



DRAFT SCOPING REPORT
FOR THE CLEARING OF
VEGETATION ON THE
PTN 2 & REMAINDER OF
FARM ZWEM KUIL NO.
37 AND REMAINDER ON
OF FARM SMITSKLOOF
NO. 38, PRIESKA

PREPARED FOR


ZWEMKUIL GORDONII CC

APRIL 2022



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TABLE OF CONTENTS

Background	6
Environmental Studies	6
Phase 1	7
Phase 2	7
Investigation Procedure	7
Desk study	7
Field investigation	7
Details of the Applicant	9
Landowner	9
Legislation	10
Details of the Author	18
Description of the Receiving environment	20
Site Location	20
Project Description	21
Planning Phase	21
Construction Phase	23
Operational Phase	24
Decommissioning Phase	25
Alternatives investigated for the proposed development	25

Need and Desirability of the Project	28
Environmental Impact Assessment	32
Environment	32
Receiving Environment	33
Regional Climate	33
Topography	36
Geology & Palaeontology	37
Soils	38
Land Use and Land Capability	42
Flora	44
Photo record of the Upper Western Section	46
Photo record of the Upper Eastern Section	47
Photo record of the Southern Section	50
Fauna	53
Sensitive Sites	61
Water	66
Air Quality	69
Noise	70
Waste Generation	71
Visual impact and aesthetic acceptability	72
Transport Impact	73

Socio-Economic Impact.....	74
Structures of Archaeological and Cultural Interest	75
Public Participation for the Scoping Phase	75
Plan of Study	77
Introduction.....	77
Objectives of the EIA.....	78
EIA Approach	78
A Description of the Alternatives to be considered	79
Alternative layout	79
Alternative land use	80
No development of the site.....	85
Aspects to be assessed during the EIA phase.....	86
Specific issues to be addressed in Specialist Studies	87
Methodology of Impact Assessment	87
Stages of Consultation with Department of Agriculture, Environmental Affairs, Rural Development and Land Reform.....	92
Public Participation Process during the EIA.....	92
Tasks to be Undertaken for the EIA	94
Possible Mitigation Measures	98
References	98
Undertaking of EAP	101

Appendix A – EAP Qualification.....	102
Appendix B – Site Plan	107
Appendix C – Public Participation.....	114
Appendix D – Screening Tool Report and Site Verification Report	121
Appendix E – Specialist Reports	122

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BACKGROUND

Digital Soils Africa (Pty) LTD (DSA) was tasked by Zwemkuil Gordonii CC to conduct environmental investigations and complete the Environmental Authorisation Application for the authorisation of clearing of vegetation on Portion 2 and the Remainder of the Farm Zwem Kuil No. 37 and the Remainder of Farm Smitskloof No. 38, Prieska in the Northern Cape, for the purpose of crop production.

In terms of the National Environmental Management Act 107 of 1998 (“NEMA”), environmental authorisation must be obtained before any person can conduct activities that cause damage to the environment.

DSA was appointed by Zwemkuil Gordonii CC (also referred to as the Applicant) as the independent environmental assessment practitioner (EAP) to undertake the Environmental Authorisation Application for the commencement of a listed activity in terms of the Environmental Impact Assessment Regulations 2014, as amended in 2017.

The Applicant would like to develop 504.7 Ha of which about 406Ha of vegetation will be cleared to establish pivots for irrigating maize/wheat/lucerne crops and also vineyard and nut trees. Of the 504.7 Ha about 98.7 Ha will be used as an offset area for rescued plants.

Currently the majority of the site host intact vegetation with some evidence of overgrazing and past cultivation. Soil samples were taken and analysed to investigate if the soil is suitable for establishing crops. The soil study indicated that the A and B horizons are characteristically sandy and therefore will facilitate good drainage. The drainage restricting layers were the major determining factor for suitability. Approximately 5% of the area has a shallow depth and is not suitable for irrigation or vineyard, while essentially 15% is suitable for vineyard production under drip irrigation. The rest of the area is suitable for all irrigation.

From an environmental point of view, 504.7Ha area should be under application, although only 406Ha would most likely be disturbed, the rest of the 98.7Ha that are located between the proposed ploughing areas should be used as an off-set area and to preserve if for conservation purposes and possible transplant of vegetation, depending on the outcome of the vegetation report.

An application to cultivate virgin soil (commonly known as a plough certificate) will also be applied for at the Department of Agriculture to ensure all legal requirements for such a development are met.

The Applicant has existing water use rights and therefore do not require additional applications for a Water Use Right. In the future, they might apply for an increase in usage, however, at this stage, it is not required.

ENVIRONMENTAL STUDIES

The environmental studies for this project will be divided into 2 phases. This Scoping Report is a product of Phase 1 and identifies issues and concerns which are required to be evaluated by specialists and documented in Phase 2.

PHASE 1

- This Environmental Scoping Report aims to identify potential and biophysical impacts associated with the proposed clearing of vegetation and to propose further studies that are required to be undertaken and included within the EIA and EMP report.
- This report acts as a discussion document, and comments from the Department of Agriculture, Environmental Affairs, Rural Development and Land Reform on this report are encouraged.

PHASE 2

- Further investigation and assessment of all potentially significant environmental impacts (social and biophysical) identified in the Environmental Scoping Report. Mitigation measures are to be recommended where required, and the completion of the Environmental Impact Assessment and Environmental Management Report.

INVESTIGATION PROCEDURE

DESK STUDY

The investigation commenced with a desk study of all available information. This provided information on environmental and technical studies that have been conducted and identified potential issues to consider. Historical documentation included all the documents submitted in the previous applications for this area, maps of the area, and land use.

The desk study revealed that this potentially could be a site to develop into cropland, but will depend on the field investigation, which should also include a soil survey and vegetation survey.

FIELD INVESTIGATION

A site visit was conducted on 15 February 2022 to investigate the sensitivity of the site and identify the listed activities that would be triggered for the application for environmental authorisation. The site can be divided into three sections: The Upper Western Section, the Upper Eastern Section, and the Southern Section (see Figure 1).

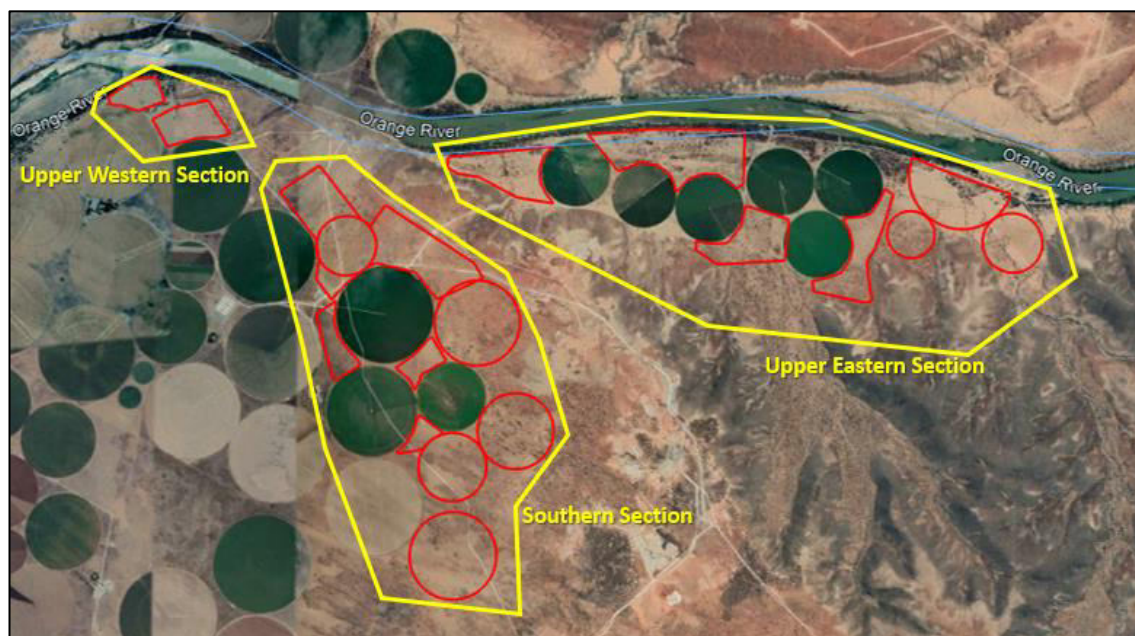


FIGURE 1: DIFFERENT SECTIONS OF THE SITE

During the site visit, it was noted that the area has received incredible amounts of rainfall due to the lush vegetation. The La Nina is a complex weather pattern that occurs every few years and has been the cause for the extreme wet conditions that occurred in December 2021 and the first part of January 2022 over large parts of the Summer Rainfall Area in South Africa, including most of the Northern Cape. The annual rainfall for the Northern Cape is sparse, generally between 50-400mm per annum, however in the study area, they received more than their annual rainfall within these two months.

Despite this amount of rain, it was noted during the site visit that the majority of the Upper Western Section and the Upper Eastern Section areas have been severely transformed, due to historic agricultural activities of more than 10 years ago. The majority of the areas not under pivots on the Southern Section is mostly used for grazing and can be considered fairly intact. In the Upper Eastern Section, there are a few drainage lines and due to the heavy rainfall, some of the drainage lines have caused severe erosion within the area under the application.

As per normal farming practices, the site has been portioned through fencing and would limit the movement of larger wild animals. No important ecological features with ecological functions were identified on the site.

A soil survey was carried out on the site and it was found that the A and B horizons are characteristically sandy and therefore will facilitate good drainage. The drainage restricting layers were the major determining factor for suitability. Approximately 5% of the area has a shallow depth and is not suitable for irrigation or vineyard, while

essentially 15% is suitable for vineyard production under drip irrigation. The rest of the area is suitable for all irrigation.

The soil texture results confirm the morphological interpretations and good drainage is expected on the soils where restricting layers are not present.

The laboratory results indicate that the chemical parameters are manageable. The exchangeable sodium percentage (ESP) values are low and the pH values indicate that salinity is not a major risk. The study area (excluding the Brandvlei soil areas) is of low risk to salinization, with low ESP and EC together with good drainage. A fertilization plan on soils with low CEC should be implemented to ensure maximum crop production.

DETAILS OF THE APPLICANT

Zwemkuil Gordonii CC (2007/054970/23)
P. O. Box 320
Prieska
8940
Cellphone: 071 682 3703
Email: zgprieska@gmail.com

LANDOWNER

Dirk Loots Familie Trust
Contact Person: Jurrie Loots
P. O. Box 320
Prieska
8940
Cellphone: 071 682 3703
Email: zgprieska@gmail.com

Dirk Ernst Loots
Contact Person: Jurrie Loots
P. O. Box 320
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8940
Cellphone: 071 682 3703
Email: zgprieska@gmail.com

Responsible person:

Mr. Jurie Loots will be the responsible person for this application. Jurie Loots is a member of the Dirk Loots Familie Trust and Ernst Loots is a family member that gave consent to this development.

LEGISLATION

Environmental legislation intends to regulate the interaction of human life with the natural environment. The purpose of environmental legislation is to protect and preserve the environment for current and future generations. The following Acts and Regulations apply to the proposed project and a summary of the most relevant environmental legislation is provided in this section.

1. Section 24 of the **Constitution of the Republic of South Africa Act (No 108 of 1996)** states that everyone has the right:
 - (ii) to an environment that is not harmful to their health or well-being;
 - (iii) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources, while promoting justifiable economic and social development.
2. The **National Environmental Management Act (Act No 107 of 1998)**. NEMA is based on the concept of sustainable development and the objective is to provide for co-operative environmental governance, by providing the legal framework for environmental planning and development.

NEMA has basic principles that state:

- That all the principles throughout the Republic apply to the actions of all organs of state that may significantly affect the environment;
- Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural, and social interests equitably.
- Development must be socially, environmentally, and economically sustainable.
- Sustainable development requires consideration of all relevant factors.
- Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated, and it must take into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option.
- There should be equal access to environmental resources, benefits, and services to meet basic human needs and the Government should promote public participation when making decisions about the environment;

- Decisions must be taken openly and transparently and there must be access to information;
 - Communities must be given environmental education;
 - Workers have the right to refuse to do work that is harmful to their health or the environment;
 - The role of youth and women in environmental management must be recognized;
 - The person or company who pollutes the environment must pay to clean it up;
 - The environment is held in trust by the state for the benefit of all South Africans; and
 - The utmost caution should be taken when permission for new developments is granted.
3. The **Environmental Impact Assessment Regulations: 324, 325, 326 & 327** of 7 April 2017. The purpose of these Regulations is to regulate the procedure and criteria as contemplated in Chapter 5 of the Act relating to the preparation, evaluation, submission, processing, and consideration of, and decision on, applications for environmental authorizations for the commencements of listed activities, subjected to environmental impact assessment, to avoid or mitigate detrimental impacts on the environment, and to optimize positive environmental impacts, and for matters pertaining thereto.

Duty of Care

Chapter 7 of the NEMA prescribed a general ‘duty of care’ and the requirement to remediate environmental damage. Section 28(1) of NEMA states:

Every person who causes/has caused, or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing, or recurring, or insofar as such harm to the environment is authorized by law or cannot reasonably be avoided or stopped, to minimize and rectify such pollution or degradation of the environment.

The Duty of Care can, inter alia, be enforced through directives issued by the competent authority.

In terms of 2014 NEMA EIA Regulations, as amended, the activities listed in the below Table (Table 1) will be triggered by the clearing of vegetation, thereby requiring an EA from the Department of Agriculture, Environmental Affairs, Rural Development and Land Reform (DAEARDLR).

TABLE 1: EIA LISTED ACTIVITIES

Government Notice No. R325 Activity No(s):	Details of Activity(ies) requiring a Scoping Report and EIA
GNR 325: Activity 15	The clearance of an area of 20 hectares or more of indigenous vegetation.

4. The **National Water Act (No. 36 of 1998) (NWA)**.

The Upper Western and Upper Eastern Section of the site is situated near the Orange River, with a few drainage lines on the site. Thus, to prevent environmental damage, the clearing of vegetation will not take place within 100m from the drainage line or the Orange River and would therefore also not trigger any listed activity in terms of NEMA or NWA (Section 21 (c)&(i)).

The landowner does have existing water use rights for irrigation, therefore at this stage, a Section 21 (a) application in terms of the NWA is not required.

5. The **National Environmental Management: Biodiversity Act:**

The act provides the framework for: i) the management and conservation of biological diversity within the Republic and the components of such biological diversity; ii) the use of indigenous biological resources in a sustainable manner; and iii) the fair and equitable sharing among stakeholders of benefits arising from bioprospecting involving indigenous biological resources.

The act also provides for co-operative governance in biodiversity management and by establishing a South African National Biodiversity Institute, the objectives of the Act can be achieved.

Three Regulations are applicable: 1) Threatened and Endangered Ecosystems, 2) ToPs (2008) (Threatened or Protected species), and 3) AIS (Alien and Invasive Species).

6. The **National Environmental Management: Protected Areas Act:**

The Protected Areas Act provides for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes. It provides for the establishment of a national register of all national, provincial and local protected areas and the management of those areas. The Act also provides for the governance and functions of South African National Parks and matters in connection therewith.

7. The **National Forests Act No. 84 of 1998 (NFA) & List of Protected Tree Species under the National Forest Act, 1998 (Act No. 84 of 1998)**.

The purposes of this Act are to promote the sustainable management and development of forests for the benefit of all. The Act also provides special measures for the protection of certain forests and trees and promotes the

sustainable use of forests for environmental, economic, educational, recreational, cultural, health and spiritual purposes.

According to the Act, a natural forest is defined as a group of indigenous trees whose crowns are largely contiguous or which have been declared by the Minister to be a natural forest under section 7(2). No person may cut, disturb, damage or destroy any indigenous tree in a natural forest; or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any tree, or any forest product derived from a tree within a natural forest.

The principals of the Act indicate that:

- a) Natural forests must not be destroyed save in exceptional circumstances where, in the opinion of the Minister, proposed new land use is preferable in terms of its economic, social or environmental benefits;
- b) A minimum area of each woodland type should be conserved; and
- c) Forests must be developed and managed so as to-
 - conserve biological diversity, ecosystems and habitats;
 - sustain the potential yield of their economic, social and environmental benefits;
 - promote the fair distribution of their economic, social, health and environmental benefits;
 - promote their health and vitality;
 - conserve natural resources, especially soil and water;
 - conserve heritage resources and promote aesthetic, cultural and spiritual values; and
 - advance persons or categories of persons disadvantaged by unfair discrimination. Page 15 of 82 (4) The Minister must determine the minimum area of each woodland type to be conserved in terms of subsection (3)(b) based on scientific advice.

The protected trees that commonly occur in this region are *Acacia erioloba* and *Boscia albitrunca*. The presence of these trees on site will be confirmed as part of the Ecological Impact Assessment to be conducted during the EIA Phase.

8. Conservation of Agricultural Resources Act (Act 43 of 1983):

The objectives of the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA) are to provide for the conservation of the natural agricultural resources of South Africa by the:

- Maintenance of the production potential of land;
- Combating and prevention of erosion and weakening or destruction of the water sources; and

- Protection of the vegetation and the combating of weeds and invader plants.

The CARA states that no land user shall utilise the vegetation of wetlands (a watercourse or pans) in a manner that will cause its deterioration or damage. This includes cultivation, overgrazing, diverting water run-off and other developments that damage the water resource.

The CARA includes regulations on alien invasive plants. According to the amended regulations (GN R280 of March 2001), declared weeds and invader plants are divided into three categories:

- Category 1 may not be grown and must be eradicated and controlled,
- Category 2 may only be grown in an area demarcated for commercial cultivation purposes and for which a permit has been issued, and must be controlled, and
- Category 3 plants may no longer be planted and existing plants may remain as long as their spread is prevented, except within the flood line of watercourses and wetlands.

It is the legal duty of the land user or landowner to control invasive alien plants occurring on the land under their control. Should alien plant species occur within the study area; this will be managed in line with the EMPr.

9. Bio-regional Plans:

In terms of the provincial and local protected areas, the area under application is situated within an area that has been identified as other natural areas according to the BGIS of the Northern Cape Biodiversity Conservation Plan and does fall within a critically biodiversity area 1&2. The Siyathemba Municipality Spatial Development Framework (SDF) identified areas within the Municipality

The purpose of the SDF is:

- To guide spatial planning, land development, and land use management in the local municipal area. More specifically, to geographically detail land use.
- To give strategic direction in terms of investment in the local Municipal area to the private sector and community investors concerning the levels, locations, types, and forms of investment that need to be made and that will be supported by the Local Municipality.
- The SDF identified impacts associated with mixed farming (crops and livestock) as:
 - The destruction of biodiversity;
 - Indigenous flora being substituted with exotic species;
 - The loss of herbaceous annuals;
 - Exposure of bare soil and subsequent erosion;
 - Areas are homogenized and ecosystem functioning on cultivated land is essentially simplified to the production of bio-mass;

- Depletion and degradation of soils may lead to unproductive soils.

The Siyathemba Municipality has mapped the environmental sensitivity of the municipal area in the SDF. The sensitivity is rated from 0-6 (0 being no sensitivity, 1 being low sensitivity, 6 being high sensitivity). According to the SDF, the site falls within an environmental area that is rated 2 and thus has low sensitivity.

The vegetation survey that will be conducted will verify the sensitivity of the site from a botanical and ecological point of view.

10. Northern Cape Nature Conservation (Act 09 of 2009):

The objective of the Act is to provide for the sustainable utilisation of wild animals, aquatic biota, and plants, to provide for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora, to provide for offences and penalties for contravention of the Act, to provide for the appointment of nature conservators to implement the provisions of the Act, to provide for the issuing of permits and other authorisations, and to provide for matters connected therewith.

This Act aims at improving sustainability in terms of balancing natural resource usage and protection or conservation thereof. It includes six schedules, as follows:

- Schedule 1 - Specially Protected species;
- Schedule 2 - Protected species;
- Schedule 3 - Common indigenous species;
- Schedule 4 - Damage causing animal species;
- Schedule 5 - Pet species; and
- Schedule 6 - Invasive Species.

With regards to protected flora, the Northern Cape Nature Conservation Act includes a list of protected flora. The plant species potentially present within the proposed project area will be identified as part of the Flora Impact Assessment specialist study. However, it will be recommended as part of the EMPr, that a detailed plant search and rescue operation be conducted before the clearance of vegetation. If any of the listed species are found, the relevant permits should be obtained by the Applicant before their relocation or destruction.

11. The Provincial Spatial Development Framework for the Northern Cape (Office of the Premier of the Northern Cape, 2012):

On 22 August 2012, the Northern Cape Provincial Spatial Development Framework (PSDF) was approved in accordance with the Northern Cape Planning and Development Act, 1998. However, the Spatial and Land Use Management Act (SPLUMA) was approved in 2013 and now requires the review of the Northern Cape PSDF 2012, which commences in 2018.

The PSDF needs to address spatial inefficiencies and inequalities, identify areas of opportunity and ensure proactive management of natural resources and ecosystems in the Province. The PSDF will focus on transforming spatial development whilst SPLUMA provides the tool for that transformation.

The approval of the PSDF in terms of the Northern Cape Planning and Development Act 7 of 1998 means that the PSDF has statutory status as the common spatial vision and strategy around which to align the future development and management of the province.

In terms of Land Use Management, there are 6 (six) Spatial Planning Categories, which are, 1) Category A (Nature Conservation Area); 2) Category B (Natural Buffer Areas) 3) Category C (Agricultural Areas); 4) Category D (Urban Related Areas); Category E (Industrial Areas); Category F (Surface Infrastructure Areas).

The SPCs are not a blueprint for land-use classification, or a zoning scheme, however, the SPCs provide a framework to guide decision-making regarding land use at all levels of planning, and they have been articulated in a spirit of creating and fostering an organised process that enables people to work together to achieve sustainable development in a coherent manner. The designation of SPCs does not change existing zoning or land-use regulations or legislation. SPCs merely help to clarify and facilitate coherent decision-making that can lead to better zoning, laws and regulations. The SPCs, furthermore, provide a framework in terms of which land-use decisions can be standardised throughout the province.

The land-use classification has further adopted a bioregional planning approach which provides for three broad land-use categories, i.e. a core conservation area (SPC A), a conservation focussed buffer area (SPC B), and a transition area (SPC C-F).

In terms of this application, the proposed development will fall within the Land Use Management Category C, since the Applicant would like to clear vegetation to establish intensive agricultural crop production. The plan is to establish a maize/wheat/lucern/vineyard/nut trees.

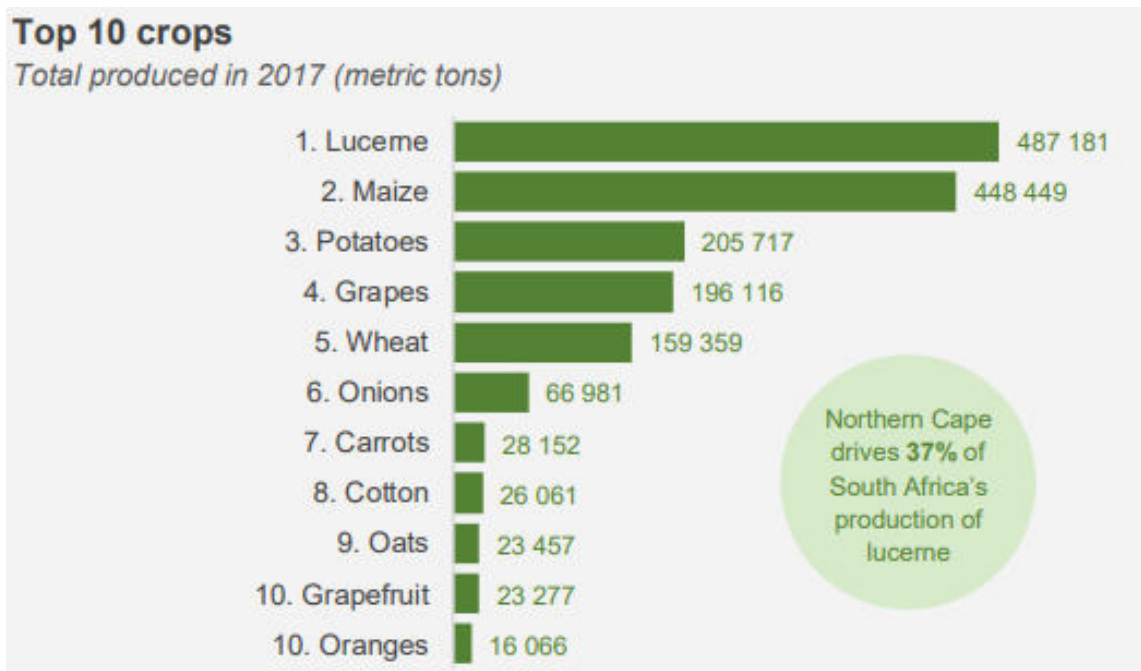


FIGURE 2: TOP 10 CROPS PRODUCED IN NORTHERN CAPE (SOURCE STATS SA, 2020).

The Northern Cape produces about 37% of South Africa lucerne (STATS SA, 2020) and about 9% of South Africa’s total maize production (Department of Agriculture, Forestry and Fisheries, 2017), therefore the proposed production is in line with the achievement of the agricultural sector in the Northern Cape.

In terms of the Agricultural Areas in Spatial Planning, the key strategies and intervention are:

- Giver effect to the ideas of the sustainable Development Goals pertaining to the promotion of sustainable agriculture and rural development.
- Development of an Agricultural Master Plan for the Province to identify and protect the most fertile land for cultivation and food security purposes.
- Consider the rezoning of low-potential agricultural land as a mechanism to promote sustainable economic development by unlocking the latent capital vested in non-agricultural uses through the Sustainable Development Initiative (SDI) approach.
- Encourage bona fide game farms to combine their landholdings to create an extensive Spatial Planning Buffer Area (SPC B), that would support biodiversity conservation in a meaningful manner. Such areas should be managed as Special Management Areas.
- Encourage local processing of farm products and the provision of local farm services to enhance the total economy, increase the viability of agricultural production and reduce rural poverty.

12. The **National Heritage Resources Act (No 25 of 1999)**:

The basic objectives of the National Heritage Resources Act are to set norms and maintain essential national standards and general principles for the governing and management of heritage resources in the Republic and to protect heritage resources of national significance.

The South African Heritage Resources Agency (SAHRA) has been established to coordinate and promote the management of heritage resources at the national level.

The proposed site is situated on agricultural land currently used for grazing, however, a heritage assessment will be completed during the EIA phase.

DETAILS OF THE AUTHOR

Natalie Sharp is the project manager and senior Environmental Assessment Practitioner leading this project and is registered as an Environmental Assessment Practitioner (EAP) with the Certification Board for Environmental Assessment Practitioners of South Africa (EAPSA) (Registration Number: 2020/230) and as a Professional Natural Scientist (Pri.Sci.Nat) with the South African Council for Natural Scientific Professions (SACNASP) (Registration Number: 123443) (see Appendix A). Natalie Sharp has worked in the environmental industry for over seventeen years.

CURRICULUM VITAE

NATALIA SHARP

Personal Details	Date of birth: 12 August 1979 Nationality: South African Identity number: 790812 000 7080 Gender: Female Languages: English / Afrikaans
Qualifications:	BSc (2000) UFS – Zoology and Botany BSc Honors (2001) UFS - Limnology Masters in Environmental Management (2003) UFS - Evaluation of Phytoplankton as an indicator in a biomonitoring program, with special reference to the Modder River.

During the 2 years associated with the Centre for Environmental Management intense training was provided for equipping Natalia Sharp with adequate knowledge in terms of biomonitoring water systems and scientific report writing for research done by her through the Centre. Various scientific contributions were made during these few years which included formal reports to Bloem Water and seminars providing management principles for polluted water bodies, thus providing her with additional regulatory and environmental skills.

During the 5 years associated with the DME, now changed to the Department of Mineral Resources (DMR), vast knowledge was gained in terms mine environmental management, the development, rehabilitation and closure of mining and prospecting areas. Environmental Management Programmes, Environmental Performance Assessment Reports, and Closure Reports were scrutinized continually. Therefore, adequate expertise was gained to assist the applicants with relevant environmental and mining advice and providing her with adequate knowledge to evaluate environmental impacts relating to mining.

During the 11 years associated with SES (Stellenryck Environmental Solutions), Natalia Sharp has obtained immense understanding in completing environmental impact assessments, not only associated with mining projects, but also for a wide variety of different developing projects such as Light Industrial developments, Road upgrade projects, bush clearing for agricultural developments, and applications for exemptions, and so forth. She has excellent experience in writing environmental reports, which ranges from Scoping Reports, Environmental Management Plans, Environmental Awareness Plans, Mining Work Programs, Closure Plans, Risk Assessments, Performance Evaluations on projects, and Plan of Study reports. She has also been involved in performing biomonitoring on river systems associated with some of the projects, completing it by obtaining all the data and writing the Biomonitoring Report for the relevant Department. This is mainly attributed to her Limnology background and she is competently able to add value to this field in her current position.

Experience (Seventeen years' experience in environmental law and environmental management)

Previous Employment

Centre for Environmental Management University of the Free State: Lab Assistant [2001 – 2003]
Mine Environmental Management [2003-2005] at the Department of Mineral Resources: Environmental Officer
Mine Environmental Management [2005-2008] at the Department of Mineral Resources: Senior Environmental Officer
Stellenryck Environmental Solutions: Senior Environmental Practitioner [2008-2019]

Current Employment

Digital Soils Africa Pty Ltd: Senior Environmental Practitioner [2020-currently]

Digital Soils Africa Pty Ltd (DSA) is an independent environmental consulting firm that is also soil specialists, focussing on all soil solutions in the agricultural and environmental fields. The specialists are SACNASP registered and recognized leaders in their fields of study.

The soil specialist services provided include soil surveys, soil erosion mitigation, fertilization management, soil and land capability studies, and wetland delineation amongst others, while the fields of specialization are hydropedology and digital soil mapping. Together the directors have 58 years of experience.

Prof. Pieter le Roux boasts more than 35 years of experience as a soil scientist. He is the initiator and main driving force behind hydropedology research in South Africa, which has earned him a C2 NRF research grading. As such, he has published more than 50 peer reviewed scientific publications, but also oversaw more than 40 consultancy projects. He is SACNASP registered and recently co-produced a webinar on hydropedology.

Prof. Johan van Tol is currently the national leading researcher on hydropedology. He is a Y1 NRF rated researcher, who boasts 34 peer reviewed scientific publications and has put his research to work in more than 30 consultancy reports. He is also a SACNASP registered scientist.

Dr. George van Zijl is Africa's foremost Digital Soil Mapper. For his PhD he developed a DSM protocol for use in southern Africa, and has subsequently improved the methodology to include machine learning such as shown in the mapping of Ntabelanga catchment and City of Joburg Hydropedological mapping. He has served on the scientific committee for international DSM conferences. George has conducted more than 60 consultancy projects and is a SACNASP registered scientist.

Dr. Darren Boucher boasts 10 years' experience as a soil scientist. His PhD incorporated chemical measurements into hydropedological assessments, which improves flow path determination. He has also completed a post doctorate at Ghent University, Belgium, where he specifically worked on hydropedological modelling. Darren is a SACNASP registered scientist and has completed more than 45 consultancy reports.

DESCRIPTION OF THE RECEIVING ENVIRONMENT

SITE LOCATION

The site is situated north-east of Prieska in the Northern Cape (29° 26' 05.43"S; 23° 03' 03.81"E most centre point of the site) on Portion 2 and the Remainder of Farm Zwem Kuil No. 37 and the Remainder of Farm Smitskloof No. 38, within the Siyathemba Municipal area. The farm can be reached by travelling along the R357 for about 18km onto the Muishoek road. This Muishoek road turns into a gravel road and the farm is reached about 30km straight along this gravel road, until a T-junction is reached. Zwem Kuil farm is left off the T-junction, for another 5km.

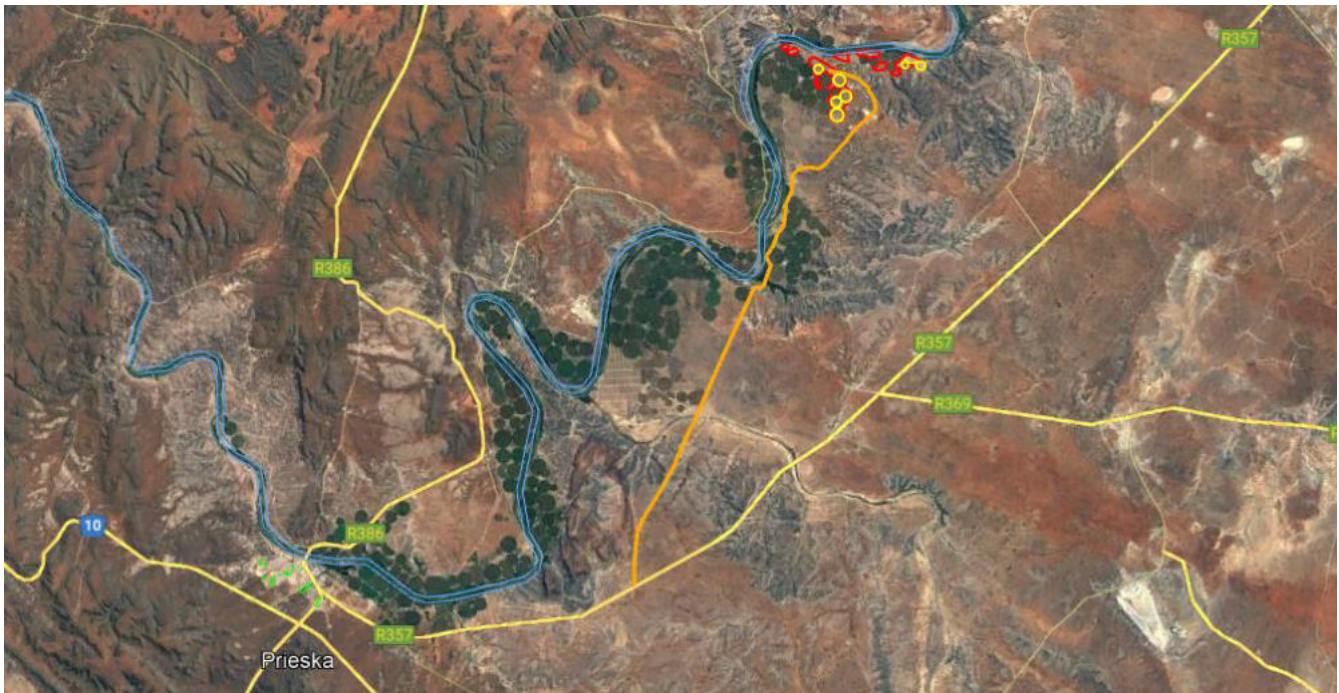


FIGURE 3: SITE LOCATION. THE ORANGE RIVER IS THE BLUE LINE, THE MUISHOEK ROAD IS THE ORANGE LINE, THE PROPOSED SITE IS REPRESENTED BY THE RED AND YELLOW POLYGONS.

PROJECT DESCRIPTION

In terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), an Environmental Authorisation (EA) must be obtained from the relevant competent authority before commencing with any listed activity that may impact the environment. The Applicant would like to clear more than 20Ha of vegetation to establish crops for agricultural purposes.

The Applicant already has a Water Use License, for the abstraction of water for irrigation and is in the process of obtaining approval for cultivating virgin soil (commonly referred to as a plough certificate) from the Directorate Land Use and Soil Management of the Department of Agriculture.

The area under application is not regarded as a site of ecological importance when studying the vegetation nor does the site have any high conservation value. The development is however situated close to the Orange River on a fairly flat, undulated landscape.

PLANNING PHASE

Although 504.7 Ha are under application, only 406 Ha will potentially be cleared from vegetation to establish crops. Thus, during the planning phase, the location of the crops and pivots must be determined based on soil suitability. There are existing pivots on the farm and the applicant would like to establish another 7 (seven) pivots for maize and lucerne crops and utilise the areas between the existing pivots on the farm for either vineyard or pecan nut crops.

The soil report and findings were the leading factors in deciding to allocate the crop areas. Deep soil depths, favoured soil types, and drainage led to the best soil suitability areas. The soil report identified a fairly large area in the northern part of the Southern Section, as unsuitable for irrigation, mixed with a portion suitable for vineyard production, under drip irrigation as the soil could be mechanically altered to accommodate vineyards. The area for vineyard production was approximately 76 Ha. The areas not suitable for irrigation or vineyard production were the Coega and parts of the Glenrosa, Vaalbos, Plooyburg, and Brandvlei soil forms. Soil that had a freely drainable depth of <700 was unsuitable for irrigation and vineyard production.

Considering the soil findings, the vineyard should be restricted to the northern part of the Southern Section, but should not exceed more than 10% of unsuitable soil in the area. This principle should apply to the rest of the site, where the soil was identified as suitable and not suitable.

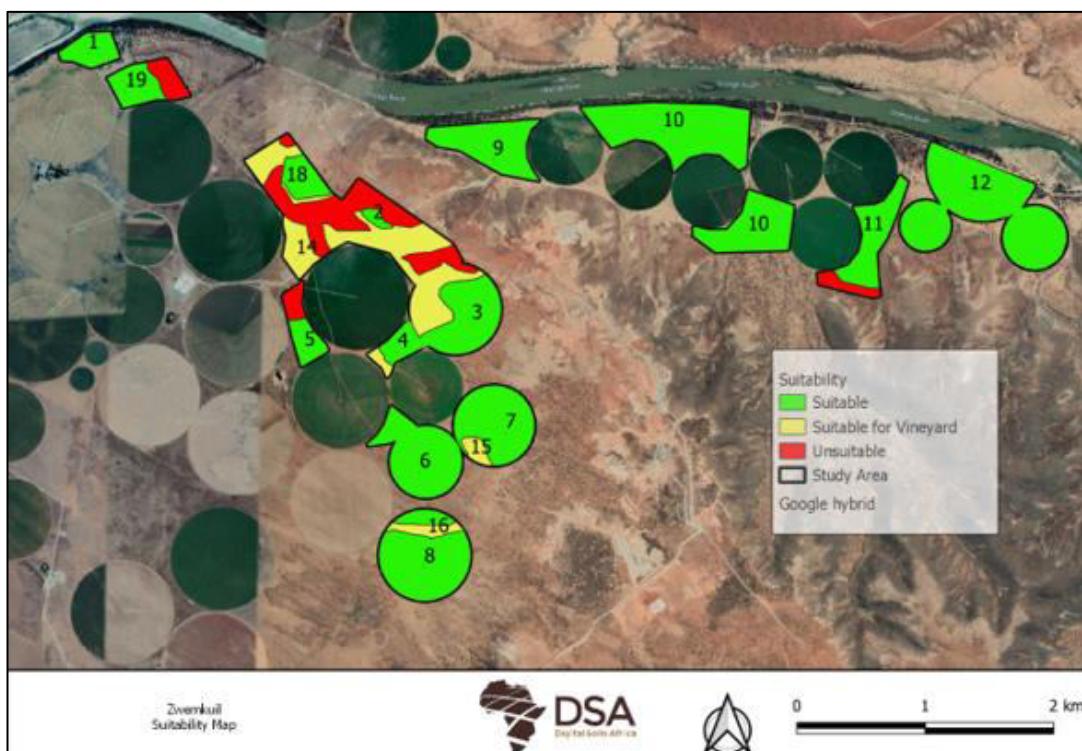


FIGURE 4: SOIL SUITABILITY MAP FROM THE SOIL REPORT

Ultimately, the study area under application is 504.7 Ha, but if the proposed areas are developed only 406Ha will be cleared from vegetation while the rest of the 98.7Ha will be left undisturbed and can be used as a nursery if plants are identified to be transplanted and conserved.

CONSTRUCTION PHASE

The clearance of vegetation will take place over the next 5 years. The construction phase will result in the clearing of natural veld on the allocated suitable areas according to the soil report and preparing the soil. Soil tillage, particularly primary tillage, is the foundation of any crop production system and is the biggest cost factor (du Plessis, 2003). According to du Plessis (2003), the most important processes affected by soil tillage include infiltration and evaporation of water. Because water availability during the growing season is the single most important factor in crop production in South Africa, soil tillage must be aimed at optimising infiltration and minimising evaporation.

According to the soil report, the A and B horizons are characteristically sandy and therefore will facilitate good drainage. Approximately 5% of the area has a shallow depth and is not suitable for irrigation or vineyard, while essentially 15% is suitable for vineyard production under drip irrigation. The rest of the area is suitable for all irrigation.

The laboratory results indicate that the chemical parameters are manageable. The exchangeable sodium percentage (ESP) values are low and the pH values indicate that salinity is not a major risk. The study area (excluding the Brandvlei soil areas) is of low risk to salinization, with low ESP and EC together with good drainage. A fertilization plan on soils with low CEC should be implemented to ensure maximum crop production.

Thus during the construction phase and into the operational phase, soil management will be the most important principle to apply to manage the chemical parameters and prevent soil degradation.

In terms of general soil requirements for vineyard production during the construction phase:

- Vineyards are best suitable for soil that has a pH between 5.5 and 6.5 and requires phosphorus between 40 to 50 ppm and a soil depth of between 600 mm and 800 mm is required. Therefore the areas allocated for vineyards in the soil report should be used for this crop and the areas should be pegged out.
- The soil should be deeply ripped to allow the roots to penetrate the soil and access water and nutrients.
- The soil texture at the site is generally very sandy, with clay percentages generally under 20%, thus dryland vineyards will not be suitable for these soil types as no water would be retained. During the construction phase, after the site has been cleared and ripped and vine trees planted, a drip irrigation system should be installed that would be better suited for the soil type.
- The pH is not within the optimal range and acidic fertilization should be applied; it is also expected that soil pH will decrease with continued cultivation.

In terms of general soil requirements for Pecan nut production during the construction phase:

- Pecan nut trees perform best in fertile, well-drained, deep soil which consists of a medium texture. The soil depth should at least be 2 m deep.
- The soil should not be calcareous as calcareous soil causes deficiencies in micro-nutrients, especially zinc. The pH recommendation for pecan-nut trees is 6.5 to 7. Suitability for pecan-nut trees were defined as suitable (depths of 1000 mm and non-calcareous) and moderately suitable (depths of 1000 mm and calcareous) and the areas allocated for pecan nuts in the soil report should be used for this crop and the areas should be pegged out.
- Pecan-nut trees prefer soil that is freely drained and has a sandy loam texture. All the soils meet the textures requirements.
- The pH(KCl) of the soil samples is between 5.7 and 7.4. More acidifying fertilizers should be applied in the alkaline soils (Red apedal of profile 75 and Orthic of profile 88). A slightly acidic pH was found for the rest of the area. Liming is not required on the alkaline soils as it is anticipated that the pH will lower with continued cultivation and irrigation. More alkaline soils could lead to micro-nutrient deficiencies.
- Calcium carbonate (Found in Coega and Brandvlei and soils with Neocarbonate horizons) exerts a major influence on P fixation. The phosphorous within the soil (6-8 mg/kg) is low. Phosphate availability is largely dependent on the pH. Soil pH values below 5.5 and between 7.5 and 8.5 limit phosphate availability to plants due to phosphorous being highly fixated at very low pH soils (pH 3-4) and moderately fixated at pH 7.5-9. Therefore, the more alkaline soils of Zwemkuil could experience P deficiency.
- The Zinc requirements within areas where pH is higher than 7 (Red apedal of profile 75 and Orthic of Profile 88) are especially at risk for zinc deficiencies.
- Thus, the pH is not within the optimal range and acidic fertilization as well as Zn should be applied; it is also expected that soil pH will decrease with continued cultivation.

In terms of general soil requirements for maize/other crops:

- Once the vegetation is cleared, the soil will be deep ripped, which will further improve drainage
- Once the soil is prepared, the maize or wheat will be planted.

Most of the workforce will be sourced locally or provincially.

OPERATIONAL PHASE

After about 5 years after the commencement of the project, all the areas applied for should be cleared and crop production should be established. It will be managed and maintained by the farmer and will be a permanent

establishment. It is also the intent of the Applicant to rest the maize and crop fields annually through rotating crops. Resting camps will be grazed by cattle, feeding on crop residue and pasture land would be established.

In terms of the vineyard:

- During the operational phase regular soil sampling will inform the farmer of best management practices concerning alkalinity/acidity.
- It is recommended that phosphate be applied to prevent plant deficiencies.

In terms of the pecan nut crops:

- Regular soil sampling will inform the farmer of best management practices concerning alkalinity/acidity.

As with the operational phase, the workforce (upkeep of the land) will be sourced locally.

DECOMMISSIONING PHASE

This is a permanent change from grazing to crop production. Should the activity be authorized, it is highly unlikely that the proposed development will be decommissioned. However, should crop production cease, the site will be used for pasture. Should the Applicant elect to decommission the crops and pasture land at any point in the future, the necessary authorization must be obtained and the correct decommissioning protocol must be followed. The relevant Government Departments (those applicable at the time of decommissioning) should be consulted before decommissioning.

Following the decommissioning, the site should be rehabilitated back to a predetermined state, e.g. sufficient for grazing or a near-natural state with natural vegetation cover. A qualified botanical specialist should be contacted for more information on rehabilitation techniques.

ALTERNATIVES INVESTIGATED FOR THE PROPOSED DEVELOPMENT

Alternative sites/land use/layout are chosen based on the outcome of the site investigation and proposed activities, which determine the social and environmental impacts. In the process, each environmental parameter and the possible impact of bush clearing is considered and investigated to determine any alternative location/land use/layout or method that could reduce the environmental and social impact and improve the sustainability of the project.

The investigation has led to no alternative sites being chosen for this particular project since no alternative land is available that belongs to, or is rented by the Applicant, which has water use rights.

Alternative land uses, instead of agriculture will not be considered, since it involves an application for change of land use and the landowner does not wish to change the land use of the property.

The soil report indicated that a vineyard can be established on at least 76Ha of the site, while 330Ha is suitable for maize, wheat, lucerne, and pecan nuts. Because the proposed pivots and clearing of vegetation is between existing pivots or extensions thereof, the ecological connection will not be fragmented. A desktop study of the vegetation indicated that the Upper Western Section, most of the Upper Eastern Section and a portion of the Southern Section is situated on the Upper Gariep Alluvial Vegetation type, while the rest of the Southern Section is situated on the Northern Upper Karoo vegetation type.

In terms of the Upper Gariep Alluvial Vegetation, the conservation status is: Vulnerable. Only about 3% statutorily conserved in Tussen Die Riviere, Gariep Dam and Oviston Nature Reserves. More than 20% were transformed for cultivation (vegetables, grapes) and the building of dams. Exotic woody species such as *Salix babylonica*, *Eucalyptus camaldulensis*, *E. sideroxylon*, *Prosopis* and *Populus* species have become common dominants in patches of heavily disturbed alluvial vegetation (Mucina and Rutherford, 2006).

In terms of the Northern Upper Karoo the conservation status is: Least threatened. Target 21%. None conserved in statutory conservation areas. About 4% has been cleared for cultivation (the highest proportion of any type in the Nama-Karoo) or irreversibly transformed by the building of dams (Houwater, Kalkfontein and Smart Syndicate Dams) (Mucina and Rutherford, 2006).

In terms of alternative site layout, irrigated lands are prone to salinization and water-logging because of added salts brought in by irrigation water. The properties of soil must adhere to the infiltration of water through the soil as well as the built-up of sodium and salt. It was, therefore, essential to investigate the soil properties for the sustainability of the proposed irrigation project and to prevent situations where the soil could reach the extent where it cannot be vegetated anymore.

The suitability of the area was defined into 3 categories namely, Suitable, Suitable for vineyard, and Unsuitable. Soils not suitable for irrigation, but which had freely drainable depths of at least 700 mm, i.e., soils with a depth of 700 – 1000 mm, would be suitable for vineyard production, with the provision that the soils are broken, and deep ripping is done.

Approximately 330 ha is suitable for irrigation. According to the soil report, soils with a freely drainable depth of 1000 mm, which included the Hutton, Augrabies, Prieska, Addo, and sections of the Plooyburg, Prieska, Glenrosa and Vaalbos soil forms were suitable for irrigation. The soil forms not suitable for irrigation (Sections of the Plooyburg, Vaalbos, Brandvlei, Prieska, and Glenrosa) were suitable for vineyards under drip irrigation as the soil could be mechanically altered to accommodate vineyards. The area for vineyard production was approximately 76 ha. The areas not suitable for irrigation or vineyard production were the Coega and parts of the Glenrosa, Vaalbos, Plooyburg, and Brandvlei soil forms. Soil that had a freely drainable depth of <700 was unsuitable for irrigation and vineyard production.

Therefore the findings in the soil report are very specific and alternative pivot layouts or crop production would not be recommended to prevent soil degradation and crop failure. Considering the suitability of the soil for irrigation (see Figure 5) most of the area is suitable for maize, lucerne, wheat, etc, except for the northern part of the Southern Section of the study area, which, according to the soil report is mostly suitable for vineyard production. Therefore no alternative site layout will be considered, other than what is proposed by the soil report.

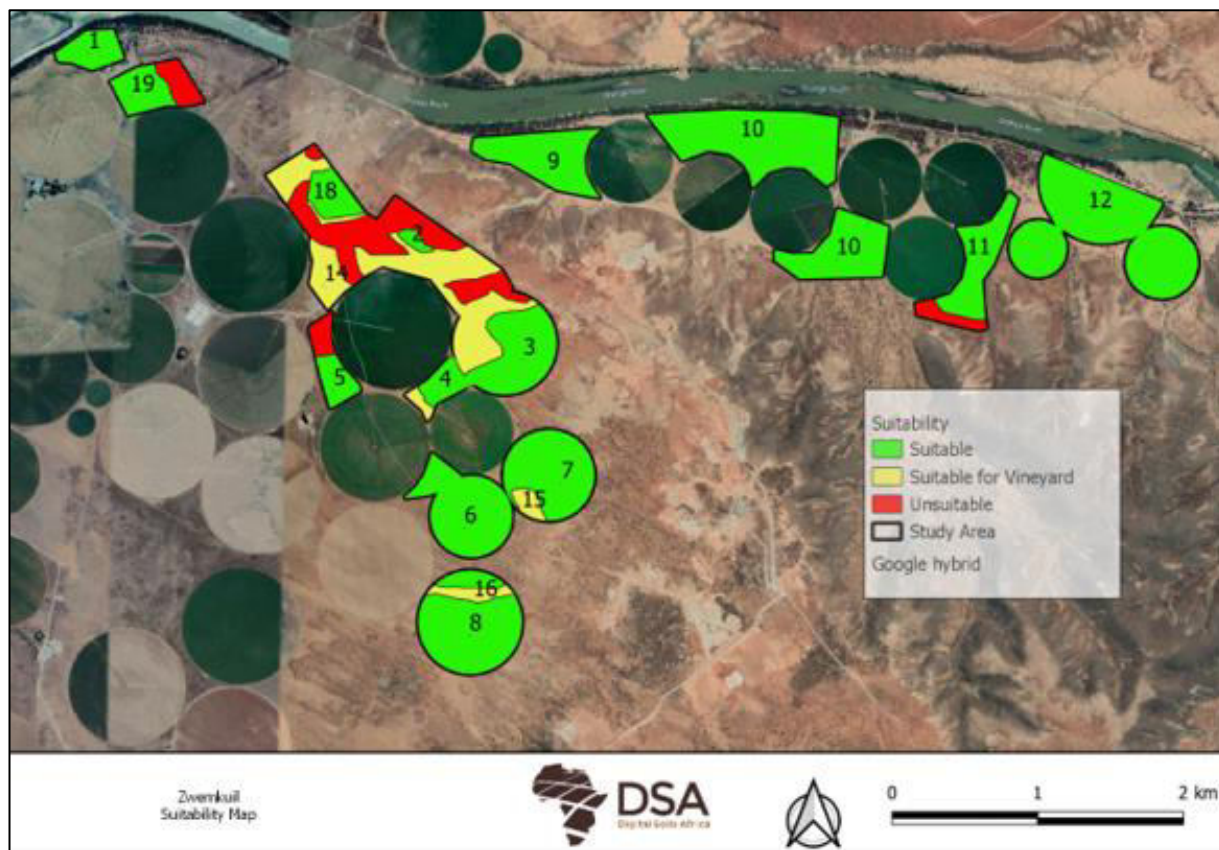


FIGURE 5: IRRIGATION SUITABILITY OF THE STUDY AREA (DSA SOIL REPORT, 2022).

In light of this, it is recommended that this site be developed, with the benefit of socio-economic improvement and job creation opportunities, while remaining an agricultural unit. Developing this farm will be the best viable land-use option for the applicant who is also the landowner.

In terms of the ‘no-go’ option; if the site is not developed there will be no change (good or bad) to the status of the site; it will remain as-is: areas that have been severely impacted due to past agricultural practices and areas that are fairly intact and used for grazing. Considering that the proposed study area is directly adjacent to established pivot areas, it will be a continuation of the development on the farm.

From an economic and agricultural point of view, it is better to develop the area and improve the agricultural potential of the land and from a soil management perspective to allow crop rotation production. Therefore, in the

EIA no alternative site, no alternative land use, and the 'no-go' option will not be considered or evaluated. The EIA will assess the impacts of the area under application only.

NEED AND DESIRABILITY OF THE PROJECT

The purpose of this Environmental Authorisation Application is for the Applicant to obtain permission from the Department to develop 504.7 Ha of which about 406 Ha of vegetation will be cleared to establish crops and pasture land, alternating years. Resting camps will be grazed by cattle, feeding on crop residue and pasture land would be established. During the resting period, attention will be given to soil upgrading, as suggested in the soil report.

The benefit of crop rotation is of great value to farmers not only from a financial perspective but also from an environmental and social-economic perspective. Rotation can also help manage diseases caused by pathogens that survive in the soils or in crop debris and pathogens whose populations decline in the absence of a susceptible host (Semini, 2020).

In terms of insect management, crop rotation is not effective for managing insect pests, but crop rotation can be used to break the life cycle of such insect pests with limited mobility and narrow host ranges.

According to Semini (2020), crop rotation can also be used to help manage weed problems, because different crops compete with weed species in diverse ways. Crops vary in their time of planting rate of canopy development, canopy height, row spacings, and harvest times, which creates varied environmental conditions that can prevent the buildup of a few weed species.

Thus from a socio-economic perspective, crop rotation can reduce the financial risk on the Applicant, not only saving him money on the costs of herbicides but also reducing the risk of a potential loss on abutting crops as a result of pathogens or insect pest outbreaks.

From an environmental and financial perspective, and in terms of soil moisture management, normally the late summer and early autumn rainfall results in some moisture storage and retention in the soils for the next production season. However, in the event of a drought, especially if monocultures such as maize are planted, the farmer can potentially face a dire situation of being unable to plant the next maize at the start of the season (Grain SA, 2016). Crop rotation and moisture conservation practices can reduce drought risks and will ensure that a variety of crops can be planted over a much longer period from October to January in a particular summer production season.

From a nutrient requirement and soil management perspective, crops differ in their nutrient requirements and their abilities to extract nutrients from the soil. Legumes such as lucerne help fix nitrogen in the soil and when it dies, the fixed nitrogen is released and becomes available to other plants. A mature maize plant, on the other hand, has total nutrient uptake of 8.7g of nitrogen, 5.1 g of phosphorus, and 4.0 g of potassium. Resulting in each ton of grain

produced removes 15.0 - 18.0 kg of nitrogen, 2.5-3.0kg of phosphorus, and 3.0-4.0 kg of potassium from the soil (du Plessis, 2003).

Thus the benefit of rotating maize with lucerne will increase soil nitrogen and carbon content in the soil (Huynh, *et al.* 2019). In the Huynh, *et al.* study, maize was rotated with lucerne and it was found that crop rotation led to a higher yield than continuous maize planting as a result of this soil relationship. It also found that the significant effect of crop rotation on the yield of the following maize crop continued after two cycles of a 4-year crop rotation. This soil relationship will also reduce the application of fertilizers and reduce the potential impact on water resources.

The influence of agriculture practices on water quality (activities on farms that leads to an increase in nitrogen (N) release into water resources) has promptly improved farming practices to optimize the use of fertilizer N and reduce N loss to surface and groundwater. According to Al-Kaisi (2021) crop rotation can play a major role in minimizing the potential risk of nitrate leaching to the surface and groundwater by enhancing soil N availability, reducing the amount of N fertilizer applied, and minimizing the potential risk of N leaching. This can lead to a positive impact and the receiving environment.

Overall, the advantages of proper planning of a crop rotation system will ultimately include better moisture conservation, reduced financial risk, reduce mechanization costs and improve crop and soil health to ensure a sustainable farming future, and therefore the desirability of this project.

Maize and wheat will be planted, rotating with lucerne the following year and so forth and in terms of the need for this project, maize and wheat are an important field crop in South Africa, serving as the staple food for the majority of its population, particularly for low-income households (Ala-Kokko, 2021). Maize is also the major feed grain for the animal feed industry.

In South Africa, there is a surplus of maize production, which forces industry role players to utilise maize in one of two ways (BFAP, 2015). The first option involves exports. South Africa exported 2.5 million tons of raw maize (or 19 percent of maize production) during the 2013/14 season, with leading export destinations including Japan, China, Mexico, Namibia, Zimbabwe, and Mozambique. The second option is to transform maize into secondary or value-added products,¹ such as maize meal, animal feed, and starch (BFAP, 2015).

The maize industry is important to the economy both as an employer and earner of foreign currency because of its multiplier effects (Mogala, 2017). This is because maize also serves as a raw material for manufactured products such as paper, paint, textiles, medicine, and food. The industry is divided into commercial and developing agriculture.

Although fluctuating, there has been a general increase in the contribution of the maize industry to the gross value of South African agricultural production (GVP) from 2006 of about 10 billion rands to 2016 of just under 30 billion Rands. The Northern Cape contributes to 9% of maize production in South Africa.

About 45 000 people are employed in agriculture in the Northern Cape, which represents approximately 16% of employment. The province supports livestock farming (mainly goats and sheep with cattle in the north), table grapes,

dates, cotton, cereal crops, and vineyards along the banks of the Orange River and large varieties of crops including cotton, groundnuts, wheat, and maize on irrigated lands (including the large Vaalharts scheme) (Young, 2017).

In terms of wheat, the Northern Cape produces about 262 800 tons per year (DAFF, 2016). According to Coale (2017), wheat is important to South African food security. South Africa has become a net wheat importer, due to the significant drop in wheat area planted since the abolishment of the fixed price marketing system provided by the wheat board in 1997. Further, recent political uncertainty has resulted in the South African Rand devaluing (by 58% to the USD during 2012–2017), leaving South Africa exposed to risk in global wheat and exchange rate markets and increasing its food insecurity vulnerability. Thus, an assertive effort has been made to break South Africa's dependence on imported wheat by increasing wheat yields per hectare (Coale, 2017).

South Africa experienced its worst drought in 23 years in November 2015 and food insecurity spiked. According to STATSSA (2016), the number of 41% of households in the Northwest territory and 32%, 31%, and 26% in the Eastern Cape, Northern Cape, and the Free State respectively ran out of money to buy food. This disparity was driven by the fact that cereal prices (mainly maize and wheat) rose by an estimated 53.7% for the same time period (STATSSA, 2016). A situation that one would like to avoid in the future.

Four years later, South Africa is set to grow in importance as a grain exporter in 2020-21, on the back of an increased corn harvest and increased demand from its neighbors. The country's economy, like many, is reeling from the effects of the COVID-19 pandemic, although it has not directly had a major effect on farm output (Lyddon, 2021).

For the year 2020-2021, the International Grains Council (IGC) placed South Africa's total grains production at 18.6 million tonnes, up from 18 million the previous year. The total includes 2.1 million tonnes of wheat, compared with 1.5 million in 2019-20. The country's corn crop in 2020-21 is put at 15.8 million tonnes, down from 16 million the year before (Lyddon, 2021).

Lyddon further reports that South Africa's total grain imports in 2020-21 are put at 2.2 million tonnes, down from 2.9 million the year before. Its grain exports are forecast at 2.8 million tonnes, up from 2.1 million. Forecast imports include 1.9 million tonnes of wheat, down from 2.4 million in 2019-20. Exports include 2.7 million tonnes of corn, compared with 1.9 million the previous year. This is important since maize and wheat are the staple food for the majority of South Africans and it reduces food insecurity. If less wheat and maize are imported it benefits the households reliant on the staple food, if more wheat and maize are exported, it benefits the farmer and Gross Domestic Product (GDP) of the area which is a positive economic impact.

At this stage, lucerne will be planted on alternative years during the rest period for the land. Lucerne has excellent qualities for grazing, but it can cause bloat, which can be treated.

In terms of the vineyard, according to Gale, 2020 the South African raisin industry is poised for a significant expansion in the next few years and this application will be in line with this projection. In 2019 the raisin production was a record 74 830 tonnes from a total planted area of 13 085Ha across the Northern and Western Capes.

The annual raisin production is around 70 000 dried tonnes and there are about 1 000 growers in total. A 2019 vine census showed that seedless sultanas account for an estimated 34% of total cultivars. Merbein seedless raisins are at 41%; Selma Pete 9% (which is known for being the most resistant to rainfall); Sugra 39 and currents at 4% each; and Flame seedless 3%. About 85% of all production is exported. In percentage terms, the UK accounts for 7% of total export while the EU collectively imports 49%. Canada and the USA imports 12%, Russia 12%, Africa 9%, the Middle East 2% and the Far East 2%.

South Africa's strategy is based on the long-term sustainability of the South African raisin industry. Raisins can only be produced under certain climatic conditions and the Northern Cape benefits from plenty of sunlight and very warm weather which means that a premium quality raisin can be produced with minimal to zero traces of chemical residues. Raisins are known for being excellent quality products and the production of fresh grapes average 30-35t/Ha on new varieties, which reduces to 20-25t/Ha on old varieties.

In terms of the socio-economic benefit, it is no secret that South Africa has one of the world's highest unemployment rate, with the IDP of the Siyathemba Municipality indicating that in 2009 the unemployment rate was about 34.7%, which has steadily increased over the past decade. A small portion of workers (10.3%) can be classified as highly skilled, but more than 52% of workers can be regarded as semi- or unskilled workers.

Therefore, the raisin industry plays a key role to generate economic activity, creating jobs, earning foreign currency and stimulating rural economies in general. According to Raisins SA, the production of raisins will:

- Produce a total GDP in the region of R 4.1 billion at constant 2019 prices;
- Resulting in total Capital utilisation of R5.1 billion;
- Sustain 30 110 job opportunities, of which just over 16 079 will be for unskilled workers; thereby significantly contributing to South Africa's job creation and poverty alleviation goals for unskilled workers;
- Generate just over R2 791 million in additional household income, of which over R 611 million will accrue to low-income households; thereby significantly contributing to poverty alleviation and;
- Generate additional Government Revenue of just over R1 122 million.

In terms of pecan nut production, according to Global Africa Network (2020), production of pecan nuts grew from 5 000 tons in 2010 to 10 500 tons in 2015, and the figure continues to rise as world markets react positively to the South African product. At one time it was thought that pecan nuts were better suited to tropical and subtropical climates, but the consensus is now that the Northern Cape is ideal for the cultivation of the versatile and healthy nut.

It costs around R140 000/ha to establish and grow the trees (at 100/ha), which includes soil preparation, hiring of equipment such as bulldozer and tractor disc, contractors, trees, labour, installing an irrigation system, etc. Thus there is an initial outlay of costs with benefits to employees, contractors and nurseries but no economic benefit to the farmer, as it takes six to eight years for a tree to start producing nuts, and around 10 years until a farmer can start turning a profit. According to Dugmore (2011), it takes one mature pecan nut tree of about eight years old to produce an average of 20kg/year of pecan nuts at the average nut-in-shell (NIS) price paid to the farmers producing

larger nuts from the hotter, drier regions above R80/kg (Botha, 2018). Or, alternatively, the income from 50kg of pecan nuts harvested from two trees is equivalent to that from 1t of maize. According to SAPPA records, the pecan nut industry in South Africa is expanding by 2 000ha/year and therefore holds large economic benefit to the farmer and employment opportunities to the community.

Most of the agricultural economy consists of extensive farming of sheep and goats, as well as game farming. However, there is intensive agriculture along the Orange Riet Canal System, along the upper Orange River (Coleberg-Hopetown area), and along the middle Orange River area. Prieska is a centre of irrigation farming.

If this project is approved, it is expected that at least 50 previously disadvantaged individual employment opportunities on the farm would be created. Although this would seem a small number, for those families, it would mean a steady monthly income and other benefits over and above monthly salaries. The permanent work for these families must be seen as a small but positive contributor to the upliftment of farm workers in this region.

This development will not only benefit the Applicant but will also create job opportunities for a few low-income households that will assist in poverty alleviation. It is thus clear that crop production, as proposed by the Applicant, will contribute to economic growth within the Siyathemba Municipal area and achieve the IDP objective of ensuring sustainable jobs.

ENVIRONMENTAL IMPACT ASSESSMENT

ENVIRONMENT

Field and desktop studies were completed to establish which impacts might potentially be significant/insignificant and which impacts would require a specialist study.

The environmental parameters are identified and discussed below and potential impacts are classified. A complete Environmental Management Programme (EMP) will be compiled during the EIA process (second phase of the application) to mitigate, manage or eliminate the impacts. As a minimum the EMP document will contain:

1. The environmental impact assessment rating,
2. Specific mitigation measures and guidelines for the development to proceed in the most environmentally sustainable manner,
3. Relevant specialist reports identified during this scoping phase,
4. Maps,
5. Interested and Affected Party comments and objections (if any), and
6. Any additional information required by the DMR.

RECEIVING ENVIRONMENT

REGIONAL CLIMATE

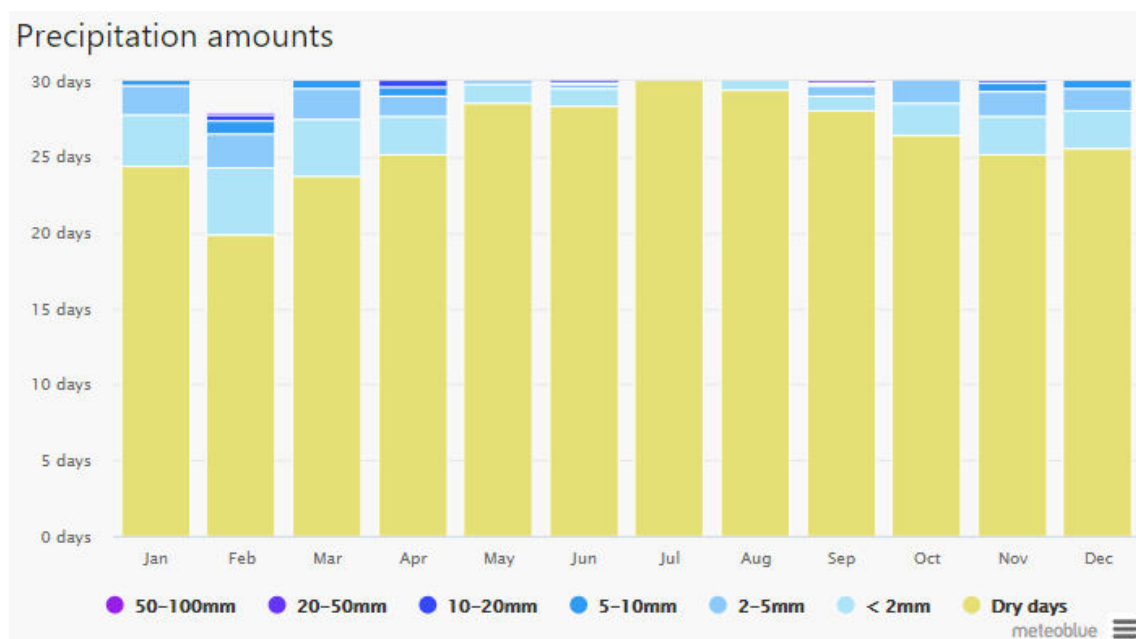
Climatic conditions such as temperature, rainfall, and wind velocity influence for example plant growth, erosion level of disturbed areas, dust generation, and air pollution levels as well as social impact in terms of quality of life. Climatic conditions can, therefore, influence the significance of impacts caused by developments. It is important to understand the role thereof when determining the impacts of specific development and the remedial measures that need to be implemented.

The study site falls within the Hot Desert Climatic (BWh) Region of South Africa, according to the Köppen Climate Classification System. Mild Desert Climate is characterised by warm to hot summers, high evaporation, and dry warm winters.

RAINFALL & TEMPERATURE

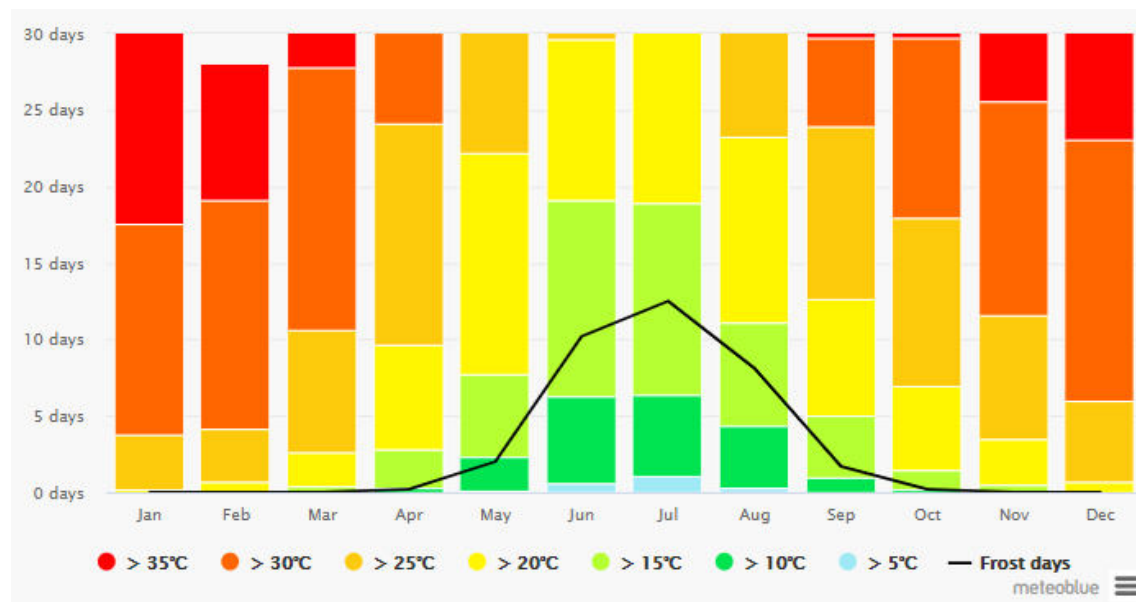
The site is situated in a rainfall area that receives about 201-400mm per annum according to the AGIS Comprehensive Atlas, which is a general classification. Prieska has a summer rainfall between October to May.

TABLE 2: PRECIPITATION AMOUNTS (SOURCE METEOBLUE)



Daily mean maximum temperatures range between 30°C and 35°C and daily mean minimum temperatures between 0.1°C and 2°C. January is the hottest month of the year and July the coldest.

TABLE 3: AVERAGE TEMPERATURES (SOURCE METEOBLUE)



The proposed farm area falls within an area where the annual evaporation is very high, more than 2400mm.

The moisture availability is the ratio of actual to potential evapotranspiration. Evapotranspiration is the process by which water is transferred from the land to the atmosphere by evaporation from the soil, other surfaces (e.g. rivers, dams, wetlands, etc.), and by transpiration from plants. The moisture availability of the area is classified as being very severe. In other words, the evapotranspiration of the area is very high.

This is important for irrigation strategies. The low rainfall combined with the high evapotranspiration rates will result in a higher amount of water required for irrigation per hectare than a farm situated for example in the sub-tropics, where the rainfall is higher and the evapotranspiration is low. The Applicant will consider working out an irrigation scheduling to establish and maintain the crops.

WIND REGIMES

The prevailing wind directions are predominantly westerlies and north-north-easterlies, with wind speeds, recorded highest during August to October (>38km/h but <50km/h).

There is a distinct seasonal variation between summer and winter wind direction with predominant winds in summer being westerlies (west and west-south-west) and predominant winds in winter being north-north-easterlies. Generally, wind speeds are also stronger during night-time compared to daytime conditions.

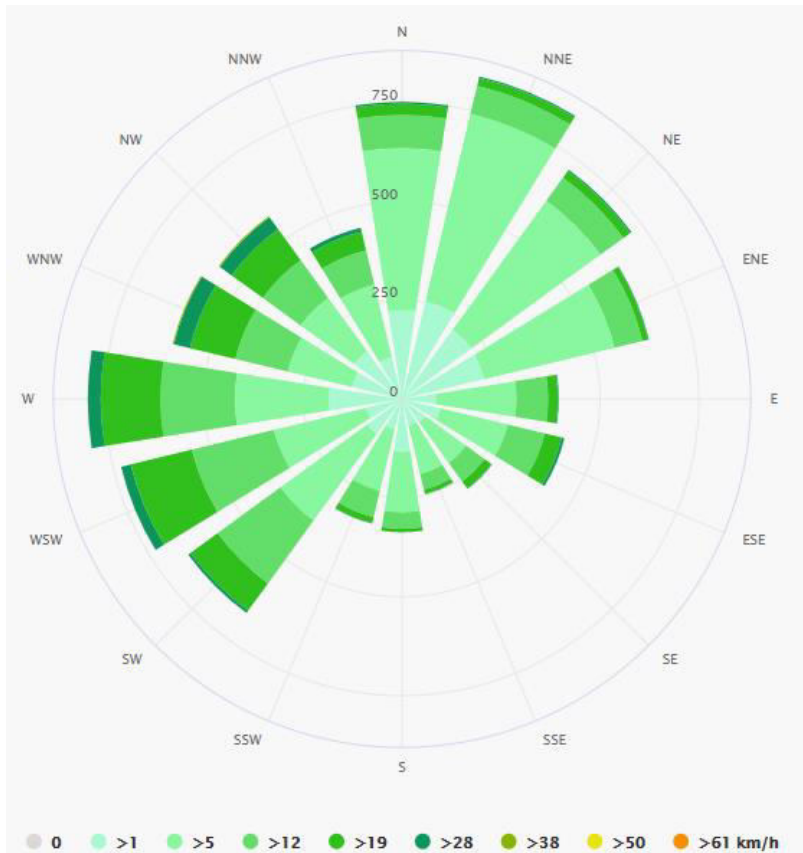
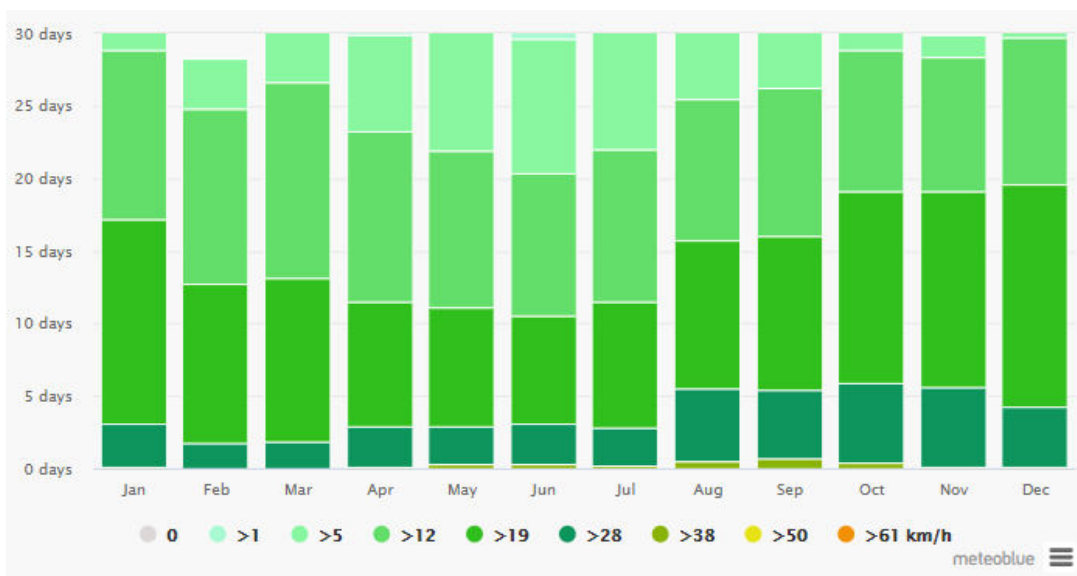


FIGURE 6: WIND ROSE OF PRIESKA AREA (SOURCE METEOBLUE)

TABLE 4: WINDSPEED OF PRIESKA AREA (SOURCE METEOBLUE)



TOPOGRAPHY

Morphology or the Topography of an area can be described as the form and structure of the landscape. The structure is given by the underlying geology and the form is given by erosion factors such as the rivers cutting through the geology to form valleys, or the wind eroding the tops of the mountains and filling in the valleys to form rolling hills and plains.

The topography of the area was flat with the majority of the area having a slope less than 0.8°. The area is situated in a valley and is surrounded by hills with slopes between 0.8 and 2.6°. Drainage would occur in a northern, direction leading to the orange river as it flows from the hills.

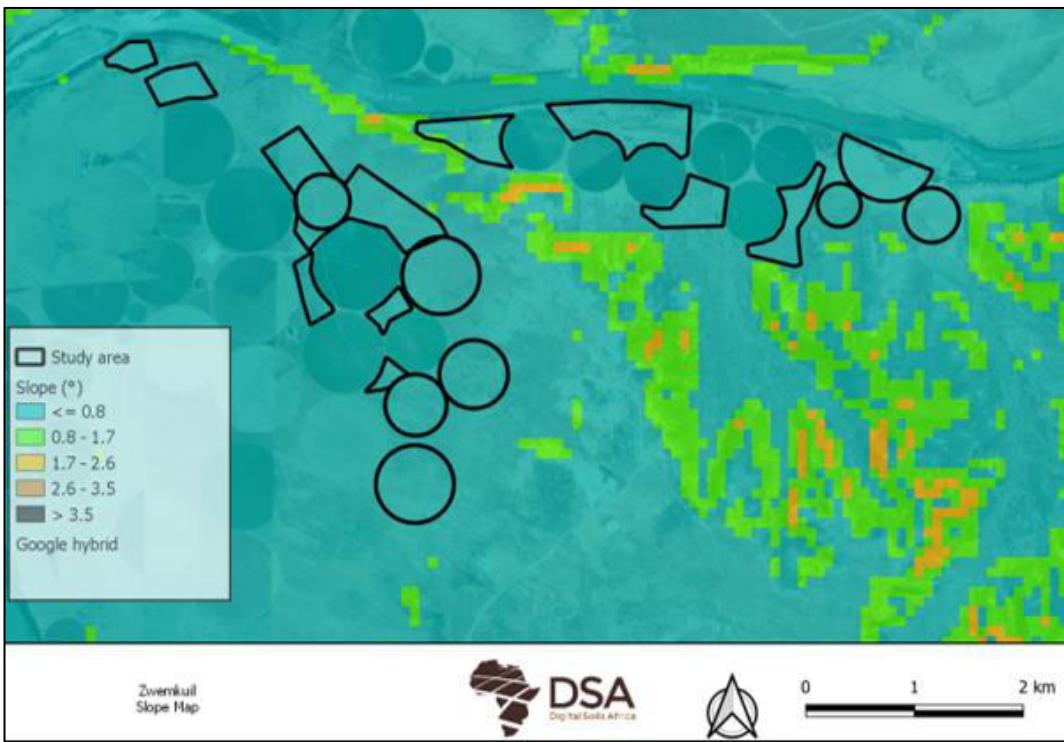


FIGURE 7: SLOPE OF THE STUDY AREA (SOIL REPORT, 2022)

It is not expected that the proposed development will impact the topography of the site.

POSSIBLE MITIGATION MEASURES

The impact on the topography of cleared out will be minimum. Topsoil will be disturbed but the general topography of the site will remain intact. Possible mitigations to prevent topographical scarring could include:

- Clearing of vegetation may not result in excavations, areas where trees might be uprooted must be filled in.
- Clearing of vegetation must follow the same incline as the natural environment.

- Buffer zones should be maintained between the clearing of vegetation and the drainage lines, with at least 100m buffer.

GEOLOGY & PALAEOLOGY

During an interval of some 150 million years, from Late Carboniferous through to Early Jurassic times, deposition of a very thick succession of Karoo Supergroup sediments took place within several intra-continental basins in the Northern Cape. The most extensive of these was the Main Karoo Basin. This basin now occupies the southern half of the province and in ancient Karoo times, it was situated within the interior of the Supercontinent Pangaea. The proposed site falls within the earliest Karoo sediments – massive glacial tillites of the Permocarbiniferous Dwyka Group – are largely unfossiliferous, although thin intervals of interglacial and post-glacial mudrocks yield sparse fossils of marine invertebrates and fish (e.g. near Douglas) as well a small range of trace fossils generated by arthropods and fish. Reddish sandy and pebbly glacial outwash sediments contain plant fossils (leaves, wood, and other debris) of the Glossopteris Flora that soon colonised southern Pangaea following the final retreat of the Permocarbiniferous ice sheets (Almond & Pether, 2008).

TABLE 5: FOSSIL HERITAGE OF THE NORTHERN CAPE (ALMOND & PETHER, 2008)

Geological Unit		Rock Types & Age	Fossil Heritage
Karoo Supergroup	Dwyka Group (C-Pd)	Glacial, interglacial and post-glacial siliciclastic sediments (e.g. tillites) Late Carboniferous – Early Permian c. 320-290 Ma	Trace fossils, organic-walled microfossils, rare marine invertebrates (e.g. molluscs), fish, vascular plants.

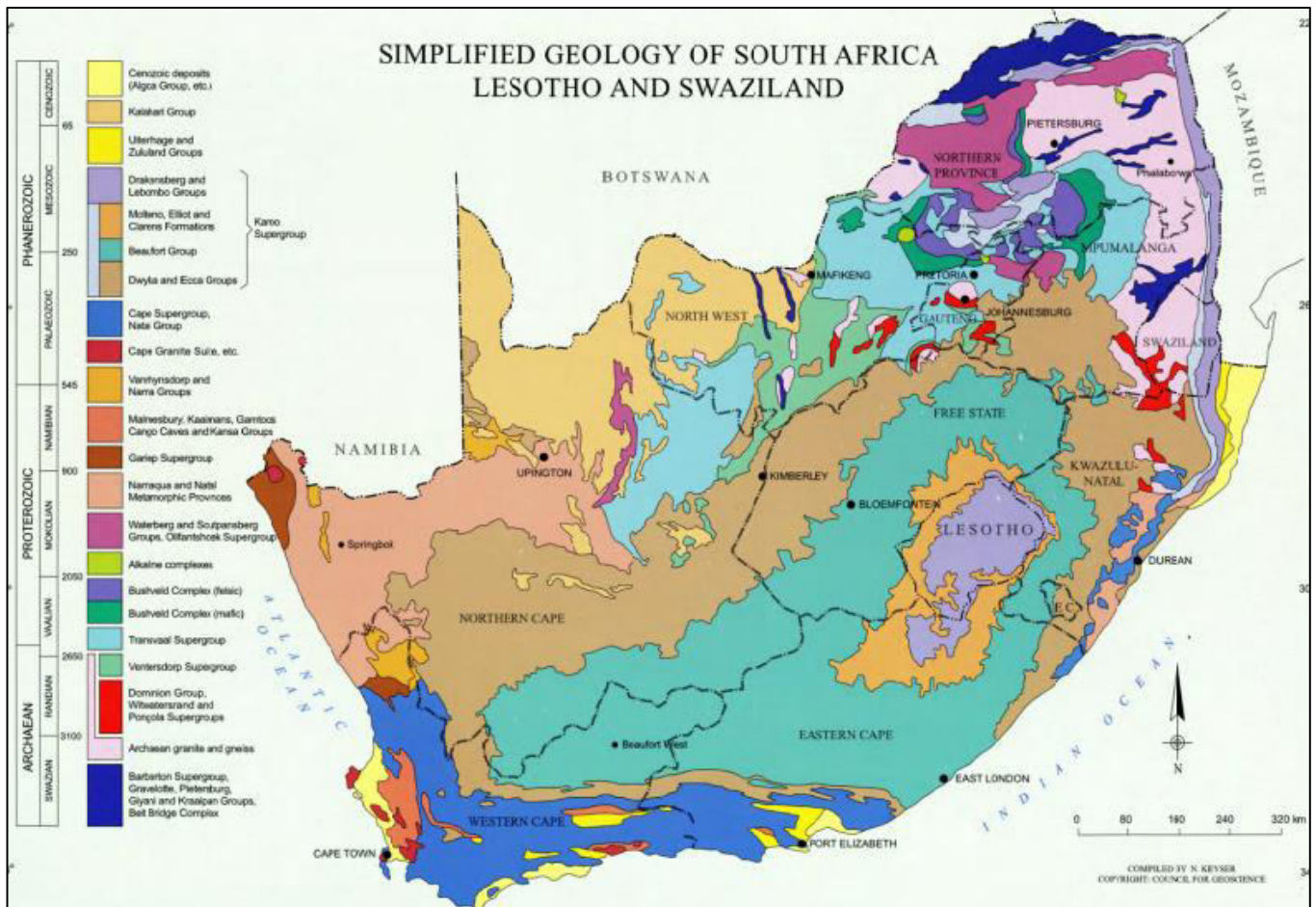


FIGURE 8: SIMPLIFIED GEOLOGY OF SOUTH AFRICA

POSSIBLE MITIGATION MEASURES

The clearing of vegetation will not impact the geology of the site. No mitigations will be required.

SOILS

Topsoil:

Topsoil is a very precious, non-renewable resource with high conservation importance and is necessary for the production of grapes that the topsoil be protected. The potential of soils to produce crops is dependent on its depth, structure, texture, and sequence of soil horizons.

The opposite of topsoil preservation is topsoil degradation, which involves the removal of soil, and alteration or damage to soil and soil-forming processes, usually due to human activity. Stripping of vegetation will impact negatively soil formation, natural weathering processes, moisture levels, soil stability, humus levels, and biological activity. It is therefore essential that where it occurs, it be preserved and protected or upgraded to improve the agricultural potential of the property.

A soil survey was conducted to determine whether the land would be suitable for irrigating the cultivation of crops. The soil forms found included: Augrabies (214 Ha) soil form is the dominant soil form in the study area. The Hutton soil form was found in the southern parts of the study area and covered 37 Ha. The Coega soil form (31.5 Ha) was found in the northern parts of the Southern Section and was characteristically shallow. The Addo soil form was found near the Augrabies soil forms in the Upper Eastern Section and covered approximately 36 Ha. The Glenrosa soil form (23.6 Ha) was found throughout the study area, while the Vaalbos soil form (25 Ha) was found near the Plooyburg soil form in the centre of the study area. The Prieska and Brandvlei soil form were only found in a small area of the study area and covered approximately 18 and 16 Ha of the study area (see Figure 9).

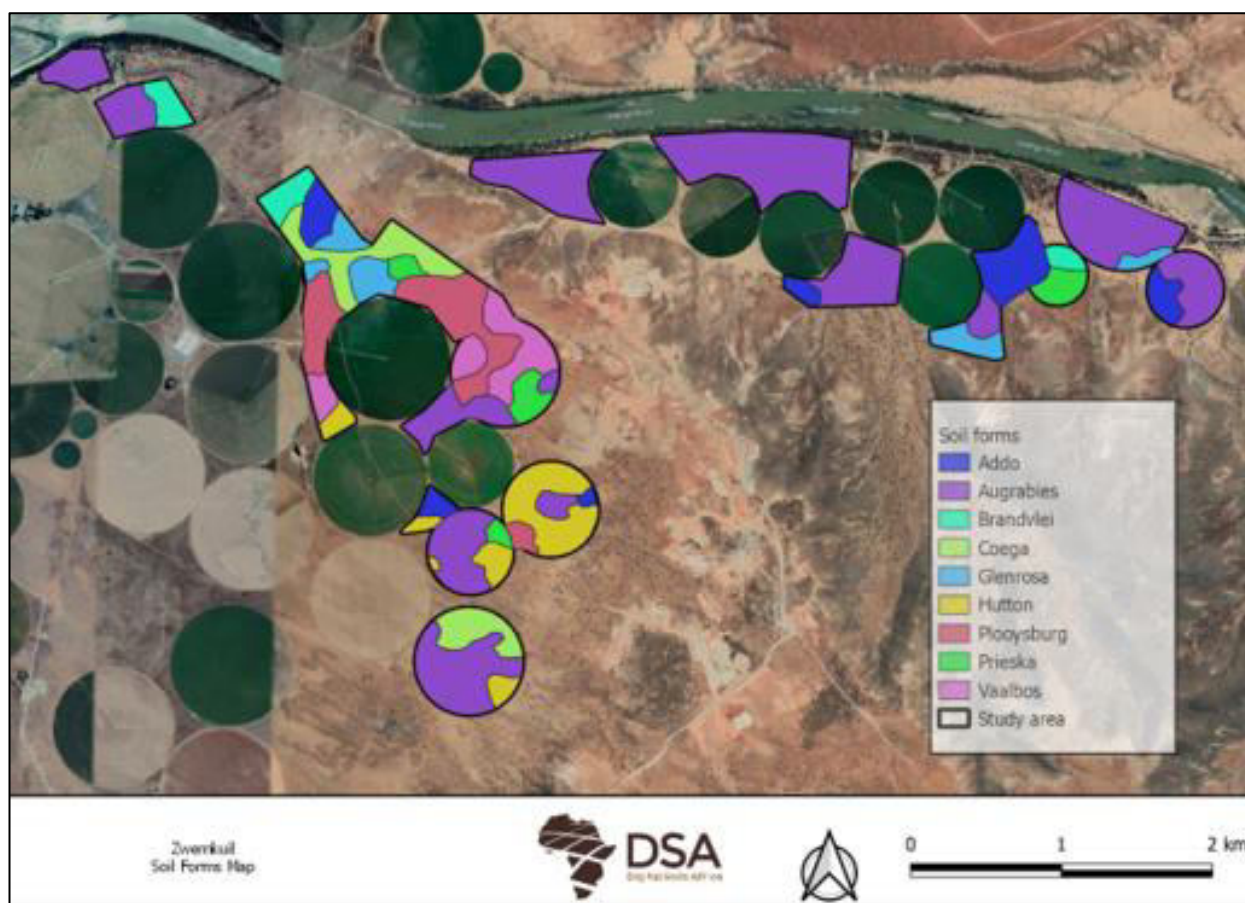


FIGURE 9: SOIL FORMS IN THE STUDY AREA (SOIL REPORT, 2022).

According to the soil report, the total and freely drainable soils depths of the study area are moderate to deep with most of the soils ranging from 1.51-2.00 mm in depth. A small portion of the area had depths shallower than 500 mm. The Coega and parts of the Glenrosa soils were associated with the 0-0.50 m soil depths. The restricting layers encountered were Hard Carbonate, Fractured rock, Soft Carbonate, and Lithic horizons. The Fractured rock was found within the Vaalbos soil form, while the Lithic occurred in the Glenrosa soil forms. Soft Carbonate was found in the Addo and Brandvlei soil forms, while Hard Carbonate was found in the Coega and Plooyburg soil forms. The Lithic horizon had a restricting layer at 300-1600 mm depths for the Glenrosa. Fractured rock was found at between 500 and 1000 mm. Soil depths not exceeding 700 mm were deemed not suitable for irrigation or vineyard cultivation.

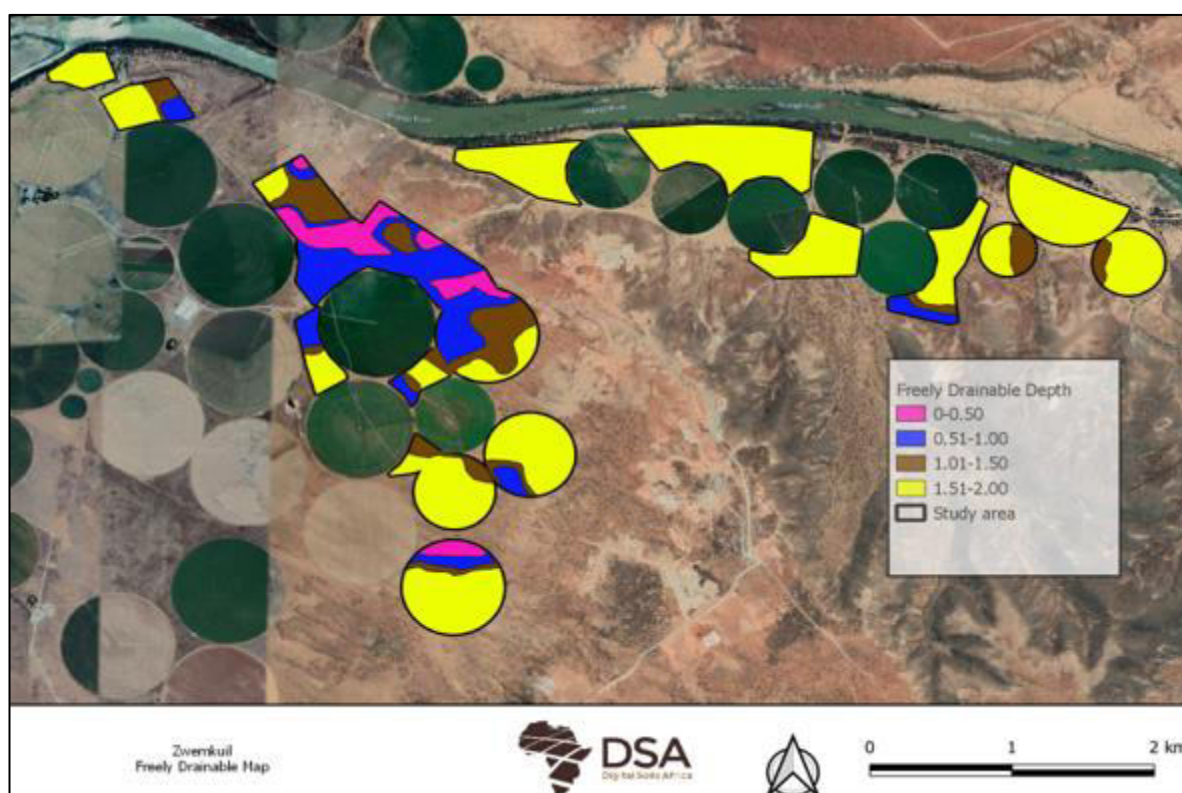


FIGURE 10: FREELY DRAINED DEPTH FOR STUDY AREA (SOIL REPORT, 2022).

Chemical analysis of the soil was done and the laboratory results indicate that the chemical parameters are manageable, it is expected that irrigation with high-quality irrigation water will leach some of the base-forming cations out of the soil profiles and thereby lower the pH. Salinity is of low risk within all areas except the Brandvlei soil area where salinity could be of risk. The exchangeable sodium percentage (ESP) and electrical conductivity (EC) for the rest of the areas are low and the soils have good drainage. The texture results show that in general, the soils do have sufficient drainage.

Clay percentages range from very sandy to moderate. Most soils will have good drainage, but soil water holding capacity and fertility in some areas are low and would require good management. Since the soils are generally sandy, the soil depth would be the biggest contributing factor to drainage.

Ultimately the soil report concluded that approximately 330 Ha of the survey area is suitable for irrigation. Soils with a freely drainable depth of 1000 mm, which included the Hutton, Augrabies, Prieska, Addo, and sections of the Plooyburg, Prieska, Glenrosa and Vaalbos soil forms were suitable for irrigation. The soil forms not suitable for irrigation (Sections of the Plooyburg, Vaalbos, Brandvlei, Prieska, and Glenrosa) were suitable for vineyards under drip irrigation as the soil could be mechanically altered to accommodate vineyards. The area for vineyard production was approximately 76 Ha. The areas not suitable for irrigation or vineyard production were the Coega and parts of the Glenrosa, Vaalbos, Plooyburg, and Brandvlei soil forms. Soil that had a freely drainable depth of <700 was unsuitable for irrigation and vineyard production.

The impact on soil properties is expected to be rated low if recommendations of the soil report are carried out.

Erosion:

Soil erosion is a natural process that, without disturbance, would balance itself with the formation of new soil. Any development that destroys the natural protective canopy of vegetation speeds up the process of soil erosion. Soil properties determine the erodibility of soils and their ability to support vegetation and this needs to be understood in assessing the potential for erosion and the suitability for the proposed establishment of a crop and pasture. Soils susceptible to water erosion are normally silty, are weakly structured, have low organic contents, and have poor internal drainage.

The erodibility index is determined by combining the effects of slope and soil type, rainfall intensity, and land use. These aspects are represented by terrain morphology (soil and slope), mean annual rainfall, and broad land-use patterns.

According to the soil report, the Augrabies and the Coega soil forms have medium potential for wind and water erosion, and the Plooyburg soil form has a low potential for wind and medium potential for water erosion.

The clearing of vegetation will not cause depressions or changes in natural topography and will follow the natural incline of the area, which will reduce the erosion impact. The level of impact and erosion, as a result of the clearance of vegetation, will be investigated further in the EIA phase.

Soil pollution:

Soil pollution can only occur should hydrocarbon spills occur, or when 1) used oils and lubricants are purposefully drained into the soil, 2) storage facilities are destabilized or 3) if ablution facilities contaminate soils. At the proposed site there is a very low risk for hydrocarbon pollution since there will be vehicular/earthmoving activity to clear the site. The impact is rated of very low significance if the limited number of vehicles on the site, that will be required, is considered. Also, no servicing of vehicles or storage of fuels, oils, and lubricants or refueling will take place on-site.

Chemical toilet facilities can be provided for workers during the construction phase (clearing of vegetation) and be managed well and it is anticipated that the impacts on soil pollution will be very low.

During the construction and operational phase, the soil will be upgraded with fertilizer. The leaching of nutrients could be a potential impact. It will be further assessed during the EIA phase of the application.

POSSIBLE MITIGATION MEASURES

- All topsoil should be preserved as much as possible.
- When the clearance of vegetation is completed, the topsoil should be ploughed.
- Upgrading of topsoil will be investigated during the EIA and EMP phase.
- Any erosion that develops must be filled in and rehabilitated and an erosion control programme must be adopted. The appropriate programme will be investigated during the EIA and EMP phase.
- Hydrocarbon spillages should be prevented by not allowing any storage of fuels, oils & lubricants within the area under application and conducting any repairs within allocated areas at the farm workshop.
- If spills occur, the affected areas must be treated with bio-remedial products and an appropriate response will be stipulated in the EIA and EMP phase.
- The toilet facilities should be well maintained according to Municipal bylaws and the surrounds should not be used as ablutions.

LAND USE AND LAND CAPABILITY

Although land use is not a feature of the environment as such, it does represent the current status of the land surface as a whole, and therefore also reflects the condition of the environment. Land use is reflected by land-use patterns, based on terrain morphological units.

Conservation is the maintenance of environmental quality and resources or a particular balance among the species present in a given area. The resources may be physical, biological, or cultural.

The study area is zoned agricultural. The AGIS figure below is outdated as areas in the Southern and Upper Eastern Sections are used for commercial irrigation. Overall the study area itself can be mostly described as an area with a mix of shrubland, low fynbos, thicket, bushland and high fynbos.

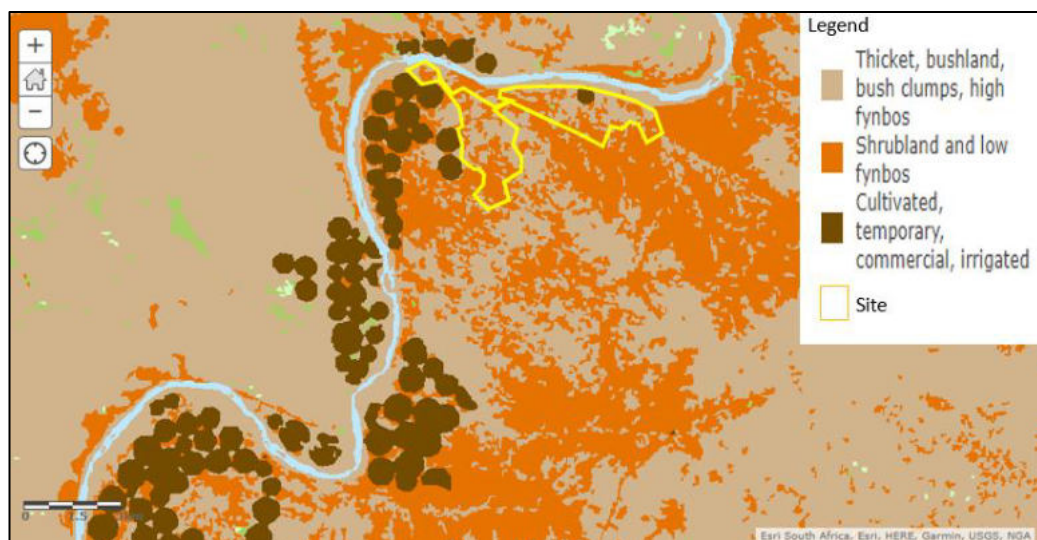


FIGURE 11: LAND COVER CLASSIFICATION ACCORDING TO AGIS

Considering the conservation status of the site and the zoning, a change in agricultural practice would not detrimentally affect the ecological value of the property concerned. As with any disturbance, there will be a limited impact, but with the proposed crop rotation method, the negative impacts could be effectively be mitigated.

As a contribution and a step towards reclaiming the protected plant species from the site should the clearing of vegetation be granted, the transport/transfer and/or rehabilitation and processes to achieve this objective will be further investigated in the EIA and EMP phase.

It is the author's view that this particular development can be integrated with the surrounding land uses. The development of agricultural land from grazing to crop production would also not compromise the needs and the well-being of future generations.

The clearing of vegetation to establish a crop and pasture will conform to the land use abutting the farm and increase the land capability in terms of agricultural potential as a whole farm.

POSSIBLE MITIGATION MEASURES

- An area identified for the transfer of protected plant species (if identified on-site) should be established and during the EIA and EMP the specific method and recommendations of a botanical specialist should be applied.
- In circumstances where species cannot be transferred, the offset area identified should be seeded with similar species.
- The maize/wheat/lucerne, vineyard and pecan nut crops and the maintenance thereof will be discussed in the EIA phase, to prevent the establishment of alien vegetation, weeds, pest control, or degradation of the site if the crop is unsuccessful.

FLORA

Vegetation plays an important role in maintaining ecosystems, stabilizing soils, maintaining the aesthetics of an area, and providing income for landowners. Therefore, when development is anticipated the vegetation structure needs to be analyzed, and rare or endangered plant species must be identified. Vegetation structure is mostly determined by the geology and climatic factors.

There are an estimated 5 400 plant species in the Northern Cape that occur in six large biomes: the Nama Karoo Biome, Succulent Karoo Biome, Savanna Biome, Grassland Biome, Fynbos Biome, and Desert Biome. More than 30% of the plants found in the Northern Cape are endemic and most of these occur in the Succulent Karoo along the West Coast of South Africa. Many of these plants are rare or threatened, with very limited distribution.

A tree aloe that is a typical landscape feature of the Northern Cape is the kokerboom, or quiver tree (*Aloe dichotoma*). This tree aloe is found growing mainly on the rocky habitat of the hills along the Orange River. In places it occurs in dense “forests”, and good examples of these occur just south of Kenhardt and between Pofadder and Pella. The Doringberg hiking trails near Prieska pass by these gentle aloe giants, and close to 4 000 trees can be seen in the Kokerboom forest on the Kokerboom hiking trail near Kenhardt. Necessitated by the harsh climatic conditions, the kokerboom has adapted to survive. Low air humidity, low soil moisture and intense sunshine levels have made it necessary for it to absorb every available scrap of moisture. It, therefore, has a superficial root system enabling it to absorb moisture quickly (Experienccnortherncape).

A vegetation survey will be completed by a SACNASP registered specialist. The site, according to Mucina and Rutherford (2006), host two vegetation types, namely the Upper Gariep Alluvial vegetation (AZa) and the Northern Upper Karoo (NKu3).

Upper Gariep Alluvial vegetation (AZa)

In terms of the distribution, the Upper Gariep Alluvial vegetation occurs in the Free State and Northern Cape Provinces: Broad alluvia of the Orange River, lower Caledon as well as lower stretches of the Vaal, Riet and Modder Rivers as far as Groblershoop. These river stretches are surrounded by vegetation units of broad transitional regions between the dry facies of the Savanna and Grassland and northern regions of the Nama-Karoo Biome.

Important Taxa

Riparian thickets Small Trees: *Acacia karroo* (d), *Celtis africana* (d), *Salix mucronata* subsp. *mucronata* (d).

Tall Shrubs: *Diospyros lycioides* (d), *Melianthus comosus* (d), *Rhus pyroides*.

Low Shrubs: *Asparagus setaceus*, *A. suaveolens*.

Woody Climber: *Clematis brachiata*.

Succulent Shrubs: *Lycium arenicola*, *L. hirsutum*.

Herb: *Rubia cordifolia*.

Flooded grasslands & herblands

Graminoid: *Melica decumbens* (d).

Herbs: *Cineraria dregeana*, *C. lobata*.

Conservation Vulnerable. Target 31%. Only about 3% statutorily conserved in Tussen Die Riviere, Gariep Dam and Oviston Nature Reserves. More than 20% transformed for cultivation (vegetables, grapes) and building of dams. Exotic woody species such as *Salix babylonica*, *Eucalyptus camaldulensis*, *E. sideroxylon*, *Prosopis* and *Populus* species have become common dominants in patches of heavily disturbed alluvial vegetation.

Northern Upper Karoo (NKu3)

In terms of the distribution, this vegetation type occurs in the Northern Cape and Free State Provinces: Northern regions of the Upper Karoo plateau from Prieska, Vosburg and Carnarvon in the west to Philipstown, Petrusville and Petrusburg in the east. Bordered in the north by Niekerkshoop, Douglas and Petrusburg and in the south by Carnarvon, Pampoenpoort and De Aar. A few patches occur in Griqualand West.

Important Taxa

Small Trees: *Acacia mellifera* subsp. *detinens*, *Boscia albitrunca*.

Tall Shrubs: *Lycium cinereum* (d), *L. horridum*, *L. oxycarpum*, *L. schizocalyx*, *Rhigozum trichotomum*.

Low Shrubs: *Chrysocoma ciliata* (d), *Gnidia polycephala* (d), *Pentzia calcarea* (d), *P. globosa* (d), *P. incana* (d), *P. spinescens* (d), *Rosenia humilis* (d), *Amphiglossa triflora*, *Aptosimum marlothii*, *A. spinescens*, *Asparagus glaucus*, *Barleria rigida*, *Berkheya annectens*, *Eriocephalus ericoides* subsp. *ericoides*, *E. glandulosus*, *E. spinescens*, *Euryops asparagoides*, *Felicia muricata*, *Helichrysum lucilioides*, *Hermannia spinosa*, *Leucas capensis*, *Limeum aethiopicum*, *Melolobium candicans*, *Microloma armatum*, *Osteospermum leptolobum*, *O. spinescens*, *Pegolettia retrofracta*, *Pentzia lanata*, *Phyllanthus maderaspatensis*, *Plinthus karoocicus*, *Pteronia glauca*, *P. sordida*, *Selago geniculata*, *S. saxatilis*, *Tetragonia arbuscula*, *Zygophyllum lichtensteinianum*. Succulent Shrubs: *Hertia pallens*, *Salsola calluna*, *S. glabrescens*, *S. rabieana*, *S. tuberculata*, *Zygophyllum flexuosum*. Semiparasitic

Shrub: *Thesium hystrix* (d),

Herbs: *Chamaesyce inaequilatera*, *Convolvulus sagittatus*, *Dicoma capensis*, *Gazania krebsiana*, *Hermannia comosa*, *Indigofera alternans*, *Lessertia pauciflora*, *Radyera urens*, *Sesamum capense*, *Sutera pinnatifida*, *Tribulus terrestris*, *Vahlia capensis*.

Succulent Herb: *Psilocaulon coriarium*.

Geophytic Herb: *Moraea pallida*. Graminoids: *Aristida adscensionis* (d), *A. congesta* (d), *A. diffusa* (d), *Enneapogon desvauxii* (d), *Eragrostis lehmanniana* (d), *E. obtusa* (d), *E. truncata* (d), *Sporobolus fimbriatus* (d), *Stipagrostis obtusa*

(d), *Eragrostis bicolor*, *E. porosa*, *Fingerhuthia africana*, *Heteropogon contortus*, *Stipagrostis ciliata*, *Themeda triandra*, *Tragus berteronianus*, *T. koelerioides*, *T. racemosus*.

Biogeographically Important Taxa

Herb (western distribution limit): *Convolvulus boedeckerianus*.

Tall Shrub (southern limit of distribution): *Gymnosporia szyszylowiczii* subsp. *namibiensis*.

Endemic Taxa

Succulent Shrubs: *Lithops hookeri*, *Stomatium pluridens*.

Low Shrubs: *Atriplex spongiosa*, *Galenia exigua*.

Herb: *Manulea deserticola*.

Conservation Least threatened. Target 21%. None conserved in statutory conservation areas. About 4% has been cleared for cultivation (the highest proportion of any type in the Nama-Karoo) or irreversibly transformed by building of dams (Houwater, Kalkfontein and Smart Syndicate Dams). Areas of human settlements are increasing in the northeastern part of this vegetation type. Erosion is moderate (46.2%), very low (32%) and low (20%). *Prosopis glandulosa*, regarded as one of the 12 agriculturally most important invasive alien plants in South Africa, is widely distributed in this vegetation type. *Prosopis* occurs in generally isolated patches, with densities ranging from very scattered to medium (associated with the lower Vaal River drainage system and the confluence with the Orange River) to localised closed woodland on the western border of the unit with Bushmanland Basin Shrubland.

The vegetation report will indicate more specific vegetation and identify any species of concern. During the EIA phase the full impact will be evaluated and discussed.

PHOTO RECORD OF THE UPPER WESTERN SECTION

Most of the area was historically used for lucerne production. Notice the green vegetation due to the large amount of rain this region has received. The Upper Western Section falls within the Vulnerable Upper Gariep Alluvial vegetation.





PHOTO RECORD OF THE UPPER EASTERN SECTION

The entire eastern part of this section is severely disturbed due to historic lucerne production. The majority of the area is infested with *Dicerocaryum eriocarpum* (Devils thorn).





Most of the Upper Eastern Section falls within the Vulnerable Upper Gariep Alluvial vegetation, but as can be seen in the photos some portions have been severely disturbed.



There are a few drainage lines or non-perennial streams that were noted in this Upper Eastern Section (as seen in the above photos) and a 100m buffer zone should be kept from these drainage lines from development.





PHOTO RECORD OF THE SOUTHERN SECTION

Most of the Southern Section falls within the Northern Upper Karoo vegetation type and has been impacted due to grazing.



Above are photos of the area that is allocated for vineyard production.





Notice the diamond mine stockpile area in the background



POSSIBLE MITIGATION MEASURES

- No vegetation outside the approved area should be removed or damaged.
- All indigenous plant species, that can be transplanted should be removed from the proposed study area.
 - A rehabilitation plan (i.e. relocation of plants that can be transplanted to identify areas outside of the proposed area to be cleared) must be implemented, which will be investigated in the EIA and EMP phase. This must be done in consultation with the botanical specialist.
 - Some of the geophytes must be transplanted into other natural areas.
- Alien plant species should be removed and eradicated from the site as a high priority.
 - The spread of alien vegetation must be prevented through an alien vegetation control programme, which will be investigated in the EIA and EMP phase.
- Veld fires should be controlled and prevented.

FAUNA

Animals play an important role in maintaining the functioning of any ecosystem, for example, pollination, spreading of seeds, removing of pests, trimming of vegetation, etc. The largest part of the Northern Cape falls within the Nama-Karoo biome with a vegetation of low shrubland, grass and trees limited to watercourses. The region is typically an arid environment and the terrain and general landscape do not represent much topographical variation. Therefore faunal species are generally widespread across the region, although some key biotopes such as rivers or pans, or the presence of a particular plant species can become an obvious niche for particular animal species that can result in a concentration of species at a certain location.



FIGURE 12: SENSITIVE MAMMAL SPECIES IN THE REGION. THE BLACK ARROW INDICATES THE LOCATION OF THE SITE.

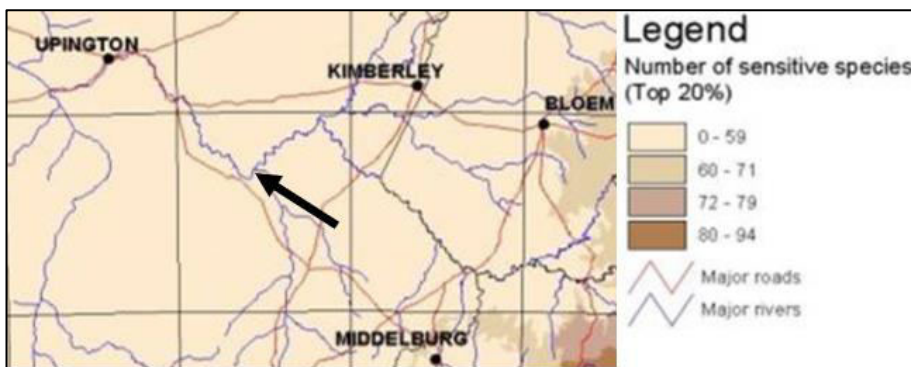


FIGURE 13: SENSITIVE BIRD SPECIES IN THE REGION. THE BLACK ARROW INDICATES THE LOCATION OF THE SITE.

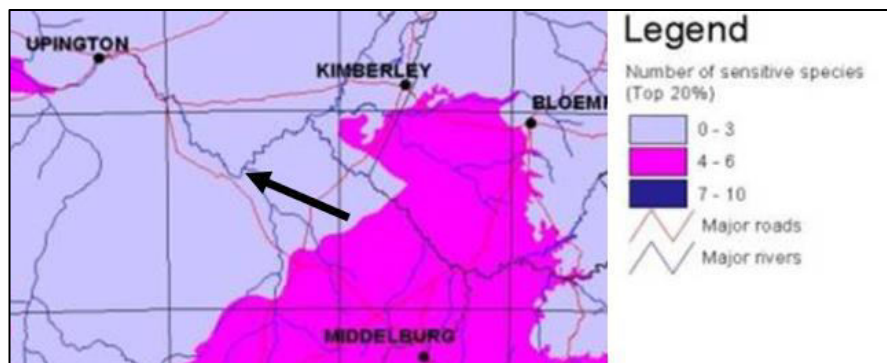


FIGURE 14: SENSITIVE REPTILE SPECIES IN THE REGION. THE BLACK ARROW INDICATES THE LOCATION OF THE SITE.



FIGURE 15: SENSITIVE BUTTERFLY SPECIES IN THE REGION. THE BLACK ARROW INDICATES THE LOCATION OF THE SITE.

The occurrence of faunal species within the proposed area is likely, however, it is farm properties and generally fenced-in camps, which will hinder the mobility of some of the larger wildlife that cannot jump a fence or the smaller wildlife that cannot borrow. Typically, many of the species encountered in the region are species such as the Common Duiker (*Sylvicapra grimmia*), Springbok (*Antidorcas marsupialis*), Steenbok (*Raphicerus campestris*), Blesbok, (*Damaliscus pygargus phillipsi*), Smiths red rock rabbit (*Pronolagus rupestris*), Scrub Hare (*Lepus saxatilis*), Spring Hare (*Pedetes capensis*), Meerkat (*Suricata suricatta*), Ground Squirrel (*Xerus inauris*), Rock elephant shrew (*Elephantulus myurus*), Suricate or Stokstertmeerkat (*Suricata suricatta*), Rock dassie (*Procavia capensis*), Yellow Mongoose (*Cynictis penicillata*), and Aardvark (*Orycteropus afer*).

Some reptiles can include the Leopard tortoise (*Stigmochelys pardalis*), Cape Cobra (*Naja Nivea*), Puff adder (*Bitis arietans*), Mole snake (*Pseudaspis cana*), Bibron's gecko (*Pachydactylus bibronii*), Southern rock agama (*Agama atra*), Ground agama (*Agama aculeata*), Striped skink (*Plestiodon fasciatus*), Cape skink (*Trachylepis capensis*). Amphibians such as the Common caco (*Cacosternum boettgeri*), Giant bullfrog (*Pyxicephalus adspersus*), Karoo Toad (*Bufo gariensis*), Common platanna (*Xenopus laevis*) might also occur in the region.

This arid region hosts at least 215 bird species of which 68 species are endemic or near-endemic species, 18 red-listed species, and 5 red-listed endemic species. Several large terrestrial bird and raptor species, of which the most important are Ludwig's Bustard (*Neotis ludwigii*), Kori bustard (*Ardeotis kori*), Secretarybird (*Sagittarius seppentarius*), Karoo Korhaan (*Eupodotis vigorsii*), Verreaux's Eagle (*Aquila verreauxii*), the Tawny eagle (*Aquila rapax*) and Martial Eagle (*Polemaetus bellicosus*), Lanner falcon (*Falco biarmicus*).

The Northern Cape is home to an assemblage of arid zone adapted smaller bird species including larks, such as Spike-heeled Lark (*Chersomanes albofasciata*), sparrow-larks, and others. From a conservation perspective, the Red Lark (*Calendulauda burra*) and Sclater's Lark (*Spizocorys sclateri*), who are both listed as regionally threatened species (vulnerable and near-threatened respectively). They have very restricted ranges. Other species can include the Spotted Eagle-owl (*Bubo africanus*), Martial Eagle (*Polemaetus bellicosus*).

Other potential birds include the Sociable weaver (*Philetarius socius*) which builds huge grass nests to the critical infrastructure of developments which can cause problems.

On the day of site inspection, the following animal species were noted at the site, kudu (*Tragelaphus strepsiceros*), blesbok (*Damaliscus pygargus phillipsi*), gemsbok (*Oryx gazella*) springbok (*Antidorcas marsupialis*), ground squirrel (*Xerus inauris*), guineafowls, falcons, finches, the northern black korhaan (*Afrotis afroides*) and vervet monkeys (*Chlorocebus pygerythrus*) was within the abutting crop fields, mongoose (*Herpestidae*), and various common birds. A few burrows were noted and diggings out of old termite hills, which could indicate the presence of aardvark (*Orycteropus afer*).

Due to the heavy rains this region received, huge swarms of brown locust (*Locustana pardalina*) have been spotted in the region, and on the day of site inspection, many locusts in nymph stage were noted. They are considered a pest for agricultural activities and can cause huge financial losses if crop fields are devoured by adults.



FIGURE 16: BROWN LOCUST SPOTTED ON THE FARM

The clearing of vegetation would be restricted to limited areas and the fairly slow clearance rate would provide adequate time for migration of any animals remaining on-site to be sustained in similar adjoining habitats. Also, noise generated by vehicles will cause most animals to vacate the site temporarily. If certain species were to be affected they would simply vacate the proposed cleared areas during the day and return during the night. Since adequate buffer zones will be maintained from drainage lines, the clearing of vegetation will not impact amphibian species.

With regards to insects and pathogens, it would be important to discuss the potential impact, since not all insects are environmentally or economically beneficial for the farm. For example, bees pollinate certain crops, which is essential for crop production, while certain moths species lay eggs in stems that can ruin crops. Crop rotation has been used as a method to prevent, curb and/or decrease possible insect pests and pathogens from spreading.

In terms of pathogens such as fungi, nematodes, and a few bacteria, they can inhabit soil and can persist for many years in the absence of a susceptible crop. Although the populations of these types of pathogens may not decline with crop rotation, the rotation can prevent the populations from increasing or reduce the rate of increase (Seminis, 2020). Some pathogens have wide host ranges that can include crops in different rotational groups, thus care must be taken when designing rotational sequences to manage such pathogens. In addition, crop rotation will not be effective against pathogens that primarily enter fields on air currents, by vectors (e.g. insects), or on the seed.

The length of time between similar crops also requires management concerning the pathogen. Some pathogens remain viable in the soil or infested crop debris for a short time, thus rotating away from a susceptible host for 1-2 years is adequate for reducing populations of the pathogens.

It must be noted that crop rotation will not be a successful tool in fighting or reducing pathogens levels in the soil if plants that belong to the same family are rotated, because the same family often share the same pest problems.

Another factor that needs to be considered in crop rotation, is that it is not very effective on pathogens that have a wide host range, such as: *Rhizoctonia solani*, and *Pythium* species. It is very difficult to find a suitable crop to rotate with and crop rotations need to be especially carefully selected to reduce pathogens such as these. The full impact will be discussed in the EIA and EMP phase.

In terms of insects pests, there are a few that can cause much damage to maize crops. According to Bell (2016):

- The maize stalkborer (*Busseola fusca*), is the most serious insect pest of maize in South Africa and has caused enormous crop losses (estimated at more than 10% of the national crop). The use of pheromone moth traps has greatly enhanced timeous spraying against this pest.
- The cutworm (*Euxoa* and *Agrotis* species) is the second most important maize pest in South Africa. It is a general feeder, and attacks almost any kind of succulent young plant, causing the most damage in spring.
- The black maize beetle, (*Heteronychus arator*), affects a wide variety of crops, including maize, sorghum, wheat, ryegrass and oats. Symptoms are sometimes confused with cutworm damage. Although it occurs virtually throughout S.A., there are certain areas in which it assumes plague proportions. It seems to favour cooler areas and sandy soils.
- The common name, maize snout beetle, refers to several kinds of closely-related weevils which feed on the leaves of young maize plants. Four different species cause the most loss and others that are occasionally troublesome. The four major species are *Tanymecus destructor*, *Systates exaptus*, *Mesoleurus dentipes* and *Protoctrophus* spp. None of these fly. Once land is infested trouble can be expected year after year.
- The spotted maize beetle, *Astylus atromaculatus*, is also known as the *Astylus* beetle or the pollen beetle. The adult feeds on pollen, but will also attack the soft, young kernels of maize cobs when the silks are wilting

off. Larvae can reduce seedling stands drastically. Larvae are also known to drill into maize pips, preventing their germination.

- The American bollworm, *Heliothis armigera*, derives its common name from the fact that it is one of the worst pests of cotton in the United States. Where it attacks maize cobs it is commonly called the cobworm.
- The maize chafer beetle, *Adoretus cribrus*, attacks tender growth at night, causing damage to the leaves. It is easily controlled with insecticides, but spraying is seldom necessary.
- Various members of the family Aphididae suck the sap from young leaves. Spraying is seldom necessary.
- The maize rootworm, *Bufoxena murina*, is becoming a significant pest in parts of South Africa. A granular systemic insecticide is registered for use against maize rootworms.
- Leafhoppers belonging to the family Jassidae transmit streak virus in maize. Systemic insecticides are registered for use against these leafhoppers.
- Wireworms (Elateridae) and false wireworms (Tenebrionidae) are sporadic but potentially serious pests, and it is occasionally necessary to treat for these pests.

In terms of insects on wheat, according to the ARC, 2014 the following insects can cause damage to the crops:

- The greater false wireworm (*Somaticus* spp.) They are controlled through cultural practices supporting germination and rapid seedling development, which will shorten the vulnerable 'damage period' of the plant thus limiting seedling loss and retaining plant densities. Targeting the larval stage in the soil through seed treatments can also be used with the best effect where seedlings grow actively under moist soil conditions.
- The lesser false wireworm (*Gonocephalum* spp.). They are controlled through cultural practices supporting germination and rapid seedling development which will shorten the 'damage period' of the plant thus limiting seedling loss and retaining plant densities. Targeting the larval stage in the soil through seed treatments can also be used with the best effect where seedlings grow actively under moist soil conditions.
- The black maize beetle (*Heteronychus arator*). Cultural practices supporting germination and rapid seedling development will shorten the 'damage period' of the plant thus limiting seedling loss and retaining plant densities. Chemical seed treatments are registered as pre-plant approach toward control of adult beetles.
- The Russian wheat aphid (*Diuraphis noxia*). The best control option for RWA is the use of resistant cultivars.
- The greenbug (*Schizaphis graminum*). Infestations during hot, dry conditions seem more injurious. Chemical interventions can be considered when 30-40% of the tillers are infested with 10 or more aphids per tiller.
- The oat aphid (*Rhopalosiphum padi*). The oat aphid is less harmful than RWA. Population increase generally occurs after the flag leaf stage and chemical control can be considered when 50% of the tillers are infested with 10 or more aphids per tiller.
- The maize aphid (*Rhopalosiphum maidis*). Mixed populations of Maize Aphid, Brown Ear Aphid and Oat Aphid do occur and should be controlled when 50% of the tillers are infested with 10 or more aphids per tiller.
- The brown wheat mite (*Petrobia latens*). In South Africa, two systemic insecticides are registered against the Brown Wheat Mite on wheat. Rainfall of more than 12 mm will destroy mite populations.

All of these insects can be controlled by applying insecticides (in the correct manner). However, by understanding the life cycles of these insects and by disrupting their habitat through ploughing and crop rotation, insects can be

managed. Unfortunately, for crop rotation to control an insect pest effectively, the insect must live in one crop to the beginning of the next in a stage with low mobility and must have a restricted range of host plants, of which not many insects fit this pattern. Most adult insects can travel easily across at least a single farm and emerge from their overwintering stage in the spring, so crop rotation from one year to the next will not affect them. But by growing a crop that is not a host plant for that pathogen or insect could lead to the pest dying out and its population levels lowering.

For example, the hibernating larva is the weak link in the stalkborer life-cycle, and ploughing can reduce the stalkborer threat (Bell, 2016). Likewise, winter ploughing before August destroys winter weeds and the cutworm larvae exposed on the soil surface might be damaged or taken by birds. Frost also kills cutworm larvae and the destruction of winter weeds prevents the larvae from feeding and also denies the moth a site for oviposition.

Cultivation can be used to control the black maize beetle, because the larval stage is very sensitive to disturbance. Partial suppression of insect numbers might be obtained by cultivating during September and October. While the American bollworm can be controlled if the maize lands are kept free of weeds.

Genetically modified crops can greatly reduce or completely eliminated the stalkborer infestation.

In terms of pathogens, during wet years (usually once every 5 years) the *Fusarium* fungus could potentially become a problem in the lower-lying areas. The *Fusarium* fungus grows on the dead residue from the maize crops and favours moist and warm conditions which then affects the wheat crop that is planted during winter. The fungus is effective to control via chemical control, however, the farm predominately does not battle with fungus or bacteria due to the dry climate.

In terms of fungus and pests on vine trees, high dust levels can introduce harmful fungus and mould and can cause mass infection and fruit rot, which will lead to harvest loss and loss of income. Excess dust can also increase the likelihood of dust mite infestation, which negatively impacts the health of plants. Mites settle on plants and reduce the ability to absorb sunlight (photosynthesis) and plants become deprived of essential nutrients. To control fungus, mould or mites, requires costly pesticides and can compromise grape quality. Also, if dust becomes problematic, is that while crops suffer the weeds thrive, which further exacerbate the problem of delayed or stunted growth. Dust control must be investigated and discussed in the EIA and EMP.

In terms of pests, grapes are frequently attacked by grape berry moths, whose larvae feed on grapes (DAFF, 2012). To control diseases resistant cultivars are used, vines are regularly pruned and only when necessary fungicides are used. Sanitation is also important. The following diseases, according to the DAFF (2012) are common when rainfall, humidity and temperatures are high:

Powdery Mildew

Any part of the plant (leaves, blossoms, fruit and young leaves) can become affected. This is more important from the viewpoint of the export of fresh grapes. The disease leaves blemishes on the affected berries and results in

deformation. As the name suggests, the first symptom is the appearance of a white powdery (ash-like) substance on the leaves, young shoots and immature berries. The disease is common under warm and dry conditions. During the EIA and EMP control measures will be investigated and discussed.

Downy Mildew

According to the DAFF (2012), the disease is caused by light and continuous rain or heavy dew that is associated with high humidity; or low temperature also favours the development of the disease. It attacks the leaves, flowers, clusters, and young fruit. The first symptoms are light-yellow spots on the upper surface of the mature leaves corresponding with white spots on the lower side. The affected leaves turn brown and cannot support bunch development due to reduced photosynthetic activity. During the EIA and EMP control measures will be investigated and discussed.

Bacterial leaf spot

The disease is more frequent when the temperature is 25°C to 30°C and humidity is 80-90%. The first symptoms appear on young growing shoots. This disease infects leaves, shoots and berries. On the leaf, it appears as minute water-soaked spots on the lower surface of the leaves along the main and lateral veins. The spots coalesce later to form larger patches and brown-black lesions on the berries which become small and shrivelled. During the EIA and EMP control measures will be investigated and discussed.

Black rot

The disease occurs more frequently in areas with a warm and moist climate and extended periods of rain and cloudy weather, therefore highly unlikely to occur in the Northern Cape. However, with the recent high rainfall events, it is a small possibility. The disease attacks the leaves, stems, flowers and berries. All the new growth will likely be attacked during the growing season. The symptoms are usually reddish-brown spots on the leaves and a black scab on the berries. During the EIA and EMP control measures will be investigated and discussed.

In terms of diseases and pests on pecan nut crops, scab is caused by a fungus and is the most important disease in pecan nuts in South Africa (DA, 2000). Early symptoms are the appearance of numerous small, brown to black spots, especially on the underside of the leaves. The spots become larger and merge until the entire leaf turns black. Immature leaves drop off. Similar spots are visible on the shuck of the nut. Such nuts suffer from delayed development and they are misshapen. Immature nuts may drop off and have no commercial value.

The fungus winters on branches and old shucks that have dropped. Fungal spores rapidly develop in spring and are spread by wind and rain. New spring growth on the trees is infected when the leaf surfaces are wet, especially after rain. Susceptibility for the disease varies in different cultivars. Ukulinga, Shoshoni, Moore and Barton are regarded as highly tolerant, while Mohawk, Wichita and Chocktaw are susceptible.

In terms of pests on pecan nut crops, the pecan nut stem borer is sporadically observed on pecan nut trees. The first sign of an infestation is red-brown granular excretions around the base of the trunk. This discharge comes from the pink coloured larvae which have burrowed into the trunk and branches of the trees (DA, 2000). The tunnels vary in size according to the age of the larvae and can be as much as pencil thickness. Numerous tunnels occur in a single tree trunk. Young larvae hatch from the middle of December until the end of February. The larvae reach their maximum size of approximately 40 mm during spring and early summer. At this stage, the larvae become inactive and change into pupae in the tunnels. The pupal stage lasts approximately 6 weeks and it appears that only 1 generation occurs per year. The larvae remain in the trunk for about 11 months. Control will be investigated and discussed in the EIA and EMP.

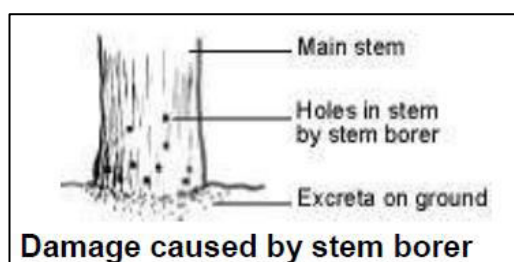


FIGURE 17: ILLUSTRATION OF DAMAGE CAUSED BY THE STEM BORER (DA, 2000)

The bark borer is another pest of the pecan nut crop and the larvae of the bark borer feed on the living bark of pecan nut trees, especially in young plantings. They later bore into the hardwood. Penetration is usually where branches are formed and can occur in branches of any thickness. The holes in the branches that serve as shelter for the larvae are about 70 mm long and 5 mm in diameter when the larvae reach maximum size. Feeding marks on the bark are covered with larval excreta spun together with threads in such a way that the larvae can move freely underneath the threads. As the larva feeds, this "house" of spun threads and excreta becomes bigger and could be found around a branch. Although infected trees do not die, the branch is ring-barked and it could die back. Control will be investigated and discussed in the EIA and EMP.

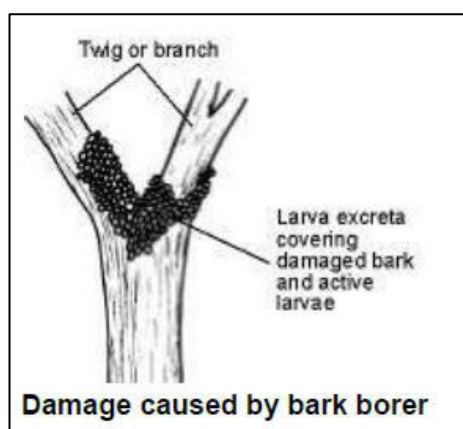


FIGURE 18: ILLUSTRATION OF DAMAGE CAUSED BY BARK BORER (DA, 2000).

Parasitic plants in pecan-nut trees such as *Tapinanthus* spp. (bird-lime), occur in most pecan-nut producing areas of South Africa (DA, 2000). These plants have no root system and parasitise the host plant. They debilitate the tree and reduce the bearing area. The plants, with their red and yellow flowers, are easily seen on the tops of pecan trees, especially during winter and September. Control will be investigated and discussed in the EIA and EMP.

The full impact on animal species and pest control will be concluded in the EIA and EMP phase.

POSSIBLE MITIGATION MEASURES

- The areas to be cleared should be swept before vegetation is removed and if animals are found, then they should be relocated, without harming, or killing the animal. An expert who holds a Competency Certificate to handle Dangerous and Venomous Reptiles should be contracted to remove such animals. This requirement should be included in the environmental awareness programme that will be provided in the EIA and EMP phase.
- No hunting or snaring should be allowed outside or inside the proposed study area and the Applicant should implement a severe penalty system for people transgressing this requirement.
- Chemical control and genetically modified cultivars must be used by following the prescribed methods.

SENSITIVE SITES

The National Protected Area Expansion Strategy (NPAES) was developed to expand protected areas in South Africa to increase ecological sustainability and adaptation to climate change. The proposed study area does not fall within any National Protected area, nor is close to any formal or informal protected area. The Gariiep Focus area is about 19.5km south and about 30km southeast of the proposed site.

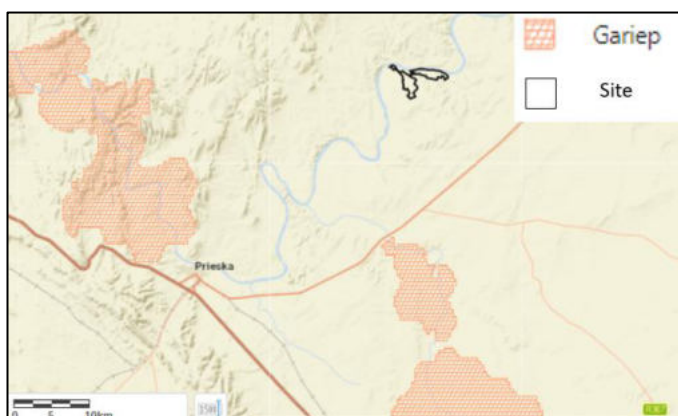


FIGURE 19: THE NATIONAL PROTECTED AREAS EXPANSION STRATEGY (NPAES) INDICATES THAT THE GARIEP FOCUS AREA, IS SITUATED MORE THAN 10KM FROM THE SITE.

The Northern Cape has a full Protected Area Expansion Strategy developed by the Northern Cape Department of Environment with support from the National Department of Environmental Affairs. The PAES priorities are largely a subset of the Critical Biodiversity Areas from the systematic conservation plan that were identified on implementation priority. SANParks priorities were fully included in the provincial PAES.

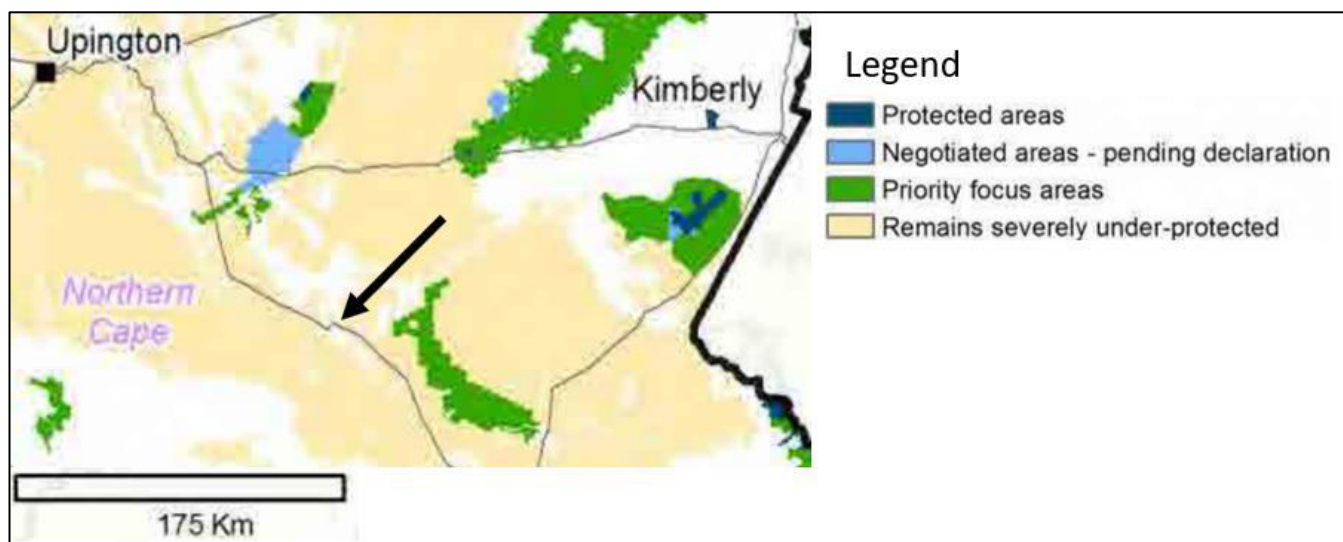


FIGURE 20: PRIORITY AREAS FOR THE PROTECTED AREA EXPANSION IN THE NORTHERN CAPE (BELFOUR ET AL, 2016).

The priority areas in the Northern Cape are in the Succulent Karoo areas of the Namakwa District, Bushmanland, the southern Nama-Karoo as well as in the expansion areas of the existing national parks in the province. The main biodiversity features are the Succulent Karoo and southern Nama-Karoo priorities, as well as river and wetlands. Arid Savanna and some Desert ecosystems are currently not fully included in these priorities. As indicated in the map above, the site does not fall within a focus area.

According to the Northern Cape Biodiversity Conservation Plan, the site falls within a Terrestrial CBA 1 area. Critically Biodiversity Areas (CBA) play an important role in supporting ecological processes. This is particularly the case with riparian areas, some key catchment areas, and key pieces of corridors. CBA areas should preferably not be further developed, no further intensification of land-use activities should be permitted and they should be prioritised for rehabilitation, where possible.



FIGURE 21: THE SITE FALLS WITHIN CBA 1 ACCORDING TO THE BGIS OF THE NORTHERN CAPE BIODIVERSITY CONSERVATION PLAN.

Critical biodiversity areas (CBA) map and guidelines assist in decision-making when considering the biodiversity status of an area and the proposed land-use or development proposal. The overall aim is to avoid loss and degradation of natural habitat in critical biodiversity areas (CBA's), whilst managing sustainable development in other natural areas remaining. Although the CBA maps constitute the best available biodiversity information, they can never replace a site-assessment and are always to be viewed as the biodiversity informant only in the triple bottom line of sustainable development, i.e. social, economic and natural environments (Vromans, D. C et al. 2008).

TABLE 6: CBA CATEGORY AND LAND MANAGEMENT OBJECTIVES

CBA category	Land Management Objective
CBA 1	<p>Natural landscapes: Ecosystems and species fully intact and undisturbed</p> <ul style="list-style-type: none"> • These are areas with high irreplaceability or low flexibility in terms of meeting biodiversity pattern targets. If the biodiversity features targeted in these areas are lost then targets will not be met. • These are landscapes that are at or past their limits of acceptable change
CBA 2	<p>Near-natural landscapes:</p> <ul style="list-style-type: none"> • Ecosystems and species are largely intact and undisturbed. • Areas with intermediate irreplaceability or some flexibility in terms of the area required to meet biodiversity targets. There are options for the loss of some components of biodiversity in these landscapes without compromising the ability to achieve targets.

	<ul style="list-style-type: none"> • These are landscapes that are approaching but have not passed their limits of acceptable change.
Ecological Support Areas (ESA)	<p>Functional landscapes:</p> <ul style="list-style-type: none"> • Ecosystems moderately to significantly disturbed but still able to maintain basic functionality. • Individual species or other biodiversity indicators may be severely disturbed or reduced. • These are areas with low irreplaceability with respect to biodiversity pattern targets only.
ONA (Other Natural Areas) and Transformed	<p>Production landscapes: manage land to optimize sustainable utilization of nature.</p>

According to the Spatial Development Framework, the key issue in the Siyathemba Municipality is the long-term sustainability of all land development practices which is the key factor in the environmental and economic future of this predominantly agricultural region. In terms of land conservation, there are various areas along the Orange River that are well suited for tourism and agricultural development alike. These areas are however sensitive to overutilization and pollution and will have to be protected and conserved to ensure long-term benefits thereof.

The SDF identified amongst others mixed agriculture (livestock & crops), with the following impacts associated with such activities:

- The destruction of biodiversity;
- Indigenous flora being substituted with exotic species;
- The loss of herbaceous annuals;
- Exposure of bare soil and subsequent erosion;
- Areas are homogenized and ecosystem functioning on cultivated land is essentially simplified to the production of bio-mass;
- Depletion and degradation of soils may lead to unproductive soils; or

The Siyathemba Municipality has mapped the environmental sensitivity of the municipal area in the SDF. The sensitivity is rated from 0-6 (0 being no sensitivity, 1 being low sensitivity, 6 being high sensitivity). Unfortunately, the ecological sensitivity map of the SDF is a bit unclear, but it does seem to appear that the site falls within an environmental area that is rated 2 and thus low sensitivity (see Figure 22).



FIGURE 22: SDF OF THE SIYATHEMBA MUNICIPALITY, THE BLACK ARROW INDICATE THE POSITION OF THE SITE.

Considering all the maps available and data presented, it must be concluded that the NPAES, the Northern Cape PAES, and the Siyathemba SDF all indicate that the proposed site does not fall within any biodiversity-sensitive area. On the other hand, the Northern Cape Biodiversity Conservation Plan (NCBCP) indicates that the site falls within a CBA 1 terrestrial area. While most of these plans are broad-based, regional/national plans are wide-scale plans and do not consider the land-use of the area and surround or site-specific features and locations. Others are more regionally specific like the Siyathemba Municipality SDF is a localised plan. Thus broad-based, regional/national plans might indicate that a site is not sensitive, but localised plans might indicate otherwise, or *vice versa*.

To assess the sensitivity of the environment the onsite verification is therefore essential. The preliminary investigation indicated that the site does not host sensitive fauna or flora, however, a SACNASP registered botanist will be appointed to conduct the vegetation survey and to determine the ecological importance of the vegetation at the site, which will then be regarded as the localised plan and evaluation of onsite conditions.

Mitigation measures will be detailed in the EIA phase but the objective will be to reduce the biodiversity impact due to the clearance of vegetation through an ‘offset plan’. The impact might range from low-moderate to moderate, but with mitigation, it could be reduced to low or very low.

The principal approach to biodiversity offsets is to provide a ‘like for like or better’ area to compensate for the area which will be negatively affected. Offsets that do not involve securing and managing habitat but include funding research, education, staffing, etc. are generally believed to be unacceptable for impacts on biodiversity. Biodiversity offsets are to be used in cases where the EIA process identifies negative residual impacts of ‘medium’ or ‘high’ significance on biodiversity. Activities resulting in impacts of ‘low’ significance may not require an offset. In other

words, biodiversity offsets can provide a mechanism to compensate for significant residual impacts on biodiversity. It refers to measures over and above rehabilitation to compensate for the residual negative effects on biodiversity, after every effort has been made to minimise and then rehabilitate impacts.

POSSIBLE MITIGATION MEASURES

- Those mitigation measures listed under the headings 'Fauna' and 'Flora'.
- Providing a biodiversity offset plan.

WATER

Surface Water

The proposed site falls within the Orange River Catchment area. The Orange River originates in the Lesotho Highlands and flows in a westerly direction 2 200 km to the west coast where the river discharges into the Atlantic Ocean (ORASECOM, 2007). The Orange River basin is one of the largest river basins south of the Zambezi with a catchment area of approximately 1 million km².

It has been estimated that the natural runoff of the Orange River basin is in the order of 11 300 million m³/a of which approximately 4 000 million m³/a originates in the Lesotho Highlands and approximately 800 million m³/a from the contributing catchment downstream of the Orange/Vaal confluence which includes a small portion in Botswana feeding the Nossob and Molopo rivers. The remaining 6 500 million m³/a originates from the areas contributing to the Vaal, Caledon, Kraai and Middle Orange rivers

The Northern Cape is divided into the following four Water Management Areas:

- Lower Orange;
- Upper Orange;
- Olifants/Droon; and
- Lower Vaal.

More specifically the proposed site falls within Lower Orange Water Management Area, in the D71D. The National Freshwater Ecosystems Priority Areas (NFEPAs) identifies important catchments based on the presence of important biota or the degree of riverine degradation.

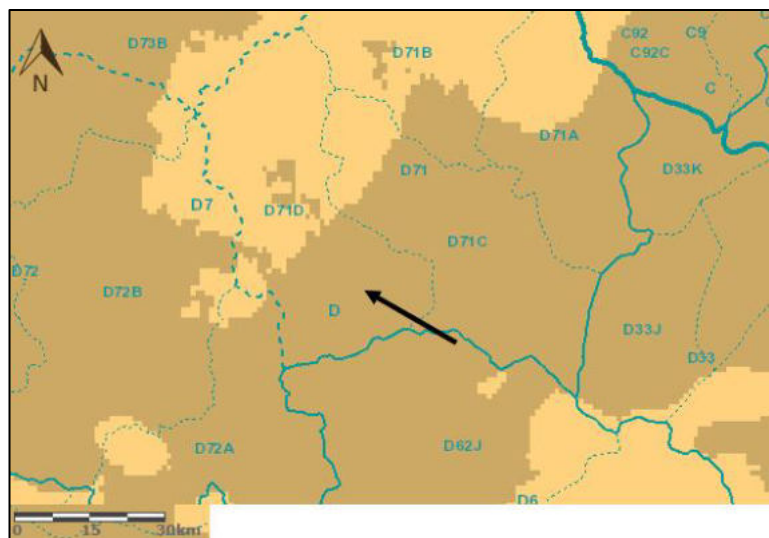


FIGURE 23: QUATERNARY CATCHMENT OF THE SITE IS D71D

TABLE 7: PRESENT ECOLOGICAL STATE CATEGORIES USED TO DESCRIBE THE CURRENT AND DESIRED FUTURE CONDITION OF SOUTH AFRICAN RIVERS, FOR NFEPA, RIVERS IN AN A OR B CATEGORY WERE REGARDED AS BEING IN GOOD CONDITION.

Ecological category	Description
A	Unmodified, natural
B	Largely natural
C	Moderately modified
D	Largely modified
E	Seriously modified
F	Critically/Extremely modified

Fish sanctuaries in a good condition (A or B ecological category) were identified as FEPAs, and the whole associated sub-quaternary catchment is shown in dark green. The remaining fish sanctuaries in lower than an A or B ecological condition were identified as Fish Support Areas, and the associated sub-quaternary catchment is shown in medium green. Fish Support Areas also include sub-quaternary catchments that are important for the migration of threatened or near-threatened fish species – these are not marked with a fish symbol.

The site is located within a Fish Support Area of the *Barbus anoplus*. The back fish symbol on the map (see Figure 24) indicates the presence of vulnerable or near-threatened fish populations. If it was a red fish symbol, it would have

indicated that there is at least one 13 population of a critically endangered or endangered fish species within that sub-quaternary catchment. Some fish sanctuaries are FEPAs, with their associated sub-quaternary catchments shown in dark green; others are Fish Support Areas, with their associated sub-quaternary catchments shown in medium green, such as the proposed site.

A goal of NFEPA is to keep further freshwater species from becoming threatened and to prevent those fish species that are already threatened from going extinct. To achieve this, there should be no further deterioration in river condition in fish sanctuaries and no new permits should be issued for stocking invasive alien fish in farm dams in the associated sub-quaternary catchment. Since there are drainage lines or perennial stream on the site and the Orange river are situated more than 100m from some of the proposed pivot areas, there is a small possibility of impact on the *Barbus anoplus* fish sanctuary.



FIGURE 24: THE SITE FALLS WITHIN A FISH SUPPORT AREA

During the EIA and EMP phase, the watercourse attributes will be further investigated, but it is not foreseen that the proposed clearing of vegetation will have an impact on the water sources surrounding the site since the buffer zones will be maintained. The Application already has a Water Use Right, therefore water abstraction has already been accounted for.

POSSIBLE MITIGATION MEASURES

- Clearing of vegetation should be restricted to the proposed footprint and development plan and 100m buffer zone be maintained from all drainage lines/non-perennial streams/ river/etc.
- Water for establishing the crops will be obtained as per the Water Use Right.
- No foreign or unapproved material/substance should be dumped or stored within the footprint of the study area.
- Refuelling of vehicles (such as the bulldozer) will be done by fuel browser and all vehicles/equipment shall be maintained to a high standard off-site and shall not display any major leaks. Vehicle/machinery inspection should be done regularly and emphasis should be on checking hydraulic hoses and couplings.

- In case of an emergency, repairs on site must be done over a drip pan at least 100m away from any drainage line.
- In case of large, critical spills the Departments of Water Affairs and DMR will be informed immediately for assistance and advice and a competent company conversant with bio-remediation will be appointed immediately to address the possible impacts of such spill. All costs would be for the account of the applicant.
- The applicant accepts the principle of 'polluter pays'.

AIR QUALITY

The air quality of the immediate surroundings is good due to its rural status. During windy periods a limited amount of dust will be deposited into the atmosphere causing a slight rise in air pollution levels during the clearing of vegetation. Since the property involved is still zoned agricultural and rural, it would cause tolerable ambient levels to be higher than those for residential areas. It would on the other hand not exempt the applicant to implement measures to keep disturbed areas as small as possible and to reduce dust generation when and wherever possible.

The amount of dust generated on a site is directly linked to the type of material that is extracted, mechanical processes involved, traffic volumes, wind speed and soil moisture content. The finer the material (more easily airborne) and the higher the clay and silt concentrations, the more severe the impact is. The dryer the soil becomes the more dust it generates therefore the site will be cleared in phases and the crops planted as soon as possible and irrigated. This will reduce the areas exposed to wind and will limit dust generation.

The potential dust generation source will mainly be during the clearing of vegetation until the crops are established, this will include harvest times, as mechanical processes will continue into the operational phase since summer crops will be alternated with winter crops or lucerne for the 'rest years'. It will be restricted to the clearing of vegetation and ploughing, since ploughing is currently taking place on abutting farming sites, the dust generation would remain similar to what is currently being experienced. During normal climatic conditions, a very low impact is anticipated.

In terms of the potential dust generation source at the vineyard and pecan nut plantation, it will mainly be during the clearing of vegetation until the vineyard and plantation are established, thus during the operation phase dust should be limited.

The overall impact on air quality, without mitigation, is anticipated to be low (calm days) to low-moderate (windy days) only during the construction phase, considering the small sections to be developed at any given time.

POSSIBLE MITIGATION MEASURES

- No cooking fires will be allowed on the property, no chemicals will be stored or disposed off on-site and no waste will be burned on site.
- Waste should not be buried.

- Water will be used to irrigate areas.
- The clearing of vegetation should not impose dust counts of more than 20 mg/m²/per day at any residence or more than 40 mg/m²/per day during abnormal climatic conditions.
- Speed of vehicles should be restricted to 30km/h, which will assist in mitigating dust generated on haul roads.

NOISE

The impact of noise levels generated by farming activities is determined by the type of activity, the time of day, the consistency thereof, distance to people, whether it is a low or high-pitched noise and whether beneficiation is taking place. Noise levels are more intense in the morning and evening than during the rest of the day and are more irritating if it is high-pitched. The more continuous the noise is the higher the impact. In terms of SABS standards, noise levels for rural residential areas are 45dB during the day, 40dB in the early evening, and 35dB at night. Noise impact is rated against the following: 1) The average dB will result in no or sporadic complaints from communities whilst an increase between 5-10dB will result in widespread complaints, 3) An intruding noise is defined by National Noise Regulations as disturbing if it causes the ambient noise levels at the border of the property from which it emanates to increase with 7dB, 4) An average person will perceive such an increase in the ambient noise levels as a doubling of noise levels and very strong response will be expected from communities/residents.

The rural setting of the study area and the extensive agricultural activities characteristics of the area would, under normal circumstances, probably result in the ambient noise levels being between 40 and 45dB during the day. Since the site is 12km from the R375, cumulative impact concerning provincial roads will not be a factor. There is a small diamond mine on the property and trucks might cause an intermittently increase in noise levels to approximately 65-70dB along the gravel road. Since there are no receptors it is not anticipated that the proposed development will impact the tranquillity of the area, but rather fit in with the surrounding area.

Noises generated during the construction and operational phase (clearing of vegetation and crops) will generally be low-pitched if earth-moving machinery is well maintained. There is one exception and that is the reverse sirens which produce a high-pitched, irritating noise and could cause some irritation to the applicant's home residence early in the morning or later at night. In terms of neighbours, the closest resident is more than 2.5km from the site, very low to no impact is expected. Since the fitting of sirens is a requirement of the OHS Act, there is no mitigation possible.

No campsite would be established in the study area, therefore no noise would be generated at night that could become a nuisance.

Management of the human impact during the day could be achieved via the environmental awareness programme. Also, staff and contractors should be sensitized not to engage in unnecessary hooting, shouting, flapping of tailgates, and use of exhaust brakes during operational hours. Maintaining speeds below 40km/h would assist in curbing noise impact.

The expected impact rating on noise is very low, but will be further investigated during the EIA and EMP phase.

POSSIBLE MITIGATION MEASURES

- Unnecessary hooting, shouting, flapping of tailgates, and use of exhaust brakes should be discouraged as well as the unnecessary idling of vehicles.
- Moving parts of vehicles should be regularly serviced and repair work that involves using grinders and hammers on steel or any other steel on steel activity should be done during the day at the farm workshop.
- This potential impact should be addressed in an environmental awareness programme, which will be completed during the EIA and EMP phase.

WASTE GENERATION

Domestic Waste

The waste stream will consist mainly of small volumes of domestic waste (food, bottles, plastic bags, paper, clothing, rags, etc) and will be deposited in small containers provided in the earth moving vehicles, for this purpose. It can be emptied once a day in a refuse bin at the farmhouse/workshop. Poor control over domestic waste handling could lead to littering the site and abutting properties and must be avoided since it could lead to livestock mortality or impacts on fauna. Due to the limited number of people anticipated on-site, the limited waste stream will have negligible impacts on soils, water vegetation, air quality, and humans.

Clearing of vegetation residue

The geology of the area restricts the type of residue to possible oversize stones, and root mass. The former could be returned to old excavation areas (diamond mine) and be covered with some of the root mass. The rest of the root mass can be worked into the topsoil as organic matter. The cumulative impact on soils, water quality, vegetation and aesthetics is expected to be rated of low significance.

Sewage system

A chemical toilet must be provided. Considering the limited number of people on-site, the effluent stream will be limited to approximately 0,1 m³ per month and no impacts on soils, groundwater, surface water, air and humans are anticipated if it is maintained/serviced properly.

Hydrocarbons

No hydrocarbon storage will take place onsite. Servicing of equipment and vehicles would be done off-site at the farm workshop therefore no hydrocarbon waste such as used oil, lubricants and hydrocarbon-contaminated filters will be generated. Any such material generated during emergency repairs will be removed from the site immediately. No-wash bay or oil trap will be constructed as vehicles will be washed off-site and all hydrocarbon spills will be contained within large drip pans. The impact is anticipated to be a low impact.

POSSIBLE MITIGATION MEASURES

- Any domestic waste produced would be temporarily stored at allocated areas in the farm area and removed continuously to a legal waste facility. Appropriate containers and storage areas will be investigated during the EIA and EMP phase. Easy access to these should be a priority and no waste should be burned or buried on site.
- The site should always remain neat and tidy.
- Any hydrocarbon spills would be cleaned up immediately and vehicles will be maintained to a fuel, oil, or lubricants leak-free status. Vehicles should be parked over drip trays.
- The chemical toilet/s would be regularly serviced and emptied at an approved waste site in Prieska and strict controls will be enforced to ensure that the surrounds are not used as ablutions. This aspect would be included in the environmental awareness programme. Waste from the toilet should be taken to a licensed WWTW.
- The chemical toilet/s can be moved to and from the site as they are needed.
- Residue in the form of oversize stones could be returned to old excavation sites on the farm.

VISUAL IMPACT AND AESTHETIC ACCEPTABILITY

Originally, the landscape would have been described as very attractive and of high aesthetic quality because of the meandering status of the river and the unique riverine environment. However, due to the anthropogenic impacts such as the establishment of cultivation areas, Eskom servitudes, a diamond mine, and road infrastructure, the current surrounding landscape can be viewed as impacted, but with a moderate-high aesthetic quality, due to the location of the site (fairly close to the Orange River) and the tranquillity that farming generally provides to areas.

The landscape itself does not provide valleys and ridges to add to the visual character of the area, and roads, bridges, telephone and power lines, and residences on farms, farm buildings, etc. further reduced the aesthetic value of the surroundings. Onsite assessment of immediate landscapes revealed that the majority of the Southern-, Upper Western- and Upper Eastern Sections are transformed due to past and present agricultural activities, while the southern parts of the Southern Section are more intact, but borders the diamond mining area.

With the removal of vegetation and establishment of crops, the anthropogenic impact will be evident, but it will be site-specific and since it will be directly abutting existing pivot areas, it would seem like a continuation of the same activity and therefore reduce the perceived aesthetic impact.

The clearing of vegetation will temporarily change the texture (vegetated/rough to bare/smooth) and colour (green/brown to whitish-grey) of the cleared out areas and will increase onsite visibility, but as the crops are established the onsite visuals will be absorbed into the landscape and will fit in with the surrounding land use. This will be a continued impact during the operational phase, as summer and winter crops are planted or lucerne for alternating years.

In terms of the areas allocated for vineyards and pecan nuts, once established the onsite visuals will be absorbed into the landscape and will fit in with the surrounding land use.

During the EIA phase this procedure will be elaborated on. This visual impact should, however, be temporary and of very low significance considering the frequent ploughing of abutting croplands.

POSSIBLE MITIGATION MEASURES

- No vegetation clearing should take place outside the proposed study area and the visual impact will be reduced through the establishment of crops and alien control programme.
- Excessive dust generated by the bulldozer, haul roads, and ploughing machinery, harvesting, etc. that increases visual impact could be reduced through an irrigational plan.

TRANSPORT IMPACT

The existing access roads on the farm and the R357 will be used. During the construction phase (vegetation clearing) a bulldozer will be at the site and will not add heavy vehicle traffic to the national and provincial road system. It is not anticipated that there will be any impact on the farm road infrastructure.

Once operational, the R357 will be used to transport harvest crops, dried fruit and nuts to the relevant markets. It is anticipated that during the harvest time, heavy vehicles will add to the traffic count on the R357, but since this road is built for heavy vehicles, the impact is anticipated to be low.

During the EIA and EMP phase the condition/integrity of the roads will be investigated, but despite the sometimes poor quality of the road, safety risks for motorists would not increase since the proposed development will just be a continuation of existing agricultural activities on the farm. Cyclists and pedestrians will experience a similar risk and truck drivers will be sensitized on the matter and provided with the necessary transport training.

POSSIBLE MITIGATION MEASURES

- All vehicles and earthmoving machinery would be properly maintained and will be road-worthy and all drivers must dispose of applicable driver's licenses.
- Traffic should be observed and necessary road etiquette enforced and this aspect will be included in the environmental awareness programme.
- The appropriate road signage should be erected on both sides of the farm entrance and if needed, a flagman will be appointed at the access point to increase road safety during harvest periods when an increase in trucks are expected on the farm.

SOCIO-ECONOMIC IMPACT

During the construction phase, the development will provide permanent and casual work for a number of people, whether it is renting a bulldozer from a local company, employing workers to 1) remove the vegetation, 2) remove stones, 3) construct the irrigation infrastructure, or 4) fencing/moving fencing the camps, etc. Once in operation and the crops are harvested, it will create job opportunities for harvesters, transport companies, etc. and must be seen as a positive contributor to upliftment of inhabitants of the Siyathemba Municipal area.

Once in operation and the crops are harvested, the vineyard starts producing fruit, and the pecan nut plantation starts producing nuts, an annual raisin production/nut harvesting and crops harvesting will create job opportunities for harvesters, transport companies, etc. and must be seen as a positive contributor to upliftment of inhabitants of the Siyathemba Municipal area.

In terms of the socio-economic benefit, it is no secret that South Africa has one of the world's highest unemployment rate, with the IDP of the Siyathemba Municipality indicating that in 2009 the unemployment rate was about 34.7%, which has steadily increased over the past decade. A small portion of workers (10.3%) can be classified as highly skilled, but more than 52% of workers can be regarded as semi- or unskilled workers.

It is thus clear that raisin production, pecan nut production, maize/wheat/lucerne crops, as proposed by the Applicant, will contribute to economic growth within the Siyathemba Municipal area. This development will not only benefit the Applicant but will also create job opportunities for about 50 permanent staff and 300 seasonal staff to be employed during the operational phase of the vineyard and pecan nut harvesting, thus assisting the low-income households that will assist in poverty alleviation.

In terms of the negative impacts, it could potentially pose some social impacts on residents in terms of safety and security issues, nuisance factors such as dust & noise generation. However, the Applicant is a farmer and has a close relationship with the local community. Most of the families employed on the farm will be from families that have been on the farm for generations, which is the basis of their mutual trust in each other. The Applicant will therefore employ local community members known to the farming community, which is in line with current farming practices. Farm safety remains a major concern and will be investigated during the EIA and EMP phase.

Based on the above, the overall social-economic impact is expected to be rated positive.

POSSIBLE MITIGATION MEASURES

- If needed, meetings with nearby neighbors should be held to address any unknown impacts.
- Farmworkers may not wander on any area outside the farm and stock theft and poaching should not be tolerated. Any farm worker/contract worker found guilty of these transgressions should be removed from the property, dismissed and handed over to the police for sentencing.
- No wood should be gathered from outside the study area and no plant or crop should be removed by the workforce.
- Landowners will be fully compensated for stock or crop loss.

STRUCTURES OF ARCHAEOLOGICAL AND CULTURAL INTEREST

These sites represent the heritage of communities and are therefore protected in terms of current legislation. In addition, all materials/buildings older than 60 years are protected. The Northern Cape is rich in fossils and archaeological heritage and therefore the area will be subject to a Phase 1 Archaeological and Paleontology Report will be completed by Dr. Lloyd Rossouw who has a BA Hons (SU), MSc (Wits), and PhD (UFS). The full report will be submitted with the EIA and EMP phase. Also, an environmental awareness plan will be compiled to inform the operators of earthmoving equipment of the company's obligation to protect any archaeological or cultural artefacts and to inform management when anything of interest is noted on the site.

POSSIBLE MITIGATION MEASURES

- Recommendations from the Heritage Survey Report will be included in the mitigation measures, which will be completed during the EIA and EMP phase.
- Operators of earthmoving equipment should be informed of the company's obligation to preserve archaeological and historical material and this aspect will be included in the environmental awareness programme.

PUBLIC PARTICIPATION FOR THE SCOPING PHASE

In terms of Regulation 40 of the Schedule published in GNR 326 under NEMA 107 of 1998, interested and affected parties must be consulted as part of the public participation process. To follow 'green' practises, it is proposed that

where possible email correspondence will be used as opposed to hard copies of documents. Thus the following steps were taken, following current legislation:

- A Notice Board to inform the public about the application and allow registering as an interested and affected party was placed at the entrance to the property that is accessible to the public. The date of the notice is 14 April 2022 and the comment period will stop on 18 May 2022.
- An advert was placed in Die Oewernuus on 14 April 2022 to inform the public about the application and provide an opportunity to register as interested and affected parties to register or raise concerns about the proposed project. The comment period will however stop on 18 May 2022, which gives potential I&AP's more time to register.
- Dirk Ernst Loots, one of the landowners (as the Dirk Loots Familie Trust is the other landowner and Applicant), has agreed with Zwemkuil Gordonii CC to allow development on the property. In addition a letter of consent was provided, therefore he will not be consulted again.
- All abutting neighbours were consulted with a detailed letter and sent via email and an opportunity was given to object or raise concern to the proposed project. The letter was emailed on 14 April 2022 and the comment period will stop on 18 May 2022. The following people are abutting neighbours:
 - Zandfontein Delwery Mine
 - Gerrie Du Plessis
 - Frans Terblanche
 - Giel van Niekerk (Mr. van Niekerk indicated in a phone call that he does not have an email address and register post will be sent to him)
 - Bennie van Niekerk
- The Siyathemba Municipal was consulted via email and register post and an opportunity was given to object or raise concern to the proposed project. The letter was sent on 14 April 2022 and the comment period will stop on 18 May 2022.
- The Pixle Ka Seme District Municipal was consulted via email and register post and an opportunity was given to object or raise concern to the proposed project. The letter was sent on 14 April 2022 and the comment period will stop on 18 May 2022.
- The Ward 3 Councilor was consulted via email and an opportunity was given to object or raise concerns to the proposed project. The letter was sent on 14 April 2022 and the comment period will stop on 18 May 2022.
- The Department of Water and Sanitation was consulted via email and register post and an opportunity was given to object or raise concern to the proposed project. The letter was sent on 14 April 2022 and the comment period will stop on 18 May 2022.
- The Department of Agriculture was consulted through an application for the cultivation of virgin soil that was submitted on 16 March 2022, therefore no formal correspondence to comment on the Scoping Report was provided to them. The application is in process.
- The Lands Claim Commissioner of the Northern Cape was consulted via email and an opportunity was given to object or raise concerns to the proposed project. The letter was sent on 14 April 2022 and the comment period will stop on 18 May 2022.
- An application to the South African Resource Agency will be submitted online as per their SAHRIS application format and requirements.

Section 41 (3) of the regulations indicates that the notice, notice board, and advertisement must give details of the application and state if the application is a BAR or an EIA. In addition, the notice must also provide the activities being applied for, the location, where further information on the application can be obtained, and how a person can register as an IAP. According to Section 41 (6)(b) of the regulations, the potential or registered IAPs must have a reasonable opportunity to comment on the application.

The timeframes are very clear in the NEMA Regulations, that IAPs must have 30 days to comment and register as IAPs and the time frames to submit the Scoping Report are very rigid (44 days – of which 10 days could be utilized by the authority to accept/reject the application; 30 days must be provided to IAPs to comment and register, thus leaving 4 days for finalization of the Scoping Report before submitting). This results in the Scoping Report is available to any potential IAP for comment and not just registered IAPs.

The Scoping Report and Plan of Study will be submitted 2-3 days after acceptance of the application is received from the Department of Agriculture, Environmental Affairs, Rural Development and Land Reform and the notice board, advertisement and notification letters will be placed/mailed accordingly. If any IAP wants to comment on the Scoping Report and Plan of Study they can contact Digital Soils Africa (contact information provided in the notice) and enquire regarding the website information where the document is available for public viewing.

The Scoping Report will also be submitted to all organs of the state which have jurisdiction in respect of the activity or any part thereof during the mentioned 30 day period. At the cessation of the 30 day comment period, the Public Participation Report will be finalized and submitted with the Final Scoping Report to the DAEARDLR.

If no comment or written request to be registered as an IAP is received from potential IAPs during this 30 day consultation period, then the public participation process will be concluded and only entities regarded as registered IAPs will be given notice of the EIA.

Proof of consultation during the Scoping Phase is attached in Appendix C – Public Participation.

During the EIA phase, another 30-day comment period on the draft EIA and EMP will be provided to all registered I&AP's.

PLAN OF STUDY

INTRODUCTION

Any activity which is listed in Listing Notice 1 or Listing Notice 2 of these EIA Regulations is subject to environmental authorization. The difference between Listing Notices 1 and 2 is in the process that needs to be followed, with Listing Notice 1 activities being subject to Basic Assessment and those in Listing Notice 2 to Scoping and Impact Assessment. For this application activities listed under Notice 2 were identified, therefore the EIA process has to be followed.

The amendments to the National Environmental Management Act have led to the Plan of Study to be included in the Scoping Report and are no longer a separate document submitted with applications. Since, a detailed description of the components and issues considered, have been included in the Scoping Report, this chapter of the report, therefore, provides the context for the Plan of Study for the Environmental Impact Assessment, supplementary to the Scoping Report.

Therefore this Plan of Study describes how the EIA for the proposed project will proceed and includes proposed specialist studies to be completed for those potential impacts provisionally evaluated to be of significance.

Should the Scoping Report be accepted by the Department of Agriculture, Environmental Affairs, Rural Development, and Land Reform, the application will proceed with the EIA Process as described in the NEMA Regulations of 8 December 2014 as amended in 2017.

OBJECTIVES OF THE EIA

The objective of the assessment of impacts is to identify and assess all the significant impacts that may arise from the undertaking of an activity. The findings of impact assessments are used to inform the competent authority's decision as to whether the activity should be authorized. The objectives of the EIA are:

- To identify issues/concerns that should be included in the scope of the Environmental Impact Assessment process;
- To provide an assessment and rating of the social and biophysical environments affected by the proposed project, to an appropriate level of detail, which will include the physical, biological, and socio-economic components.
- Identify and recommend appropriate mitigation measures for potentially significant environmental impacts;
- To identify possible specialist studies to be conducted to address significant issues;
- To describe/ recommend mitigation measures/ Environmental Management Plan (EMP) to be implemented to address significant aspects/ impacts associated with the proposed development to fall within acceptable levels;
- To inform all stakeholders about the proposed mining development through a public participation process as published in Regulation 41 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) as amended and ensure that IAP's have the opportunity to raise their concerns.

EIA APPROACH

In the EIA, aspects, and impacts (cumulative impacts, degree of impacts, nature of impacts, the degree to which impacts can be reversed), associated with the construction, operational, and closure phases shall be extensively assessed, as determined through site visits and field investigation to determine the baseline environmental parameters. A desktop study will determine:

- Ecological sensitive sites;
- Conservation areas;
- Surface water resources;
- Soil stability; and
- Vegetation sensitivity.

Comprehensive mitigation measures informed by the investigation and specialist reports, as well as consultation with key stakeholders, shall be included in the EIA report and the Draft Environmental Management Plan.

Since this will be a change from grazing land to crop production and the proposed development will have a lifespan of more than 10 years, a closure phase should consist of rehabilitating the site back to a natural veld used for grazing. However, ten years from now, it is most likely that environmental laws would have been amended and requirements might change. Therefore as a condition to guard the long-term sustainability of the project, it is proposed that as a condition of approval, the following be stipulated: should the Applicant decide to cease the crop production, a closure plan must be submitted to the relevant Department for approval.

A DESCRIPTION OF THE ALTERNATIVES TO BE CONSIDERED

No alternative sites were investigated as:

1. The Applicant is one of the trustee members of the Trust that is the landowner and has an agreement with Mr. Dirk Ernst Loots to continue with the project;
2. A Soil Report indicated that the site is suitable for crop production and from an environmental point of view the best option that will have the least amount of impact, and
3. The Applicant already has the necessary water use right for irrigation.

Alternative site layout will be investigated since the soil report identified better areas for crop production within the study area and recommends that no more than 10% of unsuitable soil should be included in pivot areas.

ALTERNATIVE LAYOUT

In terms of alternative site layout, irrigated lands are prone to salinization and water-logging because of added salts brought in by irrigation water. The properties of soil must adhere to the infiltration of water through the soil as well as the built-up of sodium and salt. It was, therefore, essential to investigate the soil properties for the sustainability of the proposed irrigation project and to prevent situations where the soil could reach the extent where it cannot be vegetated anymore.

The suitability of the area was defined into 3 categories namely, Suitable, Suitable for vineyard, and Unsuitable. Soils not suitable for irrigation, but which had freely drainable depths of at least 700 mm, i.e., soils with a depth of 700 – 1000 mm, would be suitable for vineyard production, with the provision that the soils are broken, and deep ripping is done.

Approximately 330 ha is suitable for irrigation. According to the soil report, soils with a freely drainable depth of 1000 mm, which included the Hutton, Augrabies, Prieska, Addo, and sections of the Plooyburg, Prieska, Glenrosa and Vaalbos soil forms were suitable for irrigation. The soil forms not suitable for irrigation (Sections of the Plooyburg, Vaalbos, Brandvlei, Prieska, and Glenrosa) were suitable for vineyards under drip irrigation as the soil could be mechanically altered to accommodate vineyards. The area for vineyard production was approximately 76 ha. The areas not suitable for irrigation or vineyard production were the Coega and parts of the Glenrosa, Vaalbos, Plooyburg, and Brandvlei soil forms. Soil that had a freely drainable depth of <700 was unsuitable for irrigation and vineyard production.

Therefore the findings in the soil report are very specific and alternative pivot layouts or crop production would not be recommended to prevent soil degradation and crop failure. Considering the suitability of the soil for irrigation (see Figure 5) most of the area is suitable for maize, lucerne, wheat, etc, except for the northern part of the Southern Section of the study area, which, according to the soil report is mostly suitable for vineyard production. Therefore no alternative site layout will be considered, other than what is proposed by the soil report.

ALTERNATIVE LAND USE

Alternative land uses, instead of agriculture will not be considered, since it involves an application for change of land use and the landowner does not wish to change the land use of the property. However, it is important to discuss the process of this conclusion.

Agriculture

The area under application is used for grazing. According to the AGIS, the grazing capacity is 32Ha per LSU (Large-stock unit) which is considered a fair carrying capacity. This action will result in the same environmental impact as clearing the site for maize or wheat crops. The difference is that the agricultural use will change from grazing to crop production.

The soil investigation found that the A and B horizons are characteristically sandy and therefore will facilitate good drainage. The drainage restricting layers were the major determining factor for suitability. Approximately 5% of the area has a shallow depth and is not suitable for irrigation or vineyard, while essentially 15% is suitable for vineyard production under drip irrigation. The rest of the area is suitable for all irrigation.

The soil texture results confirm the morphological interpretations and good drainage is expected on the soils where restricting layers are not present.

The laboratory results indicate that the chemical parameters are manageable. The exchangeable sodium percentage (ESP) values are low and the pH values indicate that salinity is not a major risk. The study area (excluding the Brandvlei soil areas) is of low risk to salinization, with low ESP and EC together with good drainage. A fertilization plan on soils with low CEC should be implemented to ensure maximum crop production.

In terms of crop production of vineyard and pecan nuts, the soil report found that the general soil requirements for vineyard production are best suitable for soil that has a pH between 5.5 and 6.5 and has required phosphorus between 40 to 50 ppm. Additionally, for vineyards to be successful a depth of between 600 mm and 800 mm is required. By breaking up the soil, deep ripping can allow roots to penetrate the soil and access water and nutrients. Soil texture is one of the most important components regarding vineyards, a sandy soil will require intensive irrigation in order to achieve production goals, while clay soil struggles with cultivation and cracks that disrupts water and nutrient movement.

For the Zwem Kuil farm specifically, the soil report found that a vineyard production requires less soil depth than traditional agricultural produce. The area shown as suitable for vineyard has sufficient depth for vineyard roots to develop and is suitable for production. In the unsuitable area, vineyard roots will be restricted, and the available water and nutrients will be limited.

In terms of soil texture, it is generally very sandy, with clay percentages generally under 20%. Dryland vineyard will therefore not be suitable for these soil types as no water would be retained, while drip irrigation would be better suited for the soil type.

The pH(KCl) of the soil samples is between 5.7 and 7.4. The more alkaline soils (Red apedal horizon of profiles 75 and Orthic of 88) require a reduction in pH, while the rest of the area has a suitable pH for vineyards. It is recommended that acidifying fertilizers be used on the soils to lower the pH. Liming is not required. Regular soil sampling will inform the farmer of best management practices concerning alkalinity/acidity.

In terms of phosphorous, Calcium carbonate (Found in Coega and Brandvlei and soils with Neocarbonate horizons) exerts a major influence on P fixation. The phosphorous within the soil (6-8 mg/kg) is below the required rate of 40 mg/kg. and it is recommended phosphate be applied to prevent plant deficiencies. Phosphate availability is largely dependent on the pH. Soil pH values below 5.5 and between 7.5 and 8.5 limit phosphate availability to plants due to phosphorous being highly fixated at very low pH soils (pH 3-4) and moderately fixated at pH 7.5-9 (USDA, 2001). Therefore, the more alkaline soils of Zwemkuil could experience P deficiency.

In conclusion, the soils indicated as suitable for vineyards are generally suitable for vineyard production. The pH is not within the optimal range and acidic fertilization should be applied; it is also expected that soil pH will decrease with continued cultivation. The texture is suitable for vineyards under drip irrigation. It is recommended that phosphate be applied to prevent plant deficiencies.

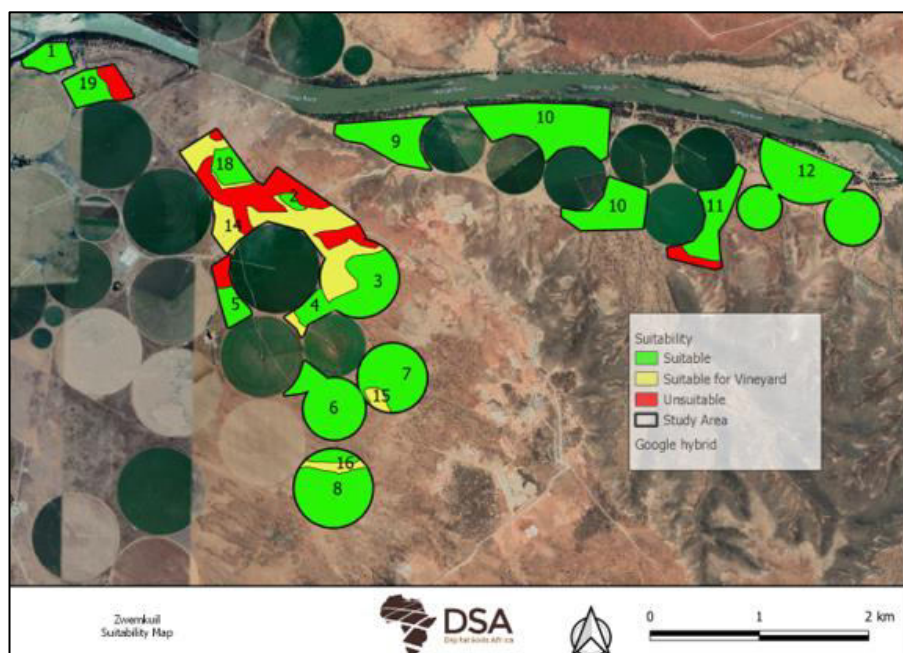


FIGURE 25: SOIL SUITABLE FOR VINEYARD

In terms of soil requirements for Pecan nut production, it is known that pecan nut trees perform best in fertile, well-drained, deep soil which consists of a medium texture. The soil depth should at least be 2 m deep. The soil should not be calcareous as calcareous soil causes deficiencies in micro-nutrients, especially zinc. The pH recommendation for pecan-nut trees is 6.5 to 7. Suitability for pecan-nut trees was defined as suitable (depths of 1000 mm and non-calcareous) and moderately suitable (depths of 1000 mm and calcareous).

For the Zwem Kuil farm specifically, the soil report found that soils with a freely drained depth >1000 mm were considered to have sufficient depth for pecans, which is a large portion of Zwem Kuil farm. The soil texture is generally very sandy, with clay percentages under 20%, and pecan-nut trees prefer soil that is freely drained and has a sandy loam texture. Thus, all the soils meet the textures requirements.

In terms of the pH, the soil report found that the pH(KCl) of the soil samples is between 5.7 and 7.4. More acidifying fertilizers should be applied in the alkaline soils (Red apedal of profile 75 and Orthic of profile 88). A slightly acidic pH was found for the rest of the area. Liming is not required on the alkaline soils as it is anticipated that the pH will lower with continued cultivation and irrigation. Soils that are more alkaline could lead to micro-nutrient deficiencies. Regular soil sampling will inform the farmer of best management practices concerning alkalinity/acidity.

Calcium carbonate exerts a major influence on P fixation similar as what was discussed with vineyard. The phosphorous within the soil (6-8 mg/kg) is low. The recommendations for pecan-nut trees are provided in Table 7.

TABLE 8: PHOSPHOROUS RECOMMENDATION FOR PECAN NUT TREES

Plant nutrient	Year fertilizer application for trees during years			
Phosphorous	1	2	3	4
(g per tree)	34	68	102	136

In terms of the zinc requirements within areas where pH is higher than 7 (Red apedal of profile 75 and Orthic of Profile 88) are especially at risk for zinc deficiencies. The pH can be decreased and thereby increasing zinc uptake in the roots or applying the zinc for foliage uptake. It is recommended to pursue lowering the pH, since the good drainage of the soils allows leaching which, with chemical amendments, can lower pH effectively.

In conclusion, the soil report indicated that the soils indicated as suitable for pecan-nut trees are both physically (depth and texture) and chemically suitable for Pecan-nut trees production. The pH is not within the optimal range and acidic fertilization, as well as Zn, should be applied; it is also expected that soil pH will decrease with continued cultivation.

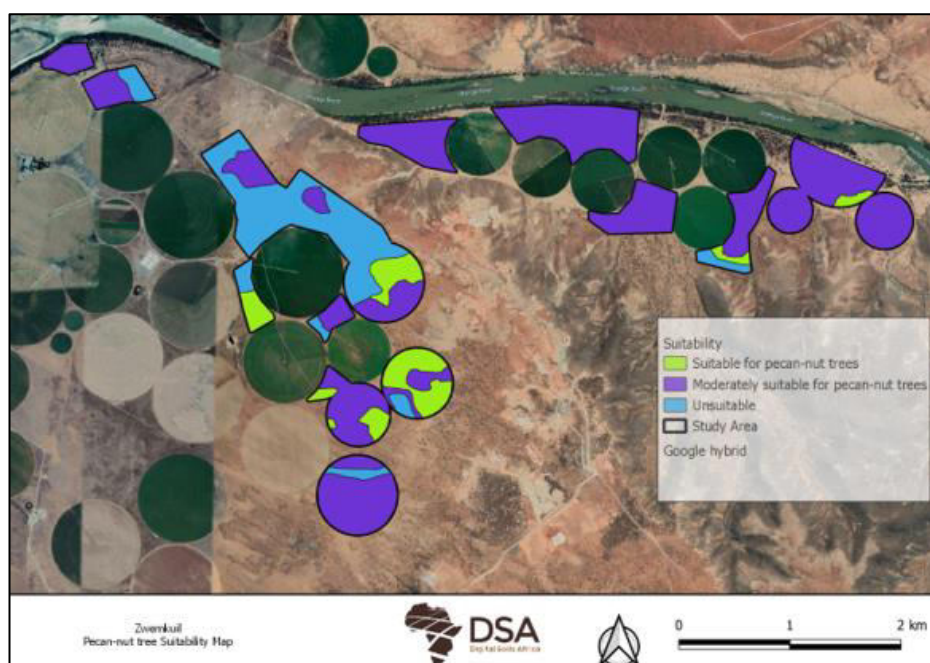


FIGURE 26: SUITABILITY FOR PECAN NUT TREES

Currently, there are cultivation lands surrounding the proposed areas to be developed and if cultivation is to be approved, it will fit in with the surrounding land use and appear to be an extension of existing cultivated lands.

It must, however, be noted that the area under application will never be able to carry large amounts of cattle, even if this development is not approved. Since the proposed crop production will add great value to the farming industry; agriculture, as land use, will remain the choice land use to be the best option for development.

Conservation

The final consideration of alternative land use versus developing the site for crop production is to establish the site as a conservation area.

A desktop study of the vegetation indicated that the Upper Western Section, most of the Upper Eastern Section and a portion of the Southern Section are situated on the Upper Gariep Alluvial Vegetation type, while the rest of the Southern Section is situated on the Northern Upper Karoo vegetation type.

In terms of the Upper Gariep Alluvial Vegetation, the conservation status is: Vulnerable. Only about 3% statutorily conserved in Tussen Die Riviere, Gariep Dam and Oviston Nature Reserves. More than 20% were transformed for cultivation (vegetables, grapes) and the building of dams. Exotic woody species such as *Salix babylonica*, *Eucalyptus camaldulensis*, *E. sideroxylon*, *Prosopis* and *Populus* species have become common dominants in patches of heavily disturbed alluvial vegetation (Mucina and Rutherford, 2006).

In terms of the Northern Upper Karoo the conservation status is: Least threatened. Target 21%. None conserved in statutory conservation areas. About 4% has been cleared for cultivation (the highest proportion of any type in the Nama-Karoo) or irreversibly transformed by the building of dams (Houwater, Kalkfontein and Smart Syndicate Dams) (Mucina and Rutherford, 2006).

Depending on the vegetation survey, some important or protected plant species might be identified on the site, and this should be considered during the EIA Phase. The site also falls within a CBA 1 area and for this site to become a prime conservation area, the following must be addressed first:

- The immediate and surrounding land needs to be upgraded from agricultural land use to conservation, which will be a problem since a diamond mine has mining rights on the farm and the Applicant is in a legal agreement with the mine to continue mining and is therefore not in a position to enforce this transformation. In areas that the Applicant oversees, the transformation from agriculture to conservation will result in income loss generated from farming and job losses will occur for farmworkers.
- All neighboring property owners must agree to conserve their properties and fences must be removed to ensure a suitable size area that is a viable conservation area that can host biodiversity and act as a corridor for animal movement.

- All alien vegetation must be removed and indigenous vegetation must be established.

This option as land use is therefore not recommended, since:

1. It will be a highly costly exercise with very little to no return income to cover rehabilitation costs and implement conservation procedures.
2. This will be a significant expense that will not benefit the Applicant or landowners since they will not be allowed to farm optimally. Also, farming is the main income for the property owners and many workers are dependent on agricultural produce for their livelihood. It is highly unlikely that fences will be removed.
3. The soil report indicated that crop production can be established on the site.

Establishing this site alone as a conservation area will be futile since it is only about 406 Ha in size and is mostly isolated and surrounded by transformed areas. For a conservation area to be successful it needs to interrelate with the broader landscape and socio-economic context within which they are situated. If surrounding areas are not going to change, the conservation of this section will be futile.

In light of this, it is recommended that this site be developed into crop production, with the benefit of socio-economic improvement and job creation opportunities, while remaining an agricultural unit. Developing this site will be the best viable land-use option for the Applicant who is also the landowner.

NO DEVELOPMENT OF THE SITE

In terms of the 'no-go' option; if the site is not developed there will be no change (good or bad) to the status of the site; it will remain as-is: areas that have been severely impacted due to past agricultural practices and areas that are fairly intact and used for grazing. Considering that the proposed study area is directly adjacent to established pivot areas, it will be a continuation of the development on the farm.

The development of the site into a crop production of maize, wheat, and alternating lucerne, as well as vineyard and pecan nut as a continuous development on the farm on areas between existing pivots, indicates that the farmer has considered the logistics in terms of irrigation availability and utilizing much of the areas between pivots for optimal development.

The proposed farm practice will increase the yield production of the land and increase capital revenue substantially for the farm, and due to the rotation practice, minimal losses will occur in terms of grazing capacity. The offset against crop production, the increased job opportunities, and the capital value of the property outweighs the option not to develop this site.

From an economic and agricultural point of view, it is better to develop the area and improve the agricultural potential of the land and from a soil management perspective to allow crop rotation production. Therefore, the 'no-go' option for this portion of land as an alternative is not recommended.

Furthermore, in the EIA no alternative site, no alternative land use, no alternative site layout, and the 'no-go' option will not be considered or evaluated. The EIA will assess the impacts of the area under application only.

ASPECTS TO BE ASSESSED DURING THE EIA PHASE

For the application, a few activities triggered the requirement to apply for environmental authorization. These listed activities include:

Vegetation of clearing

- GNR 325 Activity 15: The clearance of an area of 20 Ha or more of indigenous vegetation.
- GNR 324: Activity 12 (g)(ii): The clearance of an area of 300m² or more of indigenous vegetation in the Northern Cape within a critical biodiversity area identified in bioregional plans.

The above-listed activities will cause direct, indirect, and/or cumulative impacts on the biophysical environment. Therefore each listed activity will be assessed in perspective to the biophysical parameter and the following biophysical parameters will be assessed:

Topographical assessment

Geological & Soil assessment

Land capacity assessment

The vegetation assessment

The fauna assessment

Site Sensitivity assessment

Surface & Ground Water assessment

Air quality assessment

Noise impact assessment

Waste management assessment

Visual impact assessment

Traffic impact assessment

Socio-Economic impact assessment

Archaeological & Palaeontology assessment

Management actions or mitigation measures will be fully described in the Environmental Management Plan (EMP) that forms part of the EIA process. In the above Scoping Report, potential mitigation measures have been discussed,

but as the EIA progress, more specific mitigation measures will be prescribed to the proposed project to mitigate specific impacts.

SPECIFIC ISSUES TO BE ADDRESSED IN SPECIALIST STUDIES

The Terms of Reference for each specialist should be outlined, before appointing the specialist, and for each specialist study, the method of assessing the environmental impacts should be similar to the below to ensure uniformity in providing scientific information.

The site visit during the Scoping Phase revealed that the following specialist studies should be completed, also considering the applicable legislation:

- Soil survey – to be completed by Dr. Bouwer and Mr. Marx (Soil Scientists and Hydropedologists)
- Ecological & Botanical survey – to be completed by Mrs. A. Eyssell-Knox a SACNASP registered (Ecology)
- Heritage and Palaeontology survey – to be completed by Dr. Rossouw (Heritage & Paleontologist Specialist)

If additional issues are identified by the consulting authorities or through interested and affected parties that must be investigated by a specialist, the additional specialist will be appointed and the studies completed and input from the specialists will be included during the EIA and EMP phase.

METHODOLOGY OF IMPACT ASSESSMENT

The identification and assessment of environmental impacts is a multi-faceted process, which combines quantitative and qualitative analysis and evaluation. It involves the application of scientific measurements and professional judgment to determine the significance of environmental impacts associated with the proposed project.

The assessment of impacts will be based in accordance with Section 3: Assessment of Impacts, in DEAT Guideline 5, June 2006. This identification of potential impacts should include impacts that may occur during the different phases of the operation (construction, operational, and closure phases) and assessment of the impacts should include the direct, indirect, and cumulative impact.

The process of the identification and assessment of impacts must always include the conditions of the current environment so that an environmental baseline is determined from which impacts can be identified and measured. The process must also determine future changes to the environment that will occur if the activity proceeds and the consequences (environmental/social risks as well as the positive and negative consequences).

Different approaches can be adapted to the undertaking of the assessment of impacts, but they should always be based on a methodology that includes:

- A clear process for impact identification, prediction and evaluation;
- Criteria for evaluating the significance of impacts;
- Identifying and assessing the potential impacts associated with a proposed activity and its alternatives (if any) and defining types of impacts (direct, indirect or cumulative);
- Predicting the nature, magnitude, extent and duration of potentially significant impacts;
- The design of mitigation measures to address impacts;
- Evaluating the significance of residual impacts i.e. impacts that remain after taking mitigation measures into account; and
- Specifying uncertainties.

As per the DEAT Guideline, the following methodology is to be applied to the prediction and assessment of impacts. Potential impacts should be rated in terms of direct, indirect, and cumulative:

Direct impacts – are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity.

Indirect impacts – are impacts caused as a result of the activity and normally do not manifest immediately when the activity is undertaken or could occur at a different place as a result of the activity.

Cumulative impacts – these are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present, or reasonably foreseeable future activities. Cumulative impacts can include both direct and indirect impacts and can occur from the coactive impacts of individual minor actions over a period of time.

Cumulative Scoring: None, Very Low, Low, Low-Medium, Medium, Medium-High, High, Very High.

Impacts will be assessed according to the criteria listed below:

TABLE 9: IMPACT ASSESSMENT TABLE

Criteria	Description	Rating	
Spatial Extent	Whether the impact will occur on a scale limited to the immediate site of the proposed activity, local area and immediate communities and settlements, sub-regional (municipal), regional (provincial), or national scale.	None/Insignificant	0
		Site	1
		Local	2
		Sub-Regional	3
		Regional	4
Duration	Whether the period of the impact will be short term (0-5 years), medium term (5-15 years), long term (> 15 years) or permanent where natural processes or mitigation processes cannot eliminate the impacts.	None	0
		Short Term	1
		Medium Term	2
		Long Term	3
		Permanent	4

Intensity	Whether the size of the impact is low, medium, high, or negligible.	None	0
		Very Low	1
		Low	2
		Low-Medium	3
		Medium	4
		Medium-High	5
		High	6
		Very High	7
Probability	The probability of the impact occurring as either unlikely, probable, likely or definite.	None	0
		Unlikely	1
		Probable	2
		Likely	3
		Definite	4
Significance	The total level of impact.	Insignificant	0-6
		Very Low	7-15
		Low	16-22
		Low-Moderate	23-31
		Moderate	32-40
		Moderate-High	41-47
		High	48-55
		Very High	>55

These criteria are evaluated in terms of

- Significance (Insignificant-low-moderate-high)
- Status (positive-negative-neutral)
- Confidence (based on academic information, specialist knowledge, site evaluations, applicants approach)

To determine/calculate the level of significance, the weight of the spatial extent, the duration, and intensity ratings are added and this total is multiplied by the probability rating.

Example: If the spatial extent is site-specific (thus = 1), the duration of the project is permanent (thus = 4), and the intensity of the impact is high (thus = 6) the total is (1+4+6) = 11.

If the probability of that impact occurring is likely (thus = 3), then the significance of the impact is (11 x 3) = 33 – which will make this impact of moderate significance.

The significance of the impact on the parameters of the affected environment is rated as:

Low Significance

The project will not cause any major adverse or beneficial changes to the biophysical, social, or economic environment. Impacts experienced will abate almost immediately after cessation of activities and the biophysical, social or economic system should recover and return more or less to the natural state. No

expensive mitigating measures will be needed to address any of these impacts. Ecological functions will continue undisturbed and no complaints from Interested and Affected Parties (I&APs) are anticipated. No rare and endangered species or sensitive areas exist in the area.

Moderate Significance

The project will induce moderate short to medium term changes to the biophysical, social, or economic environment. The impact would be induced outside the development area and also possibly on a sub-regional level. Over the medium term the impacts could fade away but the implementation of mitigation measures is normally required to eliminate these impacts. The impacts would be experienced for some time after cessation of activities but would not affect the biophysical, social, or economic environment severely. With mitigation, the biophysical, social, or economic system should recover but the return to the natural state would be very slow and in some instances may not be achieved. I&APs might express some concerns and complaints may be received on an *ad hoc* basis. Rare and endangered species or sensitive areas may exist in the area and could be marginally affected.

High Significance

The project will induce extensive long-term changes to the biophysical, social, or economic environment. The impact would be induced outside the development area and also possibly on a regional to national level. The possibility of secondary impacts arising from the project is high. Over the long term the impacts could fade away but the implementation of expensive mitigation measures is normally required to eliminate or mitigate these impacts. These impacts would be experienced after cessation of activities and could affect the biophysical, social, or economic environment severely. With mitigation, the biophysical, social, or economic system could recover but the return to the natural state would normally not be achieved. Ecological functions will be permanently disturbed and major complaints from Interested and Affected Parties (I&APs) could be expected. Rare and endangered species or sensitive areas existing in the area might be critically affected.

Status

Whether the impact on the overall environment will be positive (environment overall will benefit from the impact), negative (environment overall will be adversely affected by the impact), or neutral (environment overall will not be affected).

Confidence

The degree of confidence in predictions is based on available information and specialist knowledge.

The discussion in the EIA leading up to the assessment/rating of the impact and the baseline environmental conditions are measured up to the potential impact and the quantitative and qualitative analyses are evaluated (of a specific activity resulting in an impact) during the construction, operational and closure phase. In the discussion, the impact is categorized as a direct, indirect, or cumulative impact and scientific and professional judgment is applied to rate the significance of the impact. The ratings are also influenced by the presence or absence of mitigation measures and once the discussion is concluded, the ratings are displayed in a table format.

TABLE 10: EXAMPLE OF THE IMPACT RATING

	CONSTRUCTION	WEIGHT	OPERATIONAL (no mitigation)	WEIGHT	OPERATIONAL (with mitigation)	WEIGHT	CLOSURE	WEIGHT
Extent	Site Specific	1	Site Specific	1	Site Specific	1	Site Specific	1
Duration	Short Term	1	Medium Term	2	Short Term	1	Short Term	1
Intensity	Medium-High	5	High	6	Medium-High	5	Medium	4
Probability	Likely	3	Definite	4	Likely	3	Probable	2
Cumulative Impact	Very Low		Low		Very Low		None	
Status	Negative		Negative		Negative		Negative	
Confidence	High		High		High		High	
Significance	Low	21	Moderate	36	Low	21	Very Low	12

In the table, the cumulative impact is presented as surrounding activities (not necessarily agriculture) which can add to the direct or indirect impacts experienced by receptors. Through the scoring system, the weight of the impact is determined and then the impact is categorized.

Should the impact assessment as a minimum reflect 2-3 impacts of high significance and 2-3 impacts of moderate significance, the project shall be viewed as potentially flawed and continuation of the project should be seriously reconsidered or special engineering or biophysical/social intervention must be implemented.

The definition of indigenous vegetation is defined in the NEMA Regulations as: “vegetation consisting of indigenous plant species occurring naturally in an area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding 10 years.” Considering that the vegetation and soil of the area under application have not been disturbed, through ploughing or clearing for more than 10 years, the current state of the vegetation is therefore regarded as ‘indigenous vegetation’. This application will also require an application with the Department of Agriculture for cultivating virgin soil or more commonly known as a ploughing certificate.

STAGES OF CONSULTATION WITH DEPARTMENT OF AGRICULTURE, ENVIRONMENTAL AFFAIRS, RURAL DEVELOPMENT AND LAND REFORM

TABLE 11: STAGES OF CONSULTATION WITH THE DEPARTMENT OF AGRICULTURE, ENVIRONMENTAL AFFAIRS, RURAL DEVELOPMENT AND LAND REFORM

DATE	SUBMISSION/CONSULTATION
January-March 2022	Initiate specialist studies to identify environmentally sensitive areas.
April-May 2022	Submit Environmental Authorisation Application and compile Scoping Report and submit for public review to registered IAPs for 30 day period.
June 2022	Submit Scoping Report to DAEARDLR.
July - August 2022	Compile EIA and EMP and submit for public review to registered IAPs for 30 day period.
September-October 2022	Submit Final EIA and EMP to DAEARDLR.
As per regulations (107 days from receipt of EIA)	Authority Decision-making period.
As per regulations (5 days from ROD)	Authority to notify the Applicant of the decision or the appeal of the decision from the Applicant, if necessary.
As per regulations (14 days from ROD notification)	Registered IAPs to be notified of the authority's decision and right to appeal.

PUBLIC PARTICIPATION PROCESS DURING THE EIA

As per NEMA Regulations, there is a specific public participation protocol that must be followed:

- A written notice either via email or register post will be given to:
 - the occupiers of the site, if the applicant is not the owner or person in control of the site;
 - the adjacent owners, occupiers or persons in control of such land;
 - the municipal councilor;
 - the applicable Municipality (Local & District);
 - any organ of state that has jurisdiction in respect of any aspect of the activity, including the Department of Agriculture, Environmental Affairs, Rural Development and Land Reform; and
 - any other party as required by the competent authority.
 - all those who registered during the Scoping Phase public participation period as a result of the newspaper advertisement or notice board.

By definition, according to NEMA Regulations, as amended in April 2017, a 'registered interested and affected party', in relation to an application, means an interested and affected party whose name is recorded in the register opened for that application in terms of Regulation 42.

In order for an IAPs name to be placed on a register (and thus become a registered IAP) and according to Regulation 42, it is any person who has submitted written comments or attended public meetings held by the applicant or EAP; or any person requesting, in writing, that their name be placed on the register as a result of the public participation process being conducted in specific timeframes by the EAP.

According to Section 43 (1), a registered IAP is entitled to comment, in writing, on all reports or plans submitted, provided that the IAP discloses any direct business, financial, personal, or other interest(s) which that party may have in the approval or refusal of the application.

Thus, once a person has registered as an IAP, he/she is obligated to disclose his/her matter of interest in the application and as part of the public participation process and will be requested to complete an undertaking under oath, disclosing their interest.

Furthermore, the EAP must submit an undertaking under oath or affirmation that there is a level of agreement between the EAP and the registered IAP on the Plan of Study for undertaking the environmental impact assessment. If no comment is received on the Plan of Study it would therefore be presumed that the IAP does not have any objection and that a level of agreement has been reached.

If Digital Soils Africa (the EAP) receives a comment on the Scoping Report and Plan of Study or receives requests to be placed on the register, then only those parties will be considered registered IAPs for the application process going forward. However, no comment or written request was received from registered IAPs during this 30 day consultation period, thus the public participation process is concluded for the Scoping Phase. Most correspondence will be via email (digital) and only where necessary will hard copies be forwarded, to allow the application to be as 'green friendly' as possible.

The results of the specialist studies will be integrated into the EIA and EMP and the EIA and EMP will be released to the registered IAPs for a 30 day period to review the document and comment. Registered IAPs will be notified via email, telephonically, or registered post, where the EIA and EMP will be available and the timeframes constraint on such a review period.

No public meetings are proposed to be held during this period since it is a rural area with a sparse population. If necessary, one-on-one meetings will take place with registered IAPs upon request and would most likely be virtual. Comments raised by registered IAPs and responses given to the EAP will be captured in a Public Participation Report and will be included in the Final EIA and EMP.

TASKS TO BE UNDERTAKEN FOR THE EIA

1. Topographical assessment –

- A desktop assessment of available literature to identify and describe the general topography of the area under application;
- Conduct field investigation and assess the site-specific topography and site layout and identify potential constraints imposed on the proposed development plan;
- Assess the slope of the study area and the surroundings and determine the risk of erosion;
- Identify and assess project related impact as per the prescribed methodology; and
- Outline mitigation measures for the management of potential impacts.

2. Soil assessment –

- A specialist will be appointed to conduct the assessment, which should include:
 - A desktop assessment of available literature to identify and describe the soil classification of the affected area;
 - Through soil field investigation.
 - Assess onsite soil properties and characteristics and identify potential constraints imposed on the proposed development of crops.
 - Assess the potential impact in relation to the soil features, as per the prescribed methodology; and
 - Recommend mitigation measures for the management of potential impacts.

3. Land capacity assessment –

- A desktop assessment of available literature and aerial special data will identify the land use/capacity area under application;
- Conduct field investigation and assess the site-specific land use;
- Determine the current economic viability of the land parcel vs the proposed agricultural development;
- Identify potential constraints imposed on the proposed development;
- Identify and assess project-related impacts as per the prescribed methodology; and
- Outline mitigation measures for the management of potential impacts.

4. The vegetation assessment –

- A specialist will be appointed to conduct the assessment, which should include:
 - A desktop assessment of available literature to identify and describe the status of the vegetation and ecological/conservational value of the vegetation type;
 - Through the desktop assessment, determine whether the study area falls entirely or partially within a biodiversity area;

- Conduct field investigation and identification of vegetation found on-site and their relevant ecological status (Least Threatened, Vulnerable, Endangered, Critically Endangered, and Protected);
- Conduct a floral survey, assess red data list, and assess vegetation maps;
- Identify and determine alien species present and their distribution within the study area and ecological state of the site, and
- Recommend mitigation measures for the management of potential impacts.

5. The faunal assessment –

- A desktop assessment of available literature to identify and determine whether the study area falls entirely or partially within the distribution range of species listed as Vulnerable, Endangered, Critically Endangered or Protected;
- Conduct field investigation to identify potentially important or unique faunal habitats on-site;
- Discuss faunal presence with landowners/abutting landowners where necessary;
- Determine activities that could impact the fauna;
- Determine the effectiveness of general remedial measures to prevent activities to impact fauna;
- Determine faunal corridors in the study area and the significance of the corridors;
- Identify and assess project related impact as per the prescribed methodology; and
- Outline mitigation measures for the management of potential impacts.

6. The sensitive site assessment –

- A desktop assessment of available literature and aerial special data will identify the ecological sensitivity of the area under application;
- Conduct field investigation and assess the ecological status of the land;
- Compare field investigation findings with desktop assessment and determine the current ecological viability of the area;
- Identify potential constraints imposed on the proposed development;
- Identify and assess project-related impacts as per the prescribed methodology; and
- Outline mitigation measures for the management of potential impacts.

7. Surface & Ground Water assessment –

- A desktop assessment of available literature will identify the catchment area and impacts and constraints on the catchment area;
- Identify if an application to the Department of Water and Sanitation must be made;
- Assess possible sensitivity of surface resources;
- Determine sediments and hydro-carbon generating activities and the likelihood of spills reaching surface water and or groundwater;
- Identify and assess project related impact as per the prescribed methodology; and

- Outline mitigation measures for the management of potential impacts.
8. Air quality assessment –
- A desktop assessment of available literature to identify and describe the general wind directions, strengths, frequencies, and land uses that can influence the air quality of the surrounding area;
 - Determine the population density (number of people to be affected);
 - Determine the potential dust generating capacity of various activities that will take place or be used on-site;
 - Determine the distances to receptors and how distances from the study area will influence ambient dust levels at receptor areas.
 - By doing a site visit, determine how possible topographical and vegetation screens will reduce dust dispersion to receptor areas.
 - Identify and assess project related impact as per the prescribed methodology; and
 - Outline mitigation measures for the management of potential impacts.
9. Noise impact assessment –
- Determine the population density (number of people to be affected);
 - Estimate the noise levels of various pieces of equipment/vehicles that will be used on-site;
 - Determine the distances to receptors;
 - Determine how distances from the study area will influence ambient noise levels at receptor areas;
 - Determine how possible topographical and vegetation screens will reduce the propagation of noise waves and ultimately noise levels at receptor areas;
 - Determine activities that could result in instant and severe spikes in noise levels;
 - Identify and assess project-related impacts as per the prescribed methodology; and
 - Outline mitigation measures for the management of potential impacts.
10. Waste management assessment –
- Determine the number of people on-site and type/number of ablution facilities and waste receptacles required at the site;
 - Determine the possibility of spills and the impact that standard mitigation measures will have;
 - Determine the hydrocarbon disposal strategy required to result in limited to zero impact.
 - Determine the number of vehicles to be used on-site;
 - Determine the distance to water resources and soils with high agricultural potential;
 - Identify and assess project related impact as per the prescribed methodology; and
 - Outline mitigation measures for the management of potential impacts.
11. Visual impact assessment –
- Through a site visit, the following will be determined:

- Vegetation and topography screens between the study area and receptor areas;
- The slope and elevation of the affected area in relation to the receptor areas;
- The distance to receptor areas and sensitivity of receptor areas.
- Assess the influence of remedial action of phase development on the impact in the absence of any natural visual mitigation factors;
- Determine the possibility of dust liberated into higher air columns and its visibility from receptor areas;
- Assess the implementation of dust suppression measures on the impact of dust generation;
- Identify and assess project related impact as per the prescribed methodology; and
- Outline mitigation measures for the management of potential impacts.

12. Traffic impact assessment –

- Determine locality of haul roads in relation to distance from receptor areas;
- Assess the possible impact on the wearing course and restrict it to a minimum;
- Determine the production capacity and the hauling density in order to determine the traffic count and the possible impact on traffic volume;
- Identify and assess project related impact as per the prescribed methodology; and
- Outline mitigation measures for the management of potential impacts.

13. Socio-Economic impact assessment –

- Determine the value of grazing practices on natural veldt versus crop production;
- Through consultation with the applicant, determine:
 - Whether the development will permanently host employees on-site;
 - the possibility of the theft of stock/wildlife and trespassing;
 - the possibility of fires and the impact of farming in relation to the locality of receptors;
 - the number of jobs created in relation to the available labour pool and the unemployment rates;
 - the possibility of breaching the safety requirements of abutting residences;
- Identify and assess project related impact as per the prescribed methodology; and
- Outline mitigation measures for the management of potential impacts.

14. Archaeological and Palaeontology assessment –

- A specialist will be appointed to conduct the assessment which should include:
 - A desktop assessment in order to determine the type and location of artefacts that may be present within the study area
 - Survey the area on foot and record the findings
 - Compile a report and recommendations which must indicate if further Phases 2 or 3 investigations must follow.
- Identify and assess project-related impacts as per the prescribed methodology; and
- Outline mitigation measures for the management of potential impacts.

POSSIBLE MITIGATION MEASURES

Possible mitigation measures to avoid, reverse, mitigate or manage identified impacts were listed under the heading 'Receiving Environment'. During the EIA and EMP phase, the extent of the residual risks that need to be managed and monitored will be identified.

REFERENCES

Ala-Kokko, K., Nalley, L.L., Shew, A. M., Tack, J.B., Chaminuka, P., Matlock, M.D., D'Haese, M., 2021. Economic and ecosystem impacts of GM maize in South Africa, *Global Food Security*, Volume 29, 2021, 100544, ISSN 2211-9124.

Al-Kaisi, M., 2021. Value of crop rotation in nitrogen management. Iowa State University Extension and Outreach. Integrated Crop Management. <https://crops.extension.iastate.edu/encyclopedia/value-crop-rotation-nitrogen-management>. 28/07/2021, 12:02

Almond, J. & Pether, J. 2009; SAHRA Palaeotechnical Report. *Palaeontological Heritage of the Northern Cape*. <https://sahris.sahra.org.za/sites/default/files/website/articledocs/NC%20palaeotechnical%20report.pdf>. 29/07/2021, 10:50

ARC (Agricultural Research Council), 2014. Insects pest of seeds or seedlings. <http://www.arc.agric.za/arc-sgi/Pages/Crop%20Protection/Insects-pests-of-seeds-or-seedlings.aspx>. 30/07/2021, 10:58.

Balfour, D., Holness, S., Jackelman, J., Skowno, A., 2016. National Protected Area Expansion Strategy for South Africa. Department of Environmental Affairs. https://www.environment.gov.za/sites/default/files/docs/national_protectedareas_expansionstrategy2016_ofsouthafrica.pdf. 02/08/2021, 09:32.

Bell, R.A., 2016. Insect pests of maize in Kwazulu Natal. Kwazulu-Natal Province: Agriculture and Rural Development, the Republic of South Africa. <https://www.kzndard.gov.za/insect-pests-of-maize-in-kwazulu-natal>. 28/07/2021, 10:18.

BFAP (Bureau for Food and Agricultural Policy), 2015. Adding value in the South African maize value chain. file:///C:/Users/27824/Downloads/ADDING%20VALUE%20IN%20THE%20SOUTH%20AFRICAN_%20MAIZE%20VALUE%20CHAIN%2013%20April%202017.pdf. 28/07/2021, 13:20.

Botha, L. 2018. Pecan nut farming: high cost, big returns. <https://www.farmersweekly.co.za/crops/fruit-and-nuts/pecan-nut-farming-high-cost-big-returns/>. 29/03/2022, 09:49.

Coale, M. J. 2017. The economic benefits of the South African Agricultural Research Council's wheat breeding program: 1992-2015. University of Arkansas, Fayetteville. ScholarWorks@UARK 12-2017. <https://scholarworks.uark.edu/cgi/viewcontent.cgi?article=4149&context=etd>. 05/08/20201, 13:51.

DA (Department of Agriculture) South Africa, 2000. Cultivating Pecan nuts. <https://www.nda.agric.za/docs/pecan/pecan.htm>. 30/03/2022, 10:42.

DAFF (Department of Agriculture, Forestry and Fisheries) South Africa, 2012. Production Guideline for grapes. <https://www.nda.agric.za/docs/brochures/grapesprod.pdf>. 30/03/2022, 09:58.

DAFF (Department of Agriculture, Forestry and Fisheries) South Africa, 2016. Production Guideline for wheat. <https://www.dalrrd.gov.za/Portals/0/Brochures%20and%20Production%20guidelines/Wheat%20-%20Production%20Guideline.pdf>. 05/08/2021, 13:17

DAFF (Department of Agriculture, Forestry and Fisheries). 2017. A Profile of the South African maize market value chain. <https://www.nda.agric.za/daDev/sideMenu/Marketing/Annual%20Publications/Commodity%20Profiles/field%20crops/Maize%20Market%20Value%20Chain%20Profile%202017.pdf>. 21/07/2021, 13:55

Du Plessis, J., 2003. Maize production. Compiled by Directorate Agriculture Information Services Department of Agriculture in cooperation with ARC-Grain Crops Institute. <https://www.arc.agric.za/arc-gci/Fact%20Sheets%20Library/Maize%20Production.pdf>. 22/07/2021.

Dugmore, H. 2011. Pecan nut profits. <https://www.farmersweekly.co.za/uncategorized/pecan-nut-profits/#:~:text=Take%20one%20mature%20pecan%20nut,start%20flowing%2C%20writes%20Heather%20Dugmore,29/03/2022,09:44>.

Experiencenortherncape, Floral Kingdoms. <https://www.experiencenortherncape.com/visitor/experiences/flora#:~:text=There%20are%20an%20estimated%2005,Fynbos%20Biome%20and%20Desert%20Biome.29/07/2021,15:16>.

Gale, J. 2020. *South African raisin industry gears up for growth*. <https://raisinsa.co.za/south-african-raisin-industry-gears-up-for-growth/>, 2021/01/28, 13:31.

Global Africa Network, 2020. Agri-Processing an ideal vehicle to drive economic growth in the Northern Cape. <https://www.globalafricanetwork.com/company-news/agri-processing-drives-economic-growth-in-northern-cape-province/>, 29/03/2022, 09:15.

Grain SA, 2016. Practical crop rotation principles. <https://www.grainsa.co.za/practical-crop-rotation-principles>. 28/07/2021, 11:01.

Huynh, H.T., Hufnagel, J., Wurbs, A., Bellingrath-Kimura, S.D., 2019. Influences of soil tillage, irrigation and crop rotation on maize biomass yield in a 9-year field study in Müncheberg, Germany, *Field Crops Research*, Volume 241, 107565, ISSN 0378-4290.

Lyddon, C., 2021. Focus on South Africa. <https://www.world-grain.com/articles/15331-focus-on-south-africa>. 05/08/2021, 14:12

Mogala, M., 2017. A profile of the South African maize market value chain. Department of Agriculture, Forestry and Fisheries.

<https://www.nda.agric.za/doaDev/sideMenu/Marketing/Annual%20Publications/Commodity%20Profiles/field%20crops/Maize%20Market%20Value%20Chain%20Profile%202017.pdf>. 28/07/2021, 13:32.

Mucina, L. and Rutherford, M.C. (eds) 2006. The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

Seminis, 2020. Importance of crop rotation. Agronomic Spotlight. <https://www.seminis-us.com/resources/agronomic-spotlights/importance-of-crop-rotation/>. 27/07/2021, 14:18

STATS SA, 2016. <http://www.statssa.gov.za/?p=9922>. 05/08/2021, 14:06.

STATS SA, 2020. Census of commercial agricultura CoCA2017. Fact sheets Version 2. <http://www.statssa.gov.za/publications/Report-11-02-01/CoCA%202017%20Fact%20Sheets.pdf>. 30/07/2021, 10:43.

Young, J., 2017. A regional overview of the Northern Cape. <https://www.globalafricanetwork.com/company-news/a-regional-overview-of-the-northern-cape/>. 28/07/2021, 13:44.

UNDERTAKING OF EAP

The EAP herewith confirms

- a) the correctness of the information provided in the reports;
- b) the inclusion of comments and inputs from stakeholders and I&AP's; (To be completed with the Final Scoping Report, once the public participation has been completed).
- c) the inclusion of inputs and recommendations from the specialist reports where relevant; and
- d) that the information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties are correctly reflected herein. (To be completed with the Final Scoping Report, once the public participation has been completed).

Since this is a Draft Scoping Report and currently under public review for public participation, any comments received will therefore be considered and included in the Final Scoping Report.



Signature of the environmental assessment practitioner(s)

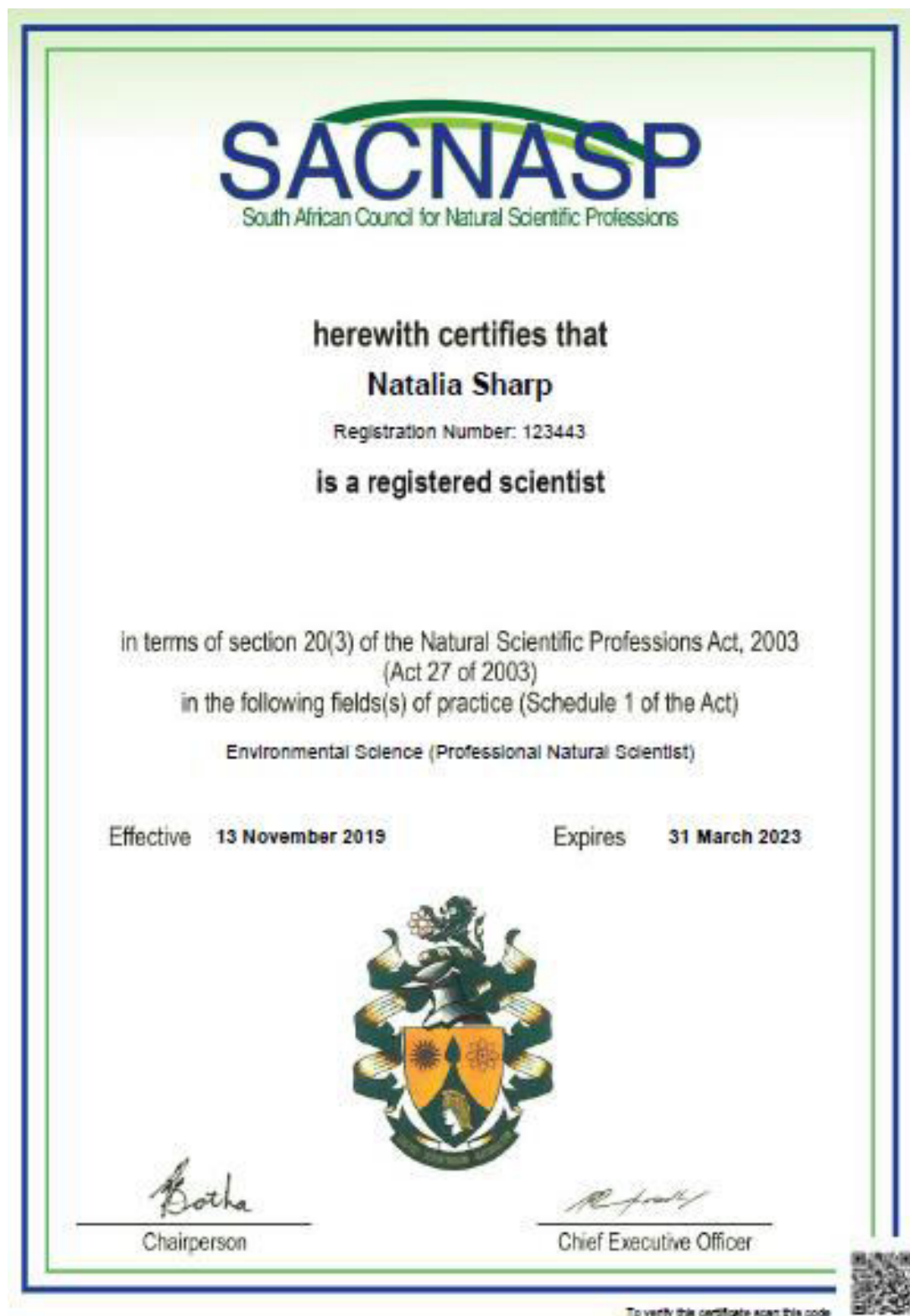
Digital Soils Africa (Pty) Ltd

Name of the company

11 April 2022

Date

APPENDIX A – EAP QUALIFICATION





DIE UNIVERSITEIT
VAN DIE ORANJE-
VRYSTAAT



THE UNIVERSITY
OF THE ORANGE
FREE STATE

HIERMEET WORD VERKLAAR DAT DIE GRAAD THIS IS TO CERTIFY THAT THE DEGREE

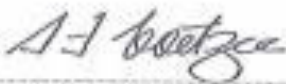
Baccalaureus Scientiae
Bachelor of Science

TOEGEKEN IS AAN
HAS BEEN CONFERRED UPON

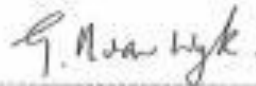
NATALIA POTGIETER

NADAT AAN DIE STATUTE EN REGULASIES VAN DIE UNIVERSITEIT VOLDOEN IS, AS BEWYS DAARVAN PLAAS ONS ONS ONDERSEKE HANDTEKENINGE EN DIE SEEL VAN DIE UNIVERSITEIT HIERONDER.

IN ACCORDANCE WITH THE STATUTES AND REGULATIONS OF THE UNIVERSITY, AS WITNESS OUR RESPECTIVE SIGNATURES AND THE SEAL OF THE UNIVERSITY BELOW.



VICE-CHANCELLOR



DEAN



BLOEMFONTEIN
2001-01-16
190002314



REGISTRAR

I hereby declare that the attached is a true copy of the original, and that it has been examined by me, and that it is correct and true in all particulars.

Date: 12/6/2019

Place: M

Dean: M

UNIVERSITEIT
VAN DIE
VRYSTAAT



UNIVERSITY
OF THE
FREE STATE

HIERMEE WORD VERKLAAR DAT DIE GRAAD THIS IS TO CERTIFY THAT THE DEGREE

Honneursbaccalaureus Scientiae

in LIMNOLOGIE

in LIMNOLOGY

TOEGEKEN IS AAN
HAS BEEN CONFERRED UPON

NATALIA POTGIETER

NADAT AAN DIE STATUTE EN REGULASIES VAN DIE UNIVERSITEIT VOLDOEN IS, AS BEWYS DAARVAN PLAAS ONS ONS ONDERSKEIE HANDTEKENINGE EN DIE SEEL VAN DIE UNIVERSITEIT HIERONDER.

IN ACCORDANCE WITH THE STATUTES AND REGULATIONS OF THE UNIVERSITY, AS WITNESS OUR RESPECTIVE SIGNATURES AND THE SEAL OF THE UNIVERSITY BELOW.

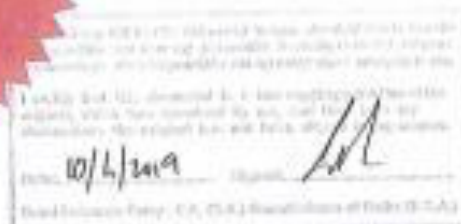

VISEKANSIELEKANEEL


DEKANEEL




REGISTRAR

REGISTRAR
2003-04-28
19980314


Date: 10/4/2019

UNIVERSITEIT
VAN DIE
VRYSTAAT



UNIVERSITY
OF THE
FREE STATE

HIERMEE WORD VERKLAAR DAT DIE THIS IS TO CERTIFY THAT THE

Magister in Omgewingsbestuur
Magister in Environmental Management

TOEGEKEN IS AAN
HAS BEEN CONFERRED UPON

NATALIA POTGIETER

NADAT AAN DIE STATUTE EN REGULASIES VAN
DIE UNIVERSITEIT VOLDOEN IS, AS BEWYS
DAARVAN PLAAS ONS ONS ONDERSKEIE
HANDTEKENINGE EN DIE SEËL VAN DIE
UNIVERSITEIT HIERONDER.

IN ACCORDANCE WITH THE STATUTES AND
REGULATIONS OF THE UNIVERSITY, AS
WITNESS OUR RESPECTIVE SIGNA-
TURES AND THE SEAL OF THE
UNIVERSITY BELOW.


VICE-CHANCELLOR


DEKANUS


REGISTRAR



BLIDSIGHEID
DIE 00/01

12/4/2019

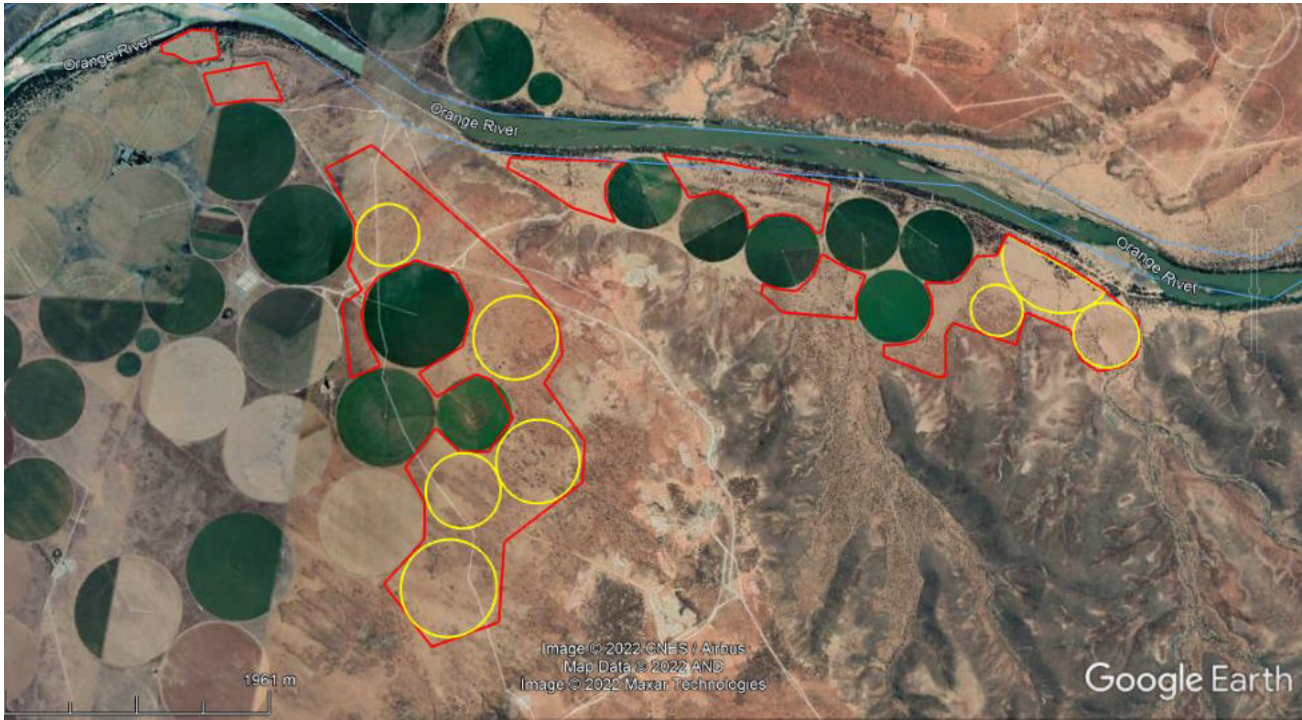
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APPENDIX B – SITE PLAN



The site in total. The red polygon represents the entire site under application (earmarked nuts or vineyard crop production). The yellow polygons represent the proposed areas for additional pivots (maize/wheat/lucerne).

Below are Google Images of the different sections of the site.

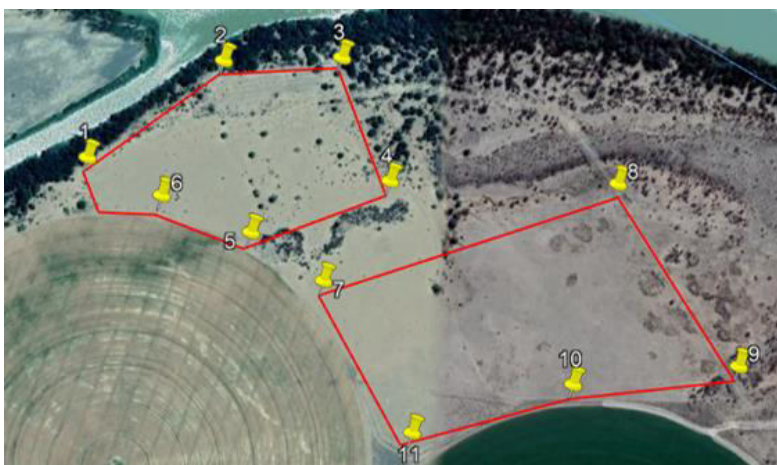


FIGURE 27: UPPER WESTERN SECTION OF THE APPLICATION AREA

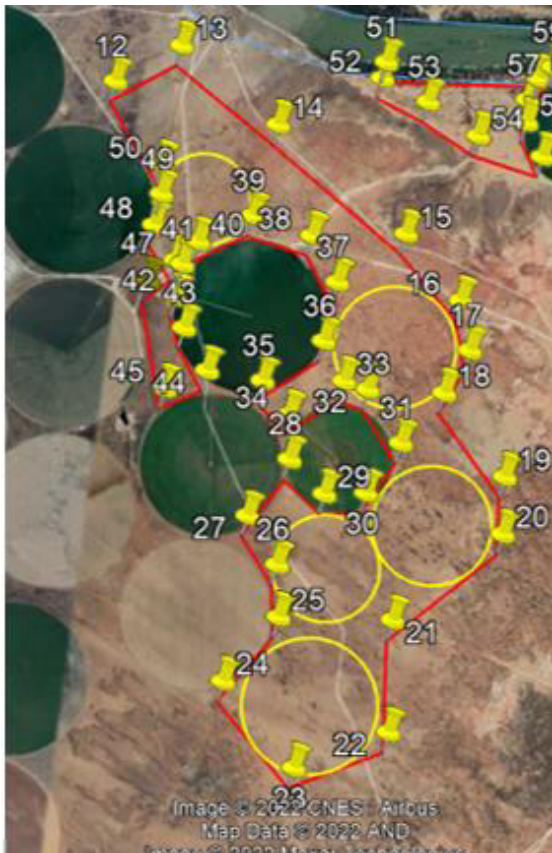


FIGURE 28: SOUTHERN SECTION OF THE APPLICATION AREA



FIGURE 29: THE UPPER EASTERN SECTION OF THE APPLICATION AREA

Coordinates of the site

ID	X	Y
1	23,0188511	-29,4183826
2	23,02107203	-29,41698806
3	23,023008	-29,41693026
4	23,0238151	-29,4186782
5	23,02154241	-29,41942798
6	23,02007274	-29,41891235
7	23,02273873	-29,42010672
8	23,02754528	-29,41868791
9	23,02955175	-29,42126379
10	23,02684208	-29,42154452
11	23,0242143	-29,42225404
12	23,0339359	-29,42574302
13	23,03730643	-29,42363801
14	23,04312933	-29,42686638
15	23,05082288	-29,4313428
16	23,05424962	-29,43419303
17	23,0550756	-29,4365165
18	23,05397036	-29,43868232
19	23,05779684	-29,44230255
20	23,05805945	-29,44500666
21	23,05269207	-29,44969954
22	23,05320463	-29,45497763
23	23,04837075	-29,45719545
24	23,04397192	-29,4535656
25	23,04652111	-29,45023248

26	23,04608951	-29,4477739
27	23,04416598	-29,44564468
28	23,0460454	-29,442733
29	23,04817005	-29,44416395
30	23,05040742	-29,44387699
31	23,05195668	-29,44131314
32	23,04980022	-29,43897009
33	23,04846558	-29,43871028
34	23,04572963	-29,44061784
35	23,04404326	-29,43917027
36	23,04709123	-29,43692866
37	23,04742555	-29,43404484
38	23,04573718	-29,43198822
39	23,04238164	-29,4313787
40	23,03958325	-29,43292979
41	23,03888251	-29,43409694
42	23,03877631	-29,43572442
43	23,03941569	-29,43712754
44	23,04096472	-29,43901595
45	23,03881228	-29,44012132
46	23,03713739	-29,43514574
47	23,03847655	-29,43396357
48	23,03706923	-29,43240879
49	23,03725679	-29,43087452
50	23,03709746	-29,42946973
51	23,0485961	-29,42322482
52	23,0484927	-29,42401745

53	23,05113685	-29,42488054
54	23,05409839	-29,42622797
55	23,05772161	-29,42684012
56	23,0566245	-29,4252894
57	23,05654147	-29,42419779
58	23,05702169	-29,42311914
59	23,0577081	-29,42247155
60	23,06081067	-29,42158014
61	23,06339732	-29,42439669
62	23,06533005	-29,4237611
63	23,06683045	-29,42396269
64	23,06790607	-29,42475272
65	23,06841636	-29,4260655
66	23,06961088	-29,42501833
67	23,07094439	-29,42469365
68	23,07212913	-29,42471669
69	23,0732708	-29,42522919
70	23,07382277	-29,42576495
71	23,07428322	-29,42546174
72	23,07442625	-29,42220614
73	23,06634111	-29,42153865
74	23,0744466	-29,4271512
75	23,07397644	-29,42879315
76	23,07274981	-29,42993894
77	23,07128608	-29,43005282
78	23,07004215	-29,42982835
79	23,07007288	-29,43050023

80	23,07189618	-29,43161583
81	23,07763382	-29,43130943
82	23,07756528	-29,42989562
83	23,07798395	-29,42875823
84	23,07810474	-29,42823952
85	23,0766498	-29,4279444
86	23,082841	-29,42822114
87	23,08343604	-29,42918666
88	23,08367102	-29,43023833
89	23,08341081	-29,4313691
90	23,08256566	-29,43237217
91	23,08135959	-29,43273999
92	23,08010185	-29,43294266
93	23,08018848	-29,43371704
94	23,0846089	-29,43460733
95	23,08523093	-29,43446838
96	23,08488143	-29,43147618
97	23,08542382	-29,43073689
98	23,09049959	-29,43173152
99	23,09097896	-29,42936685
100	23,09457671	-29,43016694
101	23,09571792	-29,4320947
102	23,0970641	-29,43276357
103	23,09885575	-29,43222233
104	23,10004696	-29,43135752
105	23,10010893	-29,43007691
106	23,09989903	-29,42891241

107	23,0982619	-29,42780587
108	23,09698297	-29,42712442
109	23,09365908	-29,42572302
110	23,08897185	-29,42400644
111	23,08821608	-29,42565467
112	23,086589	-29,4259346
113	23,08604932	-29,4269654
114	23,08540359	-29,42779775
115	23,08466033	-29,42804102

Total area under application: 504.7 Ha
 Area expected to be cleared: 406 Ha
 Area set aside for offset: 98.7 Ha

APPENDIX C – PUBLIC PARTICIPATION

A Notice Board were erected along the proposed boundary next to the gravel road in accordance with NEMA Regulations. Below is an aerial photo indicating the location of placing the board. The red polygon represents the study area under application, while the red drop pins represent the location of the board.

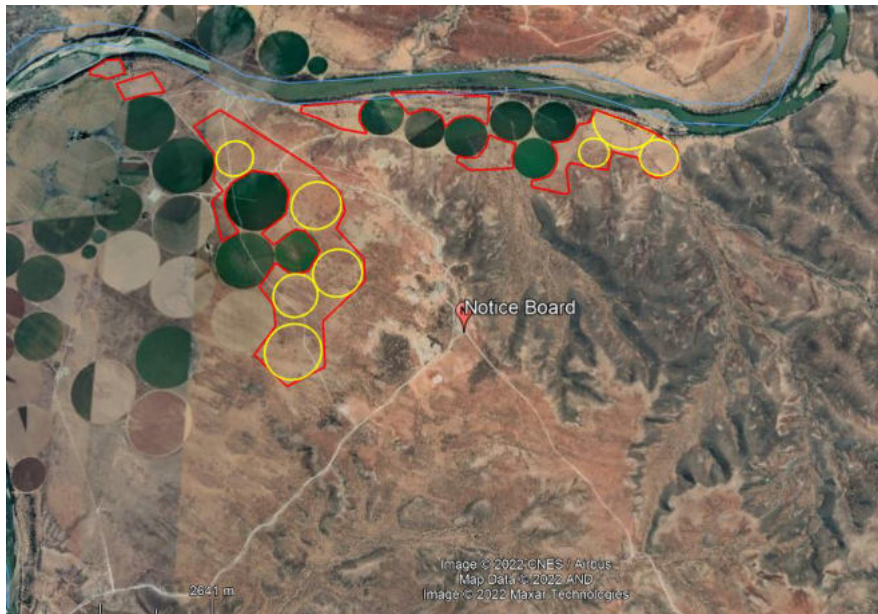


FIGURE 30: LOCATION OF THE NOTICE BOARD

Response for potential I&AP's was requested to be submitted by 18 May 2022 and those who registered / commented will be recorded in the I&AP registry.

NOTICE OF AN ENVIRONMENTAL IMPACT ASSESSMENT FOR THE CLEARING OF VEGETATION ON 504,7 HA ON PORTION 2 & REMAINDER OF FARM ZWEM KUIL NO. 37 AND REMAINDER OF FARM SMITSKLOOF NO. 38, PRIESKA

Notice is hereby given in terms of Section 41 of the Schedule published in GNR 326, of the NEMA Regulations (2014 as amended in April 2017) of the intent to submit a Scoping Report and Environmental Impact Assessment to undertake the following :

Location:

Ptn 2 & Remainder of Farm Zwem Kuil No. 37 & Remainder of
Farm Smitskloof No. 38, Prieska, Northern Cape (29° 26' 05.43"S; 23° 03' 03.81"E)

Proponent:

Zwemkuil Gordonii CC

Activities:

1. GNR 325: 7 April 2017, Activity (15): The clearance of an area of 20Ha or more of indigenous vegetation.
2. GNR 324: 7 April 2017, Activity (12) g.ii.: The clearance of an area of 300m² or more indigenous vegetation in the Northern Cape within a critically biodiversity area identified in bioregional plans.

If you consider yourself an interested and/or affected person/party, it is important that you register and comment in writing to Digital Soils Africa before or on 18 May 2022. Should you require further information or access to environmental documentation, please contact the office before the said date.

Please send your enquiries and/or comments to:

Digital Soils Africa
1 Kemsley Street
Port Elizabeth
6001

Tel: 067 622 5687
Email: natalie@dsafrika.co.za

Date of Notice:

14 April 2022

FIGURE 31: EXAMPLE OF THE WORDING OF THE NOTICE BOARD THAT WAS PLACED ABUTTING THE SITE ALONG THE GRAVEL ROAD.

Public Participation advert placement in the Oewer Newspaper in accordance with the NEMA Regulations, on 14 April 2022, time to register is given until 18 May 2022.

NOTICE OF AN ENVIRONMENTAL IMPACT ASSESSMENT FOR THE CLEARING OF VEGETATION ON 504,7 HA ON PORTION 2 & REMAINDER OF FARM ZWEM KUIL NO. 37 AND REMAINDER OF FARM SMITSKLOOF NO. 38, PRIESKA

Notice is hereby given in terms of Section 41 of the Schedule published in GNR 326, of the NEMA Regulations (2014 as amended in April 2017) of the intent to submit a Scoping Report and Environmental Impact Assessment to undertake the following:

Location:

Ptn 2 & Remainder of Farm ZwemKuיל No. 37 & Remainder of Farm Smitskloof No. 38, Prieska, Northern Cape (29° 26' 05.43"S; 23° 03' 03.81"E)

Proponent:

ZwemkuilGordonii CC

Activities:

1. GNR 325: 7 April 2017, Activity (15): The clearance of an area of 20Ha or more of indigenous vegetation.
2. GNR 324: 7 April 2017, Activity (12) g.ii.: The clearance of an area of 300m² or more indigenous vegetation in the Northern Cape within a critically biodiversity area identified in bioregional plans.

If you consider yourself an interested and/or affected person/party, it is important that you register and comment in writing to Digital Soils Africa before or on **18 May 2022**. Should you require further information or access to environmental documentation, please contact the office before the said date.

Please send your enquiries and/or comments to:

Digital Soils Africa
1 Kemsley Street
Port Elizabeth 6001

Tel: 067 622 5687
Email: natalie@dsafrica.co.za

Date of Notice:

14 April 2022

FIGURE 32: EXAMPLE OF THE TEARSHEET FROM THE OEWERNUUS NEWSPAPER.

Example of consultation letter sent to DWS and Department of Agriculture, Environmental Affairs, Rural Development and Land Reform during the Scoping Phase

2022-04-14

Department of Water and Sanitation
Private Bag X5912
Upington
8800
Attention: Mr. Steven Shibambu

ENVIRONMENTAL IMPACT APPLICATION IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998, FOR THE CLEARING OF VEGETATION ON PORTION 2 AND REMAINDER OF FARM ZWEM KUIL NO. 37 AND REMAINDER OF FARM SMITSKLOOF NO. 38, PRIESKA. APPLICANT: ZWEMKUIL GORDONII CC. Scoping Public Participation Phase.

Zwemkuil Gordonii CC appointed Digital Soils Africa (Pty) Ltd (DSA) to conduct the necessary environmental impact assessment and public participation for the above-mentioned project.

In terms of Section 41 of NEMA Regulations, you have been identified as an Interested and Affected Party and are invited to participate in the public participation. All written comments will be responded to and forwarded to the relevant departments, in the form of a Public Participation Report.

This communication, therefore, serves to inform you of the intention of Zwemkuil Gordonii CC to apply for environmental authorisation and cultivation of virgin soil on 504,7 Ha to establish crops that, if approved, will be developed over the next 5 years. You have been identified as an interested and affected party (I&AP) in the project and the purpose of this letter is therefore to:

- Inform you of the locality of the proposed site.
- Allow you to raise any informed comments you might have in respect of the proposed development.
- Incorporate any written comments in the Interested & Affected Parties' Register and Scoping Report to be submitted to the Department of Agriculture, Environmental Affairs, Rural Development and Land Reform in terms of Regulation 19 published in GNR 326 on 7 April 2017 under NEMA 107 of 1998.

This consultation process is important as it raises your awareness as to the nature of the proposed development and grants you the opportunity to raise any comments/observations/concerns you might have thereon and submit such in writing. Should any observation/concern be identified as a definite and significant environmental/social impact, the relevant matter will be further investigated, assessed and where necessary, mitigation measures will be developed and captured in the Final Scoping Report to satisfactorily address any identified impact.

To ensure that your detailed written comments are captured in the I&AP Register and submitted to all applicable Regulating Authorities as an integral part of the environmental assessment process, your response is required in writing **not later than 18 May 2022** no later than 5pm. This is done in accordance with GNR 326, chapter 2, Regulation 3, of the Environmental Impact Assessment Regulations (2014), as amended on 7 April 2017, of the National Environmental Management Act of 1998. Below is the link to the Scoping Report for your attention.

Where we are in the process

- Please note that in an attempt to follow a more 'green friendly' approach, a hard copy of the Draft Scoping Report will not be placed in a public place as a hard copy for the public, nor would one be couriered to your Department, rather a digital copy will be made available on the DSA website.
- A digital Draft Scoping Report has been submitted for Public Participation to other Departments, the Local and District Municipalities, and I&AP's (general public).

Way Forward

1. The outcome of this consultation process will be submitted to the Department of Agriculture, Environmental Affairs, Rural Development and Land Reform as part of the Final Scoping Report.
2. Upon completion of the Scoping process, the EIA process will commence.
3. The Draft EIA & EMP document will be submitted for public review and the outcome of that consultation process will be submitted to the said Department as part of the final EIA & EMP.
4. If the said Departments decision-making process results in approval of the clearance of vegetation an Environmental Authorization will be issued and the EMP approved. All registered Interested & Affected Parties will be notified of the issue of the Environmental Authorization.
5. The approved activities would then proceed and be conducted in accordance with the approved EMP.
6. Environmental audits should be conducted and submitted to the said Department for evaluation and any appropriate decision-making.

The documents will be made available on the DSA website, www.dsafrica.co.za. Please follow the link to Services, Environmental Services, Documents and choose the Zwemkuil link. To access the loaded documents use the password: zWem@no37.

Yours sincerely



Natalie Sharp

Pri.Sci.Nat (Reg nr. 123443)

Reg. EAP (EAPASA)

Cover letter & Background Information document sent to all I&AP's as identified during the Scoping Phase.

2022-04-14

Dear Interested and Affected Party

ENVIRONMENTAL IMPACT APPLICATION IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998, FOR THE CLEARING OF VEGETATION ON PORTION 2 AND REMAINDER OF FARM ZWEM KUIL NO. 37 AND REMAINDER OF FARM SMITSKLOOF NO. 38, PRIESKA. APPLICANT: ZWEMKUIL GORDONII CC. Scoping Public Participation Phase.

Zwemkuil Gordonii CC appointed Digital Soils Africa (Pty) Ltd (DSA) to conduct the necessary environmental impact assessment and public participation for the above-mentioned project.

In terms of Section 41 of NEMA Regulations, you have been identified as an Interested and Affected Party and are invited to participate in the public participation. All written comments will be responded to and forwarded to the relevant departments, in the form of a Public Participation Report.

The purpose of this letter and attached document is therefore to:

- Inform you of the locality of the proposed environmental authorization application.
- Allow you the opportunity to raise concerns or comments in respect of the proposed project detailed in the attached Background Information Document.

Public Participation Process

The purpose of the Background Information Document is to provide you with *basic information* regarding the proposed project and provide the opportunity to register as interested and affected parties and grant you the opportunity to raise any comments you might have on the proposed project.

If you would like to participate in the process, please register as an interested and affected party (I&AP), in writing. Comments/registration must be received **on or before 18 May 2022** no later than 5pm. If no comments are received from you, it will then be regarded that you do not have any comments.

Way Forward

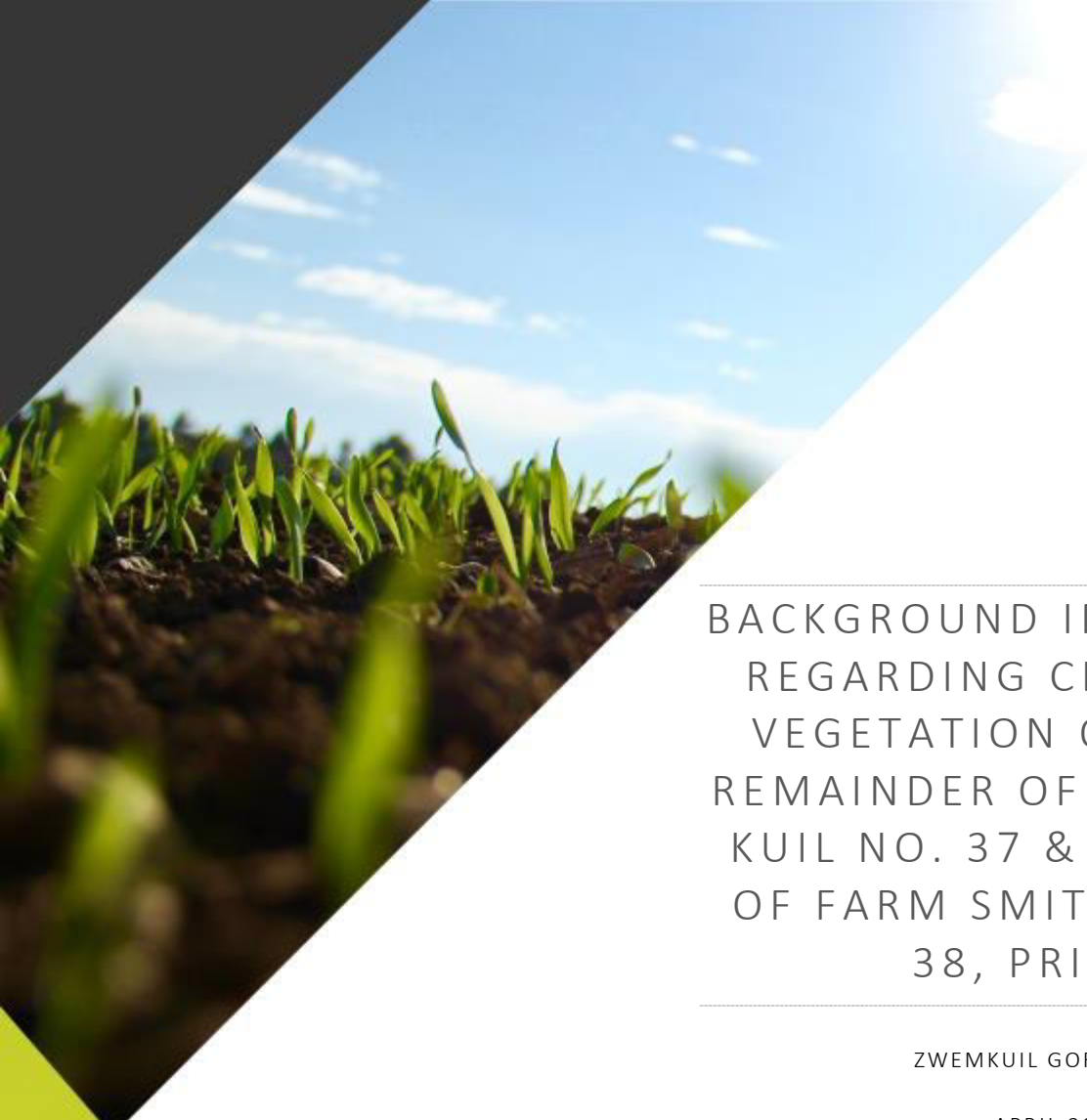
- The outcome of this consultation process will be submitted to the Department of Agriculture, Environmental Affairs, Rural Development and Land Reform as part of the Final Scoping Report.
- Upon completion of the Scoping process, the EIA process will commence.
- The Draft EIA & EMP document and required specialist reports will be subjected to review by all registered I&AP's and relative governmental departments, following the time frames as stipulated in Section 3 (1) & (8) of the NEMA regulations (30 days).

- The outcome of that consultation process will be submitted to the Department of Agriculture, Environmental Affairs, Rural Development and Land Reform as part of the final EIA& EMP.
- The documents will be made available on the DSA website, www.dsafrica.co.za. Please follow the link to Services, Environmental Services, Documents and choose the Zwemkuil link. To access the loaded document use the password: zWem@no37.
- All required documents will be submitted to the relevant department for decision-making.
- If the application is accepted, the relevant department will either issue or reject the Environmental Authorisation.
- As an I&AP's, you will be notified of the final decision of the relevant departments.

Yours sincerely



Natalie Sharp
Pri.Sci.Nat (Reg nr. 123443)
Reg. EAP (EAPASA)



BACKGROUND INFORMATION
REGARDING CLEARING OF
VEGETATION ON PTN 2 &
REMAINDER OF FARM ZWEM
KUIL NO. 37 & REMAINDER
OF FARM SMITSKLOOF NO.
38, PRIESKA

ZWEMKUIL GORDONII CC

APRIL 2022



DSA
Digital Soils Africa



+27 82 414 0472



www.dsafrica.co.za



natalie@dsafrica.co.za



1 Kemsley Street

Port Elizabeth

Directors:

Prof Pieter le Roux

Dr George van Zijl

Dr Darren Bouwer

Dr Johan van Tol

PURPOSE OF THIS DOCUMENT

The purpose of this document is to provide all I&AP's with information about the intent of Zwemkuil Gordonii CC to apply for environmental authorisation and certificate for cultivation of virgin land on 504,7 Ha to establish crops on Portion 2 & Remainder of Farm Zwem Kuil No. 37 and Remainder of Farm Smitskloof No. 38, Prieska in the Northern Cape Province. As an identified I&AP, you are invited to register and comment on any aspect related to the proposed development between the 14th of April 2022 and 18th of May 2022.

BRIEF PROJECT DESCRIPTION

The site is situated north-east of Prieska in the Northern Cape ($29^{\circ} 26' 05.43''S$; $23^{\circ} 03' 03.81''E$ most centre point of the site) on Portion 2 and the Remainder of Farm Zwem Kuil No. 37 and the Remainder of Farm Smitskloof No. 38, within the Siyathemba Municipal area. The farm can be reached by travelling along the R357 for about 18km onto the Muishoek road. This Muishoek road turns into a gravel road and the farm is reached about 30km straight along this gravel road, until a T-junction is reached. Zwem Kuil farm is left off the T-junction, for another 5km.

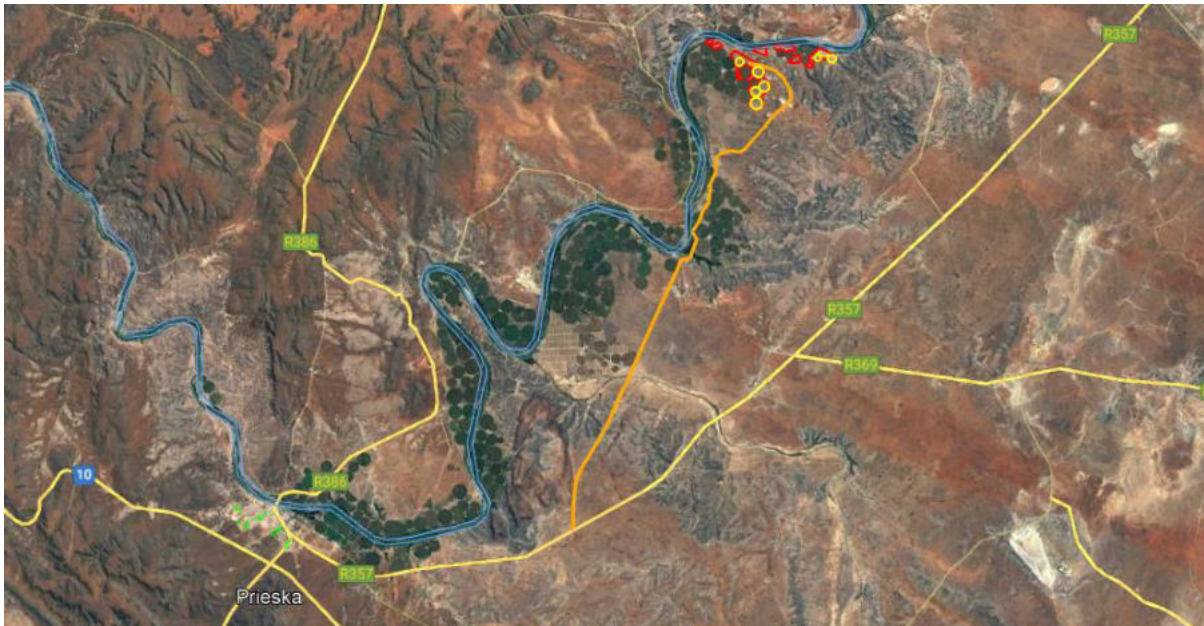


Figure 1: Site location

Digital Soils Africa (Pty) LTD (DSA) was tasked by Zwemkuil Gordonii CC to conduct environmental investigations and complete the environmental application and cultivation of virgin soil. Although 504.7 Ha are under application, only 406 Ha will potentially be cleared from vegetation to establish crops based on soil suitability. There are existing pivots on the farm and the applicant would like to establish another 6-7 pivots for maize/wheat/lucerne crops and utilise the areas between the existing pivots on the farm for either vineyard or pecan nut crops.

NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT NO. 107 OF 1998) AS AMENDED

Environmental Assessment

DSA was appointed by Zwemkuil Gordonii CC as the independent environmental assessment practitioner (EAP) to undertake the Environmental Application and apply for GNR 325 listed activities and the submission of a Scoping Report and Environmental Impact Assessment. According to the latest Government Notice No. 324; 325 & 327, the following Listed Activities were triggered:

GNR 325 (15): The clearance of an area of 20 hectares or more of indigenous vegetation.	<i>An area of 406 Ha of natural veldt used for grazing will be cleared to establish crops.</i>
GNR 324: (12) g.ii. The clearance of an area of 300 m² or more of indigenous vegetation in the Northern Cape within a critical biodiversity area identified in bioregional plans.	<i>Although the threshold for clearing of vegetation is covered in the GNR 325 (15) activity, the site does fall within a CBA 1 & 2 area.</i>

POTENTIAL ENVIRONMENTAL ISSUES

The full impact on all environmental parameters will be concluded in the EIA and EMP phases. For background information, the most important potential environmental issues that will be addressed in the assessment include, but are not limited to:

Soil Suitability:

A soil survey was conducted on the farm to determine whether the land would be suitable for the cultivation of maize/wheat/lucern/vineyard/pecan nuts. About 504,7 Ha of land was investigated. The soil report and findings were the leading factors in deciding to allocate the crop areas. The soil report concluded that approximately 330 Ha of the survey area is suitable for irrigation. Soils with a freely drainable depth of 1000 mm, which included the Hutton, Augrabies, Prieska, Addo, and sections of the Plooyburg, Prieska, Glenrosa and Vaalbos soil forms were suitable for irrigation. The soil forms not suitable for irrigation (Sections of the Plooyburg, Vaalbos, Brandvlei, Prieska, and Glenrosa) were suitable for vineyards under drip irrigation as the soil could be mechanically altered to accommodate vineyards. The area for vineyard production was approximately 76 Ha. The areas not suitable for irrigation or vineyard production were the Coega and parts of the Glenrosa, Vaalbos, Plooyburg, and Brandvlei soil forms. Soil that had a freely drainable depth of <700 was unsuitable for irrigation and vineyard production.

Loss of on-site fauna and flora:

The site, according to Mucina and Rutherford (2006), hosts two vegetation types, namely the Upper Gariiep Alluvial vegetation, which has a vulnerable conservation status and the Northern Upper Karoo, which has a least threatened conservation status. A vegetation survey will be

conducted by a SACNASP registered ecologist to evaluate the sensitivity of the site in terms of the flora component and ecological status.

The occurrence of faunal species within the proposed area is likely, however, it is farm properties and generally fenced-in camps, which will hinder the mobility of some of the larger wildlife that cannot jump a fence or the smaller wildlife that cannot borrow. Typically, many of the species encountered in the region are species such as the Common Duiker (*Sylvicapra grimmia*), Springbok (*Antidorcas marsupialis*), Steenbok (*Raphicerus campestris*), Blesbok, (*Damaliscus pygargus phillipsi*), Smiths red rock rabbit (*Pronolagus rupestris*), Scrub Hare (*Lepus saxatilis*), Spring Hare (*Pedetes capensis*), Meerkat (*Suricata suricatta*), Ground Squirrel (*Xerus inauris*), Rock elephant shrew (*Elephantulus myurus*), Suricate or Stokstertmeerkat (*Suricata suricatta*), Rock dassie (*Procavia capensis*), Yellow Mongoose (*Cynictis penicillata*), and Aardvark (*Orycteropus afer*).

The clearing of vegetation would be restricted to limited areas and the fairly slow clearance rate would provide adequate time for migration of any animals remaining on-site to be sustained in similar adjoining habitats. Also, noise generated by vehicles will cause most animals to vacate the site temporarily. If certain species were to be affected they would simply vacate the proposed cleared areas during the day and return during the night. Since adequate buffer zones will be maintained from drainage lines, the clearing of vegetation will not impact amphibian species.

Sensitive Sites:

According to the Northern Cape Biodiversity Conservation Plan, the site falls within a Terrestrial CBA 1 area.

According to the Spatial Development Framework environmental sensitivity of the municipal area has been mapped and the site falls within an environmental area that is rated 2 and thus fairly low sensitivity.

To assess the sensitivity of the environment onsite verification is therefore essential. The preliminary investigation indicated that the site does not host sensitive fauna or flora, however, a SACNASP registered scientist will be appointed to conduct the vegetation survey and to determine the ecological importance.

The clearing of vegetation will be restricted to approved areas and a 100m buffer area between the clearance and drainage lines and Orange River will be maintained, thus no surface water systems will be impacted.

The objective will be to reduce the biodiversity impact due to the clearance of vegetation through an 'offset plan'. The principal approach to biodiversity offsets is to provide a 'like for like or better' area to compensate for the area which will be negatively affected. Offsets that do not involve securing and managing habitat but include funding research, education, staffing, etc. are generally believed to be unacceptable for impacts on biodiversity. Biodiversity offsets are to be used in cases where the EIA process identifies negative residual impacts of 'medium' or 'high' significance on biodiversity. Activities resulting in impacts of 'low' significance may not require an offset. In other words, biodiversity offsets can provide a mechanism to compensate for significant residual impacts on biodiversity. It refers to measures over and above

rehabilitation to compensate for the residual negative effects on biodiversity, after every effort has been made to minimise and then rehabilitate impacts.

PUBLIC PARTICIPATION

In terms of the NEMA, public participation forms an integral part of the environmental assessment process. The public participation process provides people who may be affected by the proposed development with an opportunity to provide comments and raise issues of concern about the project or make suggestions that may result in enhanced benefits for the project.

For this application, there will be two phases of public participation.

- 1. Scoping Phase**
- 2. EIA Phase.**

This is the first phase, and during the **Scoping Phase**, *potential* interested and affected parties (I&APs) are given notice via a notice board and local newspaper advertisement informing the public of the application. The *registered* I&APs are considered directly abutting neighbours and organs of state that have jurisdiction over the area, e.g. the Municipality, Ward counsellor, etc. and would be provided with a Background Information Document and given access to a digital copy of the Scoping Report on Digital Soils website for comment.

Comments and issues raised during the Scoping Phase of the public participation process will be captured, evaluated, and included in a Public Participation Report. These issues will be addressed and included in the final Scoping Report, which will be submitted to the Department of Agriculture, Environmental Affairs, Rural Development, and Land Reform.

During the **EIA Phase** (which is the second phase) of public participation, only those I&AP's that are registered would be given notice and access to a digital copy of the Environmental Impact Assessment Report on Digital Soils website for comment.

Comments and issues raised during the EIA Phase of the public participation process will be captured, evaluated, and included in a Public Participation Report. These issues will be addressed and included in the final EIA Report, which will be submitted to the Department of Agriculture, Environmental Affairs, Rural Development, and Land Reform.

To register and/or submit a comment as an Interested and Affected Party, please respond in writing to the following email: natalie@dsafrica.co.za on or before **18 May 2022** no later than 5pm.

Alternatively, a copy of the Draft Scoping Report is also available on the DSA website at www.dsafrica.co.za. Please follow the link to Services, Environmental Services, Documents and choose the Zwemkuil link. To access the loaded documents use the password: zWem@no37.

If you have any other questions or inquiries, please do not hesitate to contact the office at 067 622 5687. If no comments are received from you, it will then be regarded that you do not have any comments.

Response from Dirk Ernst Loots

Dirk Ernst Loots Snr

**Application for clearing of the natural vegetation on the Remainder of Farm Smitskloof No. 38,
Prieska for establishing crops.**

I, Dirk Ernst Loots (ID nr. 5603135003081) is the owner of the abovementioned property and are aware of the application to clear vegetation for the establishing of crops on the said property.

I would like to indicate that I support the application and have no objection to the proposed development.

Date & Signed by D.E. Loots



11-03-2022

Register post and email:

All IAP's will be emailed, except for Mr. Giel van Niekerk does not have an email address, therefore will receive correspondence via register mail.

Response and comments:

Once the public participation is completed, the emails and IAP register with a response and comments table will be completed and represented in the Final Scoping Report.

APPENDIX D – SCREENING TOOL REPORT AND SITE VERIFICATION REPORT

The Screening Tool Report does not allow for multiple sites to be loaded that are under one application. For the purpose of identifying sensitivities and the information required, all the different sites on the farm were merged into one site, so that one Screening Tool Report could be generated.

Therefore, the area on the Screening tool does NOT represent the exact area of the site but is an enlargement of the area (about 800Ha) to allow for the merging of the different sites on the farm that includes the 504,7 Ha under the application.

This was accepted by the Department at the submission of the application.

**SCREENING REPORT FOR AN ENVIRONMENTAL AUTHORIZATION AS
REQUIRED BY THE 2014 EIA REGULATIONS – PROPOSED SITE
ENVIRONMENTAL SENSITIVITY**

EIA Reference number: 000

Project name: Zwem Kuil

Project title: Clearing of vegetation for crop production

Date screening report generated: 09/03/2022 10:40:55

Applicant: Zwemkuil Gordonii CC

Compiler: DSA

Compiler signature:



Application Category: Agriculture_Forestry_Fisheries|Crop Production



Table of Contents

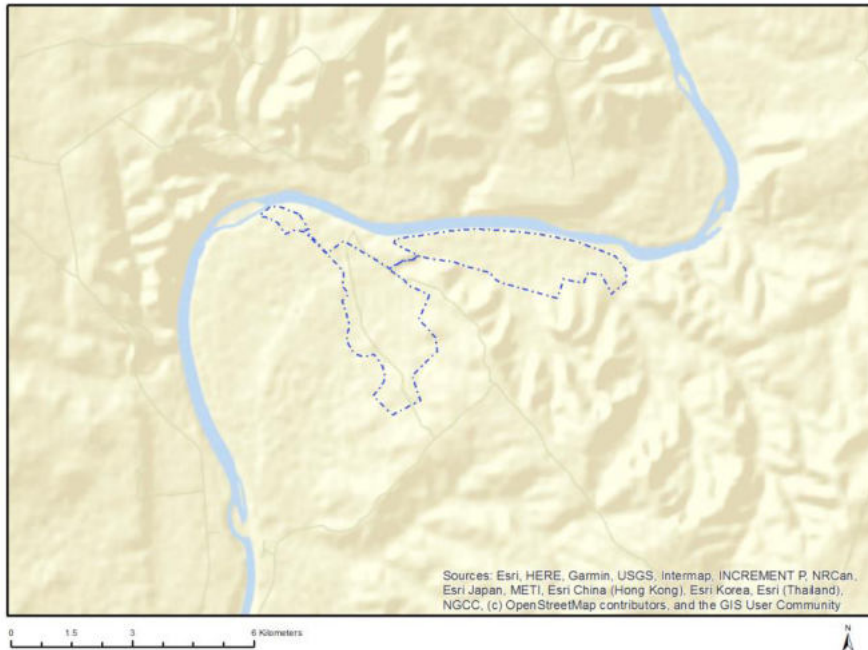
Proposed Project Location	3
Orientation map 1: General location	3
Map of proposed site and relevant area(s)	4
Cadastral details of the proposed site	4
Wind and Solar developments with an approved Environmental Authorisation or applications under consideration within 30 km of the proposed area	5
Environmental Management Frameworks relevant to the application	5
Environmental screening results and assessment outcomes	5
Relevant development incentives, restrictions, exclusions or prohibitions	5
Map indicating proposed development footprint within applicable development incentive, restriction, exclusion or prohibition zones	6
Proposed Development Area Environmental Sensitivity	6
Specialist assessments identified	7
Results of the environmental sensitivity of the proposed area	9
MAP OF RELATIVE AGRICULTURE THEME SENSITIVITY	9
MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY	10
MAP OF RELATIVE AQUATIC BIODIVERSITY THEME SENSITIVITY	11
MAP OF RELATIVE ARCHAEOLOGICAL AND CULTURAL HERITAGE THEME SENSITIVITY	12
MAP OF RELATIVE CIVIL AVIATION THEME SENSITIVITY	13
MAP OF RELATIVE DEFENCE THEME SENSITIVITY	14
MAP OF RELATIVE PALEONTOLOGY THEME SENSITIVITY	15
MAP OF RELATIVE PLANT SPECIES THEME SENSITIVITY	16
MAP OF RELATIVE TERRESTRIAL BIODIVERSITY THEME SENSITIVITY	17

Proposed Project Location

Orientation map 1: General location



Map of proposed site and relevant area(s)



Cadastral details of the proposed site

Property details:

No	Farm Name	Farm/ Erf No	Portion	Latitude	Longitude	Property Type
1	SMITSKLOOF	38	0	29°28'16.05S	23°8'32.13E	Farm
2	ZWEM KUIL	161	0	29°25'41.03S	23°4'51.14E	Farm
3	MOOIDRAAI	36	0	29°29'21.01S	23°3'2.41E	Farm
4	ZWEM KUIL	37	0	29°26'53.12S	23°4'28.47E	Farm
5	SMITSKLOOF	38	0	29°28'17.07S	23°8'26.63E	Farm Portion
6	ZWEM KUIL	37	2	29°25'33.83S	23°4'29.47E	Farm Portion
7	ZWEM KUIL	37	8	29°25'54.23S	23°1'4.35E	Farm Portion
8	ZWEM KUIL	37	10	29°25'44.18S	23°5'21.04E	Farm Portion
9	ZWEM KUIL	161	0	29°25'42.98S	23°4'54.96E	Farm Portion
10	MOOIDRAAI	36	0	29°29'36.74S	23°3'14.96E	Farm Portion
11	SMITSKLOOF	38	2	29°25'47.32S	23°5'49.04E	Farm Portion
12	MOOIDRAAI	36	3	29°27'50.09S	23°1'48.65E	Farm Portion
13	ZWEM KUIL	37	9	29°26'37.26S	23°1'53.88E	Farm Portion
14	ZWEM KUIL	37	10	29°25'49.81S	23°2'41.25E	Farm Portion
15	ZWEM KUIL	37	0	29°26'55.06S	23°4'30.98E	Farm Portion

Development footprint¹ vertices:
No development footprint(s) specified.

¹ “development footprint”, means the area within the site on which the development will take place and includes all ancillary developments for example roads, power lines, boundary walls, paving etc. which require vegetation clearance or which will be disturbed and for which the application has been submitted.

Wind and Solar developments with an approved Environmental Authorisation or applications under consideration within 30 km of the proposed area

No	EIA Reference No	Classification	Status of application	Distance from proposed area (km)
1	12/12/20/1942	Solar PV	Approved	19.4
2	14/12/16/3/3/2/937	Solar PV	Approved	27.7
3	12/12/20/2645	Solar PV	Approved	22.4
4	14/12/16/3/3/1/484	Solar PV	Approved	22.4

Environmental Management Frameworks relevant to the application

No intersections with EMF areas found.

Environmental screening results and assessment outcomes

The following sections contain a summary of any development incentives, restrictions, exclusions or prohibitions that apply to the proposed development site as well as the most environmental sensitive features on the site based on the site sensitivity screening results for the application classification that was selected. The application classification selected for this report is:

Agriculture_Forestry_Fisheries | Crop Production.

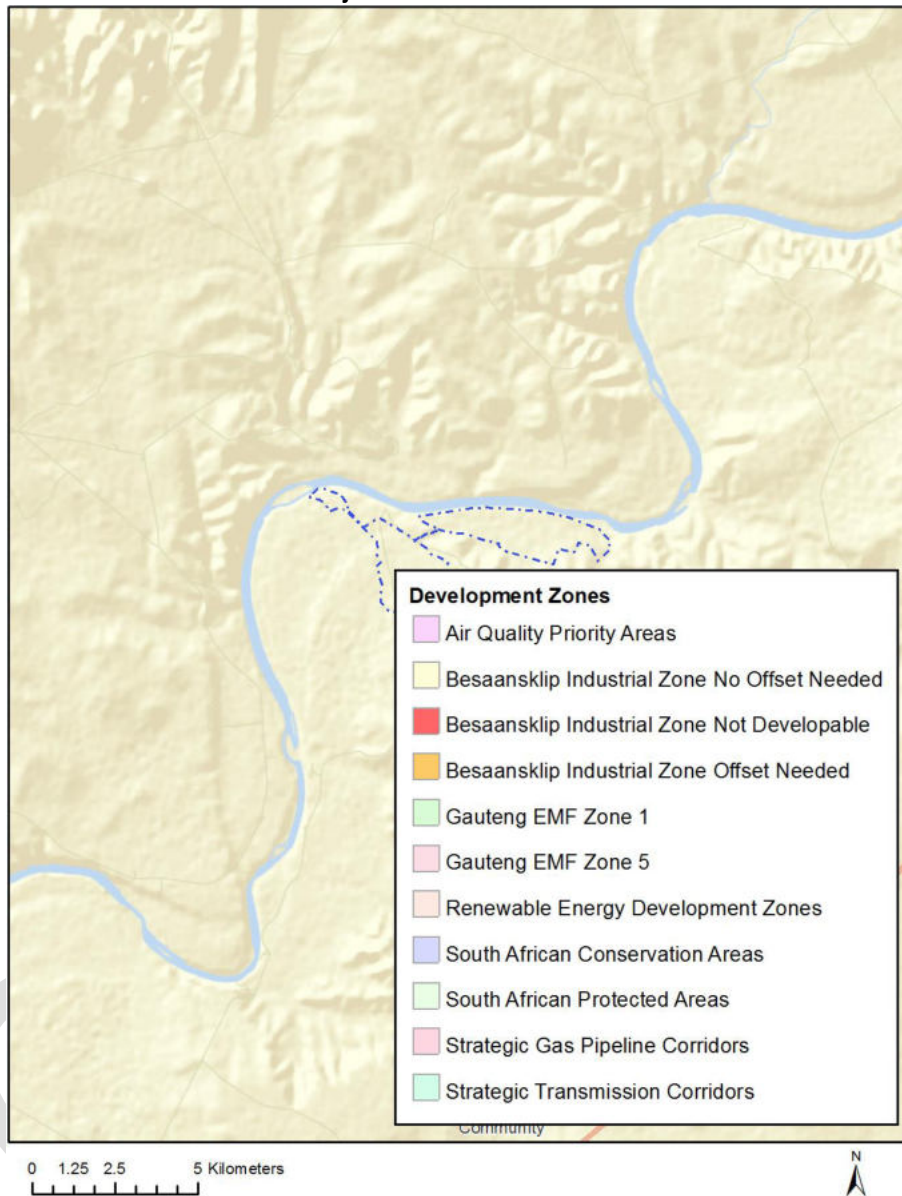
Relevant development incentives, restrictions, exclusions or prohibitions

The following development incentives, restrictions, exclusions or prohibitions and their implications that apply to this site are indicated below.

No intersection with any development zones found.

Map indicating proposed development footprint within applicable development incentive, restriction, exclusion or prohibition zones

Project Location: Zwem Kuil



Proposed Development Area Environmental Sensitivity

The following summary of the development site environmental sensitivities is identified. Only the highest environmental sensitivity is indicated. The footprint environmental sensitivities for the proposed development footprint as identified, are indicative only and must be verified on site by a suitably qualified person before the specialist assessments identified below can be confirmed.

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Agriculture Theme	X			
Animal Species Theme		X		

Aquatic Biodiversity Theme	X			
Archaeological and Cultural Heritage Theme				X
Civil Aviation Theme			X	
Defence Theme				X
Paleontology Theme		X		
Plant Species Theme			X	
Terrestrial Biodiversity Theme	X			

Specialist assessments identified

Based on the selected classification, and the environmental sensitivities of the proposed development footprint, the following list of specialist assessments have been identified for inclusion in the assessment report. It is the responsibility of the EAP to confirm this list and to motivate in the assessment report, the reason for not including any of the identified specialist study including the provision of photographic evidence of the site situation.

No	Specialist assessment	Assessment Protocol
1	Agricultural Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Agriculture_Assessment_Protocols.pdf
2	Landscape/Visual Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
3	Archaeological and Cultural Heritage Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
4	Palaeontology Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
5	Terrestrial Biodiversity Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Terrestrial_Biodiversity_Assessment_Protocols.pdf
6	Aquatic Biodiversity Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Aquatic_Biodiversity_Assessment_Protocols.pdf
7	Hydrology	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols

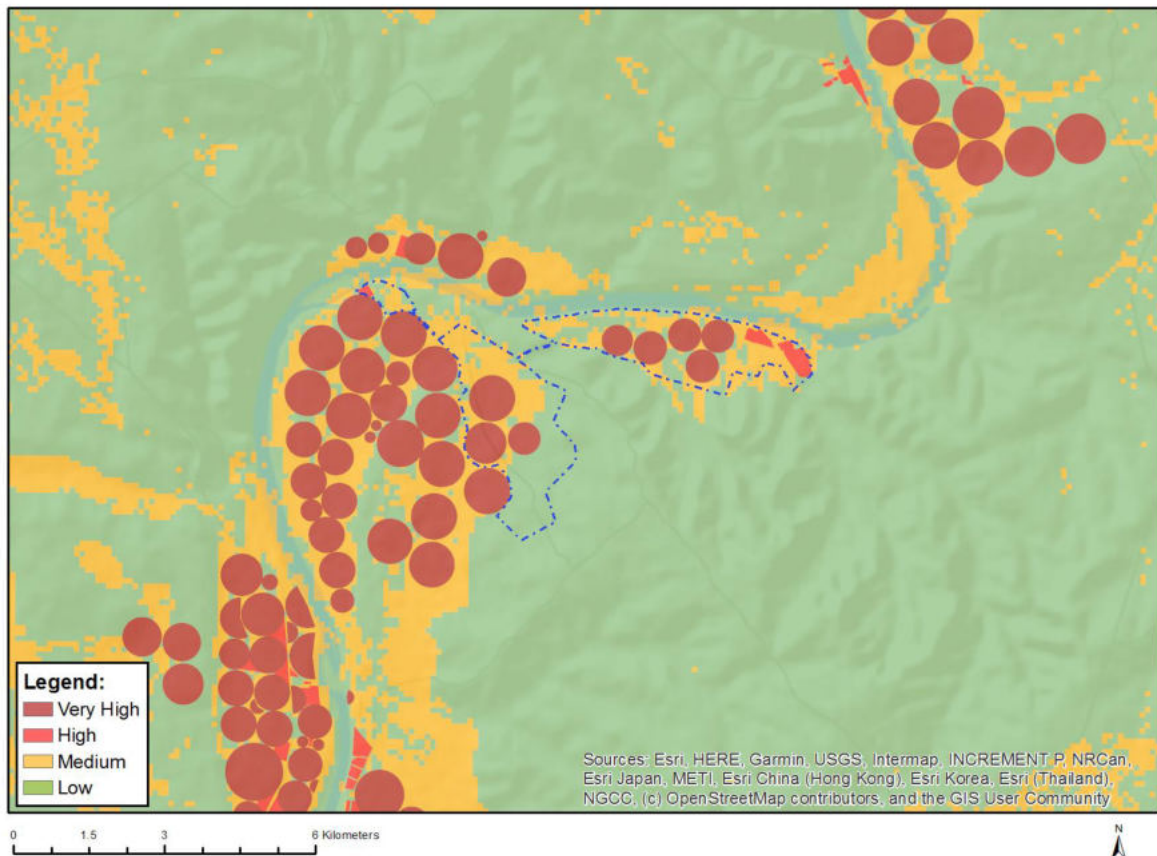
	Assessment	/Gazetted General Requirement Assessment Protocols.pdf
8	Socio-Economic Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted General Requirement Assessment Protocols.pdf
9	Plant Species Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted Plant Species Assessment Protocols.pdf
10	Animal Species Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted Animal Species Assessment Protocols.pdf

OFFICIAL

Results of the environmental sensitivity of the proposed area.

The following section represents the results of the screening for environmental sensitivity of the proposed site for relevant environmental themes associated with the project classification. It is the duty of the EAP to ensure that the environmental themes provided by the screening tool are comprehensive and complete for the project. Refer to the disclaimer.

MAP OF RELATIVE AGRICULTURE THEME SENSITIVITY

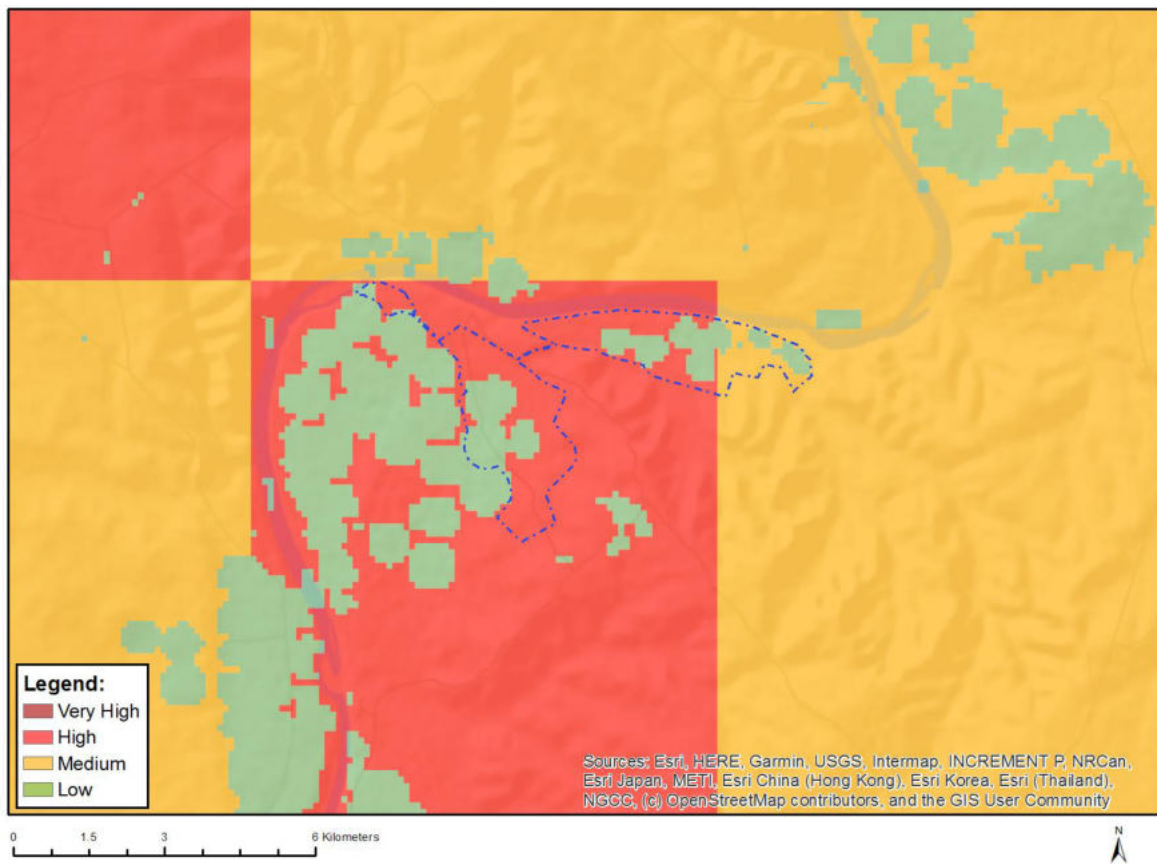


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
High	Annual Crop Cultivation / Planted Pastures Rotation; Land capability; 01. Very low/02. Very low/03. Low-Very low/04. Low-Very low/05. Low
High	Annual Crop Cultivation / Planted Pastures Rotation; Land capability; 06. Low-Moderate/07. Low-Moderate/08. Moderate
Low	Land capability; 01. Very low/02. Very low/03. Low-Very low/04. Low-Very low/05. Low
Medium	Land capability; 06. Low-Moderate/07. Low-Moderate/08. Moderate
Very High	Pivot Irrigation; Land capability; 01. Very low/02. Very low/03. Low-Very low/04. Low-Very low/05. Low
Very High	Pivot Irrigation; Land capability; 06. Low-Moderate/07. Low-Moderate/08. Moderate

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



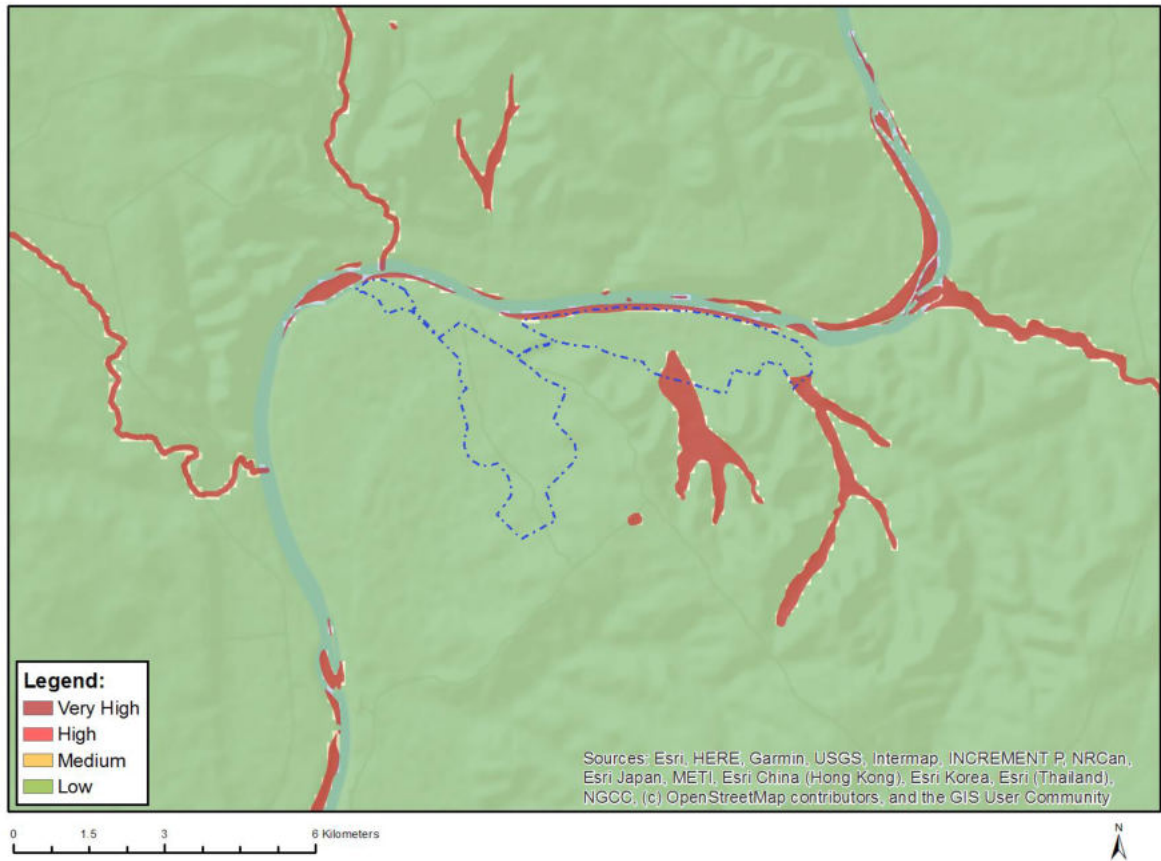
Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Aves-Neotis ludwigii
High	Aves-Aquila verreauxii
Low	Low sensitivity
Medium	Aves-Neotis ludwigii

MAP OF RELATIVE AQUATIC BIODIVERSITY THEME SENSITIVITY

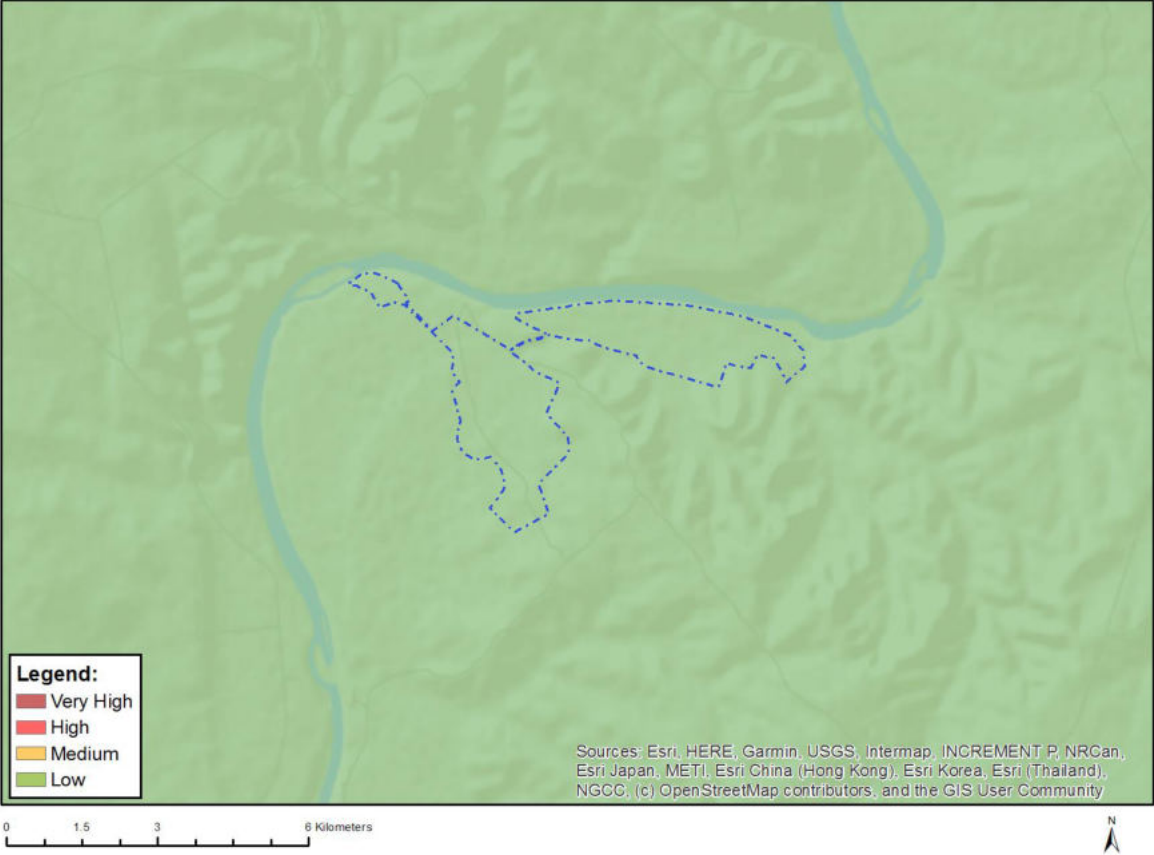


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low sensitivity
Very High	Wetlands and Estuaries

MAP OF RELATIVE ARCHAEOLOGICAL AND CULTURAL HERITAGE THEME SENSITIVITY

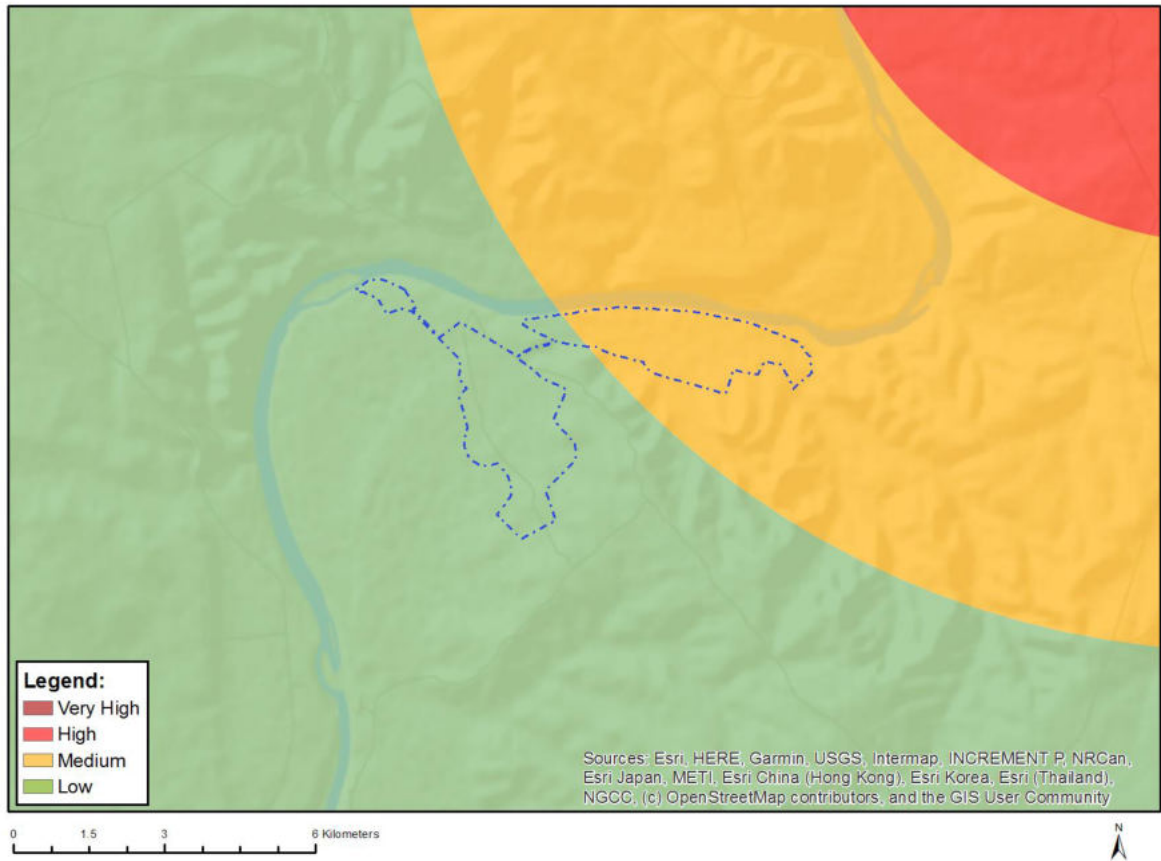


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
			X

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low sensitivity

MAP OF RELATIVE CIVIL AVIATION THEME SENSITIVITY

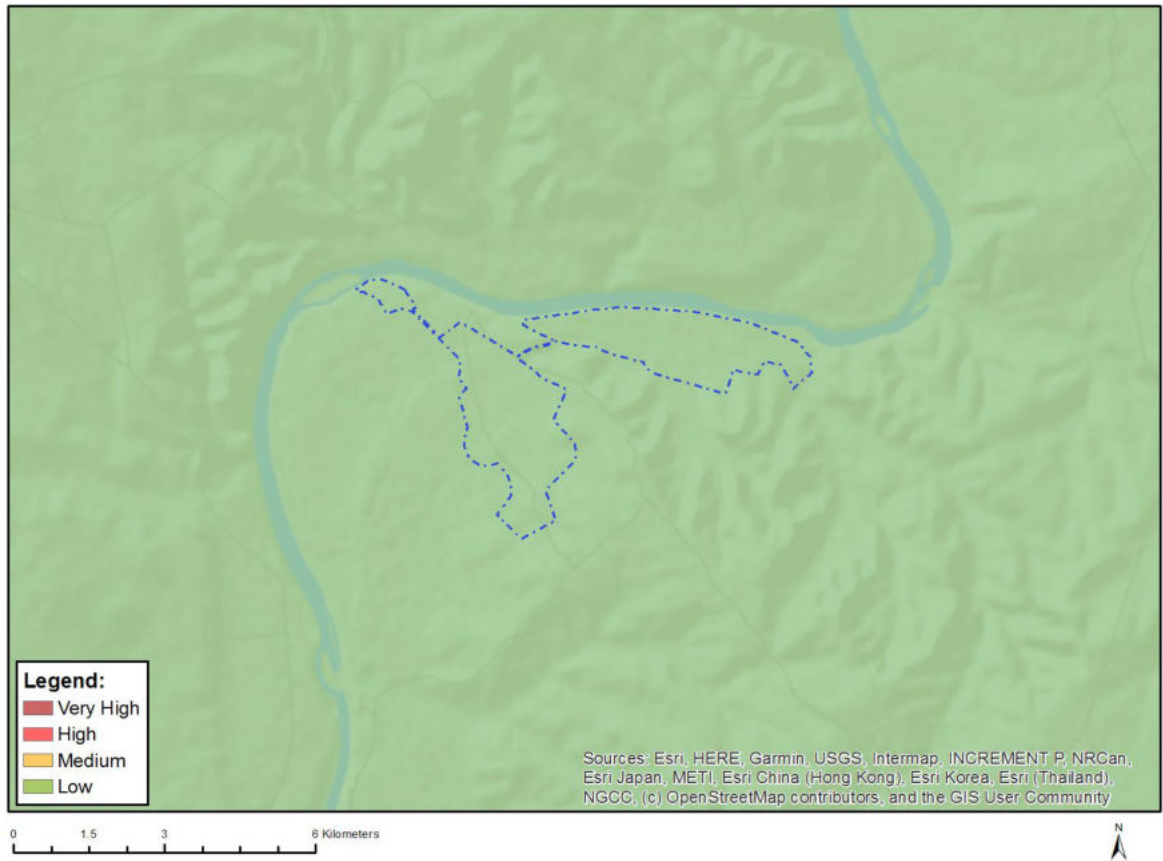


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low sensitivity
Medium	Between 8 and 15 km of other civil aviation aerodrome

MAP OF RELATIVE DEFENCE THEME SENSITIVITY

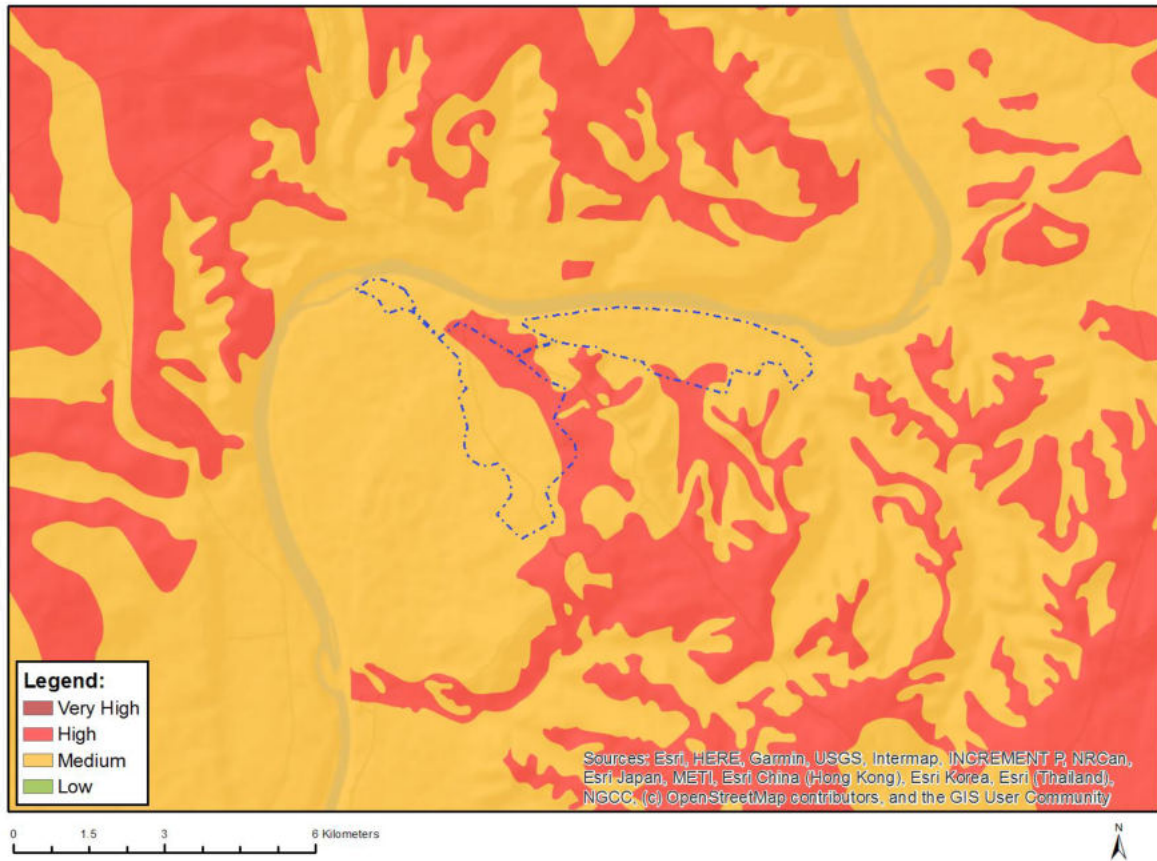


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
			X

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity

MAP OF RELATIVE PALEONTOLOGY THEME SENSITIVITY

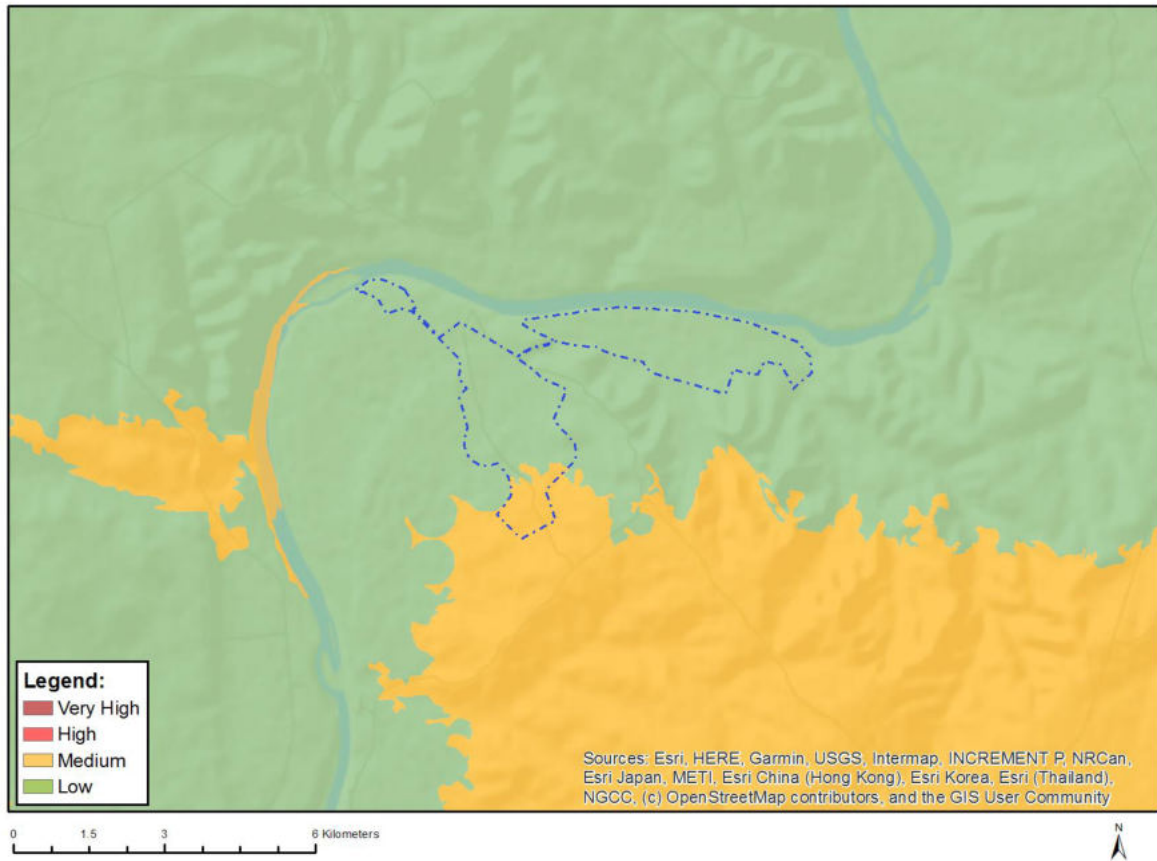


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Features with a High paleontological sensitivity
Medium	Features with a Medium paleontological sensitivity

MAP OF RELATIVE PLANT SPECIES THEME SENSITIVITY



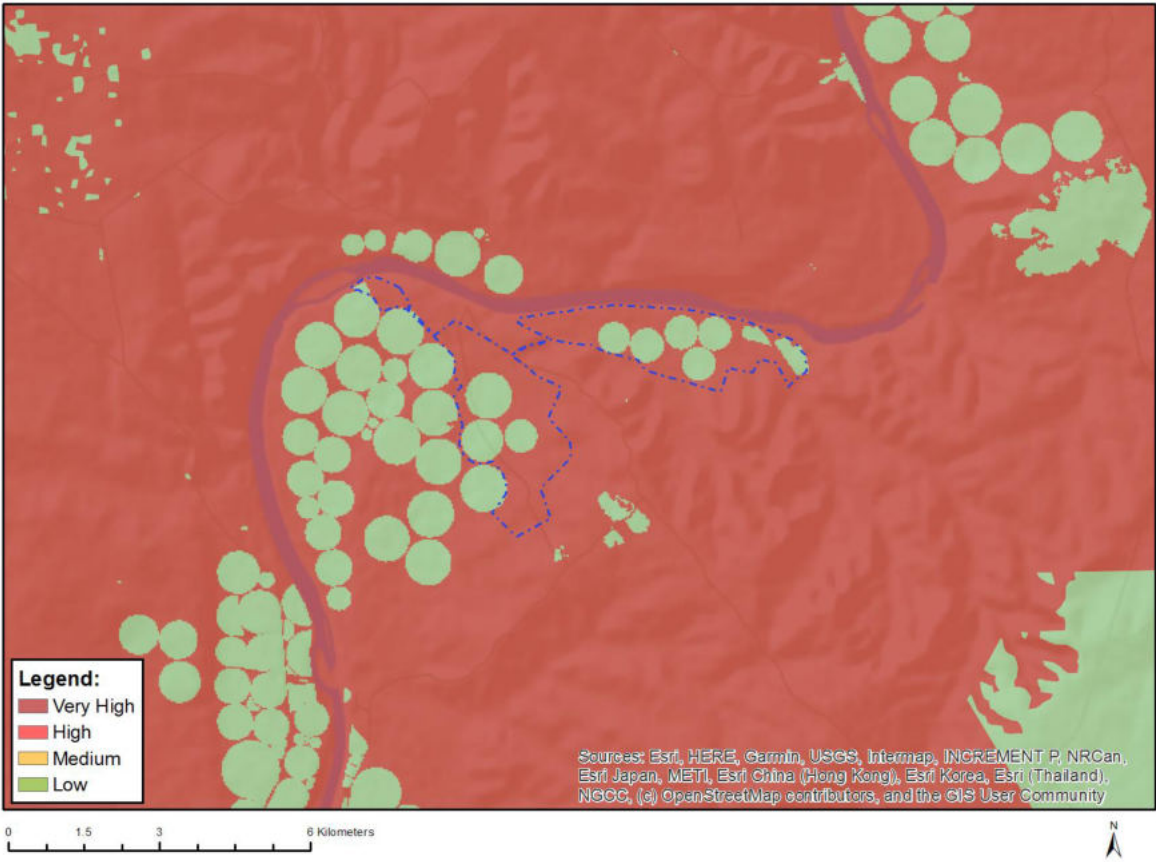
Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Medium	Tridentea virescens

MAP OF RELATIVE TERRESTRIAL BIODIVERSITY THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Very High	Critical biodiversity area 1
Very High	Critical biodiversity area 2



APPENDIX D

SITE VERIFICATION REPORT

For the

Application for Environmental Authorisation for the
clearing of vegetation on Ptn 2 & Remainder of Farm
Zwem Kuil No. 37 and Remainder of Farm Smitskloof No.
38, Prieska

Prepared for


ZWEMKUIL GORDONII CC

APRIL 2022



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Dr Johan van Tol

TABLE OF CONTENTS

Background	4
Location	5
Desktop Analysis of the Site	7
Land Use	7
Site Inspection	7
Photo record of the Upper Western Section	8
Photo record of the Upper Eastern Section	8
Photo record of the Southern Section	10
Environmental Sensitivity Themes	10
Agricultural Theme	11
Animal Species Theme	14
Aquatic Biodiversity Theme	16
Archaeological & Heritage Impact and Palaeontological Theme	18
Civil Aviation Theme	19
Defence Theme	19
Plant Species Theme	19
Terrestrial Biodiversity Theme	20
Specialist Assessments identified	24
Agricultural Impact Assessment	24

Landscape/Visual Impact Assessment	25
Archaeological and Heritage Impact Assessment & Palaeontological Impact Assessment .	25
Terrestrial Biodiversity Impact Assessment	26
Aquatic Biodiversity Impact Assessment.....	26
HydroloGy Assessment	26
Socio-Economic Assessment	26
Plant Species Assessment.....	27
Animal Species Assessment.....	28
Conclusion of Site Sensitivity Verification Report	28
References	28

BACKGROUND

Digital Soils Africa (Pty) LTD (DSA) was tasked by Zwemkuil Gordonii CC to conduct environmental investigations and complete the Environmental Authorisation Application for the authorisation of clearing of vegetation on Portion 2 and the Remainder of the Farm Zwemkuil No. 37 and the Remainder of Farm Smitskloof No. 38, Prieska in the Northern Cape, for crop production. The Applicant would like to develop 504.7 Ha of which about 406Ha of vegetation will be cleared to establish pivots for irrigating maize/wheat/lucerne crops and also vineyard and nut trees. Of the 504.7 Ha about 98.7 Ha will be used as an offset area for rescued plants.

In terms of the National Environmental Management Act 107 of 1998 (“NEMA”), environmental authorisation must be obtained before any person can conduct activities that cause damage to the environment.

DSA was appointed by Zwemkuil Gordonii CC as the independent environmental assessment practitioner (EAP) to undertake the Environmental Authorisation Application for the commencement of a listed activity in terms of the Environmental Impact Assessment Regulations 2014, as amended in 2017.

Currently the majority of the site host intact vegetation with some evidence of overgrazing and past cultivation. Soil samples were taken and analysed to investigate if the soil is suitable for establishing crops. The soil study indicated that the A and B horizons are characteristically sandy and therefore will facilitate good drainage. The drainage restricting layers were the major determining factor for suitability. Approximately 5% of the area has a shallow depth and is not suitable for irrigation or vineyard, while essentially 15% is suitable for vineyard production under drip irrigation. The rest of the area is suitable for all irrigation.

From an environmental point of view, 504.7Ha area should be under application, although only 406Ha would most likely be disturbed, the rest of the 98.7Ha that are located between the proposed ploughing areas should be used as an off-set area and to preserve if for conservation purposes and possible transplant of vegetation, depending on the outcome of the vegetation report.

The Screening Tool Report has been generated for the proposed development. According to the screening tool report, the following specialist assessments were identified:

1. Agricultural Impact Assessment;
2. Landscape/Visual Impact Assessment;
3. Archaeological and Heritage Impact Assessment;
4. Palaeontological Impact Assessment;
5. Terrestrial Biodiversity Impact Assessment;
6. Aquatic Biodiversity Impact Assessment;
7. Hydrology Assessment;
8. Socio-Economic Assessment;
9. Plant Species Assessment; and
10. Animal Species Assessment.

Therefore, this site sensitivity verification report is compiled to determine whether Specialist Assessments or Compliance Statements for the abovementioned specialist studies are required for the proposed development.

LOCATION

The site is situated north-east of Prieska in the Northern Cape ($29^{\circ} 26' 05.43''S$; $23^{\circ} 03' 03.81''E$ most centre point of the site) on Portion 2 and the Remainder of Farm Zwem Kuil No. 37 and the Remainder of Farm Smitskloof No. 38, within the Siyathemba Municipal area. The farm can be reached by travelling along the R357 for about 18km onto the Muishoek road. This Muishoek road turns into a gravel road and the farm is reached about 30km straight along this gravel road, until a T-junction is reached. Zwem Kuil farm is left off the T-junction, for another 5km.

The site can be divided into three sections: The Upper Western Section, the Upper Eastern Section, and the Southern Section (see Figure 1).

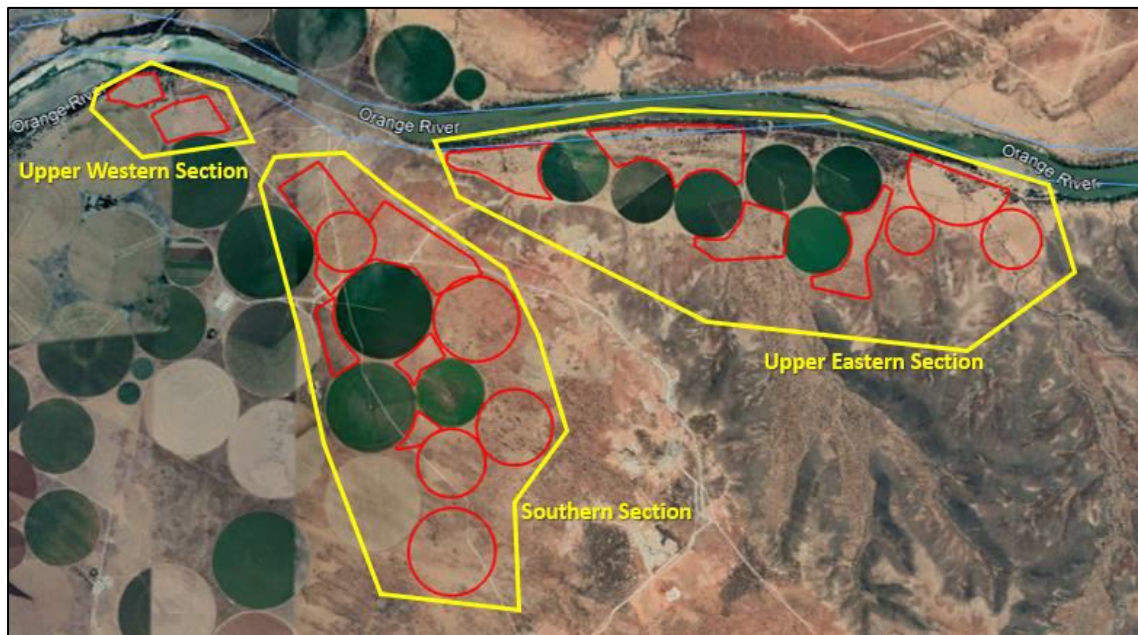


FIGURE 1: DIFFERENT SECTIONS OF THE SITE

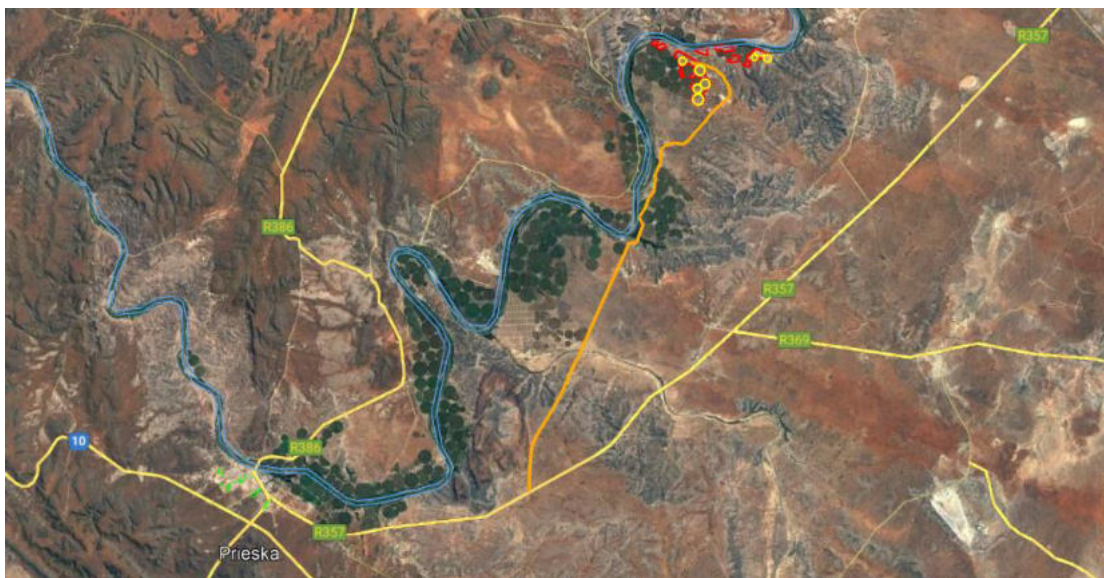


FIGURE 2: SITE LOCATION. THE ORANGE RIVER IS THE BLUE LINE, THE MUISSHOEK ROAD IS THE ORANGE LINE, THE PROPOSED SITE IS REPRESENTED BY THE RED AND YELLOW POLYGONS.

The 21 digit Surveyor General code:

C060 0000 0000 0037 00000
C060 0003 0000 0037 00002
C060 0003 0000 0038 00000

The properties belongs to the Dirk Loots Familietrust and Dirk Ernst Loots. Mr. Jurie Loots is a director of the Zwemkuil Gordonii CC, who is the applicant and also a trustee member of the Dirk Loots Familietrust. Mr. D.E. Loots gave consent to the project.

DESKTOP ANALYSIS OF THE SITE

LAND USE

The study area is zoned agricultural. The AGIS figure below is outdated as areas in the Southern and Upper Eastern Sections are used for commercial irrigation. Overall the study area itself can be mostly described as an area with a mix of shrubland, low fynbos, thicket, bushland and high fynbos.

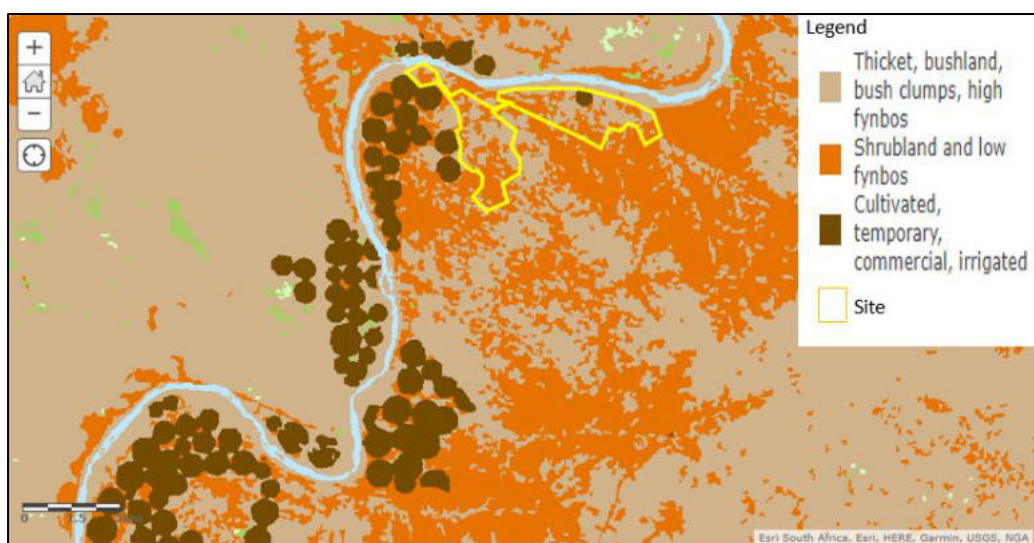


FIGURE 3: LAND COVER CLASSIFICATION ACCORDING TO AGIS

It is the author's view that this particular development can be integrated with the surrounding land uses. The development of agricultural land from grazing to crop production would also not compromise the needs and the well-being of future generations.

SITE INSPECTION

During the site inspection, it was clear that there are portions that have been severely impacted due to historic cultivation and other areas that host more intact vegetation. It is a large site and can be divided into three (3) main areas, the Upper-Western Section, the Upper-Eastern Section and the Southern Section.

The Upper-Western Section and the Upper-Eastern Section have mostly been impacted due to past lucerne production and not rehabilitating the irrigated areas. The Southern Section host more intact vegetation where overgrazing has not caused an impact.

PHOTO RECORD OF THE UPPER WESTERN SECTION

Most of the area was historically used for lucerne production. Notice the green vegetation due to the large amount of rain this region has received. The Upper Western Section falls within the Vulnerable Upper Gariep Alluvial vegetation.



PHOTO RECORD OF THE UPPER EASTERN SECTION

The entire eastern part of this section is severely disturbed due to historic lucerne production. The majority of the area is infested with *Dicerocaryum eriocarpum* (Devils thorn).



Most of the Upper Eastern Section falls within the Vulnerable Upper Gariep Alluvial vegetation, but as can be seen in the photos some portions have been severely disturbed.



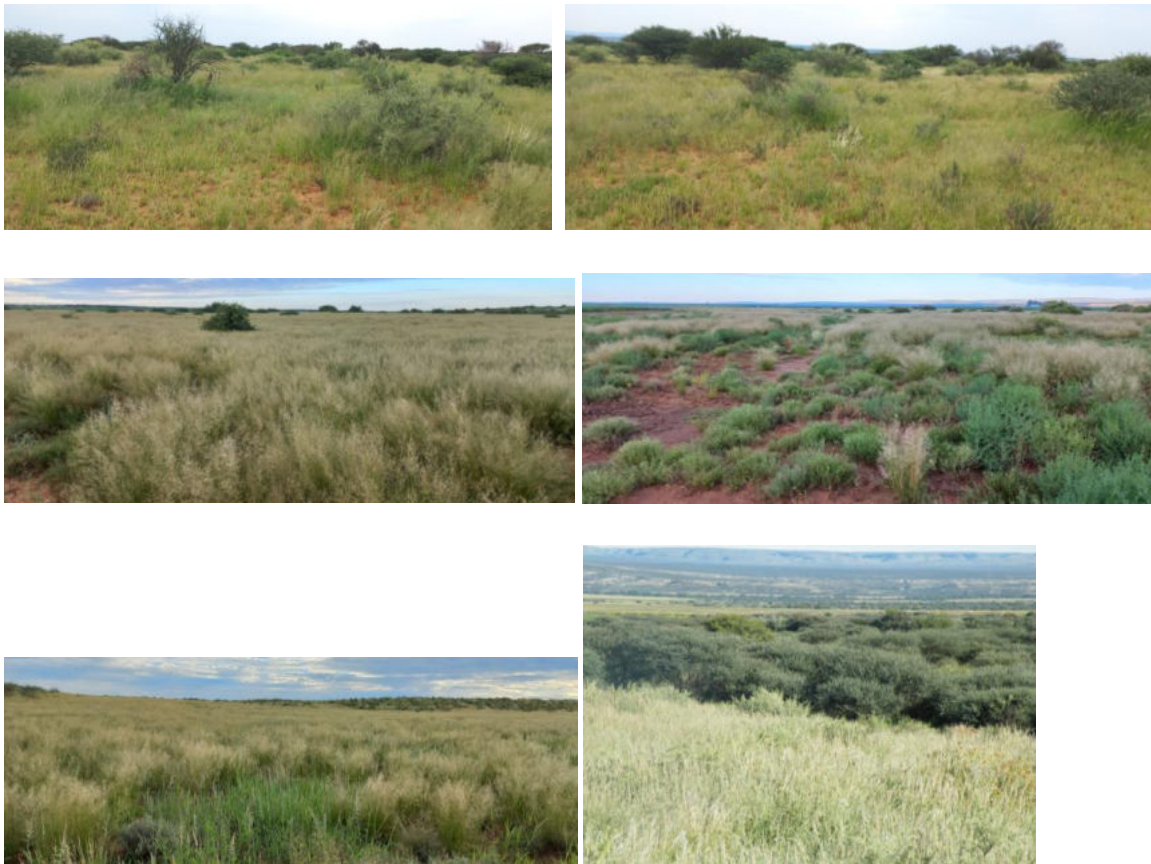
There are a few drainage lines or non-perennial streams that were noted in this Upper Eastern Section.



Due to the very high, and unusual, rainfall the area had over the past few months, the fields were lush with annual grass species, as can be seen in the above photos.

PHOTO RECORD OF THE SOUTHERN SECTION

Most of the Southern Section falls within the Northern Upper Karoo vegetation type and has been impacted due to grazing.



ENVIRONMENTAL SENSITIVITY THEMES

The Screening Tool Report identified certain environmental sensitivity themes and depending on the level of scoring (High, Medium, or Low) will determine what protocol criteria for specialist assessments and minimum report content should be provided.

TABLE 1: ENVIRONMENTAL SENSITIVITY ACCORDING TO THE SCREENING TOOL REPORT

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Agriculture Theme	X			
Animal Species Theme		X		
Aquatic Biodiversity Theme	X			
Archaeological and Cultural Heritage Theme				X
Civil Aviation Theme			X	
Defence Theme				X
Paleontology Theme		X		
Plant Species Theme			X	
Terrestrial Biodiversity Theme	X			

AGRICULTURAL THEME

The area under application is mixed-used for both grazing and crop production. About 282 Ha are existing pivots that were historically established within the applied for the area that would either be incorporated into pecan nuts plantation or continued to be used as pivot areas. In total, an area of about 406Ha will be cleared from natural vegetation to establish crops and vineyards as these soils were deemed suitable according to the soil study completed.

According to the AGIS, the grazing capacity is 32Ha per LSU (Large-stock unit) which is a low carrying capacity, unless the area is cleared from the natural vegetation and lucern or Kikuyu is planted and irrigated the carrying capacity will not increase.

The Agricultural Theme was given a very high sensitivity score for the site. Considering the activity, and clearing of vegetation to establish crops, the soil must be evaluated to conclude whether it is suitable for 1) irrigation and 2) the proposed crops to be planted. If the soil survey indicates that one of these is not feasible, the clearing of vegetation would be futile and the impact a highly negative result. In the Northern Cape, ploughing and irrigating soil can lead to serious degradation of soils.

The soil survey must aim to determine which areas would be suitable for irrigation. When land is irrigated it is necessary to understand the risks of waterlogging, chemical changes, and salinization for it to be sustainable. It is for this reason that the properties of soil must be evaluated. The study area was thus investigated by a SACNASP registered soil scientist, to

investigate the sustainability of the soil properties as well as areas where irrigation would be manageable whilst being sustainable.

In summary, the report found that approximately 5 % of the area has a shallow depth and is not suitable for irrigation, while essentially 15 % is suitable for vineyard production under drip irrigation. The rest of the area is suitable for all irrigation according to the norms and standards provided by the Northern Cape Department of Agriculture.

The soil forms found included: Augrabies (214 Ha) soil form is the dominant soil form in the study area. The Hutton soil form was found in the southern parts of the study area and covered 37 Ha. The Coega soil form (31.5 Ha) was found in the northern parts of the Southern Section and was characteristically shallow. The Addo soil form was found near the Augrabies soil forms in the Upper Eastern Section and covered approximately 36 Ha. The Glenrosa soil form (23.6 Ha) was found throughout the study area, while the Vaalbos soil form (25 Ha) was found near the Plooyburg soil form in the centre of the study area. The Prieska and Brandvlei soil form were only found in a small area of the study area and covered approximately 18 and 16 Ha of the study area

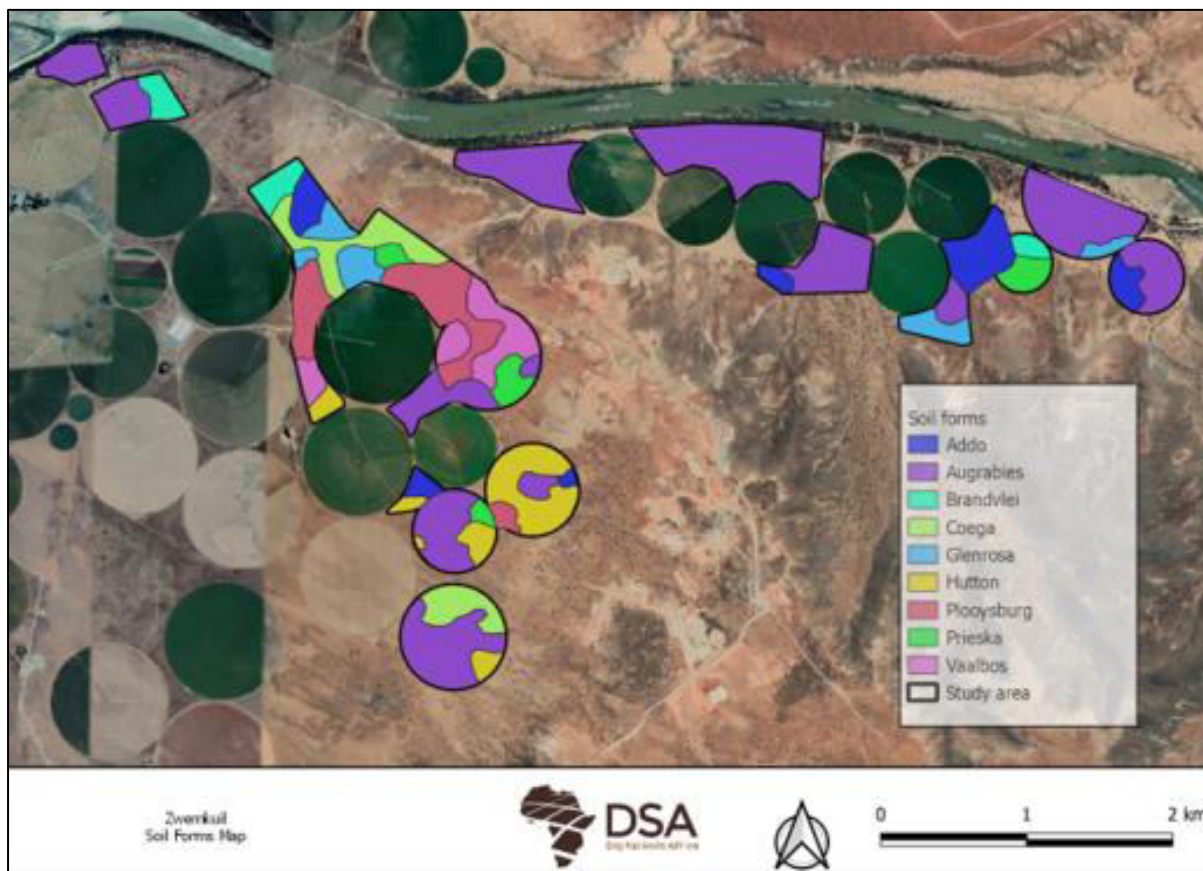


FIGURE 4: SOIL FORMS IN THE STUDY AREA

Chemical analysis of the soil was done and the laboratory results indicate that the chemical parameters are manageable, it is expected that irrigation with high-quality irrigation water will leach some of the base-forming cations out of the soil profiles and thereby lower the pH. Salinity is of low risk within all areas except the Brandvlei soil area where salinity could be of risk. The exchangeable sodium percentage (ESP) and electrical conductivity (EC) for the rest of the areas are low and the soils have good drainage. The texture results show that in general, the soils do have sufficient drainage.

Clay percentages range from very sandy to moderate. Most soils will have good drainage, but soil water holding capacity and fertility in some areas are low and would require good management. Since the soils are generally sandy, the soil depth would be the biggest contributing factor to drainage.

Ultimately the soil report concluded that approximately 330 Ha of the survey area is suitable for irrigation. Soils with a freely drainable depth of 1000 mm, which included the Hutton, Augrabies, Prieska, Addo, and sections of the Plooyburg, Prieska, Glenrosa and Vaalbos soil forms were suitable for irrigation. The soil forms not suitable for irrigation (Sections of the

Plooyburg, Vaalbos, Brandvlei, Prieska, and Glenrosa) were suitable for vineyards under drip irrigation as the soil could be mechanically altered to accommodate vineyards. The area for vineyard production was approximately 76 Ha. The areas not suitable for irrigation or vineyard production were the Coega and parts of the Glenrosa, Vaalbos, Plooyburg, and Brandvlei soil forms. Soil that had a freely drainable depth of <700 was unsuitable for irrigation and vineyard production.

The outcome of the soil evaluation report will be submitted with the Environmental Impact Assessment. It is the EAP's professional opinion that the specialist's survey and assessment will be sufficient. It is recommended that the impact on soil be discussed in the EIA.

ANIMAL SPECIES THEME

Animals play an important role in maintaining the functioning of any ecosystem, for example, pollination, spreading of seeds, removing of pests, trimming of vegetation, etc. The largest part of the Northern Cape falls within the Nama-Karoo biome with a vegetation of low shrubland, grass and trees limited to watercourses. The region is typically an arid environment and the terrain and general landscape do not represent much topographical variation. Therefore faunal species are generally widespread across the region, although some key biotopes such as rivers or pans, or the presence of a particular plant species can become an obvious niche for particular animal species that can result in a concentration of species at a certain location.

Micro habitats are shaped by factors other than vegetation, such as topography, land use, food sources and man-made factors and to determine which bird species are more likely to occur on the proposed site, it is important to understand the habitats available to birds. This arid region hosts at least 215 bird species of which 68 species are endemic or near-endemic species, 18 red-listed species, and 5 red-listed endemic species. Several large terrestrial bird and raptor species, of which the most important are Ludwig's Bustard (*Neotis ludwigii*), which was listed on the Screening Tool as a possibility of being present on the site, Kori bustard (*Ardeotis kori*), Secretarybird (*Sagittarius seppentarius*), Karoo Korhaan (*Eupodotis vigorsii*), Verreaux's Eagle (*Aquila verreauxii*) which was also listed on the Screening Tool as a possibility of being present on the site, the Tawny eagle (*Aquila rapax*) and Martial Eagle (*Polemaetus bellicosus*), Lanner falcon (*Falco biarmicus*).

The Northern Cape is home to an assemblage of arid zone adapted smaller bird species including larks, such as Spike-heeled Lark (*Chersomanes albofasciata*), sparrow-larks, and

others. From a conservation perspective, the Red Lark (*Calendulauda burra*) and Sclater’s Lark (*Spizocorys sclateri*), who are both listed as regionally threatened species (vulnerable and near-threatened respectively). They have very restricted ranges. Other species can include the Spotted Eagle-owl (*Bubo africanus*), Martial Eagle (*Polemaetus bellicosus*).

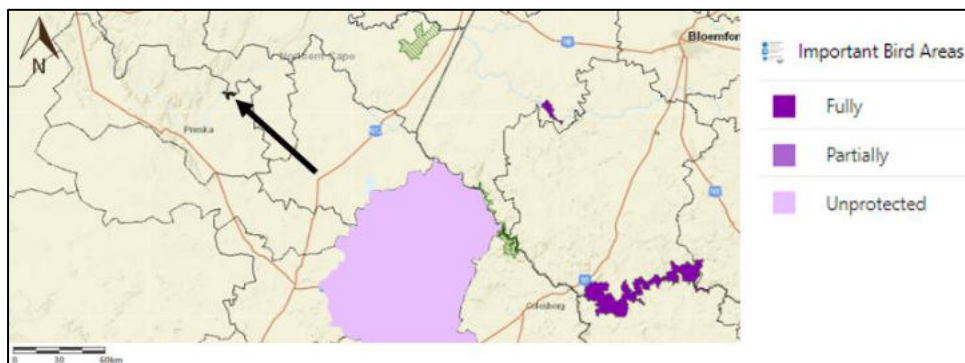


FIGURE 5: IMPORTANT BIRD AREAS ACCORDING TO BGIS

The site does not fall within an important bird area according to BGIS. The farm is impacted by agricultural and surrounding mining activities but also hosts intact habitat, and it is not to say that important bird species are not present at the site.

It must be noted that with the high mobility of avifauna, the slow clearing of vegetation, would not endanger any individual specie. The natural vegetation in the surrounding areas will provide adequate nutrition and shelter for displaced species once construction commences.

This is not a project where wind turbines or structures would be erected that could affect the flight paths of migrating birds, or cause displacement. It is the EAP’s professional opinion that the proposed development will have a very limited impact on the avifauna and that most factors have been taken into account in this site sensitivity verification report.

In terms of the other faunal species. On the day of site inspection, the following animal species were noted at the site, kudu (*Tragelaphus strepsiceros*), blesbok (*Damaliscus pygargus phillipsi*), gemsbok (*Oryx gazella*) springbok (*Antidorcas marsupialis*), ground squirrel (*Xerus inauris*), guineafowls, falcons, finches, the northern black korhaan (*Afrotis afrooides*) and vervet monkeys (*Chlorocebus pygerythrus*) was within the abutting crop fields, mongoose (*Herpestidae*), and various common birds. A few burrows were noted and diggings out of old termite hills, which could indicate the presence of aardvark (*Orycteropus afer*).

Due to the heavy rains this region received, huge swarms of brown locust (*Locustana pardalina*) have been spotted in the region, and on the day of site inspection, many locusts in nymph

stage were noted. They are considered a pest for agricultural activities and can cause huge financial losses if crop fields are devoured by adults. Currently, there is a drive in the Northern Cape to control this outbreak with pesticide design to only target the brown locust.

The clearing of vegetation would be restricted to limited areas and the fairly slow clearance rate would provide adequate time for migration of any animals remaining on-site to be sustained in similar adjoining habitats. Also, noise generated by vehicles will cause most animals to vacate the site temporarily. If certain species were to be affected they would simply vacate the proposed cleared areas during the day and return during the night. Since adequate buffer zones will be maintained from drainage lines, the clearing of vegetation will not impact amphibian species.

The Animal Species Theme was given a very high sensitivity score for the site. It should be noted that the proposed development will completely transform the vegetation and thus habitat on site. The occurrence of faunal species within the proposed area is likely, however, the current status of animal diversity at the site is fairly limited due to the anthropogenic impact of the surrounding farming and mining activities.

Due consideration has been given to the potential impact on the animal species and it is the EAP's professional opinion that a specialist survey and assessment is not required, however, the impact must still be discussed in the EIA.

AQUATIC BIODIVERSITY THEME

The proposed site falls within the Orange River Catchment area. More specifically the proposed site falls within Lower Orange Water Management Area, in the D71D.

To assess the sensitivity of the site with regards to aquatic biodiversity, one has to establish what watercourses are present on the site, the functionality thereof, and if no watercourses are present on the site, what impact would a development have on abutting watercourses, and the sensitivity and functionality thereof.

Since the site does not host any permanent watercourses, except for the Orange River that is outside of the area under application and to the north of the site. The sensitivity to the aquatic biodiversity refers to the impact the proposed development might have on drainage lines as identified in the most southern section in the Upper Eastern Section of the application area

(see Figure 6). Although not indicated on the map below, various other drainage lines were noted during the day of inspection (mostly situated in the Upper Eastern Section) and due to the heavy recent rains, some caused erosion damage to the abutting fields of a few of the established croplands.

Drainage lines do play important ecological roles, hence the reason it is also protected by the National Water Act. The site host some drainage lines, but 100m buffer zones will be kept and clearing of vegetation will not take place within the buffer zones.

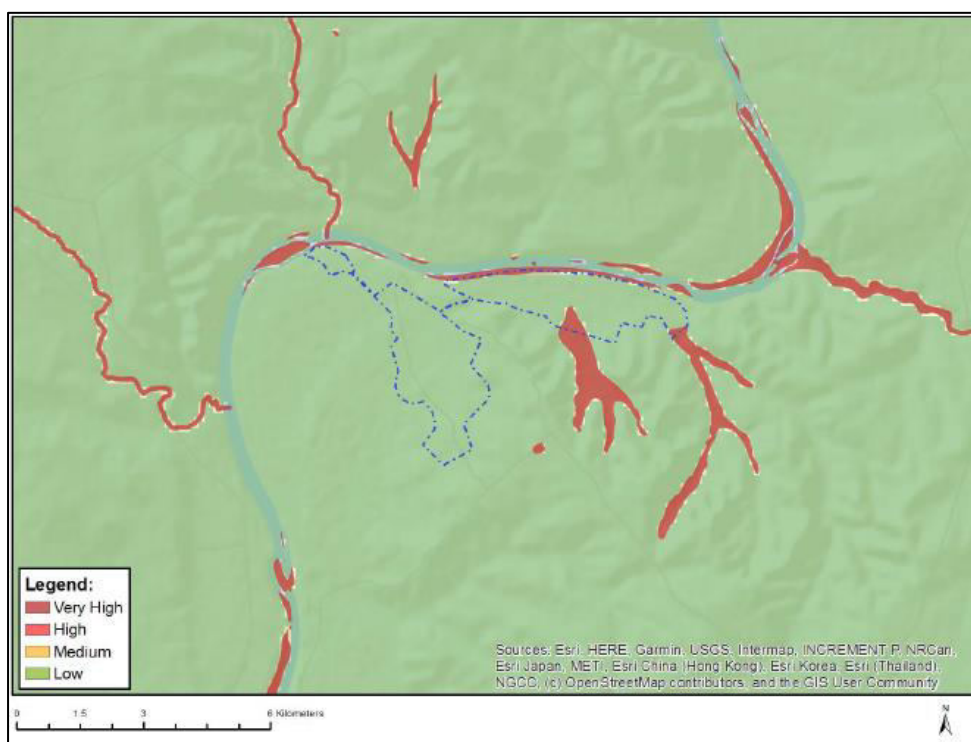


FIGURE 6: SCREENING TOOL MAP OF THE AQUATIC SENSITIVITY OF THE SITE

The site is located within a Fish Support Area of the *Barbus anoplus*. The back fish symbol on the map (see Figure 7) indicates the presence of vulnerable or near-threatened fish populations. If it was a red fish symbol, it would have indicated that there is at least one 13 population of a critically endangered or endangered fish species within that sub-quaternary catchment. Some fish sanctuaries are FEPAs, with their associated sub-quaternary catchments shown in dark green; others are Fish Support Areas, with their associated sub-quaternary catchments shown in medium green, such as the proposed site.



FIGURE 7: THE SITE FALLS WITHIN A FISH SUPPORT AREA

A goal of NFEPA is to keep further freshwater species from becoming threatened and to prevent those fish species that are already threatened from going extinct. To achieve this, there should be no further deterioration in river condition in fish sanctuaries and no new permits should be issued for stocking invasive alien fish in farm dams in the associated sub-quaternary catchment. Since there are drainage lines or perennial stream on the site and the Orange river are situated more than 100m from some of the proposed pivot areas, there is a small possibility of an impact on the *Barbus anoplus* fish sanctuary.

In conclusion, due consideration has been given to the potential impact of the proposed development on the aquatic environment. It is the opinion of the EAP that all factors regarding the aquatic theme were taken into account in this sensitivity verification report. Therefore, it is not required for an Aquatic Biodiversity Compliance Statement to be compiled, although the impact on surface water must still be discussed in the EIA.

ARCHAEOLOGICAL & HERITAGE IMPACT AND PALAEOONTOLOGICAL THEME

The Palaeontological Theme was given a high sensitivity score for the site, but low sensitivity for the archaeological and heritage sensitivity. The Northern Cape is rich in fossils and archaeological heritage and therefore the area will be subject to a Phase 1 Archaeological and Paleontology Report will be completed by Dr. Lloyd Rossouw who has a BA Hons (SU), MSc (Wits), and PhD (UFS) and is ASAPA registered.

An impact on the Palaeontological Heritage will only take place should any fossils be disturbed, damaged, destroyed, or permanently sealed-in at or below the ground surface and then no longer be available for scientific study.

Due consideration has been given to the potential impact of the proposed development on heritage and palaeontological resources. It is the opinion of the EAP that all factors regarding the heritage and palaeontological theme have been taken into account in this site sensitivity verification report. It is recommended that the specialist report be conducted and the impact be discussed in the EIA.

CIVIL AVIATION THEME

The Prieska airstrip is about 25km southwest of the proposed site and is most likely the reason the Screening Tool categorized civil aviation impact as 'medium'. The proposed activity does not involve the construction of wind turbines, solar panels, high buildings/towers, or infrastructure. It is the development of crops. There will be no industrial factories that might cause air emissions to impair the vision of flight. The clearing of vegetation and the establishment of crops will not restrict the airspace.

The site information that was gathered therefore does not align with the 'medium' sensitivity rating of the Screening Tool. It is the opinion of the EAP that the development will not have any impact on civil aviation and therefore it is proposed that no further assessment is made.

DEFENCE THEME

There are no navy- or army bases, airforce bases, or special forces in or near Prieska. According to the Defence Theme Protocol, if the sensitivity is regarded as 'low', it is therefore proposed that no further assessment is required.

PLANT SPECIES THEME

There are an estimated 5 400 plant species in the Northern Cape that occur in six large biomes: the Nama Karoo Biome, Succulent Karoo Biome, Savanna Biome, Grassland Biome, Fynbos Biome, and Desert Biome. More than 30% of the plants found in the Northern Cape are endemic and most of these occur in the Succulent Karoo along the West Coast of South Africa. Many of these plants are rare or threatened, with very limited distribution.

A tree aloe that is a typical landscape feature of the Northern Cape is the kokerboom, or quiver tree (*Aloe dichotoma*). This tree aloe is found growing mainly on the rocky habitat of the hills along the Orange River. In places it occurs in dense “forests”, and good examples of these occur just south of Kenhardt and between Pofadder and Pella. The Doringberg hiking trails near Prieska pass by these gentle aloe giants, and close to 4 000 trees can be seen in the Kokerboom forest on the Kokerboom hiking trail near Kenhardt. Necessitated by the harsh climatic conditions, the kokerboom has adapted to survive. Low air humidity, low soil moisture and intense sunshine levels have made it necessary for it to absorb every available scrap of moisture. It, therefore, has a superficial root system enabling it to absorb moisture quickly (Experiencenortherncape).

The site, according to Mucina and Rutherford (2006), host two vegetation types, namely the Upper Gariep Alluvial vegetation (AZa) and the Northern Upper Karoo (NKu3) and the Screening Tool scored the site a ‘medium’ sensitivity. Due to the size of the site and sensitivity rating, a report will be completed by Antoinette Eyssell from Dimela Eco Consulting who is SACNASP registered scientist.

The botanical survey will be submitted in the EIA. It is the EAP’s professional opinion that the specialist’s survey and assessment will be sufficient.

TERRESTRIAL BIODIVERSITY THEME

Terrestrial Biodiversity can be defined as the variety of life on land that includes the fauna, flora, and habitat connectivity of an area. High biodiversity is often used as an indication of ecosystem health.

Desktop studies must be completed and the site must be plotted against various biodiversity plans, Province or Local related biodiversity plans, and maps. Thereafter, the onsite assessment must be completed to either confirm or refute the findings of the desktop studies.

In terms of this project, the locality of the proposed area was cross-referenced with the following conservation plans: The National Protected Area Expansion Strategy (NPAES); the Northern Cape Protected Area Expansion Strategy (NCPAES); the Northern Cape Biodiversity Conservation Plan, and the Spatial Development Framework of the Siyathemba Municipality.

The National Protected Area Expansion Strategy (NPAES) was developed to expand protected areas in South Africa to increase ecological sustainability and adaptation to climate change.

The proposed study area does not fall within any National Protected area, nor is close to any formal or informal protected area. The Gariep Focus area is about 19.5km south and about 30km southeast of the proposed site.

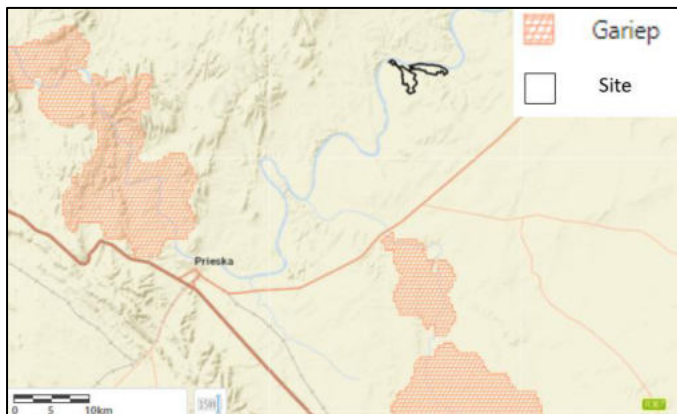


FIGURE 8: THE NATIONAL PROTECTED AREAS EXPANSION STRATEGY (NPAES) INDICATES THAT THE GARIEP FOCUS AREA, IS SITUATED MORE THAN 10KM FROM THE SITE.

With regards to the Northern Cape Protected Area Expansion Strategy (NCPAES), the site does not fall within any priority or protected area.

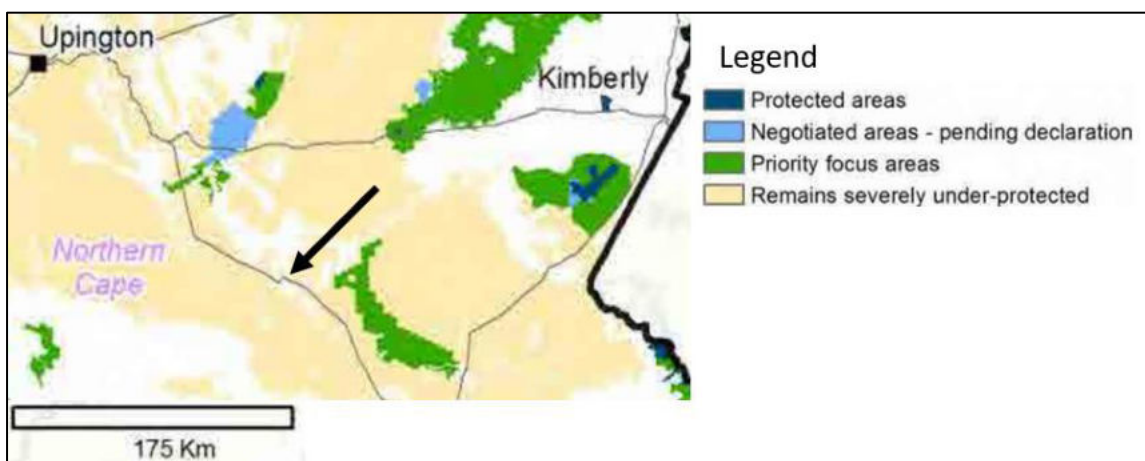


FIGURE 9: PRIORITY AREAS FOR THE PROTECTED AREA EXPANSION IN THE NORTHERN CAPE (BELFOUR ET AL, 2016).

According to the Northern Cape Biodiversity Conservation Plan, the site falls within a Terrestrial CBA 1 area.



FIGURE 10: THE SITE FALLS WITHIN CBA 1 ACCORDING TO THE BGIS OF THE NORTHERN CAPE BIODIVERSITY CONSERVATION PLAN.

The Siyathemba Municipality has mapped the environmental sensitivity of the municipal area in the SDF. The sensitivity is rated from 0-6 (0 being no sensitivity, 1 being low sensitivity, 6 being high sensitivity). Unfortunately, the ecological sensitivity map of the SDF is a bit unclear, but it does seem to appear that the site falls within an environmental area that is rated 2 and thus low sensitivity.



FIGURE 11: SDF OF THE SIYATHEMBA MUNICIPALITY, THE BLACK ARROW INDICATE THE POSITION OF THE SITE.

In terms of the site environmental sensitivity (Screening Tool Report) with regards to terrestrial, the report allocated a very high sensitivity to the theme.

However, one must consider site-specific parameters and the surrounding land use and conservation value to determine the biodiversity importance of a site, and not just rely on

desktop studies. To assess the sensitivity of the environment onsite verification is therefore essential. The preliminary onsite investigation indicated that the site does not host sensitive fauna or flora, and could be preliminarily aligned with the Siyathemba Municipality environmental sensitivity map.

In terms of the flora or habitat representation of the site, a Botanical evaluation of the proposed development site will be conducted by a SACNASP registered scientist, to assess if any natural vegetation is present on the proposed development site. The report would suffice to consider the impact on the ecology from a flora point of view, but will also be indicative of the ecological state and sensitivity, which was regarded as severely impacted. This will then be regarded as the localised plan and evaluation of onsite conditions.

From a terrestrial biodiversity aspect, the location of the site has rendered it to be an extension of existing development areas, as most of the area east of the proposed development is transformed due to agricultural activities. A large section of the north-eastern section that is under application already hosts 6 pivot areas of about 30 Ha each and the proposed clearance will be an extension of this area. South of the Southern Section of the site is an active diamond mine which will further impact the overall terrestrial sensitivity.

The Orange River and associated riparian vegetation north of the site, as well as areas further east and south, do provide continuity with undisturbed areas. It is a farm, thus camps have been fenced off. The site is not regarded as a site of ecological importance when studying the vegetation nor does the site have any high conservation value.

However, a vegetation report will provide better insight into the condition of the veld and connectivity potential.

The anthropogenic impact (farming and mining) has caused the wild animals to move towards more secluded areas (further east from the site), however, wild animals are found on the farm and areas that have not been disturbed can be regarded as CBA areas. The three farm areas are in total 7 309.6 Ha of which 281 Ha is already under crop production. If the development is approved, an additional 404 Ha of the natural area will be disturbed. Thus, in total less than 10% of the farm will be developed in terms of agricultural development. Considering that the proposed development will be an extension of existing pivot areas, it will not lead to the disconnection of ecological corridors.

Considering the current anthropogenic impact on the site, the proposed development would not endanger any species. The vegetation further east will provide adequate nutrition and shelter for displaced species once clearing commences.

Since this development is not a wind turbine or solar farm application that could impact avifauna species, nor will it produce any pollutants or effluent that will impact terrestrial animals. Therefore, it is not required for a Terrestrial Biodiversity Compliance Statement to be compiled, although the impact should still be discussed in the EIA.

SPECIALIST ASSESSMENTS IDENTIFIED

Based on the selected classification and the environmental sensitivities of the proposed development footprint, the following list of specialist assessments has been identified for inclusion in the assessment report, according to the Screening Tool Report. However, it is the responsibility of the EAP to confirm the list and to motivate with reason, for not including any of the identified specialists' studies in the report.

As previously indicated, the following specialist assessments were identified:

1. Agricultural Impact Assessment;
2. Landscape/Visual Impact Assessment;
3. Archaeological and Heritage Impact Assessment;
4. Palaeontological Impact Assessment;
5. Terrestrial Biodiversity Impact Assessment;
6. Aquatic Biodiversity Impact Assessment;
7. Hydrology Assessment;
8. Socio-Economic Assessment;
9. Plant Species Assessment; and
10. Animal Species Assessment.

AGRICULTURAL IMPACT ASSESSMENT

As discussed in detail under the heading 'Agricultural Theme', it was identified that a soil report must be completed and was done by a SACNASP registered soil scientist. This specialist assessment will therefore be included in the EIA.

LANDSCAPE/VISUAL IMPACT ASSESSMENT

The proposed development will result in the transformation of impacted natural vegetation into croplands

Onsite assessment of immediate landscapes revealed that originally, the landscape would have been described as very attractive and of high aesthetic quality because of the meandering status of the river and the unique riverine environment. However, due to the anthropogenic impacts such as the establishment of cultivation areas, Eskom servitudes, a diamond mine, and road infrastructure, the current surrounding landscape can be viewed as impact, but with a moderate-high aesthetic quality, due to the location of the site (fairly close to the Orange River) and the tranquillity that farming generally provides to areas.

With the removal of vegetation and establishment of crops, the anthropogenic impact will be evident, but it will be site-specific and since it will be directly abutting existing pivot areas, it would seem like a continuation of the same activity and therefore reduce the perceived aesthetic impact. In terms of the areas allocated for vineyards and pecan nuts, once established the onsite visuals will be absorbed into the landscape and will fit in with the surrounding land use.

Due consideration has been given to the potential visual impacts of the proposed development and it is the EAP's professional opinion that a specialist assessment is not required, however, the visual impact must still be discussed in the EIA.

ARCHAEOLOGICAL AND HERITAGE IMPACT ASSESSMENT & PALAEOONTOLOGICAL IMPACT ASSESSMENT

A Heritage report was completed by Paleo Field Services, of which Dr. Lloyd Rossouw has a BA(Hons) (SU); MSc (Wits), Ph.D. (UFS) and is ASAPA registered and an application to SAHRIS will also be made online.

TERRESTRIAL BIODIVERSITY IMPACT ASSESSMENT

As discussed in detail under the heading 'Terrestrial Biodiversity Theme' it is not required for a Terrestrial Biodiversity Compliance Statement to be compiled, although the impact should still be discussed in the EIA.

AQUATIC BIODIVERSITY IMPACT ASSESSMENT

As discussed in detail under the heading 'Aquatic Biodiversity Theme', it is not required for an Aquatic Biodiversity Compliance Statement to be compiled, although the impact on surface water must still be discussed in the EIA.

HYDROLOGY ASSESSMENT

Agriculture can impact water systems if it is improperly managed as agricultural activities may impact surface water by contributing nutrients, pesticides, sediment, and bacteria, or by altering streamflow. Fertilizer and pesticide use, tillage, irrigation, and tile drainage can affect water quality and hydrology. The soil report completed will assist the farmer to manage fertilizers, tillage, and irrigation and has identified drainage issues on the property. Modified crops have greatly reduced the use of pesticides.

The clearing of vegetation and establishing of crops will be restricted to the proposed footprint and development plan and a 100m buffer zone be maintained from all drainage lines/non-perennial streams/ river/etc.

Due consideration has been given to the potential hydrology impact of the proposed development. It is EAP's professional opinion that most factors regarding the impact have been taken into account and therefore, it is not required to submit a hydrological report, although the impact must still be discussed in the EIA.

SOCIO-ECONOMIC ASSESSMENT

During the construction phase, the development will provide permanent and casual work for a number of people, whether it is renting a bulldozer from a local company, employing workers to 1) remove the vegetation, 2) remove stones, 3) construct the irrigation infrastructure, or 4) fencing/moving fencing the camps, etc. Once in operation and the crops are harvested, it will create job opportunities for harvesters, transport companies, etc. and must be seen as a positive contributor to upliftment of inhabitants of the Siyathemba Municipal area.

Once in operation and the crops are harvested, the vineyard starts producing fruit, and the pecan nut plantation starts producing nuts, an annual raisin production/nut harvesting and crops harvesting will create job opportunities for harvesters, transport companies, etc. and must be seen as a positive contributor to upliftment of inhabitants of the Siyathemba Municipal area. This development will not only benefit the Applicant but will also create job opportunities for about 50 permanent staff and 300 seasonal staff to be employed during the operational phase of the vineyard and pecan nut harvesting, thus assisting the low-income households that will assist in poverty alleviation.

In terms of the negative impacts, it could potentially pose some social impacts on residents in terms of safety and security issues, and nuisance factors such as dust and noise generation. However, the Applicant is a farmer and has a close relationship with the local community. Most of the families employed on the farm will be from families that have been on the farm for generations, which is the basis of their mutual trust in each other. The Applicant will therefore employ local community members known to the farming community, which is in line with current farming practices.

Due consideration has been given to the potential socio-economic impact of the proposed development. It is EAP's professional opinion that most factors regarding the socio-economic impact have been taken into account in this site sensitivity verification report. Therefore, as the proposed development will have a positive socio-economic impact, a Socio-Economic Impact Assessment is thus not required, although the impact on socio-economic must still be discussed in the EIA.

PLANT SPECIES ASSESSMENT

As discussed in detail under the heading 'Plant Species Theme', it was identified that a botanical evaluation must be completed and was done by a SACNASP registered scientist. This specialist assessment will therefore be included in the EIA.

ANIMAL SPECIES ASSESSMENT

As discussed in detail under the heading 'Animal Species Theme', it is not required that a specialist survey and assessment be conducted, however, the impact must still be discussed in the EIA.

CONCLUSION OF SITE SENSITIVITY VERIFICATION REPORT

Digital Soils Africa (DSA) was appointed by Zwemkuil Gordonii CC to facilitate the Environmental Authorisation Application for the proposed development of crops. There will be environmental impacts, but all could be mitigated and reduced to limited impacts on the surroundings.

A Screening Tool Report has been generated for the proposed development and various themes were rated and specialist studies listed.

As mentioned above soil assessment, botanical assessment, and heritage and paleontology assessment were identified as specialist studies to be completed for the proposed development.

According to the professional opinion of the EAP and the outcome of this Site Verification Report the remaining specialist assessments identified in the Screening Tool Report do not require further specialist input. It is recommended to the Department of Economic, Environmental Affairs and Tourism that the listed specialist studies are not necessary to be conducted, rather all direct, indirect and cumulative impacts must still be discussed in the Basic Assessment Report.

REFERENCES

Comprehensive Atlas Ver. 2.1. http://daffarcgis.nda.agric.za/Comp_Atlas_v2/. 08/04/2022, 09:30.

SANBI Northern Cape Biodiversity Plan, 2016.
http://bgisviewer.sanbi.org/Html5Viewer/Index.html?configBase=http://bgisviewer.sanbi.org/Geocortex/Essentials/REST/sites/2016_NorthernCape_CBA/viewers/Northern_Cape/virtualdirectory/Resources/Config/Default&user=&extent=&layerTheme= 08/04/2022, 10:45

SANBI National Land Cover, 2014.
http://bgisviewer.sanbi.org/Html5Viewer/Index.html?configBase=http://bgisviewer.sanbi.org/Geocortex/Essentials/REST/sites/2013__14_South_African_National_Landcover/viewers/2014_National_Landcover/virtualdirectory/Resources/Config/Default&user=&extent=&layerTheme= 08/04/2022, 11:30.

Siyathemba Municipality 2021/2025: Integrated Development Plan (Final Review).

APPENDIX E – SPECIALIST REPORTS

At this stage, only the Soil report was completed. During the EIA Phase, a vegetation report and Heritage Report will be completed and available for comment during the Draft EIA Phase of the public participation process.



IRRIGATION SUITABILITY FOR THE FARM ZWEMKUIL


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PREPARED FOR JURY LOOTS



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TABLE OF CONTENTS

Table of Contents

Executive summary	1
Introduction	2
Location	3
Methodological Approach	5
Desktop survey	5
Results	7
Soil Forms.....	7
Augrabies 3110.....	8
Plooyburg 2100	9
Coega 2100	10
Glenrosa 2210.....	11
Addo 3110.....	12
Vaalbos 2111	13
Hutton 2110.....	14
Prieska 2110.....	15
Brandvlei 2200 &3200.....	16
Soil Depths.....	17
Slope	21
Chemical And Textural Analysis	23

Suitability.....	24
Crop Recommendation	28
Recommendation	33
Conclusions	33
Reference.....	34
Disclaimer	35
Appendix 1 Modal Profiles	36
Appendix 2: Soil Observations	39
Appendix 3: Specialist CV	44
Specialist Declaration	45

EXECUTIVE SUMMARY

A soil survey was conducted at Zwemkuil on approximately 448 ha of land near Prieska in the Northern Cape to determine whether the land would be suitable for irrigation. The soil forms observed included the Augrabies, Addo, Hutton, Vaalbos, Glenrosa, Plooyburg, Prieska, Brandvlei and Coega. The Augrabies, Hutton, Addo, Prieska, and parts of the Vaalbos, Glenrosa, and Plooyburg soil forms were considered suitable for irrigation and therefore suitable for vineyards, while the Coega and parts of the Glenrosa soil forms were not suitable for irrigation or vineyard production due to root restriction caused by limiting layers and shallow soil depths. The chemical results indicated that only a few horizons were alkaline, while one was slightly acidic and the rest neutral. Approximately 330 ha of the 448 ha survey area is suitable for irrigation, while approximately 76 ha were suitable for vineyard production.

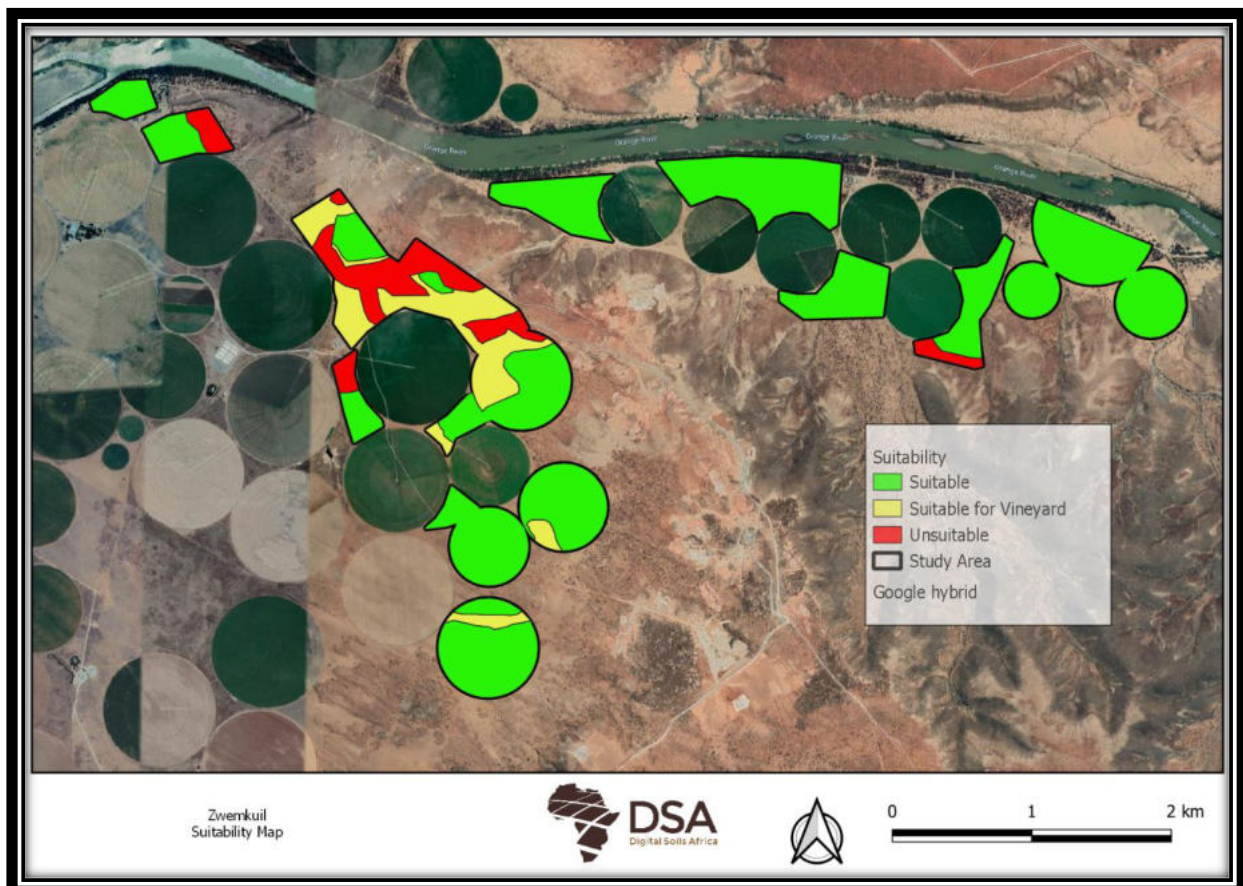


FIGURE 1: SUITABILITY OF THE STUDY AREA.

INTRODUCTION

Digital Soils Africa (Pty) LTD (DSA) was tasked by Jurie Loots to conduct irrigation suitability and soil survey to comply with the Northern Cape Department of Agriculture ploughing certificate. A soil survey was conducted on approximately 448 ha. The survey aimed to determine which areas would be suitable for traditional irrigation and vineyards.

Irrigated lands are prone to salinization and water-logging because of added salts brought in by irrigation water. Salinization is the accumulation of salts within the soil, causing a white salt crust at the soil surface. Insufficient rainfall is the main cause as rainfall is not able to flush out salts from the crop root zone. The water is applied faster than it can be drained, thus causing salinization to increase. If this is not negated by proper management, the soil could reach the extent where it cannot be vegetated anymore.

The Department of Agriculture, Northern Cape has provided guidelines to which the properties of soil must adhere before a ploughing license can be granted. The adherence of properties refers to the infiltration of water through the soil as well as the built-up of sodium and salt. The focus site was thus investigated for the sustainability of the soil properties as well as areas where irrigation would be manageable whilst being sustainable (Gupta, et al., 2008).

LOCATION

The farm Zwemkuil, is situated approximately 50 km outside of Prieska on the R357 road to Douglas (Figure 2). The coordinates of the study area are presented in Table 1.

TABLE 1: COORDINATES OF SELECTED POINTS ON THE PERIMETER OF THE STUDIED AREA

id	x	y	id	x	y
1	23.0188511977	-29.4183826390	21	23.0529887140	-29.4414570668
2	23.0238151732	-29.4186782712	22	23.0485961086	-29.4232248248
3	23.0229505615	-29.4203765743	23	23.0577216078	-29.4268401245
4	23.0295517510	-29.4212637935	24	23.0608106672	-29.4215801431
5	23.0339359633	-29.4257430283	25	23.0744633461	-29.4215489671
6	23.0412391075	-29.4280801458	26	23.0684163612	-29.4260655396
7	23.0508228876	-29.4313428096	27	23.0744466500	-29.4271512012
8	23.0457509419	-29.4320228319	28	23.0767776724	-29.4312979284
9	23.0385073258	-29.4340342115	29	23.0700728856	-29.4305002324
10	23.0371373935	-29.4351457427	30	23.0865895451	-29.4259346570
11	23.0409647272	-29.4390159546	31	23.0846089816	-29.4346073306
12	23.0459726744	-29.4405109444	32	23.0828410243	-29.4282114248
13	23.0476291965	-29.4369844418	33	23.0907145579	-29.4299267621
14	23.0547595115	-29.4361698346	34	23.0867346081	-29.4289960588
15	23.0460454069	-29.4427331733	35	23.0932554200	-29.4251163984
16	23.0458288510	-29.4454379627	36	23.0941786894	-29.4289984610
17	23.0518114444	-29.4471109781	37	23.0999550172	-29.4309395956
18	23.0480228345	-29.4501111456			
19	23.0486563328	-29.4564335713			
20	23.0576124980	-29.4437848694			

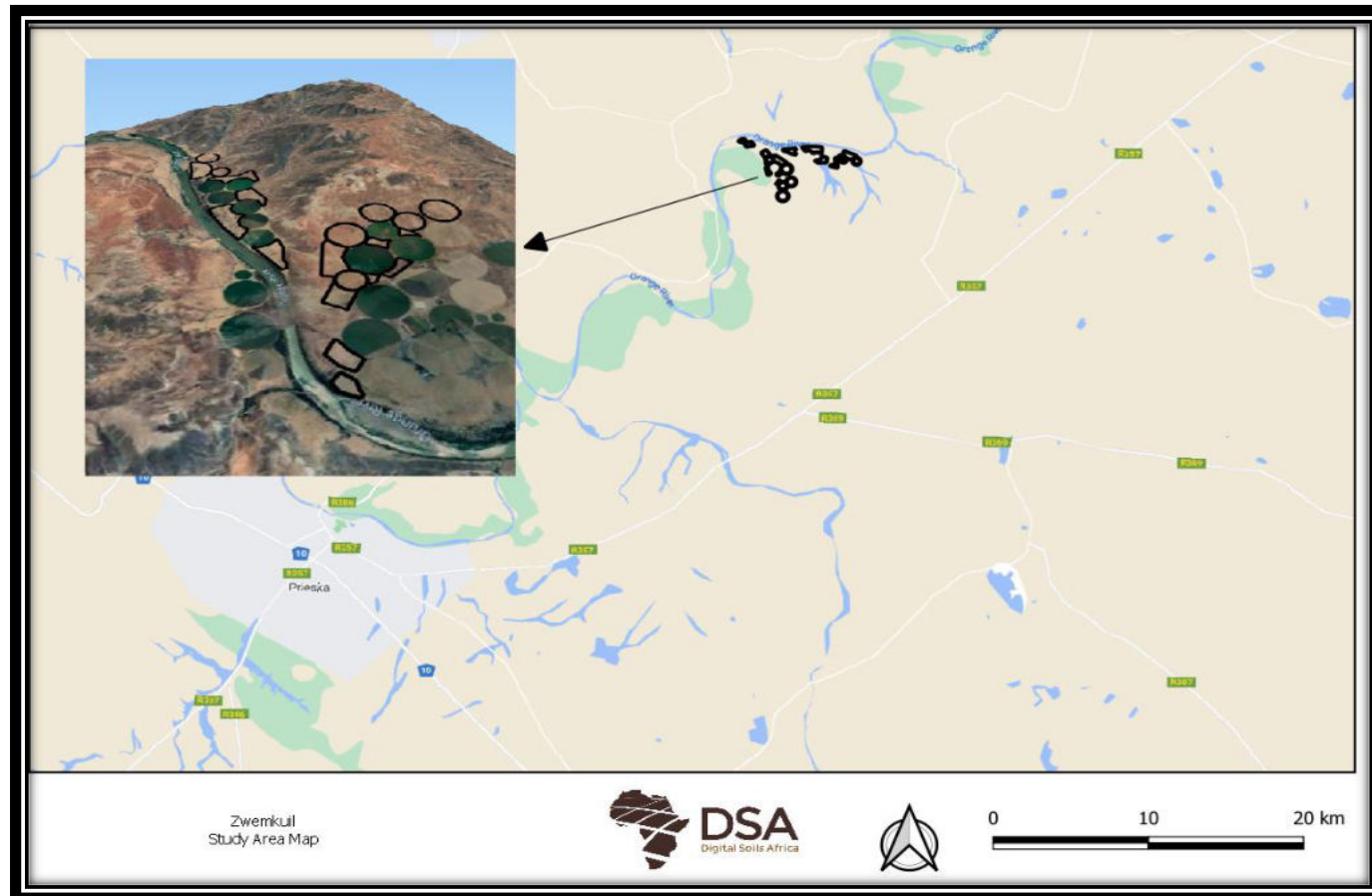


FIGURE 2: THE FARM ZWEMKUIL NEAR PRIESKA.

METHODOLOGICAL APPROACH

DESKTOP SURVEY

A field visit was conducted from the 17th to the 19th of January 2022. A total of 113 profiles were made by a TLB. Soils were classified according to Soil Classification: A Natural and Anthropogenic System for South Africa (2018) which is now the officially recognized classification system for South African soils. Soil depth, freely drainable depth, and limiting material were noted and mapped. Samples were taken at 4 profiles, one for every horizon. The profiles sampled were 36A and B, 59, 75A and B, 88A and 103A. A total of 4 topsoil horizons (0-300 mm) and 3 subsoil horizons (300-1000) were analyzed. The texture was measured with the pipette method, basic cations from a 1:10 NH₄OAc extract (White 2006), and soil pH in a 1:2.5 KCl extract. Phosphorus was measured with Bray I method.

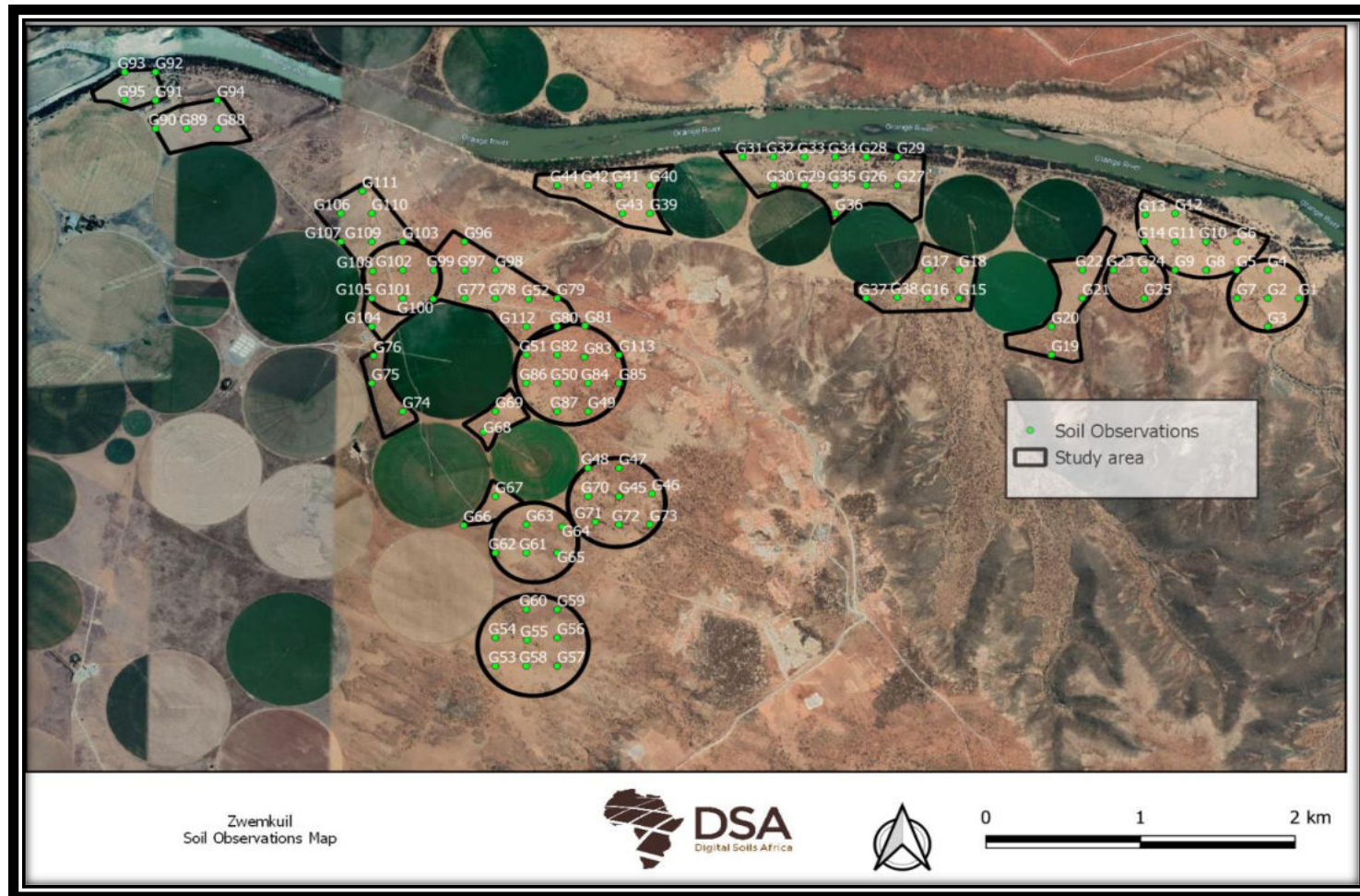


FIGURE 3: THE LOCATION OF THE OBSERVATIONS.

RESULTS

SOIL FORMS

The Augrabies (214 ha) soil form is the dominant soil form in the study area (Figure 4). The Hutton soil form was found in the southern parts of the study area and covered 37 ha. The Coega soil form (31.5 ha) was found in the north western areas and was characteristically shallow. The Addo soil form was found near the Augrabies soil forms in the eastern side of the study area and covered approximately 36 ha. The Glenrosa soil form (23.6 ha) was found throughout the study area, while the Vaalbos soil form (25 ha) was found near the Plooyburg soil form in the centre of the study area. The Prieska and Brandvlei soil form were only found in a small area of the study area and covered approximately 18 and 16 ha of the study area.

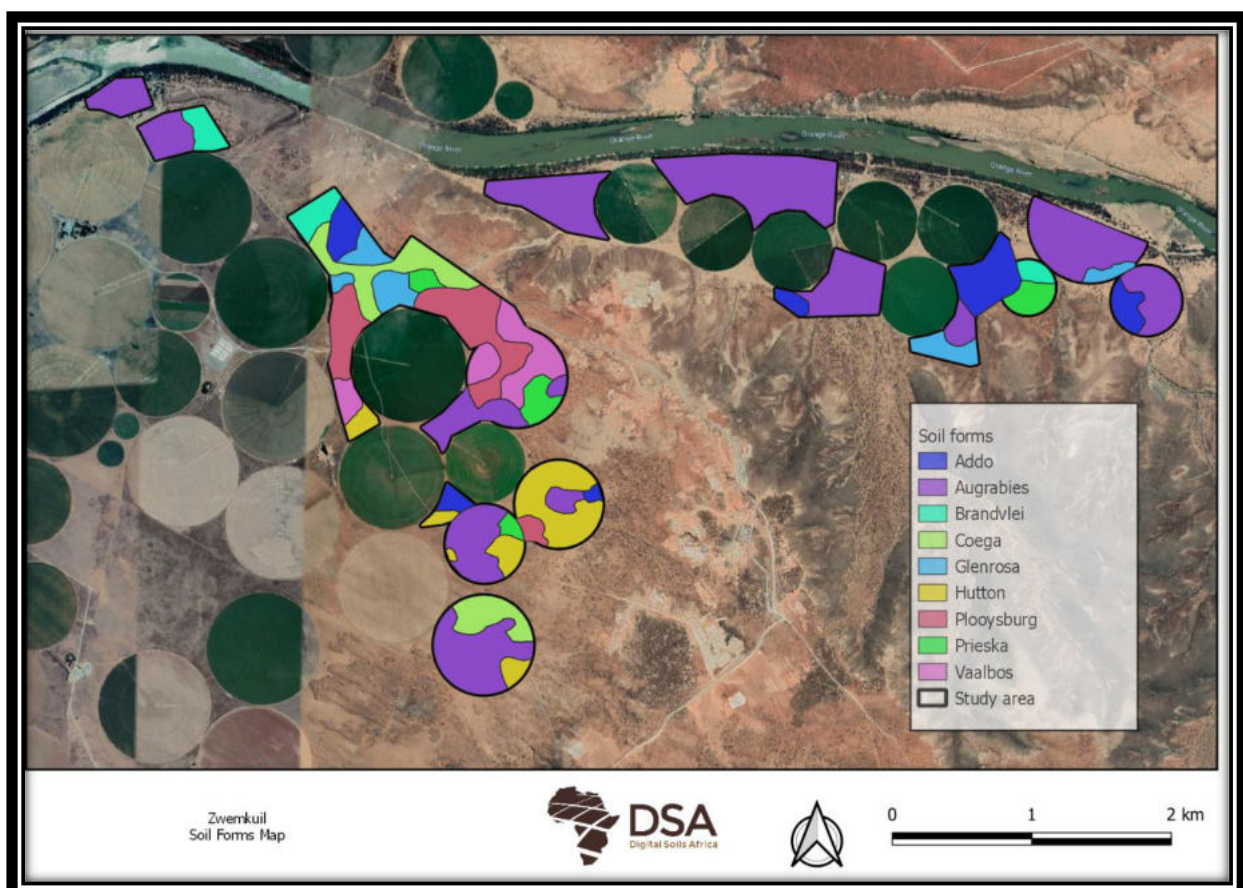


FIGURE 4: SOIL FORMS IN THE STUDY SITE.

AUGRABIES 3110

The Augrabies soil form consists of an Orthic A (200 mm for the study area) overlying a Neocarbonate horizon. The Augrabies soil form covered the majority of the study area. The thickness of the Neocarbonate ranged between 1600- 1800 mm. The 3110 soil family has a bleached topsoil horizon overlying a brown, aluvic, neocarbonate horizon. No restriction on root growth was observed (Figure 5A). The soil form was highly suitable for irrigation due to the depth, absence of restricting layers and absence of hydromorphic properties.

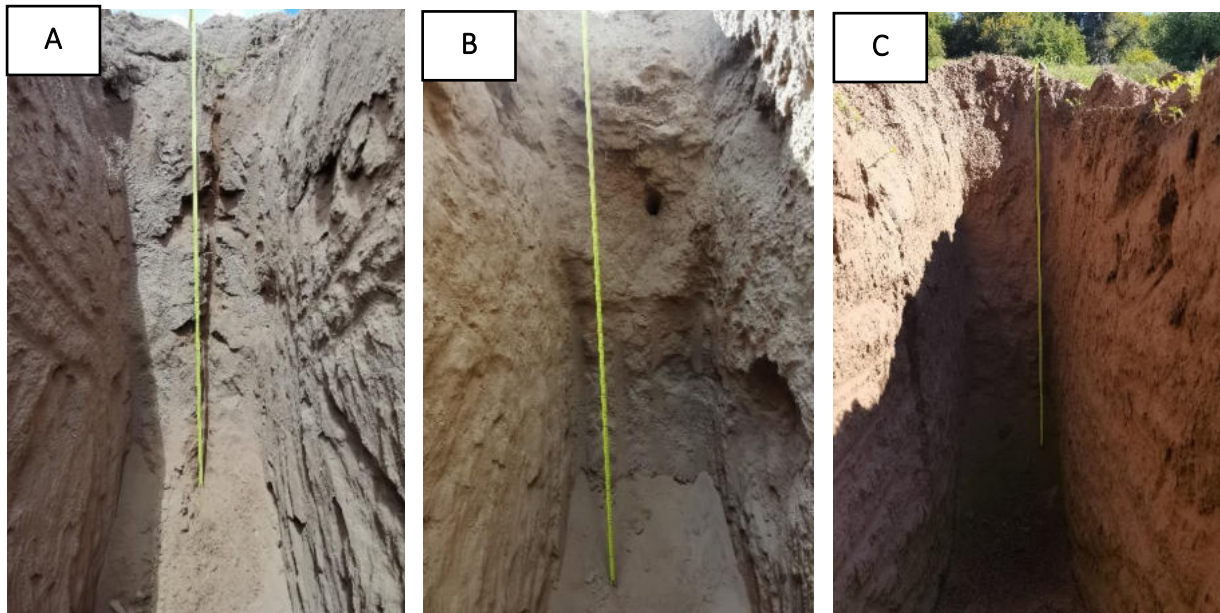


FIGURE 5: AUGRABIES SOIL FORM.

PLOOYSBURG 2100

The Plooyburg soil form consists of an Orthic A, overlaying a Red Apedal horizon on Hard Carbonate. The Orthic A thickness ranged from 200-300 mm and the Red Apedal ranged from 400-1500 mm. The 2100 family consists of a chromic topsoil horizon normally overlaying a eutrophic, aluvic, Red Apedal horizon on Hard Carbonate. The depth of the hard carbonate at certain profiles was the factor for the soils not being suitable as root depth did not meet requirements (Figure 6 A). Root penetration did not exceed through the Hard Carbonate layer and was only suitable for irrigation where depths exceeded 1000 mm as seen in Figure 6 B.

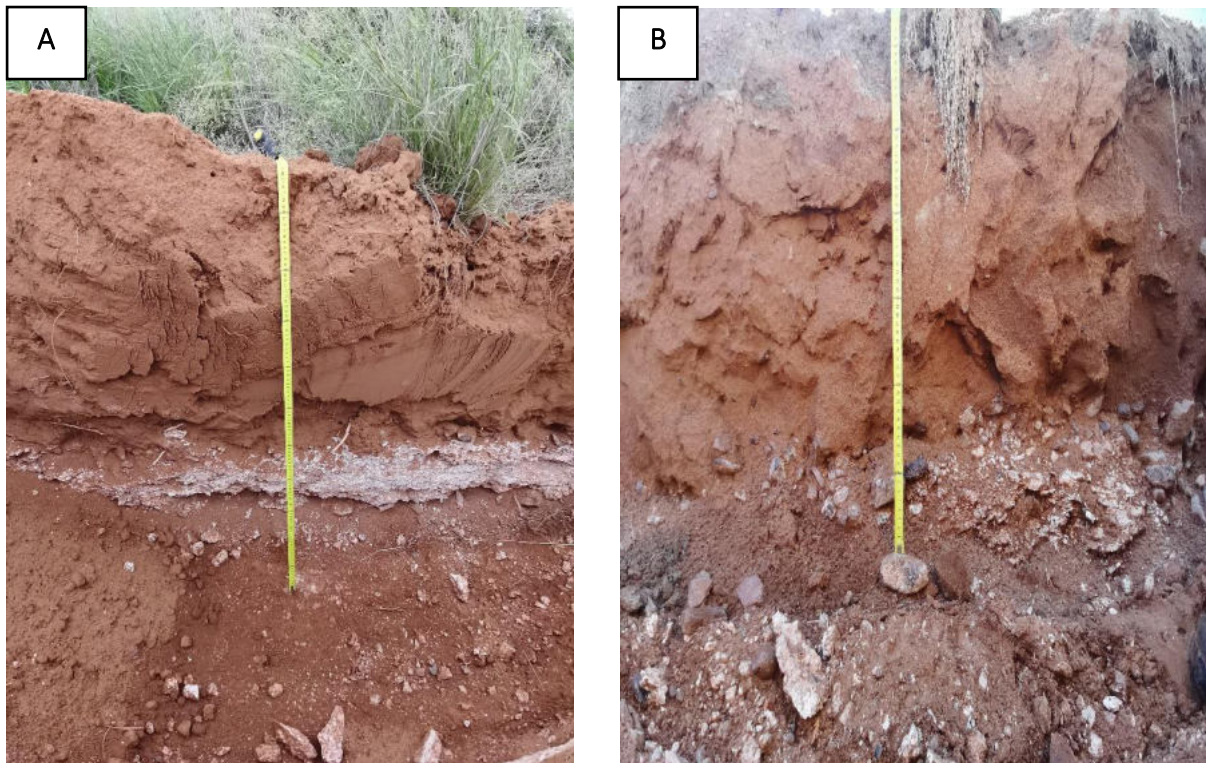


FIGURE 6: PLOOYSBURG SOIL FORM.

COEGA 2100

The Coega soil form consists of an Orthic A underlying a Hard Carbonate. The Coega soils found on site had a maximum depth of 700 mm. Sepiolite was not present within the hard carbonate. Hard carbonate is massive, vesicular, or platy and has a hard to extremely hard consistency. It was observed that certain parts of the hard carbonate of the Coega's could be broken (Figure 7 A) and that root growth in only one profile exceeded 700 mm (Figure 7 B). Only one area of the Coega soil form was suitable for a vineyard as the depth of the profile exceeded 700 mm and the restrictive layer could be broken.

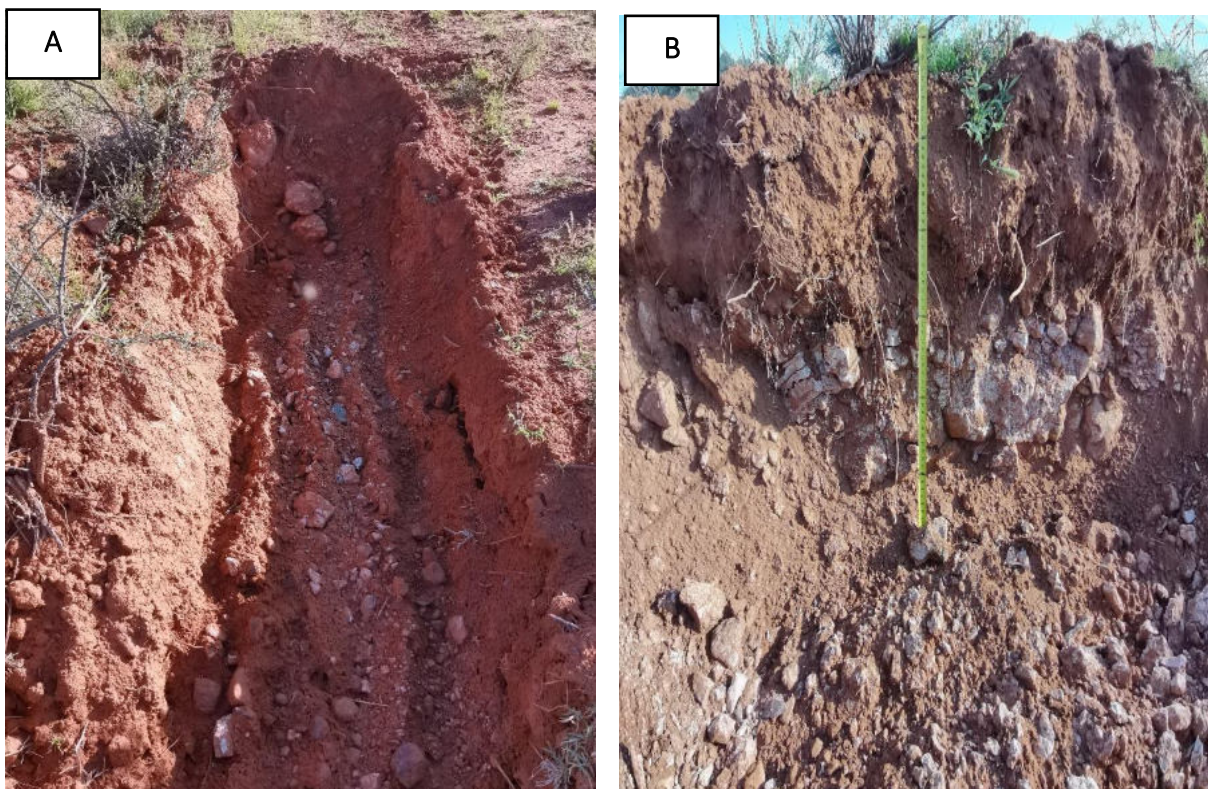


FIGURE 7: COEGA SOIL FORM

GLENROSA 2210

The Glenrosa soil consists of an Orthic A horizon on a Lithic horizon. The Lithic horizon was classified as calcareous and Saprolithic, which is a highly weathered rock material with a friable to slightly hard consistence. The Glenrosa was only found on a small part of the study area and had a maximum depth of 1600 mm. Calcareous layers were present over the Lithic horizon (Figure 8 A). Glenrosa soils are characterized by Alluvial stone deposits. If the material is soft, weathered, and/or layering is vertically positioned, it will favour root penetration to greater depths. The study area had roots at depths of 1600 mm, which indicates that root penetration within the Glenrosa soil form is possible. The Glenrosa soil form is thus suitable for irrigation where profiles exceeded 1000 mm and root penetration was visible as seen in Figure 8 B.

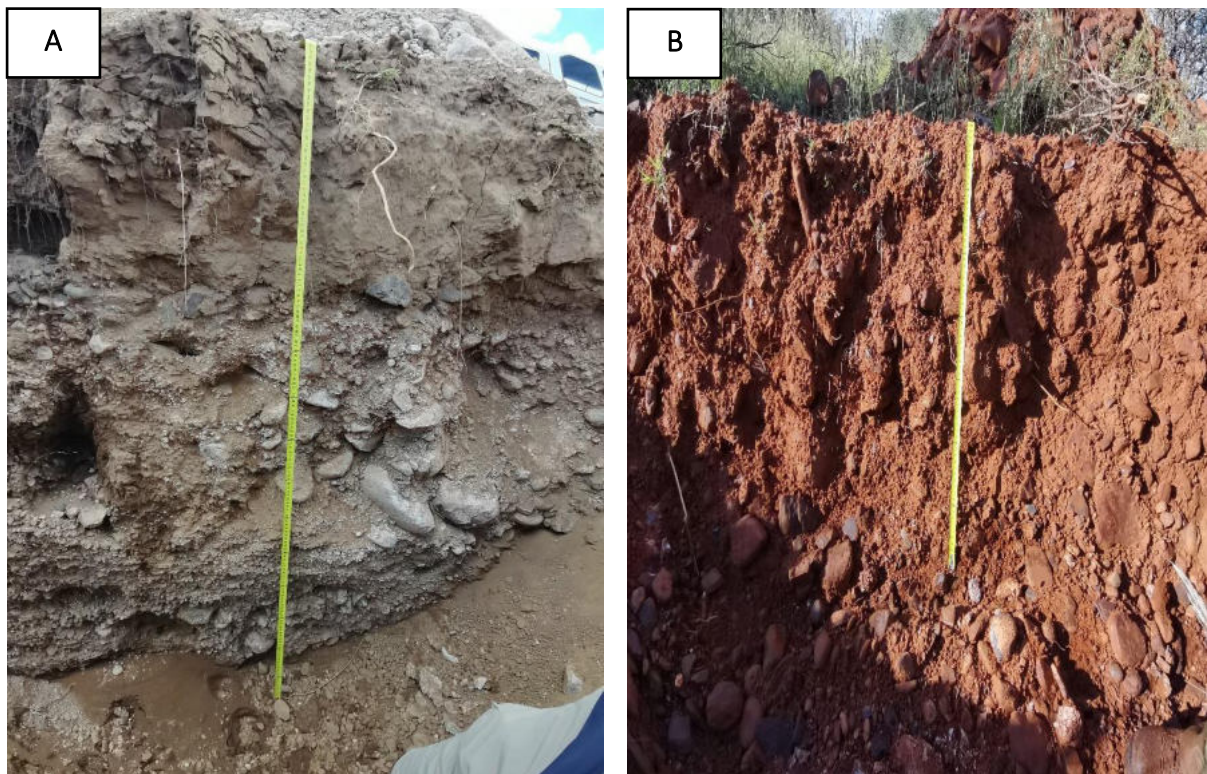


FIGURE 8: GLENROSA SOIL FORM

ADDO 3110

The Addo soil form consists of an Orthic A on top of a Neocarbonate horizon. The Neocarbonate has a Soft Carbonate horizon underlying it. The 3110 soil family has a bleached Orthic horizon and a brown, aluvic Neocarbonate horizon. Root penetration went through the soft carbonate indicating that the horizon is friable and that macropores are present to assist with drainage.. Good management should be taken as salinization could become a problem due to the Soft Carbonate horizon.

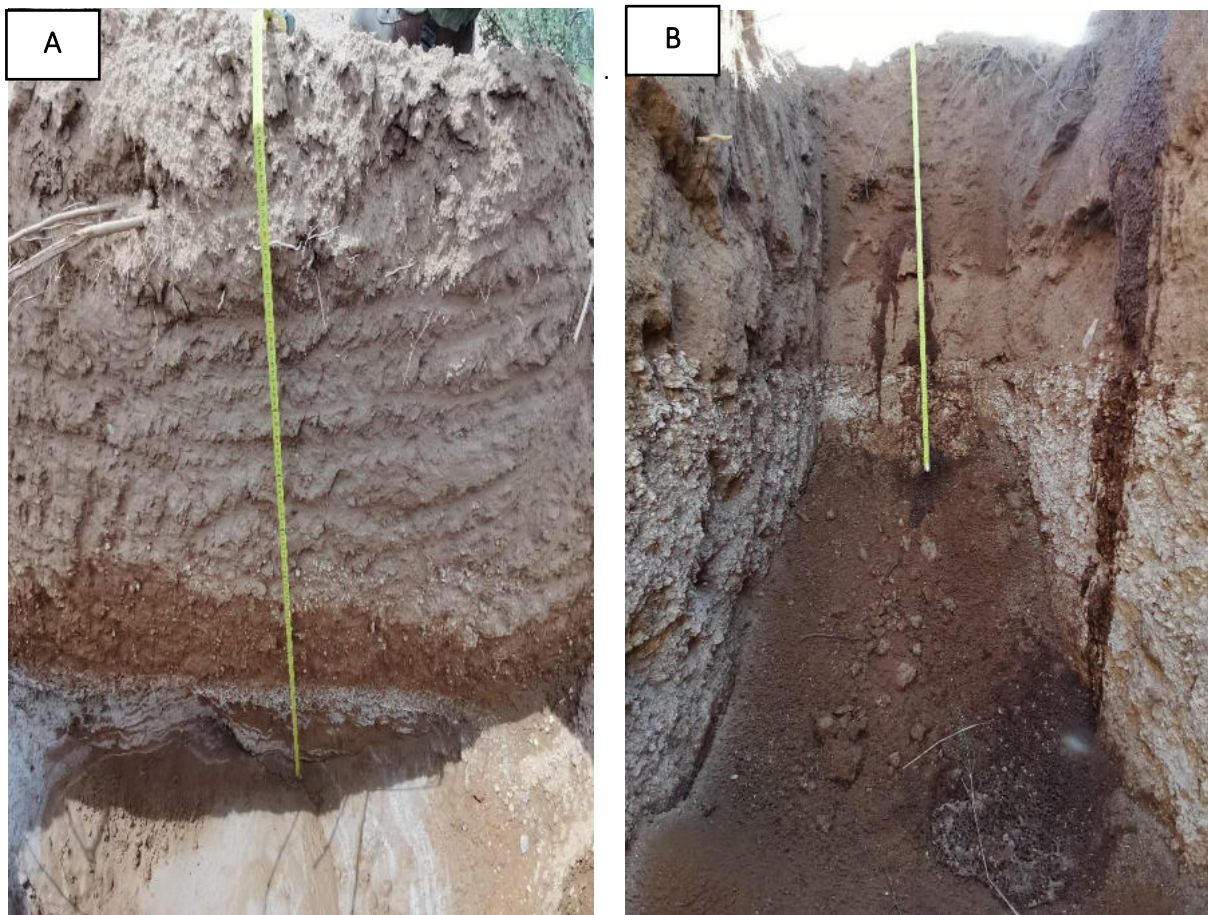


FIGURE 9: ADDO SOIL FORM.

VAALBOS 2111

The Vaalbos soil form consists of an Orthic A overlying a Red Apedal horizon with fractured rock being the restricting layer under the Red Apedal. The Vaalbos was found on various occasions in the study area and had a calcareous layer covering the fractured rock. The Vaalbos soil form was suitable if Red Apedal had depth of >1000 mm. Root growth was restricted by the fractured rock Figure 10 A.

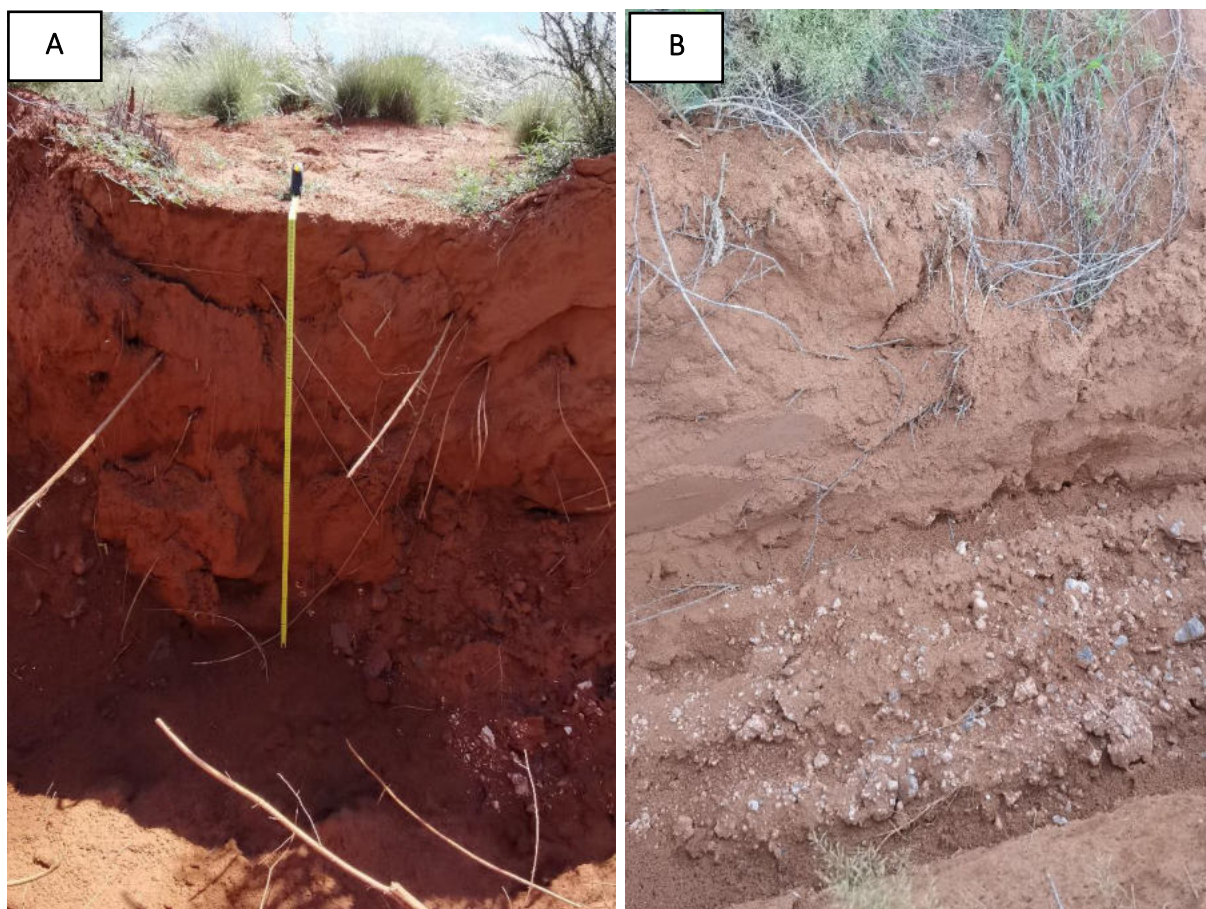


FIGURE 10: VAALBOS SOIL FORM.

HUTTON 2110

The Hutton soil form consists of an Orthic A overlying a Red Apedal horizon. The Hutton soil form was very deep with the profile depths reaching 2000 mm (Figure 11 A and B). The Hutton soil is suitable for irrigation. The red colour (5yr 5/4), together with the Apedal structure, indicated good drainage throughout the profiles. Additionally, no restrictive layers occurred, further supporting suitability for irrigation.

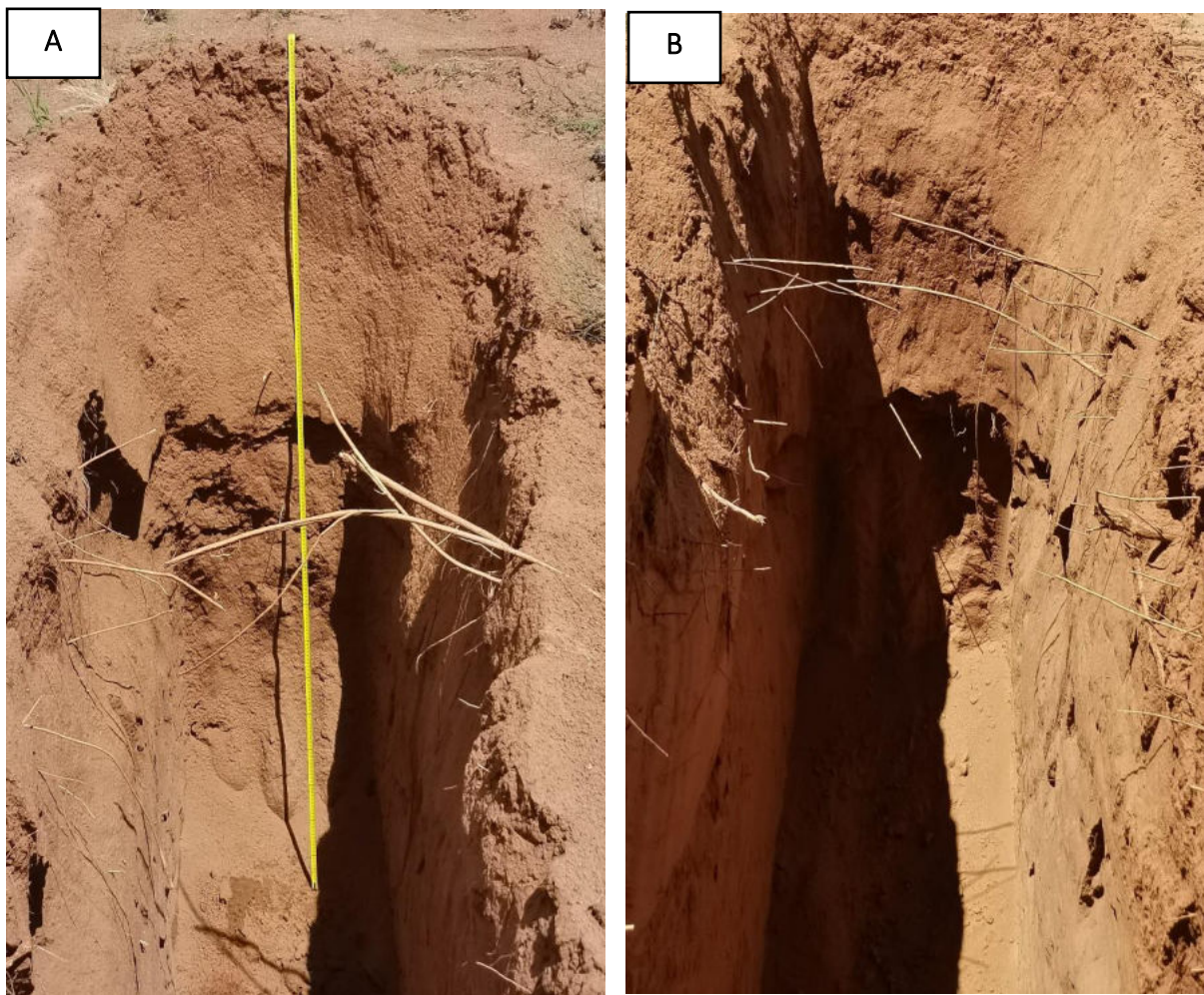


FIGURE 11: HUTTON SOIL FORM.

PRIESKA 2110

The Prieska soil form consists of an Orthic A overlying a Neocarbonate horizon on a Hard Carbonate horizon. Roots were restricted by the Hard Carbonate layer (Figure 12 A), which was the limiting layer by which suitability for irrigation was determined. The Prieska soil form had a maximum depth of 1600 mm. The Neocarbonate reached depths of 1000 mm after which the Hard Carbonate was broken to depths between 1000-1600 mm (Figure 12 B). The Prieska soil form was suitable for irrigation as the freely drainable depth was between 1000-1600 mm. This was supported by root penetration that reached 1000-1600mm.



FIGURE 11: PRIESKA SOIL FORM.

BRANDVLEI 2200 & 3200

The Brandvlei soil form consists of an Orthic A overlying a Soft Carbonate horizon. Roots weren't always restricted by the Soft Carbonate and reached depths of 1500 mm in certain profiles (Figure 13 B). The 2200 soil family has a chromic Orthic horizon (Figure 13 B), while the 3200 family has a bleached Orthic horizon (Figure 12A). The Brandvlei soil form is not suitable for irrigation due to the high risk of salinization through irrigation water on an already high salt content soil. The soil could well be cultivated with vineyard as the Soft Carbonate horizon can be broken. The risk of salinization within vineyards is lowered by drip irrigation. For vineyards to be profitable under drip irrigation, salinity should be controlled by means of adequate leaching called localized leaching. Localized leaching will decrease the risk of salinization (Hanson, 2011).



FIGURE 13: BRANDVLEI SOIL FORM.

SOIL DEPTHS

Two soil depth maps were created, namely, the total soil depth (Figure 14) and the freely drainable depth (Figure 15). The total soil depth of the area is determined by the depth of each observation up to the restrictive layer, while the freely drainable depth is determined as the depth considered to drain without restriction. The total and freely drainable soils depths of the study area are moderate to deep with most of the soils ranging from 1.51-2.00 m in depth. A small portion of the area had depths shallower than 500 mm. The Coega and parts of the Glenrosa soils were associated with the 0-0.50 m soil depths. The restricting layers encountered were Hard Carbonate, Fractured rock, Soft Carbonate, and Lithic horizons. The Fractured rock was found within the Vaalbos soil form, while the Lithic occurred in the Glenrosa soil forms. Soft Carbonate was found in the Addo and Brandvlei soil forms, while Hard Carbonate was found in the Coega and Plooyburg soil forms. The Lithic horizon had a restricting layer at 300-1600 mm depths for the Glenrosa. Fractured rock was found at between 500 and 1000 mm. Soil depths not exceeding 700 mm were deemed not suitable for irrigation or vineyard cultivation.

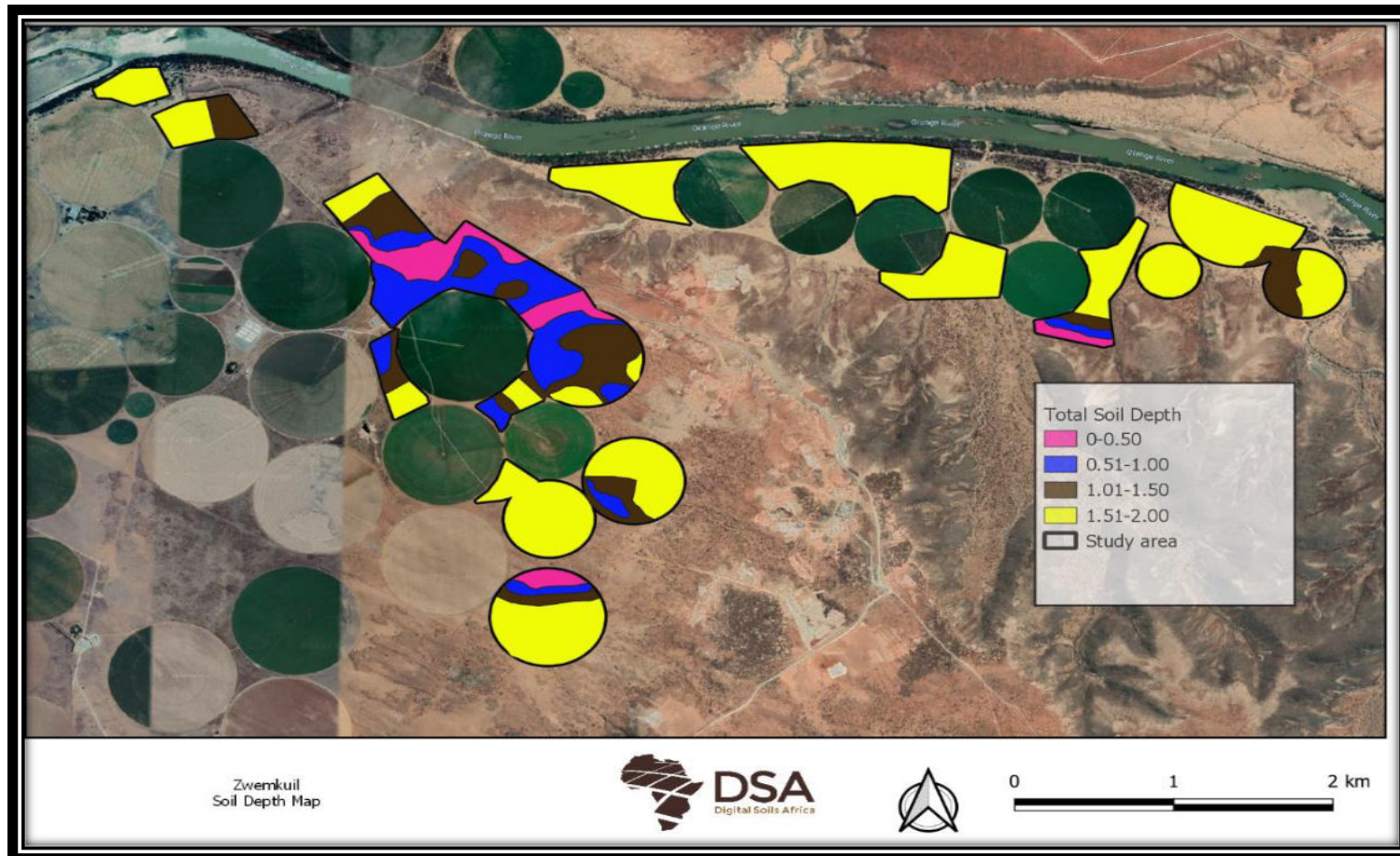


FIGURE 14: TOTAL SOIL DEPTHS.

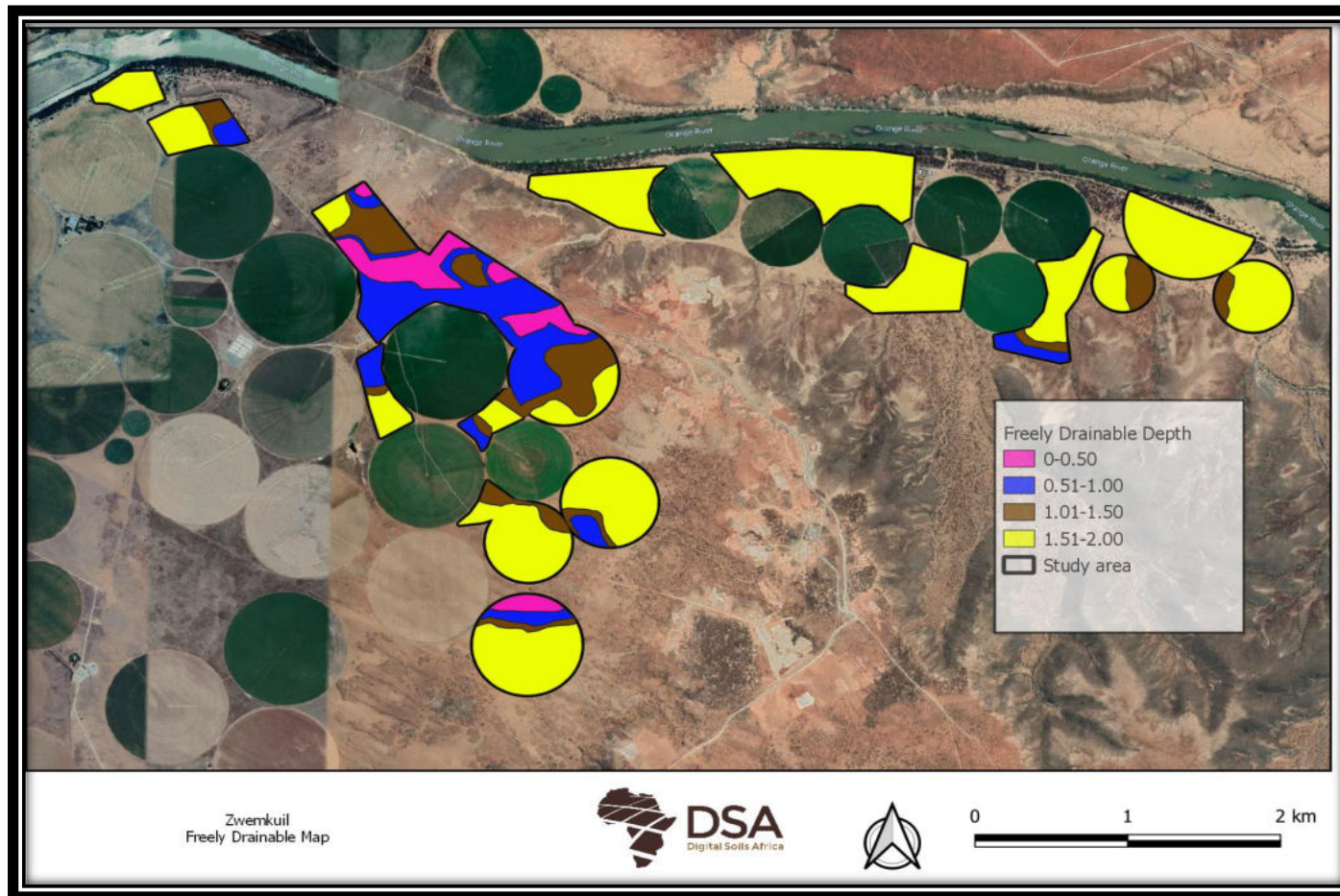


FIGURE 15: FREELY DRAINED DEPTH FOR STUDY AREA.

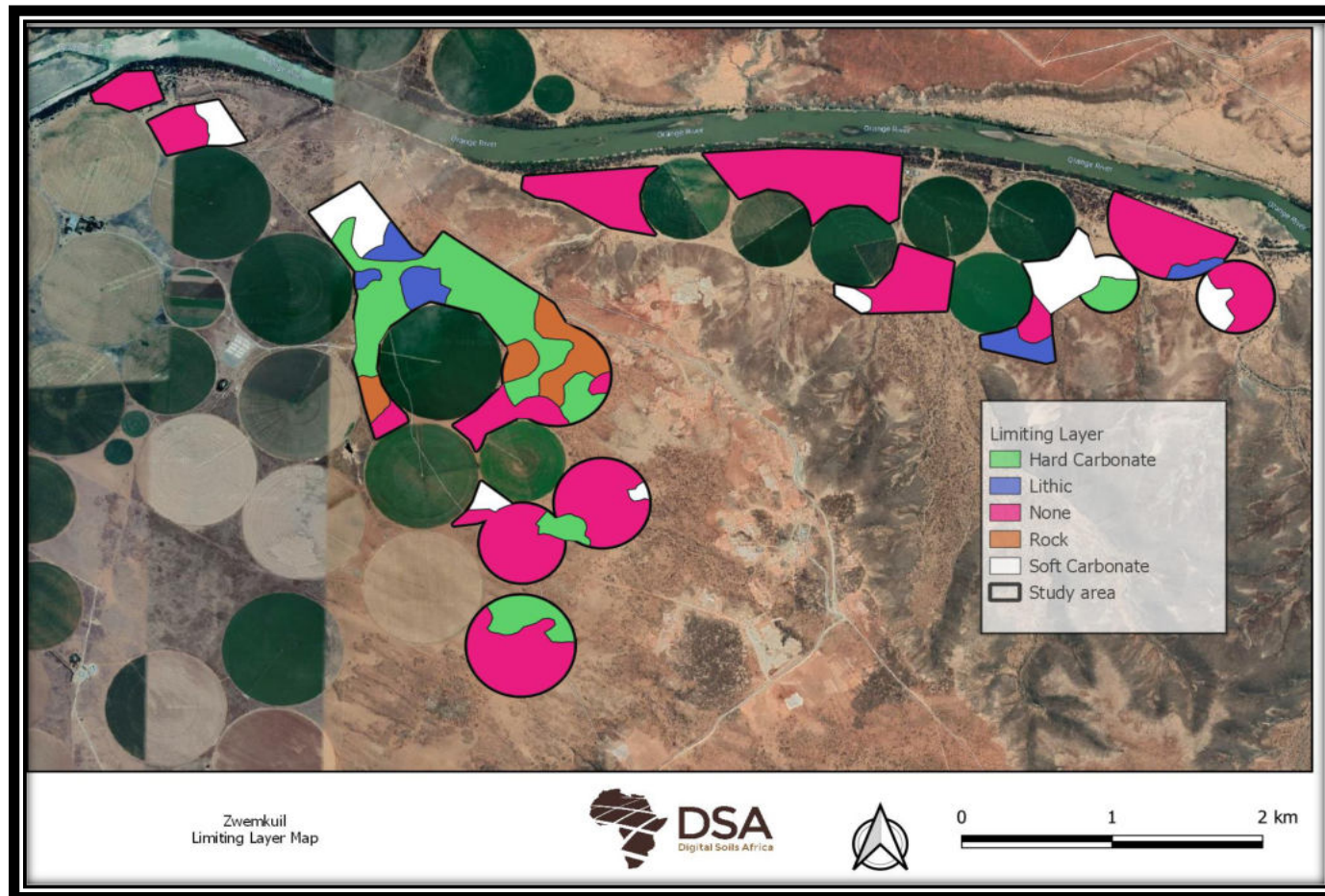


FIGURE 16: LIMITING LAYERS.

SLOPE

The topography of the area was flat with the majority of the area having a slope less than 0.8°. The area is situated in a valley and is surrounded by hills with slopes between 0.8 and 2.6°. Drainage would occur in a northern, direction leading to the orange river as it flows from the hills.



FIGURE 17: SLOPE OF THE STUDY AREA.

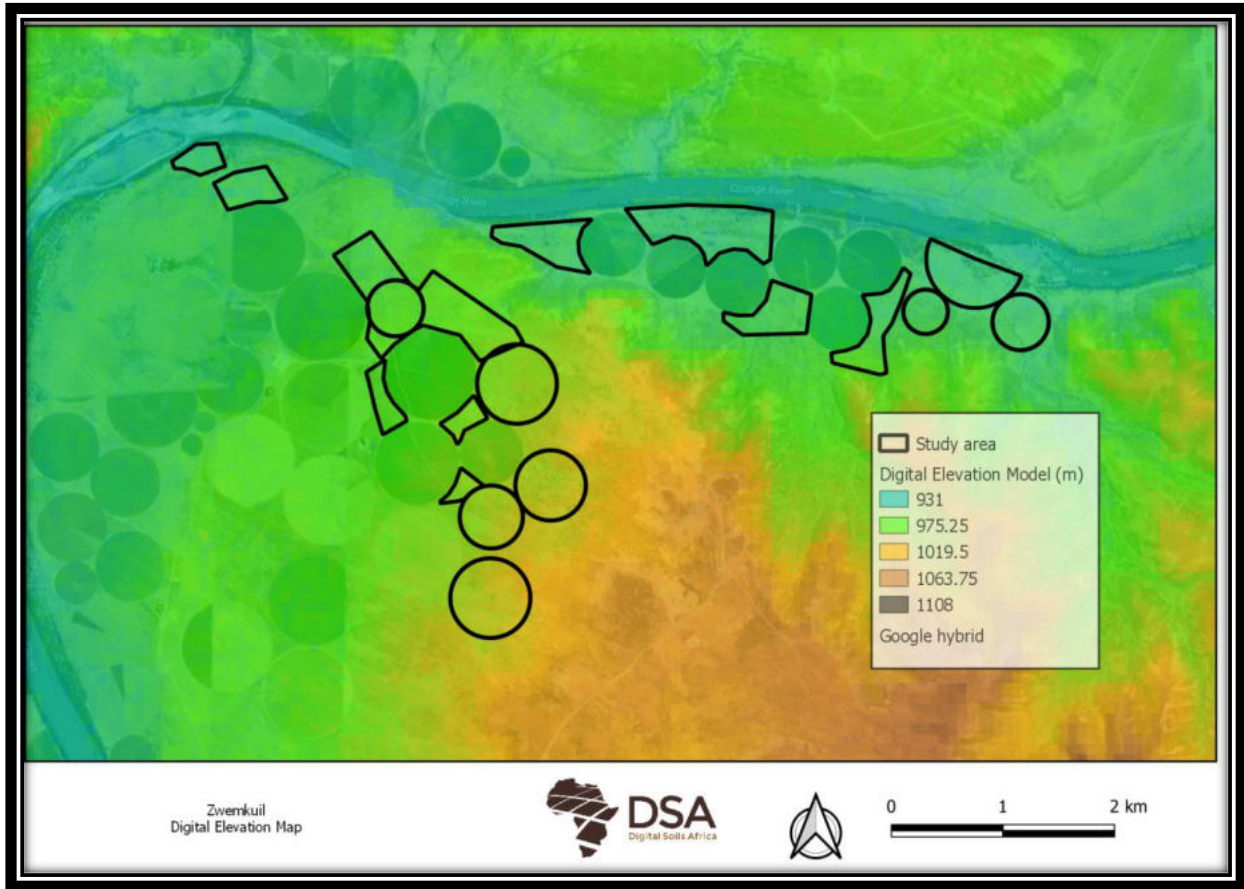


FIGURE 18: DIGITAL ELEVATION MAP.

CHEMICAL AND TEXTURAL ANALYSIS

The chemical properties (Table 2) of the soils vary over the study area. The A and B horizons are chemically different with pH ranging from 5.7 to 7.4. The Orthic horizon of profile 36 is slightly acidic while the Red Apedal and Orthic horizons of profiles 75 and 88 were alkaline, all the other profiles had a relatively neutral pH.

TABLE 2: SELECTED CHEMICAL PROPERTIES FOR MODAL SOIL PROFILES

Observation	Soil Form	Diagnostic Horizon	pH	CEC	ESP	ECe
			KCl	cmol(+)/kg	%	mS/m
G36A	Augrabies	Orthic	5,78	16,3	<1%	32,9
G36B		Neocarbonate	6,88	25,0	<1%	32,6
G59	Coega	Orthic	6,71	10,6	<1%	39,3
G75A	Vaalbos	Orthic	6,89	9,9	<1%	47,7
G75B		Red Apedal	7,43	16,5	<1%	36,4
G88A	Brandvlei	Orthic	7,38	30,0	<1%	40,1
G103A	Glenrosa	Orthic	6,58	7,2	<1%	50,6

The Cation Exchange Capacity (CEC) for the A-horizons of profile 59, 75 and 103 were low (7.2, 9.9, and 10.6 cmol(+)/kg). The other horizons had a moderate CEC and profiles 88 and 36B have a high CEC. The high CEC could be attributed to the high pH levels, which could stimulate high levels of pH-dependent charges on the soil colloids of profiles 88 and 36B and be correlated to increase in clay. Fertility for soils with a lower CEC should be managed with an adequate fertilization plan to ensure optimal production. The exchangeable sodium percentage (ESP) was low in all horizons and indicate non-sodic soils (Table 3). The irrigation threshold of EC for water is 400 mS/m and the soils observed are all below the threshold.

TABLE 3: GENERAL CLASSIFICATION OF SALINE AND SODIC SOILS (CHHABRA, 1996)

Classification	pH _w	EC (mS m ⁻¹)	SAR	ESP (%)
Slightly saline	< 8.5	200 – 400	< 13	< 15
Saline	< 8.5	> 400	< 13	< 15
Sodic	> 8.5	< 400	> 13	> 15
Saline-Sodic	< 8.5	> 400	> 13	> 15

Clay percentages range from very sandy to moderate. Most soils will have good drainage, but soil water holding capacity and fertility in some areas are low and would require good management. Since the soils are generally sandy, the soil depth would be the biggest contributing factor to drainage.

TABLE 4: PARTICLE SIZE DISTRIBUTION OF MODAL SOIL PROFILES

Observation	Soil Form	Diagnostic Horizon	% Clay	% Silt	% Sand
G36A	Augrabies	Orthic	20,7	11,6	68,6
G36B		Neocarbonate	25,5	11,3	64,0
G59	Coega	Orthic	11,6	4,7	84,5
G75A	Vaalbos	Orthic	9,5	4,8	86,3
G75B		Red Apedal	9,2	4,4	87,0
G88A	Brandvlei	Orthic	14,8	7,0	78,6
G103A	Glenrosa	Orthic	8,8	4,6	87,0

The laboratory results indicate that the chemical parameters are manageable, it is expected that irrigation with high-quality irrigation water will leach some of the base-forming cations out of the soil profiles and thereby lower the pH. Salinity is of low risk within all areas except the Brandvlei soil area where salinity could be of risk. The ESP and EC for the rest of the areas are low and the soils have good drainage. The texture results show that in general, the soils do have sufficient drainage.

SUITABILITY

The suitability of the area (Figure 18) was defined into 3 categories namely, Suitable, Suitable for vineyard, and Unsuitable. Soils not suitable for irrigation, but which had freely drainable depths of at least 700 mm, i.e., soils with a depth of 700 – 1000 mm, would be suitable for vineyard production, with the provision that the soils are broken, and deep ripping is done.

Approximately 330 ha of the 448 ha survey area is suitable for irrigation. Soils with a freely drainable depth of 1000 mm, which included the Hutton, Augrabies, Prieska, Addo, and sections of the Plooyburg, Prieska, Glenrosa and Vaalbos soil forms were suitable for irrigation. The soil forms not suitable for irrigation (Sections of the Plooyburg, Vaalbos, Brandvlei, Prieska, and Glenrosa) were suitable for vineyards under drip irrigation as the soil could be mechanically altered to accommodate vineyards. The area for vineyard production was approximately 76 ha. The areas not suitable for irrigation or vineyard production were the Coega and parts of the Glenrosa, Vaalbos, Plooyburg, and Brandvlei soil forms. Soil which had a freely drainable depth of <700 was unsuitable for irrigation and vineyard production. The area suitability for vineyards perimeter points is given in Table 5 and the areas suitable for irrigation in Table 6.

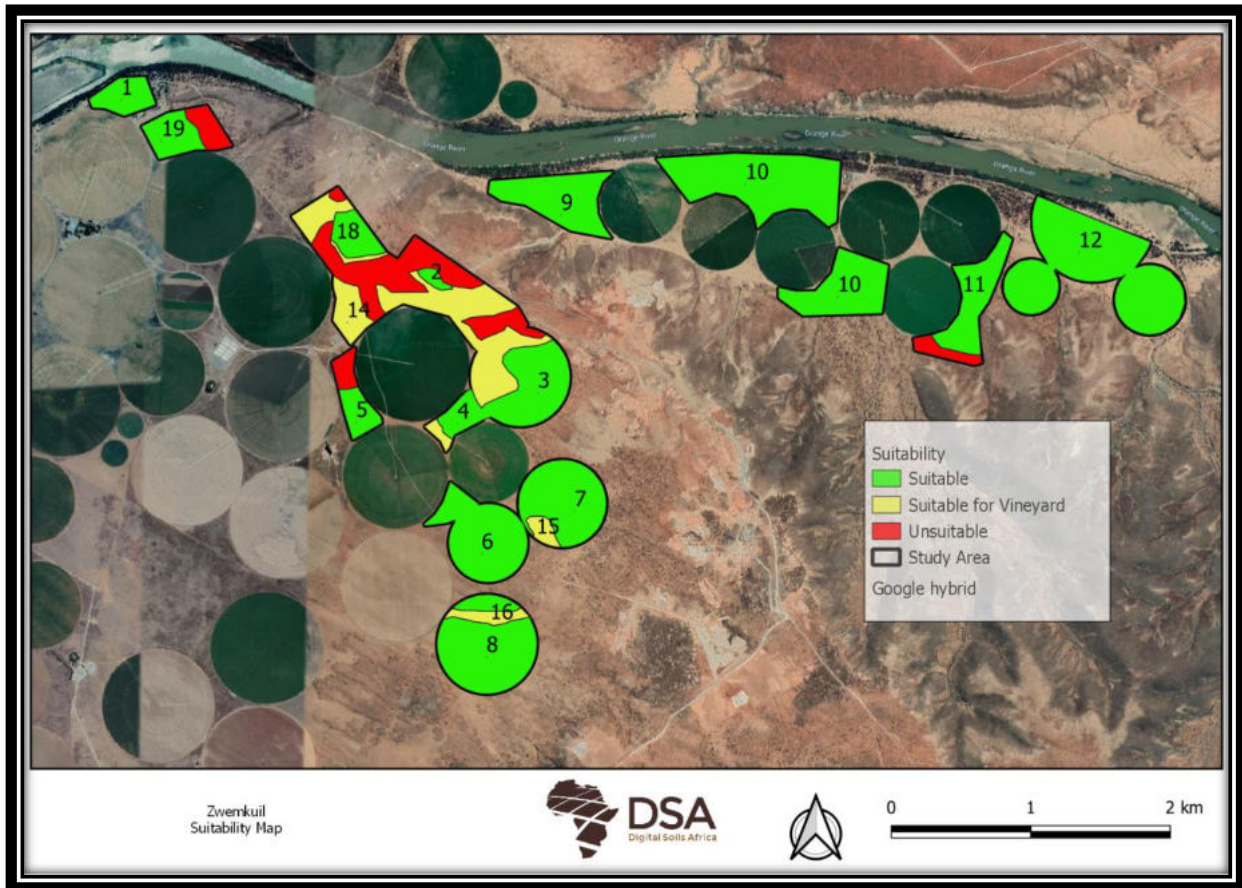


FIGURE 19: IRRIGATION SUITABILITY OF THE AREA.

TABLE 5: THE COORDINATES OF THE CORNERS OF THE PERIMETER OF SUITABLE AREA FOR VINEYARD

Area	X	Y
19	23.0814171323	-29.4327079138
	23.0846089816	-29.4346073306
	23.0801975147	-29.4337232751
14	23.0474073469	-29.4358871201
	23.0457509419	-29.4320228319
	23.0457509419	-29.4320228319
	23.0396485144	-29.4328858518
	23.0373959332	-29.4310085190
	23.0421910347	-29.4307156799
	23.0488908959	-29.4304035627
15	23.0533956683	-29.4450650644
	23.0529871926	-29.4466028649
16	23.0487200414	-29.4510941691

	23.0459485810	-29.4513747572
	23.0515969427	-29.4509468316
	23.0295517510	-29.4212637935

TABLE 6: THE COORDINATES OF THE CORNERS OF THE PERIMETER OF SUITABLE AREA FOR IRRIGATION

Area	X	Y
1	23.0188511977	-29.4183826390
	23.0230037978	-29.4168703526
	23.0214882181	-29.4194505797
2	23.0240942779	-29.4222203770
3	23.0498098755	-29.4345374926
	23.0544274756	-29.4372458576
4	23.0484369229	-29.4387004908
	23.0450707177	-29.4386016565
5	23.0387811559	-29.4401672646
	23.0386144924	-29.4368210256
6	23.0460454069	-29.4427331733
	23.0508137928	-29.4447191320
	23.0476993348	-29.4489731871
7	23.0552103477	-29.4412887356
	23.0568603568	-29.4458567294
8	23.0452926060	-29.4535038089
	23.0510986474	-29.4558647614
	23.0526233991	-29.4526664926
9	23.0484826604	-29.4240027324
	23.0577661692	-29.4224634928
	23.0577216078	-29.4268401245
10	23.0608106672	-29.4215801431
	23.0744633461	-29.4215489671
	23.0736704247	-29.4258206031
	23.0667786976	-29.4239528948
11	23.0744466500	-29.4271512012
	23.0777505729	-29.4313668860
	23.0700728856	-29.4305002324
12	23.0865895451	-29.4259346570
	23.0828410243	-29.4282114248
	23.0848468030	-29.4314730896
	23.0899074563	-29.4279915598

	23.0932554200	-29.4251163984
	23.0977385349	-29.4279053151
	23.0962092661	-29.4321254742
18	23.0339359633	-29.4257430283
	23.0386517529	-29.4252301990
	23.0373140342	-29.4274808713
	23.0406359629	-29.4278063195

CROP RECOMMENDATION

1. General soil requirements for Vineyard Production

Vineyards are best suitable for soil that has a pH between 5.5 and 6.5 and has a required phosphorus between 40 to 50 ppm. Additionally, for vineyards to be successful a depth of between 600 mm and 800 mm is required. By breaking up the soil, deep ripping can allow roots to penetrate the soil and access water and nutrients. Soil texture is one of the most important components regarding vineyards, a sandy soil will require intensive irrigation in order to achieve production goals, while a clay soil struggles with cultivation and cracks that disrupts water and nutrient movement. (B. Oberholzer– Personal communication, 2013).

2. Specific Zwemkuil situation

a. Soil depth

Vineyard production requires less soil depth than traditional agricultural produce. The area shown as suitable for vineyard has sufficient depth for vineyard roots to develop and is suitable for production. On the unsuitable area, vineyard roots will be restricted, and the available water and nutrients will be limited.

b. Soil texture

The soil texture is generally very sandy, with clay percentages generally under 20%. Dryland vineyard will not be suitable for these soil types as no water would be retained, while drip irrigation would be better suited for the soil type.

c. pH

The $pH_{(KCl)}$ of the soil samples is between 5.7 and 7.4. The more alkaline soils (Red apedal horizon of profiles 75 and Orthic of 88) require a reduction in pH, while the rest of the area has a suitable pH for vineyards. It is recommended that acidifying fertilizers be used on the soils to lower the pH. Liming is not required. Regular soil sampling will inform the farmer of best management practices concerning alkalinity/acidity.

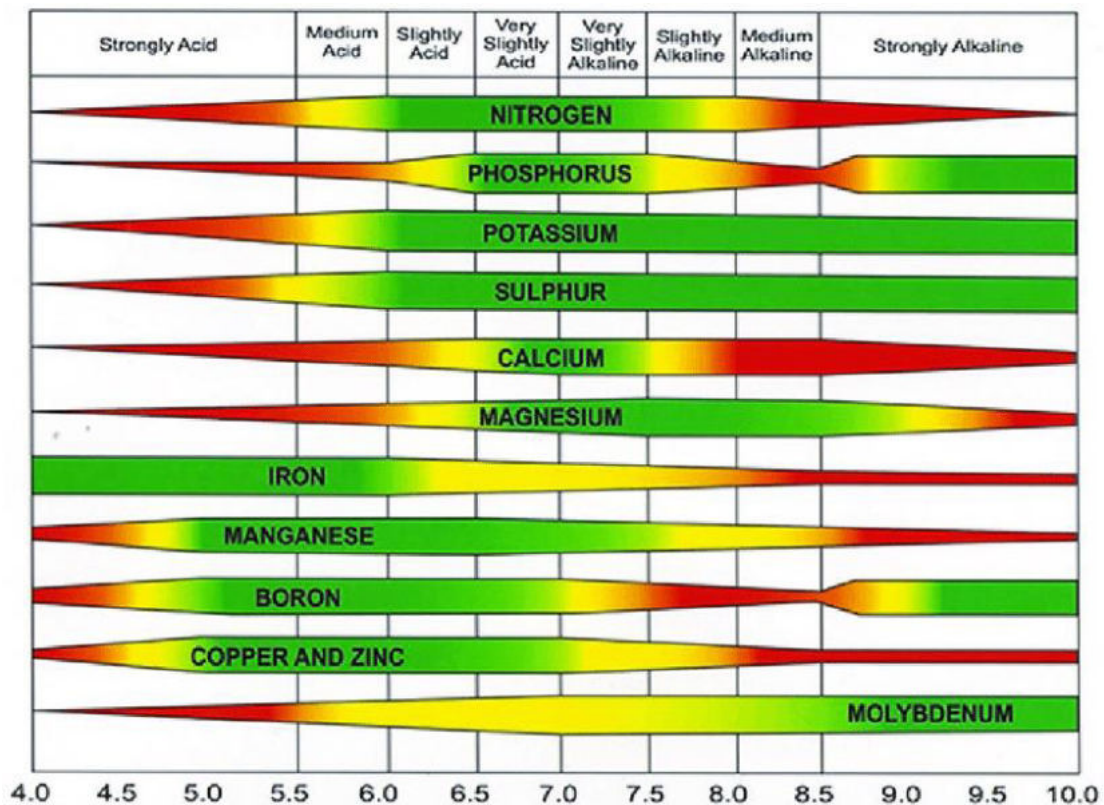


FIGURE 20: AVAILABILITY OF PLANT NUTRIENTS AT DIFFERENT PH RANGES.

d. Phosphorous

Calcuim carbonate (Found in Coega and Brandvlei and soils with Neocarbonate horizons) exerts a major influence on P fixation. The phosphorous within the soil (6-8 mg/kg) is below the required rate of 40 mg/kg. and it is recommended phosphate be applied to prevent plant deficiencies. Phosphate availability is largely dependent on the pH. Soil pH values below 5.5 and between 7.5 and 8.5 limit phosphate availability to plants due to phosphorous being highly fixated at very low pH soils (pH 3-4) and moderately fixated at pH 7.5-9 (USDA, 2001). Therefore, the more alkaline soils of Zwemkuil could experience P deficiency.

3. Conclusion

The soils indicated as suitable for vineyards in Figure 19 are generally suitable for vineyard production. The pH is not within the optimal range and acidic fertilization should be applied; it

is also expected that soil pH will decrease with continued cultivation. The texture is suitable for vineyards under drip irrigation. It is recommended that phosphate be applied to prevent plant deficiencies.

4. General soil requirements for Pecan nut Production

Pecan nut trees perform best in fertile, well- drained, deep soil which consists of a medium texture. The soil depth should at least be 2 m deep. The soil should not be calcareous as calcareous soil causes deficiencies in micro-nutrients, especially zinc. The pH recommendation for pecan-nut trees is 6.5 to 7. Suitability for pecan-nut trees were defined as suitable (depths of 1000 mm and non-calcareous) and moderately suitable (depths of 1000 mm and calcareous).

5. Specific Zwemkuil situation

a. Soil depth

Soils with a freely drained depth >1000 mm were considered to have sufficient depth for pecans, which is a large portion of Zwemkuil farm

b. Soil texture

The soil texture is generally very sandy, with clay percentages under 20%. Pecan-nut trees prefer soil that are freely drained and has sandy loam texture. All the soils meet the textures requirements.

c. pH

The $pH_{(KCl)}$ of the soil samples is between 5.7 and 7.4. More acidifying fertilizers should be applied in the alkaline soils (Red apedal of profile 75 and Orthic of profile 88). A slightly acidic pH was found for the rest of the area. Liming is not required on the alkaline soils as it is anticipated that the pH will lower with continued cultivation and irrigation. Soils that are more alkaline could lead to micro-nutrient deficiencies. Regular soil sampling will inform the farmer of best management practices concerning alkalinity/acidity.

d. Phosphorous

Calcium carbonate exerts a major influence on P fixation as discussed with vineyard. The phosphorous within the soil (6-8 mg/kg) is low. The recommendations for pecan-nut trees are provided in Table 7.

Table 7: Phosphorous recommendation for Pecan-nut trees

Plant nutrient	Year fertilizer application for trees during years			
	1	2	3	4
Phosphorous (g per tree)	34	68	102	136

e. Zinc

Zinc requirements within areas where pH is higher than 7 (Red apedal of profile 75 and Orthic of Profile 88) are especially at risk for zinc deficiencies. The pH can be decreased and thereby increasing zinc uptake in the roots or apply the zinc for foliage uptake. It is recommended to pursue lowering the pH, since the good drainage of the soils allows leaching which, with chemical amendments, can lower pH effectively.

6. Conclusion

The soils indicated as suitable for pecan-nut trees in Figure 21 are both physically (depth and texture) and chemically suitable for Pecan-nut trees production. The pH is not within the optimal range and acidic fertilization as well as Zn should be applied; it is also expected that soil pH will decrease with continued cultivation.

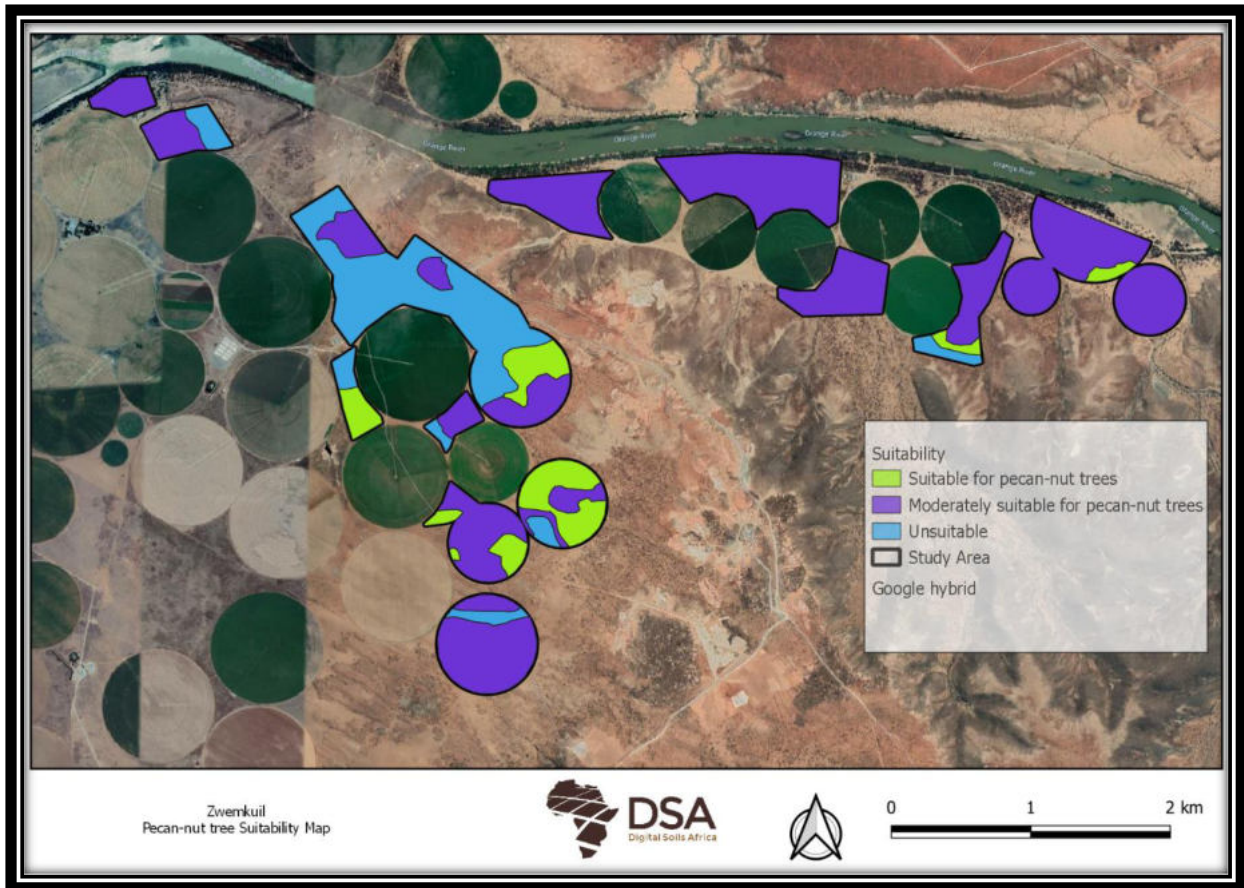


FIGURE 21: SUITABILITY FOR PECAN-NUT TREES.

RECOMMENDATION

It is recommended that the pivot placement does not exceed more than 10% of unsuitable soil. Areas with a freely drainable depth >1000 mm is suitable for irrigation with no restrictions, while soils with a depth of 700 - 1000 mm could be used for vineyard production under drip irrigation. Areas with a depth of less than 700 mm are considered not suitable for irrigation or vineyard.

CONCLUSIONS

The A and B horizons are characteristically sandy and therefore will facilitate good drainage. The drainage restricting layers were the major determining factor for suitability. Approximately 5% of the area has a shallow depth and is not suitable for irrigation or vineyard, while essentially 15% is suitable for vineyard production under drip irrigation. The rest of the area is suitable for all irrigation.

The soil texture results confirm the morphological interpretations and good drainage is expected on the soils where restricting layers are not present.

The laboratory results indicate that the chemical parameters are manageable. The exchangeable sodium percentage (ESP) values are low and the pH values indicate that salinity is not a major risk. The study area (excluding the Brandvlei soil areas) is of low risk to salinization, with low ESP and EC together with good drainage. A fertilization plan on soils with low CEC should be implemented to ensure maximum crop production.

REFERENCE

Briers-Louw, J., 2016 Dryland viticulture: an overview of the South African situation. Dissertation. Thesis. Cape Wine Academy.

Brown, B., 2013. *Soil sampling vineyards and guidelines for interpreting the soil test results*. [Online]

Available at: [https://www.canr.msu.edu/news/soil sampling vineyards and guidelines for interpreting the soil test resul](https://www.canr.msu.edu/news/soil_sampling_vineyards_and_guidelines_for_interpreting_the_soil_test_result)

[Accessed 26 February 2021].

Gupta, R. K., Abrol, I. & Finkl, C. W., 2008. Soil salinity and salinization. In: W. Chesworth, ed. *Encyclopedia of Soil Science*. Chesworth, Ward ed. Dordrecht: Springer, pp. 611-613.

Hanson, B. M. D., 2011. Drip irrigation Salinity Managemenent for Row Crops, California: ANR.

Industries, N. D. o. P., 2022. *Cation Exchange Capacity*. [Online] Available at: <https://www.dpi.nsw.gov.au/agriculture/soils/guides/soil-nutrients-and-fertilisers/cec>

[Accessed 12 February 2022].

Overheu, T. L. J. H. D., 2021. *Identifying dispersive (sodic) soils*. [Online] Available at: <https://www.agric.wa.gov.au/dispersive-and-sodic-soils/identifying-dispersive-sodic-soils>

[Accessed 15 December 2021].

Rajakaruna, N. B. R., 2008. Edaphic Factor. In: B. D. F. Sven Erik Jørgensen, ed. *Encyclopedia of Ecology*. USA: Academic Press, pp. 1201-1207.

Soil Classification Working Group, 2018. Soil classification – a Taxonomical System for South Africa.

USDA, 2001. *Soil Phosphorous*, United States: USDA.

White R E, 2006. Principles and Practice of Soil Science: The Soil as a Natural Resource. 4th ed. Blackwell Science, Oxford, UK.

DISCLAIMER

Digital Soils Africa cannot be held responsible for any advice given based on incorrect laboratory analysis given by our providers. Although all care is taken to ensure that the results reported are correct, we are dependent on services from other companies.

APPENDIX 1: MODAL PROFILES

General Information

Site:	ZWEMKUIL	Soil form:	Augrabies
Map/Photo example:	GPS Figure 4	Soil family:	2110
Position:	23.036438 -29.421823	Colour	Brown
Surface stones:	5%	Occurrence of flooding:	Medium
Altitude:	947 m	Wind erosion potential:	Medium
Terrain unit:	Valley	Water erosion potential:	High
Slope:	0.28%	Vegetation/Land use:	Lucerne
Slope shape:	Planform	Water table:	None
Aspect:	None		
Micro-relief:	None	Described by:	JD Marx
Parent material solum:	Dolomite	Date described:	2022-01-24
Geological group:	Dwyka Grp, Karoo Spgrp	Weathering of underlying material:	<u>low</u>

Profile Information

<i>Horizon Depth (mm)</i>	<i>Diagnostic Horizon</i>	<i>Colour</i>	<i>Structure</i>	<i>Redoximorphic features</i>	<i>Lime</i>	<i>Transition</i>
A 200	Orthic A	Brown	Moderate, medium, SANBL	None	Present	Clear
B 2000	Neocarbonate	Brown	Moderate, weak, SANBL	None	Present	Clear

General Information

Site:	ZWEMKUIL				Soil form:	Plooyburg	
Map/Photo example:	Figure 5				Soil family:	2100	
GPS Position:	23.05021	-29.434673			Colour	Red/Brown	
Surface stones:	5%				Occurrence of flooding:	Low	
Altitude:	989 m				Wind erosion potential:	low	
Terrain unit:	Upper slope				Water erosion potential:	moderate	
Slope:	0.4 %				Vegetation/Land use:	Grasses	
Slope shape:	Planform		Straight	Profile	Straight	Water table:	600-800 mm
Aspect:	None						
Micro-relief:	None				Described by:	JD Marx	
Parent material solum:	Dolomite				Date described:	2021-11-15	
Geological group:	Dwyka Grp, Karoo Spgrp				<u>Weathering of underlying material:</u>	<u>low</u>	

Profile Information

<i>Horizon Depth (mm)</i>	<i>Diagnostic Horizon</i>	<i>Colour</i>	<i>Structure</i>	<i>Redoximorphic features</i>	<i>Lime</i>	<i>Transition</i>
A 200	Orthic A	Brown	Moderate, medium, SANBL	None	None	Clear
B 800	Red apedal	Red/Brown	Moderate, medium, SANBL	None	None	Clear
C 1200	Hard Carbonate	White	Strong	None	Present	Clear

General Information

Site:	ZWEMKUIL	Soil form:	Coega
Map/Photo example:	Figure 6	Soil family:	2100
	23.039805 -29.429419	Colour	Red /Brown
GPS Position:		Occurrence of flooding:	Low
Surface stones:	2%	Wind erosion potential:	Medium
Altitude:	970 m	Water erosion potential:	Medium
Terrain unit:	Foot slope	Vegetation/Land use:	Grasses
Slope:	0.26 %	Water table:	None
Slope shape:	Planform		
Aspect:	None		
Micro-relief:	None	Described by:	JD Marx
Parent material solum:	Dolomite	Date described:	2022-01-24
Geological group:	Dwyka Grp, Karoo Spgrp	<u>Weathering of underlying material:</u>	Moderate

Profile Information

<i>Horizon Depth (mm)</i>	<i>Diagnostic Horizon</i>	<i>Colour</i>	<i>Structure</i>	<i>Redoximorphic features</i>	<i>Lime</i>	<i>Transition</i>
A 300	Orthic A	Red	Moderate, medium, SANBL	None	Present	Clear
B 400	Hard Carbonate	White	Strong, SANBL	None	Present	Clear

APPENDIX 2: SOIL OBSERVATIONS

Name	x	y	Soil Form	Limiting layer	Soil Depth	Freely Drainable Depth
G1	23.0995998243	-29.4302948649	Augrabies	None	1.51-2.00	1.51-2.00
G2	23.0975392250	-29.4303273440	Augrabies	None	1.51-2.00	1.51-2.00
G3	23.0975763102	-29.4321312072	Augrabies	None	1.51-2.00	1.51-2.00
G4	23.0975021431	-29.4285234803	Augrabies	None	1.51-2.00	1.51-2.00
G5	23.0954415767	-29.4285559252	Glenrosa	Lithic	1.01-1.50	1.01-1.50
G6	23.0954045345	-29.4267520586	Augrabies	None	1.51-2.00	1.51-2.00
G7	23.0954786222	-29.4303597913	Addo	Soft Carbonate	1.01-1.50	1.01-1.50
G8	23.0933810069	-29.4285883383	Glenrosa	Lithic	1.51-2.00	1.51-2.00
G9	23.0913204338	-29.4286207195	Augrabies	None	1.51-2.00	1.51-2.00
G10	23.0933440011	-29.4267844693	Augrabies	None	1.51-2.00	1.51-2.00
G11	23.0912834643	-29.4268168482	Augrabies	None	1.51-2.00	1.51-2.00
G12	23.0912464982	-29.4250129763	Augrabies	None	1.51-2.00	1.51-2.00
G13	23.0892546342	-29.4251240372	Augrabies	None	1.51-2.00	1.51-2.00
G14	23.0892229242	-29.4268491952	Augrabies	None	1.51-2.00	1.51-2.00
G15	23.0769330458	-29.4306503839	Augrabies	None	1.51-2.00	1.51-2.00
G16	23.0748724095	-29.4306825127	Augrabies	None	1.51-2.00	1.51-2.00
G17	23.0748357276	-29.4288786230	Augrabies	None	1.51-2.00	1.51-2.00
G18	23.0768963276	-29.4288464965	Augrabies	None	1.51-2.00	1.51-2.00
G19	23.0831885996	-29.4341615653	Glenrosa	Lithic	0-0.50	0-0.50
G20	23.0831517656	-29.4323576861	Augrabies	None	1.51-2.00	1.51-2.00
G21	23.0851755578	-29.4305215501	Addo	Soft Carbonate	1.51-2.00	1.51-2.00
G22	23.0851386941	-29.4287176722	Addo	Soft Carbonate	1.51-2.00	1.51-2.00
G23	23.0871992774	-29.4286853864	Addo	Soft Carbonate	1.51-2.00	1.51-2.00
G24	23.0892598572	-29.4286530689	Brandvlei	Soft Carbonate	1.51-2.00	1.01-1.50

G25	23.0892967937	-29.4304569421	Prieska	Hard Carbonate	1.51-2.00	1.01-1.50
G26	23.0706047101	-29.4235310940	Augrabies	None	1.51-2.00	1.51-2.00
G27	23.0726652077	-29.4234990383	Augrabies	None	1.51-2.00	1.51-2.00
G28	23.0705681143	-29.4217271975	Augrabies	None	1.51-2.00	1.51-2.00
G29	23.0726285756	-29.4216951441	Augrabies	None	1.51-2.00	1.51-2.00
G29	23.0664837049	-29.4235951100	Augrabies	None	1.51-2.00	1.51-2.00
G30	23.0644231973	-29.4236270702	Augrabies	None	1.51-2.00	1.51-2.00
G31	23.0623262359	-29.4218550927	Augrabies	None	1.51-2.00	1.51-2.00
G32	23.0643867105	-29.4218231667	Augrabies	None	1.51-2.00	1.51-2.00
G33	23.0664471818	-29.4217912088	Augrabies	None	1.51-2.00	1.51-2.00
G34	23.0685076497	-29.4217592191	Augrabies	None	1.51-2.00	1.51-2.00
G35	23.0685442092	-29.4235631179	Augrabies	None	1.51-2.00	1.51-2.00
G36	23.0685807719	-29.4253670163	Augrabies	None	1.51-2.00	1.51-2.00
G37	23.0707511267	-29.4307466748	Addo	Soft Carbonate	1.51-2.00	1.51-2.00
G38	23.0728232920	-29.4306538090	Augrabies	None	1.51-2.00	1.51-2.00
G39	23.0562174782	-29.4255585051	Augrabies	None	1.51-2.00	1.51-2.00
G40	23.0561811336	-29.4237545928	Augrabies	None	1.51-2.00	1.51-2.00
G41	23.0541206094	-29.4237863938	Augrabies	None	1.51-2.00	1.51-2.00
G42	23.0520600819	-29.4238181630	Augrabies	None	1.51-2.00	1.51-2.00
G43	23.0543943407	-29.4255931217	Augrabies	None	1.51-2.00	1.51-2.00
G44	23.0499995511	-29.4238499004	Augrabies	None	1.51-2.00	1.51-2.00
G45	23.0545201825	-29.4436294263	Augrabies	None	1.51-2.00	1.51-2.00
G46	23.0567134833	-29.4434347855	Addo	Soft Carbonate	1.51-2.00	1.51-2.00
G47	23.0544838411	-29.4418255169	Hutton	None	1.51-2.00	1.51-2.00
G48	23.0524229499	-29.4418573093	Hutton	None	1.51-2.00	1.51-2.00
G49	23.0523503498	-29.4382494843	Prieska	Hard Carbonate	0.51-1.00	1.01-1.50

G50	23.0502532693	-29.4364773246	Vaalbos	Rock	0.51-1.00	0.51-1.00
G51	23.0481562616	-29.4347051279	Vaalbos	Rock	0.51-1.00	0.51-1.00
G52	23.0482376431	-29.4311481095	Plooyburg	Hard Carbonate	0.51-1.00	0.51-1.00
G53	23.0464936963	-29.4545799152	Augrabies	None	1.51-2.00	1.51-2.00
G54	23.0464574807	-29.4527759997	Augrabies	None	1.51-2.00	1.51-2.00
G55	23.0485812713	-29.4528981947	Augrabies	None	1.51-2.00	1.51-2.00
G56	23.0505797165	-29.4527125463	Augrabies	None	1.51-2.00	1.51-2.00
G57	23.0506160050	-29.4545164571	Hutton	None	1.51-2.00	1.51-2.00
G58	23.0485548523	-29.4545482021	Augrabies	None	1.51-2.00	1.51-2.00
G59	23.0505434314	-29.4509086349	Coega	Hard Carbonate	0-0.50	0-0.50
G60	23.0484823515	-29.4509403752	Coega	Hard Carbonate	0-0.50	0-0.50
G61	23.0484098640	-29.4473325462	Augrabies	None	1.51-2.00	1.51-2.00
G62	23.0463488536	-29.4473642500	Hutton	None	1.51-2.00	1.51-2.00
G63	23.0483736252	-29.4455286309	Augrabies	None	1.51-2.00	1.51-2.00
G64	23.0507725691	-29.4456394194	Prieska	Hard Carbonate	1.51-2.00	1.01-1.50
G65	23.0504708710	-29.4473008105	Hutton	None	1.51-2.00	1.51-2.00
G66	23.0441981159	-29.4456399273	Hutton	None	1.51-2.00	1.51-2.00
G67	23.0462764521	-29.4437564142	Addo	Soft Carbonate	1.51-2.00	1.01-1.50
G68	23.0454050396	-29.4396548910	Augrabies	None	0.51-1.00	0.51-1.00
G69	23.0461678745	-29.4383446566	Augrabies	None	1.51-2.00	1.51-2.00
G70	23.0524592549	-29.4436612211	Hutton	None	1.51-2.00	1.51-2.00
G71	23.0529749029	-29.4452837997	Plooyburg	Hard Carbonate	0.51-1.00	0.51-1.00
G72	23.0545565272	-29.4454333351	Hutton	None	1.51-2.00	1.51-2.00
G73	23.0566174880	-29.4454015061	Hutton	None	1.51-2.00	1.51-2.00
G74	23.0399853696	-29.4384395421	Hutton	None	1.51-2.00	1.51-2.00
G75	23.0378884876	-29.4366671774	Vaalbos	Rock	0.51-1.00	0.51-1.00

G76	23.0379811761	-29.4349201290	Plooyburg	Hard Carbonate	0.51-1.00	0.51-1.00
G77	23.0439624645	-29.4311606234	Plooyburg	Hard Carbonate	0.51-1.00	0.51-1.00
G78	23.0460231506	-29.4311289723	Plooyburg	Hard Carbonate	1.01-1.50	0.51-1.00
G79	23.0501445131	-29.4310655746	Vaalbos	Rock	0.51-1.00	0.51-1.00
G80	23.0501807619	-29.4328694918	Vaalbos	Rock	0.51-1.00	0.51-1.00
G81	23.0520456729	-29.4327899558	Vaalbos	Rock	0-0.50	0-0.50
G82	23.0502170140	-29.4346734085	Plooyburg	Hard Carbonate	1.01-1.50	1.01-1.50
G83	23.0520358484	-29.4347852082	Vaalbos	Rock	1.01-1.50	1.01-1.50
G84	23.0523140548	-29.4364455710	Prieska	Hard Carbonate	1.01-1.50	1.01-1.50
G85	23.0543748369	-29.4364137855	Augrabies	None	1.51-2.00	1.51-2.00
G86	23.0481924806	-29.4365090464	Plooyburg	Hard Carbonate	0.51-1.00	0.51-1.00
G87	23.0502895280	-29.4382812403	Augrabies	None	1.51-2.00	1.51-2.00
G88	23.0272618334	-29.4205890188	Brandvlei	Soft Carbonate	1.01-1.50	0.51-1.00
G89	23.0252013358	-29.4206203694	Augrabies	None	1.51-2.00	1.51-2.00
G90	23.0231408351	-29.4206516883	Augrabies	None	1.51-2.00	1.51-2.00
G91	23.0231050820	-29.4188477374	Augrabies	None	1.51-2.00	1.51-2.00
G92	23.0230693322	-29.4170437859	Brandvlei	Soft Carbonate	1.51-2.00	1.51-2.00
G93	23.0210089008	-29.4170750683	Augrabies	None	1.51-2.00	1.51-2.00
G94	23.0272260076	-29.4187850724	Brandvlei	Soft Carbonate	1.01-1.50	1.01-1.50
G95	23.0210446143	-29.4188790221	Augrabies	None	1.51-2.00	1.51-2.00
G96	23.0438901950	-29.4275527735	Coega	Hard Carbonate	0-0.50	0-0.50
G97	23.0439263281	-29.4293566987	Prieska	Hard Carbonate	1.01-1.50	1.01-1.50
G98	23.0459869779	-29.4293250499	Coega	Hard Carbonate	0-0.50	0-0.50
G99	23.0418656750	-29.4293883157	Glenrosa	Lithic	0-0.50	0-0.50
G100	23.0418764964	-29.4312409406	Glenrosa	Lithic	0.51-1.00	0.51-1.00
G101	23.0398410822	-29.4312238301	Coega	Hard Carbonate	0.51-1.00	0.51-1.00

G102	23.0398050186	-29.4294199008	Coega	Hard Carbonate	0-0.50	0-0.50
G103	23.0397689583	-29.4276159709	Glenrosa	Lithic	1.01-1.50	1.01-1.50
G104	23.0378164167	-29.4330593168	Plooyburg	Hard Carbonate	0.51-1.00	0.51-1.00
G105	23.0377803862	-29.4312553856	Plooyburg	Hard Carbonate	0.51-1.00	0.51-1.00
G106	23.0356117240	-29.4258751059	Brandvlei	Soft Carbonate	1.51-2.00	1.51-2.00
G107	23.0356477084	-29.4276790409	Coega	Hard Carbonate	0-0.50	0-0.50
G108	23.0378016052	-29.4295262140	Glenrosa	Lithic	0-0.50	0-0.50
G109	23.0377083350	-29.4276475218	Addo	Soft Carbonate	1.01-1.50	1.01-1.50
G110	23.0376723143	-29.4258435891	Addo	Soft Carbonate	1.01-1.50	1.01-1.50
G111	23.0370083735	-29.4244285083	Brandvlei	Soft Carbonate	1.51-2.00	0-0.50
G112	23.0481200459	-29.4329012089	Plooyburg	Hard Carbonate	0-0.50	0-0.50
G113	23.0543385087	-29.4346098740	Vaalbos	Rock	1.01-1.50	1.01-1.50

APPENDIX 3: SPECIALIST CV

DR DARREN BOUWER

EDUCATION

PhD Soil Science	University of the Free State	2018
M.Sc. Soil Science	University of the Free State	2013
B.Sc. Soil Science (Hon)	University of the Free State	2009
B.Sc. Soil Science	University of the Free State	2008
Matric certificate	Queens College	2005

PROFESSIONAL AFFILIATIONS

- SACNASP- Pri Nat Sci 400081/16
- Member of the Soil Science Society of South Africa
- Member of the Soil Classification Work Group
- Member of South African Soil Surveyors Organisation

WORK EXPERIENCE

- **Digital Soils Africa** / Soil Scientist - May 2012 – Present
- **Ghent University** / Researcher- January 2016 - December 2016
- **University of the Free State**/ Assistant Researcher- January 2011- December 2015

PUBLICATIONS

Bouwer, D., Le Roux, P. A., van Tol, J. J., & van Huyssteen, C. W. (2015). Using ancient and recent soil properties to design a conceptual hydrological response model. *Geoderma*, 241, 1–11.

Van Zijl, G. M., Bouwer, D., van Tol, J. J., & le Roux, P.A.L. (2014). Functional digital soil mapping: A case study from Namarroi, Mozambique. *Geoderma*, 219-220, 155–161.

JAN-DIRK MARX

EDUCATION

M.Sc. Soil Science	University of the Free State	2021
B.Sc. Soil Science	University of the Free State	2019
Matric certificate	Secunda High School	2015

PROFESSIONAL AFFILIATIONS

WORK EXPERIENCE

- **Digital Soils Africa / Soil Scientist** -January 2020– Present

SPECIALIST DECLARATION

I, Jan-Dirk Marx, declare that –

- I act as the independent specialist in this application;
- I regard the information contained in this report to be true and correct;
- I do not have a conflict of interest in this project;
- I will conduct the work relating to the project in an objective manner.

Jmarx

Jan-Dirk Marx

- Candidate SACNASP- 132344