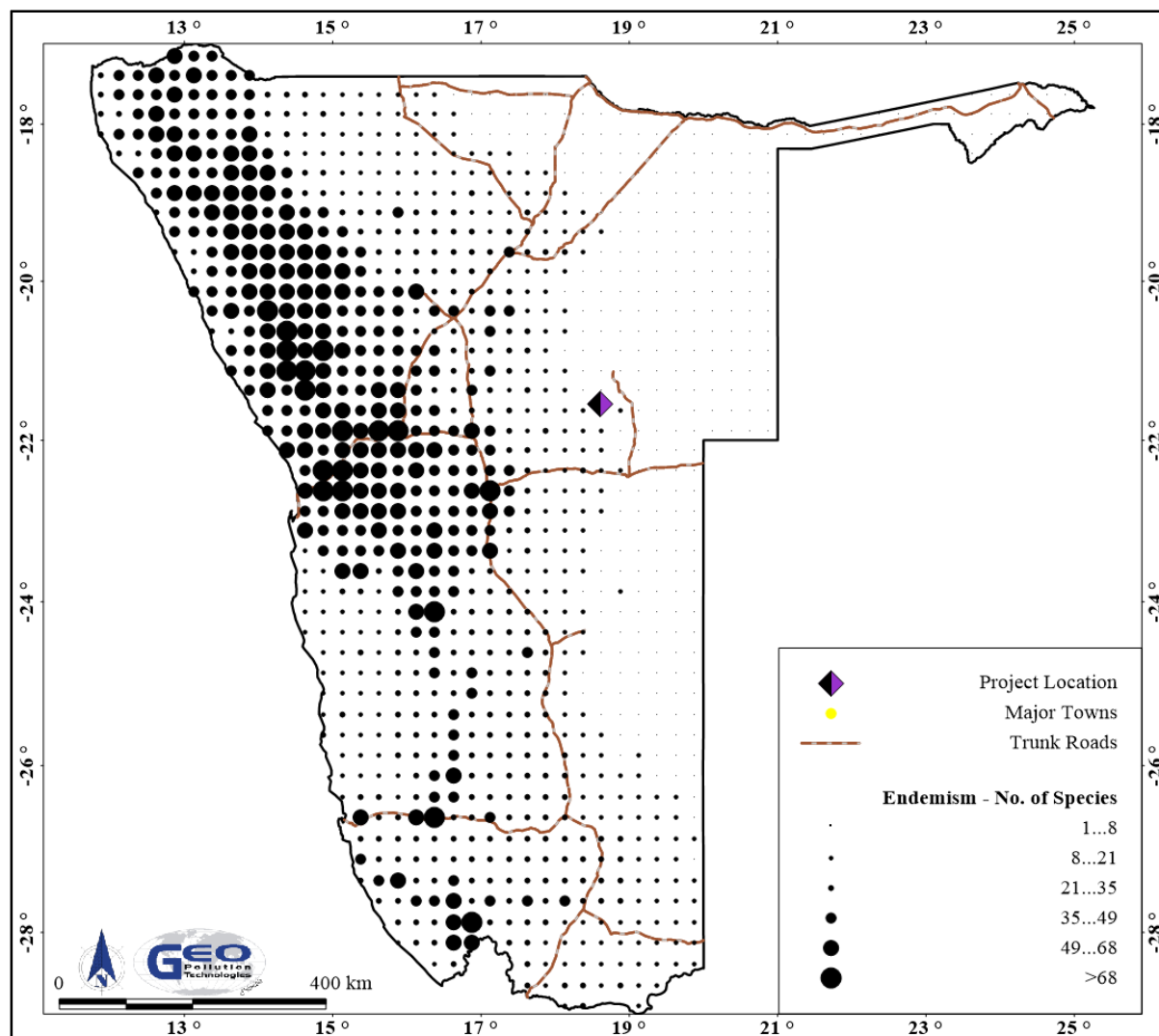


Figure 7-8. Combined higher taxa endemism in Namibia (Digital Atlas of Namibia, 2002)

Table 7-6. Trees with conservation concerns in quarter degree square 2118DA (Curtis & Mannheimer 2005)

Name	Common Name	Conservation Concerns
<i>Acacia erioloba</i>	Camel-thorn	Protected by forestry legislation
<i>Acacia mellifera</i> subsp <i>detinens</i>	Blue-thorn Acacia	Aggressive invader
<i>Acacia reficiens</i> subsp <i>reficiens</i>	Red-thorn	Very aggressive invader
<i>Boscia albitrunca</i>	Shepherd's Tree	Protected by forestry legislation
<i>Catophractes alexandri</i>	Trumpet-thorn; Rattlepod	Invasive in some areas

<i>Dichrostachys cinerea</i> subsp <i>africana</i>	Kalahari Christmas Tree; Sickle-bush	Invasive in some areas
<i>Melia azedarach</i>	Syringa	Alien and should be eradicated
<i>Ziziphus mucronata</i>	Buffalo-thorn	Protected by forestry legislation

Implications and Impacts

Agricultural activities of the Proponent have long been established. Poaching and illegal collection of plant and animal material may impact on the local environment. Pollution of the soil and groundwater by hazardous chemicals and/or the excessive use of fertilizers and pesticides may negatively impact the local ecology. Irresponsible use of pesticides to kill vermin such as jackal may further impact on already threatened vulture populations as well as other scavengers. Pesticides may also magnify (biomagnification) in higher trophic levels, especially top predators. This may lead to reproductive and other physiological defects and ultimately declining populations. Over-abstraction of groundwater may lead to ecosystem changes as groundwater levels decrease. Deep rooted terrestrial plants dependent on groundwater will dry out and eventually die.

7.7 DEMOGRAPHIC AND ECONOMIC CHARACTERISTICS

The project area is located in the Okorukambe Constituency of the Omaheke Region. It is located 10 km south of the Summerdown settlement. The constituency has a lower unemployment rate than the Omaheke Region and Namibia as a whole. Demographic information of the 2011 population and housing census is indicated in Table 7-7 (Namibia Statistics Agency, 2011), which includes the details for the Okorukambe Constituency in relation to the National and regional averages.

Table 7-7. Demographic characteristics of the Okorukambe Constituency, the Omaheke Region and Nationally (Namibia Statistics Agency, 2011)

	Okorukambe Constituency	Omaheke Region	Namibia
Population (Males)	5,498	37,217	1,021,912
Population (Females)	4,562	34,016	1,091,165
Population (Total)	10,060	71,233	2,113,077
Population density (people/km²)	0.5	0.8	2.6
Unemployment (15+ years)	29%	40%	37%
Literacy (15+ years)	65%	73%	89%

The Okorukambe Constituency relies heavily on the agricultural sector in terms of employment, with the sector being the largest contributor to the employment sector (Table 7-8). The economy of the area is built largely on commercial livestock farming supplemented with crop production and charcoal manufacturing. Unemployment is at 29% which is significantly lower than the nearby Otjinene Constituency's 48.9%.

Table 7-8. Main industry of employed population aged 15 years and above for the Okorukambe Constituency and Omaheke Region

Main industry	Omaheke Region	Okorukambe Constituency
Total	17,048	3,225
Agriculture Forestry and Fishing	7,692	2,096
Construction	1,236	289
Administrative and Support Service Activities	1,457	195
Public Administration and Defence	1,013	40
Activities of Private Households	1,145	167

The farming unit as a whole provide for a variety of employment opportunities. Although generally cattle farming is considered to use unskilled labour, some experience sharing is required to conduct certain tasks. Similarly, skills and training are required to maintain and operate the irrigation systems. The conservation agricultural systems are relatively unique and may be seen as a pioneering enterprise in Namibia. Skills and training related thereto are required from cultivation to marketing of the products. The farming unit as a whole provide 8 permanent and 10 seasonal job opportunities of which a portion receives training.

Implications and Impacts

Operations on the farm sustain valuable full time as well as seasonal employment opportunities in a constituency that has a high unemployment rate. Some skills development and training also benefit employees during the operational phase.

7.8 CULTURAL, HERITAGE AND ARCHAEOLOGICAL ASPECTS

There are no cultural, heritage or archaeological aspects known to be present on the farm.

Implications and Impacts

No implications or expected impacts.

8 PUBLIC CONSULTATION

Consultation with the public forms an integral component of an environmental assessment investigation and enables interested and affected parties (IAPs) e.g. neighbouring landowners, local authorities, environmental groups, civic associations and communities, to comment on the potential environmental impacts associated with projects and to identify additional issues that they feel should be addressed in the environmental assessment.

Public participation notices were advertised twice in two weeks in the national papers: The Republikein and the Namibian Sun on 05 and 12 August 2020. A site notice was placed on site and notification letters were e-mailed to neighbours. See Appendix D for proof of the public participation processes and registered IAPs. Various responses from interested and or affected parties were received. These are detailed in the issues and responses report (Appendix D).

9 MAJOR IDENTIFIED IMPACTS

During the scoping exercise, a number of potential environmental impacts were identified. The following section provides a brief description of the most important of these impacts.

9.1 SOIL AND GROUNDWATER CONTAMINATION

Soil and groundwater contamination are possible when large quantities of fertilizers or pesticides are applied. Excessive fertilizer use may result in increased soil nutrient levels (i.e. nitrogen, phosphorus and potassium), to a point that soil is regarded as contaminated. Similarly, pesticides can accumulate in soil at levels detrimental to biota. Fertilizers and pesticides can leach deeper into the ground and eventually reach and contaminate groundwater. Chemical spills, inclusive of fertilizers and pesticides, may result in very high but localised contamination of soil, increasing the risk of groundwater pollution if spill clean-up is not performed.

Hydrocarbon pollution, resulting from the spilling of fuel, oil or hydraulic fluids, is possible. Tractor and other vehicle breakdowns, or incorrect refuelling and storage of fuel, are the most likely causes of hydrocarbon pollution.

9.2 GROUNDWATER ABSTRACTION

Groundwater abstraction is a very sensitive topic in a dry country where the value of land is drastically reduced if no or unusable groundwater is present on the land. Abstraction of groundwater must be conducted in a sensible way to prevent impacts on other groundwater users

that depend on such groundwater. This includes water abstracted for human and animal use, irrigation, and also ecosystems that depend on groundwater. A typical groundwater balance was compiled to illustrate the potential consequences of over abstraction of groundwater, see Figure 9-1.

Recharge to the area is considered to be relatively high. In a typical groundwater environment, a water balance would consist of inflow and outflow of the groundwater system. Over time an equilibrium (or steady state) is normally reached with rising water tables following good recharge events and declining water tables when recharge is below average.

Inflow into the system would typically be from infiltration following rainfall in the area and in upstream areas. The inflow component will further be enhanced by the high secondary porosity nature of the alluvial sand and gravel aquifer.

Outflow would be comprised of water leaving the system through springs and as outflow over the lower boundary of the groundwater system, as well as evapotranspiration losses. Groundwater abstraction through boreholes is important as this is normally necessary to sustain human and animal demands where such users became essentially dependant on the abstracted groundwater as a reliable and sustainable source.

Typical consequences of over abstraction will include a lowering in the water table. This may lead to the drying up of boreholes and springs. Vegetation will be impacted where such vegetation has access to groundwater. It is important to note that the groundwater basin forms a transboundary aquifer that extent from Namibia into Botswana. Over abstraction in any of the countries will have a negative impact on the other countries and can causes disputes. As the groundwater flows from the recharge area in Namibia, out to Botswana, care must be taken in Namibia to ensure that the quality of water is not affected as this will later on affect the neighbouring country.

Based on current water level fluctuations in the area, as presented in the specialist hydrogeology report, a short term threshold of 5 m below the long term average water level is set from where abstraction rates should be reduced. Note that this level refers to rest water levels and not pump water levels.

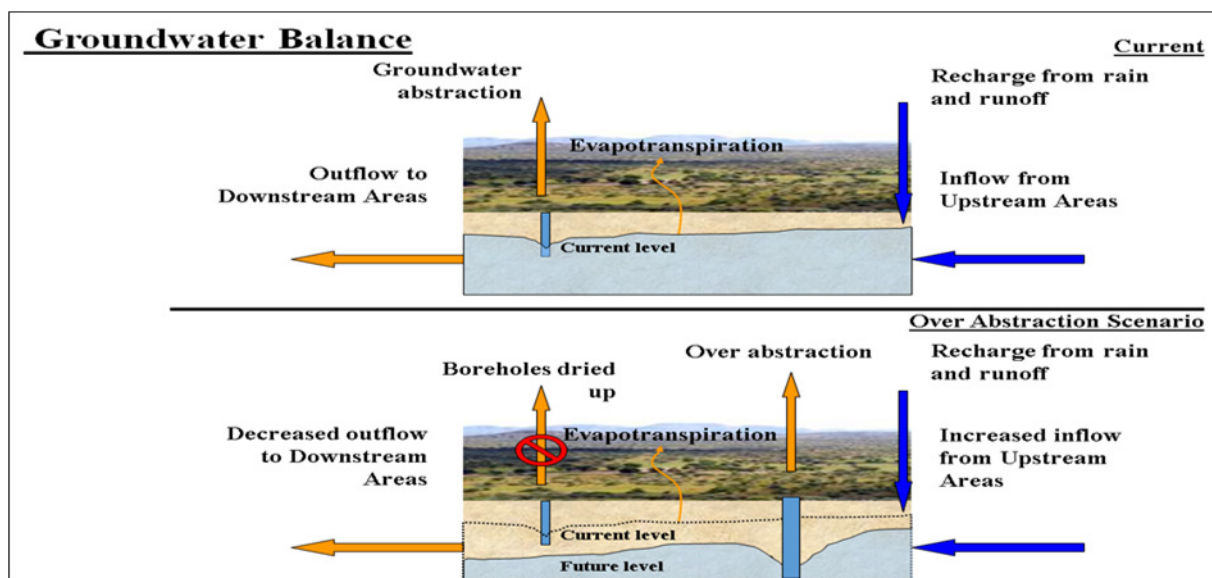


Figure 9-1. Conceptual groundwater balance with over abstraction scenario

9.3 FIRE

A risk of veld fires exist. Fires, used for example to cook food in areas not designated for this purpose, may spread to the nearby veld. Machinery can ignite dry vegetation if sufficient heat (e.g. exhaust pipes) or sparks are produced. Chemicals and fuels stored and used for general activities may be flammable. Electrical shorts on the electricity supply network can cause fires

in buildings. Improper burning of waste and discarding of cigarettes. Lightning can be a natural ignition source for veld fires which in turn can spread and damage infrastructure and crops or pose health impacts.

9.4 HEALTH AND SAFETY

Injuries related to working with machinery (e.g. moving parts), chemicals, pesticides, etc. can occur. Inhalation and dermal contact with pesticides are possible where pesticides are for example applied by means of tractor mounted sprayers or via the irrigation system. Spray drift in windy conditions can reach nearby workers or the tractor driver. Vehicle accidents involving staff when transported to and from work, or during movement of machinery like tractors on the farm, can occur. Venomous animals like snakes, scorpions and spiders may be present.

9.5 ECOSYSTEM AND BIODIVERSITY IMPACT

No additional land clearing is foreseen for irrigation fields in the near future. Poaching and illegal collection of plant and animal material by staff and/or non-staff members is possible. Pollution of the environment and groundwater, especially by fuel, pesticides and fertilizers, can deteriorate or alter the ecosystem structure and function. Irresponsible pesticide use may negatively impact ecology in the short and long term.

9.6 SOCIO-ECONOMIC IMPACTS

The project contribute to food security at a national level and contribute towards a positive trade balance by exporting produce and livestock. Permanent employees and seasonal employees work on the farm. Housing and amenities are available to permanent employees and their families. Proper sanitation facilities are present for all workers.

Existing and planned developments typically entice jobseekers to migrate to the area. This may lead to high levels of unemployment and its associated social ills. This include increased spread of HIV/AIDS and other diseases, alcohol or drug abuse, and theft or violence.

10 ASSESSMENT AND MANAGEMENT OF IMPACTS

The purpose of this section is to assess and identify the most pertinent environmental impacts that are expected from the operational, construction, care and maintenance, and potential decommissioning activities of the farm. An EMP based on these identified impacts is present in this section.

For each impact, an environmental classification was determined based on an adapted version of the Rapid Impact Assessment Method (Pastakia, 1998). Assessment of impacts is based on the following categories: importance of condition (A1); magnitude of change (A2); permanence (B1); reversibility (B2); and cumulative nature (B3) (Table 10-1).

The environmental classification is calculated as follows:

$$\text{Environmental classification} = A1 \times A2 \times (B1 + B2 + B3)$$

The environmental classifications of impacts and the respective classes are provided in Table 10-2.

The probability ranking refers to the probability that a specific impact will happen following a risk event. These can be improbable (low likelihood); probable (distinct possibility); highly probable (most likely); and definite (impact will occur regardless of prevention measures).

Table 10-1. Assessment criteria

Criteria	Score
Importance of condition (A1) – assessed against the spatial boundaries of human interest it will affect	
Importance to national/international interest	4
Important to regional/national interest	3
Important to areas immediately outside the local condition	2
Important only to the local condition	1

No importance	0
Magnitude of change/effect (A2) – measure of scale in terms of benefit/disbenefit of an impact or condition	
Major positive benefit	3
Significant improvement in status quo	2
Improvement in status quo	1
No change in status quo	0
Negative change in status quo	-1
Significant negative disbenefit or change	-2
Major disbenefit or change	-3
Permanence (B1) – defines whether the condition is permanent or temporary	
No change/Not applicable	1
Temporary	2
Permanent	3
Reversibility (B2) – defines whether the condition can be changed and is a measure of the control over the condition	
No change/Not applicable	1
Reversible	2
Irreversible	3
Cumulative (B3) – reflects whether the effect will be a single direct impact or will include cumulative impacts over time, or synergistic effect with other conditions. It is a means of judging the sustainability of the condition – not to be confused with the permanence criterion.	
Light or No Cumulative Character/Not applicable	1
Moderate Cumulative Character	2
Strong Cumulative Character	3

Table 10-2. Environmental classification (Pastakia 1998)

Environmental Classification	Class Value	Description of Class
72 to 108	5	Extremely positive impact
36 to 71	4	Significantly positive impact
19 to 35	3	Moderately positive impact
10 to 18	2	Less positive impact
1 to 9	1	Reduced positive impact
0	-0	No alteration
-1 to -9	-1	Reduced negative impact
-10 to -18	-2	Less negative impact
-19 to -35	-3	Moderately negative impact
-36 to -71	-4	Significantly negative impact
-72 to -108	-5	Extremely Negative Impact

10.1 RISK ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PLAN

The EMP provides management options to ensure impacts of the agricultural and related activities on the farm are minimised. An EMP is a tool used to take pro-active action by addressing potential problems before they occur. This should limit corrective measures needed, although additional mitigation measures might be included if necessary. The environmental management measures are provided in the tables and descriptions below. These management measures should be adhered to during the execution of various activities on the farm. This section of the report is also presented as a stand-alone document for easy reference. All personnel taking

part in the operations of the farm should be made aware of the contents of this section, so as to plan the operations accordingly and in an environmentally sound manner.

The objectives of the EMP are:

- ◆ to include all components related to operational and possible construction activities of the farm;
- ◆ to prescribe the best practicable control methods to lessen the environmental impacts associated with the farm;
- ◆ to monitor and audit the performance of operational personnel in applying such controls; and
- ◆ to ensure that appropriate environmental training is provided to responsible operational personnel.

Various potential and definite impacts will emanate from the operations, maintenance/construction and decommissioning phases. The majority of these impacts can be mitigated or prevented. The impacts, risk rating of impacts, as well as prevention and mitigation measures are listed below.

As depicted in the tables below, impacts related to the operational phase are expected to mostly be of medium to low significance and can mostly be mitigated to have a low significance. The extent of impacts are mostly site specific to local and are not of a permanent nature. Due to the nature of the surrounding areas, cumulative impacts are possible and the most important of these are potential groundwater and biodiversity/ecological impacts.

10.1.1 Planning

During the phases of planning for the operations, maintenance/construction and decommissioning phases of the farms, it is the responsibility of proponent to ensure they are and remain compliant with all legal requirements. The proponent must also ensure that all required management measures are in place prior to, and during all phases, to ensure potential impacts and risks are minimised. The following actions are recommended for the planning phase and should continue during all other phases of the project:

- ◆ Ensure that all the necessary permits from the various ministries, local authorities and any other bodies that governs the operations, maintenance/construction and decommissioning activities on the farms remain valid. This includes the consumer fuel installation certificate.
- ◆ Ensure all appointed contractors and employees enter into an agreement, which includes the EMP. Ensure that contractors, sub-contractors, employees and all personnel present on site understand the contents of the EMP.
- ◆ Make provisions to have a Health, Safety and Environmental (HSE) Coordinator to implement the EMP and oversee occupational health and safety as well as general environmental related compliance.
- ◆ Have a system in place to deal with complaints, keeping record thereof and allowing for a grievance mechanism.
- ◆ Have the following emergency plans, equipment and personnel on site, where reasonable, to deal with all potential emergencies:
 - EMP, risk management plan, emergency response plan and HSE manuals;
 - Adequate protection and indemnity insurance cover for incidents;
 - Procedures, equipment and materials required for emergencies (e.g. firefighting, first aid, etc.).
- ◆ Establish and maintain a fund for future ecological restoration, specifically for instances of environmental damage caused during operations including pollution remediation where required. Should project activities cease completely, and future land-use will not involve agriculture, the funds should be utilised to remove all redundant infrastructure and waste.
- ◆ Establish and/or maintain a reporting system to report on aspects of operations, maintenance/construction, and decommissioning as outlined in the EMP. Keep monitoring reports on file for bi-annual submission to MEFT in support of environmental clearance certificate renewal applications. This is a requirement by MEFT.
- ◆ Appoint a specialist environmental consultant to update the environmental assessment and EMP and apply for renewal of the environmental clearance certificate prior to expiry.

10.1.2 Skills and Development

During the operations and maintenance/construction phases, some training is provided to a portion of the workforce, to allow them to conduct certain tasks according to the required standards. Training include safety and technical aspects. Skills are transferred to an unskilled workforce for general tasks and irrigation system operation and management. Development of people and technology are key to economic development and the success of operations. The Proponent plays a role in promoting and sustaining the agricultural industry.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Employment and transfer of skills, technological advancements	2	1	2	3	1	12	2	Probable
Daily Operations	Employment and transfer of skills	2	1	2	3	2	14	2	Definite
Indirect Impacts	Employment and transfer of skills in Namibia's agricultural sector	2	1	2	3	3	16	2	Definite

Desired Outcome: To see an increase in skills of local Namibians, as well as development and technological advancements in the agricultural industry.

Actions

Enhancement:

- ◆ Sourcing of employees and contractors must first be at local level and if not locally available, regional or national options should be considered. Deviations from this practice must be justified.
- ◆ Inform employees about parameters and requirements for references upon employment.
- ◆ Provide managerial references for unofficial training or skills transfer.

Responsible Body:

- ◆ Proponent

Data Sources and Monitoring:

- ◆ Keep records of all training provided to employees.
- ◆ Ensure that all training is certified or managerial references provided (proof provided to the employees) inclusive of training attendance, completion and implementation.

10.1.3 Revenue Generation and Employment

Skilled and unskilled labour are required for the operations and maintenance/construction activities associated with the farms. Livelihoods are thus sustained and the spending power of the local community increased. Revenue is generated through the sale of products (maize, wheat and cattle,) on national and international markets.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Employment and contribution to local and national economy	2	1	2	2	2	12	2	Definite
Daily Operations	Employment contribution to local and national economy	2	1	3	3	1	14	2	Definite
Indirect Impacts	Decrease in unemployment, contribution to local economy	3	1	3	3	3	27	3	Definite

Desired Outcome: Contribution to national treasury and provision of employment to local Namibians.

Actions

Enhancement:

- ◆ The proponent must employ local Namibians where possible.
- ◆ If the skills exist locally, employees must first be sourced from the area, then the region and then nationally.
- ◆ Deviations from this practice must be justified.

Responsible Body:

- ◆ Proponent

Data Sources and Monitoring:

- ◆ Employee remuneration records be kept.

10.1.4 Demographic Profile and Community Health

Farming activities rely on labour. Jobseekers migrating to the Summerdown area may lead to increased unemployment and expansion of informal settlements. Here, factors such as communicable disease like HIV/AIDS as well as alcoholism and drug abuse may thrive. These are typically aggravated when an influx of seasonal workers, and possible foreign construction teams and contractors, occur. An increase in foreign people in the area, linked to unemployment, may potentially increase the risk of criminal and socially/culturally deviant behaviour. It is however not foreseen that the project will result in significant migration to the Summerdown settlement.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	In-migration and social ills related to foreign contractors temporarily on site	2	-1	1	1	2	-8	-1	Probable
Daily Operations	Social ills possibly associated with staff and jobseekers	2	-1	1	2	2	-10	-2	Probable
Indirect Impacts	The spread of disease	2	-1	2	2	2	-12	-2	Improbable

Desired Outcome: To prevent the occurrence of social ills and prevent the spread of diseases such as HIV/AIDS.

Actions:

Prevention:

- ◆ Appointment of reputable contractors where applicable.
- ◆ Adhere to all local authority by-laws relating to environmental health, which includes, but is not limited to, sanitation requirements for employees.
- ◆ Provide educational, awareness information for employees on various topics of social behaviour and HIV/AIDs.
- ◆ Disciplinary steps, within the legal parameters of Namibia, to be taken for socially deviant behaviour at the employee-housing compound or during working hours should be clearly stipulated in employment contracts.

Mitigation:

- ◆ Take disciplinary action against employees not adhering to contractual agreements with regard to socially deviant behaviour (e.g. alcohol or drug abuse during working hours).

Responsible Body:

- ◆ Proponent

Data Sources and Monitoring:

- ◆ Summary report based on educational programmes and training conducted.
- ◆ Employee contracts on file.
- ◆ Employee remuneration records be kept.

10.1.5 Agricultural Produce

The project is in line with the objectives of Namibia's NDP5 and related implementation plans and strategies. It contributes to the economy of, and food security in, Namibia. It employs mechanised and conservation agriculture technologies. Locally produced crops decrease the amount of crops that needs importing and increases food security in Namibia. Production of crops and cattle for export to international markets strengthens the Namibian economy.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction and Daily Operations	Contribution to economy, contribution to food security in Namibia	3	1	3	3	2	24	3	Definite
Indirect Impacts	Reduced import needs, increase in trade balance, spread of knowledge and skills, increased crop productivity	3	1	3	3	3	27	3	Definite

Desired Outcome: Maximum contribution to the food security and economy of Namibia. Provide a positive contribution to the trade balance of Namibia by reducing the amount of imported produce and exporting products.

Actions:

Enhancement:

- ◆ Train employees on sustainable farming practices to enable the spread of knowledge and skills and thereby increase the productivity of small-scale farming as well.
- ◆ Diversification and continuous improvement to maximise sustainability of the farm.

Responsible Body:

- ◆ Proponent

Data Sources and Monitoring:

- ◆ Recording of educational programmes and training conducted.

10.1.6 Health, Safety and Security

Daily operational and intermittent maintenance and construction activities on the farm are reliant on human labour. Such activities have varying degrees of health and safety risks. Examples include the operation of vehicles and machinery with moving parts, such as harvesters and the handling of hazardous chemicals with inherent health hazards, such as pesticides and fuel, when ingested, inhaled or physical contact occur. Encounters with wild animals, and especially venomous species like snakes, may pose risks to employees. Security risks relates to unauthorized entry on the farms, theft and sabotage.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Physical injuries, exposure to chemicals and criminal activities	1	-2	3	3	1	-14	-2	Probable
Daily Operations	Physical injuries, exposure to chemicals and criminal activities	1	-2	3	3	2	-16	-2	Probable

Desired Outcome: To prevent injury, health impacts and theft.

Actions

Prevention:

- ◆ Implement and maintain an integrated health and safety management system, to act as a monitoring and mitigating tool.
- ◆ Comply with all health and safety standards as specified in the Labour Act and related legislation.
- ◆ Clearly label dangerous and restricted areas as well as dangerous equipment and products.
- ◆ Lock away or store all equipment and goods on site in a manner suitable to discourage criminal activities (e.g. theft).
- ◆ Provide all employees with required and adequate personal protective equipment (PPE) where required.
- ◆ Ensure that all personnel receive adequate training on the operational procedures of equipment and machinery and the handling of hazardous substances.
- ◆ Train selected personnel in first aid and ensure first aid kits are available on site.
- ◆ The contact details of all emergency services must be readily available.
- ◆ Implement a maintenance register for all equipment whose malfunction can lead to injury or exposure to hazardous substances.
- ◆ Apply and adhere to all industry specific health and safety procedures and regulations applicable to the handling of food produce for markets.

Mitigation:

- ◆ Treat all minor work related injuries immediately and obtain professional medical treatment if required.
- ◆ Assess any safety problems and implement corrective action to prevent future occurrences.

Responsible Body:

- ◆ Proponent
- ◆ Contractors

Data Sources and Monitoring:

- ◆ Record any incidents with the actions taken to prevent future occurrences.
- ◆ Record all training which was conducted and when safety equipment and structures were inspected and maintained.

10.1.7 Fire

Fires may be ignited in a number of ways. Lightning can be a natural ignition source for veld fires, which in turn can spread and damage infrastructure and crops or pose health impacts. Failing electrical infrastructure and fires outside of designated areas may increase the risk of the occurrence of uncontrolled fires which may spread into the nearby fields and surrounding farms. Similarly machinery can ignite dry vegetation if sufficient heat (e.g. exhaust pipes) or sparks are produced. Chemicals and fuels stored and used for general activities may be flammable. Improper waste burning or discarding of cigarette buds further increases fire risks.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Fire risk	2	-2	2	2	1	-20	-3	Probable
Daily Operations	Fire risk	2	-2	2	2	1	-20	-3	Probable

Desired Outcome: To prevent property damage, veld fires, possible injury and impacts caused by uncontrolled fires.

Actions:

Prevention:

- ◆ Prepare a holistic fire protection and prevention plan. This plan must include evacuation plans and signage, an emergency response plan and a firefighting plan.
- ◆ Personnel training (safe operational procedures, firefighting, fire prevention and responsible housekeeping practices).
- ◆ Ensure all flammable chemicals are stored according to material safety data sheet (MSDS) and SANS instructions and all spills or leaks are cleaned immediately.
- ◆ Maintain regular site, mechanical and electrical inspections and maintenance.
- ◆ Maintain firefighting equipment and promote good housekeeping.
- ◆ Notify the farmers' association as well as all surrounding farmers if planned burns (e.g. to create firebreaks) are planned.
- ◆ Allow fires used for purposes such as cooking (by staff) in designated areas only.

Mitigation:

- ◆ Implement the fire protection and firefighting plan in the event of a fire.
- ◆ Quick response time by trained staff will limit the spread and impact of fire.

Responsible Body:

- ◆ Proponent

Data Sources and Monitoring:

- ◆ Maintain a register of all incidents is. Include measures taken to ensure that such incidents do not repeat themselves.
- ◆ Record when fire drills were conducted and when firefighting equipment were tested and training given.

10.1.8 Noise

Noise is generated by various operational and possible construction/maintenance activities. Machinery like grinders and hammers cause elevated noise levels that may result in hearing impairment after long term exposure. Activities are generally remote from receptors other than the Proponent, his employees and their families residing on the farms. The nature of the noise is related to typically operations on a farm with elevated noise levels being of short duration.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Excessive noise generated from construction activities – nuisance and hearing loss	1	-1	2	2	1	-10	-1	Probable
Daily Operations	Noise generated from the operational activities – nuisance and hearing loss	1	-1	2	2	1	-10	-1	Definite

Desired Outcome: To prevent any nuisance and hearing loss due to noise generated.

Actions

Prevention:

- ◆ Follow World Health Organization (WHO) guidelines on maximum noise levels (Guidelines for Community Noise, 1999) to prevent hearing impairment.
- ◆ Regularly service all machinery to ensure minimal noise production.

Mitigation:

- ◆ Hearing protectors as standard PPE for workers in situations with elevated noise levels.

Responsible Body:

- ◆ Proponent

Data Sources and Monitoring:

- ◆ WHO Guidelines.
- ◆ Maintain a complaints register.
- ◆ Record any complaints and actions taken to address complaints and prevent future occurrences.

10.1.9 Waste Production

Various waste streams result from the operational and possible construction and maintenance activities. Waste may include hazardous waste associated with hydrocarbon products and chemicals, as well as soil and water contaminated with such products. Construction/maintenance waste may include building rubble and discarded material and equipment. Domestic waste will be generated by the residents and employees on the farm. Waste presents a contamination risk and when not removed regularly may become a health and/or fire hazard and attract wild animals and scavengers. Sewage is a form of liquid biological waste that needs disposal. Since no official waste disposal facilities, especially for hazardous waste, are available, all waste that cannot be re-used are burned at dedicated waste sites.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Excessive waste production, littering, illegal dumping, contaminated materials	1	-2	2	2	2	-12	-2	Definite
Daily Operations	Excessive waste production, littering, contaminated materials	1	-2	2	2	2	-12	-2	Definite

- Implement waste reduction measures. All waste that can be re-used/recycled must be kept separate.
- Ensure adequate temporary storage facilities for disposed waste are available.
- Prevent windblown waste from entering the environment.
- Prevent scavenging (human and non-human) of waste at the storage facilities.
- Train employees on the importance of proper waste handling and disposal in the professional and domestic setting.

Mitigation:

- Alternative waste disposal methods should be investigated for hazardous waste or waste that present specific pollution risks. This include transporting such wastes to recyclers in Windhoek when empty trucks travel there to collect goods.
- Discarded waste should be disposed of and burned regularly to reduce health and pollution risks.
- Empty chemical containers that may present a contamination/health risk must be treated as hazardous waste. Workers should not be allowed to collect such containers for purposes of storing water or food. This can be achieved by puncturing or crushing such containers prior to disposal.
- Ensure all ablution facilities are connected to properly constructed effluent treatment systems to prevent groundwater contamination.

Responsible Body:

- Proponent

Data Sources and Monitoring:

- Maintain a register of disposal of hazardous waste. This should include type of waste, volume as well as disposal method/facility.
- Record any complaints received regarding waste with notes on actions taken.

10.1.10 Ecosystem and Biodiversity Impact

Agriculture and related activities are ongoing at the farms and no expansion is foreseen in the nearby future. However, should the current environmental investigation and operations prove operations and water abstraction feasible, and expansion of current operations may be considered. Such expansion may be included in areas already debused. No further impacts on vegetation are thus expected from additional land clearing. Pollution of the environment may however impact on the ecosystem and biodiversity. Poaching and illegal collection of plant and animal materials may occur. Irresponsible pesticide use, for example as method of vermin control, may impact on scavengers such as vultures and in the long run on top predators through biomagnification in higher trophic levels.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Impact on fauna and flora. Loss of biodiversity	2	-1	3	2	2	-14	-2	Probable
Daily Operations	Impact on fauna and flora. Loss of biodiversity – poaching, poisoning, etc.	2	-1	2	2	2	-12	-2	Probable

Actions.

Prevention:

- ◆ Strictly adhere to pesticide application instructions and use pesticides only for the purposes for which it is registered and marketed. Importantly, pesticides should not be used to kill vermin unless specifically registered for that purpose, and even then alternative, environmentally friendly methods should be investigated and used.
- ◆ Prevent pesticides from ending up in the hands of potential poachers.
- ◆ Educate all contracted and permanent employees on the value of biodiversity and strict conditions prohibiting harvesting and poaching of fauna and flora must be part of employment contracts. Include prohibitions or regulations on the collection of firewood.
- ◆ Regular inspection of fences, game footpaths and other sites for snares, traps or any other illegal activities.
- ◆ Over-abstraction of groundwater may potentially have devastating effects on plant and animal populations reliant on it. This include the drying up of springs, dying of trees and migration or dying of animals.

Mitigation:

- ◆ For construction/maintenance activities, if any, contain construction material to a designated laydown area and prevent unnecessary movement out of areas earmarked for clearing and construction.
- ◆ Report any extraordinary animal sightings to the Ministry of Environment, Forestry and Tourism.
- ◆ Mitigation measures related to waste handling and the prevention of groundwater, surface water and soil contamination should limit ecosystem and biodiversity impacts.
- ◆ Avoid scavenging of waste by fauna.
- ◆ Take disciplinary action against any employees failing to comply with contractual conditions related to poaching and the environment.

Responsible Body:

- ◆ Proponent

Data Sources and Monitoring:

- ◆ Report on all extraordinary animal or plant sightings or instances of poaching.

- ◆ Keep frequent records of borehole water levels and abstracted water volumes to identify any trends or consistent reduction in water levels.

10.1.11 Groundwater, Surface Water and Soil Contamination

Leakages and spillages of hazardous substances from vehicles and accidental fuel, oil or hydraulic fluid spills during the operational phase. Increase of nutrient levels (from over application of fertilizers) in the soil that can leach to the groundwater. Pollution due to sewerage system overflow or leakage. Overuse / incorrect application of herbicides / pesticides may also pose a risk.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Hazardous material, spillages, hydrocarbon leakages from vehicles and machinery.	2	-1	2	2	1	-10	-2	Improbable
Daily Operations	Over application of fertilizer, pesticides, herbicides, etc. Sewerage system malfunction.	2	-1	2	2	2	-12	-2	Probable

Desired Outcome: To prevent the contamination of groundwater, surface water and soil.

Actions

Prevention:

- ◆ Appoint reputable contractors.
- ◆ Vehicles may only be serviced on a suitable spill control structure.
- ◆ Regular inspections and maintenance of all vehicles to ensure no leaks are present.
- ◆ All hazardous chemicals should be stored in a sufficiently bunded area.
- ◆ Follow prescribed dosage of fertilizers and pesticides / herbicides and to avoid over application.
- ◆ Maintain sewerage systems and conduct regular monitoring.
- ◆ All hazardous waste must be removed from the site and disposed of timeously at a recognised hazardous waste disposal facility, including any polluted soil or water.

Mitigation:

- ◆ All spills must be cleaned up immediately.
- ◆ Consult a relevant Material Safety Data Sheet information and a suitably qualified specialist where needed.

Responsible Body:

- ◆ Proponent

Data Sources and Monitoring:

- ◆ Maintain Material Safety Data Sheets for hazardous chemicals.
- ◆ Soil should be sampled and analysed annually to ensure the correct amounts of fertilizer is applied and soil and groundwater quality is maintained.
- ◆ Groundwater should be sampled and analysed to test for nitrate concentrations from the fertilizer and for traces of chemicals used in pesticides and herbicides.
- ◆ Registers be kept by the Proponent on the type, quantities and frequency of application of fertiliser, pesticides and any other chemicals utilised in crop production.
- ◆ A register of all incidents must be maintained on a daily basis. This should include measures taken to ensure that such incidents do not repeat themselves.
- ◆ All spills or leaks must be reported on and cleaned up immediately.

10.1.12 Groundwater Abstraction

The over abstraction of groundwater for irrigation and other activities may lead to declining water levels. This may negatively impact on surrounding users as well as existing habitats that depend on groundwater. For example the availability of groundwater may have an impact on the farm and surrounding farms, as well at a wider spatial scale due to the cumulative impact. Over abstraction of groundwater by surrounding users may contribute to the decline in water levels (cumulative impact). Such an impact may have significant implications for the continued operations of the farms and surrounding enterprises. It is important to note that the groundwater basin forms a transboundary aquifer that extent from Namibia into Botswana. Over abstraction can causes disputes between countries.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Daily Operations	Over-abstraction of the local aquifer, decrease in the local hydraulic head.	2	-2	2	2	2	-24	-3	Probable

Desired Outcome: To utilise the groundwater sustainably.

Actions

Prevention:

- ◆ Spread the water abstraction points over a larger area to diffuse the impact.
- ◆ Monthly water level monitoring.

Mitigation:

- ◆ Reduce abstraction when the water levels nears 5 m below the long-term average rest water level of each borehole.

Responsible Body:

- ◆ Proponent

Data Sources and Monitoring:

- ◆ Monthly water rest water level monitoring.
- ◆ Baseline values should be reviewed every 3 years based on all historic water level data.
- ◆ A summary report on all monitoring results must be prepared.

10.1.13 Visual Impact

This impact relates to the aesthetic appearance of the site during operations. This impact will be minimal due to the area already being disturbed and widely utilised for agricultural activities. The impact will therefore mostly relate to poor housekeeping and waste not disposed of timeously. This impact that not only affects the aesthetic appearance, but also the integrity of the farm related infrastructure. De-bushing activities has resulted in aesthetically pleasing rangelands. Well maintained rangelands enhance the original landscape character of the area.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Aesthetic appearance and integrity of the site	1	-1	2	2	2	-6	-1	Probable
Daily Operations	Aesthetic appearance and integrity of the site	1	-1	2	2	2	-6	-1	Probable

Desired Outcome: To enhance the aesthetic appearance associated with the farms.

Actions

Enhancement:

- ◆ Regular waste disposal, good housekeeping and routine maintenance on infrastructure will ensure that the longevity of structures are maximised and maintain a low visual impact.
- ◆ Maintenance of rangelands and crop field through implementation of a de-bushing aftercare programme where applicable.

Responsible Body:

- ◆ Proponent
- ◆ Contractors

Data Sources and Monitoring:

- ◆ Record all complaints received and actions taken.

10.1.14 Cumulative Impact

Possible cumulative impacts associated with the operational phase and any maintenance/construction activities are grouped in positive and negative impacts. Negative impacts are strongly linked to groundwater quality and groundwater availability seeing that all persons and operations in the area use and are reliant on groundwater. Additional cumulative impact relate to the condition of the road and related traffic impacts, security concerns such as poaching and overall change in biodiversity. Positive cumulative impacts relate to increased national food security, strong contribution to employment in the agricultural sector and region and revenue generation.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	The build-up of minor impacts to become more significant	2	-1	2	2	1	-10	-2	Improbable
Daily Operations	The build-up of minor impacts to become more significant	2	-1	2	2	1	-10	-2	Probable

Desired Outcome: To minimise negative cumulative all impacts associated with the farm while enhancing positive cumulative impacts.

Actions

Mitigation:

- ◆ Addressing each of the individual impacts as discussed and recommended in the EMP would reduce the cumulative impact.
- ◆ Reviewing biannual reports for any new or re-occurring impacts or problems would aid in identifying cumulative impacts. Planning and improvement of the existing mitigation measures can then be implemented.

Responsible Body:

- ◆ Proponent

Data Sources and Monitoring:

- ◆ Create a summary report based on all other impacts to give an overall assessment of the impacts of the operational phase.

10.2 DECOMMISSIONING AND REHABILITATION

Closure and decommissioning of agricultural and related activities on the farms as a whole is not foreseen during the validity of the environmental clearance certificate or in the near future. However, it is more likely that certain components may be decommissioned. Decommissioning is therefore included for this purpose as well as the fact that construction activities may also include modification and decommissioning of infrastructure. Future land use after decommissioning should be assessed prior to decommissioning and rehabilitation initiated if the land would not be used for future purposes. Should decommissioning occur at any stage, rehabilitation of the area may be required. Decommissioning will entail the complete removal of all infrastructure including buildings and irrigation infrastructure. Any pollution present on the site must be remediated. The impacts associated with this phase include noise and waste production as structures are dismantled. Noise must be kept within WHO standards and waste should be contained and disposed in an environmentally safe manner. The EMP for the farms will have to be reviewed at the time of full decommissioning to cater for changes made to the site and to implement guidelines and mitigation measures.

10.3 ENVIRONMENTAL MANAGEMENT SYSTEM

The proponent could implement an environmental management system (EMS) for their operations. An EMS is an internationally recognized and certified management system that will ensure ongoing incorporation of environmental constraints. At the heart of an EMS is the concept of continual improvement of environmental performance with resulting increases in operational efficiency, financial savings and reduction in environmental, health and safety risks. An effective EMS would need to include the following elements:

- ◆ A stated environmental policy which sets the desired level of environmental performance;
- ◆ An environmental legal register;
- ◆ An institutional structure which sets out the responsibility, authority, lines of communication and resources needed to implement the EMS;
- ◆ Identification of environmental, safety and health training needs;
- ◆ An environmental program(s) stipulating environmental objectives and targets to be met, and work instructions and controls to be applied in order to achieve compliance with the environmental policy; and
- ◆ Periodic (internal and external) audits and reviews of environmental performance and the effectiveness of the EMS.
- ◆ The EMP.

11 CONCLUSION

Agricultural and related activities as performed on the Farm Springvale No. 337, contributes positively to the economy of Namibia. Food and fodder is produced for national markets while livestock (beef and sheep) is produced for both local and international markets. A number of employment opportunities are sustained and skills development within the local workforce occur. Revenue is generated that contributes to the Namibian economy.

Negative impacts associated with operational and intermittent maintenance and construction activities on the farm, as summarised in Table 11-1, can successfully be mitigated. Implementing a HSE policy will contribute to effective management procedures to prevent and mitigate impacts. All regulations relating to the agricultural and related activities of the Proponent, including health and safety legislation, should be adhered to and implemented where applicable. Groundwater and soil pollution must be prevented at all times while regular monitoring of water levels and related abstraction be conducted and the results provided the Ministry of Agriculture, Water and Land Reform. All staff must be made aware of the importance of biodiversity and the poaching or illegal harvesting of animal and plant products prohibited. This includes the proper handling and correct application of pesticides. Any waste produced must be properly disposed, re-used, or recycled where possible.

The EMP (Section 10) should be used as an on-site reference document for the operations of the farms. Parties responsible for transgression of the EMP should be held responsible for any rehabilitation that

may need to be undertaken. The proponent could use an in-house Health, Safety, Security and Environmental Management System in conjunction with the EMP. All operational personnel must be taught the contents of these documents.

Should the Directorate of Environmental Affairs DEA agree with the impacts and related mitigation measures, they may issue an environmental clearance certificate to the proponent. The environmental clearance certificate will render this document legally binding on the proponent. The assessment process's aim is not to stop the farming activities, or any of its components, but to rather determine its impact and guide sustainable and responsible development as per the spirit of the EMA.

Table 11-1. Impact summary class values

Impact Category	Impact Type	Construction		Operations	
<i>Positive Rating Scale: Maximum Value</i>		5		5	
<i>Negative Rating Scale: Maximum Value</i>		-5		-5	
EO	Skills and Development	2		2	
EO	Revenue Generation and Employment	2		2	
SC	Demographic Profile and Community Health		-1		-2
EO	Agricultural Produce and Economic Diversification		3	3	
SC	Health, Safety and Security		-2		-2
PC	Fire		-3		-3
PC	Noise		-1		-1
PC	Waste Production		-2		-2
BE	Ecosystem and Biodiversity Impact		-2		-2
PC	Groundwater, Surface Water and Soil Contamination		-2		-2
BE/EO	Groundwater Abstraction				-3
SC	Visual Impact		1		1
	Cumulative Impact		-2		-2

BE = Biological/Ecological EO = Economical/Operational PC = Physical/Chemical SC = Sociological/Cultural

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Appendix A: Correspondence with the MAWLR



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CELL.: (+264-81) 1220082
PO BOX 11073 ♦ WINDHOEK ♦ NAMIBIA
E-MAIL: gpt@thenamib.com

To: Executive Director
Ministry of Agriculture, Water and Land Reform
Government Office Park, Luther St
Private Bag 13184
Windhoek

Cc: Director: Policy and Water Law Administration
Mr F Witbooi

Re: Requirement for a Water Permit on the Farm Springvale No. 337, Omaheke Region

29 September 2020

Dear Sir,

Irrigation of approximately 40 ha, on the above mentioned property, by means of a pivot irrigation systems, is being conducted by the land owner. Water use is monitored (with installed flow metres) and boreholes levels checked on a regular basis. As such the approximate water use per annum amounts to 157,000 m³.

It is our understanding the property is not located in a subterranean water control area (as depicted in the attached map). Kindly please advise whether a water permit is required for the annual abstraction of 350,000 m³. Alternatively please indicate what course of action should be taken, if any.

Your time and consideration regarding the matter is much appreciated.

Sincerely,

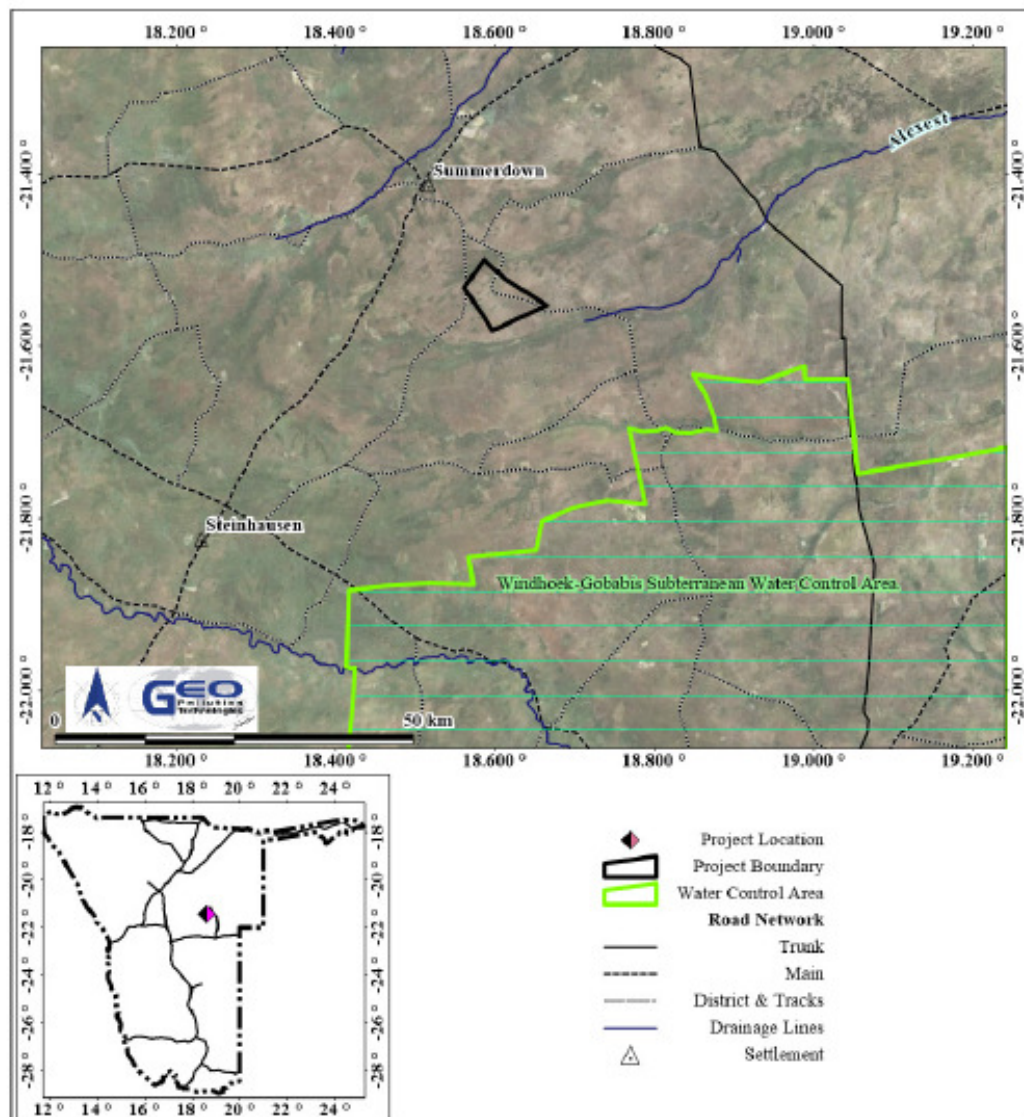
A handwritten signature in black ink, appearing to read "Q Bosman".

Q Bosman
Geo Pollution Technologies



Directors:

Page 1 of 2
P. Botha (B.Sc. Hons. Hydrogeology) (Managing)



Appendix B: Hydrogeological Specialist Study

IRRIGATION ACTIVITIES ON FARM SPRINGVALE NO. 337, OMAHEKE REGION

HYDROGEOLOGICAL SPECIALIST STUDY



Assessed by:



Assessed for:

**Elize van Niekerk t/a
Vision Farming**

December 2020

Project:	IRRIGATION ACTIVITIES ON FARM SPRINGVALE NO.337, OMAHEKE REGION, HYDROGEOLOGICAL SPECIALIST STUDY	
Report Version/Date	V1/ December 2020	
Prepared for	Elize van Niekerk t/a Vision Farming P O Box 31180 Windhoek Namibia	
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Cite this document as:	Botha P.; Brunette C., December 2020; Irrigation Activities on Farm Springvale No. 337, Omaheke Region, Hydrogeological Specialist Study.	
Copyright	Copyright on this document is reserved. No part of this document may be utilised without the written permission of Geo Pollution Technologies (Pty) Ltd.	
Report Approval	 Pierre Botha Managing Director	

TABLE OF CONTENTS

1	INTRODUCTION	1
2	SCOPE OF WORK	1
3	METHODOLOGY	1
4	LEGAL	2
5	DESCRIPTION OF NATURAL ENVIRONMENT	3
5.1	LOCALITY AND SURROUNDING LAND USE	3
5.2	CLIMATE	4
5.3	TOPOGRAPHY & DRAINAGE	5
5.4	SOILS.....	5
5.5	GEOLOGY AND HYDROGEOLOGY	6
5.6	PROJECT GROUNDWATER USAGE.....	20
6	ASSESSMENT OF BOREHOLE DATA	23
6.1	TEST PUMPING	23
7	WATER SUITABILITY FOR IRRIGATION PURPOSES.....	26
8	SOIL SUITABILITY FOR IRRIGATION PURPOSES	27
9	ASSESSMENT OF IMPACTS	29
9.1	GROUNDWATER ABSTRACTION.....	31
9.2	GROUNDWATER, SURFACE WATER AND SOIL CONTAMINATION.....	33
10	CONCLUSION	34
11	REFERENCES	34

LIST OF APPENDICES

APPENDIX A:	TEST PUMPING DATA.....	36
APPENDIX B:	CHEMICAL ANALYSES	39

LIST OF FIGURES

FIGURE 1-1.	PROJECT LOCATION.....	1
FIGURE 5-1.	GROUNDWATER BASINS, WATER CONTROL AREAS AND TRANSBOUNDARY AQUIFER	3
FIGURE 5-2.	DAILY AND SEASONAL RAINFALL (FUNK ET AL., 2015)	5
FIGURE 5-3.	DOMINANT SOIL AND ROCK TYPE (ATLAS OF NAMIBIA PROJECT, 2002)	6
FIGURE 5-4.	REGIONAL GEOLOGY MAP (GSN, SCALE 1:1,000,000)	8
FIGURE 5-5.	SIMPLIFIED STRUCTURAL PROFILE ACROSS THE DAMARA BELT OF NAMIBIA (GOSCOMBE ET AL., 2017)	9
FIGURE 5-6.	PROFILE ACROSS CENTRAL NAMIBIA AND BOTSWANA	9
FIGURE 5-7.	GROUNDWATER CATCHMENTS (KLOCK, 2001), TRANSBOUNDARY AQUIFER (IGRAC & UNESCO-IHP, 2015) AND KALAHARI BASIN DEPOSITS.....	10
FIGURE 5-8.	SCHEMATIC PROFILE OF EXTENSIONAL (SOUTHWEST STRIKING) AND COMPRESSIVE (NORTHWEST STRIKING) DEPOCENTERS (AFTER KLOCK, 2001)	11
FIGURE 5-9.	GROUNDWATER FLOW AND GROUNDWATER CATCHMENTS (ADAPTED FROM KLOCK, 2001) AND APPROXIMATE PROJECT LOCATION	12
FIGURE 5-10.	REGIONAL SURFACE ELEVATION PROFILE WITH WATER LEVEL INFORMATION.....	13
FIGURE 5-11.	MONITOR BOREHOLES, PROFILE, SPRINGS AND EISEB GRABEN WITH ELEVATION ..	14
FIGURE 5-12.	REGIONAL WATER LEVEL CHANGES (MAWLF; 2020) AND MONTHLY AND SEASONAL CUMULATIVE RAINFALL AT FARM SPRINGVALE NO. 337	15
FIGURE 5-13.	HISTORICAL HYDROCHEMICAL DATA MAUCHA PLOT	17
FIGURE 5-14.	HISTORICAL HYDROCHEMICAL DATA PIPER PLOT FOR PROJECT VICINITY	18
FIGURE 5-15.	HISTORICAL HYDROCHEMICAL DATA PIPER PLOT FOR THE REGION	19

FIGURE 5-16.	LOCATIONS OF BOREHOLES AND IRRIGATION AREAS ON FARM SPRINGVALE NO. 337	21
FIGURE 5-17.	ABSTRACTION BOREHOLE MONITORING DATA AND RAINFALL DATA	22
FIGURE 6-1.	COOPER-JACOB 1 DRAWDOWN CURVE FOR BOREHOLE 1.....	24
FIGURE 6-2.	COOPER-JACOB 1 DRAWDOWN CURVE FOR BOREHOLE 2.....	25
FIGURE 7-1.	GROUNDWATER SODIUM ADSORPTION RATION.....	26
FIGURE 7-2.	PIPER DIAGRAM FOR FARM SPRINGVALE NO. 233	27
FIGURE 8-1.	SOIL pH EFFECTS ON AVAILABILITY OF ELEMENTS (AFTER UNIVERSITY OF CALIFORNIA; 2019).....	28
FIGURE 9-1.	CONCEPTUAL GROUNDWATER BALANCE WITH OVER ABSTRACTION SCENARIO.....	31

LIST OF TABLES

TABLE 4-1.	NAMIBIAN LAW APPLICABLE TO THE PROJECT	2
TABLE 5-1.	SUMMARY OF CLIMATE CONDITIONS (ATLAS OF NAMIBIA PROJECT, 2002).....	4
TABLE 5-2.	RAINFALL STATISTICS (FUNK ET AL., 2015).....	4
TABLE 5-3.	GROUNDWATER STATISTICS	16
TABLE 5-4.	SUMMARY OF BOREHOLE INFORMATION OBTAINED FROM THE PROPONENT	20
TABLE 8-1.	SOIL SAMPLE RESULTS	28
TABLE 9-1.	ENVIRONMENTAL CLASSIFICATION OF IMPACTS ACCORDING TO THE RAPID IMPACT ASSESSMENT METHOD OF PASTAKIA 1998.	29
TABLE 9-2.	ASSESSMENT CRITERIA	30
TABLE 9-3.	ASSESSMENT – GROUNDWATER ABSTRACTION	32
TABLE 9-4.	ASSESSMENT – GROUNDWATER, SURFACE WATER AND SOIL CONTAMINATION.....	33

LIST OF ABBREVIATIONS

CHIRPS-2	Climate Hazards Group Infra-Red Precipitation with Station data version 2
DWA	Department of Water Affairs
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMS	Environmental Management System
GPT	Geo Pollution Technologies
ha	Hectare
IGRAC	International Groundwater Resources Assessment Centre
m/s	Metre per second
Ma	Million years
mamsl	Meters Above Mean Sea Level
MAWLR	Ministry of Agriculture, Water and Land Reform
MAR	Magnesium Adsorption Ratio
mbs	Metres below surface
MEFT	Ministry of Environment, Forestry and Tourism
mm/a	Millimetres per annum
mm/m	Millimetres per month
m³/m	Cubic metres per month
Mm³	Million cubic metres
SRTM	Shuttle Radar Topography Mission
TPA	Test Pump Analyses
UNESCO-IHP	UNESCO International Hydrological Programme

1 INTRODUCTION

Elize van Niekerk, operating as Vision Farming, requested Geo Pollution Technologies (Pty) Ltd to undertake a hydrogeological specialist study for irrigation activities on farm Springvale no. 337 adjacent to the D1638 district road in the Omaheke Region (Figure 1-1). For purposes of crop cultivation, the Proponent has cleared 270 ha, of which 40 ha is under irrigation and the remainder dryland cropping. The main produce are maize, oats and wheat. Irrigation is from production boreholes, by means of centre pivot irrigation systems. Additional activities performed include livestock farming.

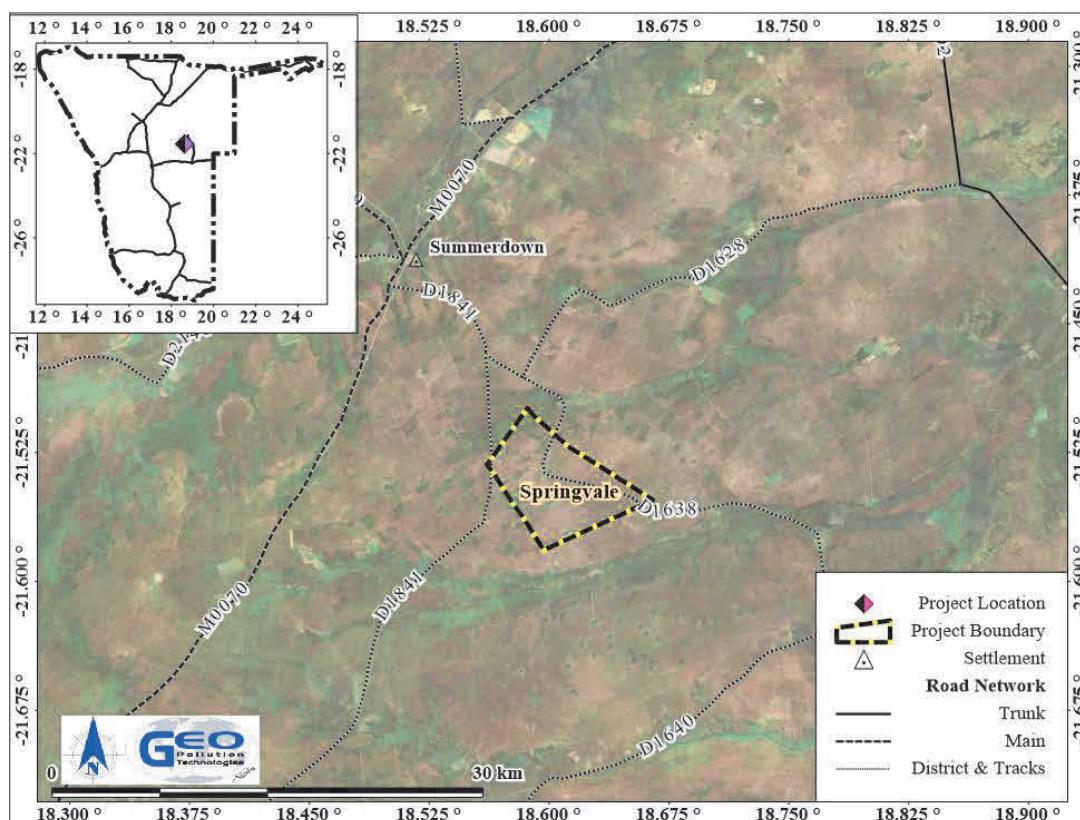


Figure 1-1. Project location

2 SCOPE OF WORK

The aims of the study were to:

1. Conduct a hydrogeological assessment based on a hydrocensus-survey of the project area.
2. Gather historic information and compile a hydrogeological assessment based on the information.

3 METHODOLOGY

Available geological and hydrogeological information/reports for the investigation area were obtained and reviewed. The hydrogeological catchment and sub-catchments within the investigation area were reviewed and delineated. This was based on historic groundwater level data contained in the Department of Water Affairs (DWA) database and on hydrocensus data done on behalf of the proponent. Satellite imagery such as SRTM 30 m data (Shuttle Radar Topography Mission) was utilised for the catchment delineation and elevation mapping purposes. Utilizing the various data sources, a specialist report for the investigation was prepared.

4 LEGAL

To protect the environment and achieve sustainable development, all projects, plans, programmes and policies deemed to have adverse impacts on the environment require an environmental impact assessment (EIA), as per the Namibian legislation. The key legislation provided in Table 4-1 govern the environmental assessment process in Namibia and/or are relevant to the study.

Table 4-1. Namibian law applicable to the project

Law	Key Aspects
The Namibian Constitution	<ul style="list-style-type: none"> ◆ Incorporate a high level of environmental protection. ◆ 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.
Environmental Management Act Act No. 7 of 2007, Government Notice No. 232 of 2007	<ul style="list-style-type: none"> ◆ Defines the environment. ◆ Promote sustainable management of the environment and the use of natural resources.
The Water Act Act No. 54 of 1956	<ul style="list-style-type: none"> ◆ Defines the interests of the state in protecting water resources. ◆ Defines and prohibits pollution of water resources. ◆ Controls the disposal of effluent. ◆ Whenever an owner of land obtains, by artificial means on his own land, a supply of water which is not derived from a public stream, such water shall be deemed to be private water. ◆ Remains in force until the new Water Resources Management Act comes into force.
Water Resources Management Act Act No. 11 of 2013	<ul style="list-style-type: none"> ◆ Provide for management, protection, development, use and conservation of water resources. ◆ Prevention of water pollution and assignment of liability. ◆ Not in force yet.
Soil Conservation Act (Act No. 76 of 1969)	<ul style="list-style-type: none"> ◆ 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 Namibia.

Relevant water resource development and related activities listed as activities requiring an environmental clearance certificate are (Government Notice No. 29 of 2012):

8.1 The abstraction of ground or surface water for industrial or commercial purposes.

8.2 The abstraction of groundwater at a volume exceeding the threshold authorised in terms of a law relating to water resources.

8.6 Construction of industrial and domestic wastewater treatment plants and related pipeline systems.

8.7 Irrigation schemes for agriculture excluding domestic irrigation.

8.8 Construction and other activities in water courses within flood lines.

8.9 Construction and other activities within a catchment area.

The relevance of 8.2 is not clear, as the act defining such a threshold, if any, is not known. The Water Resources Management Act (Act No. 11 of 2013) is likely to define such a threshold and it is expected to make the whole of Namibia a water control area in which abstraction permits would be required. The current Water Act (Act No. 54 of 1956) only requires abstraction permits within water control areas, see Figure 5-1. Abstraction permits are currently issued by the Ministry of Agriculture Water and Land Reform (MAWLR). The project falls outside a control area, thus an abstraction permit is not required.

Within the Water Act (Act No. 54 of 1956) it is clearly stipulated that the purification and disposal of industrial water and effluents as well as the disposal of effluents by local authorities is subjected to the requirements of the Act. Agricultural activities is not subjected to the requirements of the Act, making the implementation of 8.6 questionable. The return period for flood lines is not provided for, nor a definition of flood lines to make 8.8 applicable. It is however in the proponent's best interest to ensure that the project area is outside a flood risk area. All land in Namibia is in some form of catchment area, making the practical implementation of 8.9 questionable. It however remains important to consider all activities that would/may impact on the groundwater.

5 DESCRIPTION OF NATURAL ENVIRONMENT

5.1 LOCALITY AND SURROUNDING LAND USE

The project (21.5532 °S; 18.6081 °E) is located about 14 km southeast of Summerdown, along the D1638 district road in the Gobabis District. All adjacent properties are farms and land use consist of agriculture. The farm occurs in the Omaheke Groundwater Basin. It should be noted that this groundwater basin is a management basin and that the actual groundwater basins differ from these boundaries. The project area forms part of the Northern Kalahari/Karoo Basin Transboundary Aquifer (IGRAC & UNESCO-IHP, 2015), see Figure 5-1.

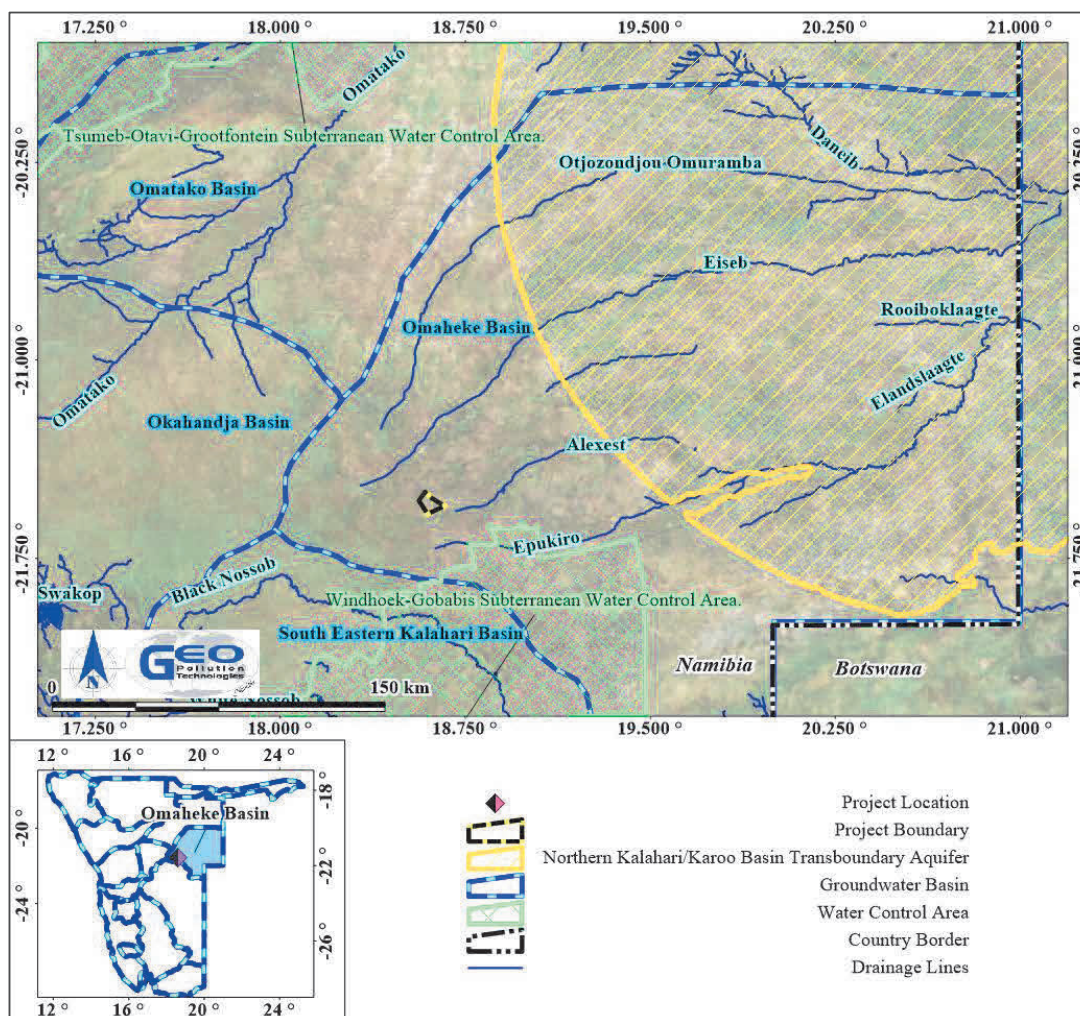


Figure 5-1. Groundwater basins, water control areas and transboundary aquifer

5.2 CLIMATE

Long term climate data was obtained from Atlas of Namibia Project (2002) and the CHIRPS-2 database (Funk et al., 2015), see Figure 5-2, Table 5-1 and Table 5-2. Atlas of Namibia Project (2002) data was compiled from almost 300 rainfall stations across Namibia, the data was contoured in 50 mm intervals prior to 1999 for variable length data sets. The CHIRPS-2 dataset (Climate Hazards Group Infra-Red Precipitation with Station data version 2) consist of long term rainfall data (1981 to near-present) obtained from satellite imagery and in-situ station data.

The project area is situated in a semi-arid climatic region. Days are mostly warm with very hot days during the summer months, while nights are generally cool. The rain season normally starts in October and last until April, peaking in January and February. Heavier rainfall (single day events) occur between October and April, with a single event of 76 mm in April (last 39 years data) being the highest. This is an obvious anomaly with most of the single day maximums being less than 60 mm.

The average annual rainfall for the last 39 years was calculated as 388 mm/a, with a coefficient of variance of 30% (Table 5-2). This coefficient of variance seem to correlate with Atlas of Namibia Project data (Table 5-1). Daily and seasonal rainfall data (Funk et al., 2015) is presented in Table 5-2. Seasonal (July to June) total rainfall, centred on the average line for the last 39 years, is presented, with the daily total rainfall and the seasonal cumulative rainfall.

From the figure it is clear that from 2010 to 2020 six seasons received above average rainfall, namely 2009-2010, 2010-2011, 2011-2012, 2013-2014, 2016-2017 and 2019-2020. The rest were all below average with the driest year (last 39 years data) being 2019, which is part of a dry period of July 2017 to June 2019.

Table 5-1. Summary of climate conditions (Atlas of Namibia Project, 2002)

Variation in annual rainfall (%)	30-40
Average annual evaporation (mm/a)	2,800-3,000
Water deficit (mm/a)	1,501-1,700
Temperature (°C)	20-21

Table 5-2. Rainfall statistics (Funk et al., 2015)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minimum (mm)	15.9	22.9	17.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maximum (mm)	288.3	184.8	121.9	132.2	13.0	1.9	0.9	1.6	10.1	44.4	100.1	160.7
Average (mm)	86.9	82.3	66.2	34.3	1.7	0.1	0.0	0.1	1.8	12.1	37.4	65.0
Variability (%)	61.0	57.0	42.0	96.0	204.0	442.0	430.0	382.0	163.0	84.0	58.0	58.0
Daily maximum (mm)	41.2	34.0	51.1	76.1	10.3	1.1	0.9	1.6	5.1	10.4	19.7	37.9
Average rain days	10	9	6	2	0	0	0	0	1	3	6	8
Season July - June average: 388 mm Season coefficient of variation: 30 %												
Data range	1981-Jul-01 to 2020-Jun-30 Lat: -21.5532°S Long: 18.6081°E											

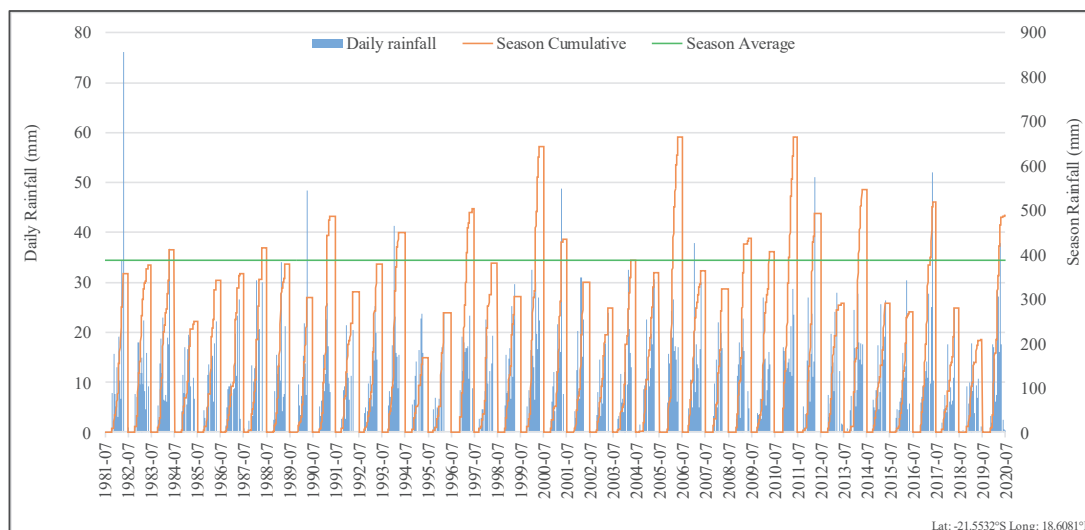


Figure 5-2. Daily and seasonal rainfall (Funk et al., 2015)

5.3 TOPOGRAPHY & DRAINAGE

The general topography of the project area can be described as relatively flat, with the elevation decreasing towards the east. Regional surface runoff is therefore generally directed towards the east. The project area forms part of the Kalahari Sandveld landscape known for its palaeo dunes and pans, which can be observed in the larger study area.

Regionally, the project falls in the catchment of the Okavango River. Locally, surface runoff collects in the Alexest River, which is located about 7 km east of the project. Local drainage is therefore expected towards the east to the Alexest River. The Alexest River flows downstream into the Epukiro River which flows toward Lake Ngami south of the Okavango Delta.

5.4 SOILS

The soils of the Kalahari Group can locally be classified as feralic Arenosols for the most of the area of the farms. Arenosols can be described as sandy soils with poor capacity to retain nutrients. These soils are common in arid and semi-arid environments and are associated with flat to undulating topography. Landforms associated with Arenosols are typically dunes, sand plains and sand ridges. Its parent material is aeolian sand.

Fluviosols are described as well drained fine to loamy sand. A Fluviosol is associated with flat to almost flat topography in drainage lines or valley bottoms. Its parent material is alluvial deposits. Figure 5-3 indicate the soil and surface geology of the project area. Surface geology is depicted as sand and calcrete.

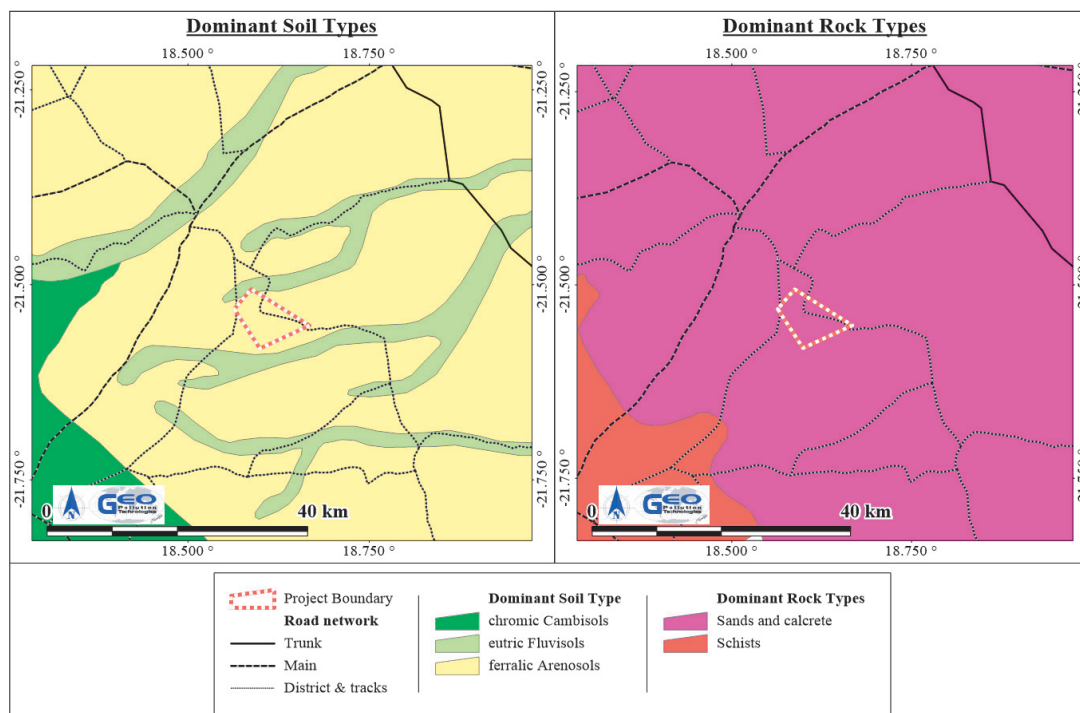


Figure 5-3. Dominant soil and rock type (Atlas of Namibia Project, 2002)

5.5 GEOLOGY AND HYDROGEOLOGY

The regional stratigraphic succession of the project area can be divided into geology belonging to the Namibian Age (Damara Sequence), Cambrium Age and Late Cretaceous- to Quaternary Age (Kalahari Group), see Figure 5-4. Kalahari Group surficial deposits occur as overburden of varying thickness over hard rock substrata. Rock outcropping is relatively rare and scattered in the project region.

Although not indicated in Figure 5-4, Naudé (2012) inferred that a northern section of the project area consist of pre-Damara geology as derived from geophysical-, mapping- and drill-hole data. This geology typically comprise of gneiss, metagranite and granite.

It is inferred that rocks of the Damara Sequence predominantly make up the bedrock of the project. The Damara Sequence is divided into various tectonostratigraphic zones, the project area being within the Southern Zone, see Figure 5-4 and Figure 5-5. The Southern Zone is characterized as a low temperature-high pressure zone that locally contains formations comprising of schist, graphitic schist, quartzite, marble and calc-silicate of the undifferentiated Nosib and Swakop Group. Swakop Group granite intrusions also occur in the study area.

Moderate folding of the Damara and Pre-Damara Sequence strata occurred during the Pan African Orogeny (680 - 450 Ma) and resulted in the formation of thrusts, synclines and anticlines. Rocks south of the Okahandja Lineament (about 60 km to the northwest of the project) have isoclinal, overturned and thrust fold structures, which can be extended throughout the Southern Zone. Within the Southern Zone the foliation is mainly northwest-dipping, with a dip angle of 20° to 40° (Goscombe et al., 2017).

A simplified structural profile across the Damara Belt is provided in Figure 5-5 with the approximate location of the project. The development of joints and fractures in the rocks are associated with the folding, which have an impact on the hydrogeological characterization of the area.

A small extent of Cambrium Age geology comprising of serpentinite, chlorite schist and talc schist is mapped on farm Okasondana no. 264 about 10 km to the northeast of the project.

Late Cretaceous to Quaternary Age Kalahari Group deposits rest unconformably over older pre-Kalahari rock formations and consist of a wide range of terrestrial sediments. These sediments originate mainly from fluvial deposition with some reworking through aeolian processes. The expected thickness of the surficial deposits at the project farms is approximately 50 - 100 m (Klock, 2001).

The onset of Kalahari Group sedimentation is assumed to have started during the late Cretaceous (~ 65 Ma) when isostatic uplift of the continental margin of Namibia and South Africa started (Klock, 2001). Isostatic uplift led to the uplift of coastal escarpments and the evolution of the intracontinental hinterland basin where down warping took place. This down warping caused a change in drainage patterns into the Kalahari Basin that formed.

Rivers crossing the escarpment subsequently underwent rejuvenation due to the increase in drainage gradient with subsequent increased erosion. Rivers draining into the Kalahari Basin had a lower drainage gradient and therefore caused sedimentation in the flatter terrain. Figure 5-6 illustrates the Kalahari Basin with a profile indicating the escarpment and interior down warp. This profile example extend from the Atlantic Ocean through the Windhoek Municipal area toward the eastern border of Botswana. Elevation was obtained from SRTM 30 m data.

Terrestrial sediments tend to vary significantly between the stratigraphically equal units in the regional setting of the Kalahari Group. Within the Kalahari Group, a general upward-fining trend of the clast-population and an upward decrease in clast abundance are observed (Klock, 2001), consisting of the basal Tsumkwe Formation, overlying Eiseb Formation, overlying Omatako Formation and most recent Aeolian Unit.

The project is located near the southwestern edge of the Omatako Basin of the Kalahari Basin deposit area. It is expected that the Tsumkwe Formation is locally absent with only the Eiseb Formation and overlaying formations being present. The Eiseb Formation geology is dominated by alternating fluvial sands, carbonate deposits and pebble horizons. The Omatako Formation consists of a narrow unit of fluvial sand and ferruginous soil. Aeolian sand overlies the older geology, inter-fingering with inter-dune deposits. Palaeochannels present in these formations might cause local lateral changes over short distances.

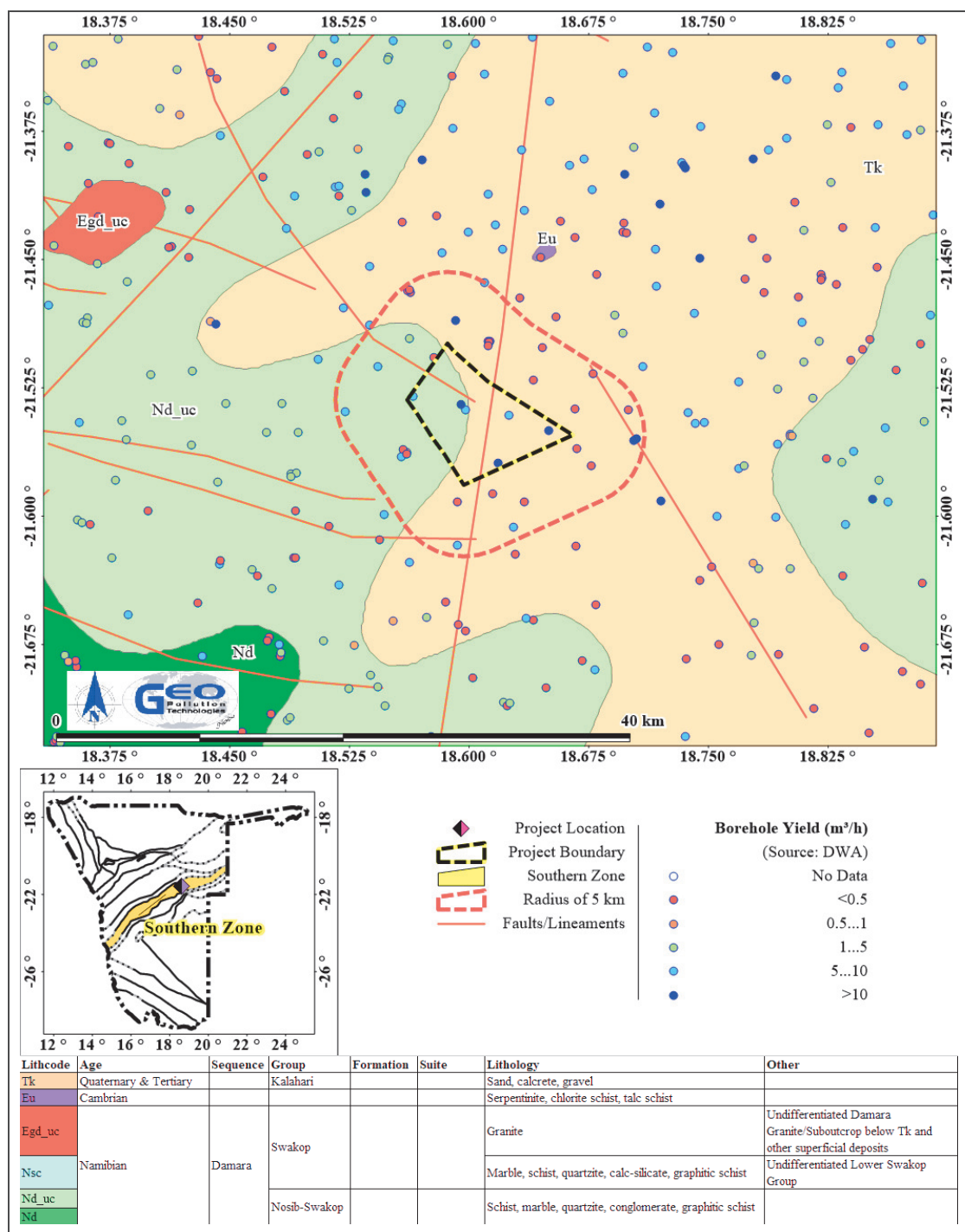


Figure 5-4. Regional geology map (GSN, scale 1:1,000,000)

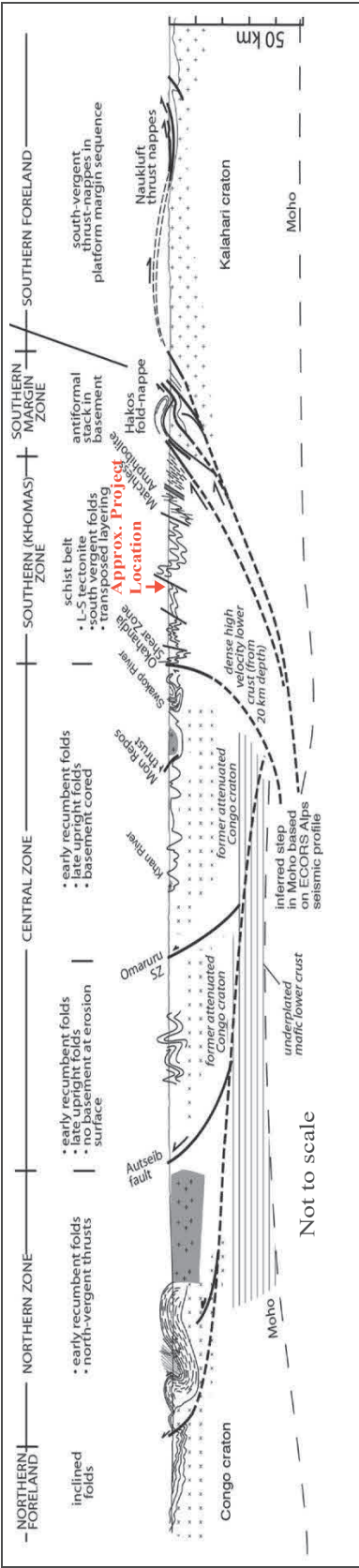


Figure 5-5. Simplified structural profile across the Damara Belt of Namibia (Goscombe et al., 2017)

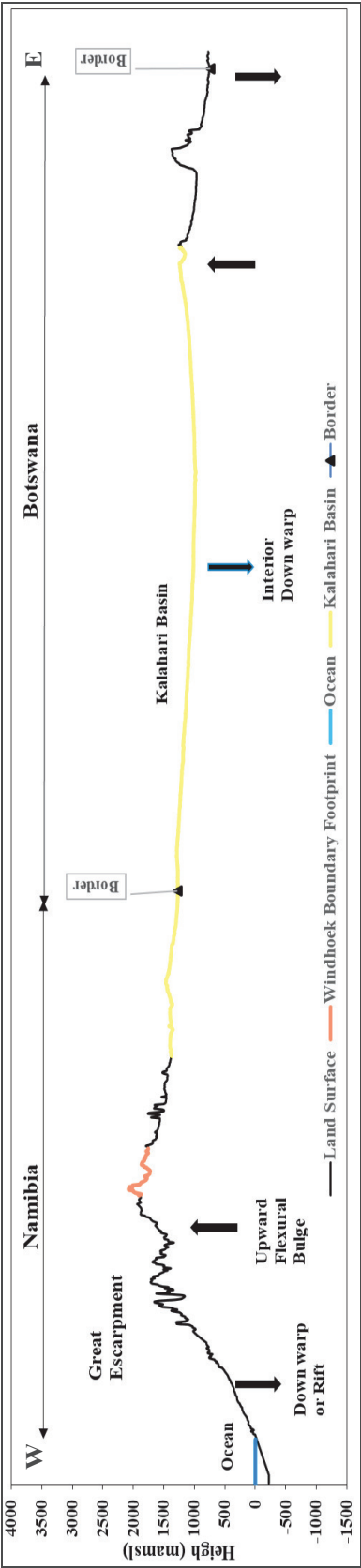


Figure 5-6. Profile across central Namibia and Botswana

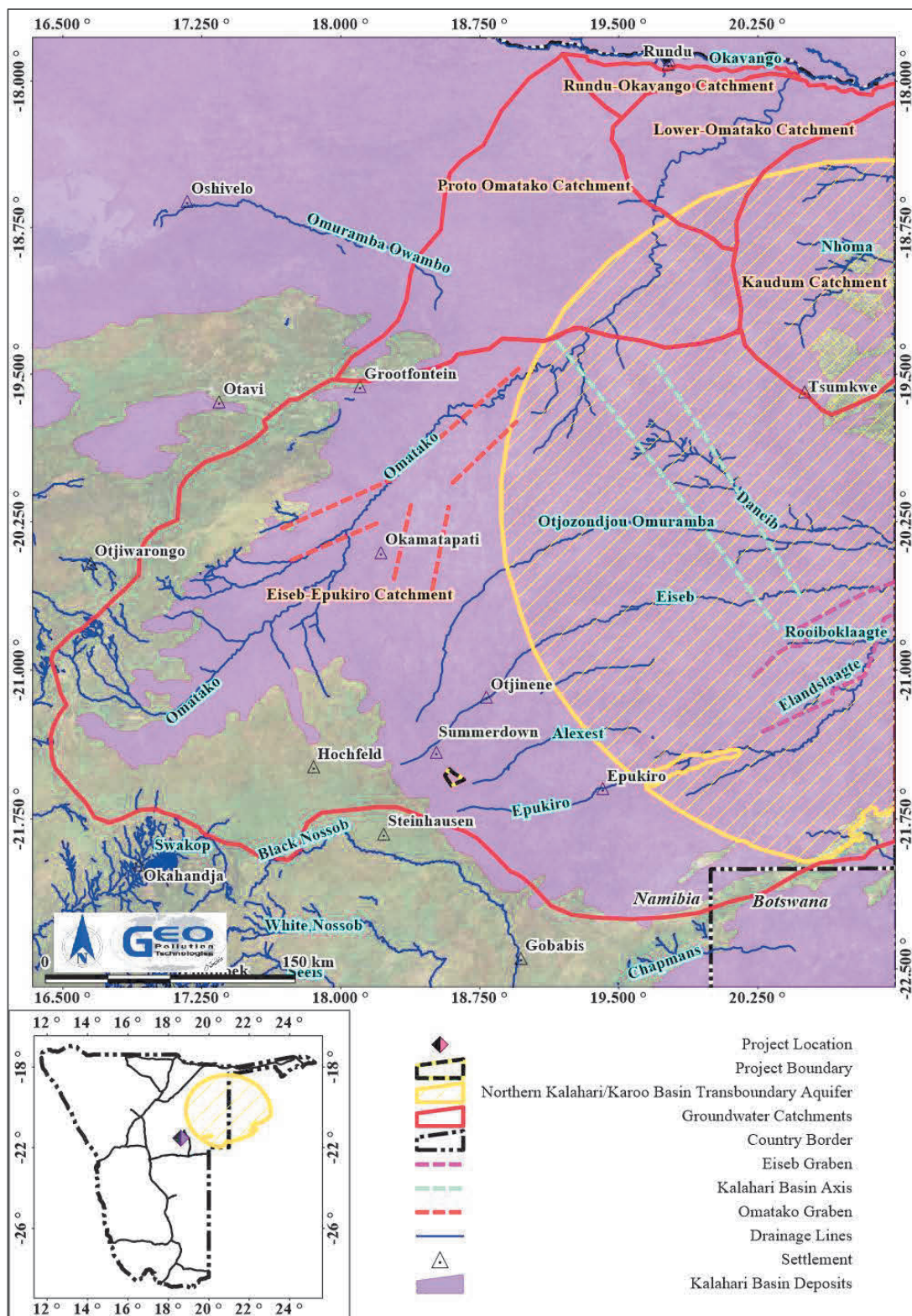


Figure 5-7. Groundwater catchments (Klock, 2001), transboundary aquifer (IGRAC & UNESCO-IHP, 2015) and Kalahari Basin Deposits

A groundwater basin for the area was determined through the calculation of water levels above mean sea level using borehole data contained in the DWA borehole database (Klock, 2001). The project area falls in the Eiseb-Epukiro Catchment, named after the Epukiro and Eiseb Rivers which flow in a similar direction as the groundwater, see Figure 5-7. Groundwater in this catchment generally flows eastward across the Botswana border in the Northern Kalahari/Karoo Basin Transboundary Aquifer system stretching the Namibian border, see Figure 5-7.

Regionally, northwest - southeast and southwest - northeast depocenters occur in the area. Northwest - southeast trending depocenters are related to the uplift of the continental margin, as illustrated in Figure 5-8. An example of such a structure feature in Namibia is the Kalahari Basin axis as illustrated in Figure 5-7 and Figure 5-8. This feature is related to compressional tectonics that take place during the interior down warping.

Depocenters that trend southwest - northeast, like that of the Eiseb Graben, are related to rifting and extensional tectonics. This feature forms part of the larger Okavango Rift Zone, a still active tectonic setting thought to represent an extension of the East African Rift System which started during the Oligocene. The Eiseb Graben is the westernmost extension of the Linyanti and Gomare Fault (Stadtler et al., 2005). According to Klock (Klock, 2001), northeast trending graben structures (e.g., Omatako and Eiseb Graben) developed along Damara pre-weakened crustal structures and are recently reactivated. Figure 5-8 represents the schematic profile of the depocenters in the region (Klock, 2001). Both these depocenters formed during and after deposition of Kalahari sediments, placing such sediments deeper than in the surrounding areas.

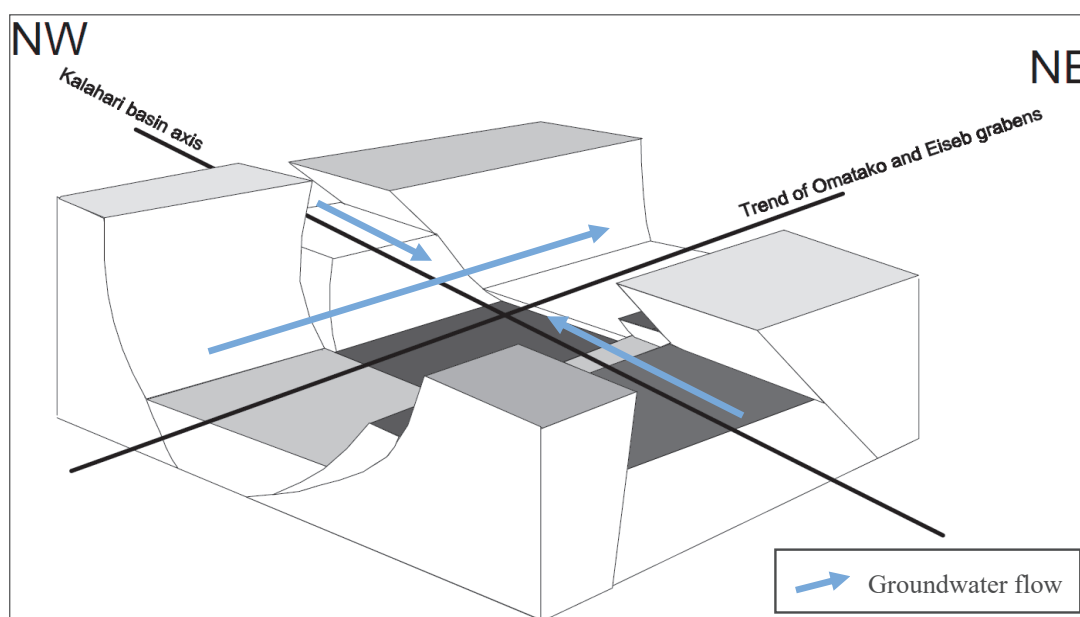


Figure 5-8. Schematic profile of extensional (southwest striking) and compressive (northwest striking) depocenters (after Klock, 2001)

A northeast-striking graben feature straddling the Namibian and Botswana border, namely the Eiseb Graben, occurs within the transboundary aquifer setting. Due to the depth of the sediments in the graben structure, favorable groundwater conditions occur (Eiseb Graben Aquifer). The thickness of alluvial filling tends to be more towards the eastern extent of the Eiseb Graben.

Groundwater recharge to the Eiseb Graben Aquifer is assumed to take place through lateral flow from localized aquifers in the main ephemeral rivers (Eiseb, Rooiboklaagte and Epukiro) that make up the catchment of the Eiseb Graben. Recharge is also assumed to take place through lateral flow from localized aquifers in surrounding Kalahari Group deposits. Groundwater flow is generally projected towards Lake Ngami to the east (Margane et al. 2004). Figure 5-9 indicates

the approximate project location relative to the groundwater flow within the Eiseb-Epukiro Catchment. The extent of the groundwater catchment can be correlated to Figure 5-7.

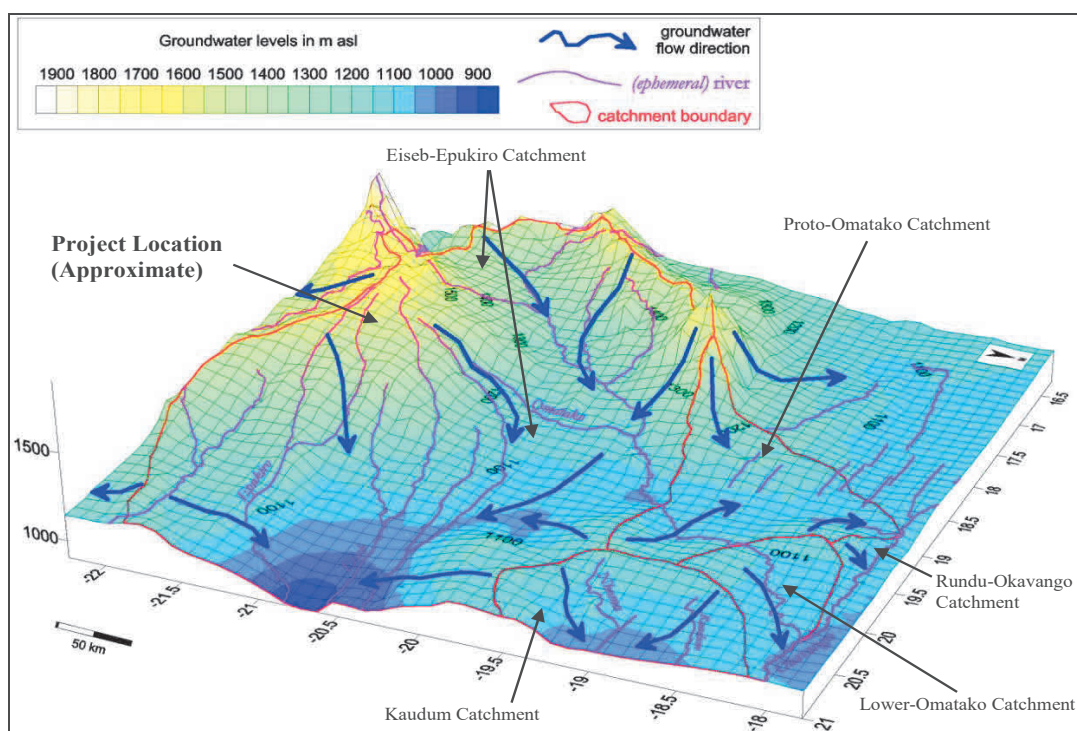


Figure 5-9. Groundwater flow and groundwater catchments (adapted from Klock, 2001) and approximate project location

Locally, flow patterns may vary due to groundwater abstraction and due to geological constraints, but the larger scale groundwater flow is expected to be from west to east towards the Eiseb Graben Aquifer. Local groundwater flow is expected to take place through primary porosity in the surface cover (Kalahari Group), while it is expected to flow along fractures, faults, dykes/mineralised faults or along contact zones (secondary porosity) and other geological structures present within the underlying rock formations.

A profile was made through boreholes WW21223, WW10210, WW204963, WW204964, WW30530, WW28819, WW200054 and WW200053 to review the regional water level changes in the basin (Figure 5-10). The orientation of the profile is mainly directed down gradient toward the Eiseb Graben and has a length of about 450 km (Figure 5-11). Boreholes WW21223 and WW10210 are located near Seeis and Omitara respectively, in the South Eastern Kalahari groundwater basin.

Boreholes WW204963 and WW204964 are located within the Eiseb-Epukiro Catchment (Omaheke Basin) and near the groundwater divide. Boreholes WW30530 and WW28819 are located near the Epukiro settlement and WW30530 forms part of the Epukiro Pos 3 NamWater scheme (Du Plessis, 2020). Boreholes WW200054 and WW200053 are located within the Eiseb Graben.

Regional water level monitoring data, sourced from the MAWLR - DWA, is presented in Figure 5-12. Monthly and seasonal (July to June) CHIRPS-2 rainfall data (Funk et al., 2015) is also presented in Figure 5-12. The locations of the selected monitoring boreholes are presented in Figure 5-11.

Borehole WW21223 is situated in a different groundwater basin than that in which the project is located. Water level monitoring in this borehole started in July 1975 and ended in March 2018. The historic water level in the borehole ranges between 1.96 to 5.28 mbs. This borehole was

drilled near the Seeis River and rely on the primary porosity from the sands in the river. A nearby NamWater scheme may impact on water levels in this area. From Figure 5-12 it is evident that the water level in this borehole has a saw tooth pattern with a generally stable trend due to sufficient recharge from the Seeis River.

WW10210 is situated about 20 km east of the settlement of Omitara, and 500 m southwest of the White Nossob River. Data from this borehole is available from July 1985 up to June 2020, with some data gaps. The water level shows a slight downward trend, but a noticeable level increase is present during 2011, corresponding with a high rainfall season. After this, the water level generally decreased over time.

Water level data of both boreholes WW204963 and WW204964 is available from November 2014 to June 2020, including some data gaps. During the short period no major changes were noted in the water level of the boreholes. These two boreholes are located near the documented groundwater divide (southern extent of Eiseb-Epukiro Catchment).

Borehole WW30530 is part of the NamWater Epikiro Post 3 water supply scheme and is probably impacted by abstraction from this scheme. The water level here seems to have a general increase in level with a good correlation between its responses and above average rainfall seasons like in 2000, 2006 and 2011.

Borehole WW28819 is located near the NamWater Epikiro Post 10 water supply scheme and is probably impacted by abstraction from this scheme. The water levels of WW28819 generally has a slight rise in level with less clear responses to above average rainfall seasons, as compared to data from WW30530.

Water levels at WW200053 and WW200054 are the deepest in the profile suggesting flow towards these boreholes. Both boreholes are located in the Eiseb Graben. Very little data is available for these two boreholes. Both boreholes generally have stable water level conditions with no clear response to above average rainfall seasons.

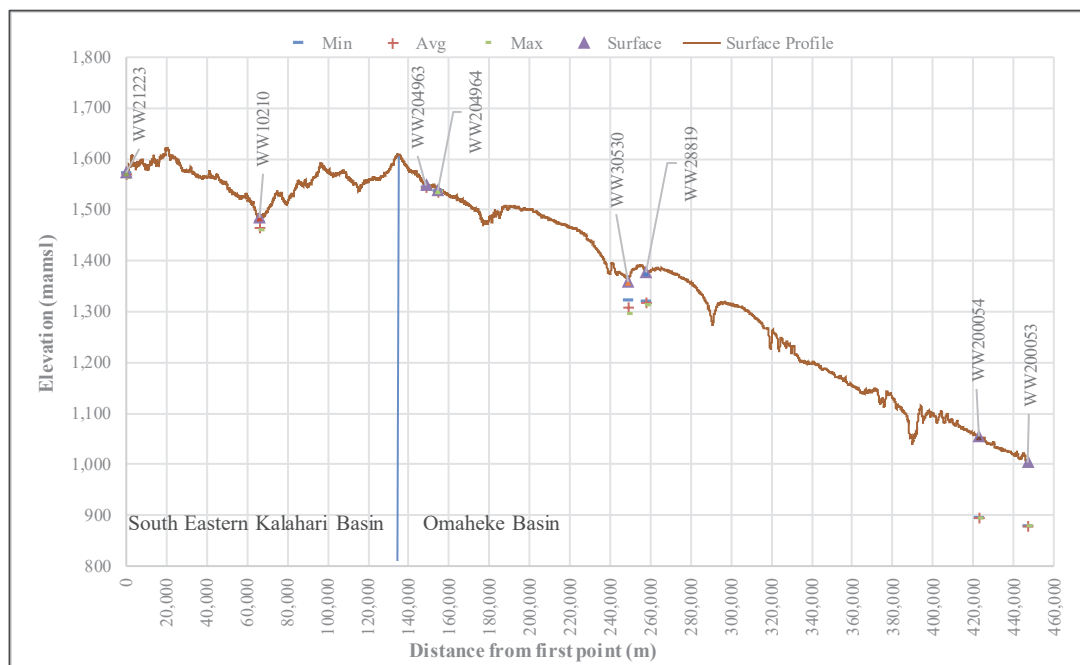
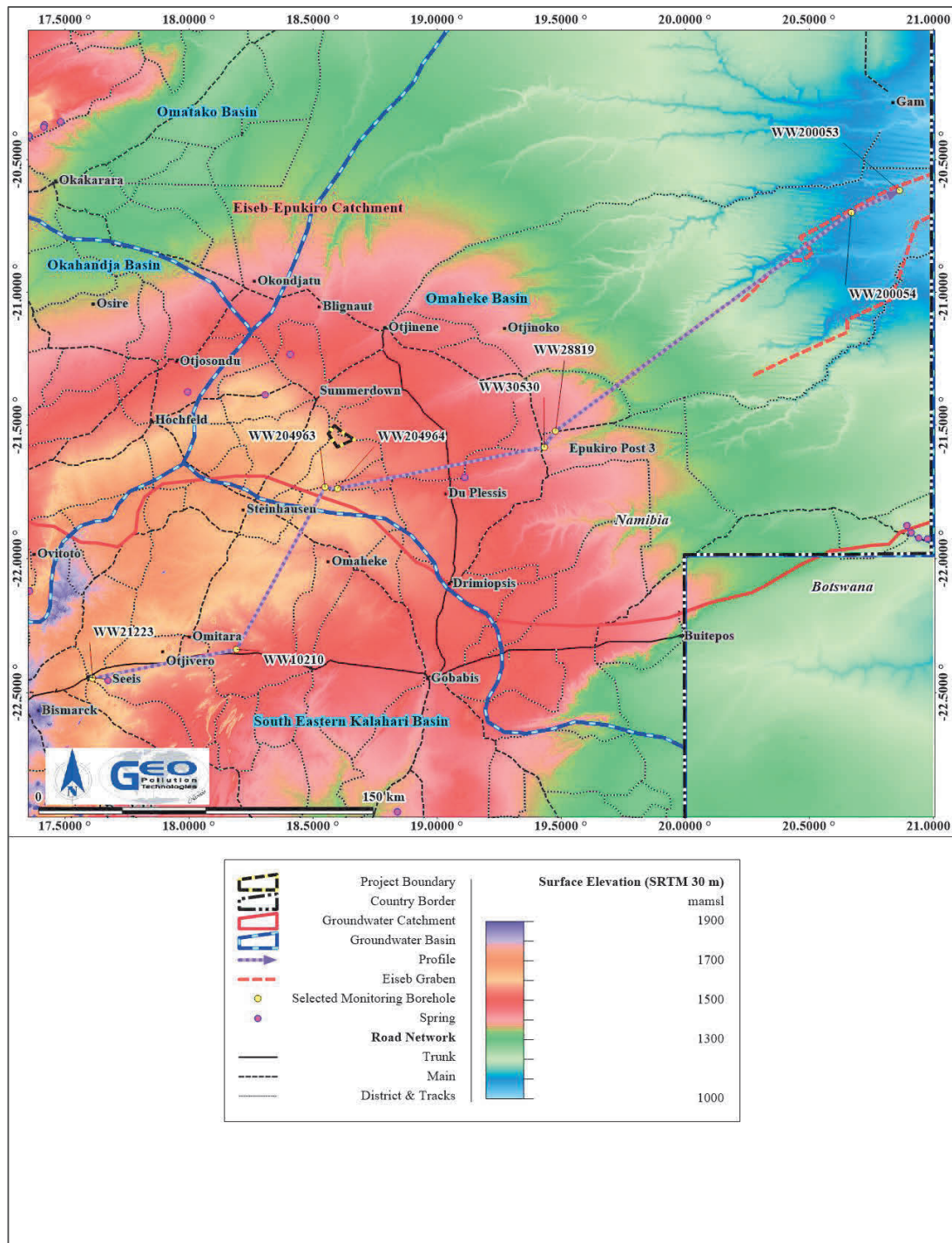


Figure 5-10. Regional surface elevation profile with water level information



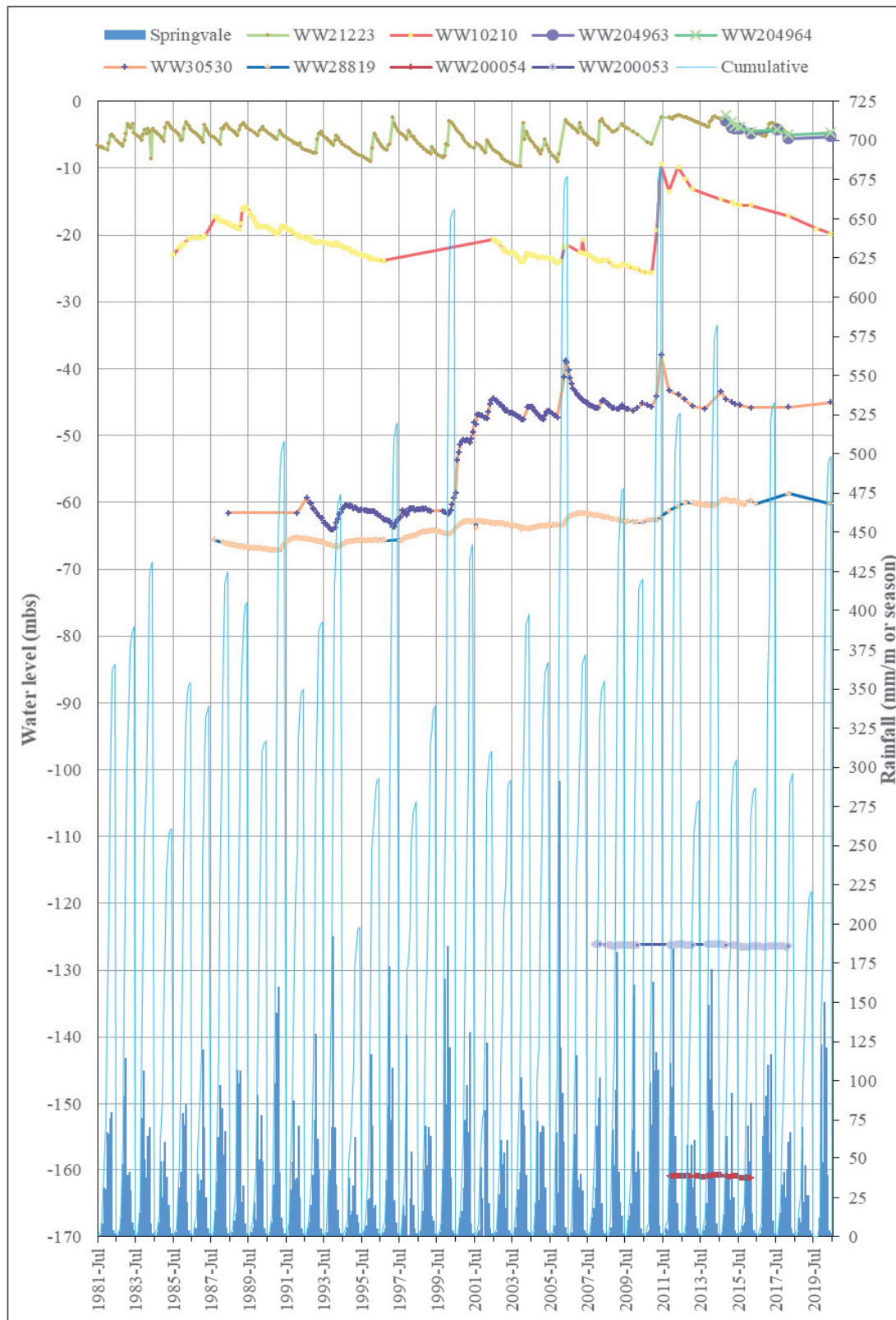



Figure 5-12. Regional water level changes (MAWLF; 2020) and monthly and seasonal cumulative rainfall at farm Springvale no. 337

Table 5-3 indicates the groundwater statistics for a radius of 5 km around the project. The groundwater information was obtained from Department of Water Affairs (DWA) borehole database. This database is generally outdated and more boreholes might be present. Groundwater is widely utilised in the study area, with a total of 12 boreholes known within a 5 km radius. The boreholes were drilled to an average depth of 52 mbs and yield between 1 and 32 m³/h. Groundwater levels within the 5 km radius is generally shallow, varying between 15 and 18 mbs. The groundwater quality falls under Group A with some boreholes having minor elevated levels of nitrate. The Group A category indicates that the water is of an excellent quality, based on the provided parameters.

Springs, possibly related to the contact zones between relatively impermeable formations and more permeable formations or shallow groundwater conditions, occur as scattered points throughout the region. The nearest spring is present approximately 31 km to the northwest of the project, see Figure 5-11. No caves or lakes are known of near (< 10 km radius) the project.

According to the Ministry of Agriculture, Water and Forestry (MAWF, 2006) the project is located outside a water control area (Figure 5-1). Government therefore does not regulate groundwater usage in this area, e.g., drilling, cleaning or deepening of boreholes and rates of water abstraction. However all groundwater remains property of the Government of Namibia.

Table 5-3. Groundwater statistics

Query Centre:	Springvale; -21.5532°S; 18.6081°E											Query Box Radius: 5.0km
		NUMBER OF KNOWN BOREHOLES	LATITUDE	LONGITUDE	DEPTH (mbs)	YIELD (m ³ /h)	WATERLEVEL (mbs)	WATERSTRIKE (mbs)	TDS (ppm)	SULPHATE (ppm)	NITRATE (ppm)	FLUORIDE (ppm)
Data points		12			7	7	5	5	8	8	8	8
Minimum			-21.508204	18.559721	24	1	15	18	184	4	0	0
Average					52	12	16	18	345	12	6	0
Maximum			-21.598196	18.656479	129	32	18	20	771	50	38	1
Group A					71.43%	42.86%	0.00%	0.00%	100.00%	100.00%	87.50%	100.00%
Limit					50	>10	10	10	1000	200	10	1.5
Group B					14.29%	42.86%	100.00%	100.00%	0.00%	0.00%	0.00%	0.00%
Limit					100	>5	50	50	1500	600	20	2.0
Group C					14.29%	14.29%	0.00%	0.00%	0.00%	0.00%	12.50%	0.00%
Limit					200	>0.5	100	100	2000	1200	40	3.0
Group D					0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Limit					>200	<0.5	>100	>100	>2000	>1200	>40	>3

Statistical grouping of parameters is for ease of interpretation, except for the grouping used for sulphate, nitrate and fluoride, which follow the Namibian guidelines for the evaluation of drinking-water quality for human consumption, with regard to chemical, physical and bacteriological quality. In this case the groupings has the following meaning:

Group A: Water with an excellent quality

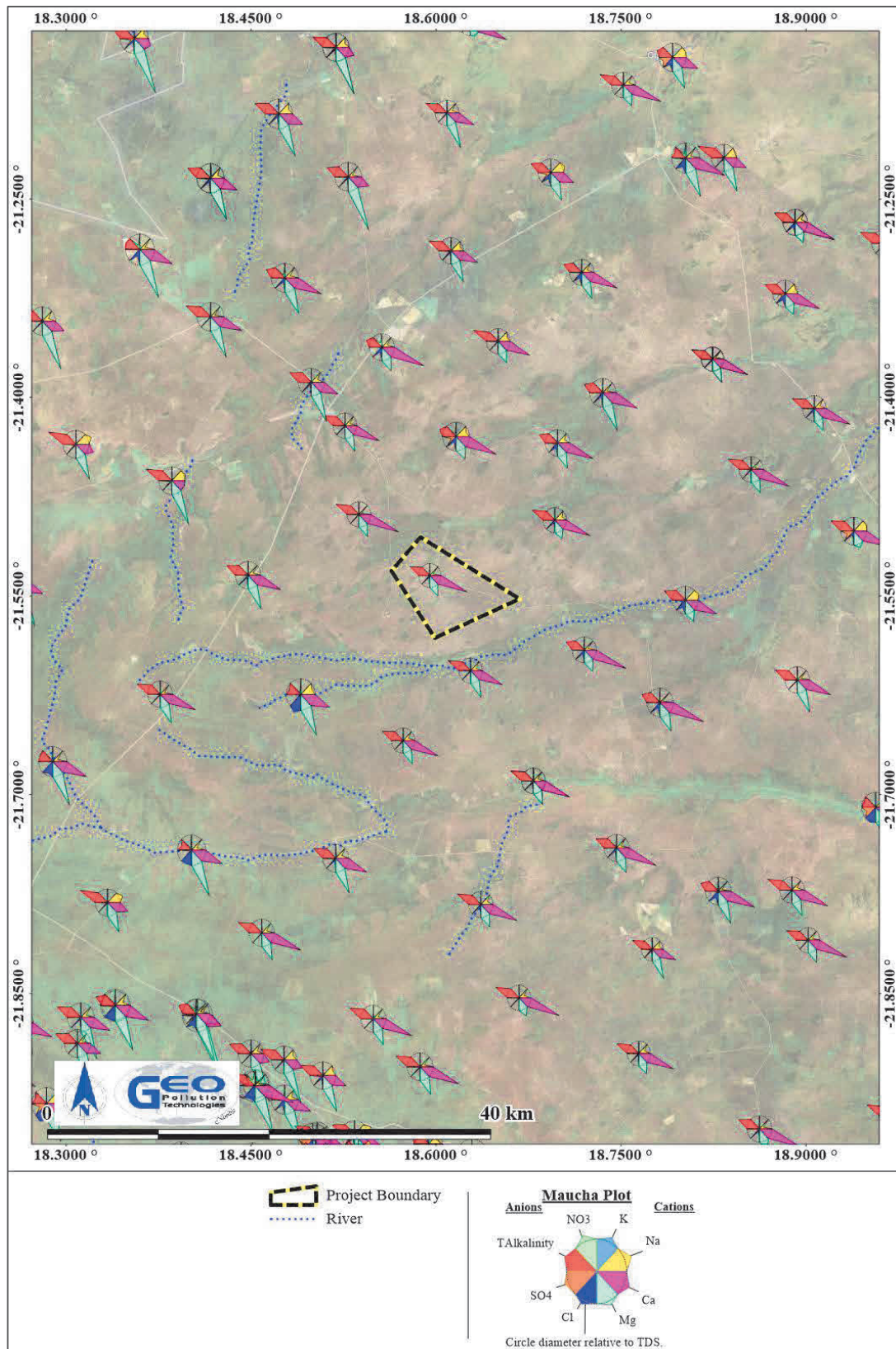
Group B: Water with acceptable quality

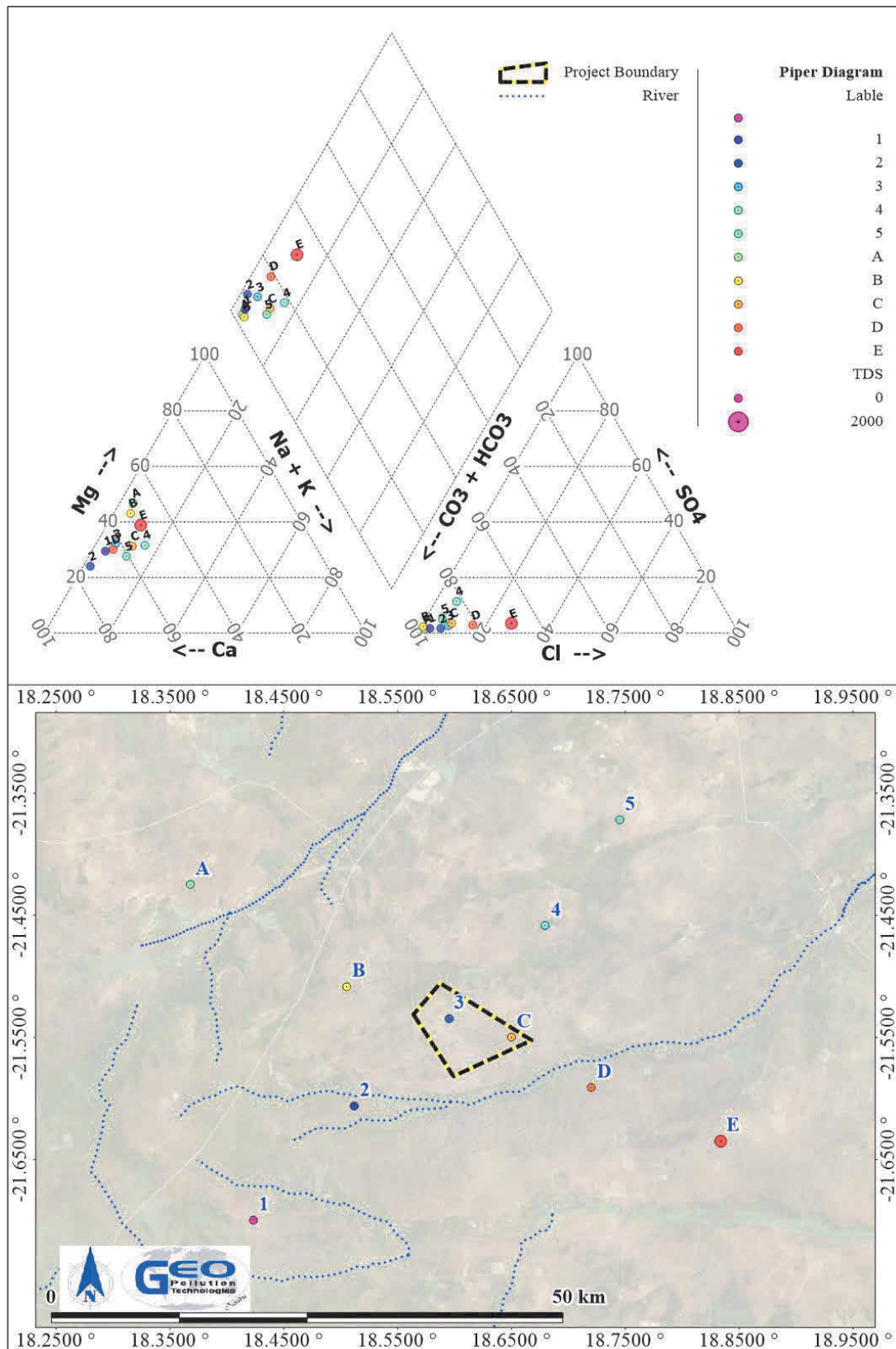
Group C: Water with low health risk

Group D: Water with a high health risk, or water unsuitable for human consumption.

Groundwater quality data is presented in Figure 5-13 as Maucha plots and in Figure 5-14 and Figure 5-15 as Piper plots. From Figure 5-13 and Figure 5-14 it is clear that the groundwater of the project location is mostly of a calcium - magnesium - bicarbonate water type which suggest the water is recently recharged. Groundwater to the west and northwest of the project has higher concentrations of magnesium (Mg) and less dominance in calcium (Ca) than the rest of the area. Localised occurrences of water with more dominant sodium (Na), sulphate (SO₄) and chloride (Cl) concentrations are present mainly to the southeast of the project area. In the immediate farm area there seems to be an increase in total dissolved solid content, associated with an increase in the chloride (Cl) concentration.

Regionally, elevated total dissolved solids (TDS) generally tend to correlate with the extent of the ephemeral rivers, see Figure 5-15. Localised evaporite mineral deposits in pans along river courses contribute to the elevated TDS concentration. However, note that some areas away from river courses also indicates an elevated TDS concentration. Although the hydrochemistry for the Eiseb-Epukiro Catchment is assumed to be relatively variable, there seem to be a trend from a magnesium bicarbonate type to a sodium chloride- and calcium chloride type water toward the down gradient area of the Eiseb-Epukiro Catchment.





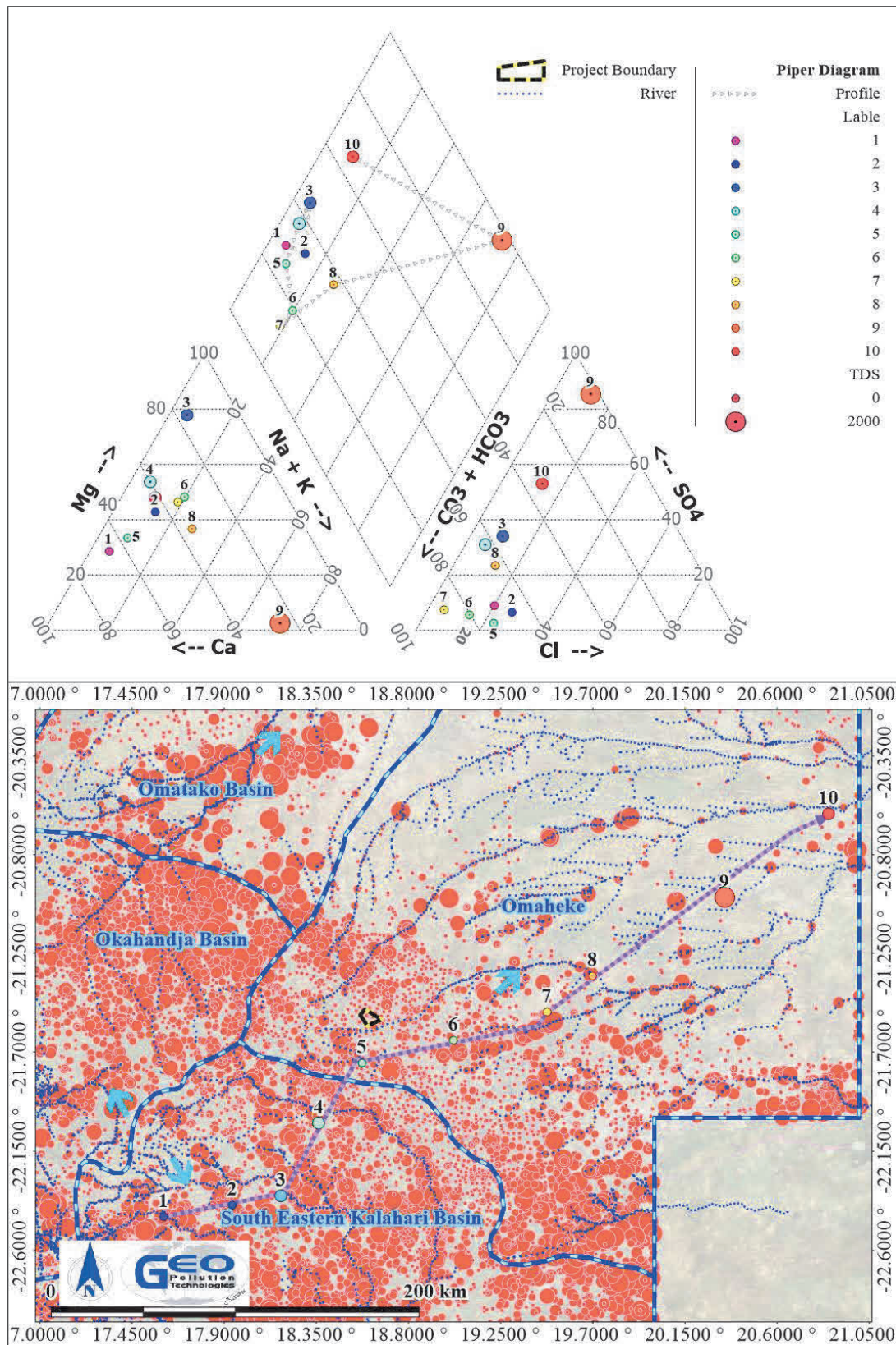


Figure 5-15. Historical hydrochemical data Piper plot for the region

5.6 PROJECT GROUNDWATER USAGE

The only available water source for the project is groundwater and the farms in the project area thus rely on boreholes for water supply for potable use, irrigation and livestock.

The project falls outside a water control area, thus an abstraction permit is not needed. However, it is in the interest of the proponent to apply for an abstraction permit to utilise the water for commercial purposes (irrigation). Groundwater remains the property of the Government of Namibia which permits and regulates water abstraction.

Ten (10) boreholes are present on farm Springvale no. 337 and operated by the Proponent. A summary of the available borehole data received from the client is provided in Table 5-4. All data could not be ascertained for some of the boreholes. The boreholes are used for purposes of potable water supply (domestic use), irrigation and stock watering. Two boreholes are currently not used.

Five boreholes are utilised for irrigation purposes on centre pivot systems. The five boreholes are split into the two irrigation areas on the farm. Irrigation boreholes named Borehole 1, Borehole 2 and Borehole 3 supply water to four centre pivots irrigation systems near the farm house. About 1.5 km toward the southeast, Borehole 4 and Borehole 5 supply water to three centre pivot irrigation systems.

The irrigation boreholes are installed with submersible pumps. Abstracted water is used to irrigate maize, oats and wheat fields via centre pivot irrigation systems. Water meters are installed at Borehole 1, Borehole 2 and Borehole 3 near the farm house. Historic water level data was supplied by the Proponent for Borehole 1, Borehole 2, Borehole 3, Borehole 4 and Borehole 5.

One borehole at the farm house is used for domestic purposes while two other boreholes are used for stock watering purposes on the farm.

Figure 5-16 illustrates all the borehole data as received from the Proponent as well as contained in the DWA database on the farms and immediate vicinity. Note that some of the DWA boreholes are not in use any more.

Table 5-4. Summary of borehole information obtained from the Proponent

Map Ref.	Borehole Name	Other Borehole Name	Use	Borehole Depth (m)	Yield (m ³ /h)	Water Level (mbs)
1	Borehole 1	Toetsgat 1	Irrigation	97	19	18
2	Borehole 2	Toetsgat 2	Irrigation	80	22	17
3	Borehole 3	Toetsgat 3	Irrigation	60	20	
4	Borehole 4	Hartbeespoos 2	Irrigation	80	78	
5	Borehole 5	Hartbees	Irrigation	50	19	
6	WW10687		Domestic		9.5	17.98
7		No. 28 (DWA)	Stock Watering		5.4	14
8		No. 29 (DWA)	Stock Watering		11.2	15
9		No. 30 (DWA)	Not Used		13.5	15.4
10		No. 27 (DWA)	Not Used		32	15

Water level and abstraction data, as supplied by the Proponent, are presented in Figure 5-17. Borehole 1 through to Borehole 3 have monitoring data from September 2018 to August 2020 and Borehole 4 and Borehole 5 from November 2013 to July 2020. Borehole 2 is located about 82 m northeast from Borehole 1 and Borehole 3 is 218 m east of Borehole 1. Borehole 4 is located about 45 m east of Borehole 5. Total monthly rainfall data (mm per month) was supplied by the client for the residence of the farm. The rainfall data stretches from October 2007 to May 2020. This rainfall was incorporated in Figure 5-17. Abstraction data was supplied for Borehole 1, Borehole 2 and Borehole 3.

From the data it is clear that water level data, over the monitoring period, remained stable for Borehole 2, Borehole 3 and Borehole 5. Water levels for Borehole 1 and Borehole 4 were mostly stable, but had water level increases for some periods. For Borehole 4, the water level increased rapidly in May 2016, and then gradually decreased to the level prior to the rapid increase. Borehole 1 had two increases of water level, during August 2019 and July 2020 respectively.

The data of all the boreholes suggest that there is no overall decrease in water level during the total monitoring period, despite water abstraction from the boreholes. There does not seem to be a correlation between the monthly peak rainfall and water level of the farm.

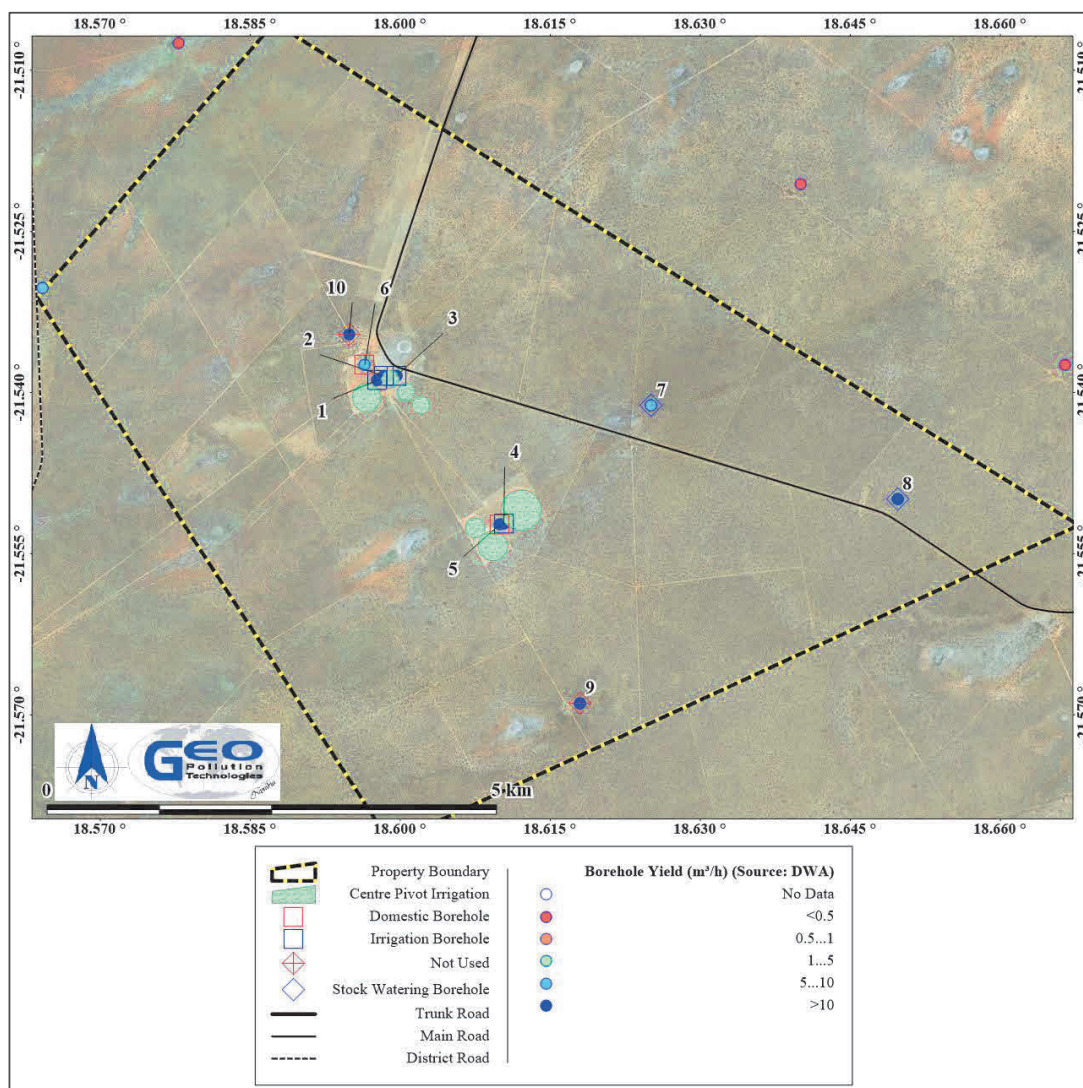


Figure 5-16. Locations of boreholes and irrigation areas on farm Springvale no. 337

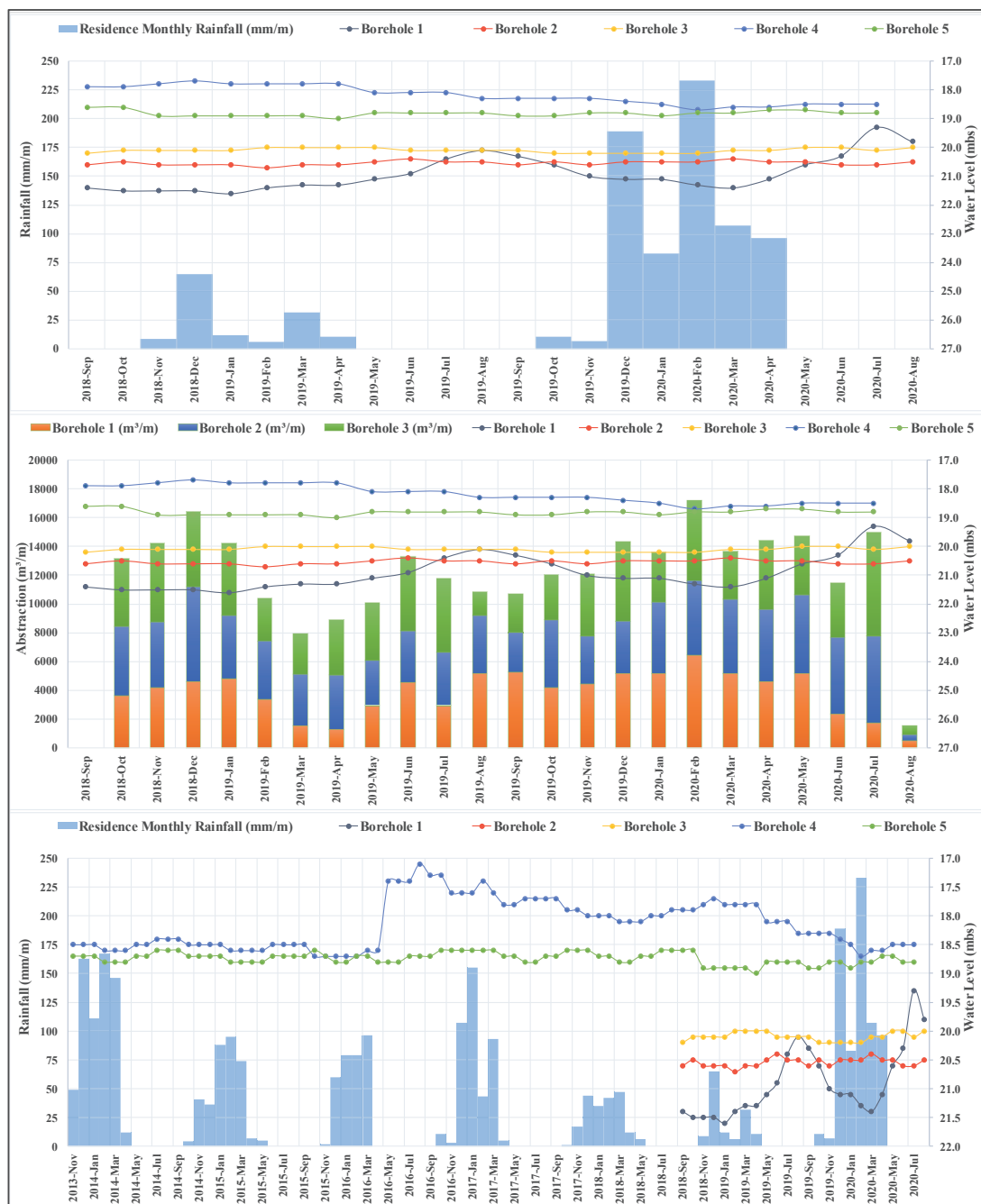


Figure 5-17. Abstraction borehole monitoring data and rainfall data

6 ASSESSMENT OF BOREHOLE DATA

Test pumping data from the Proponent was obtained and assessed.

6.1 TEST PUMPING

Test pumping data, consisting of constant discharge test data, was supplied by the Proponent. Constant discharge test data is presented for Borehole 1 and Borehole 2. Test pumping at the boreholes took place in October 2015 and November 2015 respectively. Note that the water level and flow rate data were provided as whole numbers, thus reducing the accuracy of the measurements. Raw data is attached in Appendix A for the boreholes.

Test pumping on Borehole 1 (Toetsgat 1) lasted 2 hours and recovery 30 minutes. The rest water level for this borehole was 18 mbs. Water levels dropped rapidly after test pumping commenced. After 50 minutes of test pumping the water levels stabilized and remained at 71 mbs until test pumping stopped. The borehole recovered to its rest water level of 18 mbs within 30 minutes. A Cooper-Jacob I drawdown analysis was applied to obtain the local aquifer parameters. The analysis indicated that the local aquifer has a T value (Transmissivity) of 114 m²/day (Figure 6-1). It should be noted that the rate of abstraction for this test pumping exercise decreases for the first 20 minutes of the test, contrary to what is normally observed from submersible pumps.

Test pumping on Borehole 2 (Toetsgat 2) lasted 3 hours and recovery 20 minutes. The rest water level for this hole was 17 mbs. Water levels dropped rapidly after test pumping commenced. After 35 minutes of test pumping the water levels stabilized and remained at 61 mbs until test pumping stopped. The borehole recovered back to its rest water level of 17 mbs within 20 minutes. A Cooper-Jacob I drawdown analysis was applied to obtain the local aquifer parameters. The analysis indicated that the local aquifer has a T value (Transmissivity) of 121 m²/day (Figure 6-2). It should be noted that the rate of abstraction for this test pumping exercise was inconsistent for the first 25 minutes of the test.

Based on the test pumping data, it is expected that a more permeable layer is present below 71 mbs for Borehole 1 and 61 mbs for Borehole 2, which possibly could consist of the more permeable layer near the Kalahari Group contact with the hard rock substrata.

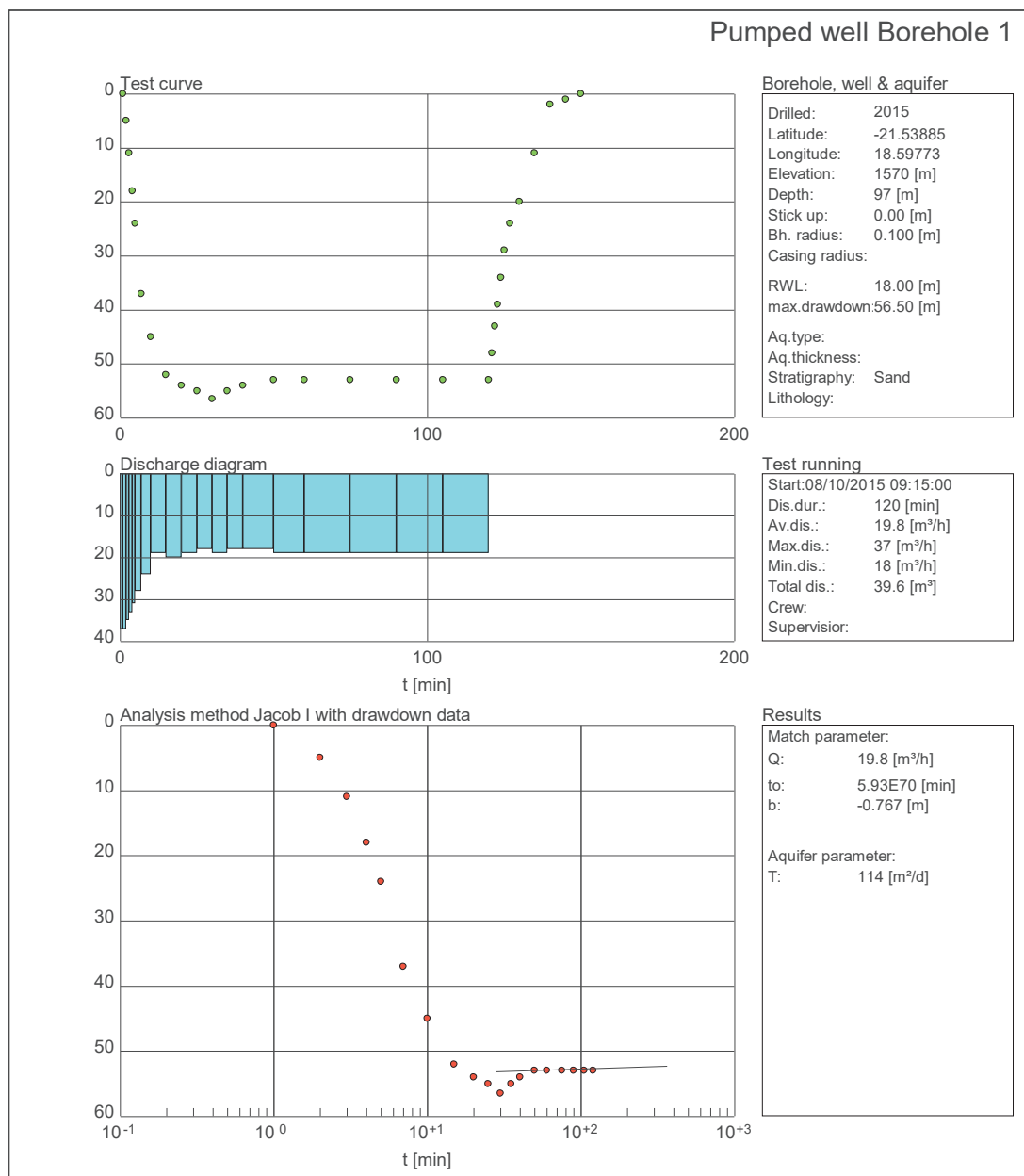


Figure 6-1. Cooper-Jacob 1 drawdown curve for Borehole 1

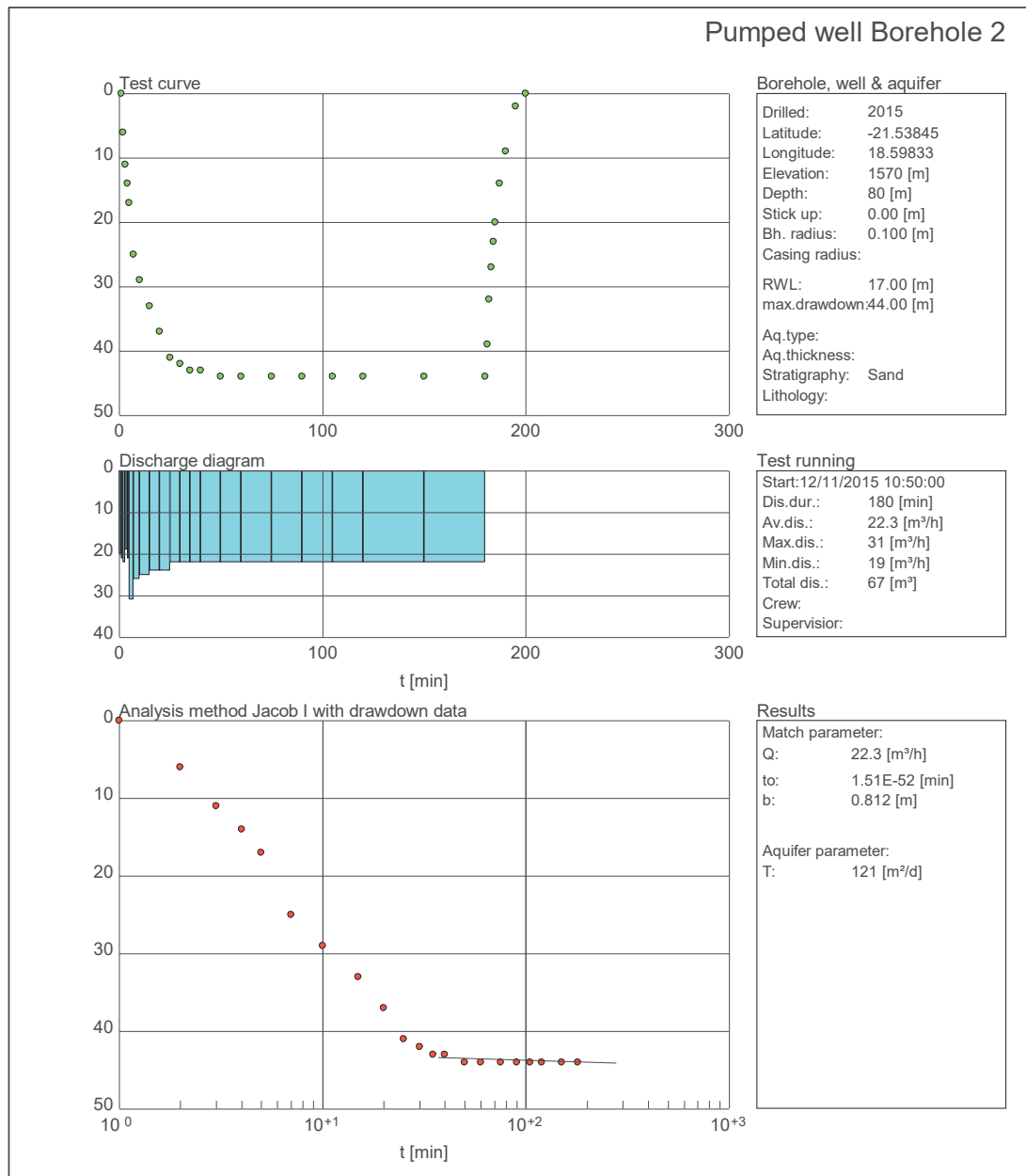


Figure 6-2. Cooper-Jacob 1 drawdown curve for Borehole 2

A single water sample was collected by the proponent on farm Springvale no. 337 in April 2019, described as Sirkel 3, and were submitted for quality analysis. The exact location where the sample were collected on the farm is not known. Chemical analysis results are contained in Appendix B.

Medium-salinity water (C2) can be used if a moderate amount of leaching occurs. Plants with moderate tolerance can be grown in most cases without special practices for salinity control.

Low sodium water (S1) can be used for irrigation on almost all soils with little danger of the development of harmful levels of exchangeable sodium.

The Permeability Index of soil is affected by irrigation water with high sodium, calcium, magnesium and bicarbonate content, coupled to its long term use. High sodium in the irrigation water can cause soil permeability problems. Permeability is also affected by CO_3^{2-} and HCO_3^- concentrations in the water. A portion of CO_3^{2-} and HCO_3^- is precipitated as CaCO_3 (or) MgCO_3 removing Ca and Mg from irrigation water, leading to increased precipitation of these elements.

Magnesium is essential for plant growth, but too much magnesium can have a severe toxicity effect on plants. A Magnesium Adsorption Ratio exceeding 50 is considered unsuitable for plants as it may increase the salinity of soil.

The pH value is suitable for irrigation, even when crop foliage is wetted, no foliar damage will occur. The sample further has safe concentrations of chloride (Cl), boron (B), sodium (Na), magnesium (Mg), fluoride (F), manganese (Mn), iron (Fe), copper (Cu), zinc (Zn) and molybdenum (Mo).

From Figure 7-2 it is evident that the water from the source has a calcium - magnesium - bicarbonate type composition. The quality of the water can be generally described as Group A or excellent quality, suitable for human consumption or irrigation.

Care must be exercised when long term irrigation takes place on unsuitable soil.

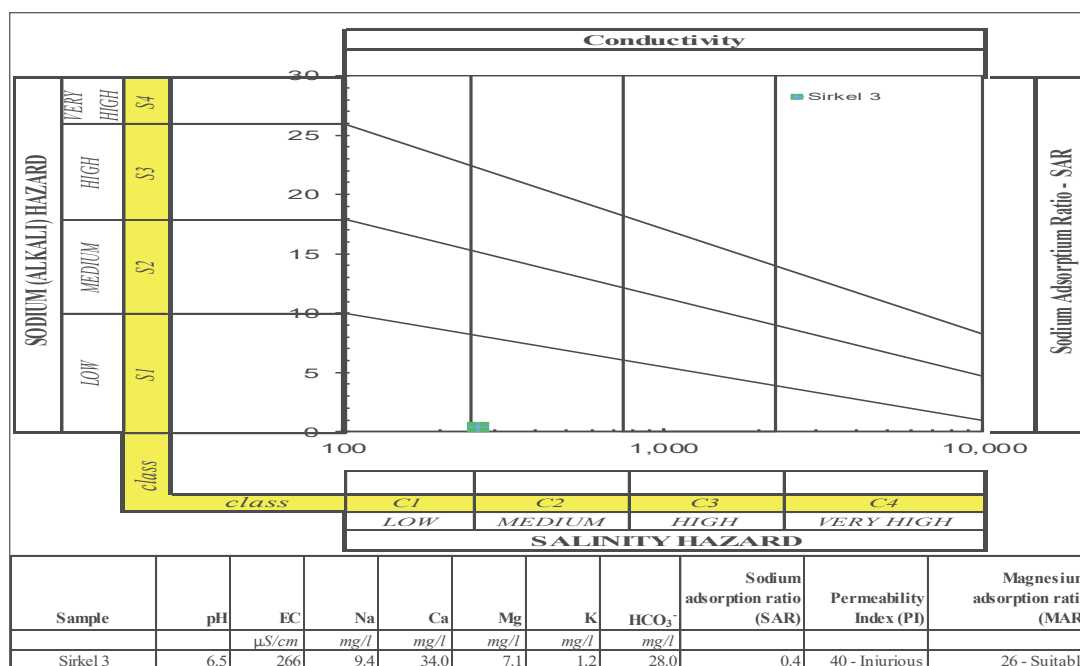


Figure 7-1. Groundwater sodium adsorption ration

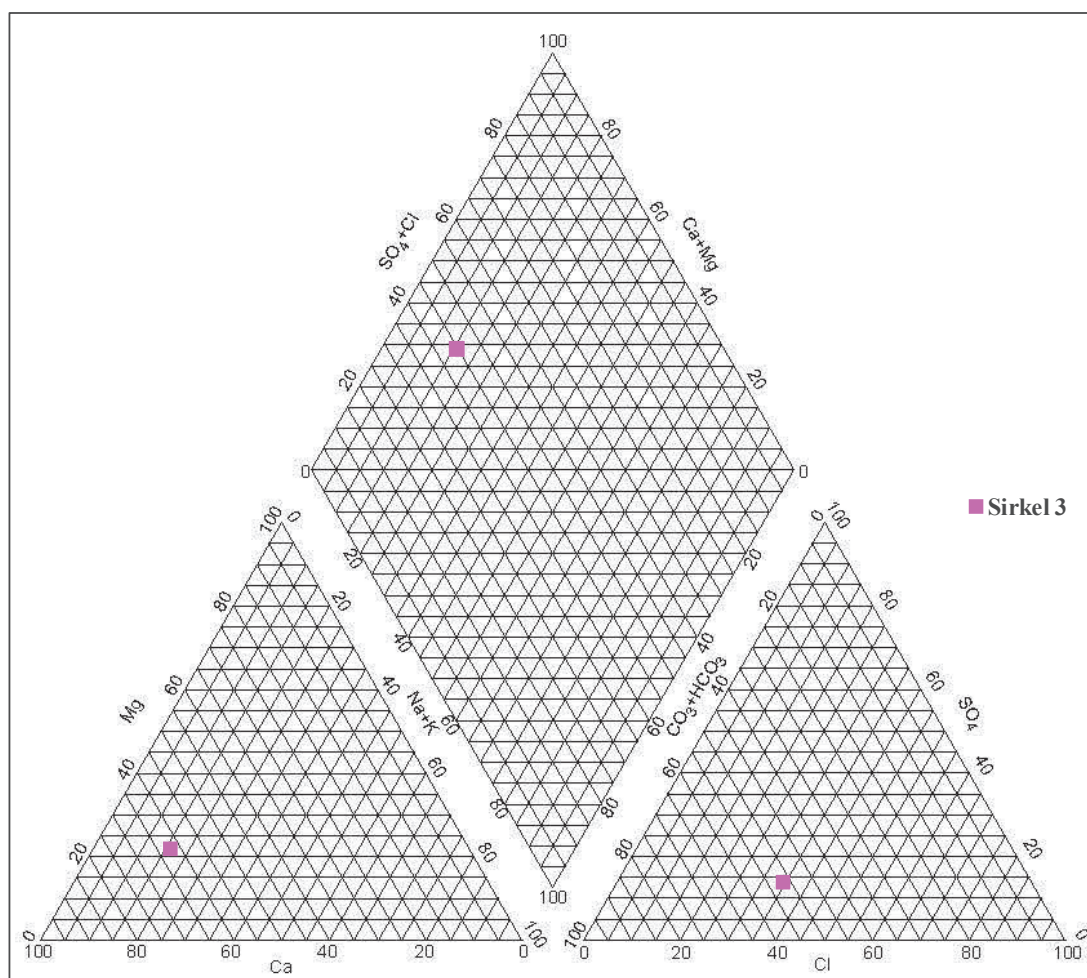


Figure 7-2. Piper diagram for farm Springvale no. 233

8 SOIL SUITABILITY FOR IRRIGATION PURPOSES

Six (6) soil samples were collected on farm Springvale no. 337 during August 2019 and chemical analysis were performed. Chemical analysis results are contained in Appendix B. The exact locations of the sampling points are not known, but the results give a general idea of the soil type and quality for the project area.

The soils had pH values ranging between 4.8 and 7.4. The soils can be described as acidic to very slightly alkaline soil. An increase in alkalinity (increase in pH) or acidity (decrease in pH) can cause deficiency of nitrogen, phosphorus and micro elements such as iron, manganese, boron, copper and zinc. Figure 8-1 indicates the solubility of elements at different pH levels, the red square representing the pH levels of the soils.

A summary of the soil sample results are depicted in Table 8-1. All elements highlighted in blue has low concentrations of the elements as required by plants. All highlighted in orange has high concentrations of the elements that can be harmful to plants. All the elements highlighted in white is in the most efficient range as required by plants. Four of the six samples showed pH levels best for crop production (pH between 5.5 and 6.7). At this level, exchange of plant nutrient cations will take place, ensuring effective plant growth. The pH of the soil sample reference CT19-16789.001 slightly high (elevated alkalinity) and not ideal for crop production. This can be expected in a calcrete rich environment, as calcrete have acid buffering properties and therefore elevate soil pH, making the soil more alkaline.

All the samples is deficient in organic carbon. When laboratories analyse for organic matter it includes hydrogen, oxygen, nitrogen and other elements that are components of organic compounds, not just carbon. In contrast, total organic carbon is a measure of only the carbon contained within soil organic matter.

Most of the samples showed insufficient concentrations of potassium and calcium. One sample had an elevated concentration of calcium. The most common symptom of plant potassium deficiency is yellowing of older plant leaves and death of leaf tissue. Calcium deficiency cause blossom end rot that cause fruit tissue to die at the flower end of the fruit, notably in tomatoes. Other symptoms of calcium deficiency include chlorosis of new leaves and death of new leaf buds.

The magnesium concentration was predominantly suitable, with two samples indicating deficient concentrations. A lack of magnesium cause stunted plant growth, thus reducing efficiency of crop production.

Sodium is not a plant nutrient and therefore is not necessary for plant growth. However, high levels of sodium are detrimental to soil tilth and plant growth.

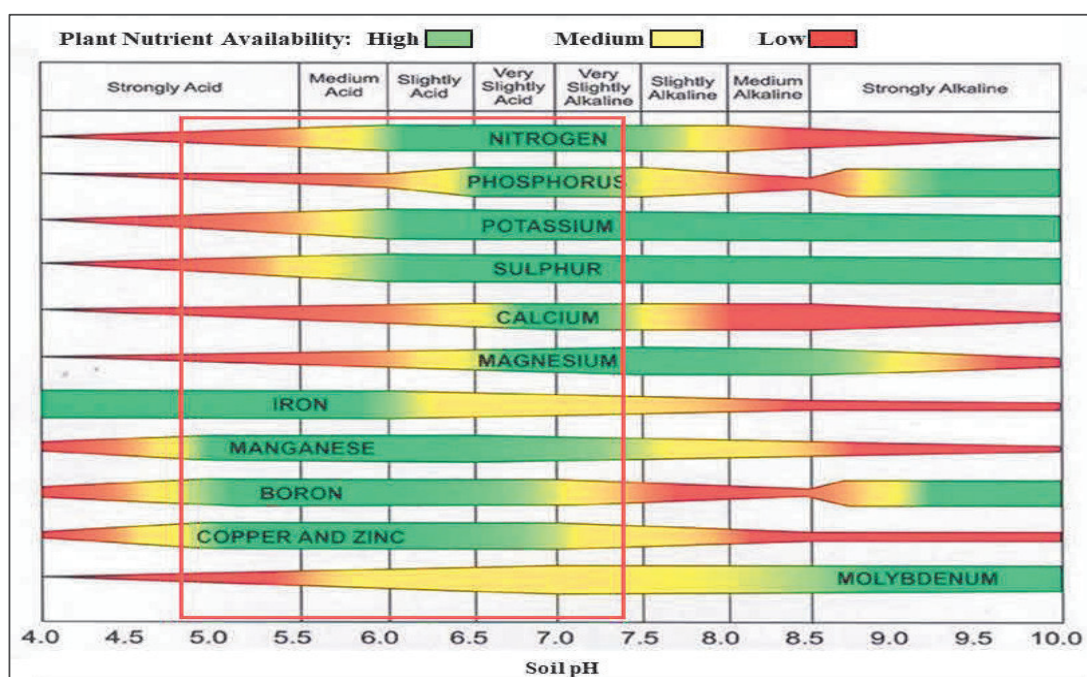


Figure 8-1. Soil pH effects on availability of elements (after University of California; 2019)

Table 8-1. Soil sample results

Type of Test:		pH	Organic carbon (C)	Potassium (K)	Magnesium (Mg)	Calcium (Ca)
Method details:		(KCL)	Walkey Black			
Lab No.	Sample Reference		% m/m C	mg K/kg	mg Mg/kg	mg Ca/kg
CT19-16789.001	Sweetcorn	7.4	0.24	139	178	2375
CT19-16789.002	Droëland A+B	5.6	0.32	167	117	555
CT19-16789.003	Droëland C+D	4.8	0.2	65	62	247
CT19-16789.004	Skuurland	5.8	0.32	120	90	452
CT19-16789.005	Tip-Land	5.7	0.28	41	38	229
CT19-16789.006	Petrus	6	0.65	112	127	817
	Low	Medium	High			
pH	<5.4	5.5 - 6.7	>6.8			
Organic Carbon	<0.9%	0.9% - 1.3%	>1.3%			
K	<150 mg/kg	150 mg/kg - 250 mg/kg	>250 mg/kg			
Mg	<60 mg/kg	60 mg/kg - 180 mg/kg	>180 mg/kg			
Ca	<1000 mg/kg	1000 mg/kg - 2000mg/kg	>2000mg/kg			

9 ASSESSMENT OF IMPACTS

The purpose of this section is to assess and identify the most pertinent environmental impacts and provide possible mitigation measures that are expected from the project. The Rapid Impact Assessment Method (Pastakia, 1998) will be used during the assessment. The Environmental Classification of impacts is provided in Table 9-1.

Impacts are assessed according to the following categories: Importance of condition (A1); Magnitude of Change (A2); Permanence (B1); Reversibility (B2); and Cumulative Nature (B3) (see Table 9-2).

Environmental Classification = $A1 \times A2 \times (B1 + B2 + B3)$

The probability ranking refers to the probability that a specific impact will happen following a risk event. These can be improbable (low likelihood); probable (distinct possibility); highly probable (most likely); and definite (impact will occur regardless of prevention measures). See Table 9-3 and Table 9-4 for the final assessment of expected impacts.

Table 9-1. Environmental classification of impacts according to the rapid impact assessment method of Pastakia 1998.

Environmental Classification (ES)	Class Value	Description of Class
72 to 108	5	Extremely positive impact
36 to 71	4	Significantly positive impact
19 to 35	3	Moderately positive impact
10 to 18	2	Less positive impact
1 to 9	1	Reduced positive impact
0	-0	No alteration
-1 to -9	-1	Reduced negative impact
-10 to -18	-2	Less negative impact
-19 to -35	-3	Moderately negative impact
-36 to -71	-4	Significantly negative impact
-72 to -108	-5	Extremely Negative Impact

Table 9-2. Assessment criteria

Criteria	Score
Importance of condition (A1) – assessed against the spatial boundaries of human interest it will affect	
Importance to national/international interest	4
Important to regional/national interest	3
Important to areas immediately outside the local condition	2
Important only to the local condition	1
No importance	0
Magnitude of change/effect (A2) – measure of scale in terms of benefit / detriment of an impact or condition	
Major positive benefit	3
Significant improvement in status quo	2
Improvement in status quo	1
No change in status quo	0
Negative change in status quo	-1
Significant negative detriment or change	-2
Major detriment or change	-3
Permanence (B1) – defines whether the condition is permanent or temporary	
No change/Not applicable	1
Temporary	2
Permanent	3
Reversibility (B2) – defines whether the condition can be changed and is a measure of the control over the condition	
No change/Not applicable	1
Reversible	2
Irreversible	3
Cumulative (B3) – reflects whether the effect will be a single direct impact or will include cumulative impacts over time, or synergistic effect with other conditions. It is a means of judging the sustainability of the condition – not to be confused with the permanence criterion.	
Light or No Cumulative Character/Not applicable	1
Moderate Cumulative Character	2
Strong Cumulative Character	3

9.1 GROUNDWATER ABSTRACTION

Groundwater abstraction is a very sensitive topic in a dry country where the value of land is drastically reduced if no or unusable groundwater is present on the land. Abstraction of groundwater must be conducted in a sensible way to prevent impacts on other groundwater users that depend on such groundwater. These include water abstracted for human and animal use, irrigation, and also ecosystems that depend on groundwater.

In a typical groundwater environment, a water balance would consist of inflow and outflow of the groundwater system (Figure 9-1). Over time an equilibrium (or steady state) is normally reached with rising water table following good recharge events and declining water table when recharge is below average. Inflow into the system would typically be from infiltration following rainfall in the recharge area and in upstream areas.

Outflow would be comprised of water leaving the system through springs and as outflow over the lower boundary of the groundwater system as well as evapotranspiration losses. Groundwater abstraction through boreholes is important as this is normally necessary to sustain human and animal demands where such users became dependant on the abstracted groundwater.

The project is located about 24 km north of the Eiseb-Epukiro Catchment documented groundwater divide. Although the project is a considerable distance away, excessive abstraction may influence upstream or downstream receptors on the long run. Typical consequences of over abstraction will include a lowering in the water table. Lowering of water table may further lead to the drying up of boreholes and springs. Vegetation will also be impacted where such vegetation has access to groundwater. It is important to note that the groundwater basin forms a transboundary aquifer that extend from Namibia into Botswana. Over abstraction in any of the countries will have a negative impact on the other country and can causes disputes. As the groundwater flows from the recharge area in Namibia, out to Botswana, care must be taken in Namibia to ensure that the quality of water is not affected as this will later on affect the neighbouring country.

Based on current water level fluctuations in the area, as presented in this report (Figure 5-12), a short term threshold of 5 m below the average rest water level of borehole data is set from where abstraction rates should be reduced.

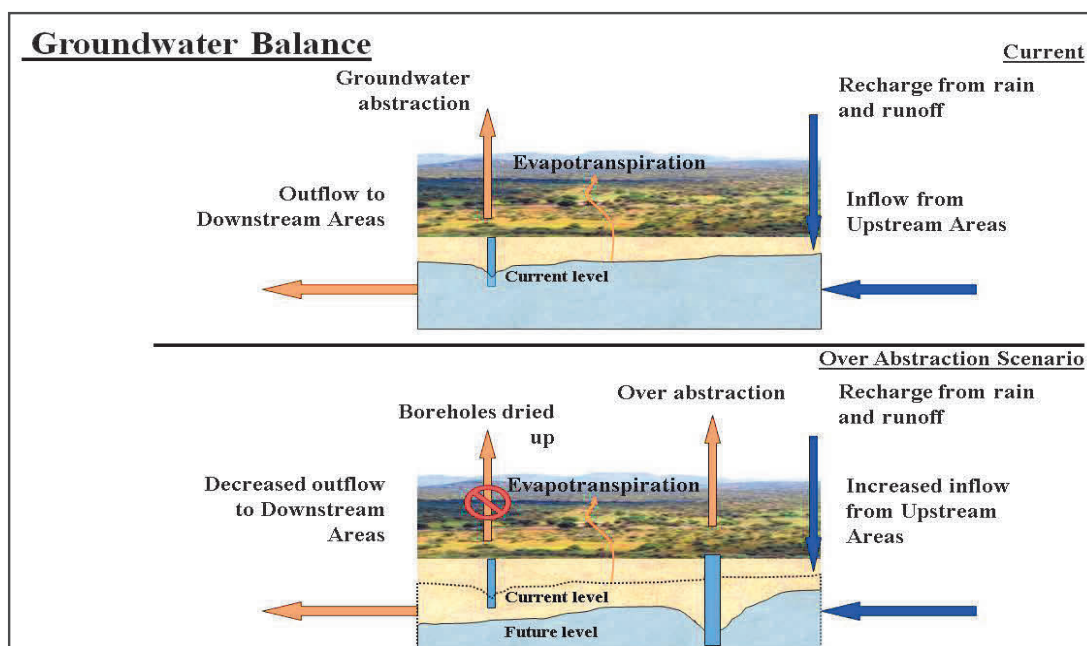


Figure 9-1. Conceptual groundwater balance with over abstraction scenario

Table 9-3. Assessment – Groundwater abstraction

Project Activity / Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Daily Operations	Over-abstraction of the local aquifer, decrease in the local hydraulic head.	2	-2	2	2	2	-24	-3	Probable

Desired Outcome: To utilise the groundwater on a sustainable level.

Actions

Prevention:

- ◆ Spread the water abstraction points over a larger area to diffuse the impact.
- ◆ Monthly water level monitoring.

Mitigation:

- ◆ Reduce abstraction when the water levels nears 5 m below the average water level of each borehole.

Responsible Body:

- ◆ The proponent

Data Sources and Monitoring:

- ◆ Monthly water rest water level monitoring.
- ◆ Baseline values should be reviewed every 3 years based on all historic water level data.
- ◆ A summary report on all monitoring results must be prepared.

9.2 GROUNDWATER, SURFACE WATER AND SOIL CONTAMINATION

Leakages and spillages hazardous substances from earthmoving vehicles and accidental fuel, oil or hydraulic fluid spills during the operational phase. Increase of nutrient levels (from over application of fertilizers) in the soil that can leach to the groundwater. Pollution due to sewerage system overflow or leakage. Overuse / incorrect application of herbicides / pesticides may also pose a risk.

Table 9-4. Assessment – Groundwater, surface water and soil contamination

Project Activity / Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Hazardous material, spillages, hydrocarbon leakages from vehicles and machinery.	2	-1	2	2	1	-10	-2	Improbable
Daily Operations	Over application of fertilizer, herbicides / pesticides, etc. Sewerage system malfunction.	2	-1	2	2	1	-10	-2	Improbable

Desired Outcome: To prevent the contamination of groundwater, surface water and soil.

Actions

Prevention:

- ◆ Appoint reputable contractors.
- ◆ Vehicles may only be serviced on a suitable spill control structure.
- ◆ Regular inspections and maintenance of all vehicles to ensure no leaks are present.
- ◆ All hazardous chemicals should be stored in a sufficiently bunded area.
- ◆ Follow prescribed dosage of fertilizers and pesticides / herbicides and to avoid over application.
- ◆ Maintain sewerage systems and conduct regular monitoring.
- ◆ All hazardous waste must be removed from the site and disposed of timeously at a recognised hazardous waste disposal facility, including any polluted soil or water.

Mitigation:

- ◆ All spills must be cleaned up immediately.
- ◆ Consult relevant Material Safety Data Sheet information and a suitably qualified specialist where needed.

Responsible Body:

- ◆ The proponent
- ◆ Contractors

Data Sources and Monitoring:

- ◆ Maintain Material Safety Data Sheets for hazardous chemicals.
- ◆ Soil should be sampled and analysed annually to ensure the correct amounts of fertilizer is applied and soil and groundwater quality is maintained.
- ◆ Groundwater should be sampled and analysed to test for nitrate concentrations from the fertilizer and for traces of chemicals used in pesticides and herbicides.
- ◆ Registers be kept by the farmers on the type, quantities and frequency of application of fertiliser, pesticides and any other chemicals utilised in crop production.
- ◆ A register of all incidents must be maintained on a daily basis. This should include measures taken to ensure that such incidents do not repeat themselves.
- ◆ All spills or leaks must be reported on and cleaned up immediately.

10 CONCLUSION

Groundwater on the farm is high yielding and can be used for irrigation. Groundwater monitoring data from the Proponent indicate stable water level conditions and does not indicate a declining trend in water levels (Figure 5-17), despite of groundwater abstraction. Data from the long-term groundwater monitoring installations generally show stable groundwater level conditions. Based on current water level fluctuations in the region, as presented in Figure 5-12, a short term rest water level threshold of 5 m below the average rest water level of each borehole is set from where abstraction rates should be reduced. This threshold may require adjustment during drought periods as abstraction from neighbouring farms may also influence the regional water levels.

Careful cooperation between farms utilising water from the aquifer, on neighbouring farms and beyond is required to optimally utilize the groundwater resource without depleting it, as depletion will be detrimental to all. This should include self-monitoring and assessment of water levels in the area as data obtained from DWA indicates a lack of sufficient monitoring in the recent years. Proper monitoring data will provide the required information to make informed decisions.

Groundwater vulnerability to contamination would be the highest around boreholes, around geological structures as well as where shallow groundwater is present. Contamination risks can be reduced through proper fertilizer, herbicide and pesticide application. Annual groundwater and soil analysis from irrigation areas will serve as early warning of contamination problems. These impacts are normally of a low magnitude and can be managed through proper housekeeping.

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Appendix A: Test Pumping Data



Northern Pump Services
P.O. Box 1378
Tsumeb
Tel: 09 264 67-222680
Fax: 09 264 67-222656
npplumbing@iway.na

Cell: 0812413898
Vat No 0136316015

HUIS
BY KUNSMIS
TENK

MAIN DISCHARGE TEST FORM

NAME: E. van Niekerk T/A Vision Farming
TEL. NO.: 062 561650 0811287900
P.O BOX: 31180 WHK
DATE: 8 Oktober 2015
FARM: Springvale 337
E-MAIL: fiyaway@iway.na

DIAMETER: 200mm
B/HOLE NO.: Toetsgat 1
B/HOLE DEPTH: 97m
PUMP DEPTH: 85m
PUMP CAPACITY: 19qub/h
DURATION: 2h

PUMP					RECOVERY			REMARKS
Clock Time [hh:mm]	Pump Time [min]	Water Level [m b collar]	Flowmeter Reading [m³/h]	EC [S/cm]	Start Time [min]	Recovery Time [min]	Water Level [m b collar]	
9h15	1	18m	37		11h15	1	66m	
	2	23m	37			2	61m	
	3	29m	35			3	57m	
	4	36m	33			4	52m	
	5	42m	31			5	47m	
	7	55m	28			7	42m	
	10	63m	24			10	38m	
	15	70m	19			15	29m	
	20	72m	20			20	20m	
	25	73m	19			25	19m	
	30	74,5m	18			30	18m	
	35	73m	19			35		
	40	72m	18			40		
	50	71m	18			50		
1 Hr	60	71m	19			60		
	75	71m	19			75		
	90	71m	19			90		
	105	71m	19			105		
2 Hr	120	71m	19			120		
	150					150		
3 Hr	180					180		
	210					210		
4 Hr	240					240		
5 Hr	300					300		
6 Hr	360					360		
8 Hr	480					480		
10 Hr	600					600		



Northern Pump Services
P.O. Box 1378
Tsumeb
Tel: 09 264 67-222680
Fax: 09 264 67-222656
npplumbing@iway.na

Cell: 0812413898
Vat No 0136316015


MAIN DISCHARGE TEST FORM

NAME: E. van Niekerk T/A Vision Farming
TEL. NO.: 062 561650 0811287900
P.O BOX: 31180 WHK
DATE: 12-Nov-15
FARM: Springvale 337
E-MAIL: flvaway@iway.na

DIAMETER: 200mm
B/HOLE NO.: Toetsgat 2
B/HOLE DEPTH: 80m
PUMP DEPTH: 65m
PUMP CAPACITY: 22qub/h
DURATION: 3h

PUMP					RECOVERY			REMARKS
Clock Time [hh:mm]	Pump Time [min]	Water Level [m b collar]	Flowmeter Reading [m³/h]	EC [S/cm]	Start Time [min]	Recovery Time [min]	Water Level [m b collar]	
10h50	1	17m	20		13h50	1	56m	
	2	23m	21			2	49m	
	3	28m	22			3	44m	
	4	31m	19			4	40m	
	5	34m	21			5	37m	
	7	42m	31			7	31m	
	10	46m	26			10	26m	
	15	50m	25			15	19m	
	20	54m	24			20	17m	
	25	58m	24			25		
	30	59m	22			30		
	35	60m	22			35		
	40	60m	22			40		
	50	61m	22			50		
1 Hr	60	61m	22			60		
	75	61m	22			75		
	90	61m	22			90		
	105	61m	22			105		
2 Hr	120	61m	22			120		
	150	61m	22			150		
3 Hr	180	61m	22			180		
	210					210		
4 Hr	240					240		
5 Hr	300					300		
6 Hr	360					360		
8 Hr	480					480		
10 Hr	600					600		

Appendix B: Chemical Analyses



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71 Newcastle Street • PO Box 86782 • Eros • Windhoek • Namibia

TEST REPORT

To: Ms Elize van Niekerk
P.O.Box 31180
Windhoek


Date received: 06 May 19
Date required:
Date completed: 21 May 19

e-mail: flyaway@iway.na Your Reference: QU-2750
Lab Reference: I190751

Sample details							
Location of sampling point	water sample						
Description of sampling point	Springvale						
Date of sampling	Sirkle 3						
Time of sampling	2019/04/22						
Test item number	07:43						
	I190751/1						

Parameter	Value	Units	me	Salinity/Chloride/RSC Hazard				
				Low	Medium	High	Very High	
pH	6,5				Acceptable pH range: 6.5-8.4			
Electrical Conductivity	26,6	mS/m		<25	25-75	75-225	>225	
P-Alkalinity as CaCO ₃	0	mg/l						
Total Alkalinity as CaCO ₃	23	mg/l						
Bicarbonate as HCO ₃ ⁻	28	mg/l	0,46					
Carbonate as CO ₃ ²⁻	0	mg/l	0					
Total Hardness as CaCO ₃	114	mg/l						
Chloride as Cl ⁻	11	mg/l		0-105	105-140	140-350	>350	
Fluoride as F ⁻	0,2	mg/l						
Sulphate as SO ₄ ²⁻	3	mg/l						
Nitrate as N	30	mg/l						
Sodium as Na	9,4	mg/l	0,41					
Potassium as K	1,2	mg/l						
Magnesium as Mg	7,1	mg/l	0,58					
Calcium as Ca	34	mg/l	1,70					
Manganese as Mn	<0.01	mg/l						
Iron as Fe	0,02	mg/l						
Copper as Cu	0,01	mg/l						
Zinc as Zn	0,80	mg/l						
Boron as B	0,03	mg/l		0.3-1.0	1.0-2.0	2.0-4.0	>4.0	
Molybdenum as Mo	<0.01	mg/l						
Quality Indices:								
Electrical Conductivity	0,27	mS/cm						
HCO ₃ :Ca	0,27	me/l						
Modified calcium value	4,21	me/l						
Adj. Sodium Adsorption Ratio	0,4	me/l						
Residual Sodium Carbonate	-1,8	me/l		<1.25	1.25-2.50	>2.50		
Magnesium Ratio	25,6	me/l			Acceptable ratio: <50			
Stability pH, at 25°C	8,5							
Ryznar Index	10,6	corrosive		<6.5=scaling, >7.5=corrosive, ≥6.5 and ≤7.5=stable				
Corrosivity ratio	0,8	increasing corrosive tendency		Applies to water in the pH range 7-8 which also contains dissolved oxygen ratios <0.2 no corrosive properties ratios >0.2 increasing corrosive tendency				

S. Rügheimer



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Assessment of water quality and its subsequent effect on soils

pH value	:	suitable , even when crop foliage is wetted, this should not cause foliar damage
Salinity hazard	:	medium , water can be used if a moderate amount of leaching occurs. Should ensure that salt sensitive crops can be grown without yield decreases when using low frequency irrigation systems
Chloride hazard	:	low , should prevent the accumulation of chloride to toxic levels in all but the most sensitive plants, even when chloride uptake is through foliar absorption
Boron hazard	:	Boron, though a plant nutrient, becomes toxic if present in water beyond a particular level. Safe
Sodium hazard	:	low , water can be used for irrigation on almost all soils with little danger of the development of harmful levels of exchangeable sodium Should prevent the accumulation of sodium to toxic levels in all but the most sensitive plants, even when crop foliage is wet.
RSC hazard	:	This index indicates the tendency of carbonate and bicarbonates to precipitate calcium as calcium carbonate. Safe
Magnesium ratio	:	Magnesium deteriorates soil structure particularly when waters are sodium-dominated and highly saline. Higher level of Mg usually promotes higher development of exchangeable Na in irrigated soils. Safe
Fluoride	:	Its contents beyond 1 mg/l in drinking water and 10ppm in irrigation water is harmful. It is not directly toxic to the plant but to animals feeding on plants which have been irrigated with high fluoride waters.
Nitrate	:	Nitrate generally occurs in trace quantities in surface water but can be present in higher concentrations in some groundwaters. Beneficial effect of nitrates on crop production has been widely reported. The presence of potassium and nitrate in appreciable amounts in irrigation water has been found to partially counteract the adverse effect of salinity and sodicity on plant growth.
Potassium	:	Being a plant nutrient, its presence in saline water counteracts the adverse effect of sodium on crop growth.
Manganese	:	Safe
Iron	:	Safe
Copper	:	Safe
Zinc	:	Safe
Molybdenum	:	Safe

S. Rügheimer
Laboratory Manager

Page 2 of 2

Appendix C: Tree Information

Trees recorded in quarter degree square 2118DA (Curtis & Mannheimer 2005)

Name	Common Name
<i>Acacia ataxacantha</i>	Flame-thorn
<i>Acacia erioloba</i>	Camel-thorn
<i>Acacia fleckii</i>	Sand-veld Acacia
<i>Acacia hebeclada</i> subsp <i>hebeclada</i>	Candle-pod Acacia
<i>Acacia hereroensis</i>	Mountain-thorn
<i>Acacia karroo</i>	Sweet-thorn
<i>Acacia luederitzii</i> var <i>luederitzii</i>	Kalahari Acacia
<i>Acacia mellifera</i> subsp <i>detinens</i>	Blue-thorn Acacia
<i>Acacia reficiens</i> subsp <i>reficiens</i>	Red-thorn
<i>Albizia anthelmintica</i>	Worm-cure Albizia; Aru
<i>Bauhinia petersiana</i> subsp <i>macrantha</i>	White Bauhinia
<i>Boscia albitrunca</i>	Shepherd's Tree
<i>Burkea africana</i>	Burkea
<i>Catophractes alexandri</i>	Trumpet-thorn; Rattlepod
<i>Combretum collinum</i> subsp <i>gazense</i>	Bi-coloured Variable Combretum
<i>Combretum hereroense</i> subsp <i>hereroense</i>	Mouse-eared Combretum
<i>Combretum psidioides</i>	Peeling-twigg Combretum
<i>Dichrostachys cinerea</i> subsp <i>africana</i>	Kalahari Christmas Tree; Sickle-bush
<i>Diospyros lycioides</i> subsp <i>lycioides</i>	Bluebush
<i>Ehretia alba</i>	White-puzzle Bush
<i>Elephantorrhiza elephantina</i>	Elands-bean
<i>Euclea undulata</i> var <i>myrtina</i>	Common Guarri; Mountain Ebony
<i>Gomphocarpus fruticosus</i>	Milkweed
<i>Grewia flava</i>	Velvet Raisin
<i>Grewia flavescens</i>	Sandpaper Raisin
<i>Grewia retinervis</i>	Kalahari Raisin
<i>Gymnosporia buxifolia</i>	Common Spikethorn
<i>Gymnosporia senegalensis</i>	Confetti Spikethorn
<i>Lycium bosciifolium</i>	Limpopo Honey-thorn
<i>Lycium eenii</i>	Broad-leaved Honey-thorn
<i>Lycium prunus-spinosa</i>	Part of Honey-thorn bushes
<i>Melia azedarach</i>	Syringa
<i>Opuntia spp</i>	Spiny Cactus; Prickly-pear
<i>Ozoroa hereroensis</i>	Herero Resin-bush
<i>Ozoroa insignis</i>	Africa Resin-tree
<i>Ozoroa paniculosa</i>	Common Resin-bush
<i>Phaeoptilum spinosum</i>	Brittle-thorn
<i>Philenoptera nelsii</i> subsp <i>nelsii</i>	Kalahari Omupanda; Kalahari Apple-leaf
<i>Prosopis spp</i>	Prosopis
<i>Rhigozum brevispinosum</i>	Simple-leaved Rhigozum

<i>Searsia ciliata</i>	Sour Karee
<i>Searsia lancea</i>	Sour Karee
<i>Searsia pyroides</i>	Fire-thorn Rhus; Common Currant
<i>Searsia tenuinervis</i> var <i>tenuinervis</i>	Kalahari Currant
<i>Schinus molle</i>	Pepper Tree
<i>Tarchonanthus camphoratus</i>	Camphor Bush
<i>Terminalia sericea</i>	Silver Cluster-leave
<i>Ziziphus mucronata</i>	Buffalo-thorn

Appendix D: Proof of Public Consultation

Registered and Notified IAPs

Name	Surname
Erna	Van Der Merwe
Johan	Mostert
Bonnie	Nieuwoudt
Hendrik	Prinsloo
Tjivi	Gurura
Karl-Heinz	Heimstädt
CEO	Omaheke Regional Council
Charmaen	Summerdown Farmers Association
Paul	van der Merwe
Lima	Maartens
Stephnie	Khul

Environmental Assessment Scoping Assessment and Environmental Management Plan for the Crop Cultivation on the Farm Springvale:
Comments and Responses Table

IAP	Correspondence	Issue / Concern	Response
Stephanie Rösemann	<i>Email received</i> 21 August 2020	Namibia is a Semi Desert country, where water availability in most parts of the country is limited. Forecasts are stating that Namibia will become drier in future. Great concern is raised that there are no detailed quantifications of water aquifers in the impacted surrounding area and Omaheke region.	Noted. Aquifer management and quantification of the resource is the responsibility of the DWA in the Ministry of Agriculture, Water and Land Reform. Based on existing information as provided by the DWA and as supplied by the proponent a hydrogeological assessment was conducted to determine the current sustainability of water resources on the farming unit of the proponent. It is strongly suggested that all farmers conduct borehole monitoring, even if not required by the DWA, in order to develop a database of groundwater levels and abstraction rates and volumes. This will be beneficial not only to the groundwater user him/herself, but also for users of groundwater in the entire basin.
Stephanie Rösemann	<i>Email received</i> 21 August 2020	Concern is raised as to ensure that water subtraction/management will be done sustainably.	The purpose of the EIA and EMP is to ensure that environmental impacts, including those on groundwater availability, are prevented or minimized. The Proponent commissioned the EIA and EMP even though he is not situated in a groundwater control area that requires such assessment. Groundwater level monitoring is proposed in the EMP with water levels indicated at which abstraction should be reduced. See section 10.1.12.
Stephanie Rösemann	<i>Email received</i> 21 August 2020	Concern is raised that a subtraction of large amounts of waters will negatively impact the environment, ecosystem, human existence and therefor the economy as a whole.	The purpose of the EIA and EMP is to ensure that environmental impacts, including those on groundwater availability, are prevented or minimized. The Proponent commissioned the EIA and EMP even though he is not situated in a groundwater control area that requires such assessment. Groundwater level monitoring is proposed in the EMP with water levels indicated at which abstraction should be reduced. See section 10.1.12.
Stephanie Rösemann	<i>Email received</i> 21 August 2020	Omaheke region is known as the "Cattle Country" where the livelihood of farmers are dependent on cattle that utilize the water of the aquifers. Concern is raised that the livelihood of all consumers who are linked to specific underground water	The purpose of the EIA and EMP is to ensure that environmental impacts, including those on groundwater availability, are prevented or minimized. The Proponent commissioned the EIA and EMP even though he is not situated in a groundwater control area that requires such assessment. Groundwater level monitoring is proposed in the EMP with water levels indicated at which abstraction should be reduced. See section 10.1.12.

IAP	Correspondence	Issue / Concern	Response
		aquifers may be affected negatively if water levels are declining due to subtraction of large amounts of water (this will not only effect neighbours of the above mentioned parties but a much larger area).	reduced. See section 10.1.12. The Proponent also produces fodder which in dry years is invaluable for feeding of such cattle.
Stephanie Rösemann	<i>Email received</i> 21 August 2020	The effects of large amounts of water subtractions cannot be comprehended fully and are unknown, as long as there are no detailed quantifications of water aquifers and how they are linked to each other.	See point 1
Stephanie Rösemann	<i>Email received</i> 21 August 2020	Great concern is raised that strong water at some places suggest that there is a great availability of water in the whole area. Boreholes in close proximity may differ greatly.	Yes agreed. Thus the need for a hydrocensus and hydrogeological study as indicated in point 1 as well as the need for DWA to do adequate monitoring.
Stephanie Rösemann	<i>Email received</i> 21 August 2020	Borehole monitoring data in the surrounding area show a decline trend of water levels.	Such borehole monitoring data was requested from the Proponent's neighbours and other relevant IAPs during the public consultation phase. No data was however received. In order for holistic investigations into water abstraction and availability it is crucial for all parties to monitor and supply information, especially to the DWA. The data used in the specialist study is clearly referenced and does not indicate a decline in decreasing levels, but rather an increase in level over a 20 year period. Boreholes used by NamWater for water supply in nearby communal areas indicate a drawdown while being pumped yet recovering quickly when not pumped.
Stephanie Rösemann	<i>Email received</i> 21 August 2020	Great concern is raised that borehole monitoring is done by the applicants of water permit holders only (which have strong water to cultivate crops) instead of a much wider spread area, which will inevitably be effected.	Aquifer management and quantification of the resource is the responsibility of the DWA in the Ministry of Agriculture, Water and Land Reform. They do have monitoring wells for example in the Omaheke Groundwater Management Basin at Epukiro Post 3, Epukiro Post 10, Plessisplaas, Otjinene, Witvlei and Hochveld state water schemes. It is noted that monitoring at these schemes can be improved.
Stephanie Rösemann	<i>Email received</i> 21 August 2020	Great concern is raised that fertilizers, pesticides and herbicides which are	This potential impact is addressed in section 10.1.11.

IAP	Correspondence	Issue / Concern	Response
		used for the Crop Cultivation and Related Activities may impact and pollute the underground water aquifers as well as the whole ecosystem.	
Stephanie Rösemann	<i>Email received</i> 21 August 2020	If water resources are depleted (also in future generations) it will degrade the whole ecosystem and economic potential of the area and country will be erased completely. Overutilisation of natural resources in general are a major concern.	Noted. The purpose of the EIA and EMP is to ensure that environmental impacts, including those on groundwater availability, are prevented or minimized. The Proponent commissioned the EIA and EMP even though he is not situated in a groundwater control area that requires such assessment. Groundwater level monitoring is proposed in the EMP with water levels indicated at which abstraction should be reduced.10.1.12.
Stephanie Rösemann	<i>Email received</i> 21 August 2020	If water levels are dropping in surrounding areas due to the subtraction of great amounts of water for Crop Cultivation and Related Activities, who will be responsible for drilling deeper boreholes?	Assigning of responsibility for such an eventuality falls outside of the scope of the environmental assessment. The mitigation measures as proposed in Section 10.1.12 are aimed at preventing such eventuality from occurring.
Stephanie Rösemann	<i>Email received</i> 21 August 2020	Great concern is raised that a few people who are residing on strong water aquifers benefit of those, while others loose their livelihood due to the subtraction of great amounts of water.	The mitigation measures as proposed in section 10.1.12 are aimed at preventing such eventuality from occurring.
Stephanie Rösemann	<i>Email received</i> 21 August 2020	Currently all are tapping in the dark concerning the water aquifers in the Omaheke Region, because there is no reliable data available. Can water subtraction be guaranteed to be sustainable under these circumstances?	Aquifer management and quantification of the resource is the responsibility of the DWA in the Ministry of Agriculture, Water and Land Reform. Based on existing information as provided by the DWA and as supplied by the proponent a hydrogeological assessment was conducted to determine the current sustainability of water resources on the farming unit of the proponent. As a safety margin, the mitigation measures proposed include reduced abstraction rates by the proponent if the water level decrease to 5 m less than the long term average rest water level of each borehole.
Karl-Heinz Heimstädt	<i>Email received</i> 24 August 2020	The average rainfall in our area is between 350 and 400mm per year. Due to information from a hydrologist about 1% of the rainwater reaches the	The hydrogeological study considered long-term rainfall data for the area (39 years), confirm rainfall between 350 and 400 mm. Note that groundwater recharge also take place as a result of through flow from upstream areas in the groundwater catchment. Both rainfall

IAP	Correspondence	Issue / Concern	Response
		<p>aquifer (groundwater). This would mean that a total of 35000- 40000 cub meter of underground water per 1000Ha farmland, per year, would be available for livestock, human consumption and irrigation, without over utilising or even exhausting the underground water resources. Cattle on the 1000Ha, about 100 head, will need (40-50 L per head and day) 1500-1800 cub meters per year. Average dwelling would use about 15000 cub m per year. Only about 35000 cub m of water per 1000Ha will be available for irrigation.</p>	<p>and through flow of groundwater therefore contribute to groundwater recharge in the Summerdown – Ojine area. Studies show the groundwater moves from west to east in the local groundwater catchment towards the Botswana border. The more downstream in the catchment, the more accumulation of groundwater occur. It is understood that the project area is located in an area where groundwater accumulation is considered high due to its distance from the upstream catchment boundary. Abstraction at NamWater schemes, e.g., Epukiro Post 3, Epukiro Post 10, Plessisplaas was considerable and however did not cause regional lowering of the water table. Water levels usually recover rapidly when abstraction is lifted, despite general elevated abstraction numbers. The Kalahari sediments is up to 100 m thick in the project area. With the observed shallow water levels, it can be assumed that the thick saturated zone (water-bearing zone) will exist in the area. Within the Kalahari sediments, more porous layers of strata or channels, thus also encouraging groundwater accumulation and recharge. Available data suggest recharge of groundwater is therefore dynamic in the project area. It is also to an extent not well understood due to lack of data. Self-monitoring of water levels is therefore crucial. However pump test data from the area suggest that the aquifer is high yielding at places.</p>
Karl-Heinz Heimstädt	<p><i>Email received</i> 24 August 2020</p>	<p>Irrigating maize and other crops needs about 700mm of water per planting cycle. Common practice is to plant at least 2 cycles per year. This would mean that a minimum of 14000 cub m of water is needed for every Ha under irrigation per year. Meaning that about 2,3Ha per 1000Ha could be planted under irrigation sustainably in our rainfall area. The concern is that other crops, like vegetables even need more water for a successful harvest.</p>	<p>Irrigation water will be lost due to evaporation losses. However the circulation of surface water to groundwater is expected due to the nature of the aquifer medium of the Kalahari sediment. A mentioned previously pump test data from the area suggest that the aquifer is high yielding and localised abstraction do not seem to affect the groundwater.</p>
Karl-Heinz Heimstädt	<p><i>Email received</i> 24 August 2020</p>	<p>Concern is raised that artificial watering of crop cultivation on big scale in this geographical area (semi-desert environment) and subtracting these huge amounts of water from the</p>	<p>An impact on the groundwater is expected on the long run, especially if the irrigation footprint of the area expand rapidly. Aquifer management and quantification of the resource is the responsibility of the DWA in the Ministry of Agriculture, Water and Land Reform. They do have monitoring wells for example in the Omaheke Groundwater</p>

IAP	Correspondence	Issue / Concern	Response
		aquifer could create an environmental disturbance.	Management Basin at Epukiro Post 3, Epukiro Post 10, Plessisplaas, Otjinene, Witvlei and Hochveld state water schemes. It is noted that monitoring at these schemes can be improved. It's the also the role of the farmers to do continual self-monitoring and consult with the DWA. It is in the interest of the DWA that the whole country become a water control area to curb over-abstraction and manage the groundwater resources.
Karl-Heinz Heimstädt	<i>Email received</i> 24 August 2020	For high intensity crop and vegetable production vast quantities of fertilizers, pesticides and herbicides is common practice. Concern is raised that fertilizers, pesticides and herbicides could have a negative impact on the environment and could pollute underground water.	This potential impact is addressed in 10.1.11. Prescribed dosages should be applied as necessary to prevent impacts.
Karl-Heinz Heimstädt	<i>Email received</i> 24 August 2020	It has been witnessed with great concern on our farms and farmland in the greater surrounding, that a huge amount of Vachellia erioloba trees (Camel thorn) and to a lesser extent Boscia albitrunca (Witgat) and other tree species are dying. We have already send photos and samples of dead and dying trees to research teams at Southern African Universities, without clear feedback on causes. Speculation is great, that it is due to disappearing water levels and/or underground water pollution.	Defining the cause of flora mortalities will always be speculative, unless studied with detail. Flora that utilise the groundwater has adapted to cope with long term water level decline associated with natural through flow and evapotranspiration. Potential causes of tree mortality may be linked to old age, pests, groundwater water deficiency or groundwater surplus. It is known that a rapid unnatural drop of the water table impact the flora that depend on it. If a rapid drop of water level is apparent at your farm, then this may be the reason for loss of fauna. However local monitoring data from farmers indicate stable water levels and in contrary increasing water levels. Studies at other locations in Namibia also indicated that mortality of tree species (e.g., Camelthorn trees) also took place due to old age, rapid rising water levels and pests such as shot hole borers.
Karl-Heinz Heimstädt	<i>Email received</i> 24 August 2020	We would like to suggest that strict regulations have to be in place for regular monitoring of the water quantity, water quality and the aquifer table in the closer and greater surroundings of every irrigation site. The appropriate measurable and	This potential impact is addressed in Section 10.1.11. It is encouraged that farmers do self-monitoring to quantify the status of their water levels. This data may be useful for the DWA in the Ministry of Agriculture, Water and Land Reform whom ultimately is responsible for the management of the groundwater basin and cooperation with the farmers. The ministry do have monitoring wells for example in the Omaheke Groundwater Management Basin at

IAP	Correspondence	Issue / Concern	Response
Karl-Heinz Heimstädt	<i>Email received</i> 24 August 2020	<p>enforceable regulations derived from such monitored data are of utmost importance.</p> <p>We are most certainly aware of our responsibility to produce food for our country to become self-sufficient. But it is of utmost importance that this can only be done, if it is sustainable for our entire environment.</p> <p>For more information on our rainfall data and the findings of the impact of the environment, you are most welcome to contact us.</p>	<p>Epukiro Post 3, Epukiro Post 10, Plessisplaas, Ojinenene, Witvlei and Hochveld state water schemes. It is noted that monitoring at these schemes can be improved. The monitoring data is there to assist the DWA in making decisions beneficial to the future sustainable use of the groundwater catchment.</p> <p>Comment noted.</p>
Hendrik Prinsloo	<i>Email received</i> 4 August 2020	<p>Thank you email received concerning environmental study on Springvale. Kindly explain what the environmental study is regarding?</p>	<p>Email Response Provided 2020.08.04:</p> <p>Thank you for the confirmation of the email. According to the Environmental Management Act of 2007, various activities which are undertaken required an Environmental Clearance Certificate. Such a certificate is applied for by means of conducting an environmental assessment (in support thereof). The listed activities which are pertinent to this application are the following:</p> <p>Listed activity 8.1 of Government Notice 30 which state:</p> <p>“the abstraction of ground or surface water for industrial or commercial purposes”</p> <p>Together with:</p> <p>8.7. “Irrigation schemes for agriculture excluding domestic irrigation”</p> <p>Additional activities which may be of interest to farms include charcoal production and lodges / tourism facilities.</p> <p>The process of the environmental assessment is further stipulated in the Act and requires the completion of various actions. In short it entails:</p> <ul style="list-style-type: none"> • Registration of the application with the Ministry of Environment, Forestry and Tourism (MEFT)

IAP	Correspondence	Issue / Concern	Response
			<ul style="list-style-type: none"> • Conduct public participation (notifying direct neighbours, newspaper advertisement, site notices) • Conduct a site investigation to determine physical attributes of the site and verify infrastructure and project component • Compile the environmental assessment (inclusive of an specialist groundwater assessment for this application). • Provide all registered interested and affected parties with an opportunity to review the report and provide comments (if so desired). • Notify commenting authorities such as the regional council and Ministry of Agriculture, Water and Land Reform (one also needs to obtain an approval letter in terms of a permit where possible) • Submit the report, authority authorisation and proof of public participation to MEFT. <p>We have notified yourself as a direct neighbour of Elize as part of the public participation process. We trust you will find the above in order. You are further most welcome to contact us for any additional information. You are also welcome to call us should that be more convenient for you.</p>

Notification Letter



TEL.: (+264-61) 257411 ♣ FAX.: (+264) 88626368
 CELL.: (+264-81) 1220082
 PO BOX 11073 ♣ WINDHOEK ♣ NAMIBIA
 E-MAIL: gpt@thenamib.com

To: Chief Regional Officer
 Omaheke Regional Council
 Gobabis
 Namibia

Re: Environmental Impact Scoping Assessment and Environmental Management Plan for Crop Cultivation Activities of Vision Farming on the Farm Springvale No. 337, Omaheke Region

20 October 2020

Dear Sir/Madam

Geo Pollution Technologies (Pty) Ltd was appointed by E van Niekerk t/a Vision Farming to undertake an environmental assessment for the irrigation and associated activities on the Farm Springvale No. 337. The assessment will be conducted according to the Environmental Management Act of 2007 and its regulations as published in 2012.

Project: Environmental Impact Scoping Assessment and Environmental Management Plan for the Crop Cultivation Activities on Farm Springvale No. 337, Omaheke Region

Proponent: E van Niekerk t/a Vision Farming

Environmental Assessment Practitioner: Geo Pollution Technologies (Pty) Ltd

Collectively the proponent has cleared 40 ha for irrigation. Pending the outcome of a hydrogeological specialist study, the total hectares of land to be irrigated simultaneously, may be increased. For irrigation, water is abstracted from a number of boreholes. Registration of such boreholes is being applied for with the Ministry of Agriculture, Water and Land Reform. The main produce include maize, oats and wheat. These are harvested on the farm before being transported to various markets. The environmental assessment will include all infrastructure and operational activities associated with the agricultural activities on the farm. This include land clearing, soil preparation, planting, pest control and fertilizer use, harvesting and support services such as electricity supply, fuel storage and use, staff accommodation and effluent disposal.

The Regional Council is invited to register with the environmental consultant to receive further documentation and communication regarding the project. By registering, the Regional Council will ensure the correct contact person to whom information may be sent and will be provided with an opportunity to provide input that will be considered in the drafting of the environmental assessment report and management plan.

Please register by either by **Fax:** 088-62-6368 or **E-Mail:** quvette@thenamib.com. Should you require any additional information please contact Geo Pollution Technologies at telephone 061-257411. Your time and consideration regarding the matter is much appreciated. Should you require any additional information please contact Geo Pollution Technologies at telephone 061-257411. Thank you in advance.

Sincerely,

Geo Pollution Technologies



Quvette Bosman
 Social and Environmental Assessment Practitioner

Director:

Page 1 of 3
 P. Botha (B.Sc. Hon. Hydrogeology) (Managing)

Advertisements



‘Pay cops more’

• GANJA USERS SAY POLICE OFFICERS ABUSE CITIZENS BECAUSE OF PALTRY SALARIES

Sun

WEDNESDAY 5 AUGUST 2020 **NEWS** **3**

PAY THEM: The Ganja Users Association of Namibia says police officers should be paid more. PHOTO: NAMPA

GUN president Borro Ndungula says the low salaries police officers earn is the why they subject members of the public to abuse.

OGONE TLHAGE
WINDHOEK

The Ganja Users Association (GUN) of Namibia has encouraged government to pay members of the police service more. This call was made during a recent demonstration to denounce the treatment members of the public experience at the hands of the police.

The organisation's president Borro Ndungula said the low salaries police officers earn is the reason why they subject members of the public to abuse. "Maybe some of the reasons they are beating people is because they are underpaid. We are calling on the line ministry or the inspector-general to give the police a raise," he said.

"We know that police officers do not have houses and such, but they provide an essential service. This is also why we are calling for a raise," he added.

Apartheid laws
The association urged the police not to use apartheid-era laws in the execution of their duties.

"How is it that our police officers are made to enforce apartheid-era laws that in ways violate people's rights and freedoms, which are guaranteed to all Namibian citizens by the supreme law, the constitution? The very same document every man and woman in uniform swore to protect, defend and uphold?" Ndungula said.

The association also accused police officers of taking the law into their own hands during the execution of their duties.

"Allegations of police brutality in all regions of Namibia continue despite a stern warning from President Hage Geingob," Ndungula said. According to him, those who act brutally often do not account for their actions.

"Nationwide police brutality and killings have been rampant against civilians by police officers. Police officers continue to shoot unarmed civilians, with little, and in most cases, no consequences," he said.

Erongo travel permits still on the table

ADOLF KAURE
SWAKOPMUND

A notice displayed in one of the Swakopmund police station's windows was removed on Saturday after it created uproar amongst the town's residents.

On the 'Namibians United Against Lock-down' Facebook group, Hannelie Horn Turner expressed her disapproval regarding the notice, which read: "No permits will be issued until further notice. The public is encouraged to stay home and stay safe. Thank you."

"I suppose this means we are now officially prisoners," she wrote.

She also sent a message to Erongo 24/7's Facebook page to voice her frustration, adding that the notice was placed in the window on Saturday at 09:50.

Meanwhile, a police officer on duty who chose to remain anonymous, later removed the notice, saying residents are allowed to apply for travel permits.

"The notice was put on the window earlier in the year and it is old. It is not even supposed to still be on the wall, so let me remove it now."

"People have been queuing up for permits, even on Friday, and they are allowed to apply for travel permits," she said.

When approached for comment, Inspector Il-eni Shapumba, the police unit commander of community affairs for the region, reiterated that residents can apply for permits to travel out of Swakopmund. "We are issuing travel permits strictly in line with the law," he said.

Shapumba made these remarks after consulting with the Swakopmund police station commander. Last Friday, President Hage Geingob urged the country's citizens to avoid unnecessary travel.

He made these remarks during a statement on the country's Covid-19 response. "I hereby inform the nation that the Erongo Region and the special dispensation for the local authority areas of Walvis Bay, Swakopmund and Arandis will remain unchanged and is hereby extended from Tuesday, 4 August, until midnight Monday, 31 August 2020."

adolf@erongo.com.na

PUBLIC PARTICIPATION NOTICE
ENVIRONMENTAL ASSESSMENT
IRRIGATION AND RELATED ACTIVITIES ON
VARIOUS FARMS IN THE OMAHEKE
REGION

Geo Pollution Technologies (Pty) Ltd was appointed by O. M. Steyn, Hanzel Investments CC, E. van Nickerk t/a Vision Farming and N. Steenkamp (the proponents), to undertake environmental assessments for crop cultivation and related activities on the farms: Springvale No. 337, Okatambaka No. 266, Bosville West No. 755, Rika No. 266, Tokat No. 343, Conellan No. 247, Ovingi No. 246, Okasondana No. 264, Elvare No. 265 and Okatjukurri No. 263 in the Omaheke Region. The detailed project locations may be viewed at:

<http://www.thenamib.com/projects/projects.html>

The environmental assessments will be conducted according to the Environmental Management Act of 2007 and its regulations as published in 2012.

The proponents currently irrigate land by means of drippers, sprinklers and centre pivot systems. For irrigation, groundwater is abstracted from boreholes. All boreholes used for irrigation will be registered with the Ministry of Agriculture, Water and Land Reform. The main produce are maize, wheat, oats and moringa.

All Interested and Affected Parties are invited to register with the environmental consultant. By registering you are provided with the opportunity to share any comments, issues or concerns related to the project, for consideration in the environmental assessments. Additional information can be requested from Geo Pollution Technologies. All comments and concerns should be submitted to Geo Pollution Technologies by 21 August 2020.

Quazette Bosman
Geo Pollution Technologies
Telephone: +264-61-257411
Fax: +264-88626368
E-Mail: gpt@thenamib.com

ENVIRONMENTAL IMPACT ASSESSMENT FOR NAMEX MINERALS (PTY) LTD FOR EXPLORATION ACTIVITIES ON EXCLUSIVE PROSPECTIVE LICENCE (EPL) 7304

Earth Environmental Services herewith gives notice in terms of the Environmental Management Act, 7 of 2007 and Regulation 21 of the Environmental Impact Assessment (EIA) Regulations for the proposed exploration activities on the abovementioned EPL.

Description of proposed activities: NamEx Minerals (Pty) Ltd wishes to conduct a comprehensive exploration program for base and rare metals, industrial minerals and precious metals on EPL 7304.

Location of the EPL area: Kunene region, Opuwo magisterial district.

Interested and Affected Parties (I&AP) are invited to register with Earth Environmental Services for the proposed exploration activities within 14 days of the advertisement. Registration can be done by requesting of the Background Information Document provided in the email below. Any persons having any comments to the proposed activity may lodge them, duly motivated in writing to the address below by the 19th August 2020.

Email: ees.earthservices@gmail.com

MISLEADING: A notice on the window of the Swakopmund police station created confusion on social media. PHOTO: ADOLF KAURE

6

WEDNESDAY 12 AUGUST 2020
OPINION

Sun

The politics of accidental opinion remarks on Fishrot

OPINION

TOBIAS NANDE NANDJIGWA

'Accidental opinion of the day' was first echoed by the author of the American Declaration of Independence, Thomas Jefferson.

In 1789, 12 years after American independence, Thomas Jefferson cemented the psychology behind the expression of accidental opinions through a self-dialogue between his 'Heart and the Head'. His dialogue educates us that situations often produce a crisis of clinging to what is dearest to a being. Hence, the head absorbs the heart but the heart keeps on beating in the mind. Thus, the Bible verse: "Out of the abundance of the heart the mouth speaks." (Matthew 12v34)

So, the above is the premise through which one can filter to understand Swapo's position on the Fishrot scandal.

Lately, the remarks of accidental opinions and from the least expected questions and answers by Namibia's executives speak more volumes than the official written correspondences.

"I don't think they are guilty," was a recent accidental remark by President Hage Geingob, referring to the Fishrot accused. Even if he subsequently corrected it to mean innocent until proven guilty, it did not happen in a vacuum but in a quantum of psychological intent at influencing that perception.

If there are unhitched legal or ethical boundaries to bear undue influence on a matter that is before a court (Samherji Fishrot) through any commentaries by President Hage Geingob and Prime Minister Saara Kuugongelwa-Amadhila, then their zeal to midwife the term and defend it as "a so-called Fishrot"

(Sona, parliament, 2020) fuel a cynical appeal harbouring an undue prejudice and influence that they are indeed claiming to avoid.

"So-called Fishrot" is a flash-point and rightly so a directional difficulty in itself: the perfect phraseology in seeding up a conspiracy to galvanise the dark force against the scandal's graphic details in the light. It exposes the underbelly's first tender piece of the executive's weight in being complicit.

The language used by these political players creates an unnecessary conundrum of reducing something (global scandal) to simply nothing and discreetly influencing the public narrative of Fishrot at a time when we are living at the edge of the post-truth Fishrot environment.

As Nigerian Nobel Laureate Wole Soyinka once said, "Language can be an instrument

of war". Beautifully crafted words can shape lives and a single pronouncement can stir conviction and change the face of a nation.

Such remarks of accidental opinion by state actors qualify to serve to decrease the likelihood of investigators and the jury of the court to act upon independently if not unbiased against the top executive wishes. It promises to destroy the Fishrot power it carries in identifying where all the illicit proceeds got stuck. It also reduces the seriousness in fronting the corruption fight in this particular case. It signalled that our leaders are operating under a different stimulus that defies analysis of Fishrot reality and that of the nation at large.

Another remark with a harmonic beat joined the fray from Netumbo Nandi Ndaitwah, minister of foreign affairs, when she told the world that "the Fishrot Saga had been spoken about too much and must be left in the hands of authority" (parliament, NBC live stream, 2020).

It's unacceptable for her to dictate quietness in the court of public opinion. Netumbo's pronouncement merely sharpened the irony and intensified the pain of people.

She is willing to put the truth to sleep even if it just rose to the light. Hers is simply a sceptical protective device counting on the nation's ability to forget a scandal since she is from the exile school of thought where "there is no comfort in the truth".

There is a clear insensibility located and grounded in the conviction of either abetting, hiding, avoiding or concealment by both the president, prime minister and foreign affairs minister because their counterpoint remarks are a barometer that does not preserve the sanctity, safety and comfort of the state, nor displays the intellectual capital that marvel stewardship glory, tender, devotion, and decency amidst a scandal of this magnitude. Their remarks instead translate into a distraction that undercuts the prospects to exhaust all our bases in fighting the Fishrot saga, given their influential voices as state actors.

The attitude on a display is nothing but an overt softening of a crime (scandal) with an artificial hypersensitivity of downplaying it without acknowledging it since their harmonic remarks are not saying anything but they are taking away the nation's

instinct that comes with the sociology around the Fishrot scandal. Why the reluctance to offend the Fishrot culprit by the top Namibian leadership?

It seriously depicts an attitude that is hard to fathom but yet easily compatible to link all these accidental opinions in the catapulting-removal of the country's chief criminal investigator, Commissioner Nelius Becker (Police chief investigator moved to forensics, *The Namibian* 2020) and the shameless senseless removal of Hannu Shipena (Intelligence official replaces ACC executive director, *The Namibian*, 2020) in a wolf pack model-style to make it look like the proactive, outspoken Shipena is the main target: a retribution for speaking out against government underfunding the graft watchdog.

In the realm of spotting out the recipients of Fishrot proceeds elements in its functional ranks, the question for the ruling Swapo leadership is from the Nigerian Yoruba tribe asking, "How many teeth do we have to count in the multiple layers of a dental deformity?"

Tobias Nande Nandjigwa is a social science educator.

The criminalisation of poverty in Katutura

OPINION

ELIFAS HELAO NGHITOMOKA

Have you ever wondered why there is always a large police presence visible in Katutura and not in other parts of Windhoek? The poor are being monitored constantly.

A simple conclusion is that if you have a higher presence of police in one area, more incidents will be reported. A

false narrative is drawn that crime is higher in that area.

Many minor infractions, that in other areas would not be picked up, are reported in informal settlements, placing young lives into a criminal justice system that does not rehabilitate, but instead churns out hardened criminals.

The masses in Havana, Goreangab and Babylon

have been living without basic services and have petitioned the City of Windhoek several times.

We were told there is no budget, yet the City of Windhoek seeks sponsorship from the Road Fund Administration for more police cars.

Did the City seek sponsorship for ablution facilities to service informal areas? Where is the appeal for donations to provide infrastructure for the street vendors?

Will the new police cars be available for our vendors to sell from? Will they be available for our people when they cannot afford the taxi money to get to work or the hospital?

Will they provide light at night when our children need to study? Will they help people fetch water easily? Will they be there to protect

our women and young girls who get raped in the riverbeds or in the bushes when they use these as toilets?

Create opportunities

If the City is really serious about crime prevention, the best strategy is to create opportunities for all its inhabitants.

With electricity at home, the youth will be able to study without fear of knocking over a candle. They will go to university and prosper; they will not have time to engage in crime.

With land, people will be able to run their businesses without fear of eviction. They will start building their houses and employ others.

Disinterested in solving problems

The City seems disinterested in solving the problems

of the poor, as clearly demonstrated when they arrested six citizens who were erecting a shack for a homeless man. City Police is not interested in protecting the poor, but rather enforcing arbitrary mandates that do not serve in the best interests of our community.

The City is expected to provide a conducive environment for all its inhabitants and having more police cars will not solve the crime problem. In fact, more crime will continue to emerge as long as what leads to crime is not addressed.

It is time the City looks at the majority of its residents as productive citizens, not only as a burden on resources.

We are people, we are residents of Windhoek, we are Namibians, and just because we live in a poor settlement

does not mean we are poor in mind. We too can think for ourselves; we too contribute meaningfully to this city.

It is us who sweep the streets, allowing Windhoek to be declared one of the cleanest cities in Africa.

It is us who build the roads that allow everyone to travel through this great city and this land.

It is us who ensure businesses are safe and houses are clean and schools are painted. The City must create an environment for collaboration. With our unique skills and talents, we are more than ready to move our city forward.

Elifas Helao Nghitomoka is a community activist and a resident of Havana in the Samora Machel constituency. He is a member of the Students Christian Movement.

PUBLIC PARTICIPATION NOTICE ENVIRONMENTAL ASSESSMENT: IRRIGATION AND RELATED ACTIVITIES ON VARIOUS FARMS IN THE OMAHEKE REGION

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WEER

WEERWAAK: Koue toestande sal in die Suid voorkom.
BINNELAND: Sonlig en matig in die Suid. Elders sal dit sonnig en warm tot baie warm wees.
KUS: Gedeeltelik bewolk en koud tot matig met miskalle plek-plek.
GETY BY WALVISBAAI: H 09:13 L 15:01 H 21:41

VOORUITSIGTE

WINDHOEK	8°	26°
GOBABIS	5°	28°
KATIMA MULILO	9°	31°
KEETMANSHOOP	3°	19°
MARIENTAL	3°	23°
OPUWO	8°	31°
OSHAKATI	10°	32°
REHOBOTH	6°	26°
RUNDU	8°	30°
WALVISBAAI	7°	21°
JOHANNESBURG	6°	24°
KAAPSTAD	12°	15°

Covid-19: Verkiesings

VAN BL. 1

Dit is volgens hom 'n moontlike aanduiding van hoe deurdag die plan is. Naas om daarop aan te dring dat alle rolspelers by die nasionale regulasies hou om die verspreiding van die siekte te bestry, sal gevolg ook kom vir politieke partye wat agente afvaardig wat as kwesbaar beskou kan word, veral weens hul ouderdom.

Mujoro sê van die voorbereidingsprosesse, soos die opleiding van kiesbeampies, moet in persoon geskied.

"Verskeie geleenthede onder meer die registrasie van kiesers, die opleiding van verkiesingsamptenare en politieke veldtogte vereis mense om in nabye kontak te wees. Die strategie beoog om oordrag te verhoed en mense teen die virus te beskerm."



Mnr. Theo Mujoro FOTO: SKAF

het Mujoro Vrydag gesê.

Van die kwelpunte sluit in wanneer iemand wat stemgeregtig is op stemdag in kwarantyn of isolasie sal wees.

Die plan, sê Mujoro, is om dié mense wel te bereik en beaampies sal toegerus wees met persoonlike beskermende drag (PPE's).

Hulle besef eweneens dat die perk op die aantal mense wat tans geld - 100 vir die 13 streke en 50 en tien vir

onderskeidelik Erongo en die drie geraakte areas (Walvisbaai, Swakopmund en Erongo) - kan mense ook op stemdag ontmoedig om hul demokratiese reg uit te oefen.

"n Aanvullende registrasieproses word vir 7 tot 15 September beplan.

Kragtens 'n hooggeregshofuitspraak van vroeër vanjaar mag elektroniese stemtoestelle (EVM's) net weer in 'n nasionale verkiesing gebruik word, mits dit vergesel word met 'n naspeurbare papierspoor.

Tjipueja het vroeër gesê dit is nie in dié stadium 'n lonende moontlikheid nie.

Derhalwe sal vanjaar se beplande verkiesings by wyse van tradisionele stembriewe geskied.

"Ons glo dat die land steeds 'n suksesvolle verkiesing kan hou as belanghebbendes elkeen 'n hydrae lewer en almal die strategie ter harte neem," het Tjipueja gesê.

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Sluit van howe in openbare belang - Dausab

Regter blootgestel

Ofskoon 'n regsbeaampie onlangs in kontak was met 'n bevestigde Covid-19-geval, werp die regbank alles in die stryd vir die voortsetting van hofverrigtinge.

Denver Kisting

Me. Yvonne Dausab, die minister van justisie, sê hoewel hofdienste, wat 'n integrale deel van geregtigheid vorm, beperk sal wees vanweë beskikbaarheid van personele, sal dit nie tot stilstand kom nie.

Sy het gereageer op nuus dat 'n regter onlangs in kontak gekom het met 'n bevestigde Covid-19-geval by die boekkeendstelling van die regter-president en adjunkhoofregter Petrus Damaseb.

Dausab het Maandag by navraag gesê: "Soos dit was tydens die inperkings sal sekere dienste steeds voorkom en toegang tot howe geniet, soos kinder-aangeleenthede, sake van huishoudelike en seksuele geweld, eerste verskynings en dringende sake en appelle."

Die huidige toedrag van sake skep naas die uitdagings wat dit teweeg bring ook moontlikhede, sê die justisieminister.

"Dit gee ons ook die geleentheid om aan nuwe maniere te dink oor hoe ons goed doen. Die howe en die justisiestelsel moet meer dienste deur middel van digitale platforms beskikbaar stel."

Die betaling van onderhoud geskied reeds deur middel van elektroniese fondoordrag, sê sy.

"So, dit is nie nodig om fisiek teenwoordig te wees om jou geld te ontvang nie, maar ons moet ons beskikbaarheid verbeter op e-pos en die telefoon in die gevalle wanneer daardie platforms probleme het."

Dausab het toegegee agterstande en vertragsmet die afhandeling van sake kan nie volkome vermy word nie.

"Dié is moeilike tye en ons moet hoe ons goed doen, aanpas, en ons moet aanpasbaar wees, maar die waarheid is: Die coronavirus sal met ons, vir ons, wees en ons moet leer om daarmee en daaronder te leef."

Sy sê toegang tot geregtigheid sluit die beskikbaarheid van regsdiens, soos onderhoudsbetalings, regshulp en toegang tot die dienste van die meeste van die hoërhof, in.

Baie van dié dienste, sê sy, is tans via die e-justice-platform beskikbaar.

Normaalweg staan regters, landdroste en aanklaers vir mekaar in, behalve in gedeeltelik voltooië verrigtinge.



Die minister van justisie, me. Yvonne Dausab. FOTO: STAATSHUIS

sê Dausab.

"Nou is ook 'n geleentheid vir diegene wat nie in kwarantyn of isolasie is nie om hulle kollegas by te staan, sê sy.

Die regbank sê by monde van sy woordvoerder, mnr. Ockert Jansen, alle regters wat Damaseb se boekkeendstelling bygewoon het, het deurgangs maskers gedra.

Net een van hulle het kontak gehad met die bevestigde geval, sê Jansen.

Regters van die hooggeregshof werk in elk geval tans van die huis af, omdat hul volgende hofsittings eers vir Oktober vanjaar geskeduleer is, sê die woordvoerder.

"Wat die hoërhof betref, selfsleer sommige regters en personele vanweë dié positiewe geval van 'n persoon met (sowat) 'n week gelede aangeteken is. Die meeste regters gaan aan met hul normale plicte en werk net van die huis af indien hulle geen sake het om aan te hoor nie."

NIE GESTOP NIE

Jansen gee vir Dausab gelyk dat "die werksaamhede van die hoërhof en die hooggeregshof nie gestop het nie, maar word sonder twyfel geraak deur die algemene styging in die aantal Covid-19-gevalle in die land."

Sedert Maandag is die landdroshof op Walvisbaai, Katima Mulilo en in Windhoek weer oop.

Dit kom nadat die kantoor van die regbank onlangs die tydelike sluiting van dié howe aangekondig het, omdat beaampies en beskuldiges positief getoets het vir Covid-19, sê Jansen.

Volgens hom is alle nodige reëlings getref om die veiligheid van regsbeaampies, personele, hofbeaampies en die publiek te verseker.

Jansen sê: "Die howe vorm 'n integrale deel van die samelewing wat verseker dat regsreëls in stand gehou word en die administrasie van geregtigheid op 'n vrye, regverdige en onpartydige manier kan geskied."

"Dit is waarom die howe nie eens tydens 'n noodtoestand vir 'n lang tydperk kan sluit nie, omdat dit 'n negatiewe impak op die lewens van Namibiërs sal hê."

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Styging in Windhoek se gevalle 'wek kommer'

VAN BL. 1

Die minister sê tans is vyf mense uiters siek; een in Khomas en vier in die Erongostreek. Ses is kritiek; vier in Khomas en twee in Erongo. Die aantal bevestigde Covid-19-gevalle in die land staan tans op 3 229 waarvan 2 495 gevalle aktief is. Die sterftesifer is steeds op 19 en tans is 1 605 mense in kwarantyn in geriewe oraloord die land. Tot op hede is 36 287 wesselmonsters getoets, met die Universiteit van Namibië se mediese skool wat nou ook toetsing doen.

Intussen het die waarnemende uitvoerende hoof van die Namibiëse Instituut vir Patologie (NIP), dr. David Uirab, in 'n onderhoud met Republikein erken 'n groot agterstand met toetsing

word steeds ervaar.

Uirab het dit as 'n "voortdurende stryd" beskryf. Volgens hom is die standaard van 540 toetse per dag tot 720 by NIP verhoog, terwyl Pathcare se toetse nog bygereken moet word.

Die Universiteit van Namibië se mediese skool en Namdeb op Oranjemund het intussen ook met toetsing begin.

PLANNE

Volgens Uirab ontvang NIP tot 1 600 toetse op 'n dag, meer as wat hulle in 24 uur kan verwerk. NIP se laboratoriums op Keetmanshoop, Oshakati en Walvisbaai kan ook nou vir Covid-19 toets, terwyl pogings onderweg is om laboratoriums op Katima Mulilo, Rundu, Onandjokwe en Otjiwarongo te betrek.

Met verwysing na die tydperk van kwarantyn en isolasie wat verkort is en 'n tweede negatiewe toets

wat nie meer nodig is om ontslaan te word nie, sê Uirab hy verwag dit sal "hopelik in twee weke" 'n positiewe uitwerking op die verwerking van toetse hê.

Met verwysing na die toets vir teenliggaampies teen die siekte by persone wat van Covid-19 herstel het, het hy gesê NIP is slegs by die diagnostiese proses betrokke.

"Dit is deel van die ministerie van gesondheid en maatskaplike dienste se openbare reaksie tot die siekte en hang onder meer van die vlak van blootstelling af," het hy gesê.

Namibië se bevestigde gevalle was Maandag 0,1% van die totale bevolking teenoor die 0,9% van Suid-Afrika, wat beteken Suid-Afrika het per capita nege keer meer gevalle as Namibië. Die buurland se sterftesifer uit bevestigde gevalle is 1,9% teenoor Namibië se 0,6%.

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PUBLIC PARTICIPATION NOTICE ENVIRONMENTAL ASSESSMENT UPDATE: OPERATIONS OF THE ZAMBIA DRY PORT FACILITY IN THE PORT OF WALVIS BAY

Geo Pollution Technologies (Pty) Ltd was appointed by Africa Union Financial Services (Pty) Ltd to update their existing environmental assessment and environmental management plan. Background information for the project, containing a location map, is available at: www.thenamib.com/projects/projects.html

The update of the environmental assessment will be according to the Environmental Management Act of 2007 and its regulations as published in 2012.

Africa Union Financial Services acts as a logistic hub, not only for cargo to and from Zambia, but for other SADC countries as well. The update is required to include the handling and storage of various types of cargo at both their sites in the Port of Walvis Bay, including but not limited to, containers, reefer containers and the handling and bagging of commodities, including hazardous cargo.

All interested and affected parties are invited to register with the environmental consultant. By registering you are provided with an opportunity to share any comments, issues or concerns related to the facility, for consideration in the updated environmental assessment. Additional information can be requested from Geo Pollution Technologies.

All comments and concerns should be submitted to Geo Pollution Technologies by 27 August 2020.

Wikus Coetzer

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PUBLIC PARTICIPATION NOTICE ENVIRONMENTAL ASSESSMENT: IRRIGATION AND RELATED ACTIVITIES ON VARIOUS FARMS IN THE OMAHEKE REGION

Geo Pollution Technologies (Pty) Ltd was appointed by O. M. Steyn, Hinz Investments CC, E. van Niekirk t/a Vision Farming and N. Steenkamp (the proponents), to undertake environmental assessments for crop cultivation and related activities on the farms: Springvale No. 337, Okatanhuka No. 266, Bosville West No. 755, Rika No. 266, Tokat No. 343, Conellan No. 247, Owingi No. 246, Okasondana No. 264, Evare No. 265 and Okatjuri No. 263 in the Omaheke Region. The detailed project locations may be viewed at: <http://www.thenamib.com/projects/projects.html>

The environmental assessments will be conducted according to the Environmental Management Act of 2007 and its regulations as published in 2012.

The proponents currently irrigate land by means of drippers, sprinklers and centre pivot systems. For irrigation, groundwater is abstracted from boreholes. All boreholes used for irrigation will be registered with the Ministry of Agriculture, Water and Land Reform. The main produce are maize, wheat, oats and moringa.

All Interested and Affected Parties are invited to register with the environmental consultant. By registering you are provided with the opportunity to share any comments, issues or concerns related to the project, for consideration in the environmental assessments. Additional information can be requested from Geo Pollution Technologies. All comments and concerns should be submitted to Geo Pollution Technologies by 21 August 2020.

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4 NUUS

Republiekein

Woensdag 5 Augustus 2020

>> Onmin in literêre bedryf oor noodfonds

‘Verligtingsplan vir kunste is onprakties’

Verskeie plaaslike kunstenaars, spesifiek letterkundiges, is glo ongelukkig met die wyse waarop die Kunsteraad die noodfonds bestuur.

Yandi du Plessis

“Die Covid-19-noodfonds vir kunste is net nóg ’n onpraktiese projek wat meer geld in die Namibiese Kunsteraad (NACN) stort, terwyl dié instelling reeds fondse het wat onderaan ’n reg bestuur word nie.”

Só sê mnr. Joseph Keamogetsi Molapong, ’n digter, dramaturg en regisseur. In sy sosiale media-inskrywings sedert die aankondiging van die verligtingsplan en noodfonds vir plaaslike kunstenaars, maak hy geen geheim daarvan dat hy ontevrede is met die wyse waarop die NACN dié inisiatief bestuur nie.

“Die struktuur wat ingestel is vir die beoogde Covid-19-verligtingsfonds vir kunstenaars, is ’n herhaling van ’n soortgelyke wanfunksionele struktuur wat deur die Kunsteraad gebruik word. Dit is nie funksioneel nie, want dit spreek nie die behoeftes van kunstenaars in Namibië aan nie.

“Soos dit nou gaan, sal dié fondse nie aan die einde van die proses die kunstenaars bereik nie. Hoeveel het die kunstenaars al werklik sedert die aankondiging van die verligtingsplan ontvang? Die burokratiese proses bestee reeds geld namens die kunstenaars en die fondse wat bedoel is vir die verligting van kunstenaars se finansiële las. Dit is ’n feit, gebaseer op realiteite: Baie kunstenaars sal nie baat vind by die Covid-19-verligtingsfonds nie,” het hy aan Republiekein gesê.

Molapong is ’n lid van Township Productions, ’n teaterproduksie-maatskappy wat in 2001 op die been gebring is en poog om kwesies soos armoede en ’n gebrek aan onderwys aan te spreek en terselfdertyd maatskaplike en kulturele



Me. M'kariko Amagulu, adjunkdirekteur van onderwys, kuns en kultuur. FOTO ARGIF

ontwikkeling in gemarginaliseerde gemeenskappe, hoofsaaklik informele nedersettings, aan te moedig. Die maatskappy lewer al jare lank ’n bydrae in die bevordering van poësie.

LETTERKUNDE

Molapong sê Township Productions gaan nie aansoek doen vir die noodfonds nie, want hulle voel daar sal niks van kom nie.

“My probleem met die NACN gaan spesifiek oor letterkunde, wat sedert die herinstelling van die NACN op die kantlyn geplaas is. Dit word selfs uit die huidige reëling gesluit. Die vraag is hoekom? Ons as skrywers kry altyd die idee dat ons werk as ‘substandaard’ gesien word.

“Hulle het onder mekaar besluit letterkunde is te ingewikkeld om gefinansier te word. Hulle kies om nie baie skrywers en akademici by die gesprek te betrek nie. Vandaar dat literatuur aan sy lot oorgelaat word. In teenstelling met hulle idees en besluite, word sommige van die substandaard-literatuur by sekondêre skole gebruik en by Namibiese universiteite ontleed. Buite Namibië se grense word dié substandaard-letterkunde waardeur vir dié bydrae tot die wêreldliteratuur,” sê hy.

Die NACN is volgens Molapong

bewus van dié griewe. “Ons het soveel gesprekke met mnr. Patrick Sam, voorsitter van die NACN, gevoer, selfs voor die Covid-19-verligtingsfonds aangekondig is.” Dié gesprekke handel hoofsaaklik oor die NACN se finansiering, of gebrek daaraan, spesifiek vir plaaslike letterkunde.

Daar is soveel kunstenaars wat oor die algemeen ontevrede met die NACN is en met betrekking tot die verligtingsfonds het hulle geen vertroue dat die NACN die finansiering vir die kunstenaars gaan deurvoer nie.

Me. M'kariko Amagulu, adjunkdirekteur van onderwys, kuns en kultuur, het op dié aantygings gereageer deur te sê die NACN het wel die finansiering van literatuur opgeskort omdat hulle nie die vermoë gehad het om literatuurvoorleggings te evalueer nie.

Die opskorting was hoofsaaklik op publikasie en drukwerk gefokus, en nie op slypskole, aanbiedings of opleidingsaktiwiteite nie.

“Die raad het oor die jare verskillende metodes ondersoek om met venne te betrekke te raak by publikasie en uit die uitgewersaspek te help, maar nie baie maatskappye was bereid om aan boord te kom nie. Die rede hiervoor was dat daar min belangstelling in fiktiewe of kreatiewe skryfwerk in Namibië was en dus is dit as riskant beskou,” het sy gesê.

Sy erken hulle is bewus van die onmin, spesifiek onder digters en skrywers. “Die raad sal in die nabye toekoms hieraan aandag skenk. Ons is tans besig met ’n proses om steun vir literatuurontwikkeling aan te moedig. As die proses afgehandel is, kan ons dit aan die publiek bekend maak. Die raad sal egter nie literêre drukwerk doen soos voorheen terwyl daar nie gehaltebeheer is nie.”

Sy het gesê die hulpfondse bly oop vir diene in die literêre bedryf wat daarvoor wil aansoek doen, behalwe in dié stadium vir diene wat hulp met drukwerk of publikasie benodig.

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Mnr. Stefanus Wimerd van die Eiland-gebied moet gereeld water gaan haal om sy tuyn nat te lei.

Waternood ry Groot Aub

Jeanette Diergaard

Gedeeltes van Groot Aub was volgens inwoners vir ’n volle twee weke sonder water, terwyl ander dele van die nedersetting vir hoogstens twee dae waterloos was. Die watertekort wat Groot Aub in die gesig gestaar het, het volgens ’n onlangse mediaverklaring net vir agt dae geduur. Die verklaring is deur mnr. Robert Kahimise, die uitvoerende hoof van Windhoek se munisipaliteit (CoW) uitgereik. Watertoeveroer aan Groot Aub is op 28 Julie herstel.

Die munisipaliteit se projekkoördineerder vir Groot Aub, mnr. James Kalundu, beweer die inwoners se klagtes dat hulle agt dae sonder water was, is ’n oordrywing. Sekere areas was wel sonder water, erken hy, maar nie vir agt dae aanes soos wat die verklaring sê nie. Hy beklemtoon dat wanneer een gebied nie water gehad het nie, sou daar water by ’n ander gebied wees.

Inwoners van die Oshakati-gebied beweer hulle was vir ’n volle twee weke sonder water. Oshakati lê laer as die ander gebiede. Die waterdruk van die hoofwater-reserwatenk is nie sterk genoeg om water aan al die gebiede te verskaf nie en hierbenewens is daar ook lekkasies aan die tenk. Kalundu sê dit sal goedkoper wees om ’n nuwe reserwatenk te bou as om die tenk te herstel. Een van die twee groot reserwatenks word nie meer gebruik nie, want dit kan nie meer die water suiwer nie. Sekere inwoners het ook oor die vuil

water gekla.

In die meeste gevalle moet inwoners na die Eiland-gebied ry om hul watertens vol te maak. In vele gevalle het inwoners egter nie vervoer om water te gaan haal nie. Daar is blykbaar ook ’n roteringsstelsel waarop die inwoners water kry, maar van die inwoners weet nie wanneer dit hul beurt is om water te kry nie. Dikwels los hulle ’n kraan oop sodat hulle kan weet wanneer die water eindig opdaag. Sedert die koms van die coronavirus betaal geen inwoner van Groot Aub vir munisipale dienste nie. Kalundu sê wanneer die water elke dag vir 24 uur beskikbaar gaan wees, sal inwoners daarvoor moet begin betaal.

BOORGATE

Daar is tans ses werkende boorgate op Groot Aub, plus twee nuwes wat glo binnekort gereed sal wees. CoW het sewe 10 000 liter-watertens, na die nedersetting gebring toe die eerste Covid-19-geval in Namibië uitgebreek het. Die nuwe tenks is strategies geplaas waar daar geen toegang tot die waternetwerk is nie.

CoW het sedert 2017 Groot Aub van die Khomas-streekraad oorgeneem. Sedertdien is blykbaar vyf boorgate geboor, met twee nuwes wat beplan word. Eienaars van plase aan die buite-ruimte van Groot Aub boor vir hul eie water.

Kalundu sê: “Vir te lank het ons negatiewe publisiteit toegelate. Dit is tyd dat die publiek sien wat ons alles vir Groot Aub doen.” Amptelike dokumentasie is aan Republiekein belowe wat uiteensit hoeveel kapitaal in Groot Aub ingegaan het sedert CoW die bestuur daarvan oorgeneem het.

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Inwoners mag nog om reispermitte aansoek doen

Adolf Kaure op Swakopmund

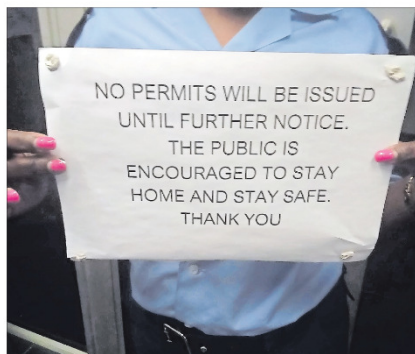
‘n Kennisgewing op ’n venster van ’n Swakopmundse polisie-kantoor is Saterdag verwyder nadat dit inwoners verwar het wat om reispermitte wou aansoek doen.

Luidens dié kennisgewing sou geen permitte voortaan uitgereik word nie. “Die publiek word aangemoedig om tuis en veilig te bly, dankie.”

Me. Hannelie Horn Turner, ’n gefrustreerde inwoner, het haar misnoeë in die Facebook-groep “Namibian United against Lock-down” te kenne gegee.

“Dié kennisgewing is vanoggend, 1 Augustus, op die venster van die Swakopmund-polisie-kantoor ten toon gestel. Ek veronderstel dit beteken ons is nou amptelik gevangesen.”

Sy het haar ook tot Erongo 24/7 se Facebook-blad gewend om te benadruk hoe ongelukkig sy is. Volgens haar het sy omstreeks 09:50 op daardie dag die kennisgewing op die venster aangetref.



Só het die kennisgewing gelui. FOTO ADOLF KAURE

Die kennisgewing is later deur ’n polisiebeampte aan diens verwyder.

Sy het op voorwaarde van anonimiteit gesê die inhoud in die kennisgewing is nie meer geldig

nie en dat inwoners wel om reispermitte aansoek mag doen. “Die kennisgewing is vroeër vanjaar teen die venster geplak en is oud. Dit is nie veronderstel om meer daar te wees nie; so, laat ek dit

nou verwyder.”

Insp. Ileni Shapumbu, gemoci met gemeenskapsake in die Erongostreek, het by navraag bevestig Swakopmund-inwoners mag aansoek doen om uit die dorp te reis. “Daar bestaan nie so iets nie (reisverbod). Ons reik steeds reispermitte streng volgens wet uit.”

Pres. Hage Geingob het Vrydag by Staatshuis ’n beroep op Namibiërs gedoen om nie onnodig o reis te gaan nie.

Hy het dié beroep gedoen to hy aangekondig het die Erongostreek bly in fase 3 en die res van die land in fase 4.

Die spesiale bedeling wat vir di plaaslike owerhede van Walvisbaai, Swakopmund en Arandigeged het, is eweneens steed van krag.

Ofskoon die regime Maandag aand om middernag sou verstry het, het Geingob gesê di maatreëls om die verdere verspreiding van Covid-19 hok te slaan, word opnuut tot middernag op 31 Augustus ingestel.

- adolf@erongo.com.na

Site Notice



Appendix E: Consultants' Curriculum Vitae

ENVIRONMENTAL ASSESSMENT PRACTITIONER**Quzette Bosman**

Quzette Bosman has 14 years' experience in the Impact Assessment Industry, working as an Environmental Assessment Practitioner and Social Assessment practitioner mainly as per the National Environmental Legislation sets for South Africa and Namibia. Larger projects have been completed in terms of World Bank and IFC requirements. She studied Environmental Management at the Rand Afrikaans University (RAU) and University of Johannesburg (UJ), including various Energy Technology Courses. This has fuelled a passion towards the Energy and Mining Industry with various projects being undertaken for these industries. Courses in Sociology has further enabled her to specialize in Social Impact Assessments and Public Participation. Social Assessments are conducted according to international best practise and guidelines. Work has been conducted in South Africa, Swaziland and Namibia.

CURRICULUM VITAE QUZETTE BOSMAN

Name of Firm	:	Geo Pollution Technologies (Pty) Ltd.
Name of Staff	:	QUZETTE BOSMAN
Profession	:	Social Impact Assessor / Environmental Assessment Practitioner
Years' Experience	:	14
Nationality	:	South African
Position	:	Senior Environmental Consultant
Specialisation	:	ESIA & ESMP; SIA
Languages	:	Afrikaans – speaking, reading, writing – excellent English – speaking, reading, writing – excellent German –speaking - fair

First Aid Class A	EMTSS, 2017
Basic Fire Fighting	EMTSS, 2017

EDUCATION AND PROFESSIONAL STATUS:

BA	Geography & Sociology	:	Rand Afrikaans University, 2003
BA	(Hons.) Environmental Management	:	University of Johannesburg, 2004

PROFESSIONAL SOCIETY AFFILIATION:

Namibian Environment and Wildlife Society
International Association of Impact Assessors South Africa (IAIA SA)
Member 2007 - 2012
Mpumalanga branch Treasurer 2008/2009

OTHER AFFILIATIONS

Mkhondo Catchment Management Forum (DWAF): Chairperson 2008-2010
Mkhondo Water Management Task Team (DWAF): Member 2009

AREAS OF EXPERTISE:

Knowledge and expertise in:

- ◆ environmental impact assessments
- ◆ project management
- ◆ social impact assessment and social management planning
- ◆ community liaison and social monitoring
- ◆ public participation / consultation, social risk management
- ◆ water use licensing
- ◆ environmental auditing and compliance
- ◆ environmental monitoring
- ◆ strategic environmental planning

EMPLOYMENT:

2015 - Present	:	Geo Pollution Technologies – Senior Environmental Practitioner
2014-2015	:	Enviro Dynamics – Senior Environmental Manager
2010 - 2012	:	GCS – Environmental Manager (Mpumalanga Office Manager)
2007 - 2009	:	KSE-uKhozi - Technical Manager: Environmental
2006 -2007	:	SEF – Environmental Manager
2004 - 2005	:	Ecosat – Environmental Manager

PUBLICATIONS:

Contract reports	:	+180
Publications	:	1