# Environmental Scoping Assessment (ESA) Report:

# The Proposed Irrigation Activities on Farm Skaapplaas No. 414 situated North of the Naute Dam in the Keetmanshoop District of the //Karas Region, Namibia

**ECC Application Reference: App-002695**

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# EXECUTIVE SUMMARY

Mandy Investments Two Hundred and Ninety-Four (294) (Pty) Ltd (hereinafter referred to as *Mandy Investment or the Proponent*) intends to carry out irrigation activities on the privately owned Farm Skaapplaas No. 414 located about 10 km north of the Naute Dam and 40 km south of Keetmanshoop in the //Karas Region.

The proposed project will entail the clearing and preparation of land, approximately 1300 hectares (ha) in total, for lucerne (animal fodder) cultivation for commercial purposes. The project land will be worked on and implemented in three phases, and these are as follows:

- Phase 1: 300 ha,
- Phase 2: a further 700 ha, and
- Phase 3: a further 300 ha (totaling 1300 ha).

The establishment of irrigation projects is however one of the listed activities in the 2012 EIA Regulations of the Environmental Management Act No. 7 of 2007 that that may not be undertaken without an Environmental Clearance Certificate (ECC). Subsequently, to ensure that the proposed activity is compliant with the national environmental legislation the project Proponent (Mandy Investment) had to appoint an independent environmental consultant to undertake the required Environmental Assessment (EA) process and apply for the ECC on their behalf.

It is for this reason that Excel Dynamic Solutions (Pty) Ltd has been appointed by the Proponent to undertake the EA and apply for the ECC. The application for the ECC was compiled and submitted to the Competent Authority (Ministry of Agriculture, Water and Land Reform (MAWLR)) on 09 June 20201. The date stamped copy of the ECC by MAWLR was also uploaded on the online portal for the Ministry of Environment, Forestry and Tourism (MEFT) as the environmental custodian for project registration purposes. Upon submission of an Environmental Scoping Assessment (ESA) Report and draft Environmental Management Plan (EMP), an ECC for the proposed project will be considered by the Environmental Commissioner at the MEFT's Department of Environmental Affairs and Forestry (DEAF).

**Public Consultation**

**Public Consultation Activities**

Regulation 21 of the EIA Regulations details steps to be taken during a public consultation process and these have been used in guiding this process. The public consultation process assisted the Environmental Consultant in identifying all potential impacts and aided in the process of identifying possible mitigation measures and alternatives to certain project activities. The communication with I&APs about the proposed projects was done through the following means and in this order to ensure that the public is notified and afforded an opportunity to comment on the proposed project:

- Registration of pre-identified stakeholders and interested & affected parties (I&APs) and updating the list throughout the environmental assessment process.
- Placement of newspaper adverts in two newspapers, *New Era on* 12 & 26 May 2021 and *The Namibian* 14 & 24 May 2021).
- Circulation of the background information document (BID) to pre-identified stakeholders and I&APs and to new I&APs (upon registration request).
- Placement of A3 notices for the public in Keetmanshoop (at the //Karas Regional Council).
- A public consultation meeting was arranged. However, no one apart from the Consultant and Proponent showed up. The Consultant assumed the meeting was a no show due to the following reasons:
    - Lack of interest in the project because the project water supply is the Naute Dam (to be supplied via NamWater water supply line) and not the local aquifers (groundwater), hence not affecting the locals directly. From experience, public interest and concern in an area would be high if the water for the project would be abstracted water from an already low potential resource like boreholes in these dry parts of the country.
    - The neighbouring properties to Farm Skaapplaas are more than 2 km away, therefore these neighbours might think that the project activities will be of no interest or have low interruption to and impact on their daily routines and livelihoods.
    - Due to the global pandemic of the coronavirus, some people are not comfortable with attending meetings or be in gatherings that may compromise their health (fear of contracting the virus from interacting with other people from different areas).

**Potential Impacts identified**

The following impacts were identified:

**Potential positive impacts**:

- Potential for creation of employment for locals, especially the non-skilled labourers,
- Enhance national food security through the production of animal (livestock) feed,
- Increase in agriculture skills and technological development in the agriculture sector,
- Provide livelihood for rural population,
- Boost to local and regional economic development, i.e., economic diversification,
- May open other investment opportunities in the Region, and
- Safeguard the sustainable existence of Namibia's agricultural sector.

**The following potential negative impacts are anticipated:**

- Land degradation (physical soil disturbance) resulting in increased soil erosion due to land irrigation,
- Biodiversity Loss through site clearing to enable construction as well as during operations,
- Potential impact on water resources (abstraction and pollution),
- Potential pollution of soils and water resources from seepage of fertilizers, pesticides, wastewater, and hydrocarbons,
- Waterlogging primarily from inadequate drainage and over-irrigation and, to a lesser extent, from seepage from canals and ditches,
- Impact on local services infrastructure (buried pipelines on the Farm),
- Salinization - Excess salinity within the root zone reduces plant growth due to increasing energy that the plant must expend to acquire water from the soil.
- Potential health and safety risks associated with mishandling of equipment (materials) as well as inadequate personal protective equipment,
- Potential dust generation from increased traffic in the area during site setup.
- Potential impact on archaeological/heritage resources through inadvertent unearthing of such sites or objects that may be located below ground surface or project related disturbance of nearby/potential archaeological sites or objects found in the vicinity.
- General environmental pollution through littering (general waste generated on the project site).

The potential negative impacts were assessed, and mitigation measures provided accordingly.

## RECOMMENDATIONS AND CONCLUSIONS

The potential impacts (both positive, negative, and cumulative) that are anticipated from the proposed project activities were identified, described, and assessed. For the significant adverse (negative) impacts with high and medium rating, appropriate mitigation measures were recommended for implementation by the Proponent, their contractors and project related employees.

The public was consulted as required by the EMA and its 2012 EIA Regulations (Section 21 to 24). This was done via the two newspapers used for this environmental assessment (New Era and the Namibian newspapers in May 2021); site/public notices placed in Keetmanshoop (at the Regional Council notice board). A notice for public consultation meeting was sent out. However, on the day of the meeting no one showed up.

The findings of this assessment were deemed sufficient and conclude that no further detailed assessments are required to the ECC application.

### Recommendations

Therefore, the Environmental Consultant is confident that the potential negative impacts associated with the proposed project activities can be mitigated by effectively implementing the recommended management action measures and with more effort and commitment put on monitoring the implementation of these measures. It is therefore, recommended that the proposed oxidation ponds and associated activities be granted an Environmental Clearance Certificate, provided that:

- All respective management measures (mitigations) provided in the EMP be effectively and progressively implemented and backed up by consistent site monitoring of environmental components listed in the EMP to achieve full EMP implementation compliance.
- All required permits, licenses and approvals for the project activities are obtained as required (please refer to the Permitting and Licensing in the EMP).
- The Proponent and all their project workers or contractors comply with the legal requirements governing their project and its associated activities and ensure that project permits and or approvals required to undertake specific site activities are obtained and renewed as stipulated by the issuing authorities.
- All the necessary environmental and social (occupational health and safety) precautions provided are adhered to.

- Environmental (EMP) Compliance Monitoring should be conducted on a weekly basis during the construction phase by the project Safety, Health and Environmental Officer or an independent Environmental Consultant and bi-annually during the operational phase. Environmental Compliance monitoring reports should be compiled and submitted to the DEAF Portal as per provision made on the MEFT/DEAF's portal**.**

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

**Conclusions**

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

Excel Dynamic Solutions (Pty) Ltd is, therefore, confident that these measures are sufficient, and thus recommends that the Proponent be issued with the Environmental Clearance Certificate (ECC). However, the ECC should be issued on condition that the provided management measures and action plans are effectively implemented and monitored on site.

Monitoring of the environmental components described in the impact assessment should be conducted by the Proponent and applicable Competent Authority. This is to ensure that all potential impacts identified in this study and other impacts that might arise during implementation are properly identified in time and addressed. Lastly, should the ECC be issued, the Proponent will be expected to be compliant with the ECC conditions as well as legal requirements governing the project and its related activities.

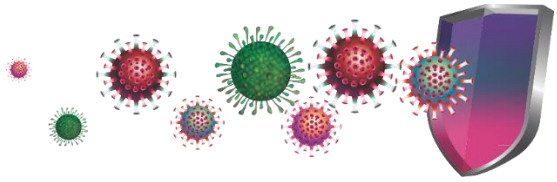
## Limitations

EDS warrants that the findings and conclusion contained herein were accomplished in accordance with the methodologies set forth in the Scope of Work and Environmental Management Act (EMA) of 2007. These methodologies are described as representing good customary practice for conducting an Environmental Impact Assessment of a property for the purpose of identifying recognized environmental conditions. There is a possibility that even with the proper application of these methodologies there may exist on the subject property conditions

that could not be identified within the scope of the assessment, or which were not reasonably identifiable from the available information. The Consultant believes that the information obtained from the record review and during the public consultation processes concerning the proposed irrigation activities/works is reliable. However, the Consultant cannot and does not warrant or guarantee that the information provided by the other sources is accurate or complete. The conclusions and findings set forth in this report are strictly limited in time and scope to the date of the evaluations. No other warranties are implied or expressed.

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

## COVID-19 Influences:



COVID-19 has changed the way the world thinks, acts, and does business. The pandemic has forced a comprehensive review of business practices, a higher level of engagement with technology to offset the constraints due to social distancing, restrictive travel, and a focus on social responsibility. The Consultant had to change very little in the way they operate and provide public consultation services.

Although the Consultant operated with limited travel during the environmental assessment to comply with the measures and regulations put in place to curb the spread of Covid-19, various other platforms were used to communicate the project information. These platforms included emails, registered mails, notices, and newspaper adverts.

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**Appendix B:** Draft Environmental Management Plan (EMP) - ***uploaded to the ECC Portal separately as required***

**Appendix C:** Curricula Vitae (CV) for the Environmental Assessment Practitioner (EAP) - ***uploaded to the ECC Portal separately as required***

**Appendix D:** List of Interested and Affected Parties (I&APs) - ***uploaded to the ECC Portal separately as required (under the ''Proof of Consultation'' file)***

**Appendix E:** Background Information Document (BID) - ***uploaded to the ECC Portal separately as required***

**Appendix F:** ESA Process Notification in the newspapers (*New Era* and *The Namibian*) - ***uploaded to the ECC Portal separately as required***

**Appendix G**: Consent Letter of Water Abstraction (Supply) by NamWater - ***uploaded to the ECC Portal separately as required***

# LIST OF ABBREVIATIONS

| **Abbreviation** | **Meaning** |
|---|---|
| AMSL | Above Mean Sea Level |
| BID | Background Information Document |
| CITES | Convention on International Trade and Endangered Species |

| Abbreviation | Meaning |
|---|---|
| CP | Centre Pivot (irrigation technique) |
| CV | Curriculum Vitae |
| DEAF | Department of Environmental Affairs and Forestry |
| DI | Drip Irrigation |
| DWA | Department of Water Affairs |
| EA | Environmental Assessment |
| EAP | Environmental Assessment Practitioner |
| ECC | Environmental Clearance Certificate |
| EDS | Excel Dynamic Solutions |
| EIA | Environmental Impact Assessment |
| EMA | Environmental Management Act |
| EMP | Environmental Management Plan |
| ESA | Environmental Scoping Assessment |
| GG | Government Gazette |
| GN | Government Notice |
| I&APs | Interested and Affected Parties |
| MAWLR | Ministry of Agriculture, Water and Land Reform |
| MEFT | Ministry of Environment, Forestry and Tourism |
| PPE | Personal Protective Equipment |
| Reg, S | Regulation, Section |
| TOR | Terms of Reference |

## KEY TERMS AND DEFINITIONS

| TERM | DEFINITION |
|---|---|
| **Alternative** | A possible course of action, in place of another that would meet the same purpose and need of the proposal. |

| TERM | DEFINITION |
|---|---|
| **Baseline** | Work done to collect and interpret information on the condition/trends of the existing environment. |
| **Biophysical** | That part of the environment that does not originate with human activities (e.g., biological, physical and chemical processes). |
| **Cumulative Impacts/Effects Assessment** | In relation to an activity, means the impact of an activity that in it 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. |
| **Decision-maker** | The person(s) entrusted with the responsibility for allocating resources or granting approval to a proposal. |
| **Ecological Processes** | Processes which play an essential part in maintaining ecosystem integrity. Four fundamental ecological processes are the cycling of water, the cycling of nutrients, the flow of energy and biological diversity (as an expression of evolution). |
| **Environment** | As defined in Environmental Management Act - the complex of natural and anthropogenic factors and elements that are mutually interrelated and affect the ecological equilibrium and the quality of life, including – (a) the natural environment that is land, water and air; all organic and inorganic matter and living organisms and (b) the human environment that is the landscape and natural, cultural, historical, aesthetic, economic and social heritage and values. |
| **Environmental Management Plan** | As defined in the EIA Regulations (Section 8(j)), a plan that describes how activities that may have significant environments effects are to be mitigated, controlled, and monitored. |
| **Interested and Affected Party (I&AP)** | In relation to the assessment of a listed activity includes - (a) any person, group of persons or organization interested in or affected by an activity; and (b) any organ of state that may have jurisdiction over any aspect of the activity. Mitigate - practical measures to reduce adverse impacts. Proponent – as defined in the Environmental Management Act, a person who proposes to undertake a listed activity. Significant 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. |

| TERM | DEFINITION |
|---|---|
| **Fauna and Flora** | All the animals and plants (vegetation) found in an area. |
| **Mitigation** | The purposeful implementation of decisions or activities that are designed to reduce the undesirable impacts of a proposed action on the affected environment. |
| **Monitoring** | Activity involving repeated observation, according to a pre-determined schedule, of one or more elements of the environment to detect their characteristics (status and trends). |
| **Nomadic Pastoralism** | Nomadic pastoralists live in societies in which the husbandry of grazing animals is viewed as an ideal way of making a living and the regular movement of all or part of the society is considered a normal and natural part of life. Pastoral nomadism is commonly found where climatic conditions produce seasonal pastures but cannot support sustained agriculture. |
| **Proponent** | Organization (private or public sector) or individual intending to implement a development proposal. |
| **Public Consultation/Involvement** | A range of techniques that can be used to inform, consult, or interact with stakeholders affected by the proposed activities. |
| **Protected Area** | Refers to a protected area that is proclaimed in the Government Gazette, according to the Nature Conservation Ordinance number 4 of 1975, as amended. |
| **Scoping** | An early and open activity to identify the impacts that are most likely to be significant and require specialized investigation during the EIA work. Can, also be used to identify alternative project designs/sites to be assessed, obtain local knowledge of site and surroundings, and prepare a plan for public involvement. The results of scoping are frequently used to prepare a Terms of Reference for the specialized input into full EIA. |
| **Terms of Reference (ToR)** | Written requirements governing full EIA input and implementation, consultations to be held, data to be produced and form/contents of the EIA report. Often produced as an output from scoping. |

# 1 INTRODUCTION

Irrigation is mostly practised in arid to semi-arid zones, here referred to as dry lands, but is also known from humid areas. Dry lands are poor in precipitation and suffer tremendous climate variability from year to year, thus increasing the vulnerability of cultivated ecosystems.

There are two main ways that farmers and ranchers use agricultural water to cultivate crops: rain-fed farming and irrigation. Rain-fed farming is the natural application of water to the soil through direct rainfall. Relying on rainfall is less likely to result in contamination of food products but is open to water shortages when rainfall is reduced. On the other hand, artificial applications of water increase the risk of contamination (Green Team Consultant, 2019).

Irrigation is the artificial application of water to the soil through various systems of tubes, pumps, and sprays. Irrigation is usually used in areas where rainfall is irregular or dry times or drought is expected. There are many types of irrigation systems, in which water is supplied to the entire field uniformly. Irrigation water can come from groundwater, through springs or wells, surface water, through rivers, lakes, or reservoirs, or even other sources, such as treated wastewater or desalinated water.

The aspect of carrying out irrigation activities with a reliance on surface water supply is common in arid counties such as Namibia. The typical water supply sources for both small, medium, and large-scale irrigation projects are shared perennial rivers on the borders of Namibia with other neighboring countries. These perennial rivers are the Orange, Kunene, Kavango and Zambezi Rivers. However, the use of these perennial river water would only be ideal and economical feasible for projects located within proximity of these rivers. Therefore, the proposal to carry out irrigation project inland (far from perennial rivers) would be dependent on either groundwater and heavily on harvested rainwater stored in artificial-made dams and or reservoirs that would also rely on good rains to fill up these dams.

Most commercial farm owners in the country beside owning land, have identified the gap in the agricultural market to provide different services and goods that can be produced from their lands. The main product that can be produced from these farms include livestock as well as crops. Since is the major driving force of economies globally, it is therefore a main challenge that hinder the implementation of such plans and achieve the dreams of successfully utilizing the land. It is for this reason that many farmers/landowners approach potential water suppliers to either do animal or crop farming at a commercial level, with some choose to undertake irrigation activities.

***According to the National Lucerne Trust of South Africa (2018), irrigation is the controlled provision of water to successfully cultivate a crop under the following conditions:***

- ***In arid areas***
- ***During drought periods in semi-arid and semi-humid areas***
- ***In areas with erratic rainfall distribution***
- ***To lengthen the effective growing period into the dry season.***

## 1.1 Project Background

Mandy Investments Two Hundred and Ninety-Four (Pty) Ltd (hereinafter referred to as The Proponent) intends to carry out irrigation activities on the privately owned Farm Skaapplaas No. 414 located about 10 km north of Naute Dam and about 40 km south of Keetmanshoop in the //Karas Region. The locality map of the proposed project site (Farm Skaapplaas No. 414) is shown in **Figure 1**.

The proposed project will entail the clearing and preparation of land, approximately 1300 ha in total, for lucerne (animal fodder) as known as Alfalfa (*Medicago sativa L*) cultivation for commercial purposes. The project land will be worked on and implemented in three phases, and these are as follows:

- Phase 1: 300 ha,
- Phase 2: a further 700 ha, and
- Phase 3: a further 300 ha (totaling 1300 ha).

The proposed irrigation scheme will consist of 26 rings of 50 ha each. It will also entail an irrigation infrastructure, comprising pipelines, balancing dam, abstraction pump station, to facilitate the planned irrigation works.

Prior to implementing the project and its associated activities, the Proponent needs to comply with Section 27 (1) of the Environmental Management Act (EMA) (No. 7 of 2007) and its 2012 Environmental Impact Assessment (EIA) regulations. The Section provides a list of activities that may not be carried out without an Environmental Scoping Assessment (ESA), or Environmental Impact Assessment (EIA) being undertaken, and an Environmental Clearance Certificate (ECC) obtained. Irrigation activities are listed among the activities that may not occur without an EIA study done (with environmental assessment report and draft Environmental Management Plan (EMP) compiled) and upon documents (report and EMP)' approval by the Environmental Commissioner, an ECC is issued for the project activities.

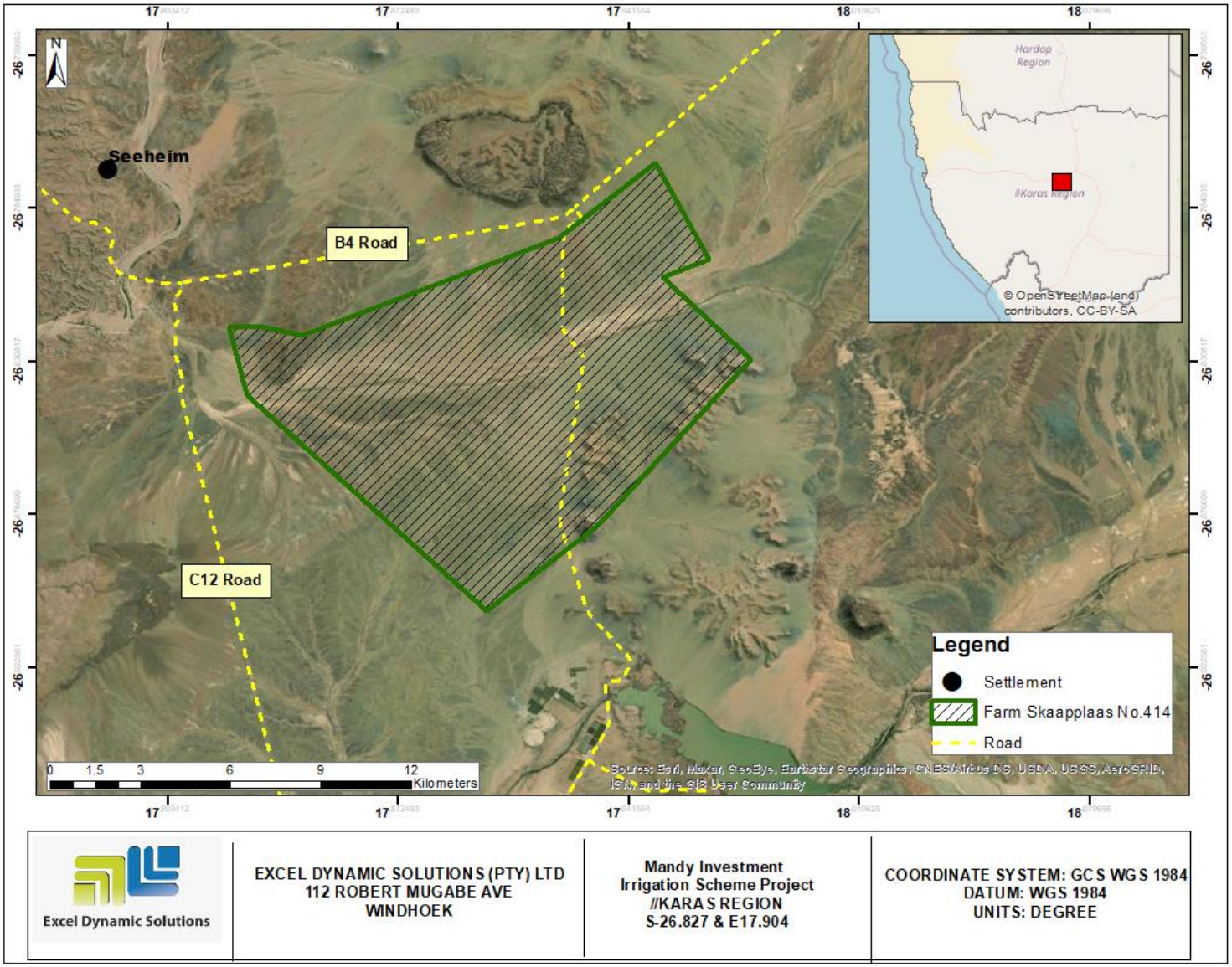


**Figure 1:** **Location of Farm Skaapplaas No. 414 north of Naute Dam, in the //Karas Region**

## 1.2 Terms of Reference (TOR), Scope of Work and Document Contents

There were no formal Terms of Reference (TOR) provided by the Proponent with regards to the required EIA Study (the Environmental Scoping Assessment (ESA) for this proposed project). Therefore, this Study has been commissioned and conducted according to the Environmental Management Act (EMA) No. 7 of 2007, and its 2012 EIA Regulations, whereby the proposed irrigation and associated works and activities is one of the listed activities in these Regulations of the EMA that may not be undertaken without an Environmental Clearance Certificate (ECC). The listed activities that are relevant to proposed project are as follows:

- ***''Regulation 8.1****: Abstraction of ground or surface water for industrial or commercial purposes.*
- ***Regulation 8.7****: Irrigation schemes for agriculture excluding domestic irrigation.*
- ***Regulation 9.2*** *Any process or activity which requires a permit, license or other form of authorization, or the modification of or changes to existing facilities for any process or activity which requires an amendment of an existing permit, license, or authorization or which requires a new permit license or authorization in terms of a law governing the generation or release of emissions, pollution, effluent, or waste.''*

Subsequently, an application for the Environmental Clearance Certificate (ECC) accompanied by the Background Information Document (BID) and was hand delivered on the 3rd of June 2021 to the Department of Water Affairs (DWA), Ministry of Agriculture, Water and Land Reform (MAWLR), the *Competent Authority* in Windhoek - **Appendix A**.

Furthermore, an ESA process will need to be undertaken, completed, and an ESA Report and draft EMP compiled and submitted to the Department of Environmental Affairs and Forestry (DEAF) of the Ministry of Environment, Forestry and Tourism (MEFT) for evaluation and consideration of ECC issuance.

The purpose of the ESA and subsequent issuance of the ECC is to ensure that the proposed project activities are undertaken in an environmentally friendly and sustainably manner, through the effective implementations of recommended environmental management and mitigation measures to minimize the adverse identified impacts while maximizing the positive impacts.

This Report has been compiled as a required output of an environmental assessment process after the ECC application has been submitted to the Competent Authority. The ESA Report, together with the draft EMP and all its appendices will be submitted to the DEAF for evaluation.

Apart from the introductory chapter, this Report covers the following chapters:

- Project description and associated activities - (**Chapter 2**).

- Project alternatives considered (that were found to be environmentally friendly and technically feasible) - **Chapter 3**).
- The legal requirements governing the proposed project and its related activities, i.e., the legislations that the proposed development will need to comply with (**Chapter 4**).
- The relevant pre-project environmental conditions (environmental and social baseline) of the project site and surrounding area as presented under **Chapter 5**.
- The Public Consultation Process undertaken to inform, invite and engage the public (stakeholders and interested & affected parties) on the proposed project- **Chapter 6**.
- The presentation and assessment of key potential identified impacts associated with the proposed development (**Chapter 7**) - This chapter presents both the positive and negative (adverse) as well as cumulative impacts, assessment methodology and the assessment of the negative impacts. The mitigation measures in the form of management and mitigation action plans, with timeframe and implementation responsibilities are given in draft Environmental Management Plan (EMP) under **Appendix B**.
- The recommendations and conclusions to the environmental assessment are presented under **Chapter 8**, while **Chapter 9** is a list of data sources (literature) consulted for the assessment.

## 1.3 The Need for the Proposed Project (Motivation)

Namibia is almost 100% self–sufficient in red meat production but imports 60% of its total grain food requirements and 90 percent of its horticultural commodity consumption requirements. The main agricultural enterprises are livestock (cattle, sheep, and goats); grain crops (maize, millet, wheat, barley, and sorghum). However, commercial farming can be a challenging business especially in a dry country such as Namibia. The current weather changes have not been easy hence adding to sustainability constraints. To farm healthy and profitable livestock, the Proponent identified the need to commence with irrigation activities, i.e., growing lucerne on Farm Skaapplaas.

The irrigation activities will not only result in the production of animal fodder (lucerne) leading to successful farming and income generation, but also the creation of employment opportunities to the locals who will be working at the irrigation site. These will both contribute to the socio-economic development in the area, //Karas Region and possibly country at large.

The agricultural sector supports 70% of the country's 2.5 million persons. However, the sector is characterized by scarce productive land and fragile soils, coupled with erratic rainfall regime. Persistent periods of draught over the past 20 years have made access to natural resources for agricultural production even harder.

Namibia's irrigation potential is between 40,000 and 50,000 ha depending on the limits that one set on the distance from, and the height above watered resources. Yet, irrigation farming in the country has been limited and developing slowly indeed. Most of the irrigation is confined to the commercial sector or State/Parastatals farms (over 90%).

Irrigation farming takes place either by way of flood recession, ground water, or using surface waters either pumping from the rivers or from storage reservoirs such as dams.

## 1.4 Appointed Environmental Assessment Practitioner

To satisfy the requirements of the EMA and its 2012 EIA Regulations, the Proponent appointed an independent team of Environmental Consultants at Excel Dynamic Solutions (Pty) Ltd (hereinafter referred to as EDS, The Consultant or Environmental Assessment Practitioner (EAP)) to conduct the required ESA process on their (Proponent's) behalf. The findings of the ESA process are incorporated into this Report. The ESA Report and the draft EMP as well as associated documents will be submitted as part of an application for an ECC to the Environmental Commissioner at the Department of Environmental Affairs and Forestry (DEAF) of the Ministry of Environment, Forestry and Tourism (MEFT).

The ESA project is headed by Mr. Nerson Tjelos, a qualified and experienced Geoscientist and experienced Environmental Assessment Practitioner with (EAP). The ESA process and this Report and the draft EMP were conducted and compiled by Ms. Fredrika Shagama, respectively. Ms. Shagama is a qualified and experienced hydrogeologist & EAP with 5 years of experience in water and environmental consulting and a member of the Namibian Hydrogeological Association and International Association of Hydrogeologists. She is also registered as a Practitioner with the Environmental Assessment Professionals of Namibia (EAPAN). The documents review was done by Mr. Tjelos. The curriculum vitae (CV) for Ms. Shagama is presented in **Appendix C.**

The following chapter is presentation of the proposed project activities, in terms of project inputs, process, outputs and resources in project phases.

# 2 PROJECT DESCRIPTION: PROPOSED IRRIGATION ACTIVITIES

This chapter comprises of the planned project activities as well as services infrastructure and resources required to commercially grow and produce lucerne or Alfalfa (*Medicago sativa L*) on the dedicated/demarcated irrigation land on Farm Skaapplaas No. 414 near Keetmanshoop. The proposed irrigation methods for lucerne cultivation are Centre Pivot and Drip systems. These methods are explained in detailed later in this chapter as well as under the Alternatives chapter.

***Lucerne or Alfalfa (Medicago sativa L), often called the ''Queen of Forages'', is widely known and accepted as the worlds' most important forage crop as it is high quality feed for all types of livestock. Lucerne is a vigorous perennial legume with a well-developed taproot system (about 3 to 5 m) that enables it to obtain water and nutrients from a large volume of soil. The plant is highly productive, yielding 8 to 10 hay cuttings per annum under optimum growing conditions. Lucerne is also a versatile crop that can be used for pasture, hay production, silage, and soil fertility improvement (Thawana, 2008).***

It should be noted that the proposed project (irrigation) activities will only commence after issuance of the ECC by the Environmental Commissioner and securing of all required permits and or license that need to be obtained prior to implementation.

Upon issuance of the ECC and obtaining the necessary and required documentations (such as approval for water supply by NamWater and other permits or licenses), the Proponent will then prepare for the actual irrigation works on the farm. The following subheadings are a presentation of the planned project activities/requirements in terms of input, processes, and outputs. The description of these project activities will ease the identification of the potential impacts, particularly the negatives impact for which are the focus of the ESA.

For easy follow of information presentation, the project activities are provided based on implementation phases, i.e., the planning & design, construction, post-construction site rehabilitation, operational and maintenance as well as decommissioning. These phases are explained as follows.

## 2.1 Planning and Design Phase

Prior to construction, the irrigation site layout and works need to be planned for and designed by an appointed contractor (planning & design engineer, Turner Consulting are currently busy with this competent of the project).

The planning and design phase which also include the ESA is aimed at presenting some key concepts of the project alongside a general overview of the study area, the legal landscape to be considered, and a preliminary assessment of the main aspects that might affect the feasibility of the project and or its associated activities. Thereafter, the environmental, technical, and financial aspects of the project is assessed by identifying potential risks and proposing mitigation measures where possible. This would also include highlighting 'fatal flaws' wherever mitigation measures are unavailable or impractical with regards to the available finances and other resources.

Prior to commencement of any site work, all personnel (including fully employed, contracted, and casual) will be inducted on the Proponent's Environmental, Health and Safety Policy as well as procedures and processes to follow while conducting the work on site or offsite work related to the project.

Consultations, particularly with competent and relevant government stakeholders will commence to notify them of the commencement of project groundwork.

## 2.2 Project Input and Resources Requirements

In terms of inputs and resources to undertake the proposed irrigation activities, the following will be required:

- Vehicles (trucks, 4x4 bakkies, etc.), equipment and machinery, temporary structure facilities such as camping, offices and or administration rooms as well as ablution.
- Hoses, centre pivots, pipes, irrigation controllers, sprinkler heads, pumps, nets, and poles.
- Storage facilities for project equipment and materials as well as containers (water, fuel, and other supplies).

In terms of services infrastructure and human resources, the following will be required:

### 2.2.1 Project Personnel and Accommodation

The number of project personnel (staff) for setting up the project site (construction) is not yet known as this will be dependent on the human resources need by the appointed construction contractor. Similarly, the number of people to be employed for the actual irrigation works cannot be determined at this stage. Accommodation provision for the construction and operation phases is planned as follows:

- **Construction**: In terms of accommodation for the construction phase, it is anticipated that the project staff will be accommodated on temporary accommodation (tented campsite) near the site on Farm Skaapplaas.
- **Operational phase**: For the operational phase, permanent accommodation facilities will be constructed on the Farm Skaapplaas.

### 2.2.2 Water Supply Requirements

Water supply for both the construction and actual irrigation works will be sourced from the Naute Dam. The water will be provided to the project site via pipelines connected to the abstraction pump station at the Dam. For onsite domestic water use (including drinking), there will be industry standard water storage tanks onsite that will be refilled by the pipeline as often as necessary to ensure uninterrupted water supply to the project activities when needed. The estimated water requirements of lucerne, as referenced 'crop' on the planned 1,300 ha under Drip irrigation, is 21,411,000$m^3$/annum. This water figure is anticipated for the entire project, i.e., Phase 1 to 3 but the initial irrigation works will only be done on the 300-ha portion of the land which will require much less annual water volume from the total of 21,000 000 $m^3$).

Given the influence of climate change in an arid country like Namibia on developments, it cannot be indicated at this stage as to how soon would the project continue to the next phase (Phase 2 and then 3) of irrigating the remaining hectares of the total land. The progress may be hindered by certain factors such as a short in water supply from the Dam due to poor or no rainfall over a prolong period (considering other users depending on the same source), or other factors beyond the Proponent's control. And due to this, the Proponent might even be forced to either scale down on operations or temporarily cease operations until a better solution is found, or the situation improves. Regardless, progress reports would need to be submitted to the relevant regulatory and competent authorities as the actual project activities progress once in operation.

The Proponent has presented two irrigation methods for consideration, namely the Drip and Centre Pivot irrigation techniques. The two techniques have different water requirement per hectare of irrigated land, therefore, the two have been weighed and assessed in the environmental assessment report (under the alternatives chapter) to select the best option or combined, from both economic, technical, and environmental perspectives.

According to preliminary figures provided by the Proponent, with a Drip irrigation technique, 1 ha of lucerne would require an average of 16,470 $m^3$ per annum totalling to about 4,941,000 $m^3$ per

annum to irrigate the 300 ha. The Centre Pivot irrigation technique would on 1 ha require an average of 20,270 $m^3$ per annum (totalling to an average of 6,081,000 $m^3$ to irrigate 300 ha).

In an essence, and from an environmental perspective, the Drip irrigation technique would require about 1,140,000 $m^3$ less than the Centre Pivot system per year to irrigate the 300 ha of land.

### 2.2.3 Power supply

The power required for construction work be supplied by the Construction contractor probably comprising temporary diesel generator sets.

For the operational phase, the main or preferred power supply is renewable energy (in the form of photovoltaic/solar) that will then be supplemented by electricity from the nearby NamPower grid. However, the final option is still to be confirmed once the engineering works/design are finalized.

For the development of the farm, the grid connection from NamPower will be considered. Power requirements will only be on small scale as irrigation itself will be gravity-fed.

### 2.2.4 Sanitation

During construction, the site will be equipped with enough portable chemical toilet system. For the operational phase, a pit latrine system with septic tanks will be considered. A sewage removal and management contractor will be appointed to ensure that the systems are maintained, and waste disposed of as deem necessary.

### 2.2.5 Site Access (Roads)

The Irrigation area is accessible via the B4 main road which runs from Keetmanshoop towards Lüderitz or accessible from the C12 road which connects to the B4 main road from Aus.

### 2.2.6 Health and safety

All project workers (for all the site project phases) will be well equipped with personal protective equipment (PPE) while performing tasks on site. A minimum of two first aid kids will be available at each working site.

### 2.2.7 Accidental Fire management

The project working sites and vehicles will be equipped with fire extinguishers.

### 2.2.8 Site Fencing

Although the activities will be undertaken within the existing farm which is already fenced off, certain project sites and areas may need to be separated off by adding extra fencing to increase security and limit access (controlled site movements to certain areas for safety and security reasons).

## 2.3 Site Clearing and Construction Phase

This will entail site clearing of some of the shrubs on the project site, and earth levelling in preparation of the installation of above-mentioned services infrastructure and erection of supporting structures.

The construction work will also include the installation of irrigation systems and associated infrastructure on the demarcated site areas on the Farm. Furthermore, in preparation for the operational phase, the construction works will also entail the establishment of the water pipeline system and its connection to the pumping station from the water source (Naute Dam) and project site pumps.

## 2.4 Post-Construction Site Rehabilitation

Once construction phase has been completed, the associated works will be ceased, and site cleaned up in preparation for the next phase (operations). The activities to be carried out to clean up and rehabilitate the site post-construction are as follows:

- Dismantling and removal of all infrastructures and structures that will no longer be required for the operational and maintenance phase. These structures include camping sites, storage tanks, onsite temporary construction offices and ablution facilities and other supporting structures erected for construction. These will be transported to designated storage facilities offsite.
- Removal of all construction related vehicles, machinery, and equipment from site to designated parking and storage sites off site, respectively.
- Carrying away the waste storage containers and disposal of waste to nearest designated and approved waste management site (in Keetmanshoop).
- Closure of all onsite access roads that may have been created for the construction phase and no longer required for operational phase.

- Levelling of stockpiled topsoil and where possible, backfilling of all construction excavated pits and trenches.

## 2.5 Operational and Maintenance Phase

It is within this phase that the irrigation and associated activities will be undertaken, and maintenance of the irrigation fields and equipment done by the Proponent (and or their appointed maintenance contractors).

### 2.5.1 Lucerne Irrigation: A Background

Lucerne is known for its drought tolerance, but at the same time is very responsive to water. In general terms Lucerne requires 65-80 mm of water to produce one ton of dry matter. In areas where summer rainfall is low, Lucerne will benefit from one or two irrigations between cuts. Around 90% of the water extracted from the soil comes from the top meter due to the high root concentration in this zone. When under moisture stress lucerne diverts its nutrients from the top to the crown and roots. Plant stress can occur when available soil moisture falls below 50% (Pioneer Brand Products, 2015).

Following germination, the young lucerne plant puts most of its emphasis into the production of a root system. In mature crops, a general darkening in crop colour, tendency to wilt, cessation of growth and drying and cracking of the surface soil all indicate that it is time to irrigate. Excessive watering, especially on poorly drained soils and where it causes localised ponding can increase root damage. Recently cut and well-grown plants are the most susceptible.

### 2.5.2 Project Processes and Outputs

As mentioned above, the preliminary information provided by the Proponent is that the proposed irrigation methods are Drip irrigation and Centre Pivot. However, it may also come to light that there will be a necessity to combine the two methods once implementation commences. The proposed irrigation model comprises 20 x 50ha units.

### 2.5.3 Description of the Proposed Irrigation Method(s)

**A. <u>Drip Irrigation (DI)</u>**

According to Brouwer *et al*., (1985), drip (trickle) irrigation involves dripping water onto the soil at very low rates (2-20 litres/hour) from a system of small diameter plastic pipes fitted with outlets called emitters or drippers. Water is applied close to plants so that only part of the soil in which the roots grow is wetted, unlike surface and sprinkler irrigation, which involves wetting the whole

soil profile. With drip irrigation water, applications are more frequent (usually every 1-3 days) than with other methods and this provides a very favourable high moisture level in the soil in which plants can flourish (**Figure 2**).

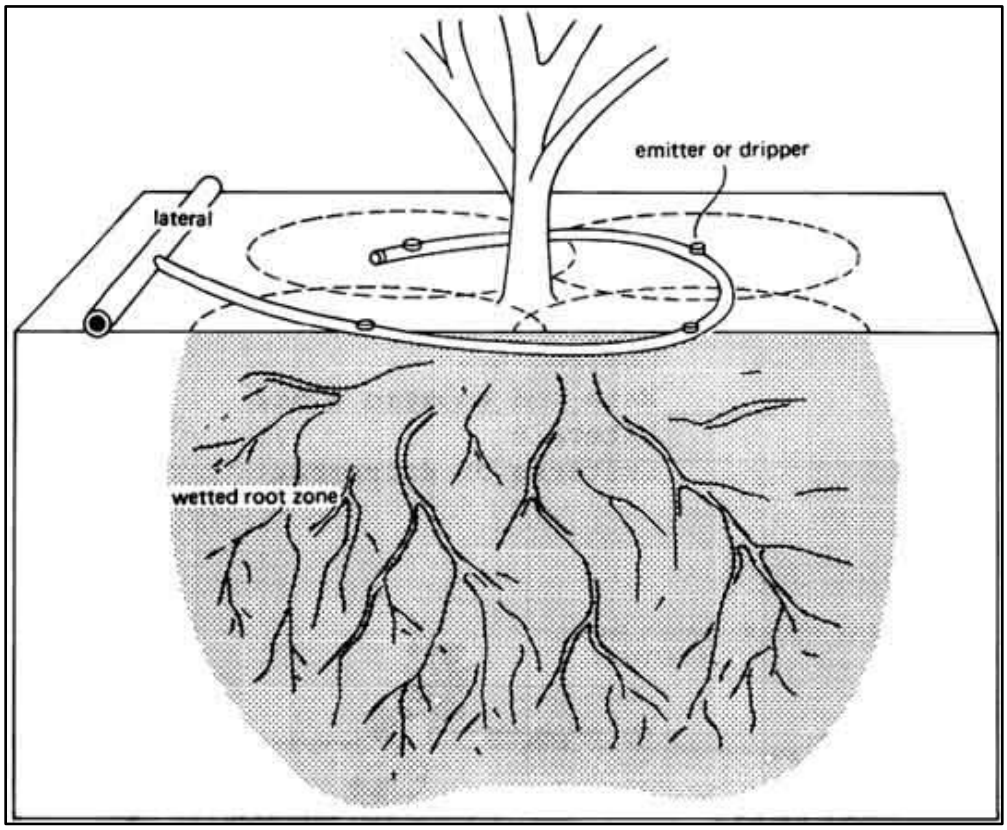


**Figure 2: Drip irrigation method, with only the part of the soil in which the roots grow is wetted (Brouwer et al., 1985)**

A typical Drip irrigation system, as seen on the layout in **Figure 3** contains:

- A pump unit,
- Control head,
- Main and submains,
- Laterals, and
- Emitters or drippers.

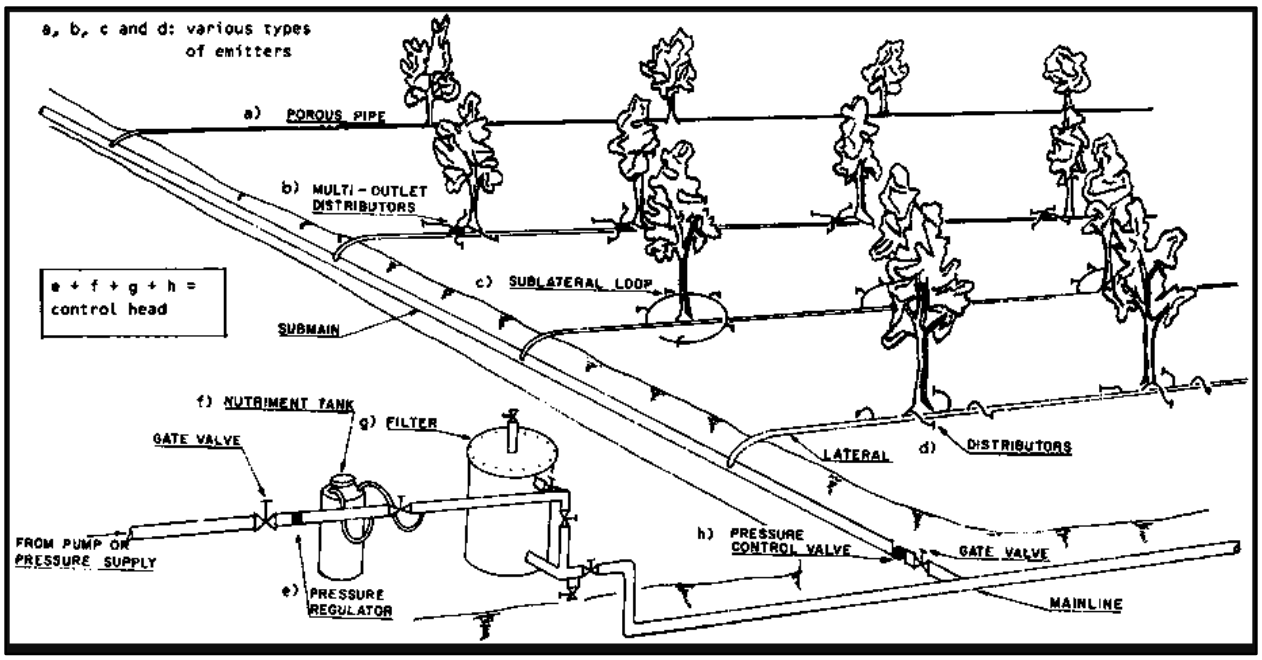


**Figure 3:** **A typical example of a Drip irrigation system layout (Brouwer et al., 1985)**

## B. Centre Pivot (Sprinkler) Irrigation description according to Phocaides (2007)

The Centre Pivot (CP) system consists of one single sprayer or sprinkler pipeline of relatively large diameter, composed of high tensile galvanized light steel or aluminum pipes supported above ground by towers move on wheels, long spans, steel trusses and/or cables (**Figure 4**). One end of the line is connected to a pivot mechanism at the center of the command area; the entire line rotates about the pivot. The application rate of the water emitters varies from lower values near the pivot to higher ones towards the outer end using small and large nozzles along the line accordingly.

Like the Drip system, a typical sprinkler irrigation system consists of the following components:

- Pump unit
- Mainline and sometimes submains,
- Laterals, and
- Sprinklers.

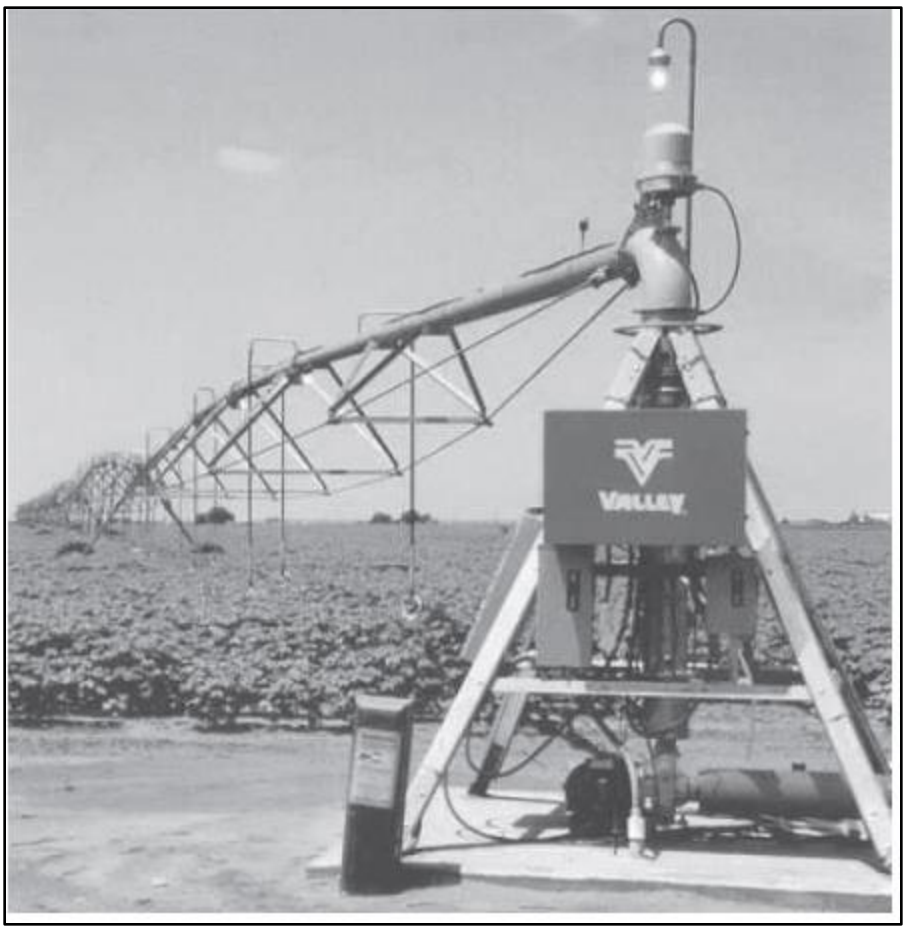


**Figure 4:** **The Centre Pivot (Sprinkler) system (Phocaides, 2007)**

The Center Pivot is a low/medium pressure fully mechanized automated irrigation system of permanent assemble. It is used for supplementary irrigation for rain fed grain. The cost of each system unit is relatively high and is therefore best suited to large, irrigated farms. The area covered can be from 3.5 ha to 60 ha, according to the size of the CP, and the larger the area the lower is the cost of the system per unit area. The typical center pivot system consists of a single long irrigating pipeline attached to a central tower and moves slowly over the field in a circular pattern and irrigates the plants with sprayers, or sprinklers placed on it at frequent spacing. The central tower with a pivot mechanism and main control panel (electric) is anchored to a small concrete base at a fixed water supply point (hydrant) at the center of the field. The entire irrigating pipeline is supported above ground by “A” frame towers move on wheels, long spans, steel trusses and/or cables; the end of the pipe is overhung with a sprinkler gun. The whole system rotates slowly, at a typical speed (last span) of 2–3 meters per minute (m/min), around the fixed pivot, self-propelled, applying water in the form of overhead spray irrigation and covers the area in a circular pattern. The drive system features small individual power units mounted on each

wheeled tower. These units are electric drive, but can be hydraulic (water, oil) or mechanical drive. An automatic alignment system always keeps the irrigating pipeline straight (**Figure 5**).

**Figure 5: The Centre Pivot system overview (Phocaides, 2007)**

### 2.5.4 Crop Production Care and Water Use and Management

The operational works will entail the following in terms of lucerne growth and production:

- Weed and nutrients (fertilizer application) control, and
- Insect, and pest management as well as diseases control.

Furthermore, operations will also include some actions for water use and management:

- Pumping water from the Naute Dam to irrigation site on Farm Skaapplaas as required,
- Frequent measuring and recording of water volumes to monitor water use and for management purposes, and
- Monitoring of onsite water storage reservoir to ensure safety and manage possible water leakages.

### 2.5.5 Harvesting and Processing

As commonly known, the Lucerne will be planted yearly, for a period of ten (10) to eleven (11) months (June to May) until harvesting and / or grazing (Green Team Consultants, 2019). After

this planting and growth period, the lucerne will then be carefully harvested (into silage and hay) to ensure maximum feed quality, packaged for the market, and sold to local customers (farmers) as well as exported to the international market.

It is currently expected that the harvest (site produce) will be transported from site to consumers on a weekly basis, but mainly dependent on consumer demand and delivery agreements.

## 2.6 Decommissioning of Project Activities

Due to the nature of irrigation projects, where the project life span is based on the reliability of resources, such as water from a drainage basin via a dam like Naute, the life span of this irrigation project is generally more than 100 years. This is linked to the long term reliable safe yield of the dam, Naute for water use. Given the fact that there would always be a need for animal fodder in the country and for the international market, a complete decommissioning of the project activities is not anticipated at this stage.

# 3 PROJECT ALTERNATIVES

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

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

**(a) What alternatives are technically and economically feasible?**

**(b) What are the environmental effects associated with the feasible alternatives?**

**(c) What is the rationale for selecting the preferred alternative?**

**(d) The alternatives considered for the proposed development are discussed in the following subsections.**

## 3.1 Types of Alternatives Considered

### 3.1.1 The "No-go" Alternative

The “No-go” alternative is the option of not proceeding with the activity, which typically implies a continuation of the status quo. In this case, this would mean, no abstraction of water from Naute Dam to cultivate Lucerne and associated benefits.

Should the proposed project not be allowed to go ahead, the current supply of lucerne by other farmers from outside the project area will continue and the bare minimum supply of lucerne to feeding livestock stays the same. Added to this, income for the Proponent and employment will not be generated and created, respectively, leading to underutilization of the Farmland and poor socio-economic development in the area.

The “no action” alternative simply implies that the status quo remains, and nothing happens. Discontinuing the irrigation proposal would mean that none of the potential impacts (positive and negative) identified would occur. The current land use for the proposed site would also remain unchanged.

Considering the above losses, the “no-action/go” alternative was not considered a viable option.

### 3.1.2 Irrigation Method: Suitability

Testing of the various methods (systems) under the prevailing local conditions provides the best basis for a sound choice of irrigation method (Green Team Consultants, 2019 cited Brouwer, et al, (2001)). There commonly used irrigation methods are surface, sprinkler or drip, basin, furrow, or border. The suitability of these methods depends mainly on the following factors:

- ***Natural conditions****: These include soil type, slope, climate, and water availability.*
- ***Type of crop:*** *Surface irrigation can be used for all types of crops. Sprinkler and drip irrigation, because of their high capital investment per hectare, are mostly used for high value cash crops, such as vegetables and fruit trees. They are seldom used for the lower value staple crops. Drip irrigation is suited to irrigating individual plants or trees or row crops such as vegetables and sugarcane. It is not suitable for close growing crops (e.g., rice).*
- ***Type of technology:*** *The type of technology affects the choice of irrigation method. In general, drip and sprinkler irrigation are technically more complicated methods. The purchase of equipment requires high capital investment per hectare. To maintain the equipment a high level of 'know-how' must be available. Also, a regular supply of fuel and*

*spare parts must be maintained which, together with the purchase of equipment. Surface irrigation systems - in particular, small-scale schemes usually require less sophisticated equipment for both construction and maintenance (unless pumps are used).*

- ***Previous experience with irrigation:*** *The choice of an irrigation method also depends on the irrigation tradition within the region or country. Introducing a previously unknown method may lead to unexpected complications,*
- ***Required labour inputs:*** *Surface irrigation often requires a much higher labor input - for construction, operation, and maintenance - than sprinkler or drip irrigation. Surface irrigation requires accurate land levelling, regular maintenance, and a high level of farmers' organization to operate the system. Sprinkler and drip irrigation require little land levelling; system operation and maintenance are less labor-intensive.*
- ***Costs and benefits:*** *Before choosing an irrigation method, an estimate must be made of the costs and benefits of the available options. On the cost side not only the construction and installation, but also the operation and maintenance (per hectare) should be considered. These costs should then be compared with the expected benefits (yields).*

### 3.1.3 Irrigation Method: Technology

The different irrigation methods are listed and briefly described below according to Centre for Disease Control and Prevention (2016) and Brouwer, *et al* (1985):

- ***Surface:*** *Water is distributed over and across land by gravity, no mechanical pump involved.*
- ***Centre pivot irrigation also known as Sprinkler irrigation****: this method is like natural rainfall. Water is pumped through a pipe system and then sprayed onto the crops through rotating sprinkler heads. In other words, water is distributed by a system of sprinklers that move on wheeled towers in a circular pattern. This system is common in flat areas of the United States.*
- ***Drip (sometimes referred to as trickle irrigation)****: With drip irrigation, water is conveyed under pressure through a pipe system to the fields, where it drips slowly onto the soil through emitters or drippers which are located close to the plants. Only the immediate root zone of each plant is wetted. Therefore, this can be a very efficient method of irrigation.*
- ***Lateral move irrigation:*** *Water is distributed through a series of pipes, each with a wheel and a set of sprinklers, which are rotated either by hand or with a purpose-built mechanism. The sprinklers move a certain distance across the field and then need to have*

*the water hose reconnected for the next distance. This system tends to be less expensive but requires more labor than others.*

- ***Sub-irrigation:*** *Water is distributed across land by raising the water table, through a system of pumping stations, canals, gates, and ditches. This type of irrigation is most effective in areas with high water tables.*
- **Manual irrigation***: Water is distributed across land through manual labor and watering cans. This system is very labor intensive.*

### 3.1.4 Preferred for or Justification of the Irrigation Method

The Proponent has presented to irrigation methods that are considered for the lucerne production, namely the Centre Pivot and Drip irrigation systems.

The two methods are described and compared in **Table 1** to select the ideal and or a combination of both based on their techniques, and economic, technological as well as environmental aspects.

**Table 1: Comparisons of the Centre Pivot and Drip Irrigation systems**

| | **Irrigation Method** | | **Preferred option or Justification** |
|---|---|---|---|
| | **Centre Pivot (Sprinkler)** | **Drip** | |
| Water requirement per hectare of irrigated land | According to preliminary figures provided by the Proponent's Planning Engineer, Centre Pivot irrigation technique would on 1 ha require an average of 20,270 $m^3$ per annum (totalling to an average of 6,081,000 $m^3$ to irrigate 300 ha of land). | According to preliminary figures provided by the Proponent's Planning Engineer, drip irrigation technique would on 1 ha of lucerne require an average of 16,470 $m^3$ per annum totalling to about 4,941,000 $m^3$ per annum to irrigate the 300 ha of land. | According to the preliminary water requirement estimate, water demand (saving) wise, the Drip irrigation would the best technique for the project compared to Centre Pivot technique which would require 1,140,000 $m^3$ less annually. |
| **Comparisons according to Brouwer *et al*., (1985)** | | | |
| Suitable crops | Sprinkler or Centre Pivot irrigation is suited for most row, field and tree crops and water can be sprayed over or under the crop canopy. However, large sprinklers are not recommended for irrigation of delicate crops such as lettuce because the large water drops produced by the sprinklers may damage the crop. | Drip irrigation is most suitable for row crops (vegetables, soft fruit), tree and vine crops where one or more emitters can be provided for each plant. Generally, only high value crops are considered because of the high capital costs of installing a drip system. | Lucerne is not considered a high value crop; therefore, sole Drip irrigation would be costly with no guarantee of return on investment. However, combined with Centre Pivot, this could work for best production. |
| Suitable slopes | Sprinkler irrigation is adaptable to any farmable slope, whether uniform or | Drip irrigation is adaptable to any farmable slope. Normally the crop would be planted along contour lines | The project site is relatively flat, and both |

| | **Irrigation Method** | | **Preferred option or Justification** |
|---|---|---|---|
| | **Centre Pivot (Sprinkler)** | **Drip** | |
| | undulating. The lateral pipes supplying water to the sprinklers should always be laid out along the land contour whenever possible. This will minimize the pressure changes at the sprinklers and provide a uniform irrigation. | and the water supply pipes (laterals) would be laid along the contour also. This is done to minimize changes in emitter discharge because of land elevation changes. | these irrigation techniques would be ideal for the project in this aspect. |
| Suitable soils | Sprinklers are best suited to sandy soils with high infiltration rates although they are adaptable to most soils. The average application rate from the sprinklers (in mm/hour) is always chosen to be less than the basic infiltration rate of the soil so that surface ponding and runoff can be avoided.<br><br>Sprinklers are not suitable for soils which easily form a crust. If sprinkler irrigation is the only method available, then light fine sprays should be used. The larger sprinklers producing larger water droplets are to be avoided. | Drip irrigation is suitable for most soils. On clay soils water must be applied slowly to avoid surface water ponding and runoff. On sandy soils higher emitter discharge rates will be needed to ensure adequate lateral wetting of the soil. | The project site soils are loamy sandy, and both these irrigation techniques would be ideal for the project in this regard. |
| Suitable irrigation water | A good clean supply of water, free of suspended sediments, is required to avoid problems of sprinkler nozzle blockage and spoiling the crop by coating it with sediment. | One of the main problems with drip irrigation is blockage of the emitters. All emitters have very small waterways ranging from 0.2-2.0 mm in diameter and these can become blocked if the water is not clean. Thus, it is essential for irrigation water to be free of sediments. If | The intended water will be supplied from the Naute Dam which is clean water and enough to cater for the irrigation through either techniques' systems. |

| | **Irrigation Method** | | **Preferred option or Justification** |
|---|---|---|---|
| | **Centre Pivot (Sprinkler)** | **Drip** | |
| | | this is not so, then filtration of the irrigation water will be needed.<br><br>Blockage may also occur if the water contains algae, fertilizer deposits and dissolved chemicals which precipitate such as calcium and iron. Filtration may remove some of the materials, but the problem may be complex to solve and requires an experienced engineer or consultation with the equipment dealer.<br><br>Drip irrigation is particularly suitable for water of poor quality (saline water). Dripping water to individual plants also means that the method can be very efficient in water use. For this reason, it is most suitable when water is scarce. | Therefore, either of the two methods / techniques can use the planned water supply.<br><br>Drip irrigation would also be ideal even if the water quality is not always the best and, in an area, where water supply is already scarce, it can be utilized. |

According to the comparisons of the two irrigation methods/techniques in the Table above, the two methods have more common aspects in terms of technology requirements. The only major difference is in the water demand currently estimated by the Planning Engineer, with the Drip irrigation system being more water conserving compared to Centre Pivot. However, this water issue would only be a problem during times of drought and poor rainfall, when the Naute Dam may not be filled to cater for the project's water needs through the Centre Pivot system solely. Drip irrigation is further also considered as the most suitable when water is scarce (Brouwer, 1985). Although the two methods may have some disadvantages associated with their applications, they have been widely applied and their advantages surpass that of other methods listed above (under section 3.1.3). Therefore, with that said, a combination of the Centre Pivot and Drip would be best preferred approach to grow and produce animal fodder (lucerne) on the Farm.

### 3.1.5 Project Location and Land Ownership

The location is strategically chosen as it is also the Proponent's property, and the land can be used for farming (agriculture) and this include crop production. The location is also chosen because the Farm is well within proximity of the water supplying dam (Naute). The location can be considered environmentally friendly because there will be no need to clear a significant number of trees that may be protected because the area earmarked for irrigation is mainly covered by shrubs only.

### 3.1.6 Water Supply Source

The water source that can be used for the proposed irrigation would either be surface or groundwater. However, given the low potential of groundwater of the project area, this option cannot be viable for a long-term commercial project such as irrigation.

The only reliable source of water supply in the area are the artificial water dams such as Neckartal and Naute for which water can be obtained via pipeline systems. This water is then stored in reservoirs and in tanks by users, depending on the intended water use.

The Skaapplaas Farm (project site) will be supplied with water from the closest dam (Naute) for the irrigation activities. Therefore, the surface source is the only way to sustain the irrigation on the Farm in a long-term compared to groundwater that is already scarce in the area.

### 3.1.7 Power Supply Source

Construction is a temporary and short-term phase; therefore, temporary diesel generator sets would be ideal for power supply compared to grided electricity.

For the development of the Farm, the grid connection from NamPower will be considered. Power requirements for the actual irrigation works will only be on small scale as irrigation itself will be gravity-fed.

For the operational phase, the main or preferred power supply is renewable energy (in the form of photovoltaic/solar) given the climatic conditions and open areas of the //Karas Region to establish and functionality of solar panels. The Farm's solar power supply will then be supplemented by electricity from the nearby NamPower grid to ensure uninterrupted operations of the project but mainly for the Farm' future developments.

The above presented project activities and associated resources are governed by certain polices, laws, regulations, etc. (legal framework). These are in terms of local, regional, national and at

some extent, international. The applicable legal framework to the proposed project and its activities are provided under chapter 4. The legal framework that requires permitting and or licensing prior to project implementation are provided as such under the draft EMP.

# 4 LEGAL FRAMEWORK: LEGISLATION, POLICIES AND GUIDELINES

A review of applicable and relevant Namibian legislation, policies, and guidelines to the proposed development is given in this section. This review serves to inform the project Proponent, Interested and Affected Parties, and the decision-makers at the DEAF of the requirements and expectations, as laid out in terms of these instruments, to be fulfilled to establish the proposed irrigation activities.

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

The Act aims at promoting sustainable management of the environment and use of natural resources. The Environmental Management Act (EMA) is broad; it regulates land use development through environmental clearance certification and/or Environmental Impact Assessments. The Act provides for the clearance certification for surface or groundwater abstractions for industrial or commercial purposes to protect water resources. It further stipulates requirements to complete the required documentation to obtain an Environmental Clearance Certificate (ECC) for permission to undertake this activity. The following Sections of the EIA Regulations that are relevant to this project are:

- ***''Regulation 8.1****: Abstraction of ground or surface water for industrial or commercial purposes.*
- ***Regulation 8.7****: Irrigation schemes for agriculture excluding domestic irrigation.*
- ***Regulation 9.2*** *Any process or activity which requires a permit, license or other form of authorization, or the modification of or changes to existing facilities for any process or activity which requires an amendment of an existing permit, license, or authorization or which requires a new permit license or authorization in terms of a law governing the generation or release of emissions, pollution, effluent, or waste.''*

Other applicable legal obligations to the proposed irrigation activities are presented in **Table 2**.

**Table 2: The list of applicable national and international legislations governing the proposed project and related activities**

| Legislation/Policy/ Guideline | Relevant Provisions | Implications for this project |
|---|---|---|
| **NATIONAL, REGIONAL AND LOCAL** | | |
| The Constitution of the Republic of Namibia, 1990 as amended | The Constitution of the Republic of Namibia (1990 as amended) addresses matters relating to environmental protection and sustainable development. Article 91(c) defines the functions of the<br><br>Ombudsman to include:<br><br>*"…the duty to investigate complaints concerning the over-utilisation of living natural resources, the irrational exploitation of non-renewable resources, the degradation and destruction of ecosystems and failure to protect the beauty and character of Namibia…"*<br><br>*Article 95(l) commits the state to actively promoting and maintaining the welfare of the people by adopting policies aimed at the:*<br><br>*"…Natural resources situated in the soil and on the subsoil, the internal waters, in the sea, in the continental shelf, and in the exclusive economic zone are property of the State."* | By implementing the environmental management plan, the establishment will be in conformant to the constitution in terms of environmental management and sustainability.<br><br>Ecological sustainability will be main priority for the proposed development. |
| The Regional Councils Act (No. 22 of 1992) | This Act sets out the conditions under which Regional Councils must be elected and administer each delineated region. From a land use and project planning point of view, their duties include, as described in section 28 "to undertake the planning of the development of the region for which it has been established with a view to physical, social, and economic characteristics, urbanisation patterns, natural resources, economic development potential, infrastructure, land utilisation pattern and sensitivity of the natural environment.<br><br>The main objective of this Act is to initiate, supervise, manage, and evaluate development. | The relevant Regional Councils are Interested &Affected Parties and must be consulted during the Environmental Assessment (EA) process. The project site area falls under the //Karas Regional Council; therefore, they should be consulted. |

| Legislation/Policy/ Guideline | Relevant Provisions | Implications for this project |
|---|---|---|
| Water Act No. 54 of 1956 | To consolidate and amend the laws relating to the control, conservation and use of water for domestic, agricultural, urban and industrial purposes; to make provision for the control, in certain respects, of the use of sea water for certain purposes; for the control of certain activities on or in water in certain areas; for the control of activities which may alter the natural occurrence of certain types of atmospheric precipitation; for the control, in certain respects, of the establishment or the extension of townships in certain areas; and for incidental matters. | This Act (Government Gazette 5367) has been passed by Parliament, but it has not yet been brought into force. The Regulations have been passed in December 2016 but have not yet been promulgated. Therefore, the Regulations of the 1956 Water Act still apply. |
| Water Resource Management Act No 11 of 2013 | Details on who and how water may be used. Section 45 describes "a person must not abstract/ irrigate and use water from a water resource unless the person holds a license issued by the Minister that authorises the abstraction and use of water from that water source. | The 2013 Water Act restricts water abstraction activities (for commercial purposes) without an authorised licence.<br>The protection (both quality and quantity/abstraction) of water resources should be a priority. |
| Fertilizers Farm Feeds and Agricultural Remedies Act No. 36 of 1947 and its 2007 Regulation | To provide for the appointment of a Registrar of Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies; for the registration of fertilizers, farm feeds agricultural remedies and stock remedies; to regulate or prohibit the importation, sale, acquisition, disposal or use of fertilizers, farm feeds, agricultural remedies and stock remedies; to provide for the designation of technical advisers and analysts; and to provide for matters incidental thereto. | The Proponent should ensure that they obtain relevant permits or licenses from the Directorate of Agricultural Extensions and Engineering Services of the Ministry of Agriculture, Water and Land Reform (MAWLR |
| Soil Conservation Act No. 76 of 1969 | The Act makes provision for the prevention and control of soil erosion and the protection, improvement and conservation of soil, vegetation and water supply sources and resources, through directives declared by the Minister. | Duty of care must be applied for soil conservation management measures must be included in the EMP. |

| Legislation/Policy/ Guideline | Relevant Provisions | Implications for this project |
|---|---|---|
| Forestry Act No. 12 of 2001 | The Act provides for the management and use of forests and related products / resources. It offers protection to any living tree, bush or shrub growing within 100 metres of a river, stream or watercourse on land that is not a surveyed erven of a local authority area. In such instances, a licence would be required to cut and remove any such vegetation.<br><br>These provisions are only guidelines. | Should there be trees within the actual footprint of the site that need to be removed; the Proponent should notify the nearest Department of Environmental Affairs and Forestry (Forestry Division) at MEFT. The number and/or type of trees to be removed to allow construction works should also be submitted to DEAF. Should these trees be of a protected species, the permit to remove them should be applied from the nearest Forestry office. |
| Nature Conservation Amendment Act, No. 3 of 2017 | National Parks are established and gazetted in accordance with the Nature Conservation Ordinance, 1975 (4 of 1975), as amended. The Ordinance provides a legal framework with regards to the permission of entering a state protected area, as well as requirements for individuals damaging objects (geological, ethnological, archaeological, and historical) within a protected area. Though the Ordinance does not specifically refer to mining as an activity within a protected area (PA) or recreational area (RA), it does restrict access to PA's and prohibits certain acts therein as well as the purposes for which permission to enter game parks and nature reserves may be granted. | The Proponent will be required to enhance the conservation of biodiversity and the maintenance of the ecological integrity of protected areas and other State land (the Naute Game Park stretch between Farm Skaapplaas and Naute Dam). |
| Public Health Act (No. 36 of 1919) | Section 119 states that "no person shall cause a nuisance or shall suffer to exist on any land or premises owned or occupied by him or of which he is in charge any nuisance or other condition liable to be injurious or dangerous to health." | The Proponent and all its employees or contractors should ensure compliance with the provisions of these legal instruments. |
| Health and Safety Regulations GN 156/1997 (GG 1617) | Details various requirements regarding health and safety of labourers. | |

| Legislation/Policy/ Guideline | Relevant Provisions | Implications for this project |
|---|---|---|
| Public and Environmental Health Act No. 1 of 2015 | The Act serves to protect the public from nuisance and states that no person shall cause a nuisance or shall suffer to exist on any land or premises owned or occupied by him or of which he is in charge any nuisance or other condition liable to be injurious or dangerous to health. | The Proponent and their contractors should ensure that the project infrastructure, vehicles, equipment, and machinery are designed and operated in a way that is safe, or not injurious or dangerous to public health and that the noise and dust emissions which could be considered a nuisance remain at acceptable levels.<br>The Proponent should ensure that the public as well as the environmental health is preserved and remain uncompromised. |
| Atmospheric Pollution Prevention Ordinance (No.11 of 1976) | This ordinance provides for the prevention of air pollution. | Measures should be instituted to ensure that dust emanating from construction activities and operations is kept at acceptable levels. In other words, the proposed project and related activities should be undertaken in such a way that they do not pollute or compromise the surrounding air quality. Mitigation measures should be put in place and implemented on site. |
| Hazardous Substance Ordinance, No. 14 of 1974 | The ordinance provides for the control of toxic substances. It covers manufacture, sale, use, disposal and dumping as well as import and export. Although the environmental aspects are not explicitly stated, the ordinance provides for the importing, storage, and handling. | The Proponent should handle and manage the storage and use of hazardous substances on site so that they do not harm or compromise the site environment |
| Petroleum Products and Energy Act (No. 13 of 1990) Regulations (2001) | Regulation 3(2)(b) states that “No person shall possess or store any fuel except under authority of a licence or a certificate, excluding a person who possesses or stores such fuel in a quantity of 600 litres or less in any container kept at a place outside a local authority area. | The Proponent should obtain the necessary authorization from the MME for the storage of fuel on-site. |

| Legislation/Policy/ Guideline | Relevant Provisions | Implications for this project |
|---|---|---|
| Road Traffic and Transport Act, No. 22 of 1999 | The Act provides for the establishment of the Transportation Commission of Namibia; for the control of traffic on public roads, the licensing of drivers, the registration and licensing of vehicles, the control and regulation of road transport across Namibia's borders; and for matters incidental thereto. Should the Proponent wish to undertake activities involving road transportation or access onto existing roads, the relevant permits will be required. | Mitigation measures should be provided for since the project activities will make use of the public roads.<br>An access road permit from the B4 and C12 providing access to the project site should be applied for. |
| National Heritage Act No. 27 of 2004 | The Act makes provision for the protection and conservation of places and objects of heritage significance and the registration of such places and objects. Part V Section 46 of the Act prohibits removal, damage, alteration, or excavation of heritage sites or remains, while Section 48 sets out the procedure for application and granting of permits such as might be required in the event of damage to a protected site occurring as an inevitable result of development. Part VI Section 55 Paragraphs 3 and 4 require that any person who discovers an archaeological site should notify the National Heritage Council. Section 51 (3) sets out the requirements for impact assessment. | The Proponent should ensure compliance with this Acts' requirements. The necessary management measures and related permitting requirements must be taken. This done by consulting with the National Heritage Council of Namibia. |
| The National Monuments Act (No. 28 of 1969) | The Act enables the proclamation of national monuments and protects archaeological sites. | |
| Labour Act (No. 6 of 1992) | The Ministry of Labour, Industrial Relations and Employment is aimed at ensuring harmonious labour relations through promoting social justice, occupational health and safety and enhanced labour market services for the benefit of all Namibians. This ministry insures effective implementation of the Labour Act no. 6 of 1992. | The Proponent should ensure that the project construction and operations and maintenance, do not compromise the safety and welfare of workers. |
| | | |
| **APPLICABLE INTERNATIONAL POLICIES, PRINCIPLES, STANDARDS, TREATIES AND CONVENTIONS** | | |

| **Legislation/Policy/ Guideline** | **Relevant Provisions** | **Implications for this project** |
|---|---|---|
| **Statue** | **Provision** | **Implication for the project and its activities** |
| The United Nations Convention to Combat Desertification (UNCCD) 1992 | Addresses land degradation in arid regions with the purpose to contribute to the conservation and sustainable use of biodiversity and the mitigation of climate change.<br>The convention objective is to forge a global partnership to reverse and prevent desertification/land degradation and to mitigate the effects of drought in affected areas to support poverty reduction and environmental sustainability. | The project activities should not be such that they contribute to desertification. |
| Convention on Biological Diversity 1992 | Regulate or manage biological resources important for the conservation of biological diversity whether within or outside protected areas, with a view to ensuring their conservation and sustainable use.<br>Promote the protection of ecosystems, natural habitats, and the maintenance of viable populations of species in natural surroundings | Removal of vegetation cover and destruction of natural habitats should be avoided and where not possible minimised |
| Stockholm Declaration on the Human Environment, Stockholm (1972) | It 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. | Protection of natural resources and prevention of any form of pollution. |
| **Other conventions include the following:**<br>• Convention on International Trade and Endangered Species of Wild Fauna and Flora (CITES), 1973,<br>• Convention on Biological Diversity, 1992, and World Heritage Convention, 1972. | | |

The legal requirements above have been listed and explained as per their relevance to the project. The project is being carried in a specific environment that may be affected in terms of its biophysical and social features. Thus, the environmental baseline (receiving environment) of the project area is presented under the next chapter.

# 5 THE RECEIVING ENVIRONMENT

The proposed irrigation activities will be undertaken in specific environmental and social conditions, and it is crucial to understand these pre-project conditions of the environment. This will aid in laying down background "information" of the status quo and future projections of environmental conditions after the implementation of the project. This also aids in identifying the sensitive environmental and social features that may need to be protected through the effective implementation of impact specific management and mitigation measures.

The baseline information has also been complemented by review of existing different and relevant data sources conducted in the Region and immediate surroundings of the site. The information has been complemented by raw data obtained from observations made on site and project area.

The summary of selected biophysical and social baseline information about the project site area is given below.

## 5.1 Climate

According to TriStone Africa & Green Earth Environmental Consultants (2019), the Karas Region in general is characterized with a semi-arid highland savannah climate typified as very hot in summer and moderate dry in winter. The highest temperatures are measured in December with an average daily temperature of maximum 31ºC and a minimum of 17ºC. The coldest temperatures, conversely, are measured in July with an average daily maximum of 20ºC and minimum 6ºC (Weather - the Climate in Namibia, 1998 – 2012). The area therefore has low frost potential.

The maximum, minimum and average temperatures for the Keetmanshoop area as well as the monthly average temperate are presented in **Figure 6**.

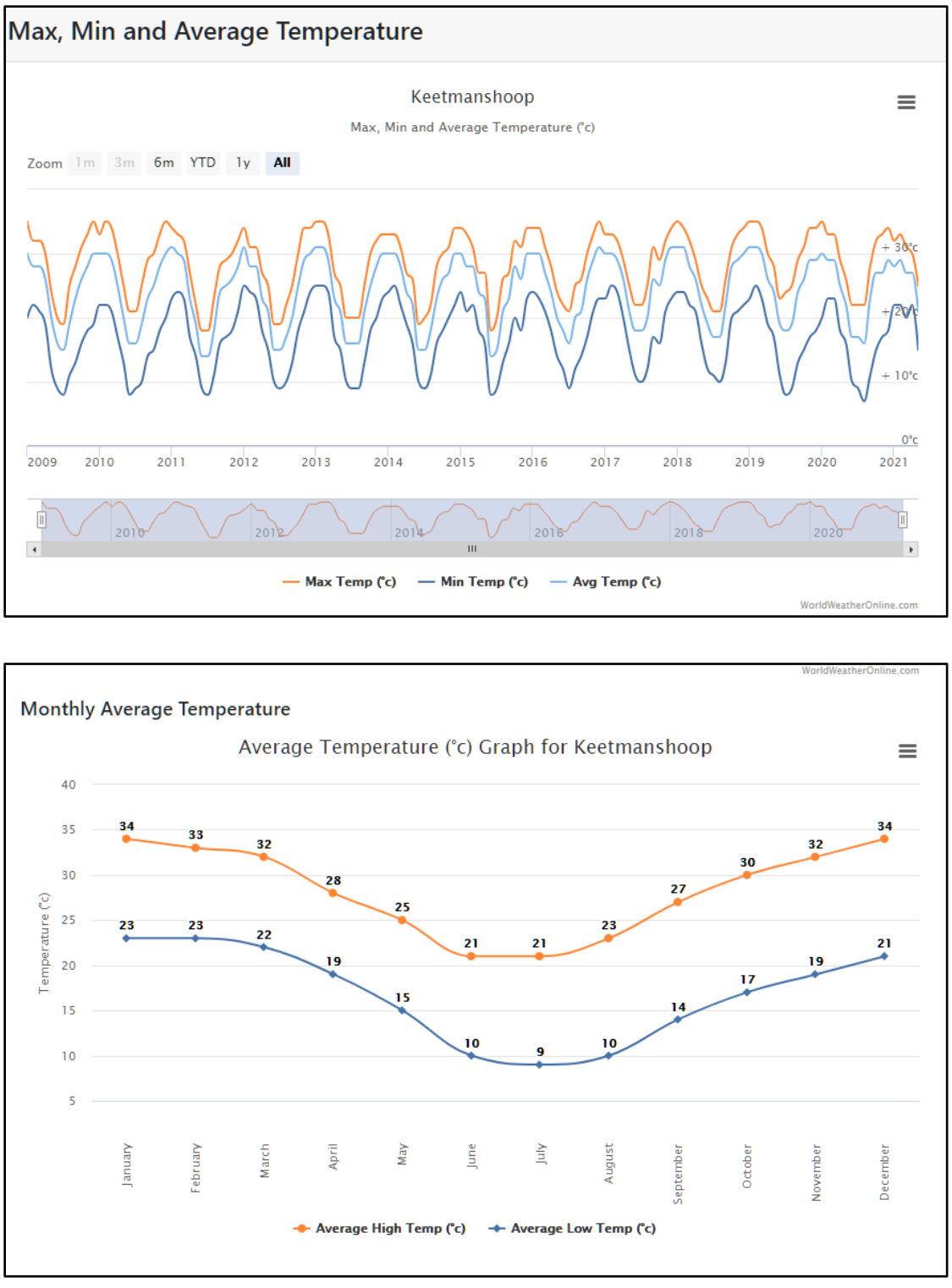


**Figure 6: The maximum, minimum and average as well as monthly average temperate for the Keetmanshoop and surrounding areas (World Weather Online, 2021)**

### 5.1.1 Rainfall

Rainfall in the form of thunderstorms is experienced in the area during the summer months between October and April. The annual average rainfall for Karas Region and surroundings is 350mm to 400mm however the average evaporation rate is 3 400mm a year (Weather- the Climate in Namibia, 1998 – 2012). Over 70% of the rainfall occurs in the summer months' period between November and March. Rainfall in the area is typically sporadic and unpredictable however the average highest rainfall months are January to March. **Figure 7** below shows the rainfall graph for the Keetmanshoop area which also cater for the project site area and the monthly average rainfall is shown in **Figure 8**.

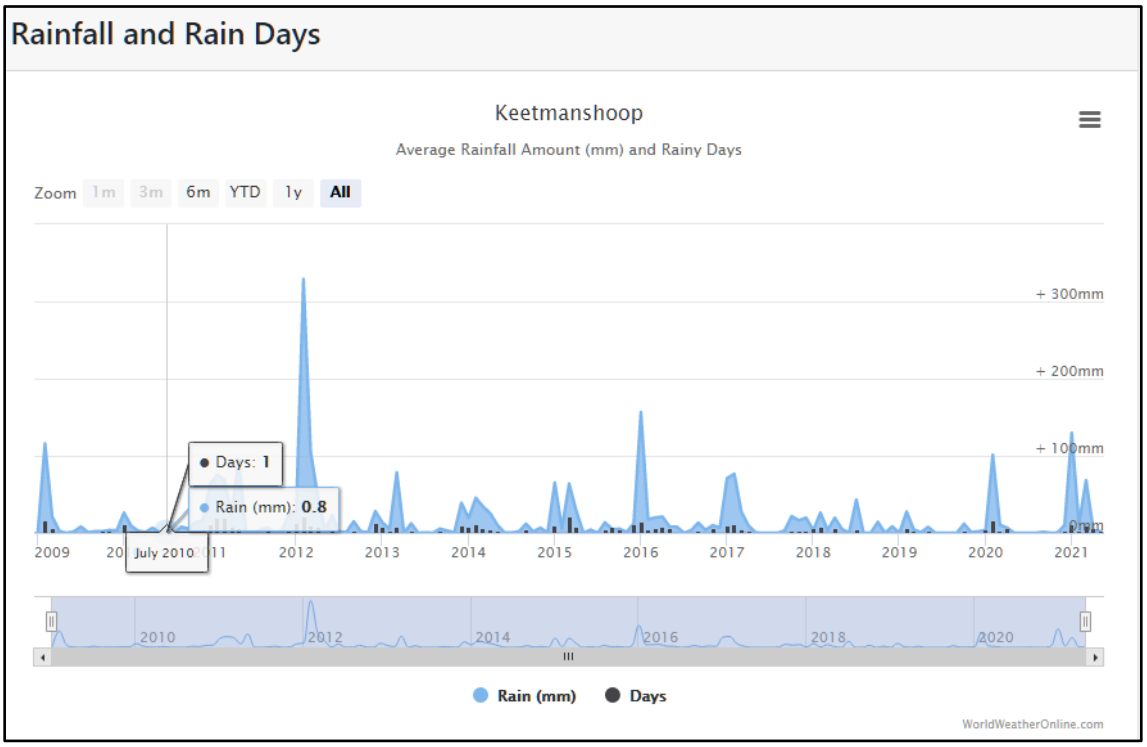


**Figure 7: The rainfall and rain days for the Keetmanshoop and surrounding areas (World Weather Online, 2021)**

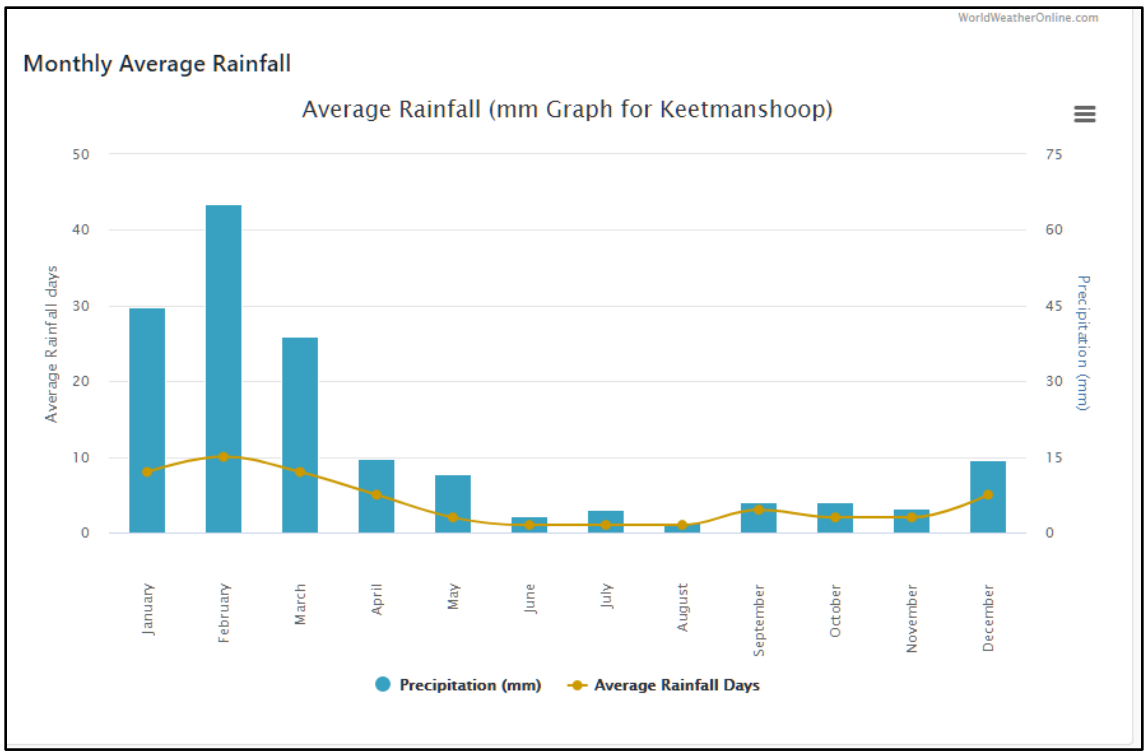


**Figure 8: The monthly average rainfall for the Keetmanshoop and surrounding areas (World Weather Online, 2021)**

### 5.1.2 Air Quality and Winds

The air quality in the area is characterised to be comparatively good, because there are no current large-scale anthropogenic activities. The only minor source of potential air pollution would be occasional dust generated on local unpaved/gravel roads by travelling vehicles, especially in dry months.

The predominant wind in the region is easterly with westerly winds from September to December (Weather - the Climate in Namibia, 1998 – 2012). Extreme winds are experienced in the months of August and September and thus significant wind erosion on disturbed areas is visible (TriStone Africa & Green Earth Environmental Consultants, 2019).

## 5.2 Topography

The Keetmanshoop area is situated within the Nama-Karoo Basin, which is a “large, flat lying plateau which dominates much of southern Namibia. Sedimentary rocks deposited in the Nama Basin and later in the same area in the Karoo Basin form the foundations of the landscape. The basin slopes from the north, where elevations are about 1,400 m above sea level, to the south, where altitudes are approximately 900 m above sea level. The Fish, Löwen and Konkiep rivers

drain the landscape, all flowing south to the Orange River (Africa Planning Forum, 2019 cited Mendelsohn, 2002).

The elevation of the project site and surrounding is shown on the map in **Figure 9** below, with the area earmarked for irrigation activities found on the northwestern part of the Farm.

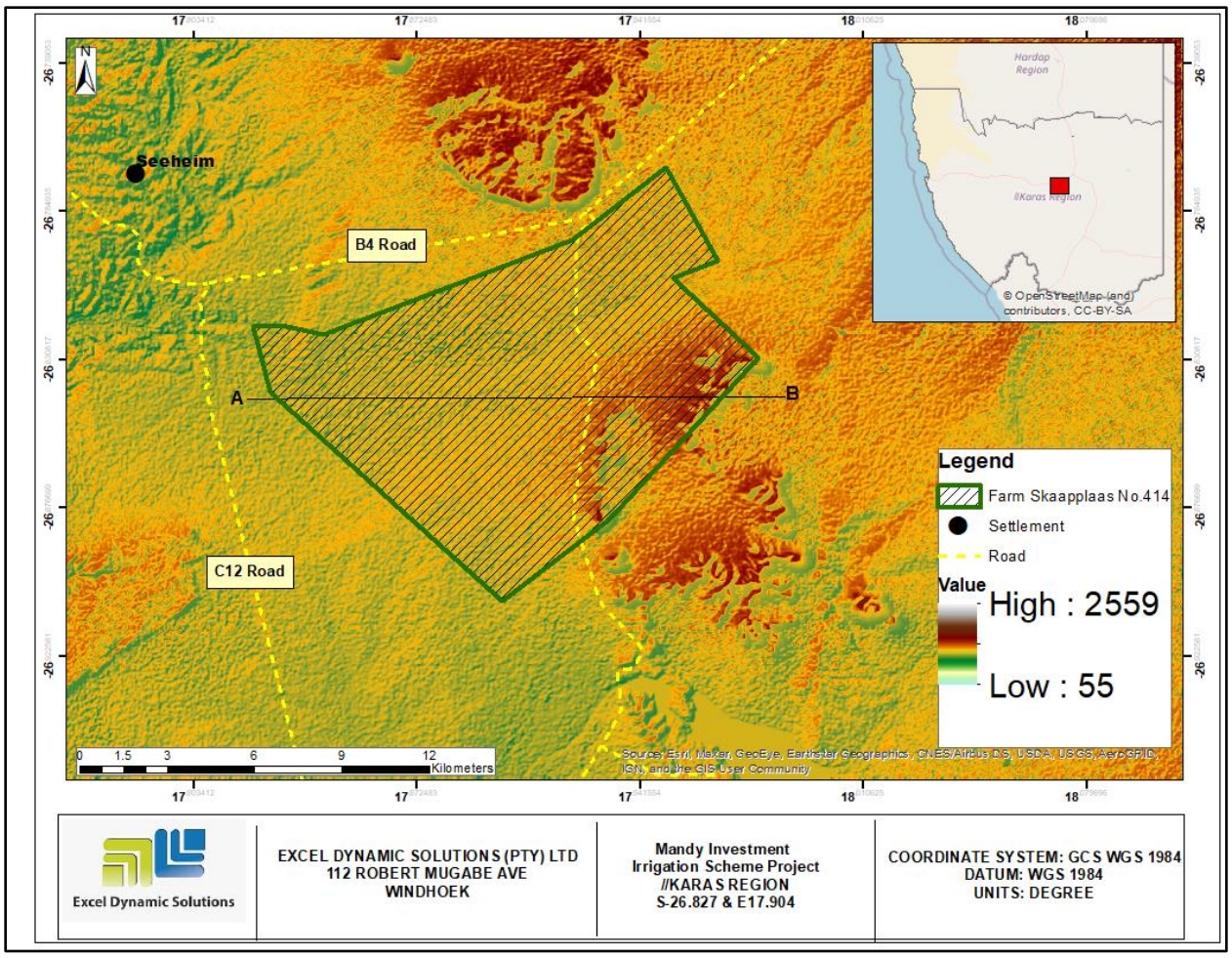


**Figure 9: The Elevation 3D Model of the project site and surrounding areas**

The northern part of the Farm earmarked for irrigation on the Farm is relatively flat, while the eastern and southwestern parts are covered by mountains as shown in photos in **Figure 10**.

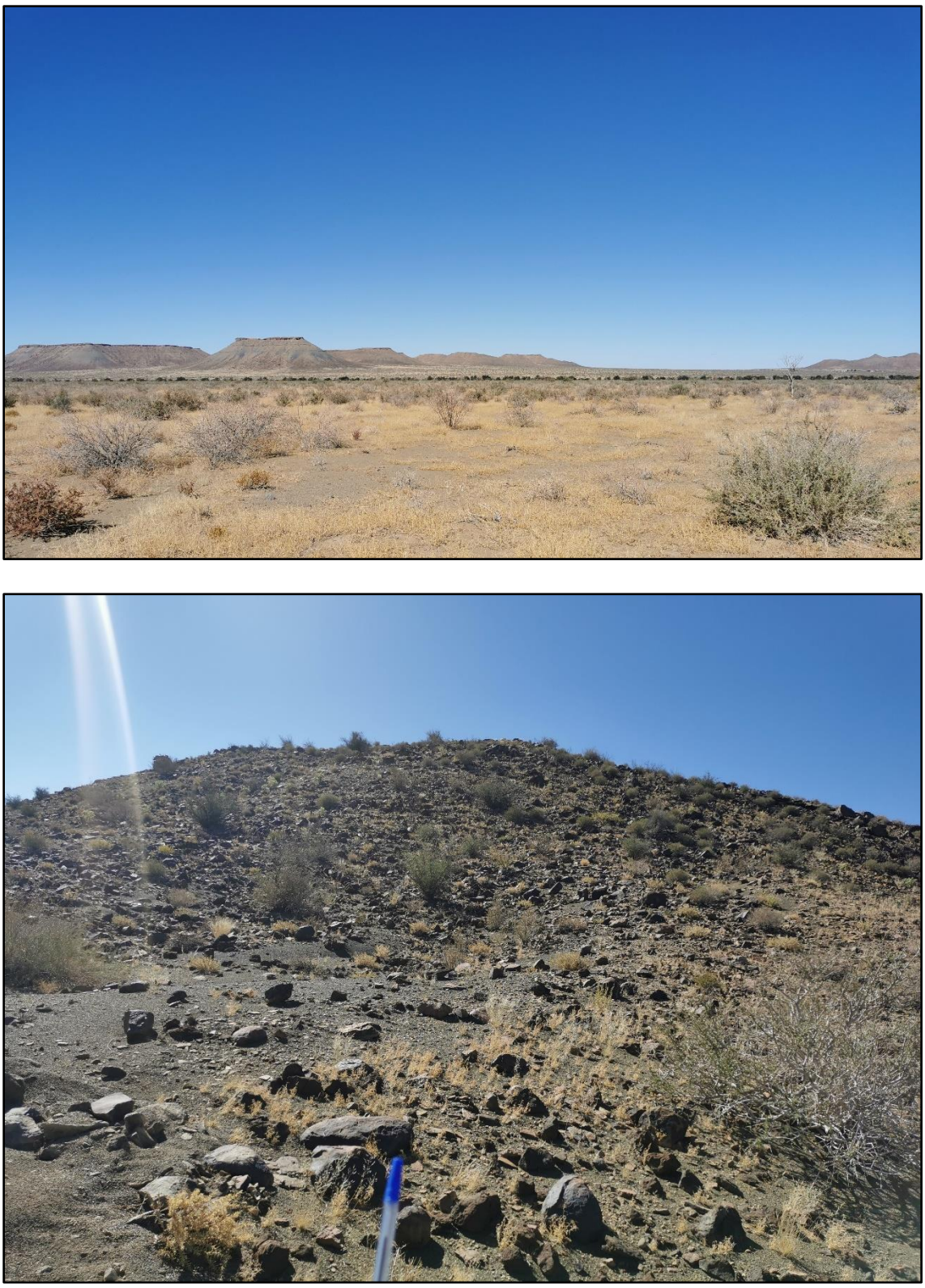

**Figure 10:** The mountainous eastern (top) and southwestern (bottom) parts of the Farm Skaapplaas

## 5.3 Geology and Soils

The Karas Region is located on a geological area classified as the Damara Supergroup and Gariep Complex and the Karoo Supergroup. The common geological formations of the Karoo Sequence, including Uppermost Karoo – Dolerite sills and Dwyka formation – bluish mudstone/ shale with various rock fragments, intercalations of sandstones and conglomerates.

The general geology map of the area is shown in **Figure 11** below.

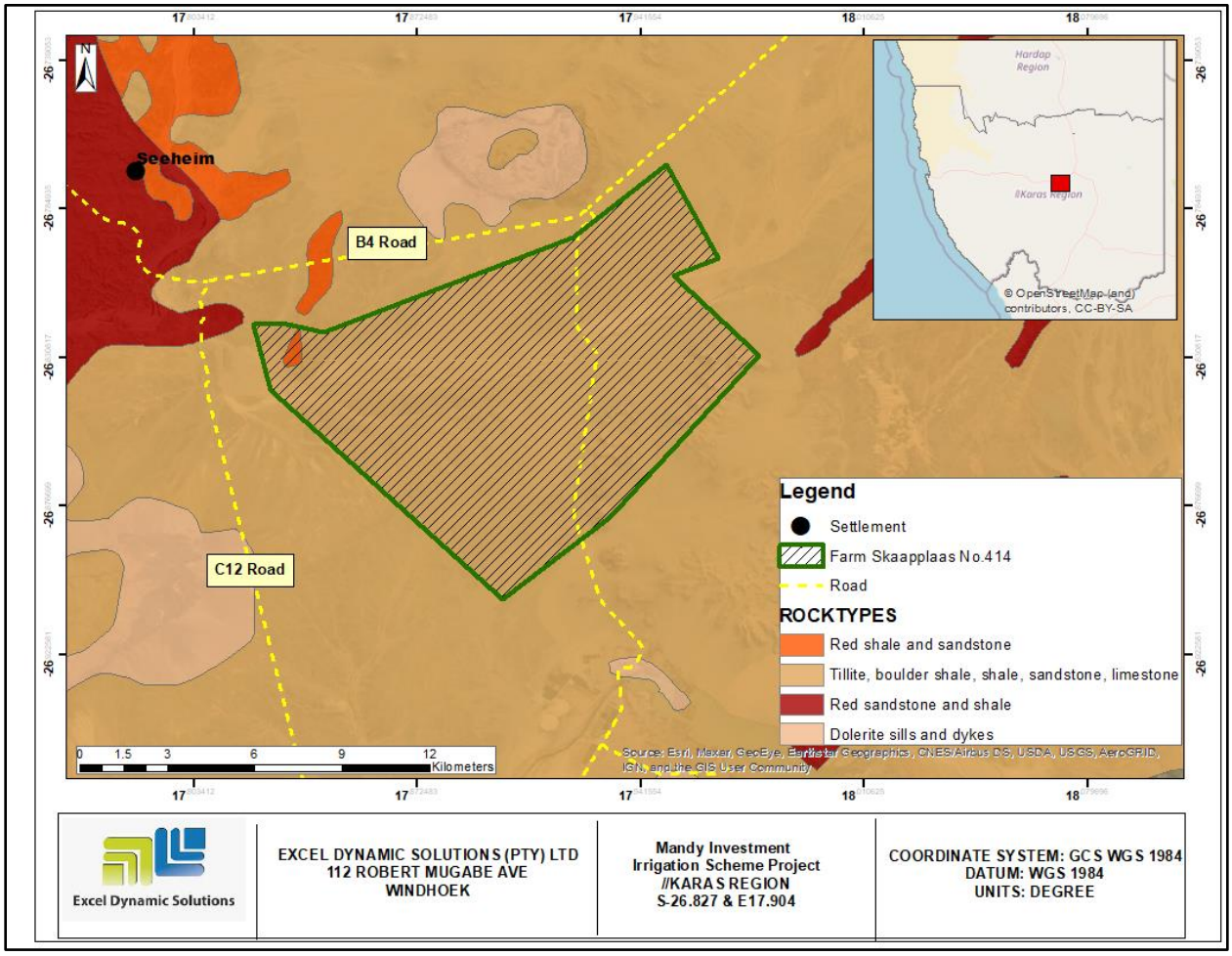


**Figure 11:** **The general geology map for the area**

The rock units observed on site include boulder shale (**Figure 12**), sandstone and limestone on the southern and southwestern side of the Farm.


**Figure 12: The typical rock units (sandstone and shales) on the southern and southwestern side of the Farm**

In terms of soil, the southern areas of Namibia are characterised by eutric leptosol soils (ISRIC Classification) and extensive stone and gravel cover. These soils are typical of the actively eroding landscapes that cover much of southern Namibia and are limited in depth by the presence of a continuous base rock layer, usually comprising calcareous or cemented material within 80 cm of the surface, hence having a high calcium content. The soils in and surrounding the project site are apedal, having poor structure and little to no distinct layering, and soil texture is fine and sandy, with very low moisture content (GCS Water and Environmental Consultants, 2017).

The project site is dominated by eutric leptosols (known as mountain soils) as seen in the soil map in **Figure 13**.

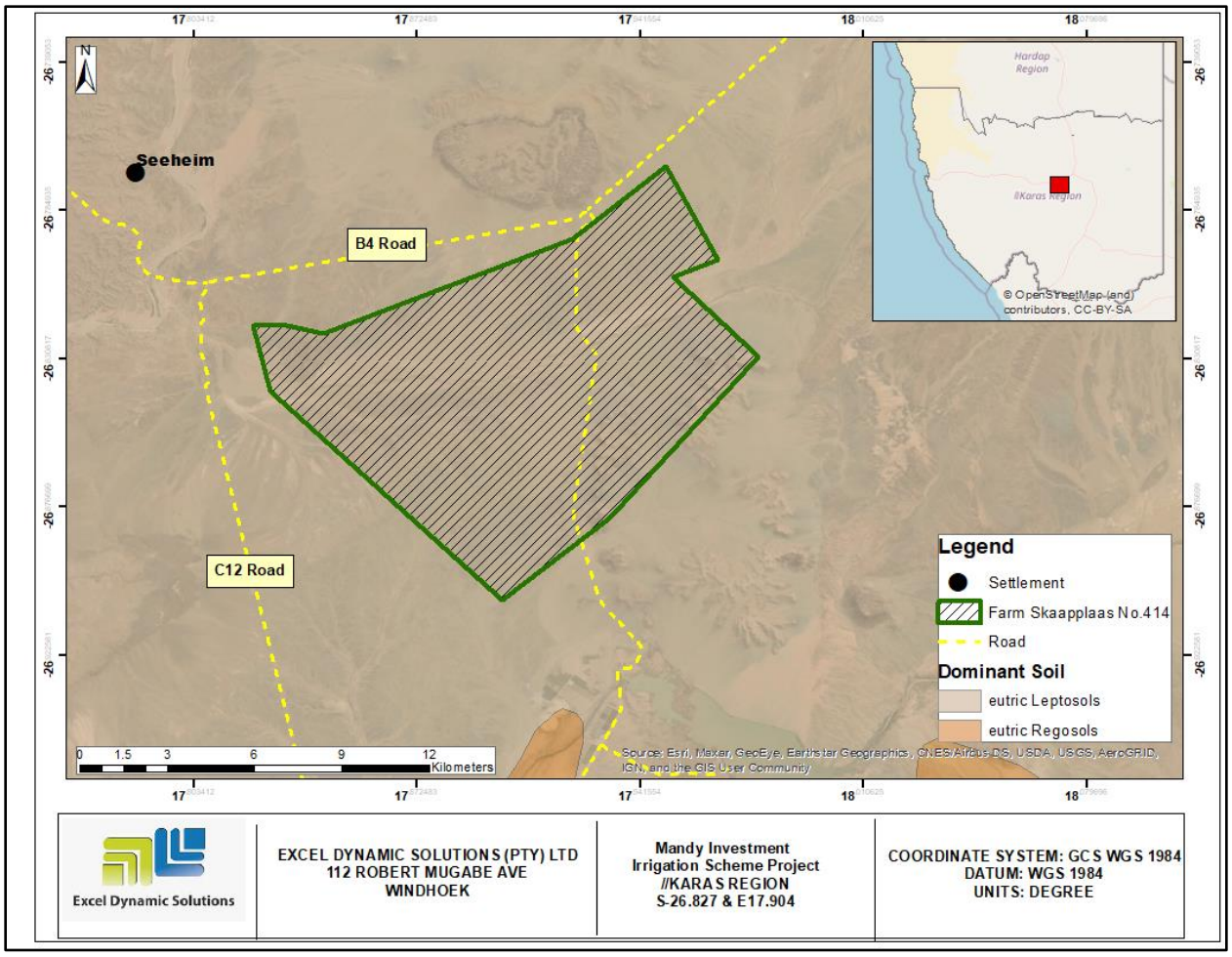


**Figure 13: The map of site soils and surroundings**

The southern part of the Farm is covered by light brown loamy sand soils while the project site on the northern part is overlain by dark brown loamy sandy soils with clayey sandy soils at visible water flow paths (near small water flow channel like streams).

From observations, certain areas of the site have light grey soils, but these appear to have been influenced by recent runoff from the Skaap River or small water channels passing through the site footprint. The typical soils overlying the project site and the Farm at large are shown in **Figure 14** below.

**Figure 14: Clayey and loamy sand soils found on Farm Skaapplaas (left photo taken at the south and right photo from northern part of the Farm (site))**

### 5.3.1 Hydrology and Hydrogeology

#### A. Hydrology (Surface water)

There are no permanent river systems in and around the project site. The only available surface water systems are ephemeral rivers, namely the Skaap River flowing through Far, Skaapplaas and Fish River flowing north of the Farm. These surface watercourses within the area can be expected to flow after an exceptional rainfall, but only for a short period of time. **Figure 15** is the hydrology map of the project area, including the project site.

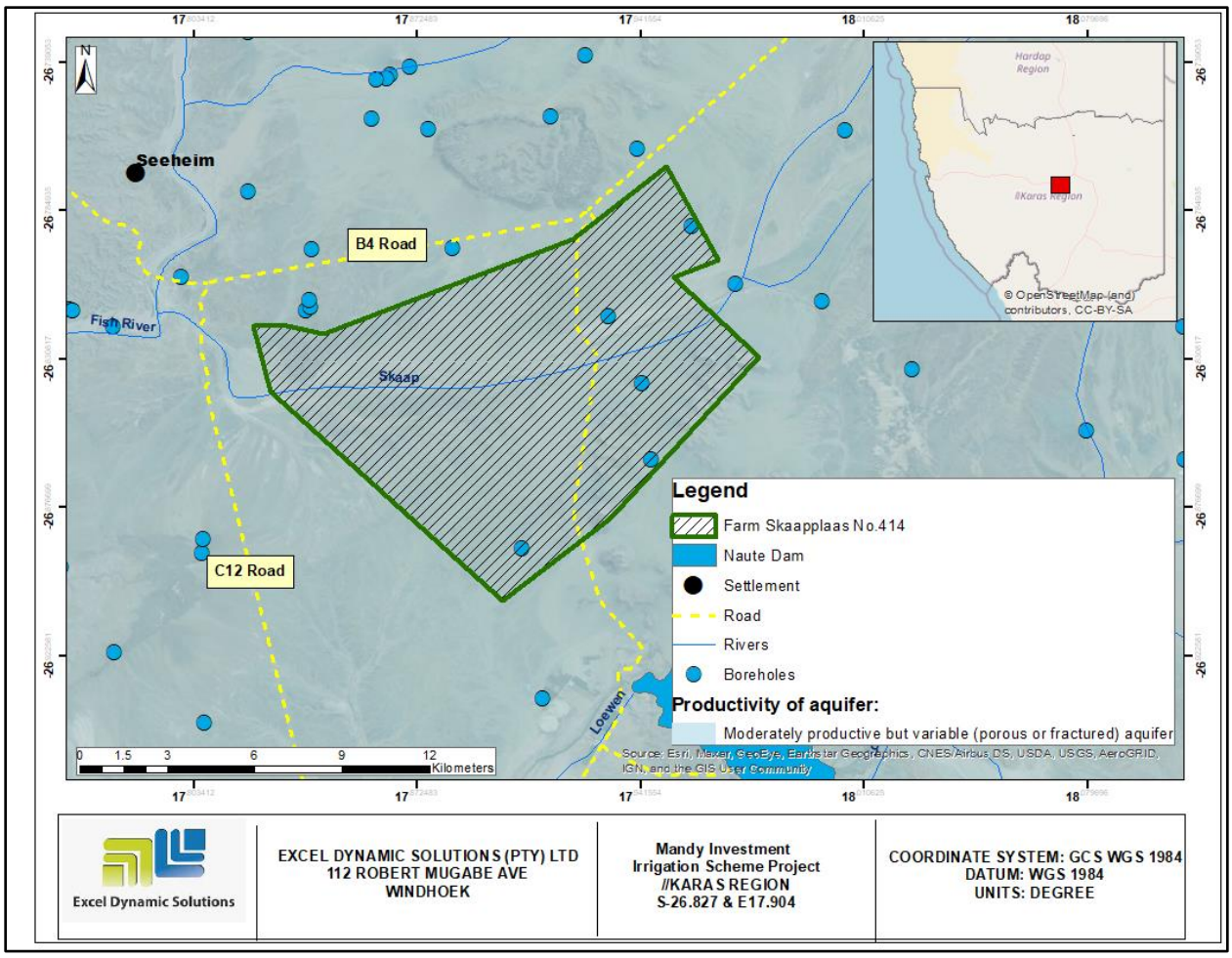


**Figure 15: The hydrology map of the area**

The photos of the two main ephemeral rivers on (Skaap River) and near Farm Skaapplaas (Fish River) are shown in **Figure 16 and 17** below.

**Figure 16: The Skaap River (left photo - view to the northeast and view to the southwest (right photo)**


**Figure 17: The Fish River (left photo - view to the west near the bridge over B4 and view to the west from the river monitoring station near B4 (right photo))**

**B. Hydrogeology (Groundwater)**

The project site and area are found within the Fish River-Aroab Groundwater Basin, whereby the rock types of the Nama Group are inherently impermeable with little or no primary porosity. Groundwater is hosted in secondary features like faults and joints in sedimentary rocks of clastic origin (sandstone, quartzite, and shale) and in solution features in limestones and dolomites. In the Hardap and Karas regions water levels are generally shallow in the east, close to the course of the Fish River, but become progressively deeper towards the escarpment in the west, where water levels deeper than 200m are recorded. Drilling targets are mostly tectonic features such as faults and joint (Christelis and Sruckmeier, 2001).

In terms of groundwater potential, site is found in an area with low groundwater potential, which explains why the main water supply in the area is through artificial surface water supply such as the Naute and Neckartal dams. As seen in the map above (Figure 15), there are privately owned boreholes in the area, for which water is used for domestic purposes and small-scale farming.

## 5.4 Terrestrial Biodiversity: Flora and Fauna

### 5.4.1 Fauna

The faunal community of the south and central Namibia is generally characterised by low species diversity. The overall mammal diversity in the general Keetmanshoop area is estimated at between 61 – 75 species (GCS Water and Environmental Consultants, 2017 cited Mendelsohn *et al.,* 2002).

**Mammals**

The project site is a home to some wildlife such as kudus, oryx, few zebras, springbok, and steenbok as well as some ancient tortoise. These animals could not be seen by the consultants during site visit, possibly due to the time of the day when site walkover was done, and animals would have been elsewhere in shades since it was hot. However, some animals' hooves and tracks could be observed on the ground (**Figure 18**).

**Figure 18:** **Wildlife animal (springbok) print passing through the site area.**

There were also some visible monkey footprints at the southwestern mountains within the Farm, but these are very far from the site intended for irrigation.

There are no domestic animals on Farm Skaapplaas. This information was verified by the Proponent during site visit.

**Birds**

The project site is notable for variety of birds; however, none could be identified from a closer range. The only sign of specific bird presence on the Farm are the tracks of the The Kori bustard (*Ardeotis kori*) on one of the site areas – **Figure 19** below.

**Figure 19: Kori's bustard footprint within the site area**

## Reptiles

There some reptiles (lizards) and burrows observed on site - **Figure 20**.


**Figure 20:** **Camouflaged lizard (in ellipse on the left photo) and burrows within the site footprint**

### 5.4.2 Flora

According to TriStone Africa & Green Earth Environmental Consultants (2019), the area in general is classified as Nama Karoo with the following species charactering the tree strata: *Combretum apiculatum* (subspecies apiculatum), *Acacia hereroensis*, *Acacia melifera* (subspecies detines), *Acacia reficiens*, *Acacia erioloba* and *Acacia erubescens*.

The project area vegetation is dominated by grasslands and low shrubs. The project site has two distinct vegetation covers, on the northern and southern sides of the Farm, whereas the southern side (towards the Naute Dam direction) is covered by a medium dry (pale) grass cover and shrubs – **Figure 21**.

**Figure 21:** **Pale and dry grass cover with scattered shrubs on the southern part of Farm Skaapplaas**

The northern side which is hosting the site earmarked for irrigation is covered by green vegetation, comprising shrubs and at some places camelthorn trees. The presence and appearance of the green vegetation on this side of the Farm (northern side) could be explained by the presence of the nearby Skaap River located within proximity of the project site to the south. There are also visible small creeks that run through some areas of the site, that could hold water for some time after the recent heavy rainfall, thus kept the vegetation watered.

**Figures 22** and **23** show the dominant vegetation within Farm Skaapplaas to the south and at the project site (northern part of the Farm), respectively. The typical vegetation on the southern part of the Farm are shrubs of; water-thorn (*Acacia nebrownii*), Tamarisk Nile (*Tamarix nilotica*), Wld Tamarisk (*Tamarisk usneoides*) and trumpet thorn (*Cataphractes alexandri*), etc.


**Figure 22:** **Wild Tamarisk and trumpet thorn shrubs on the southern part of the Farm**

The typical vegetation (shrubs and few young trees) dominating the site earmarked for irrigation at the northern part of the Farm are shown in **Figure 23**. This dominant vegetation includes bitterbrush (*Pechuel-Loeschea leubuitziae*), and Tamarisk shrubs.

**Figure 23: Shrubs and young trees at the project site north of Farm Skaapplaas house.**

Along the Skaap River but off site are big trees such as indigenous ebony, white thorn and propolis (invasive).

## 5.5 Heritage and Archaeology

At the time of this assessment, there was not nationally or locally recognized archaeological sites recorded within the site area or Farm Skaapplaas.

There is however remains of an old reservoir and unequipped borehole on the southern part of the Farm -**Figure 24**. According to the Proponent, this borehole is said to have been drilled and last used 20 years ago.

**Figure 24: Remains of an old Farm reservoir and borehole south of Farm Skaapplaas.**

Further from the site to the north is a visible old windmill that was built to power a borehole, but these have not been functional in 20 years.

There is a possibility that unrecorded or undiscovered archaeological features or artifacts may be discovered during the construction phase. In the event of an archaeological during construction works, the procedures outlined in the National Heritage Act, No. 27 of 2004 are to be followed. Section 55 (4) of the National Heritage Act, No. 27 of 2004, requires that any archaeological or paleontological object or meteorite discovered are reported to the National Heritage Council as soon as practicable.

## 5.6 Surrounding Land Uses

Farm Skaapplaas is surrounded by other commercial farms on both sides where small-scale livestock farming is undertaken.

Further to the north is the Naute Dam, southwest is the Seeheim hotel, to the southeast is the Naute Conservancy located between Farm Skaapplaas and Naute Dam. The narrow Conservancy stretches in a northeast-southwestern direction. The Naute Conservancy is shown in **Figure 25** below.

Figure 25: The Naute Conservancy stretch from the Farm Gate to Naute Dam (south of the Farm).

There is a buried NamWater water supply line running through Farm Skaapplass from the Naute Dam to Keetmanshoop. There is a servitude to the line for maintenance.

There are tourism activities (camping) on the Farm towards the eastern mountains.

## 5.7 Socio-Economic Status

### 5.7.1 Demography

According to the National Population and Housing Census in 2011, the //Karas Region is home to some 77 421 people, of which 38 014 were females and 39 407 males. The regional population made up less than 4 % of Namibia's population that year. The Region has an average population density of 0.5 persons/km² (Namibia Statistics Agency, 2011). The largest concentrations of people are found in major urban and mining centres such as Lüderitz, Oranjemund and Keetmanshoop, with the remaining population spread across the region in smaller settlements such as Berseba, Aroab, Bethanie and Tses.

The project site falls under the Keetmanshoop Rural Constituency that had a population of 7 219 in 2011. In the same year, the population of Keetmanshoop was 15 778, which was projected to reach approximately 20 000 in 2015. Of the 65% of economically active people over the age of 15, both private and public sector jobs currently account for less than half of all employment, with much economic activity in rural areas remaining informal and occasional. Though many businesses continue to absorb, train and mentor individuals into gainful economic activity in urban centres, rural areas still lag (GCS Water and Environmental Consultants, 2017).

### 5.7.2 Economy

The core economic sectors of the Region are mining, fishing and agriculture. These are well established sectors supported by high levels of modern technology and expertise, and contribute substantially to the regional and national economy, providing a sizeable portion of its export turnover in both raw and processed product.

The Karas Region is a predominantly small stock (sheep and goats) farming area. However, game and irrigation farming (at the Naute Dam and along the Orange River) have become increasingly important. Important mining operations in the Region include onshore diamond mining (Namdeb Diamond Corporation), offshore diamond mining, zinc, and lead concentrate (Rosh Pinah Zinc Corporation) and high-grade zinc at Skorpion Mine (GCS Water and Environmental Consultants, 2017).

According to the Namibia Statistics Agency (2011), the main household income was from the following components:

- Farming (5%)
- Wages & Salaries (72%)
- Cash remittance (5%)
- Business, non-farming (5%)
- Pension (9%)

### 5.7.3 Farming

Given the aridity of the country and particularly this part of the country, farming is only conducted at a small-scale level due to limited water supply in the Region and area. There is few to no medium and large-scale farming done inland of the //Karas Region because of the long distance from potential reliable bulk water supply sources like perennial rivers (Orange River).

The construction and operation of dams such as Naute and Neckartal have brought some improvements on water supply especially good rainy season where water would be available for commercial farming and agriculture.

### 5.7.4 Tourism

According to GCS Water and Environmental Consultants (2017), tourist attractions in the Region include: Hot Water Springs (Ai-Ais and Warmbad), the Kokerboom Forest (near Keetmanshoop), the Fish River Canyon (the second largest canyon in the world), Brukaros Mountain (near

Berseba), the coastal town of Lüderitz (with fishing and boat building industries) and several guest and game farms. The Quiver Tree Resort, associated with the Mesosaurus fossils, Giants Playground dolomitic features, the Quiver Trees of the area and various hospitality service providers within and surrounding Keetmanshoop.

At a local level, as mentioned above under land uses, there are tourism activities conducted on the Farm (commercialized camping). The presence of the Seeheim Hotel west of Farm Skaapplaas (**Figure 26**) in the area serves one of the indications of significant tourism activities in the surrounding areas of the project site.

**Figure 26: The Seeheim Hotel west of Farm Skaapplaas**

Further tourism activities carried out in the project area are camping, angling, and boating in the Naute Game Park just southeast of Farm Skaapplaas – see section 5.7.5 for the Game Park's description.

### 5.7.5 Conservancy: The Naute Game Park

The project site (Farm Skaapplaas) is bordering the Naute Game Park to its southeastern side. The Park was proclaimed in 1988 and covers an area of 225 km$^2$. It surrounds Namibia's second largest dam, the Naute (to the north). The dam was constructed from 1970 to 1972 to capture water from the Löwen River and its tributaries, which later feed into the Fish River. A successful

irrigation project was initiated below the dam wall in 1991 and date palms and grapes are currently cultivated here and the dam supplies water to the Keetmanshoop town.

***The natural feature*** of the Game Park is dominated by grassy plains with small shrub species. Trees grow in river washes. The dam has several sandy shores, shallow bays and islands.

**The vegetation:** Nama Karoo Biome. Vegetation types: Dwarf Shrub Savannah, Karas Dwarf Shrubland. Camelthorn (*Acacia erioloba*), Sweet-thorn (*Acacia karroo*), Water Acacia (*Acacia nebrownii*), Wild Tamarisk (*Tamarix usneoides*), trumpet-thorn (*Cataphractes alexandri*) and Quiver tree (*Aloe dichotoma*).

**Wildlife** in the Game Park include Oryx, Springbok, Klipspringer, Steenbok, Duiker. The 164 bird species recorded include African Spoonbill, South African Shelduck, African Fish-Eagle, African White Pelican (Ministry of Environment, Forestry and Tourism, 2021).

**Tourism** activities in the Naute Park include camping, angling and boating permits are obtained from the MEFT' Park Offices.

### 5.7.6 Infrastructure and Services

In terms of services infrastructure, the //Karas Region is well serviced and equipped with necessary services and infrastructure such as roads, railways, schools, health facilities, shopping malls, fuel stations and other basic services.

From a regional and local perspective, the services are concentrated towards the town of Keetmanshoop, and these includes:

- **Roads** – The B4 main tarred road, C12, other gravel roads and various farm roads,
- **Rail** – A railway station in Keetmanshoop and line running parallel to the B4 road,
- **Air** – The Keetmanshoop airport,
- **Telecommunication services** – the area is well covered with the MTC Namibia's coverage as well as Telecom Namibia (the existence of telecommunication lines on the western part of the Farm), and
- **Power Supply** lines to different small towns and settlement through NamPower national supply grid. There is power distribution line near the Farm (to the west).

The next chapter is a presentation of how the public was notified and consulted for the EIA.

# 6 PUBLIC CONSULTATION PROCESS

The Environmental Impact Assessment (EIA) Regulations GN 28-30 (GG 4878) detail requirements for public consultation within a given environmental assessment process (GN 30 S21). Public consultation forms an important component of an Environmental Assessment (EA) process. It provides potential Interested and Affected Parties (I&APs) with an opportunity to comment on and raise any issues relevant to the project for consideration as part of the assessment process. The public consultation process assists the Environmental Assessment Practitioner (EAP) in identifying all potential impacts and to what extent further investigations are necessary. Public consultation can also aid in the process of identifying possible mitigation measures. Public consultation for this project has been done under the EMA and its EIA Regulations.

## 6.1 Registered Interested and Affected Parties (I&APs)

The Consultant identified relevant and applicable national, regional, and local authorities, local leaders, and other interested members of the public. Pre-identified I&APs were contacted directly, while other parties who contacted the Consultant after project advertisement notices in the newspapers, were registered as I&APs upon their request. Newspaper advertisements of the proposed irrigation activities were placed in two widely read national newspapers in the region (*The Namibian* and *New Era* Newspapers). The project advertisement/announcement ran for two consecutive weeks inviting members of the public to register as I&APs and submit their comments. The summary of pre-identified and registered I&APs is listed below and the complete list of I&APs is provided in **Appendix D**.

- National/government ministries (Ministry of Environment, Forestry and Tourism, Ministry of Agriculture, Ministry of Urban and Rural Development, Ministry of Works, and Transport, etc.),
- Regional government (//Karas Regional Council and Keetmanshoop Rural Constituency),
- Parastatals/Services Providers (NamWater, and NamPower), and
- Members of the public.

## 6.2 Communication with I&APs

Regulation 21 of the EIA Regulations details the steps to be taken during a public consultation process and these have been used in guiding this process. Communication with I&APs with

regards to the proposed development was facilitated through the following means and in this order:

- A Background Information Document (BID) containing brief information about the proposed facility was compiled (**Appendix E**) and circulated to relevant pre-identified authorities (stakeholders), and upon request to all new registered I&APs,
- Project Environmental Assessment notices were published in *The Namibian newspaper* (**14 and 24 May 2021)** and *New Era* (**12** and **26 May 2021)** - **Appendix F**, briefly explaining the activity and its locality, inviting members of the public to register as I&APs and submit their comments/concerns.
- Site notices (A3) were placed at the //Karas Regional Council notice board in Keetmanshoop (**Figure 27 and Figure 28** (clear copy of the notice)) to inform members of the public of the EIA process and register as I&APs, as well as submit comments. **The notices could not be placed at the site (Farm Skaapplaas) because the Farm is isolated, and no one would be able to see the notice at the Farm. Therefore, the frequented place in the area where the notice would be seen by the public was in Keetmanshoop at the Regional Council.**
- A public consultation meeting was scheduled for **09 June 2021** at Farm Skaapplaas outside Keetmanshoop. However, this meeting was a no show for members of the public or the neighbors**.**


**Figure 27: Public notices placed at the //Karas Regional Council**

**THE PROPOSED IRRIGATION ACTIVITIES (PROJECT) ON FARM SKAAPPLAAS NO.414 LOCATED NORTH OF NAUTE DAM IN THE KEETMANSHOOP DISTRICT, //KARAS REGION, NAMIBIA: AN APPLICATION FOR THE ENVIRONMENTAL CLEARANCE CERTIFICATE (ECC) AND WATER ABSTRACTION & USE LICENSE**

Under the Environmental Management Act (No. 7 of 2007) and its 2012 Environmental Impact Assessment (EIA) Regulations, the public is hereby notified that an application for the Environmental Clearance Certificate (ECC), Water Abstraction & Use License for the proposed irrigation project will be submitted to the Environmental Commissioner.

**Proponent:** Mandy Investments Two Hundred and Ninety-Four (Pty) Ltd

**Environmental Consultant:** Excel Dynamic Solutions (Pty) Ltd

**Type of activity:** Irrigation activities on the privately owned Farm Skaapplaas No.414

**Location & Footprint:** The proposed irrigation activities will eb carried out on Farm Skaapplaas No. 414, about 10 km north of the Naute Dam (see map below). The approximate site coordinates are 26°49'00.16" S, 15°54'26.19" E. The total area planned for the project activities is 1300 hectares (ha). The project land will be implemented in three phases, and these are as follows:

- **Phase 1**: 300 ha,
- **Phase 2**: a further 700 ha, and
- **Phase 3**: a further 300 ha (totaling 1300 ha)

Members of the public are further invited to register as Interested and Affected Parties (I&APs) to comment/raise concerns or receive further information on the EA process. Registration is to be done with EDS on the contact details below.

**A Public Consultation Meeting will be held at:**
**Venue: Farm Skaapplaas No. 414**
**Date: 09 June 2021**
**Time: 11h00**

Registration and comments should reach EDS before end of business on **Thursday, 17 June 2021.**
**Contact Person(s): Mr. Nerson Tjelos / Ms. Althea Brandt**

Tel: +264 61 259 530

E-mail: info@edsnamibia.com or abrandt@edsnamibia.com

Excel Dynamic Solutions

Location of Farm Skaapplaas No. 414 North of the Naute Dam

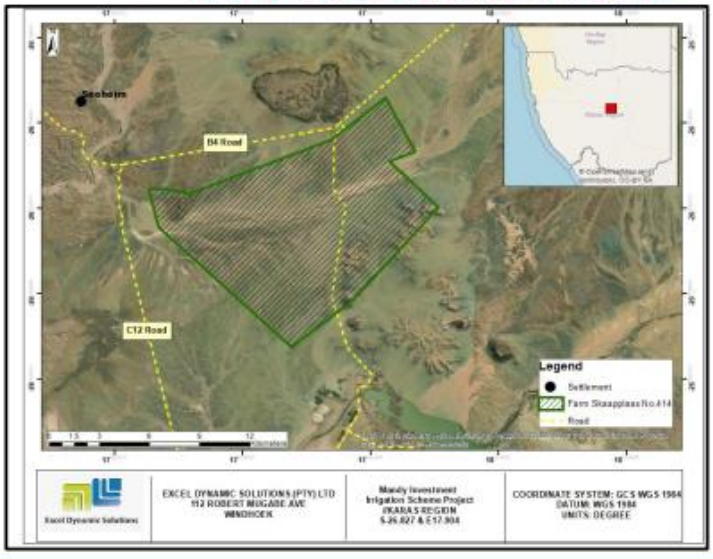


**Figure 28: Photo of the A3 Public notice**

## 6.3 Public Consultation Meeting

A public consultation meeting is one of the most important component of public consultation process as it brings the consultant and affected members of the public (particularly from the affected site area) together. The meeting is usually done in an interactive session form so that the community members or members of the public can express their opinions, give their concerns, and make suggestions to the proposed project.

A public consultation meeting was arranged for 11h00 (11am) on the 9th of June 2021 at the project site (Farm Skaapplaas No. 414). However, none of the members of the public, neighbours or representatives of the invited authorities came to the meeting venue. This is true because the EDS consultants spent the whole day at Farm Skaapplaas undertaking the site assessment (from 10h30 to 16h00). The Consultant assumed the meeting was a no show due to the following reasons:

- Lack of interest in the project because the project water supply is the Naute Dam (to be supplied via NamWater water supply line) and not the local aquifers (groundwater), hence not affecting the locals directly. From experience, public interest and concern in an area would be high if the water for the project would be abstracted water from an already low potential resource like boreholes in these dry parts of the country.
- The neighbouring properties to Farm Skaapplaas are more than 2 km away, therefore these neighbours might think that the project activities will be of no interest or have low interruption to and impact on their daily routines and livelihoods.
- Due to the global pandemic of the coronavirus, some people are not comfortable with attending meetings or be in gatherings that may compromise their health (fear of contracting the virus from interacting with other people from different areas).

## 6.4 Public Consultation Feedback

The only feedback received by EDS Consultants from newspaper adverts, emails sent to pre-identified and on request I&APs, letters (with BIDs) sent to the relevant national and regional authorities was acknowledgement of receipt.

The following chapter entails the potential impacts that are anticipated to be associated with the irrigation project activities, their description (for the negative/adverse impacts only), assessment and management/mitigation thereof to minimize their significance to the affected environmental features.

# 7 IMPACT IDENTIFICATION, ASSESSMENT AND MITIGATION MEASURES

## 7.1 Identification of Potential Impacts

Irrigation activities are usually associated with potential positive and negative impacts. For an environmental assessment, the focus is mainly placed on the negative impacts. This is done to ensure that these impacts are addressed by providing adequate mitigation measures such that an impact's significance is brought under control, while maximizing the positive impacts of the project. The potential positive and negative impacts that have been identified from the irrigation activities are listed as follow:

**Positive impacts:**

- Potential for creation of employment for locals, especially the non-skilled labourers,
- Enhance national food security through the production of animal (livestock) feed,
- Increase in agriculture skills and technological development in the agriculture sector,
- Provide livelihood for rural population,
- Boost to local and regional economic development, i.e., economic diversification,
- May open other investment opportunities in the Region, and
- Safeguard the sustainable existence of Namibia's agricultural sector.

**Negative impacts:**

- Land degradation (physical soil disturbance) resulting in increased soil erosion due to land irrigation,
- Biodiversity Loss through site clearing to enable construction as well as during operations,
- Potential impact on water resources (abstraction and pollution)
- Potential pollution of soils and water resources from seepage of fertilizers, pesticides, wastewater, and hydrocarbons,
- Waterlogging primarily from inadequate drainage and over-irrigation and, to a lesser extent, from seepage from canals and ditches,
- Impact on local services infrastructure (buried pipelines on the Farm),
- Salinization - Excess salinity within the root zone reduces plant growth due to increasing energy that the plant must expend to acquire water from the soil,
- Potential health and safety risks associated with mishandling of equipment (materials) as well as inadequate personal protective equipment,

- Potential dust generation from increased traffic in the area during site setup,
- Potential impact on archaeological/heritage resources through inadvertent unearthing of such sites or objects that may be located below ground surface or project related disturbance of nearby/potential archaeological sites or objects found in the vicinity, and
- General environmental pollution through littering (general waste generated on the project site).

## 7.2 Impact Assessment Methodology

The Environmental Assessment is primarily a process used to ensure that potential impacts that may occur from project activity are identified and addressed with environmentally cautious approaches and legal compliance. The impact assessment method used for this project is in accordance with Namibia's Environmental Management Legislation (Environmental Management Act No. 7 of 2007) and its Regulations of 2012, as well as the International Finance Corporation (IFC) Performance Standards.

### 7.2.1 Impact Assessment Criteria

The identified impacts were assessed in terms of probability (likelihood of occurring), scale/extent (spatial scale), magnitude (severity) and duration (temporal scale) as presented in **Table 3**. To enable a scientific approach to the determination of the environmental significance, a numerical value is linked to each rating scale. This methodology ensures uniformity and that potential impacts can be addressed in a standard manner so that a wide range of impacts are comparable. It is assumed that an assessment of the significance of a potential impact is a good indicator of the risk associated with such an impact. The following process will be applied to each potential impact:

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

The recommended mitigation measures prescribed for each of the potential impacts contribute towards the attainment of environmentally sustainable operational conditions of the project for various features of the biophysical and social environment. The following criteria (**Table 3**) were applied in this impact assessment:

**Table 3: Impact Assessment Criteria employed to assess the potential negative impacts**

| Nature | Description | Rating |
|---|---|---|
| **Extent (Spatial scale)** | An indication of the physical and spatial scale of the impact. | **Low (1):** Impact is localized within the site boundary: Site only.<br><br>**Low/Medium (2):** Impact is beyond the site boundary: Local.<br><br>**Medium (3):** Impacts felt within adjacent biophysical and social environments: Regional.<br><br>**Medium/High (4):** Impact widespread far beyond site boundary: Regional<br><br>**High (5):** Impact extend National or over international boundaries. |
| **Duration** | The timeframe, over which the impact is expected to occur, measured in relation to the lifetime of the project. | **Low (1):** Immediate mitigating measures, immediate progress<br><br>**Low/Medium (2):** Impact is quickly reversible, short term impacts (0-5 years)<br><br>**Medium (3):** Reversible over time; medium term (5-15 years).<br><br>**Medium/High (4):** Impact is long-term.<br><br>**High (5):** Long term; beyond closure; permanent; irreplaceable or irretrievable commitment of resources |
| **Intensity, Magnitude / Severity (Qualitative criteria)** | The degree or magnitude to which the impact alters the functioning of an element of the environment. The magnitude of alteration can either be positive or negative | **Medium/low (4):** Low deterioration, slight noticeable alteration in habitat and biodiversity. Little loss in species numbers.<br><br>**Low (2):** Minor deterioration, nuisance or irritation, minor change in species / habitat / diversity or resource, no or very little quality deterioration. |
| **Probability of occurrence** | Probability describes the likelihood of the impacts occurring. This determination is based on previous experience with similar projects and/or based on professional judgment | **Low (1):** Improbable; low likelihood; seldom. No known risk or vulnerability to natural or induced hazards.<br><br>**Medium/low (2):** Likely to occur from time to time. Low risk or vulnerability to natural or induced hazards.<br><br>**Medium (3):** Possible, distinct possibility, frequent. Low to medium risk or vulnerability to natural or induced hazards. |

| Nature | Description | Rating |
|---|---|---|
| | | **Medium/High (4):** Probable if mitigating measures are not implemented. Medium risk of vulnerability to natural or induced hazards.<br><br>**High (5):** Definite (regardless of preventative measures), highly likely, continuous. High risk or vulnerability to natural or induced hazards. |

### 7.2.2 Impact Significance

After the impact has been assessed, its significance is then determined. The impact significance is determined through a synthesis of the above impact characteristics (in Table 3 above). The significance of the impact "without mitigation" is the main determinant of the nature and degree of mitigation required. Once the above factors (**Table 3**) have been ranked for each potential impact, the impact significance of each is assessed using the following formula:

***SP = (magnitude + duration + scale) x probability***

The maximum value per potential impact is 100 significance points (SP). Potential impacts were rated as high, moderate, or low significance, based on the following significance rating scale (**Table 4**).

**Table 4: Significance rating scale**

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

**Positive (+)** – Beneficial impact

**Negative (-)** – Deleterious/ adverse Impact

**Neutral** – Impacts are neither beneficial nor adverse.

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

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

The risk/impact assessment is driven by three factors:

- **Source: The cause or source of the contamination**
- **Pathway: The route taken by the source to reach a given receptor**
- **Receptor: A person, animal, plant, eco-system, property or a controlled water source. If contamination is to cause harm or impact, it must reach a receptor.**

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

## 7.3 Assessment of Potential Negative Impacts: Construction & Operations

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

### 7.3.1 Soil Disturbance (Land Degradation)

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

The potential impact can be rated as medium if no mitigation measures are implemented. However, with the effective implementation of mitigation measures and monitoring, the impact significance will be reduced to low. The impact is assessed in **Table 5** below.

**Table 5: Assessment of the impacts of irrigation activities on soils**

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

***Mitigations and recommendation to minimize soil disturbance.***

- The topsoil that was stripped from certain site areas to enable construction works and can be returned to its initial position, should be returned. This is to avoid unnecessary stockpiling of site soils which would leave them prone to erosion.
- All construction pits excavated on site should be rehabilitated and returned to their pre-excavation state as far as possible.
- Soils that are not within the intended footprints of the site areas should be left undisturbed and soil conservation implemented as far as possible.
- Project vehicles/machinery should stick to temporary access roads provided and or meant for the project works but not to unnecessarily create further tracks on and around the site by driving everywhere which would result in compaction of site and surrounding soils.

### 7.3.2 Loss of Biodiversity: Fauna and Flora

The earthworks done to prepare the site for project structures and services infrastructure could result in land degradation. This would lead to habitat loss for a diversity of flora and fauna ranging from microorganisms, reptiles, and large animals as well as trees. Endemic species are most severely affected since even the slightest disruption in their habitat can results in extinction or put them at high risk of being wiped out.

Another impact on fauna, especially wildlife is the illegal hunting. The project would be employing different people, and some may be tempted to hunt local wildlife either for own consumption (meat) or sale. The aspect of illegal hunting will therefore be required to be communicated to all project contractors and employees. The illegal hunting of wildlife would result in loss of such significant biodiversity in the area and eventually affect wildlife-related tourism in the area.

The impact on fauna would not only be on potential habitat destruction during construction works, but also the presence of people and movement of heavy vehicles would create discomfort to Farm

wildlife, particularly which would force them to move away from this part of the Farm. However, this will be a short-term impact and the wildlife will still have other nearest or further places within the Farm to move to and continue with their existence uninterrupted.

Under the status, the impact can be of a medium significance rating. With the implementation of appropriate mitigation measures, the rating will be reduced to a low significance rating. The impact is assessed in **Table 6** below.

**Table 6: Assessment of the impacts of irrigation activities on biodiversity**

| Mitigation Status | Extent | Duration | Intensity | Probability | Significance |
|---|---|---|---|---|---|
| **Pre mitigation** | M - 3 | M - 3 | M - 6 | M/H - 4 | M – 48 |
| **Post mitigation** | L/M: -2 | L/M: -2 | L/M: -4 | L/M: 2 | L: -16 |

***Mitigations and recommendation to minimize the loss of biodiversity (fauna and flora)***

- The Proponent should avoid unnecessary removal of vegetation, to promote a balance between biodiversity and project activities.
- Important Plant species (i.e., *Acacia Mellifera*) found on the site, but not within the actual site areas planned for irrigation should not be removed but left to preserve biodiversity on the site.
- Shrubs or trees found along site boundaries should not be unnecessarily removed.
- Workers should refrain from killing or snaring animals' species (big or small) that may be found on or near the site.
- Poaching or illegal hunting of wildlife on the Farm and surrounding areas especially the Naute Game Park by either project workers or visitors is strictly prohibited.
- Any project related worker or visitor that will be caught attempting to poach (illegally hunt) wildlife in the area should be reported to the Namibian Police Force' Anti-poaching Unit for further actions.
- Environmental awareness on the importance of biodiversity preservation should be provided to the project contractors, workers as well as visitors including site inspectors.

### 7.3.3 Generation of Dust (Air Quality)

Dust emanating from site access roads when transporting project equipment, materials, and supply to and from site (time-to-time) may compromise the air quality in the area. Vehicular movements create dust even although it is not always so severe. Not only dust but also the

possible emissions of gases from heavy vehicles and machinery. These sources of dust and emissions may lead to air pollution, thus decreasing the air quality in the project area. In a dry area like the project site where it is hot and the environment is dry most of the year, loose sandy nature of the substrate and low vegetation cover causes ambient fugitive dust levels. This could contribute to short-term decrease in air quality around the working site areas.

The dust generated and fumes emissions do not only impact people (health and visual) and fauna but also flora. Mainly for nearby flora, the fallout dust could temporarily affect the rates of photosynthesis and transpiration for the duration of construction activities, particularly.

The impact can be rated as medium (significance) if no mitigation measures are implemented. However, once this is done, the impact significance can be reduced to low - please refer to the assessment below (**Table 7**).

**Table 7: Assessment of the impacts of irrigation activities on air quality**

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

### *Mitigations and recommendation to minimize dust generation.*

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

### 7.3.4 Waste Generation

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

Without any mitigation measures, the general impact of waste generation has a medium significance. The impact will reduce to low significance, upon implementing the mitigation measures. The assessment of this impact is given in **Table 8**.

**Table 8: Assessment of waste generation impact**

| Mitigation Status | Extent | Duration | Intensity | Probability | Significance |
|---|---|---|---|---|---|
| **Pre mitigation** | M - 3 | M/H - 4 | L/M - 4 | M/H - 4 | M - 44 |
| **Post mitigation** | L - 1 | L - 1 | L - 2 | L/M - 2 | L - 8 |

***Mitigations and recommendation to waste management***

- Biodegradable and non-biodegradable wastes must be stored in separate containers and collected regularly for disposal at a recognized landfill/dump site (in Keetmanshoop, upon reaching an agreement with the Municipality of Keetmanshoop).
- Any hazardous waste that may have an impact on the animals, vegetation, water resources and the general environment should be handled cautiously and disposed of carefully at the nearest approved waste management facilities (in Keetmanshoop).
- Workers should be sensitized to dispose of waste in a responsible manner and not to litter.
- After each daily works, the Proponent should ensure that there are no wastes left on the sites.
- All domestic and general operational waste produced daily should be contained until such that time it will be transported to designated waste sites.
- No waste may be buried or burned on site or anywhere else.
- The project site (in all phases) should be equipped with separate waste bins for hazardous and general/domestic waste.

- Hazardous waste, including emptied chemical containers should be safely stored on site and transported to the nearby approved hazardous waste sites for safe disposal. No waste should be improperly disposed of on site or in the surroundings, i.e., on unapproved waste sites.
- Sewage waste should be stored as per the portable chemical toilets' manufacturer's instructions and regularly disposed of at the nearest treatment facility.
- Oil spills should be taken care of by removing and treating soils affected by the spill.
- A penalty system for irresponsible disposal of waste on site and anywhere in the area should be implemented.
- Potential contaminants such as hydrocarbons and wastewater should be contained on site and disposed of in accordance with the nearest municipal wastewater discharge standards so that they do not contaminate surrounding soils and eventually groundwater.
- An emergency plan should be available for major/minor spills at the site during operation activities (with consideration of air, groundwater, soil and surface water) and during the transportation of the products(s) to the sites.
- All wastewater and hydrocarbon substances and other potential pollutants associated with the project activities should be contained in designated containers on site and later disposed of at nearby approved waste sites in accordance with MAWLR's Water Environment Division standards on wastewater discharge into the environment. This is to ensure that these hazardous substances do not infiltrate into the ground and affect the local groundwater quality.

### 7.3.5 Occupational Health, and Safety

The project construction but also operational activities can be associated with some health and safety risks. This is possible when personnel (workers) involved in the project activities are exposed to health and safety risks. These are in terms of accidental injury, owing to either minor (i.e., superficial physical injury) or major (i.e., involving heavy machinery or vehicles) accidents.

The use of heavy equipment, especially during excavation, and the presence of hydrocarbons on sites may result in accidental fire outbreaks. This could pose a safety risk to the project personnel, equipment, and vehicles.

If machinery and equipment are not properly stored and packed, there would be risks of this machinery or equipment falling and injure the project workers or visitors on site at the time.

The impact can be rated as medium significant if no mitigation measures are implemented, but upon implementation, the impact will be of low significance. This impact is assessed in **Table 9** below and mitigation measures provided thereof.

**Table 9: Assessment of the impacts of the project activities on health and safety**

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

***Mitigations and recommendation to minimize health and safety issues***

- As part of their induction, the workers should be provided with an awareness training of the risks of mishandling equipment and materials on site.
- The heavy vehicle, equipment and fuel storage area should be properly secured to prevent any harm or injury to the Proponent's personnel or even Farm animals.
- When working on site, employees should be properly equipped with personal protective equipment (PPE) such as coveralls, masks, gloves, safety boots, earplugs, safety glasses, and hard hats.
- No employee should be allowed to consume alcohol or other intoxicants prior to and during working hours as this may lead to mishandling of equipment which results into injuries and other health and safety risks.
- Employees should not be allowed on site if under the influence of alcohol or any other intoxicants.

### 7.3.6 Vehicular Traffic Use and Safety

The national road B4 and C12 are the main transportation routes for all vehicular movement in the area, that also provide access to the project site. Therefore, the project associated vehicles will obtain access to the site from the B4 via C12 road and Farm access roads. The two major roads also connect the site area to the service providers (for water, waste removal, procurement of construction materials machinery, equipment, as well as during the operational phase when transporting project materials to site and produce from site to consumers/market and generated waste to waste management facilities).

Depending on the project needs, trucks, medium and small vehicles will be frequenting the area to and from site. This would potentially increase slow moving heavy vehicular traffic along these roads. The impact would not only be felt by the district road users but the local road users such

as farms (via local access gravel and single-track roads). This would add additional pressure on the roads.

However, only so many times a week or even monthly that construction related slow moving heavy trucks will be transporting materials and equipment from and to site during construction. Therefore, the risk is anticipated to be short-term, not frequent, and therefore of medium significance. Traffic movement related to the project will however still be felt during the operational phase and this may exert pressure on the roads too and potential accidents. Pre-mitigation, the impact can be rated medium and with the implementation of mitigation measures, the significance will be low as assessed in **Table 10** below.

**Table 10: Assessment of the impacts of project activities on road use (vehicular traffic)**

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

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

- The transportation of construction materials, equipment and machinery should be limited to once or twice a week only, but not every day to reduce the pressure on local roads.
- The heavy truck loads should comply with the maximum allowed limit while transporting materials and equipment/machinery on the public and access roads.
- The carted water into the area (from other source of water supply) should be done once or twice a week in container that can supply and store water for most of the week, thus reducing the number of trucks on the road daily.
- Drivers of all project phases' vehicles should be in possession of valid and appropriate driving licenses.
- Vehicle drivers should adhere to the road safety rules.
- Drivers should drive slowly (40km/hour or less) and be on the lookout for livestock and wildlife as well as residents/travellers using public roads within proximity of the site.
- The Proponent should ensure that the site access roads are well equipped with temporary road signs condition to cater for vehicles travelling to and from site throughout the project's life cycle.
- Project vehicles should be in a road worthy condition and serviced regularly to avoid accidents owing to mechanical faults.

- Vehicle drivers should only make use of designated site access roads provided and as agreed.
- Vehicle's drivers should not be allowed to operate vehicles while under the influence of alcohol.
- Sufficient parking area for all project vehicles should be provided for and clearly demarcated on sites.
- The Proponent should make provision for safe materials and equipment offloading and loading areas on sites.
- No heavy trucks or project related vehicles should be parked outside the project site boundary or demarcated areas for such purpose.
- To control traffic movement on site, deliveries from and to site should be carefully scheduled. This should optimally be during weekdays and between the hours of 8am and 5pm.
- The site access road(s) should be upgraded to an unacceptable standard to be able to accommodate project related vehicles and access permits obtained from the Roads Authority.
- The site access roads should be equipped with road safety signs.

### 7.3.7 Heritage/Archaeological resources

During construction works, historical resources may be impacted through inadvertent destruction or damage. This may include the excavation of subsurface graves or other archaeological objects. There was no information provided about either known heritage or site of significant cultural values within the Farm. Therefore, the project activities will not have an impact of great significance on these and potentially other archaeological remains, at least on surface and visible resources if any. It should however be noted that the absence of confirmable and significant archaeological cultural heritage site is not evidence that such sites did not exist in the proposed site area.

With that said, the potential impact significance is slightly medium if no mitigation measures, are implemented. However, after the implementation of the measures provided below, this impact significance will be low. The assessment of the impact is shown in **Table 11** below.

**Table 11: Assessment of the impacts of project activities on archaeological resources**

| Mitigation Status | Extent | Duration | Intensity | Probability | Significance |
|---|---|---|---|---|---|
| **Pre mitigation** | M - 3 | M/H - 4 | L/M - 4 | M/H - 4 | M - 44 |

| | | | | | |
|---|---|---|---|---|---|
| **Post mitigation** | L/M - 2 | L/M - 2 | L - 2 | L/M - 2 | L - 12 |

***Mitigations and recommendation to minimize impact on archaeological resources.***

- Contractors working on the site should be made aware of items protected under the National Heritage Act, 2004 (Act No. 27 of 2004). Therefore, caution should be exercised when carrying out excavations associated with the construction activities if archaeological/heritage remains are discovered.
- Any items protected under the definition of heritage found during unearthing for construction works should be reported to the National Heritage Council.
- The Proponent should consider having a qualified archaeologist on standby/call during site clearing and excavations, and as required to assist in the event of any archaeological discoveries.
- Identification of any archaeological significant objects or sites (such as graves) on the site should not be disturbed but are to be reported to the project Environmental/Safety officer or National Heritage Council offices for further instructions and actions.
- Workers should be educated to not destroy or throw away but report (to the Environmental/Safety officer) of any unknown object or site found/discovered on the Farm/project site.
- The Proponent should familiarise themselves with the National Heritage Council's Chance Finds Procedure and if uncertain about the procedure should receive training by a suitably qualified archaeologist with respect to the identification of archaeological/heritage remains and the procedures to follow if such remains are discovered throughout the project activities' duration. The Chance and Finds Procedure is attached to the EMP.
- Although the possibility of encountering previously unidentified burial sites is low within the proposed site, should such sites be identified during subsurface work, they are still protected by applicable legislations, and they should be protected. Therefore, the preceding recommended actions given above should be taken.

### 7.3.8 Noise

Noise from excavations and movement of heavy vehicles during constructions may be a nuisance. However, the noise would be localized (limited to the site) because the surrounding communities/neighbours are very far from Farm Skaapplaas, and the site earmarked for irrigation. Therefore, the impact of noise to people is very minimal to none. However, noise maybe a nuisance to wildlife found on the Farm. Without any mitigation, the impact is rated as of low to

medium significance. To change the impact significance from the pre-mitigation significance to low rating, the mitigation measures should be implemented. This impact is assessed in **Table 12** below.

**Table 12: Assessment of noise impact**

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

***Mitigations and recommendation to noise***

- Noise from project vehicles and equipment on the working areas of the site should be at acceptable levels.
- Construction and operational hours should be restricted to between 08h00 and 17h00 to avoid noise by vehicles and equipment before working or after hours.
- When operating excavators and other noise generating machinery onsite, workers should be equipped with personal protective equipment (PPE) such as earplugs to reduce exposure to excessive noise.
- The transportation of project materials, equipment and machinery should be limited to once or twice a week only, but not every day.

### 7.3.9 Impact on Local Services Infrastructure (NamWater pipelines)

The movement of vehicles such as heavy truck around the Farm and unsupervised site excavation, especially along the buried Naute Dam-Keetmanshoop water supply pipeline may lead to the flattening/damaging or deformation of the pipeline when unnoticed or unmarked for new contractors on site during construction. This is likely to happen; especially during rainy seasons when the buried pipes get compacted or deformed once driven over by heavy vehicles. It should be noted that the utilization of the local / access roads by frequent heavy trucks will be limited to the construction duration.

Without any mitigation, the impact is rated as of low to medium significance. To change the impact significance from the pre-mitigation significance to low rating, the mitigation measures should be implemented. This impact is assessed in **Table 13** below.

**Table 13: Assessment of impact associated with farm infrastructure (buried pipeline)**

| Mitigation Status | Extent | Duration | Intensity | Probability | Significance |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| **Pre mitigation** | M - 3 | M/H - 4 | M - 6 | M - 3 | M - 39 |
| **Post mitigation** | L - 1 | L - 1 | L - 2 | L/M - 2 | L - 8 |

***Mitigations and recommendation to impact on local infrastructure (water supply pipeline)***

- Excavation works on top and within the servitude of the water supply pipeline should be avoided at all costs.
- The Proponent (if necessary, with a local NamWater representative) should mark the positions/route of buried water pipeline to avoid pipeline damage, especially that the pipeline runs through the Farm and particularly the irrigation site.
- If possible, heavy trucks should avoid driving over farm areas that are known to have pipelines or any related infrastructure buried.
- Project vehicles, equipment and machinery should not be parked and left/stored on areas where the buried pipeline is, respectively.

### 7.3.10 Water Resources Use: Demand and Availability

Water resources is impacted by project developments/activities in two ways, namely through pollution (water quality) or over-abstraction (water quantity) or at times both.

In terms of groundwater, the project area is in low groundwater potential area (based on the groundwater map of Namibia). The area has no permanent surface water source such as rivers therefore it relies on schemes and privately drilled boreholes for water supply. The project site and surrounding rely on the NamWater supply line from Naute Dam and further areas relying on the Neckartal Dam during good rainy seasons. Some community members use privately owned boreholes for domestic water supply.

The impact of the project activities on the resources would be dependent on the water volumes required by the project activities. Commonly irrigation activities use a lot of water, but this would also depend on the scale, crop type and duration of water demand per year.

For the planned phase 1 of the irrigation activities (irrigating 300 ha of the land) and depending on the final irrigation method (with Drip irrigation requiring 4,941,000 $m^3$ and Centre Pivot requiring 6,081,000 $m^3$ for the project's operational phase per annum). The combination of the Centre Pivot (Sprinkler) and Drip methods would also aid in decreasing the water consumption, therefore reducing the pressure on the water supply. This water will be used for irrigating the crops, washing, drinking and domestic purposes, and other water requiring activities on site.

Upon approval of water supply request/application, the required water will be supply by NamWater by connecting the project supply system from the Naute Dam to site. If not maintained and used efficiently, this water volume may exert pressure on the Dam supply in the long-term which will not only affect the sustainable supply to the project, but also other users supplied by NamWater from the same source (Dam), especially when rainy seasons are not good enough to replenish the source.

Without the implementation of any mitigation measures, the impact can be rated as medium to high, but upon effective implementation of the recommended management and measures, the impact significance would be reduced to low as presented in the **Table 14** below.

**Table 14: Assessment of the project impact on water resource use and availability**

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

***Mitigations and recommendation to manage water use.***

- Water should be used efficiently, and recycling and re-using of water on certain site activities should be encouraged, where necessary and possible. These activities include washing and cooling down of machinery on site.
- The annual volume allocated by NamWater should be adhered to and if necessary, the Proponent should aim to only abstract/pump water when needed.
- The Proponent should try to invest more in the Drip irrigation technique/system because it is less water demanding compared to the Centre Pivot. Alternatively, depending on the affordability, the two methods should be combined to reduce the pressure on the water supply source (Naute Dam).
- The design of the irrigation method systems should be done in such a way that water preservation is prioritized.
- Water storage tanks should be inspected daily to ensure that there is no leakage to minimize water wastage on site.
- In the case that there will be consideration for a reservoir(s) on site, these should be covered to minimize water losses through evaporation. Thus, minimizing the need to abstract more water from the Dam to replenish reservoir loses.

- Water conservation awareness and saving measures training should be provided to all the project workers in both phases so that they understand the importance of conserving water and become accountable.

### 7.3.11 Soil and Water Resources Pollution

The proposed construction and subsequent operational activities are associated with a variety of potential pollution sources (i.e., fuels and wastewater) that may contaminate/pollute soils and eventually groundwater and surface water. The anticipated potential source of pollution to water resources from the project activities would be hydrocarbons (oil) from project vehicles, machinery, and equipment as well as potential wastewater/effluent from construction related activities. Some of these sources of pollution will be temporary, i.e., they will only last for the duration of constructions works. The spills on the soils (depending on volumes spilled on the soils) from these machinery, vehicles and equipment could infiltrate into the ground and pollute the fractured or faulted aquifers on site, and with time reach further groundwater systems in the area.

However, some potential pollutants will impact the environment on a long-term during the operational phase when there are also additional potential pollutants such as insecticide, pesticides and fertilizers applied on the land for crop protection and growth.

Pre-mitigation measure implementation, the impact significance is low to medium for the construction phase and medium to slightly high for the operational phase. Upon the implementation of management and mitigation measures, the significance will be reduced to medium and then progressively to low (for the operational phase) and then low for the construction phase. The impact is assessed in **Table 15** below.

**Table 15: Assessment of the project impact on soils and water resources (pollution)**

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

***Mitigations and recommendation to manage soil and water pollution.***

- Irrigation systems should be designed and managed for zero or minimum deep percolation during the growing seasons to keep fertilizer and pesticides in the root zone if possible.
- Spill control preventive measures should be in place on site to management soil contamination, thus preventing and or minimizing the contamination from reaching water

resources bodies. Some of the soil control preventive measures that can be implemented include:

- Identification of oil storage and use locations on site and allocate drip trays and polluted soil removal tools suitable for that specific surface (soil or hard rock cover) on the sites.
- Maintain equipment and fuel storage tanks to ensure that they are in good condition thus preventing leaks and spills.
- The oil storage and use locations should be visually inspected for container or tank condition and spills.
- Maintain a fully provisioned, easily accessed spill kit. Spill kits should be located throughout the active project sites contain the floor dry absorbent material and absorbent booms, pads, mats. These would be suitable for ground surface areas that are covered mainly by hard rocks.

- All project employees should be sensitized about the impacts of soil pollution and advised to follow appropriate fuel delivery and handling procedures.
- The Proponent should develop and prepare countermeasures to contain, clean up, and mitigate the effects of an oil spill. This includes keeping spill response procedures and a well-stocked cache of supplies easily accessible.
- Ensure employees receive basic Spill Prevention, Control, and Countermeasure (SPCC) Plan training and mentor new workers as they get hired.
- Site areas where hydrocarbons will be utilized, the surface should be covered with an impermeable plastic liner (e.g., an HDPE liner), carefully placed to minimize risk of puncturing, to prevent any spillages from getting into direct contact with the soils and prevent eventual infiltration into the ground.
- Project machines and equipment should be equipped with drip trays to contain possible oil spills when operated on site.
- In cases of accidental fuel or oil spills on the soils from site vehicles, machinery and equipment, the polluted soil should be removed immediately and put in a designate waste type container for later disposal as per the preceding bullet point. The removed polluted soil should either be completely disposed of or cleaned and returned to where it was taken from on site or can be replaced with a cleaner soil. This is to ensure that the pollutants contained int the soil does not infiltrate into the site soils and eventually reach to groundwater.

- Polluted soil must be collected and transported away from the site to an approved and appropriately classified hazardous waste treatment facility.
- Washing of equipment contaminated hydrocarbons, as well as the washing and servicing of vehicles should take place at a dedicated area (lined), where contaminants are prevented from contaminating soil or water resources.
- Toilet water should be treated using one of the following methods:
    - Discharged into chemical toilets and periodically emptied out before reaching capacity and transported to a wastewater treatment facility.
    - A type of pit latrine (where excreta in the pit is treated to prevent the waste from being a water pollution risk).
- Septic tanks (if any) on site should be maintained regularly to ensure that this waste is not leaching into the ground and eventually groundwater.

## 7.4 Cumulative Impacts Associated with the Proposed Irrigation Works

The International Finance Corporation (2013) defines cumulative impacts as “those that result from the successive, incremental, and/or combined effects of an action, project, or activity (collectively referred to in this document as “developments”) when added to other existing, planned, and/or reasonably anticipated future ones”.

Like many irrigation projects, some of the cumulative impacts to which the proposed project and associated activities will potentially contribute are as follows:

- **Water use:** The volume of water required for irrigation activities will be significant and an add-on to the existing water uses supplied by the same source (Naute Dam). Therefore, the proposed project activities will cumulatively impact the water resources.
- **Road infrastructure.** The proposed project and its activities will cumulatively contribute (although temporarily) to various activities such as transportation of construction materials to site throughout the construction phase on B4, farming activities and travelling associated with tourism through the project area within the //Karas Region. The contribution of the proposed project to this cumulative impact is however not considered significant given the scale, duration, and extent of the intended construction activities, particularly.

# 8 RECOMMENDATIONS AND CONCLUSIONS

## 8.1 Recommendations

The potential impacts (both positive, negative, and cumulative) that are anticipated from the proposed project activities were identified, described, and assessed. It is found that most of the identified potential negative impacts are rated as medium significant. For these significant adverse (negative) impacts with medium rating significance, appropriate mitigation measures were recommended for effective implementation and continuous monitoring by the Proponent, their contractors and project related employees. The aim will be to reduce to low and maintain this impacts' significance in the long run and bring the impact under control. These management and mitigation measures are provided under chapter 7 of this ESA report, and as management action and in the draft EMP.

The public was consulted as required by the EMA and its 2012 EIA Regulations (Section 21 to 24). This was done via the two newspapers used for this environmental assessment (New Era and the Namibian newspapers in May 2021); site/public notices placed in Keetmanshoop (at the Regional Council notice board). A notice for public consultation meeting was sent out. However, on the day of the meeting no one showed up.

The findings of this assessment were deemed sufficient and conclude that no further detailed assessments are required to the ECC application.

It is therefore recommended that an Environmental Clearance Certificate be issued for the proposed irrigation activities, subject to the following recommendations:

- All required permits, licenses and approvals for the proposed activities should be obtained as required.
- The Proponent complies with the legal requirements governing this type of project and its associated activities.
- All mitigations provided in this Report and the management action plans in the draft EMP should be implemented and monitoring conducted as recommended.
- All the necessary environmental and social (occupational health and safety) precautions provided should be adhered to.
- Site areas where construction activities have been completed should be rehabilitated, as far as practicable, to their original state.

- The monitoring of the implementation of mitigation measures should be conducted, applicable impact's actions taken, reporting done and recorded as recommended in the draft EMP.
- Environmental (EMP) Compliance Monitoring should be conducted on a weekly basis during the construction phase by the project Safety, Health and Environmental Officer or an independent Environmental Consultant and bi-annually during the operational phase. Environmental Compliance monitoring reports should be compiled and submitted to the DEAF Portal as per provision made on the MEFT/DEAF's portal.

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

## 8.2 Conclusion

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

Excel Dynamic Solutions (Pty) Ltd is, therefore, confident that these measures are sufficient, and thus recommends that the Proponent be issued with the Environmental Clearance Certificate (ECC). However, the ECC should be issued on condition that the provided management measures and action plans are effectively implemented and monitored on site.

Monitoring of the environmental components described in the impact assessment should be conducted by the Proponent and applicable Competent Authority. This is to ensure that all potential impacts identified in this study and other impacts that might arise during implementation are properly identified in time and addressed. Lastly, should the ECC be issued, the Proponent will be expected to be compliant with the ECC conditions as well as legal requirements governing the project and its related activities.

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