EcoFocus
Ecological Specialist Services
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Ecological Impact Assessment Report

The Farm Reliance no 347 Agricultural Development, Griekwastad, Northern Cape Province

February 2018

Compiled for:

Secundis Beleggings (Pty) Ltd

Compiled by:

Rikus Lamprecht

Ecological Specialist (Pr.Sci.Nat)

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Executive Summary

The project applicant, Secundis Beleggings (Pty) Ltd proposes to develop a natural portion of virgin soil into approximately 135 ha of cultivated pivot lands on the Remaining Extent of the Farm Reliance no 347. The purpose of the cultivation will be for commercial planting and harvesting of potatoes. The development will be accompanied by a network of 200 mm distribution irrigation pipelines which will tie into the initial main pipeline as disused in the ecological report compiled for the Basic Assessment process.

Eco-Con Environmental was appointed by the applicant as the independent Environmental Practitioner (EAP) to conduct the Environmental Impact Assessment (EIA) process.

Due to the nature of the potential impacts of the proposed development on the local ecology, an Ecological study is required. This is required in order to determine the potential presence of ecologically significant species, habitats or wetland areas within the proposed project footprint which may be affected by the proposed development. Proposed mitigation and management measures must also be recommended in order to attempt to reduce/alleviate the identified potential impacts.

EcoFocus Consulting was therefore subsequently appointed by the EAP as the independent ecological specialist to conduct the required Ecological study for the proposed project. This report constitutes the Ecological Impact Assessment. A site visit/assessment for the proposed development footprint area was conducted on 5 December 2017. Although this date forms part of the growing season, the area has not necessarily received adequate follow up rain yet after the initial rainfall events. It must therefore be noted that the time of the assessment was not necessarily favourable for successful identification of all plant species individuals. It is recommended that an additional ecological walkthrough be conducted prior to commencement of the project during the flowering period of underground bulbous plant species. This will ensure that no provincially protected or significant species have potentially been omitted.

Methodology

The proposed assessment area was assessed on foot and visual observations/identifications were made of habitat conditions, ecologically sensitive areas and relevant species present. Species were listed and categorised as per the Red Data Species List; Protected Species List of the National Forests Act (Act 84 of 1998), Invasive Species List of the National Environmental Management: Biodiversity

Act (Act 10 of 2004), Alien and Invasive Species Regulations, 2014 and the Provincially Protected species of the Northern Cape Nature Conservation Act (Act 9 of 2009). Georeferenced photographs were taken of ecologically sensitive areas as well as the relevant nationally or provincially protected species if encountered in order to indicate their specific locations in a Geographic Information System (GIS) mapping format.

Potential impacts of the proposed project on the surrounding natural environment were identified, evaluated and rated. The Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) of the proposed project area were also assessed and rated.

Study Area

The assessment area consists of a single surface footprint area of approximately 219 ha in size and is situated on the Remaining Extent of the Farm Reliance no 347 (SG 21 Digit Code: C03100000000034700000). The farm is located approximately 11 km north-west of the town of Griekwastad which forms part of the Pixley Ka Seme District Municipality, Northern Cape Province. The assessment area falls outside the municipal urban edge. Access to the assessment area is obtained from the south via the R 325 road and subsequent dirt road.

Two potential layout alternatives for the cultivated pivot lands have been proposed by the applicant namely Alternative 1 (preferred) and Alternative 2. Alternative 1 (preferred) will constitute 7 x approximate 3 ha cultivated pivot lands; 2 x approximate 9.5 ha cultivated pivot lands and 5 x approximate 19 ha cultivated pivot lands. This results in a total footprint area of approximately 135 ha in size. Alternative 2 constitutes the same layout as Alternative 1 (preferred) except for the exclusion of 1 x approximate 19 ha cultivated pivot lands situated in the north-eastern corner of the assessment area. This results in a total footprint area of approximately 116 ha in size.

The development will be accompanied by a network of 200 mm distribution irrigation pipelines which will tie into the initial main pipeline as disused in the ecological report compiled for the Basic Assessment process. Narrow linear sections of approximately 900 mm will be cleared in order to accommodate the piping infrastructure. Trenches of approximately 900 mm wide will be excavated in order to accommodate the subsurface burial of the pipelines.

The assessment area is situated on a relatively flat open plain located in-between two large elevated hill complexes to the east and west. According to Mucina & Rutherford (2006), the entire

assessment area forms part of the Olifantshoek Plains Thornveld vegetation type (SVk 13) which mainly consists of wide plains with an open tree and shrubland layer and usually a sparse grass layer. This vegetation type is merely classified as least threatened because of its broad distribution (Mucina & Rutherford, 2006). The adjacently situated elevated hill complexes, which will be traversed by the proposed irrigation pipeline, form part of the Kuruman Mountain Bushveld vegetation type (SVk 10) which is also merely classified as least threated as very little has been transformed thus far (Mucina & Rutherford, 2006).

The entire assessment area is merely classified as 'other natural land' while the elevated hill complex situated to the east falls within an Ecological Support Area (ESA) in accordance with the Northern Cape Provincial Spatial Biodiversity Plan. ESA's are areas that play an important role in supporting the ecological functioning of a protected area or Critical Biodiversity Area (CBA), or in delivering ecosystem services (Collins, 2015). In most cases ESAs are currently in at least fair ecological condition, and should remain in at least fair ecological condition. CBA's are areas which play an important role in conservation and reaching certain minimum required provincial biodiversity targets for ecosystem types, species or ecological processes (Collins, 2015).

Results and Conclusion

The proposed cultivated pivot land developments will in all probability completely transform the existing surface vegetation on their 135 ha or 116 ha total footprint areas depending on the final footprint alternative which is eventually decided upon. The irrigation pipelines will only transform a narrow linear section of approximately 900 mm along their lengths. Although the proposed cultivated pivot land footprints scored a relatively high PES value, the Olifantshoek Plains Thornveld vegetation type (SVk 13) associated with the assessment area is merely classified as least threatened and the footprints are moderately sized relative to the surrounding natural landscape which is vast and relatively homogenous. The entire assessment area is also merely classified as 'other natural land' in accordance with the Northern Cape Provincial Spatial Biodiversity Plan and merely scored a moderate EIS value. The area is therefore not necessarily viewed as being of high conservational significance for habitat preservation or ecological functionality persistence in support of the surrounding ecosystem or broader vegetation type. Denser woody areas are however present within the eastern section of the assessment area associated with the additional footprint of Alternative 1 (preferred). These areas are viewed as being of moderate conservational significance for habitat preservation or ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type and nationally protected tree species which are present.

A total of approximately 2662 shrub and tree individuals of the nationally protected tree species *Vachellia haematoxylon* are present within the proposed footprint areas which will need to be removed. The fact that their sizes and growth forms in the open grassland are mainly restricted to low shrubs (≤ 2 m) indicates the potential impact of historic farm management practices which may have induced a degree of bush encroachment of this species, rather than natural representation/distribution. This assumption therefore detracts somewhat from their significance as nationally protected species on this specific site. The tree and shrub individuals of this species within the denser woody portions are however of more conservational significance as they form part of the dense savannah in closer proximity to the woody hill complex and adjacently located ESA. Although a portion of these denser woody areas will be transformed by the proposed development, the hill complex and ESA will remain intact and should provide sufficient remaining ecological connectivity and functionality.

Two isolated clumps of two and five medium sized tree individuals respectively of the nationally protected tree species *Vachellia erioloba* were found to be present within the southern portions of the eastern and western sections of the assessment area. They however fall outside the proposed footprints and it is therefore recommended that they be left in situ if practically possible. Two other isolated clumps of two and five medium sized tree individuals respectively of this species were also found to be present within two of the approximate 19 ha footprints of the eastern section. They will have to be removed. A single individual of the nationally protected tree species *Boscia albitrunca* was found to be present on the edge of the additional footprint associated with Alternative 1 (preferred) which must be left in situ. With the exception of a single individual of the provincially protected species *Boophone disticha,* no Red Data Listed-, or any other species of conservational significance were found to be present within the proposed cultivated pivot land footprints of the assessment area.

The open grassland of the assessment area is utilised by various smaller antelope species such as Steenbok (*Raphicerus campestris)*, burrowing mammals as well as numerous reptiles such as lizards, snakes & tortoises for foraging/persistence habitat but the mobility of such animals along with the vast, continuous, undeveloped surrounding natural landscape allows for individuals to simply leave an area where disturbance is taking place and disperse to other similar, adequate areas. The assessment area does not fall within any Important Bird Areas (IBA) as per the latest IBA map obtained from the Birdlife SA website (www.birdlife.org.za/conservation/important bird areas/iba-map). No important bird species, unique or specialised bird habitats were observed either.

The denser woody areas of the eastern section of the assessment area along with the hill complex are utilised by various larger antelope species such as Kudu as well as other mammal and bird species as refuge and for breeding/persistence purposes. It is therefore recommended that a sufficient corridor must be buffered out around the footslope of the hill complex if practicably possible in order to ensure continued ecological connectivity and functionality of the adjacent ESA and to allow for movement of fauna and flora through the broader area.

It is in the opinion of the specialist that the only significant potential ecological impact identified and which cannot necessarily be suitably reduced and mitigated to within acceptable levels, is the removal of a significant number of tree/shrub individuals of the nationally protected species *Vachellia haematoxylon*. This potential ecological impact scored a slightly higher risk rating for Alternative 1 (preferred) than for Alternative 2 due to the additional approximate 19 ha footprint. The Department of Agriculture, Forestry and Fisheries (DAFF) should therefore be notified and adequately consulted during the Public Participation Process in order to obtain their comment and recommendations with regards to the viability of the proposed development. The rest of the potential ecological impacts identified can be suitably reduced and mitigated to within acceptable levels and the project should therefore be considered by the competent authority for environmental authorisation and approval. Although Alternative 1 (preferred) scored a slightly higher risk rating than Alternative 2, the difference in ecological impact is not deemed significant due to the small relative increase in transformed footprint. Either of the alternatives can therefore be considered by the competent authority depending on the comment and recommendations received from DAFF.

The proposed project may only continue if all recommended mitigations measures as per this ecological report are adequately implemented and managed for both the construction and operational phases of the proposed project. All necessary authorisations and permits must also be obtained prior to any commencement.

List of Figures

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Abbreviations

CARA	Conservation of Agricultural Resources Act (Act 43 of 1983)
CBA	Critical Biodiversity Area
DAFF	Department of Agriculture, Forestry and Fisheries
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
ESA	Ecological Support Area
IBA	Important Bird Area
MAP	Mean Annual Precipitation
MAT	Mean Annual Temperature
NEMBA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEMA	National Environmental Management Act (Act 107 of 1998)
NFA	National Forests Act (Act 84 of 1998)
NWA	National Water Act (Act 36 of 1998)
PES	Present Ecological State
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
WULA	Water Use License Application

Details of the Specialist

Adriaan Johannes Hendrikus Lamprecht (Pr.Sci.Nat)

M.Env.Sci. Ecological remediation and sustainable utilisation (NWU: Potchefstroom)

South African Council for Natural Scientific Professions (SACNASP): Professional Ecological Scientist (No 115601)

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Abbreviated Curriculum Vitae

Qualifications

- M.Env.Sci Ecological Remediation and Sustainable Utilisation/Vegetation Ecology
  - 2010 - North West University Potchefstroom
- B.Sc Botany and Zoology (Cum Laude)
  - 2008 - North West University Potchefstroom

Accredited courses completed

- Implementing Environmental Management Systems ISO 14001
  - 2011 - North West University Potchefstroom
- Environmental Law for Environmental Managers
  - 2011 - North West University Potchefstroom
- SASS 5 Aquatic Biomonitoring Training Course
  - 2017 – GroundTruth Consulting

Professional registrations

- South African Council for Natural Scientific Professions **(SACNASP)**
  - Professional Ecological Scientist Registration number 115601

- International Association for Impact Assessment **(IAIA)**
    - Registration number 5232
- South African Green Industries Council (**SAGIC**) Invasive Species training
    - Registration number 2405/2459

Employment and Experience Background

Upon completion of his studies, Rikus started his career in 2011 as an **Environmental Professional in Training (PIT) at Anglo American Thermal Coal: Environmental Services.** He received environmental training and practical implementation experience in all environmental facets of the mining industry with the focus on: Environmental rehabilitation, land management (biodiversity and invasive species eradication), waste & water-, air quality-, game reserve-, environmental management and legislation, as well as corporate reporting. He was also appointed as the Biodiversity management custodian at Anglo American Thermal Coal collieries.

He was subsequently employed by **Fraser Alexander Tailings from October 2011 to the end of November 2015 as an Environmental Contracts Manager,** where he was responsible for the technical and operational management of all Fraser Alexander Tailings' mining environmental rehabilitation work. He was responsible for all facets of project management, as well as implementation of rehabilitation and environmental strategies, by planning activities, organising physical, financial and human resources, delegating task responsibilities, leading people, controlling risks and providing technical support.

He conducted a significant amount of quantitative and qualitative ecological vegetation monitoring during his employment period with the company. Such monitoring mainly included environmentally rehabilitated mining areas in the open-cast coal-, gold-, platinum- and chrome mining industries situated in the Free State, Gauteng, Mpumalanga, North-West and Limpopo Provinces. He was involved with analysis, processing and interpretation of environmental monitoring data and compilation of high quality technical/scientific environmental monitoring reports for clients. He was subsequently further involved with providing adequate ecological management and maintenance recommendations for rehabilitated areas. He also provided technical/scientific environmental rehabilitation support to mining clients, with regards to sufficient soil preparation and amelioration, grassing processes, as well as grass species mixtures and ratios.

He was then employed by **Enviroworks Consulting from January 2016 to the end of May 2017 as a Senior Ecological Specialist** where he was responsible for virtually all Ecological, Aquatic and Wetland specialist assessments and reporting related to Environmental Impact Assessment (EIA) and Basic Assessment (BA) projects. He also completed numerous EIA and BA projects as the main project Environmental Assessment Practitioner (EAP).

Rikus then subsequently established the company EcoFocus Consulting (Pty) Ltd, which provides high quality professional environmental and ecological specialist services and solutions to the industrial development-, construction-, mining-, agricultural and other sectors, at the end of May 2017.

He possesses significant qualifications, vast knowledge, skills and practical experience in the specialist field of ecological and environmental management. This, coupled with his disciplined, determined and goal-driven mind-set, as well as his high level of personal standards, ensure high quality, timely and outcomes based outputs and service delivery relating to any project.

Ecological Specialist Report Completion

2018

- Completion of a specialist ecological assessment and report for the proposed 30 ha Portion 30 of the Farm Lilyvale no 2313 Residential development project in Bloemfontein, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 20 ha Luckhoff Waste Facility development project in Luckhoff, Free State Province.
- Completion of a specialist ecological assessment and report for a proposed 19 ha agricultural development project outside Griekwastad, Northern Cape Province.

2017

- Completion of a specialist ecological assessment and report for the proposed Phethogo Consulting filling station development project in Bloemfontein, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 132 kV CENTLEC Harvard transmission line development project in Bloemfontein, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed Zevenfontein filling station development project in Johannesburg, Gauteng Province.

- Completion of a specialist ecological assessment and report for the proposed Olifantsvlei Curro School development project in Johannesburg, Gauteng Province.
- Completion of a specialist ecological assessment and report for the proposed 23 ha Babereki Agricultural development project in Hartswater, Northern Cape Province.
- Completion of a specialist ecological assessment and report for the proposed Eikenhof Curro School development project in Johannesburg, Gauteng Province.
- Completion of a specialist ecological assessment and report for the proposed 40 ha CoGHSTA residential development project in Norvalspont, Northern Cape Province.
- Completion of a specialist ecological assessment and report for the proposed 9 ha CoGHSTA residential development project in Williston, Northern Cape Province.
- Completion of a specialist ecological and wetland assessment and report for the proposed 100 ha Musgrave residential and commercial development in Bloemfontein, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 15 ha BVI Engineering Waste Water Treatment Works and associated pipeline development project in Britstown, Northern Cape Province.
- Completion of a specialist ecological walkthrough assessment and report and relocation of provincially protected species *Eucomis autumnalis* individuals for the Bloemwater 33.6 km Brandkop Bypass water supply pipeline in Bloemfontein, Free State Province.
- Completion and execution of a Species Relocation and Re-establishment Plan for 13 individuals of the provincially protected species, *Eucomis autumnalis,* for the Bloemwater 33.6 km Brandkop Bypass water supply pipeline in Bloemfontein, Free State Province.
- Completion of a specialist ecological exemption letter for the proposed Siloam Crematorium development in Welkom, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 0.5 ha Vuna Afrika Agricultural feedmill pelletizing plant development project outside Wepener, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 0.4 ha Olympic Flame filling station development project in Welkom, Free State Province.
- Completion of a specialist ecological assessment and report for a proposed 3000 ha agricultural development project outside Douglas, Northern Cape Province.
- Completion of a specialist ecological assessment and report for the proposed 46.04 ha University, Industrial and Residential development project in Orania, Northern Cape Province.

- Completion of a specialist ecological assessment and report for a proposed 482 ha Piet Louw NEMA Section 24G agricultural development project outside Hopetown, Northern Cape Province.
- Completion of a specialist ecological assessment and report for a proposed 500 ha Wolfkop Valley Estate development project outside Bloemfontein, Free State Cape Province.
- Completion of a specialist Erosion and Rehabilitation Management Plan for the Farms Die Kranse no 1174 and De Rotsen no 52 outside Vrede, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 4.1 ha Plot 31 Spitskop Residential development project in Bloemfontein, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 26.8 ha Oxidation Dam development project in Orania, Northern Cape Province.
- Completion of five specialist ecological assessments and reports for the proposed Dawid Kruiper Local Municipality Residential Developments around Upington, Northern Cape Province.
- Completion of a specialist Grazing and Invasive Species Management Plan for the Farm Smaldeel no 15032 outside Paul Roux, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 16.4 ha Truckstop and Filling Station development project in Senekal, Free State Province.

2016

- Completion of a specialist ecological assessment and report for the proposed 3 km Olifantshoek Bulk Water Supply and reservoir development project in Olifantshoek, Northern Cape Province.
- Completion of two specialist ecological and wetland assessments and reports for the proposed respective 16 ha and 6 ha N8 highway gravel quarries development project near Ladybrand, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 100 ha De Eelt vineyard development project near Prieska, Northern Cape Province.
- Completion of two specialist ecological and wetland assessments and reports for the Lafarge cement production facility and quarry, respectively near Lichtenburg, North-West Province.
- Completion of a specialist ecological assessment and report for the proposed 12 ha Nooitgedacht Retirement Estate development project near Nelspruit, Mpumalanga Province.

- Completion of a specialist ecological assessment and report for the proposed 42 km Ventersburg Bulk Water Supply and reservoir development project between Ventersburg and Riebeeckstad, Free State Province.

Declaration of Independence

I, Adriaan Johannes Hendrikus Lamprecht, ID 870727 5043 083, declare that I:

- am the Director and Ecological Specialist of EcoFocus Consulting (Pty) Ltd
- act as an independent specialist consultant in the field of botany and ecology
- am assigned as the Ecological Specialist consultant by the EAP, Eco-Con Environmental, for the proposed project
- do not have or will not have any financial interest in the undertaking of the proposed project activity other than remuneration for work as stipulated in the Purchase Order terms of reference
- confirm that remuneration for my services relating to the proposed project is not linked to approval or rejection of the project by the competent authority
- have no interest in secondary or subsequent developments as a result of the authorisation of the proposed project
- have no and will not engage in any conflicting interests in the undertaking of the activity
- undertake to disclose to the applicant and the competent authority any information that has or may have the potential to influence the decision of the competent authority
- will provide the applicant and competent authority with access to all relevant project information in my possession whether favourable or not

AJH Lamprecht

Signature

1. Introduction

The project applicant, Secundis Beleggings (Pty) Ltd proposes to develop a natural portion of virgin soil into approximately 135 ha of cultivated pivot lands on the Remaining Extent of the Farm Reliance no 347. The farm is situated approximately 11 km north-west of the town of Griekwastad, Northern Cape Province. The purpose of the cultivation will be for commercial planting and harvesting of potatoes. The development will be accompanied by a network of 200 mm distribution irrigation pipelines which will tie into the initial main pipeline as disused in the ecological report compiled for the Basic Assessment process.

Eco-Con Environmental was appointed by the applicant as the independent Environmental Practitioner (EAP) to conduct the Environmental Impact Assessment (EIA) process.

Due to the nature of the potential impacts of the proposed development on the local ecology, an Ecological study is required. This is required in order to determine the potential presence of ecologically significant species, habitats or wetland areas within the proposed project footprint which may be affected by the proposed development. Proposed mitigation and management measures must also be recommended in order to attempt to reduce/alleviate the identified potential impacts.

EcoFocus Consulting was therefore subsequently appointed by the EAP as the independent ecological specialist to conduct the required Ecological study for the proposed project. This report constitutes the Ecological Impact Assessment.

Preliminary preparations conducted prior to the ecological walkthrough/site assessment where as follows:

- Georeferenced spatial information was obtained of the proposed project area in order to determine the direct impact footprint area.
- A desktop study was also conducted of the information available on the relevant vegetation types and national/provincial conservation significance status associated with the proposed footprint areas.

2. Date and Season of Ecological Walkthrough/Site Assessment

The site visit/assessment for the proposed development footprint area was conducted on 5 December 2017. Although this date forms part of the growing season, the area has not necessarily received adequate follow up rain yet after the initial rainfall events. It must therefore be noted that the time of the assessment was not necessarily favourable for successful identification of all plant species individuals. It is recommended that an additional ecological walkthrough be conducted prior to commencement of the project during the flowering period of underground bulbous plant species. This will ensure that no provincially protected or significant species have potentially been omitted.

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3. Assessment Rational

South Africa is a country rich in natural resources and splendour and is rated as having some of the highest biodiversity in the world. Other than the pure aesthetic value which our biodiversity and natural resources provides, it also plays a significant positive role in our national economy. While continuous economic development and progress is a keen national focus area, which forms a cornerstone in the socio-economic improvement of society and the livelihoods of communities and individuals, the preservation and management of the integrity and sustainability of our natural resources is also essential in achieving this objective.

Socio-economic development and progress cannot be completely inhibited for the sake of ensuring environmental conservation, therefore solutions and compromises rather need to be explored in order to achieve the needs/objectives of socio-economic development without unreasonably jeopardising the requirements of environmental conservation. A sustainable and responsible balance needs to be maintained in order to accommodate the requirements of both.

Adequate, sustainable and responsible utilisation and management of our natural resources is crucial. Finding the required balance between socio-economic development and environmental conservation, should therefore always be a priority focus point during any proposed development process.

Various environmental legislation in South Africa makes provision for the protection of our natural resources and the functionality of ecological systems in order to ensure sustainability. Such acts include the National Environmental Management: Biodiversity Act (Act 10 of 2004), National Forests Act (Act 84 of 1998), Conservation of Agricultural Resources Act (Act 43 of 1983), National Water Act (Act 36 of 1998) and framework legislation such as the National Environmental Management Act (Act 10 of 2004).

An Ecological Impact Assessment of the proposed project area was therefore conducted in order to determine and quantify the potential impacts of the proposed development on the natural environment in the area.

4. Objectives of the Assessment

Ecological and habitat survey:

- Identify and list significant faunal and floral species encountered on the proposed project area and list any protected and/or Red Data Listed species.
- Determine and discuss the present condition and extent of degradation and/or transformation of the vegetation on the proposed project area.
- Determine and discuss the ecological sensitivity and significance of the proposed project area.
- Identify and delineate all watercourses/wetland areas potentially present on the proposed project area.
- Identify, evaluate and rate the potential impacts of the proposed project on the natural environment.
- Provide recommendations on mitigation and management measures in order to attempt to reduce/alleviate these identified potential impacts.
- A digital report (this document) as well as the digital KML files of any identified sensitive areas will be provided to the applicant.

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5. Methodology

- The proposed assessment area was assessed on foot and visual observations/identifications were made of habitat conditions, ecologically sensitive areas and relevant species present.
- Species were listed and categorised as per the Red Data Species List; Protected Species List of the National Forests Act (Act 84 of 1998), Invasive Species List of the National Environmental Management: Biodiversity Act (Act 10 of 2004), Alien and Invasive Species Regulations, 2014 and the Provincially Protected species of the Northern Cape Nature Conservation Act (Act 9 of 2009).
- Georeferenced photographs were taken of ecologically sensitive areas as well as the relevant nationally or provincially protected species if encountered in order to indicate their specific locations in a Geographic Information System (GIS) mapping format.

The **Present Ecological State (PES)** of the proposed project area was assessed and rated as per the table below.

- The Present Ecological State (PES) refers to the current state or condition of an area in terms of all its characteristics and reflects the change to the area from its reference condition. The value gives an indication of the alterations that have occurred in the ecosystem.

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Table 1: Criteria for PES calculations

Ecological Category	Score	Description
A	> 90-100%	**Unmodified**, natural and pristine.
B	> 80-90%	**Largely natural**. A small change in natural habitats and biota may have taken place but the ecosystem functionality has remained essentially unchanged.
C	> 60-80%	**Moderately modified**. Moderate loss and transformation of natural habitat and biota have occurred, but the basic ecosystem functionality has still remained predominantly unchanged.
D	> 40-60%	**Largely modified**. A significant loss of natural habitat, biota and subsequent basic ecosystem functionality has occurred.
E	> 20-40%	**Seriously modified**. The loss of natural habitat, biota and basic ecosystem functionality is extensive.
F	0-20%	**Critically/Extremely modified**. Transformation has reached a critical level and the ecosystem has been modified completely with a virtually complete loss of natural habitat and biota. The basic ecosystem functionality has virtually been destroyed and the transformation is irreversible.

The **Ecological Importance and Sensitivity (EIS)** of the proposed project area was assessed and rated as per the table below.

- The Ecological Importance and Sensitivity (EIS) of an area is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales, and both abiotic and biotic components of the system are taken into consideration. Sensitivity refers to the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred.

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Table 2: Criteria for EIS calculations

EIS Categories	Score	Description
Low/Marginal	**D**	Not ecologically important and/or sensitive on any scale. Biodiversity is ubiquitous and not unique or sensitive to habitat modifications.
Moderate	**C**	Ecologically important and sensitive on local or possibly provincial scale. Biodiversity is still relatively ubiquitous and not usually sensitive to habitat modifications.
High	**B**	Ecologically important and sensitive on provincial or possibly national scale. Biodiversity is relatively unique and may be sensitive to habitat modifications.
Very High	**A**	Ecologically important and sensitive on national and possibly international scale. Biodiversity is very unique and sensitive to habitat modifications.

Potential impacts of the proposed project on the surrounding natural environment were identified, evaluated and rated as per the methodology described below. The tables below indicate and explain the methodology and criteria used for the evaluation of the Environmental Risk Ratings as well as the calculation of the final Environmental Significance Ratings of the identified potential ecological impacts. Each potential environmental impact is scored for each of the Evaluation Components as per the table below.

Table 3: Scale utilised for the evaluation of the Environmental Risk Ratings

Evaluation Component	Rating Scale and Description/Criteria
Magnitude of Negative or Positive Impact	**10 - Very high**: Bio-physical features and/or ecological functionality/processes may be severely impacted upon. **8 - High**: Bio-physical features and/or ecological functionality/processes may be significantly impacted upon. **6 - Medium**: Bio-physical features and/or ecological functionality/processes may be moderately impacted upon. **4 - Low**: Bio-physical features and/or ecological functionality/processes may be slightly impacted upon. **2 - Very Low**: Bio-physical features and/or ecological functionality/processes may be slightly impacted upon. **0 - Zero**: Bio-physical features and/or ecological functionality/processes will not be impacted upon.
Duration of Negative or Positive Impact	**5 – Permanent**: Impact will continue on a permanent basis. **4 - Long term**: Impact should cease a period (> 40 years) after the operational phase/project life of the activity. **3 - Medium term**: Impact may occur for the period of the operational phase/project life of the activity. **2 - Short term**: Impact may only occur during the construction phase of the activity after which it will cease. **1 - Immediate**: Impact may only occur as a once off during the construction phase of the activity.

Extent of Positive or Negative Impact	**5 - International**: Impact will extend beyond National boundaries. **4 - National**: Impact will extend beyond Provincial boundaries but remain within National boundaries. **3 - Regional**: Impact will extend beyond 5 km of the development footprint but remain within Provincial boundaries. **2 - Local**: Impact will not extend beyond 5 km of the development footprint. **1 - Site-specific**: Impact will only occur on or within 200 m of the development footprint. **0 –** No impact.
Irreplaceability of Natural Resources being impacted upon	**5 – Definite** loss of irreplaceable natural resources. **4 – High** potential for loss of irreplaceable natural resources. **3 – Moderate** potential for loss of irreplaceable natural resources. **2 – Low** potential for loss of irreplaceable natural resources. **1 – Very low** potential for loss of irreplaceable natural resources. **0 –** No impact.
Reversibility of Impact	**5 –** Impact **cannot** be reversed. **4 – Low** potential that impact may be reversed. **3 – Moderate** potential that impact may be reversed. **2 – High** potential that impact may be reversed. **1 –** Impact **will be** reversible. **0 –** No impact.
Probability of Impact Occurrence	**5 - Definite**: Probability of impact occurring is > 95 %. **4 - High**: Probability of impact occurring is > 75 %. **3 - Medium**: Probability of impact occurring is between 25 % - 75 %. **2 - Low**: Probability of impact occurring is between 5 % - 25 %. **1 - Improbable**: Probability of impact occurring is < 5 %.
Cumulative Impact	**High**: Numerous similar historic, present or future development activities in the same geographical area, have taken or are anticipated to take place which may cumulatively contribute and increase the significance of the identified impacts. **Medium**: Few similar historic, present or future development activities in the same geographical area, have taken or are anticipated to take place which may cumulatively contribute and increase the significance of the identified impacts. **Low**: Virtually no similar historic, present or future development activities in the same geographical area, have taken or are anticipated to take place which may cumulatively contribute and increase the significance of the identified impacts. The development is anticipated to be an isolated occurrence and should therefore have a negligible cumulative impact. **None**: No cumulative impact.

Once the Environmental Risk Ratings have been evaluated for each potential ecological impact, the Significance Score of each potential ecological impact is calculated by using the following formula:

- **SS (Significance Score) = (magnitude + duration + extent + irreplaceable + reversibility) x probability.**

The maximum Significance Score value is 150.

The Significance Score is then used to rate the Environmental Significance of each potential ecological impact as per Table 4 below. The Environmental Significance rating process is completed for all identified potential ecological impacts both before and after implementation of the recommended mitigation measures.

Table 4: Scale used for the evaluation of the Environmental Significance Ratings

Environmental Significance Score	Environmental Significance Rating	Description/Criteria
125 – 150	Very high	An impact of very high significance after mitigation will mean that the development may not take place. The impact cannot be suitably reduced and mitigated to within acceptable levels.
100 – 124	High	An impact of high significance after mitigation should influence a decision about whether or not to proceed with the development. Additional, impact-specific mitigation measures must be implemented if the continuation of the development is to be considered.
75 – 99	Medium-high	Additional, impact-specific mitigation measures must be implemented for an impact of medium-high significance if the continuation of the development is to be considered.
50 – 74	Medium	An impact of medium significance after mitigation must be adequately managed in accordance with the mitigation measures provided by the specialist.
< 50	Low	If any mitigation measures are provided by the specialist for an impact of low significance after mitigation, the impact must be adequately managed in accordance with these measures.
+	Positive impact	A positive impact is likely to result in a beneficial consequence/effect and should therefore be viewed as a motivation for the development to proceed.

- Wetlands were identified and delineated on the proposed project area as per the methodology described below:

For the purposes of this investigation a wetland was defined according to the definition in the National Water Act (Act 36 of 1998) as: “land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.”

In 2005 DWAF published a wetland delineation procedure in a guideline document titled “A Practical Field Procedure for the Identification and Delineation of Wetlands and Riparian Areas”. Guidelines for the undertaking of biodiversity assessments exist. These guidelines contain a number of stipulations relating to the protection of wetlands and the undertaking of wetland assessments. These guidelines state that a wetland delineation procedure must identify the outer edge of the temporary zone of the wetland, which marks the boundary between the wetland and adjacent terrestrial areas and is that part of the wetland that remains flooded or saturated close to the soil surface for only a few weeks in the year, but long enough to develop anaerobic conditions and determine the nature of the plants growing in the soil.

The guidelines also state that locating the outer edge of the temporary zone must make use of four specific indicators namely:

- terrain unit indicator,
- soil form indicator,
- soil wetness indicator and
- vegetation indicator.

In addition the wetland and a protective buffer zone, beginning from the outer edge of the wetland temporary zone, must be designated as sensitive in a sensitivity map. The guidelines stipulate buffers to be delineated around the boundary of a wetland. A protective 32 m buffer zone, beginning from the outer edge of the wetland temporary zone, must be implemented and designated as sensitive within which no development must be allowed to occur.

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6. Study Area

The assessment area consists of a single surface footprint area of approximately 219 ha in size and is situated on the Remaining Extent of the Farm Reliance no 347 (SG 21 Digit Code: C03100000000034700000). The farm is located approximately 11 km north-west of the town of Griekwastad which forms part of the Pixley Ka Seme District Municipality, Northern Cape Province. The assessment area falls outside the municipal urban edge. Access to the assessment area is obtained from the south via the R 325 road and subsequent dirt road.

Two potential layout alternatives for the cultivated pivot lands have been proposed by the applicant namely Alternative 1 (preferred) and Alternative 2. Alternative 1 (preferred) will constitute 7 x approximate 3 ha cultivated pivot lands; 2 x approximate 9.5 ha cultivated pivot lands and 5 x approximate 19 ha cultivated pivot lands. This results in a total footprint area of approximately 135 ha in size. Alternative 2 constitutes the same layout as Alternative 1 (preferred) except for the exclusion of 1 x approximate 19 ha cultivated pivot lands situated in the north-eastern corner of the assessment area. This results in a total footprint area of approximately 116 ha in size.

The development will be accompanied by a network of 200 mm distribution irrigation pipelines which will tie into the initial main pipeline as disused in the ecological report compiled for the Basic Assessment process. Narrow linear sections of approximately 900 mm will be cleared in order to accommodate the piping infrastructure. Trenches of approximately 900 mm wide will be excavated in order to accommodate the subsurface burial of the pipelines.

See locality map below.

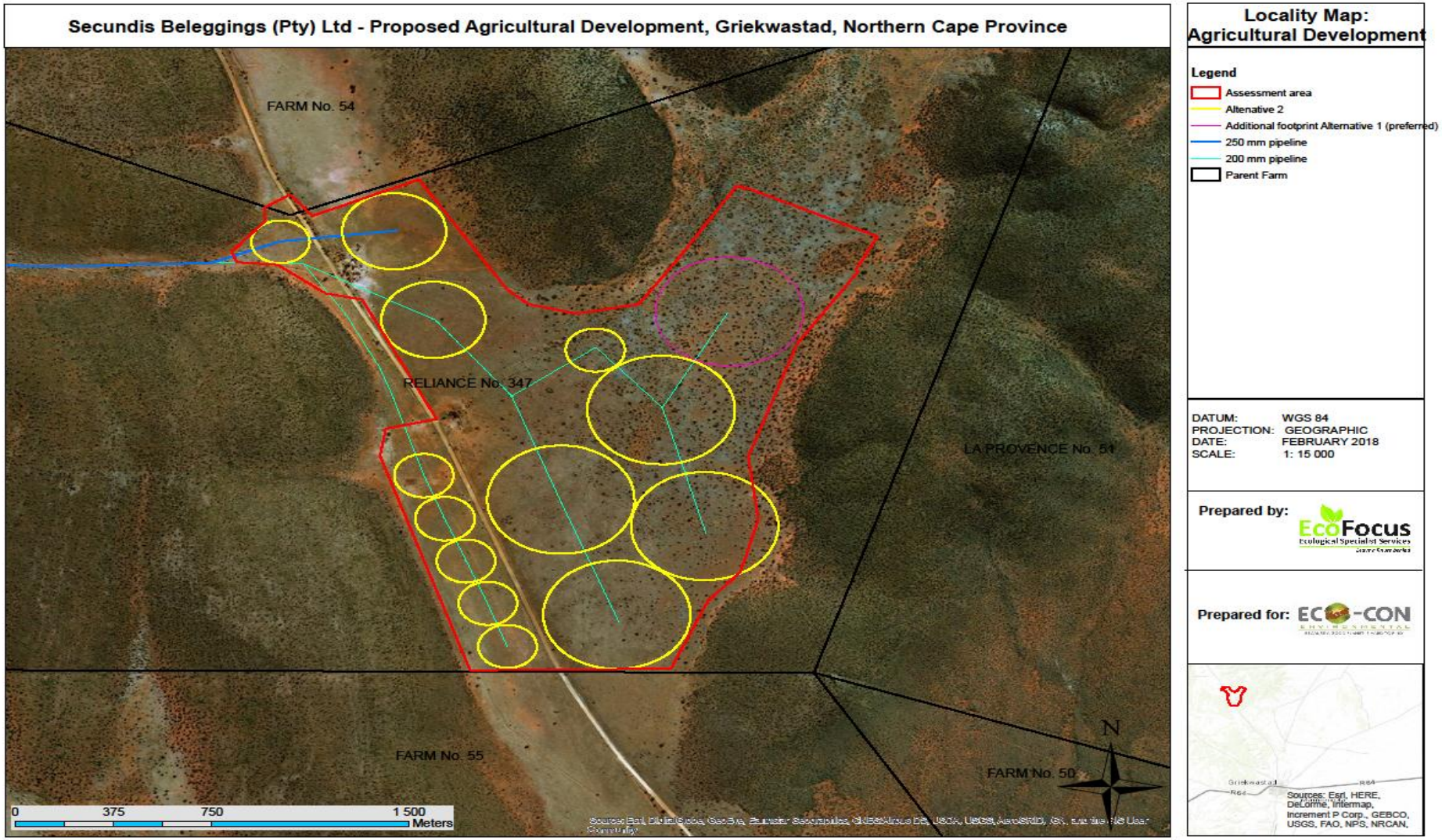

Figure 1: Locality map illustrating the assessment area, proposed cultivated pivot lands and its associated irrigation pipelines (see A3 sized map in the Appendices)

6.1. Climate

The rainfall of the region peaks during the summer months and the Mean Annual Precipitation (MAP) of the area is approximately 321 mm (www.climate-data.org). The maximum average monthly temperature is approximately 23.4°C in the summer months while the minimum average monthly temperature is approximately 8.5°C during the winter. Average maximum daily temperatures can reach up to 31.7°C in the summer months and dip to as low as -0.3°C during the winter. Frequent frost occurs during the winter months.

6.2. Geology and Soils

According to Mucina & Rutherford (2006) the geology of the landscape and associated vegetation type can be described as the following:

Red aeolian sand of tertiary or recent age (Kalahari Group) with silcrete and calcrete and some andesitic and basaltic lava of the Griqualand West Supergroup. Deep Hutton soils are overwhelmingly dominant.

6.3. Vegetation and Conservation Status

The assessment area is situated on a relatively flat open plain located in-between two large elevated hill complexes to the east and west. According to Mucina & Rutherford (2006), the entire assessment area forms part of the Olifantshoek Plains Thornveld vegetation type (SVk 13) which mainly consists of wide plains with an open tree and shrubland layer and usually a sparse grass layer. This vegetation type is merely classified as least threatened because of its broad distribution (Mucina & Rutherford, 2006). The adjacently situated elevated hill complexes, which will be traversed by the proposed irrigation pipeline, form part of the Kuruman Mountain Bushveld vegetation type (SVk 10) which is also merely classified as least threated as very little has been transformed thus far (Mucina & Rutherford, 2006).

The entire assessment area is merely classified as 'other natural land' while the elevated hill complex situated to the east falls within an Ecological Support Area (ESA) in accordance with the Northern Cape Provincial Spatial Biodiversity Plan. ESA's are areas that play an important role in supporting the ecological functioning of a protected area or Critical Biodiversity Area (CBA), or in delivering ecosystem services (Collins, 2015). In most cases ESAs are currently in at least fair ecological condition, and should remain in at least fair ecological condition. CBA's are areas which play an

important role in conservation and reaching certain minimum required provincial biodiversity targets for ecosystem types, species or ecological processes (Collins, 2015).

The proposed cultivated pivot land developments will in all probability completely transform the existing surface vegetation on their 135 ha or 116 ha total footprint areas depending on the final footprint alternative which is eventually decided upon. The irrigation pipelines will only transform a narrow linear section of approximately 900 mm along their lengths.

See vegetation and sensitivity maps below.

Figure 2: Vegetation map illustrating the vegetation type associated with the assessment area (see A3 sized map in the Appendices)

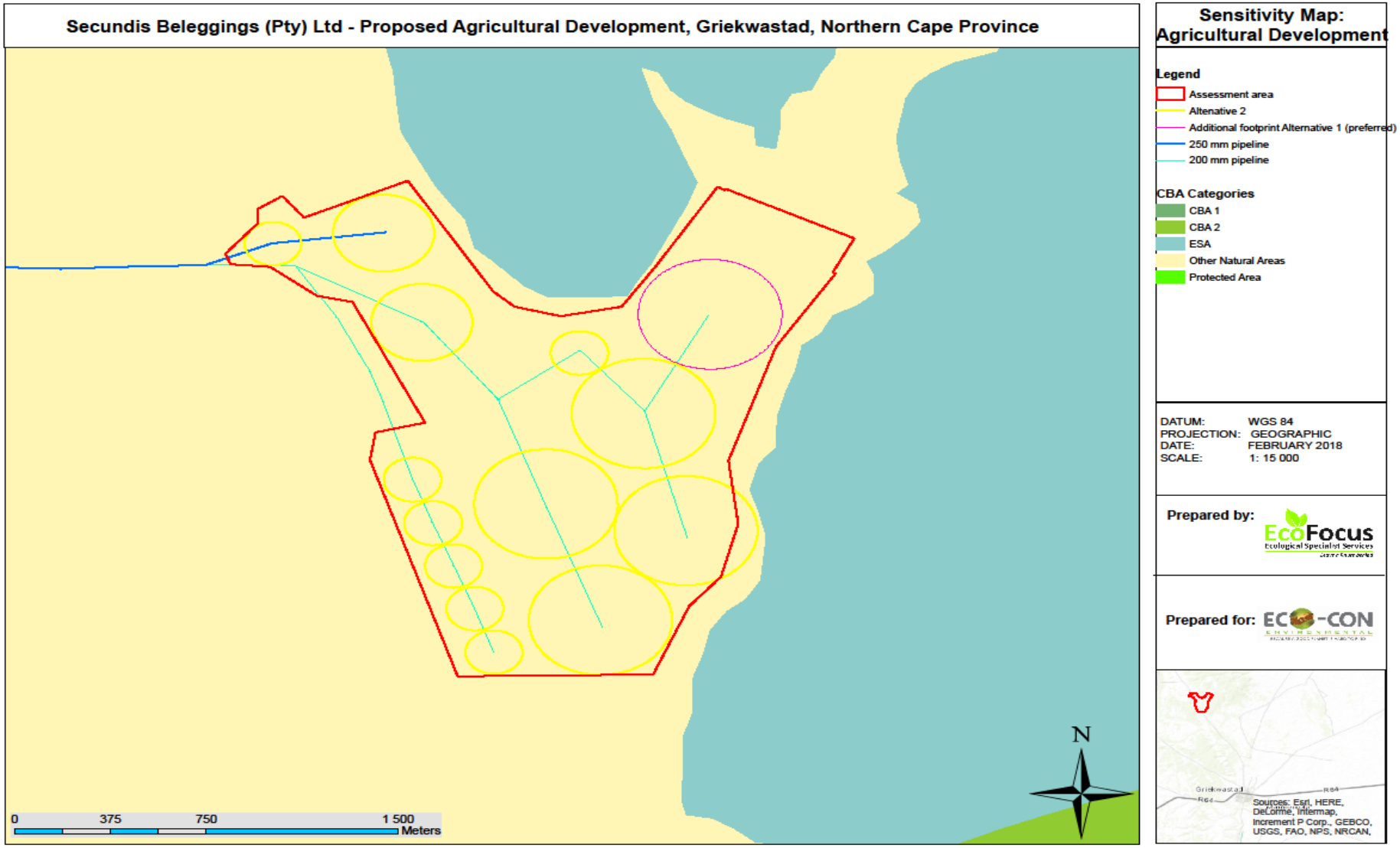

Figure 3: Sensitivity map illustrating the conservation status associated with the assessment area (see A3 sized map in the Appendices)

7. Assumptions, Uncertainties and Gaps in Knowledge

Various assumptions need to be made during the assessment process at the hand of the relevant specialist. It is therefore assumed that:

- all relevant project information provided by the applicant and engineering design team to the ecological specialist was correct and valid at the time that it was provided.
- the proposed development area as provided by the engineering design team is correct and will not be significantly deviated from as this was the only area assessed.
- strategic level investigations undertaken by the applicant prior to the commencement of the Environmental Impact Assessment process, determined that the proposed development footprint represents a potentially suitable and technically acceptable location.
- the public, local communities, relevant organs of state and landowners will receive a sufficient reoccurring opportunity to participate and comment on the proposed project during the Environmental Impact Assessment process, through the provision of adequately facilitated public participation interventions and timeframes as stipulated in the NEMA: EIA Regulations, 2014.
- the need and desirability of the proposed project is based on strategic national, provincial and local plans and policies which reflect the interests of both statutory and public viewpoints.
- the EIA process is a project-level framework and the specialists are limited to assessing the anticipated environmental impacts associated with the construction and operational phases of the proposed project.
- it is assumed that strategic level decision making by the relevant authorities will be conducted through cooperative governance principles, with the consideration of environmentally sustainable and responsible development principles underpinning all decision making.

Given that an EIA involves prediction, the uncertainty factor forms part of the assessment process. Two types of uncertainty are associated with the EIA process, namely process-related and prediction-related.

- Uncertainty of prediction is critical at the data collection phase as observations and conclusions are made, only based on professional specialist opinion. Final certainty will only be obtained upon actual implementation of the proposed development. Adequate research, specialist experience and expertise should however minimise this uncertainty.
- Uncertainty of relevant decision making relates to the interpretation of provided information by relevant authorities during the EIA process. Continual two way communication and coordination between EAP's and relevant authorities should however decrease the

uncertainty of subjective interpretation. The importance of widespread/comprehensive consultation towards minimising the risk/possibility of omitting significant information and impacts is further stressed. The use of quantitative impact significance rating formulas (as utilised in this document) can further standardise the objective interpretation of results and limit the occurrence and scale of uncertainty and subjectivity.

- The principle of human nature provides for uncertainties and unpredictability with regards to the socio-economic impacts of the proposed development and the subsequent public reaction/opinion which will be received during the Public Participation Process (PPP).

Gaps in knowledge can be attributed to:

- Although the site visit date forms part of the growing season, the area has not necessarily received adequate follow up rain yet after the initial rainfall events. It must therefore be noted that the time of the assessment was not necessarily favourable for successful identification of all plant species individuals. It is recommended that an additional ecological walkthrough be conducted prior to commencement of the project during the flowering period of underground bulbous plant species. This will ensure that no provincially protected or significant species have potentially been omitted.
- The ecological study process was undertaken prior to the availing of certain information which would only be derived from the final project design and layout. The design layout of the dam, fertiliser tanks and irrigation pipeline had not been finalised yet at the time of the ecological study.
- The potential of future similar developments in the same geographical area which could lead to cumulative impacts cannot be meaningfully anticipated. It must however be kept in mind that expected that the applicant is also applying for environmental authorisation for an approximate 19 ha cultivated pivot land on the same property.

EcoFocus Consulting is an independent ecological specialist company. All information and recommendations as per this report are therefore provided in a fair and unbiased/objective manner based on professional specialist opinion.

8. Results and Discussion

The assessment area is traversed by a regional dirt road in a north-south direction. This dirt road therefore artificially divides the assessment area into a western and an eastern section. The two sections will be discussed separately under headings 8.1. & 8.2.

8.1. Western Section

8.1.1. Current Existing Vegetation and Site Condition

The most northern portion of this western section of the assessment area is associated with a single proposed approximate 3 ha cultivated pivot land. The proposed cultivated pivot land footprint as well as surrounding landscape consists of a relatively natural, open flat medium height grassland. The footslope of a large elevated hill complex commences approximately 10 m to the north-west and south-west of the proposed cultivated pivot land footprint respectively. A woody component is virtually completely absent from the footprint with the exception of sporadic shrub individuals closer to the footslope of the hill complex. The density of the woody component outside of the proposed footprint abruptly increases from the footslope and along the sideslope of the hill complex. The hill complex forms part of an ESA and is utilised by various larger antelope species such as Kudu as well as other mammal and bird species as refuge and for breeding/persistence purposes. It is therefore recommended that a sufficient corridor must be buffered out around the footslope of the hill complex if practicably possible in order to ensure continued ecological connectivity and functionality of the adjacent ESA and to allow for movement of fauna and flora through the broader area.

Sporadic woody individuals within the proposed footprint closer to the footslope of the hill complex mainly constitute low to medium height shrubs of the species *Senegalia mellifera* & *Tarchonanthus camphoratus* which are both considered problematic bush encroachment species in the Northern Cape Province. Other woody shrubs species also found to be present but rather associated with the commencement of the footslope as opposed to the flat footprint of the proposed cultivated pivot land include *Ziziphus mucronata, Vachellia karroo* & *Lebeckia macrantha.*

The lower shrub and forb layer is mainly dominated by the species *Euryops subcarnosus, Hertia pallens* & *Crotolaria orientalis.* Other species also found to be present include *Salsola aphylla, Osteospermum leptolobum, Pteronia sp., Acrotome inflata, Hermannia comosa, Lycium horridum, Wahlenbergia nodosa, Senna italica subsp arachoides, Lebeckia spinescens, Hermannia tomentosa,* & a confined patch of *Elephantorrhiza elephantina.*

The medium height grass layer is mainly dominated by the species *Aristida congesta, Stipagrostis uniplumis* & *Schmidtia pappophoroides* while other species also found to be present include *Eragrostis lehmanniana, Pogonarthria squarrosa* & *Cymbopogon pospischilii.*

Figure 4: Image illustrating the landscape of the proposed northern portion of the western section of the assessment area with the hill complex in the background

The most southern portion of this western section of the assessment area is associated with five proposed approximate 3 ha cultivated pivot lands and an associated 200 mm irrigation pipeline. The proposed cultivated pivot land footprints as well as surrounding landscape consist of a relatively natural, open flat medium height grassland with a similar species composition to that of the northern portion. A very sparse woody component is present which mainly constitutes low woody shrubs (≤ 2 m) of the nationally protected tree species *Vachellia haematoxylon* sporadically scattered throughout the area. A total of approximately 36 shrub individuals of this species are present within the proposed five footprint areas which will need to be removed. The fact that their sizes and growth forms are mainly restricted to low shrubs (≤ 2 m) indicates the potential impact of historic farm management practices which may have induced a degree of bush encroachment of this species, rather than natural representation/distribution. This assumption therefore detracts somewhat from their significance as nationally protected species on this specific site.

A confined area within the first proposed cultivated pivot land footprint from the north has been significantly degraded due to the presence of a drinking water point for livestock. Livestock usually tend to concentrate their grazing and resting activities in the vicinity of such drinking water points to

enable quick access when required. The grass layer of this portion has been severely overgrazed which has had a surface creeping and grass 'carpet' forming effect. Virtually no grass tufting is present. A small number of individuals of the legally declared invasive species *Prosopis sp.* (Category 3) are present.

A single isolated clump of two medium sized tree individuals of the nationally protected tree species *Vachellia erioloba* were found to be present within this southern portion of the western section. They however fall closer to the footslope of the hill complex and therefore outside the proposed five footprint areas and it is therefore once again recommended that a sufficient corridor must be buffered out around the footslope of the hill complex if practicably possible to keep these trees in situ and in order to ensure continued ecological connectivity and functionality of the adjacent ESA and to allow for movement of fauna and flora through the broader area.

No Red Data Listed-, or any other species of conservational significance were found to be present within the proposed cultivated pivot land footprints of the western section of the assessment area.

Figure 5: Image illustrating the landscape of the proposed southern portion of the western section of the assessment area with the hill complex in the background

The open grassland of the western section of the assessment area is utilised by various smaller antelope species such as Steenbok (*Raphicerus campestris)*, burrowing mammals as well as numerous reptiles such as lizards, snakes & tortoises for foraging/persistence habitat but the mobility of such animals along with the vast, continuous, undeveloped surrounding natural

landscape allows for individuals to simply leave an area where disturbance is taking place and disperse to other similar, adequate areas. The assessment area does not fall within any Important Bird Areas (IBA) as per the latest IBA map obtained from the Birdlife SA website (www.birdlife.org.za/conservation/important bird areas/iba-map). No important bird species, unique or specialised bird habitats were observed either.

Table 5: Species list for the proposed cultivated pivot land footprint areas associated with the western section of the assessment area (Nationally protected species highlighted in orange and legally declared invasive species in pink)

Species name		
Graminoids	**Forbs and small shrubs**	**Shrubs & trees**
Aristida congesta	*Acrotome inflata*	*Lebeckia macrantha*
Cymbopogon pospischilii	*Crotolaria orientalis*	*Prosopis sp.*
Eragrostis lehmanniana	*Elephantorrhiza elephantina*	*Senegalia mellifera*
Pogonarthria squarrosa	*Euryops subcarnosus*	*Tarchonanthus camphoratus*
Schmidtia pappophoroides	*Hermannia comosa*	*Vachellia erioloba*
Stipagrostis uniplumis	*Hermannia tomentosa*	*Vachellia haematoxylon*
-	*Hertia pallens*	*Vachellia karroo*
-	*Lebeckia spinescens*	*Ziziphus mucronata*
-	*Lycium horridum*	-
-	*Osteospermum leptolobum*	-
-	*Pteronia sp.*	-
-	*Salsola aphylla*	-
-	*Senna italica subsp arachoides*	-
-	*Wahlenbergia nodosa*	-

8.1.2. Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS)

The Present Ecological State (PES) of the western section of the assessment area is classified as Class B as it is largely natural. A change in natural habitats and biota has taken place in a confined area within one of the proposed cultivated pivot land footprints due to significant degradation caused by concentrated cattle grazing and resting activities but the ecosystem functionality of the larger area has remained essentially unchanged.

The Olifantshoek Plains Thornveld vegetation type (SVk 13), within which the assessment area is situated, is merely classified as least threatened by Mucina & Rutherford (2006) and the footprints of the western section of the assessment area are small relative to the surrounding natural landscape associated with the vegetation type which is vast and relatively homogenous. The entire assessment area is also merely classified as 'other natural land' in accordance with the Northern Cape Provincial Spatial Biodiversity Plan.

A total of approximately 36 shrub individuals of the nationally protected tree species *Vachellia haematoxylon* are present within the proposed five footprint areas which will need to be removed. The fact that their sizes and growth forms are mainly restricted to low shrubs (≤ 2 m) indicates the potential impact of historic farm management practices which may have induced a degree of bush encroachment of this species, rather than natural representation/distribution. This assumption therefore detracts somewhat from their significance as nationally protected species on this specific site. Only a single isolated clump of two medium sized tree individuals of the nationally protected tree species *Vachellia erioloba* were found to be present within this southern portion of the western section. They however fall closer to the footslope of the hill complex and outside the proposed five footprint areas and will be left in situ. No Red Data Listed-, or any other species of conservational significance were found to be present within the proposed cultivated pivot land footprints of the western section of the assessment area.

The mobility of smaller antelope species, burrowing mammals as well as reptiles, along with the vast, continuous surrounding natural landscape allows for individuals to simply leave an area where disturbance is taking place and disperse to other similar, adequate areas. The assessment area also does not fall within any Important Bird Areas (IBA) as per the latest IBA map obtained from the Birdlife SA website (www.birdlife.org.za/conservation/important bird areas/iba-map). No important bird species, unique or specialised bird habitats were observed either.

The Ecological Importance and Sensitivity (EIS) of the western section of the assessment area is therefore merely classified as Class C (moderate) as it could be viewed as ecologically important and sensitive on local scale mainly due to the sparse presence of nationally protected tree species. Biodiversity is however still relatively ubiquitous within the broader area. The western section of the assessment area is therefore not necessarily viewed as being of high conservational significance for habitat preservation or ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type or protected tree species.

8.2. Eastern Section

8.2.1. Current Existing Vegetation and Site Condition

The most northern portion of this eastern section of the assessment area is associated with two proposed approximate 9.5 ha cultivated pivot lands and 200 mm irrigation pipelines. The proposed cultivated pivot land footprints as well as surrounding landscape consists of a relatively natural, open flat medium height grassland. A well represented woody component is present but mainly constitutes low woody shrubs (≤ 2 m) with small to medium sized trees being sparsely scattered throughout the area. The footslope of a large elevated hill complex commences approximately 40 m to the east of the proposed cultivated pivot land footprints and the density and height of the woody component outside of the proposed footprints gradually increases towards the hill complex. The hill complex forms part of an ESA and is utilised by various larger antelope species such as Kudu as well as other mammal and bird species as refuge and for breeding/persistence purposes. It is therefore recommended that a sufficient corridor must be buffered out around the footslope of the hill complex if practicably possible in order to ensure continued ecological connectivity and functionality of the adjacent ESA and to allow for movement of fauna and flora through the broader area.

A confined area directly adjacent to the dirt road has been significantly degraded due to the presence of a drinking water point for livestock. The grass layer of this portion has been severely overgrazed which has had a surface creeping and grass 'carpet' forming effect. Virtually no grass tufting is present. The area mainly constitutes a relatively dense stand of *Vachellia karroo* and the legally declared invasive species *Prosopis sp.* (Category 3) with few *Ziziphus mucronata* individuals also being present. Only a small portion of this degraded area however falls inside the most northerly situated proposed cultivated pivot land footprint.

The low woody shrub layer of the remaining majority of the northern footprint areas is dominated by the nationally protected tree species *Vachellia haematoxylon.* A total of approximately 132 shrub individuals of this species are present within the most northerly situated proposed cultivated pivot land footprint which will need to be removed. The average density of these shrubs within the second approximate 9.5 ha cultivated pivot land footprint area amounts to approximately 20 shrubs/ha which equates to a total estimate of approximately 190 shrubs within this footprint which will need to be removed. Their density and the fact that their sizes and growth forms are mainly restricted to low shrubs (≤ 2 m) indicates the potential impact of historic farm management practices which may have induced a degree of bush encroachment of this species, rather than natural representation/distribution. This assumption therefore detracts somewhat from their significance as

nationally protected species on this specific site. Medium sized tree individuals of this species are also sparsely scattered throughout the area. Only one tree individual of significant size of this species was found to be present within the northern portion of the eastern section of the assessment area but it falls outside the proposed footprints areas. This tree must be left in situ.

Other tree and shrub species also found to be sporadically present within the northern portion of the eastern section of the assessment area include *Searsia burchellii* & *Tarchonanthus camphoratus.*

The lower shrub and forb layer is mainly dominated by the species *Euryops subcarnosus, Hertia pallens, Pterothrix spinescens* & *Crotolaria orientalis.* Other species also found to be present include *Salsola aphylla, Osteospermum leptolobum, Pteronia sp., Hermannia comosa, Lycium horridum, Wahlenbergia nodosa, Senna italica subsp arachoides, Lebeckia spinescens, Hermannia tomentosa, Barleria rigida, Dicoma schinzii, Indigofera dalaeoides, Pollichia campestris, Acrotome inflata* & *Elephantorrhiza elephantina.* A single individual of the species *Boophone disticha* (provincially protected and formerly Red Data Listed) was found to be present within the most northerly situated proposed cultivated pivot land footprint. It is recommended that this individual be removed prior to the commencement of the construction phase and adequately relocated to a suitable, similar open area.

The medium height grass layer is mainly dominated by the species *Aristida congesta, Stipagrostis uniplumis* & *Schmidtia pappophoroides* while other species also found to be present include *Eragrostis lehmanniana, Pogonarthria squarrosa* & *Cymbopogon pospischilii.*

A small seasonal drainage line traverses the northern portion of the eastern section of the assessment area but it dissipates into the confined degraded area directly adjacent to the dirt road. This seasonal drainage line does not fall within any of the proposed cultivated pivot land footprints and should therefore not be adversely affected by the proposed development.

Figure 6: Image illustrating the landscape of the proposed northern portion of the eastern section of the assessment area with the hill complex in the background

The two approximate 19 ha proposed cultivated pivot land footprints and 200 mm irrigation pipeline situated directly adjacent the dirt road in the southern portion of the eastern section of the assessment area have a similar species composition and structure to that of the northern footprints. The average density of the nationally protected shrub species *Vachellia haematoxylon* is however slightly higher and amounts to approximately 30 shrubs/ha which equates to a total estimate of approximately 540 shrubs within these two footprints which will need to be removed. Five tree individuals of significant size of this species were found to be present within the southern portion of the eastern section of the assessment area of which four will need to be removed that fall inside the proposed cultivated pivot land footprints. The fifth individual falls outside the proposed footprints areas. This tree must be left in situ.

A single isolated clump of five medium sized tree individuals of the nationally protected tree species *Vachellia erioloba* were found to be present within this southern portion of the eastern section. They however fall on the edge of the most southerly located footprint and it is therefore recommended that they be left in situ if practically possible.

Within the remaining portion of the eastern section of the assessment area, the open grassland is replaced by a relatively dense savannah with a significantly increased woody density and diversity. This portion is associated with three approximate 19 ha proposed cultivated pivot lands, one of which is only associated with Alternative 1 (preferred), and a single approximate 3 ha footprint as

well as 200 mm irrigation pipelines. The reason for the significant increase in woody density and diversity is the closer proximity to the woody hill complex. The complete dominance of the woody shrub *Vachellia haematoxylon* is replaced by a more representative mixture of low to medium height trees and shrubs of the species *Vachellia haematoxylon, Searsia tridactyla, S burchellii, Tarchonanthus camphoratus, Lebeckia macrantha, Senegalia mellifera, Ziziphus mucronata, Ehretia rigida* & *Grewia flava.* The average density of *Vachellia haematoxylon* still amounts to approximately 30/ha which equates to a total estimate of approximately 1800 individuals within these four footprints which will need to be removed. Only one tree individual of significant size of this species was found to be present within the approximate 3 ha footprint of the eastern section of the assessment area which will need to be removed.

Two isolated clumps of two and five medium sized tree individuals respectively of the nationally protected tree species *Vachellia erioloba* were found to be present within two of the approximate 19 ha footprints of the eastern section. They will have to be removed.

A single individual of the nationally protected tree species *Boscia albitrunca* was found to be present on the edge of the additional footprint associated with Alternative 1 (preferred) which must be left in situ. The density of the woody component within this additional footprint associated with Alternative 1 (preferred) however made access and sufficient observation of other potential individuals difficult. It is therefore recommended that an additional ecological walkthrough of this footprint be conducted prior to commencement of the construction phase in order to identify potential additional individuals.

With the exception of the single individual of the provincially protected species *Boophone disticha,* no Red Data Listed-, or any other species of conservational significance were found to be present within the proposed cultivated pivot land footprints of the eastern section of the assessment area.

Figure 7: Image illustrating the relatively dense woody landscape of the remaining portion of the eastern section of the assessment area

As with the western section, the open grassland of the eastern section of the assessment area is utilised by various smaller antelope species such as Steenbok (*Raphicerus campestris)*, burrowing mammals as well as numerous reptiles such as lizards, snakes & tortoises for foraging/persistence habitat but the mobility of such animals along with the vast, continuous, undeveloped surrounding natural landscape allows for individuals to simply leave an area where disturbance is taking place and disperse to other similar, adequate areas. The assessment area does not fall within any Important Bird Areas (IBA) as per the latest IBA map obtained from the Birdlife SA website (www.birdlife.org.za/conservation/important bird areas/iba-map). No important bird species, unique or specialised bird habitats were observed either.

The denser woody areas of the eastern section of the assessment area (as discussed above) along with the hill complex are however utilised by various larger antelope species such as Kudu as well as other mammal and bird species as refuge and for breeding/persistence purposes. Although a portion of these denser woody areas will be transformed by the proposed development, the hill complex and ESA will remain intact and should provide sufficient remaining persistence habitat. It is recommended that a sufficient corridor must be buffered out around the footslope of the hill complex if practicably possible in order to ensure continued ecological connectivity and functionality of the adjacent ESA and to allow for movement of fauna and flora through the broader area.

Table 6: Species list for the proposed cultivated pivot land footprint areas associated with the eastern section of the assessment area (Nationally protected species highlighted in orange and legally declared invasive species in pink)

Species name		
Graminoids	**Forbs and small shrubs**	**Shrubs & trees**
Aristida congesta	*Acrotome inflata*	*Boscia albitrunca*
Cymbopogon pospischilii	*Barleria rigida*	*Ehretia rigida*
Eragrostis lehmanniana	*Boophone disticha*	*Grewia flava*
Pogonarthria squarrosa	*Crotolaria orientalis*	*Lebeckia macrantha*
Schmidtia pappophoroides	*Dicoma schinzii*	*Prosopis sp.*
Stipagrostis uniplumis	*Elephantorrhiza elephantina*	*Searsia burchellii*
-	*Euryops subcarnosus*	*Searsia tridactyla*
-	*Hermannia comosa*	*Senegalia mellifera*
-	*Hermannia tomentosa*	*Tarchonanthus camphoratus*
-	*Hertia pallens*	*Vachellia erioloba*
-	*Indigofera dalaeoides*	*Vachellia haematoxylon*
-	*Lebeckia spinescens*	*Vachellia karroo*
-	*Lycium horridum*	*Ziziphus mucronata*
-	*Osteospermum leptolobum*	-
-	*Pollichia campestris*	-
-	*Pteronia sp.*	-
-	*Pterothrix spinescens*	-
-	*Salsola aphylla*	-
-	*Senna italica subsp arachoides*	-
-	*Wahlenbergia nodosa*	-

8.2.2. Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS)

The Present Ecological State (PES) of the eastern section of the assessment area is classified as Class B as it is largely natural. A change in natural habitats and biota has taken place in two confined areas due to significant degradation caused by concentrated cattle grazing and resting activities but the ecosystem functionality of the larger area has remained essentially unchanged.

The Olifantshoek Plains Thornveld vegetation type (SVk 13), within which the assessment area is situated, is merely classified as least threatened by Mucina & Rutherford (2006). The eastern section

footprints of the assessment area are moderately sized relative to the surrounding natural landscape associated with the vegetation type which is vast and relatively homogenous. The entire assessment area is also merely classified as 'other natural land' in accordance with the Northern Cape Provincial Spatial Biodiversity Plan.

A total of approximately 2662 shrub and tree individuals of the nationally protected tree species *Vachellia haematoxylon* are present within the proposed footprint areas which will need to be removed. The fact that their sizes and growth forms in the grassland are mainly restricted to low shrubs (≤ 2 m) indicates the potential impact of historic farm management practices which may have induced a degree of bush encroachment of this species, rather than natural representation/distribution. This assumption therefore detracts somewhat from their significance as nationally protected species on this specific site. The tree and shrub individuals of this species within the denser woody portions are however of more conservational significance as they form part of the dense savannah in closer proximity to the woody hill complex and ESA. A single isolated clump of five medium sized tree individuals of the nationally protected tree species *Vachellia erioloba* were found to be present within the southern portion of the eastern section. They however fall on the edge of the most southerly located footprint and it is therefore recommended that they be left in situ if practically possible. Two other isolated clumps of two and five medium sized tree individuals respectively of this species were also found to be present within two of the approximate 19 ha footprints of the eastern section. They will have to be removed. A single individual of the nationally protected tree species *Boscia albitrunca* was found to be present on the edge of the additional footprint associated with Alternative 1 (preferred) which must be left in situ. With the exception of the single individual of the provincially protected species *Boophone disticha,* no Red Data Listed-, or any other species of conservational significance were found to be present within the proposed cultivated pivot land footprints of the eastern section of the assessment area.

The mobility of smaller antelope species, burrowing mammals as well as reptiles, along with the vast, continuous surrounding natural landscape allows for individuals to simply leave an area where disturbance is taking place and disperse to other similar, adequate areas. The assessment area also does not fall within any Important Bird Areas (IBA) as per the latest IBA map obtained from the Birdlife SA website (www.birdlife.org.za/conservation/important bird areas/iba-map). No important bird species, unique or specialised bird habitats were observed either. The denser woody areas of the eastern section of the assessment area along with the hill complex are however utilised by various larger antelope species such as Kudu as well as other mammal and bird species as refuge and

for breeding/persistence purposes. Although a portion of these denser woody areas will be transformed by the proposed development, the hill complex and ESA will remain intact and should provide sufficient remaining ecological connectivity and functionality. It is recommended that a sufficient corridor must be buffered out around the footslope of the hill complex if practicably possible in order to ensure continued ecological connectivity and functionality of the adjacent ESA and to allow for movement of fauna and flora through the broader area.

The Ecological Importance and Sensitivity (EIS) of the eastern section of the assessment area is therefore classified as Class C (moderate) as it could be viewed as ecologically important and sensitive on provincial scale mainly due to the significant presence of nationally protected tree species within the denser woody areas. Biodiversity is however still relatively ubiquitous within the broader area. The denser woody areas within the eastern section of the assessment area are however viewed as being of moderate conservational significance for habitat preservation or ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type, ESA and protected tree species.

8.3. Ecological Sensitivity Map

The sensitivity map below illustrates the proposed buffer zone to be implemented around the footslope of the hill complex. It also indicates the locations of the identified *Vachellia erioloba* clumps, significantly sized *Vachellia haematoxylon* tree individuals, the single provincially protected *Boophone disticha* individual as well as the small seasonal drainage line.

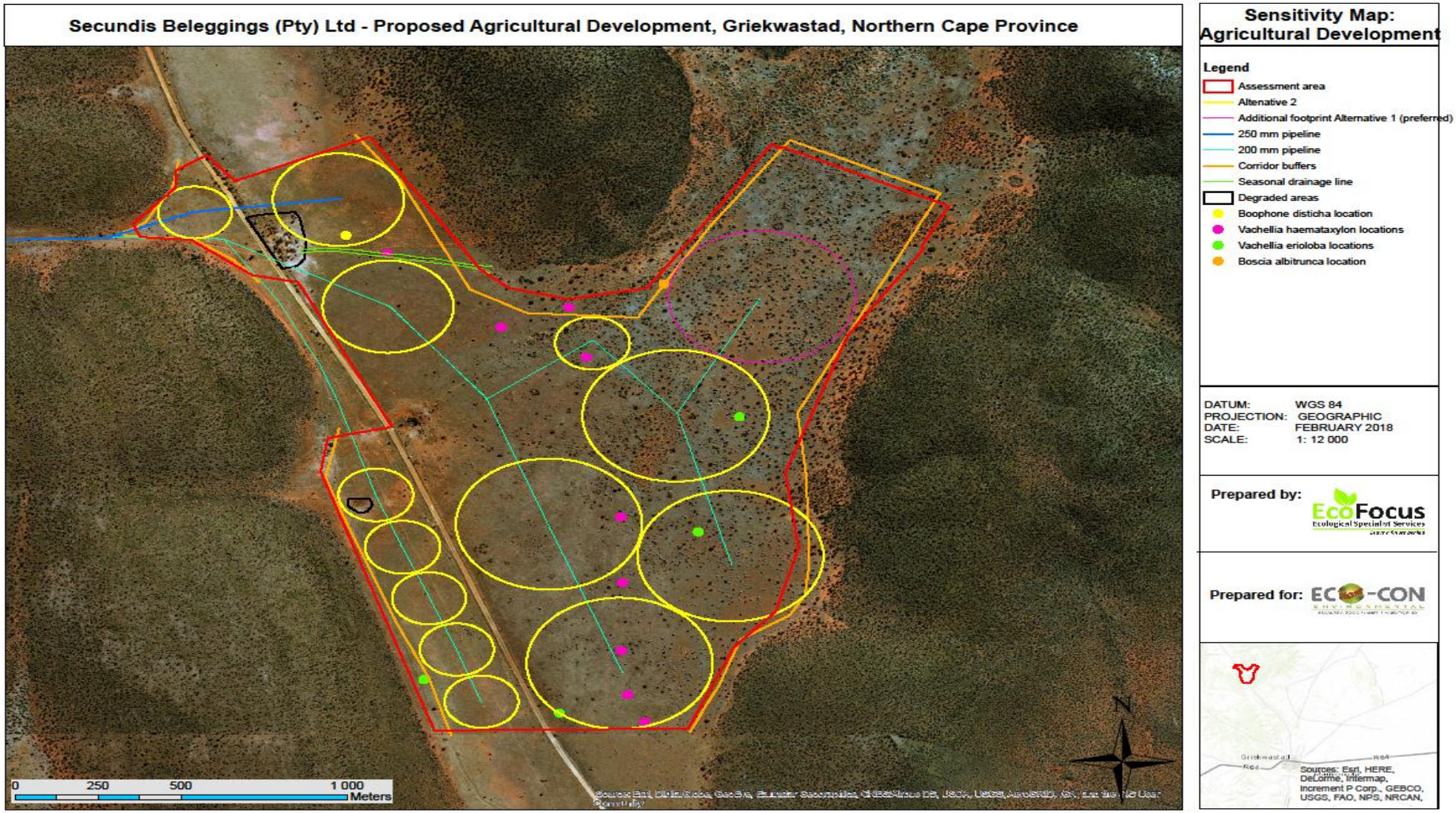

Figure 8: Sensitivity map illustrating the proposed buffer zone to be implemented around the footslope of the hill complex. The locations of the identified *Vachellia erioloba* clumps, significantly sized *Vachellia haematoxylon* tree individuals, the single provincially protected *Boophone disticha* individual as well as the small seasonal drainage line are also illustrated (see A3 sized map in the Appendices)

9. Ecological Impact Assessment

The following section identifies the potential ecological impacts (both positive and negative) which the proposed project will have on the surrounding environment.

Once the potential ecological impacts are identified, they are assessed by rating their Environmental Risk after which the final Environmental Significance is calculated and rated for each identified ecological impact.

The same Environmental Risk rating process is then followed for each ecological impact to determine the Environmental Significance if the recommended mitigation measures were to be implemented.

The objective of this section is therefore firstly to identify all the potential ecological impacts of the proposed project and secondly to determine the significance of the impacts and how effective the recommended mitigation measures will be able to reduce their significance. The potential ecological impacts which are still rated as highly significant, even after implementation of mitigations, can then be identified in order to specifically focus on implement of effective management strategies for them.

9.1. Construction Phase

Transformation of terrestrial vegetation on the assessment area associated with the Olifantshoek Plains Thornveld vegetation type (SVk 13)

The proposed cultivated pivot land developments will in all probability completely transform the existing surface vegetation on their 135 ha or 116 ha total footprint areas depending on the final footprint alternative which is eventually decided upon. The irrigation pipelines will only transform a narrow linear section of approximately 900 mm along their lengths.

Although the proposed cultivated pivot land footprints scored a relatively high PES value, the relevant vegetation type is merely classified as least threatened and the footprints are moderately sized relative to the surrounding natural landscape associated with the vegetation type which is vast and relatively homogenous. The entire assessment area is also merely classified as 'other natural land' in accordance with the Northern Cape Provincial Spatial Biodiversity Plan and merely scored a moderate EIS value. The area is therefore not necessarily viewed as being of high conservational significance for habitat preservation or ecological functionality persistence in support of the surrounding ecosystem or broader vegetation type. The denser woody areas within the eastern

section of the assessment area associated with the additional footprint of Alternative 1 (preferred) is however viewed as being of moderate conservational significance for habitat preservation or ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type and protected tree species. Although a portion of these denser woody areas will be transformed by the proposed development, the hill complex and ESA will remain intact and should provide sufficient remaining ecological connectivity and functionality. The significance of this potential impact will be medium for both alternatives with Alternative 1 (preferred) scoring a slightly higher rating to due to the additional approximate 19 ha footprint.

Mitigation measures to reduce potential impacts:

- The recommended buffer zone around the footslope of the hill complex (as per heading 8) is to be adequately implemented and maintained. This will ensure continued ecological connectivity and functionality of the adjacent ESA and will allow for movement of fauna and flora through the broader area.
- A small portion of one of the approximate 19 ha footprints will fall inside the proposed buffer zone but this should not adversely impact on the functionality of the corridor.
- The project construction footprints must be kept as small as practicably possible to reduce the actual surface impact on vegetation and no unnecessary/unauthorised footprint expansion into the surrounding areas may take place.
- No site construction camp to be established in any natural surrounding areas outside the proposed development areas. Site camps only to be established within the proposed development footprints.
- Adequately fence off the construction areas and ensure that no construction activities, machines or equipment operate or impact outside the fenced off areas.
- Natural veld situated in-between the proposed pivot lands must not be impacted upon and must be left in situ.
- Existing roads and farm tracks in close proximity to the proposed project area must be used during construction. No new roads or tracks to be constructed or implemented through any of the surrounding natural areas.
- The mechanical excavation footprint of the irrigation pipeline trench must be kept as confined as practicably possible.
    - Machines must stay on the pipeline route during excavation and no machines are allowed to move into- or impact on adjacently located natural areas.

- Areas within and immediately surrounding the excavated areas must be adequately rehabilitated to prevent significant alien invasive species establishment.

Destruction/damage to Red Data Listed, nationally or provincially protected species individuals associated with the Olifantshoek Plains Thornveld vegetation type (SVk 13)

The proposed cultivated pivot land developments will in all probability completely transform the existing surface vegetation on their 135 ha or 116 ha total footprint areas depending on the final footprint alternative which is eventually decided upon. The irrigation pipelines will only transform a narrow linear section of approximately 900 mm along their lengths.

A total of approximately 2662 shrub and tree individuals of the nationally protected tree species *Vachellia haematoxylon* are present within the proposed footprint areas which will need to be removed. The fact that their sizes and growth forms in the open grassland are mainly restricted to low shrubs (≤ 2 m) indicates the potential impact of historic farm management practices which may have induced a degree of bush encroachment of this species, rather than natural representation/distribution. This assumption therefore detracts somewhat from their significance as nationally protected species on this specific site. The tree and shrub individuals of this species within the denser woody portions are however of more conservational significance as they form part of the dense savannah in closer proximity to the woody hill complex and ESA. Two isolated clumps of two and five medium sized tree individuals respectively of the nationally protected tree species *Vachellia erioloba* were found to be present within the southern portions of the eastern and western sections of the assessment area. They however fall outside the proposed footprints and it is therefore recommended that they be left in situ if practically possible. Two other isolated clumps of two and five medium sized tree individuals respectively of this species were also found to be present within two of the approximate 19 ha footprints of the eastern section. They will have to be removed. A single individual of the nationally protected tree species *Boscia albitrunca* was found to be present on the edge of the additional footprint associated with Alternative 1 (preferred) which must be left in situ. With the exception of the single individual of the provincially protected species *Boophone disticha,* no Red Data Listed-, or any other species of conservational significance were found to be present within the proposed cultivated pivot land footprints of the assessment area. The significance of this potential impact will be medium-high for Alternative 1 (preferred) and medium for Alternative 2.

Mitigation measures to reduce potential impacts:

- A Provincial Flora Permit and National Protected Tree Permit has to be obtained prior to the commencement of any construction activities.
- The project construction footprints must be kept as small as practicably possible to reduce the actual surface impact on vegetation and no unnecessary/unauthorised footprint expansion into the surrounding areas may take place.
- No site construction camp to be established in any natural surrounding areas outside the proposed development areas. Site camps only to be established within the proposed development footprints.
- Adequately fence off the construction areas and ensure that no construction activities, machines or equipment operate or impact outside the fenced off areas.
- Natural veld and indicated nationally protected tree species individuals situated in-between the pivot lands must not be impacted upon and must be left in situ.
- Existing roads and farm tracks in close proximity to the proposed project area must be used during construction. No new roads or tracks to be constructed or implemented through any of the surrounding natural areas.
- It is recommended that the single individual of the species *Boophone disticha* (provincially protected and formerly Red Data Listed) which was found to be present within the most northerly situated proposed cultivated pivot land footprint of the eastern section be removed prior to the commencement of the construction phase and adequately relocated to a suitable, similar open area.
    - A Plant Relocation Management Plan must be compiled by a suitably qualified and experienced ecologist for the removal process.

Alien invasive species establishment

Two small confined areas within the western and eastern sections of the assessment area respectively have been significantly degraded due to concentrated cattle grazing and resting activities. The portion within the eastern section has resulted in a relatively dense stand of the legally declared invasive species *Prosopis sp.* (Category 3). No other significant invasive species establishments are present within the proposed cultivated pivot land footprints. The footprint areas and surrounding natural areas could however potentially be prone to significant alien invasive species establishment due to disturbances caused by soil preparation and cultivation activities. The footprints are moderately sized relative to the surrounding natural landscape which is vast and relatively homogenous and the significance of this potential impact will be low.

Mitigation measures to reduce potential impacts:

- Individuals of the legally declared invasive species *Prosopis sp.* (Category 3) must be actively eradicated from the assessment area and adequately disposed of in accordance with the National Environmental Management: Biodiversity Act (Act 10 of 2004); Alien and Invasive Species Regulations, 2014.
- Implement an adequate Alien Invasive Species Establishment Management and Prevention Plan during the construction phase. Such a management plan must be compiled by a suitably qualified and experienced ecologist.
- Areas within and immediately surrounding the proposed development footprints must be adequately rehabilitated to prevent significant alien invasive species establishment.
- No site construction camp to be established in any natural surrounding areas outside the proposed development areas. Site camps only to be established within the proposed development footprints.
- Adequately fence off the construction areas and ensure that no construction activities, machines or equipment operate or impact outside the fenced off areas.
- Existing roads and farm tracks in close proximity to the proposed project area must be used during construction. No new roads or tracks to be constructed or implemented through any of the surrounding natural areas.

Surface material erosion

The proposed cultivated pivot land footprints and surrounding natural areas could potentially be prone to surface soil erosion due to the loosening of materials and removal of vegetation during construction which usually binds surface material. Due to the moderately sized footprints and relatively flat topography of the area, the risk of erosion is however low. The risk of erosion associated with the irrigation pipeline will also be low due to its confined narrow linear section. The significance of this potential impact will therefore be low.

Mitigation measures to reduce potential impacts:

- An adequate Storm water and Erosion Management Plan must be implemented for the entire assessment area during the construction phase. This must be done in order to sufficiently manage storm water runoff and clean/dirty water separation in order to prevent any significant erosion from occurring.
- Areas within and immediately surrounding the assessment area and excavated pipeline trenches must be adequately rehabilitated to prevent significant erosion.

Dust generation and emissions

The soil preparation and cultivation activities associated with the proposed project construction phase could potentially result in significant fugitive dust emissions due to vegetation removal. This could spread into the surrounding natural areas but due to the moderately sized footprints of the areas, the significance of this potential impact will be low.

Mitigation measures to reduce potential impacts:

- Implement suitable dust management and prevention measures during the construction phase.
- Areas within and immediately surrounding the proposed project footprints must be adequately rehabilitated to prevent significant dust emissions.

Impeding and contamination of the surface water catchment and drainage area towards the south

The development of the proposed cultivated pivot lands could potentially impede on surface water flow within the area. The significantly broader landscape gradually decreases in topographic elevation to the south over an extended distance. Due to the moderately sized footprints and relatively flat topography of the landscape no significant surface water drainage flow impediment is however expected. The significance of this potential impact will be low.

Mitigation measures to reduce potential impacts:

- An adequate Storm water Management Plan must be implemented within the assessment area during the construction phase. This must be done in order to sufficiently manage storm water runoff and clean/dirty water separation during the construction phase.

9.2. Operational Phase

Once the construction phase has been completed, there should be no significant additional or new ecological impacts associated with the operational phase over and above the already discussed significant long term impacts of the operational phase. The destruction of nationally protected tree species was discussed under the construction phase impact section as a long term impact which will continue throughout the entire lifespan and operational phase of the proposed project.

A number of identified potential ecological impacts could however change in nature and increase in significance from the construction phase into the operational phase and will continue throughout while three additional potential significant ecological impact could additionally take place during the operational phase.

Alien invasive species establishment

The established cultivated pivot lands and surrounding natural areas could potentially be prone to significant continued alien invasive species establishment due to continual disturbances caused by soil preparation and cultivation activities. The moderately sized footprints relative to the surrounding natural landscape which is vast and relatively homogenous will result in the significance of this potential impact being low.

Mitigation measures to reduce potential impacts:

- Implement an adequate Alien Invasive Species Establishment Management and Prevention Plan during the operational phase. Such a management plan must be compiled by a suitably qualified and experienced ecologist.

Dust generation and emissions

Continued soil preparation and cultivation activities associated with the proposed project operational phase could potentially result in significant continual fugitive dust emissions during the cultivation season. This could continually spread into the surrounding natural areas but due to the moderately sized footprints of the areas, the significance of this potential impact will be low.

Mitigation measures to reduce potential impacts:

- Implement suitable dust management and prevention measures during the cultivation season.
    - Pivot lands to be sufficiently irrigated prior to commencement of cultivation and planting activities in order to prevent significant fugitive dust emissions.

Impeding and contamination of the surface water catchment and drainage area towards the south

The established cultivated pivot lands could potentially continuously impede on surface water flow within the area. Due to the moderately sized footprints and relatively flat topography of the landscape no significant continued surface water drainage flow impediment is however expected. The significance of this potential impact will be low.

Mitigation measures to reduce potential impacts:

- An adequate Storm water Management Plan must be implemented within the assessment area during the operational phase. This must be done in order to sufficiently manage storm water runoff and clean/dirty water separation during the construction phase.

Alteration/contamination of soil and groundwater characteristics/quality

Operation of the cultivated pivot lands will include significant continual irrigation, chemical and organic fertilisation as well as herbicide/pesticide treatment. This continued fertilisation and herbicide/pesticide treatment over time will result in significant long term leaching of salts, chemicals and other inorganic elements into the soil and groundwater. This will potentially alter and negatively affect the soil characteristics as well as quality/characteristics of groundwater over time. This will constitute a long term effect which will gradually commence during the operational phase and will continue for the entire duration of the proposed project lifespan and significantly beyond. The moderately sized footprints relative to the surrounding natural landscape will result in the significance of this potential impact being medium.

Mitigation measures to reduce potential impacts:

- Irrigation, fertilisation and herbicide/pesticide practices must be adequately managed in order to prevent over-fertilisation or over-irrigation which could lead to significant leaching and contamination of groundwater. A suitably qualified and experienced specialist must be consulted in order to advise on appropriate management practices.

Impeding of the ecological connectivity and functionality of the broader remaining natural area

Once the construction phase has been completed, the cultivated pivot lands could pose obstructions which will hinder the adequate movement and dispersal of fauna and flora through the grassland area. The mobility of such animals along with the vast, continuous, undeveloped surrounding natural landscape allows for individuals to simply leave an area where disturbance is taking place and disperse to other similar, adequate areas. The denser woody areas of the eastern section of the

assessment area along with the hill complex are also utilised by various larger antelope species such as Kudu as well as other mammal and bird species as refuge and for breeding/persistence purposes. Although a portion of these denser woody areas will be transformed by the proposed development, the hill complex and ESA will remain intact and should provide sufficient remaining ecological connectivity and functionality. The significance of this potential impact will be low.

Mitigation measures to reduce potential impacts:

- The recommended buffer zone around the footslope of the hill complex (as per heading 8) is to be adequately implemented and maintained. This will ensure continued ecological connectivity and functionality of the adjacent ESA and will allow for movement of fauna and flora through the broader area.

Over extraction of groundwater

Significant quantities of groundwater will be extracted for irrigation purposes. In accordance with the information received from the EAP, the boreholes to be used are approved and licensed and have been in use for many years. The boreholes will deliver water at a rate of 95 m^3/ hour and will run on average 12 hours per day (1140 m^3/ day). It will peak for approximately 3 weeks at 1900 m^3 per day. The growing season for early generation seed potatoes is from 10 January to 10 April with peak water requirements in March. The significance of this potential impact will be medium.

Mitigation measures to reduce potential impacts:

- Irrigation practices must be adequately managed in order to prevent over-irrigation. A suitably qualified and experienced specialist must be consulted in order to advise on appropriate management practices.
- Only the allotted water quantities as per the approved Water Use License are to be extracted.
    - If a valid Water Use License is however not in place, this must firstly be applied for and obtained prior to the commencement of the operational phase.
- A flow meter is to be installed in order to be able to monitor and manage water consumption.
- Water consumption figures must be submitted to the Department of Water and Sanitation (DWS) on a regular basis in order to ensure compliance with the allotted water quantities as per the approved Water Use License.

9.3. Cumulative Impacts

With the exception of the approximate 19 ha proposed pivot land which is being separately applied for by the applicant in a Basic Assessment process, virtually no other existing agricultural developments and transformation is present within the broader area. No other potential agricultural developments can be reasonably anticipated for the future within the broader area. Despite the moderate combined sizes of the proposed cultivated pivot lands, the surrounding natural landscape is vast, undeveloped and relatively homogenous and it is therefore not anticipated that the proposed development will present any significant increase in potential cumulative negative impacts.

9.4. Risk Ratings of Potential Impacts

The following section provides the Environmental Risk as well as the Environmental Significance Ratings for the potential ecological impacts for the proposed project both before and after implementation of the recommended mitigation measures.

9.4.1. Construction Phase

Table 7: Environmental Risk and Significance Ratings

	Alternative 1 (preferred)	Alternative 2
Identified Environmental Impact	**Transformation of terrestrial vegetation on the assessment area associated with the Olifantshoek Plains Thornveld vegetation type (SVk 13)**	
Magnitude of Negative or Positive Impact	Medium (6)	Low (4)
Duration of Negative or Positive Impact	Long term (4)	Long term (4)
Extent of Positive or Negative Impact	Site specific (1)	Site specific (1)
Irreplaceability of Natural Resources being impacted upon	Low (2)	Low (2)
Reversibility of Impact	Moderate (3)	Moderate (3)
Probability of Impact Occurrence	High (4)	High (4)
Cumulative Impact Rating prior to mitigation	Low	Low
Environmental Significance Score and Rating prior to mitigation	Medium (64)	Medium (56)

Mitigation Measures to be implemented	The recommended buffer zone around the footslope of the hill complex (as per heading 8) is to be adequately implemented and maintained. This will ensure continued ecological connectivity and functionality of the adjacent ESA and will allow for movement of fauna and flora through the broader area. A small portion of one of the approximate 19 ha footprints will fall inside the proposed buffer zone but this should not adversely impact on the functionality of the corridor. The project construction footprints must be kept as small as practicably possible to reduce the actual surface impact on vegetation and no unnecessary/unauthorised footprint expansion into the surrounding areas may take place. No site construction camp to be established in any natural surrounding areas outside the proposed development areas. Site camps only to be established within the proposed development footprints. Adequately fence off the construction areas and ensure that no construction activities, machines or equipment operate or impact outside the fenced off areas. Natural veld situated in-between the proposed pivot lands must not be impacted upon and must be left in situ. Existing roads and farm tracks in close proximity to the proposed project area must be used during construction. No new roads or tracks to be constructed or implemented through any of the surrounding natural areas.

	The mechanical excavation footprint of the irrigation pipeline trench must be kept as confined as practicably possible. Machines must stay on the pipeline route during excavation and no machines are allowed to move into- or impact on adjacently located natural areas. Areas within and immediately surrounding the excavated areas must be adequately rehabilitated to prevent significant alien invasive species establishment.	
Cumulative Impact Rating after mitigation implementation	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Medium (56)	Medium (56)
	Alternative 1 (preferred)	**Alternative 2**
Identified Environmental Impact	**Destruction/damage to Red Data Listed, nationally or provincially protected species individuals associated with the Olifantshoek Plains Thornveld vegetation type (SVk 13)**	
Magnitude of Negative or Positive Impact	Medium (6)	Low (4)
Duration of Negative or Positive Impact	Permanent (5)	Permanent (5)

Extent of Positive or Negative Impact	Site specific (1)	Site specific (1)
Irreplaceability of Natural Resources being impacted upon	Moderate (3)	Moderate (3)
Reversibility of Impact	Low (4)	Low (4)
Probability of Impact Occurrence	High (4)	High (4)
Cumulative Impact Rating prior to mitigation	Low	Low
Environmental Significance Score and Rating prior to mitigation	Medium-High (76)	Medium (68)
Mitigation Measures to be implemented	A Provincial Flora Permit and National Protected Tree Permit has to be obtained prior to the commencement of any construction activities. The project construction footprints must be kept as small as practicably possible to reduce the actual surface impact on vegetation and no unnecessary/unauthorised footprint expansion into the surrounding areas may take place. No site construction camp to be established in any natural surrounding areas outside the proposed development areas. Site camps only to be established within the proposed development footprints.	

	Adequately fence off the construction areas and ensure that no construction activities, machines or equipment operate or impact outside the fenced off areas. Natural veld and indicated nationally protected tree species individuals situated in-between the pivot lands must not be impacted upon and must be left in situ. Existing roads and farm tracks in close proximity to the proposed project area must be used during construction. No new roads or tracks to be constructed or implemented through any of the surrounding natural areas. It is recommended that the single individual of the species Boophone disticha (provincially protected and formerly Red Data Listed) which was found to be present within the most northerly situated proposed cultivated pivot land footprint of the eastern section be removed prior to the commencement of the construction phase and adequately relocated to a suitable, similar open area. A Plant Relocation Management Plan must be compiled by a suitably qualified and experienced ecologist for the removal process.	
Cumulative Impact Rating after mitigation implementation	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Medium (68)	Medium (68)

	Alternative 1 (preferred)	Alternative 2
Identified Environmental Impact	**Alien invasive species establishment**	
Magnitude of Negative or Positive Impact	Low (4)	Low (4)
Duration of Negative or Positive Impact	Short term (2)	Short term (2)
Extent of Positive or Negative Impact	Local (2)	Local (2)
Irreplaceability of Natural Resources being impacted upon	Low (2)	Low (2)
Reversibility of Impact	High (2)	High (2)
Probability of Impact Occurrence	Medium (3)	Medium (3)
Cumulative Impact Rating prior to mitigation	Low	Low
Environmental Significance Score and Rating prior to mitigation	Low (36)	Low (36)
Mitigation Measures to be implemented	Individuals of the legally declared invasive species Prosopis sp. (Category 3) must be actively eradicated from the assessment area and adequately disposed of in accordance with the National Environmental Management: Biodiversity Act (Act 10 of 2004); Alien and Invasive Species Regulations, 2014.	

	Implement an adequate Alien Invasive Species Establishment Management and Prevention Plan during the construction phase. Such a management plan must be compiled by a suitably qualified and experienced ecologist. Areas within and immediately surrounding the proposed development footprints must be adequately rehabilitated to prevent significant alien invasive species establishment. No site construction camp to be established in any natural surrounding areas outside the proposed development areas. Site camps only to be established within the proposed development footprints. Adequately fence off the construction areas and ensure that no construction activities, machines or equipment operate or impact outside the fenced off areas. Existing roads and farm tracks in close proximity to the proposed project area must be used during construction. No new roads or tracks to be constructed or implemented through any of the surrounding natural areas.	
Cumulative Impact Rating after mitigation implementation	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (9)	Low (9)

	Alternative 1 (preferred)	Alternative 2
Identified Environmental Impact	**Surface material erosion**	
Magnitude of Negative or Positive Impact	Low (4)	Low (4)
Duration of Negative or Positive Impact	Short term (2)	Short term (2)
Extent of Positive or Negative Impact	Local (2)	Local (2)
Irreplaceability of Natural Resources being impacted upon	Very low (1)	Very low (1)
Reversibility of Impact	High (2)	High (2)
Probability of Impact Occurrence	Low (2)	Low (2)
Cumulative Impact Rating prior to mitigation	Low	Low
Environmental Significance Score and Rating prior to mitigation	Low (22)	Low (22)
Mitigation Measures to be implemented	An adequate Storm water and Erosion Management Plan must be implemented for the entire assessment area during the construction phase. This must be done in order to sufficiently manage storm water runoff and clean/dirty water separation in order to prevent any significant erosion from occurring.	

	Areas within and immediately surrounding the assessment area and excavated pipeline trenches must be adequately rehabilitated to prevent significant erosion.	
Cumulative Impact Rating after mitigation implementation	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (8)	Low (8)
	Alternative 1 (preferred)	**Alternative 2**
Identified Environmental Impact	**Dust generation and emissions**	
Magnitude of Negative or Positive Impact	Low (4)	Low (4)
Duration of Negative or Positive Impact	Short term (2)	Short term (2)
Extent of Positive or Negative Impact	Local (2)	Local (2)
Irreplaceability of Natural Resources being impacted upon	Very low (1)	Very low (1)
Reversibility of Impact	High (2)	High (2)

Probability of Impact Occurrence	High (4)	High (4)
Cumulative Impact Rating prior to mitigation	Low	Low
Environmental Significance Score and Rating prior to mitigation	Low (44)	Low (44)
Mitigation Measures to be implemented	Implement suitable dust management and prevention measures during the construction phase. Areas within and immediately surrounding the proposed project footprints must be adequately rehabilitated to prevent significant dust emissions.	
Cumulative Impact Rating after mitigation implementation	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (16)	Low (16)
	Alternative 1 (preferred)	**Alternative 2**
Identified Environmental Impact	**Impeding and contamination of the surface water catchment and drainage area towards the south**	
Magnitude of Negative or Positive Impact	Very Low (2)	Very Low (2)

Duration of Negative or Positive Impact	Short term (2)	Short term (2)
Extent of Positive or Negative Impact	Regional (3)	Regional (3)
Irreplaceability of Natural Resources being impacted upon	Moderate (3)	Moderate (3)
Reversibility of Impact	High (2)	High (2)
Probability of Impact Occurrence	Low (2)	Low (2)
Cumulative Impact Rating prior to mitigation	Low	Low
Environmental Significance Score and Rating prior to mitigation	Low (24)	Low (24)
Mitigation Measures to be implemented	An adequate Storm water Management Plan must be implemented within the assessment area during the construction phase. This must be done in order to sufficiently manage storm water runoff and clean/dirty water separation during the construction phase.	
Cumulative Impact Rating after mitigation implementation	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (10)	Low (10)

9.4.2. Operational Phase

Table 8: Environmental Risk and Significance Ratings

	Alternative 1 (preferred)	Alternative 2
Identified Environmental Impact	**Alien invasive species establishment**	
Magnitude of Negative or Positive Impact	Medium (6)	Medium (6)
Duration of Negative or Positive Impact	Medium term (3)	Medium term (3)
Extent of Positive or Negative Impact	Local (2)	Local (2)
Irreplaceability of Natural Resources being impacted upon	Low (2)	Low (2)
Reversibility of Impact	High (2)	High (2)
Probability of Impact Occurrence	Medium (3)	Medium (3)
Cumulative Impact Rating prior to mitigation	Low	Low
Environmental Significance Score and Rating prior to mitigation	Low (45)	Low (45)

Mitigation Measures to be implemented	Implement an adequate Alien Invasive Species Establishment Management and Prevention Plan during the operational phase. Such a management plan must be compiled by a suitably qualified and experienced ecologist.	
Cumulative Impact Rating after mitigation implementation	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (10)	Low (10)
	Alternative 1 (preferred)	**Alternative 2**
Identified Environmental Impact	**Dust generation and emissions**	
Magnitude of Negative or Positive Impact	Low (4)	Low (4)
Duration of Negative or Positive Impact	Medium term (3)	Medium term (3)
Extent of Positive or Negative Impact	Local (2)	Local (2)
Irreplaceability of Natural Resources being impacted upon	Very low (1)	Very low (1)
Reversibility of Impact	High (2)	High (2)

Probability of Impact Occurrence	High (4)	High (4)
Cumulative Impact Rating prior to mitigation	Low	Low
Environmental Significance Score and Rating prior to mitigation	Low (48)	Low (48)
Mitigation Measures to be implemented	Implement suitable dust management and prevention measures during the cultivation season. Pivot lands to be sufficiently irrigated prior to commencement of cultivation and planting activities in order to prevent significant fugitive dust emissions.	
Cumulative Impact Rating after mitigation implementation	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (18)	Low (18)
	Alternative 1 (preferred)	**Alternative 2**
Identified Environmental Impact	**Impeding and contamination of the surface water catchment and drainage area towards the south**	
Magnitude of Negative or Positive Impact	Very Low (2)	Very Low (2)

Duration of Negative or Positive Impact	Medium term (3)	Medium term (3)
Extent of Positive or Negative Impact	Regional (3)	Regional (3)
Irreplaceability of Natural Resources being impacted upon	Moderate (3)	Moderate (3)
Reversibility of Impact	High (2)	High (2)
Probability of Impact Occurrence	Low (2)	Low (2)
Cumulative Impact Rating prior to mitigation	Low	Low
Environmental Significance Score and Rating prior to mitigation	Low (26)	Low (26)
Mitigation Measures to be implemented	An adequate Storm water Management Plan must be implemented within the assessment area during the operational phase. This must be done in order to sufficiently manage storm water runoff and clean/dirty water separation during the construction phase.	
Cumulative Impact Rating after mitigation implementation	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (11)	Low (11)

	Alternative 1 (preferred)	Alternative 2
Identified Environmental Impact	**Alteration/contamination of soil and groundwater characteristics/quality**	
Magnitude of Negative or Positive Impact	Low (4)	Low (4)
Duration of Negative or Positive Impact	Long term (4)	Long term (4)
Extent of Positive or Negative Impact	Regional (3)	Regional (3)
Irreplaceability of Natural Resources being impacted upon	Moderate (3)	Moderate (3)
Reversibility of Impact	Low (4)	Low (4)
Probability of Impact Occurrence	High (4)	High (4)
Cumulative Impact Rating prior to mitigation	Low	Low
Environmental Significance Score and Rating prior to mitigation	Medium (72)	Medium (72)
Mitigation Measures to be implemented	Irrigation, fertilisation and herbicide/pesticide practices must be adequately managed in order to prevent over-fertilisation or over-irrigation which could lead to significant leaching and contamination of groundwater. A suitably qualified and experienced specialist must be consulted in order to advise on appropriate management	

	practices.	
Cumulative Impact Rating after mitigation implementation	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (48)	Low (48)
	Alternative 1 (preferred)	**Alternative 2**
Identified Environmental Impact	**Impeding of the ecological connectivity and functionality of the broader remaining natural area**	
Magnitude of Negative or Positive Impact	Low (4)	Low (4)
Duration of Negative or Positive Impact	Medium term (3)	Medium term (3)
Extent of Positive or Negative Impact	Local (2)	Local (2)
Irreplaceability of Natural Resources being impacted upon	Moderate (3)	Moderate (3)
Reversibility of Impact	Moderate (3)	Moderate (3)
Probability of Impact Occurrence	Medium (3)	Medium (3)

Cumulative Impact Rating prior to mitigation	Low	Low
Environmental Significance Score and Rating prior to mitigation	Low (45)	Low (45)
Mitigation Measures to be implemented	The recommended buffer zone around the footslope of the hill complex (as per heading 8) is to be adequately implemented and maintained. This will ensure continued ecological connectivity and functionality of the adjacent ESA and will allow for movement of fauna and flora through the broader area.	
Cumulative Impact Rating after mitigation implementation	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (12)	Low (12)
	Alternative 1 (preferred)	**Alternative 2**
Identified Environmental Impact	**Over extraction of groundwater**	
Magnitude of Negative or Positive Impact	Low (4)	Low (4)
Duration of Negative or Positive Impact	Medium term (3)	Medium term (3)

Extent of Positive or Negative Impact	Regional (3)	Regional (3)
Irreplaceability of Natural Resources being impacted upon	Moderate (3)	Moderate (3)
Reversibility of Impact	Low (4)	Low (4)
Probability of Impact Occurrence	High (4)	High (4)
Cumulative Impact Rating prior to mitigation	Low	Low
Environmental Significance Score and Rating prior to mitigation	Medium (68)	Medium (68)
Mitigation Measures to be implemented	Irrigation practices must be adequately managed in order to prevent over-irrigation. A suitably qualified and experienced specialist must be consulted in order to advise on appropriate management practices. Only the allotted water quantities as per the approved Water Use License are to be extracted. If a valid Water Use License is however not in place, this must firstly be applied for and obtained prior to the commencement of the operational phase. A flow meter is to be installed in order to be able to monitor and manage water consumption. Water consumption figures must be submitted to the Department of Water and Sanitation (DWS) on a regular	

	basis in order to ensure compliance with the allotted water quantities as per the approved Water Use License.	
Cumulative Impact Rating after mitigation implementation	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (30)	Low (30)

10. Conclusion

The proposed cultivated pivot land developments will in all probability completely transform the existing surface vegetation on their 135 ha or 116 ha total footprint areas depending on the final footprint alternative which is eventually decided upon. The irrigation pipelines will only transform a narrow linear section of approximately 900 mm along their lengths. Although the proposed cultivated pivot land footprints scored a relatively high PES value, the Olifantshoek Plains Thornveld vegetation type (SVk 13) associated with the assessment area is merely classified as least threatened and the footprints are moderately sized relative to the surrounding natural landscape which is vast and relatively homogenous. The entire assessment area is also merely classified as 'other natural land' in accordance with the Northern Cape Provincial Spatial Biodiversity Plan and merely scored a moderate EIS value. The area is therefore not necessarily viewed as being of high conservational significance for habitat preservation or ecological functionality persistence in support of the surrounding ecosystem or broader vegetation type. Denser woody areas are however present within the eastern section of the assessment area associated with the additional footprint of Alternative 1 (preferred). These areas are viewed as being of moderate conservational significance for habitat preservation or ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type and nationally protected tree species which are present.

A total of approximately 2662 shrub and tree individuals of the nationally protected tree species *Vachellia haematoxylon* are present within the proposed footprint areas which will need to be removed. The fact that their sizes and growth forms in the open grassland are mainly restricted to low shrubs (≤ 2 m) indicates the potential impact of historic farm management practices which may have induced a degree of bush encroachment of this species, rather than natural representation/distribution. This assumption therefore detracts somewhat from their significance as nationally protected species on this specific site. The tree and shrub individuals of this species within the denser woody portions are however of more conservational significance as they form part of the dense savannah in closer proximity to the woody hill complex and adjacently located ESA. Although a portion of these denser woody areas will be transformed by the proposed development, the hill complex and ESA will remain intact and should provide sufficient remaining ecological connectivity and functionality.

Two isolated clumps of two and five medium sized tree individuals respectively of the nationally protected tree species *Vachellia erioloba* were found to be present within the southern portions of the eastern and western sections of the assessment area. They however fall outside the proposed

footprints and it is therefore recommended that they be left in situ if practically possible. Two other isolated clumps of two and five medium sized tree individuals respectively of this species were also found to be present within two of the approximate 19 ha footprints of the eastern section. They will have to be removed. A single individual of the nationally protected tree species *Boscia albitrunca* was found to be present on the edge of the additional footprint associated with Alternative 1 (preferred) which must be left in situ. With the exception of a single individual of the provincially protected species *Boophone disticha,* no Red Data Listed-, or any other species of conservational significance were found to be present within the proposed cultivated pivot land footprints of the assessment area.

The open grassland of the assessment area is utilised by various smaller antelope species such as Steenbok (*Raphicerus campestris)*, burrowing mammals as well as numerous reptiles such as lizards, snakes & tortoises for foraging/persistence habitat but the mobility of such animals along with the vast, continuous, undeveloped surrounding natural landscape allows for individuals to simply leave an area where disturbance is taking place and disperse to other similar, adequate areas. The assessment area does not fall within any Important Bird Areas (IBA) as per the latest IBA map obtained from the Birdlife SA website (www.birdlife.org.za/conservation/important bird areas/iba-map). No important bird species, unique or specialised bird habitats were observed either.

The denser woody areas of the eastern section of the assessment area along with the hill complex are utilised by various larger antelope species such as Kudu as well as other mammal and bird species as refuge and for breeding/persistence purposes. It is therefore recommended that a sufficient corridor must be buffered out around the footslope of the hill complex if practicably possible in order to ensure continued ecological connectivity and functionality of the adjacent ESA and to allow for movement of fauna and flora through the broader area.

It is in the opinion of the specialist that the only significant potential ecological impact identified and which cannot necessarily be suitably reduced and mitigated to within acceptable levels, is the removal of a significant number of tree/shrub individuals of the nationally protected species *Vachellia haematoxylon*. This potential ecological impact scored a slightly higher risk rating for Alternative 1 (preferred) than for Alternative 2 due to the additional approximate 19 ha footprint. The Department of Agriculture, Forestry and Fisheries (DAFF) should therefore be notified and adequately consulted during the Public Participation Process in order to obtain their comment and recommendations with regards to the viability of the proposed development. The rest of the

potential ecological impacts identified can be suitably reduced and mitigated to within acceptable levels and the project should therefore be considered by the competent authority for environmental authorisation and approval. Although Alternative 1 (preferred) scored a slightly higher risk rating than Alternative 2, the difference in ecological impact is not deemed significant due to the small relative increase in transformed footprint. Either of the alternatives can therefore be considered by the competent authority depending on the comment and recommendations received from DAFF.

The proposed project may only continue if all recommended mitigations measures as per this ecological report are adequately implemented and managed for both the construction and operational phases of the proposed project. All necessary authorisations and permits must also be obtained prior to any commencement.

11. References

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