

NEMA Section 24G
Ecological Assessment Report

Gladium Boerdery Familietrust
Agricultural Development,
Niekerkshoop, Northern Cape Province
September 2019

Compiled for:



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Executive Summary

The project applicant, Gladium Boerdery Familietrust historically cleared three separate areas of natural vegetation for the cultivation of irrigated centre pivot lands and irrigated rectangular lands on Portions 1 and 2 of the Farm Kloof no 143. The farm is situated approximately 12.5 km north-east of the town of Niekerskhoop, Northern Cape Province. The purpose of the cultivation has been for various commercial rotational crop production.

Water is extracted from a number of relevant supply boreholes on site and is utilised for irrigation of the combined approximate 35 ha areas.

In accordance with the information received from the Environmental Practitioner (EAP), the farm historically possessed ploughing- and water rights for 110 ha from the Department of Agriculture Forestry and Fisheries (DAFF). These water rights were however not used for a period in excess of 10 years after which cultivation of the areas resumed again.

No Environmental Authorisation, Ploughing Certificate or Water Use License were however obtained from the relevant competent authorities for the resumption of the cultivation processes, as is legally required. The applicant was subsequently informed by the Department of Water and Sanitation (DWS) that the water rights were no longer legally valid and that the applicant would therefore have to re-apply for a new Water Use License (WUL) in accordance with the National Water Act (Act 36 of 1998). After being informed of this legal transgression, the applicant has opted to follow a NEMA Section 24G rectification process in accordance with the National Environmental Management Act (Act 107 of 1998) (NEMA) in order to rectify the situation.

Eco-Con Environmental was appointed by the applicant as the independent Environmental Practitioner (EAP) to conduct the NEMA Section 24G rectification process.

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

EcoFocus Consulting was therefore subsequently appointed by the EAP as the independent ecological specialist to conduct the required Ecological study for the project. This report constitutes the NEMA Section 24G Ecological Assessment. A site visit/assessment for the development footprint area was conducted on 5 June 2019. This date forms part of the winter season. It must therefore be noted that the time of the assessment was not necessarily favourable for successful identification of all plant species individuals.

Methodology

The development area and surrounding areas were 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.

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

Study Area

The assessment areas consist of three separate portions namely Assessment areas 1, 2 and 3 which constitute cultivated irrigated centre pivot lands and irrigated rectangular lands. The assessment areas are situated on Portions 1 and 2 of the Farm Kloof no 143 (SG 21 Digit Codes: C0310000000014300001 and C0310000000014300002). The farm is situated approximately 12.5 km north-east of the town of Niekerskooop which forms part of the Pixley Ka Seme District Municipality, Northern Cape Province. Access to the assessment areas is obtained via the R 386 provincial road and subsequent dirt roads from the west.

The approximate sizes of the three separate areas are as follow:

- Assessment area 1 (Portion 2 of the Farm Kloof no 143) = 23.78 ha
- Assessment area 2 (Portion 2 of the Farm Kloof no 143) = 5.4 ha
- Assessment area 3 (Portion 1 of the Farm Kloof no 143) = 5.5 ha

According to SANBI (2006-), the three separate assessment areas all fall within the Northern Upper Karoo vegetation type (NKu 3) which mainly consists of flat to slightly sloping shrubland, dominated by dwarf karoo shrubs and sparse grasses. This vegetation type is classified as least threatened as very little has been transformed thus far (SANBI, 2006-).

The elevated hill complexes surrounding Assessment area 3, form part of the Kuruman Mountain Bushveld vegetation type (SVk 10) which is also classified as least threatened as very little has been transformed thus far (SANBI, 2006-). These hills have however not been directly or significantly impacted by the development of Assessment area 3.

Assessment area 1 is categorised as Other Natural Areas (ONA) in accordance with the Northern Cape Provincial Spatial Biodiversity Plan 2016 (NCPSBP), which sets out biodiversity priority areas in the province. Assessment areas 2 and 3 however fall within an Ecological Support Area (ESA). ESA's are areas that must be maintained in at least fair ecological condition (semi-natural/moderately modified state) in order to support the ecological functioning of a Critical Biodiversity Area (CBA) or protected area or that play an important role in delivering ecosystem services (Collins, 2017).

Results and Conclusion

The assessment areas constitute cultivated centre pivot lands and a number of adjoining rectangular lands of which all previously existing natural surface vegetation on the cultivated land footprints has been completely transformed.

The broader areas surrounding all three the assessment areas are mainly in an undeveloped natural condition and therefore scored high PES values. The localised undeveloped areas surrounding Assessment areas 1 & 2, constitute flat to slightly sloping low growing grassland mainly dominated by 'white grasses'. These areas also possess a well-represented dwarf karroid shrub layer while tree and shrub individuals are very sparsely present.

The localised undeveloped valley bottom areas surrounding Assessment area 3, constitute slightly sloping open savannah shrubland. The areas possess a relatively well-developed woody component which mainly consists of multi-stemmed shrubs with small single-stemmed trees also being sparsely present.

It is reasonably assumed that the historic ecology of the three assessment areas prior to the agricultural transformation, would have been comparable to that of their surrounding undeveloped

areas as they are situated directly adjacent to the assessment areas. No significant changes in soil structure or landscape topography or features are evident between the assessment areas and their surrounding undeveloped areas which further supports this assumption.

The average density of the nationally protected species *Vachellia erioloba* individuals within the undeveloped areas surrounding Assessment areas 1 & 2 amounts to approximately 0.25 trees/ha. This therefore equates to a total estimate of approximately 6 and 2 individuals within the footprints of Assessment areas 1 & 2 respectively which are reasonably assumed to have been removed during the initial cultivation.

The average density of the nationally protected species *Vachellia haemataxylon* individuals within the undeveloped areas surrounding Assessment areas 1 & 2 amounts to approximately 0.05 trees/ha. This therefore equates to a total estimate of approximately 2 individuals within the footprint of Assessment area 1 which are reasonably assumed to have been removed during the initial cultivation. The likelihood of any individuals historically being present within the cultivated land footprints of Assessment area 2 is however low.

Due to the localised undeveloped areas surrounding Assessment area 3 constituting open savannah shrubland, the density of nationally protected tree individuals is slightly higher relative to the other two assessment areas. The average density of *Vachellia erioloba* individuals within the undeveloped valley bottom areas surrounding Assessment area 3 amounts to approximately 3 trees/ha. This therefore equates to a total estimate of approximately 17 individuals within the footprint of Assessment area 3 which are reasonably assumed to have been removed during the initial cultivation.

The average density of the nationally protected species *Boscia albitrunca* individuals within the undeveloped valley bottom areas surrounding Assessment area 3 amounts to approximately 2 trees/ha. This therefore equates to a total estimate of approximately 11 individuals within the footprint of Assessment area 3 which are reasonably assumed to have been removed during the initial cultivation.

With the exception of the sparsely represented nationally protected tree species and the provincially protected species *Oxalis semiloba*, no Red Data Listed-, other provincially protected species or any other species of conservational significance were found to be present within the localised surrounding undeveloped areas. It is therefore also not anticipated that the assessment areas would

necessarily have housed large numbers of any species of conservational significance. It must however be noted that the time of the assessment was not necessarily favourable for successful identification of all plant species individuals.

Due to the natural pristine state of the broader surrounding undeveloped areas, the areas are utilised by a wide variety of common and specialised small antelope as well as burrowing and predatory mammals for breeding, foraging and persistence purposes. The mobility of such faunal species along with the broad, continuous surrounding natural landscape however allows for individuals to simply leave an area where disturbance is taking place and disperse to other similar, adequate areas.

The assessment areas and surrounding undeveloped areas do not fall within any Important Bird Area (IBA) as per the latest IBA map obtained from the Birdlife SA website (www.birdlife.org.za/conservation/important_bird_areas/iba-map). Small nests of common resident bird species were observed within some of the very sparsely represented shrub and tree individuals within the surrounding undeveloped areas, but no conservationally significant bird species, unique or specialised bird habitats were observed or are expected to utilise the areas for breeding and/or persistence purposes.

A distinct second order ephemeral water drainage line historically traversed Assessment area 1 flowing in an easterly direction and discharging into a significant ephemeral watercourse located approximately 1.9 km east of the assessment area. This significant watercourse forms an important part of the mid portion of a quaternary surface water catchment and drainage area which drains towards the south-east.

The cultivation of the rectangular lands associated with Assessment area 1, was however completed directly through the historic drainage line and the area was mechanically levelled for the lands. The original flow regime and -path of the drainage line towards the significant watercourse was therefore significantly altered and obstructed. Limited water flow however still takes place through the drainage line during rainfall events. It is recommended that the flow path of the drainage line be adequately diverted and channelled around the existing cultivated lands in order to ensure continued flow of surface water runoff during rainfall events, towards the significant ephemeral watercourse to the east.

This significant watercourse into which this drainage line flows, also flows past Assessment areas 2 & 3 directly adjacent east. The watercourse has however seemingly not been directly or significantly impacted by the development of Assessment areas 2 & 3. The original flow regime and -path of the watercourse has not been significantly altered or obstructed and unimpeded water flow still takes place through the watercourse during rainfall events. It is however recommended that a minimum approximate 40 m buffer zone should be implemented around the watercourse portion which is adjacent to Assessment area 2 and no further development may take place within the buffered area. It is also recommended that no further development may take place any closer to either of the watercourses within the localised area of Assessment area 3.

The three assessment areas and localised surrounding undeveloped natural areas would probably have scored moderate historic EIS values as these areas could have been viewed as being ecologically important and sensitive on local or possibly provincial scale mainly due to the sparse presence of nationally protected tree and shrub species individuals as well as the ephemeral water drainage line and significant ephemeral watercourses which form an important part of the mid portion of a quaternary surface water catchment and drainage area towards the south-east.

The three assessment areas would therefore historically probably have been viewed as being of moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type, ESA, nationally protected tree and shrub species individuals as well as the quaternary surface water catchment and drainage area which drains towards the south-east.

It is the opinion of the specialist that the virtually complete loss and transformation of natural habitat, biota and basic ecosystem functionality within the three assessment areas is deemed irreversible. Sufficient ecological restoration of the relevant vegetation type and its functionality within the assessment areas, will therefore not be practicably feasible.

It is further the opinion of the specialist that the development should not pose any further potentially significant long term ecological impacts which cannot be suitably reduced and mitigated to within acceptable residual levels. The significant ecological impacts associated with the impeding of the historic ephemeral water drainage line's and significant watercourses' flow regimes and alteration/contamination of soil and groundwater characteristics/quality, can be suitably reduced and mitigated to within acceptable residual levels.

The project should therefore be considered by the competent authority for Environmental Authorisation and approval. All recommended mitigations measures as per this ecological report must be adequately implemented and managed for the remainder of the operational phase and subsequent future decommissioning phase. All necessary authorisations, licenses and permits must also be obtained as soon as reasonably and practicably possible.

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Abbreviations

BA	Basic Assessment
CARA	Conservation of Agricultural Resources Act (Act 43 of 1983)
CBA	Critical Biodiversity Area
DAFF	Department of Agriculture Forestry and Fisheries
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
ESA	Ecological Support Area
MAP	Mean Annual Precipitation
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)
ONA	Other Natural Area
PES	Present Ecological State
WULA	Water Use License Application

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 Environmental Assessment Practitioner (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, Gladium Boerdery Familietrust historically cleared three separate areas of natural vegetation for the cultivation of irrigated centre pivot lands and irrigated rectangular lands on Portions 1 and 2 of the Farm Kloof no 143. The farm is situated approximately 12.5 km north-east of the town of Niekerskhoop, Northern Cape Province. The purpose of the cultivation has been for various commercial rotational crop production.

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No Environmental Authorisation, Ploughing Certificate or Water Use License were however obtained from the relevant competent authorities for the resumption of the cultivation processes, as is legally required. The applicant was subsequently informed by the Department of Water and Sanitation (DWS) that the water rights were no longer legally valid and that the applicant would therefore have to re-apply for a new Water Use License (WUL) in accordance with the National Water Act (Act 36 of 1998). After being informed of this legal transgression, the applicant has opted to follow a NEMA Section 24G rectification process in accordance with the National Environmental Management Act (Act 107 of 1998) (NEMA) in order to rectify the situation.

Eco-Con Environmental was appointed by the applicant as the independent Environmental Practitioner (EAP) to conduct the NEMA Section 24G rectification process.

Due to the nature of the impacts of the project on the local vegetation, an Ecological Assessment is required. This is required in order to determine the potential historic presence of ecologically

significant species, habitats or wetland areas within the project footprint. Proposed mitigation and management measures must also be recommended in order to attempt to reduce/alleviate the identified impacts.

EcoFocus Consulting was therefore subsequently appointed by the EAP as the independent ecological specialist to conduct the required Ecological study for the project. This report constitutes the NEMA Section 24G Ecological Assessment.

Preliminary preparations conducted prior to the ecological 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 conducted of the information available on the relevant vegetation types and national/provincial conservation significance status associated with the assessment area.

2. Date and Season of Ecological Site Assessment

A site visit/assessment for the development footprint area was conducted on 5 June 2019. This date forms part of the winter season. It must therefore be noted that the time of the assessment was not necessarily favourable for successful identification of all plant species individuals.

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 key 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 can therefore not be completely inhibited for the sake of ensuring environmental conservation, therefore solutions and compromises rather need to be explored in order to achieve the need for socio-economic development without unreasonably jeopardising the needs 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 Assessment of the proposed project area was therefore conducted in order to determine and quantify the impacts of the development on the natural environment in the area.

4. Objectives of the Assessment

Ecological and habitat survey:

- Describe the assumed historic vegetation on the assessment areas and identify and list conservationally significant faunal and floral species which could likely have been encountered on the project areas.
 - List any nationally and/or provincially protected and/or Red Data Listed species.
- Determine and discuss the Present Ecological State (PES) and extent of degradation and/or transformation of the vegetation on the assessment areas and surrounding areas. Also indicate the assumed historic Ecological Importance and Sensitivity (EIS) of the assessment areas in order to provide an indication of the assumed historic conservational significance of the assessment areas.
- Identify and delineate all watercourses/wetland areas potentially present on and in close proximity to the assessment areas.
- Identify, evaluate and rate the ecological impacts of the developments on the natural environment.
- Provide recommendations on mitigation and management measures in order to attempt to reduce/alleviate these identified ecological impacts.
- Provide recommendations on the suitability of the proposed development areas.
- A digital report (this document) as well as the digital KML files of any identified ecologically sensitive/conservationally significant areas will be provided to the applicant.

5. Methodology

- The development areas were 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 project areas were 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.

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 project areas and surrounding undeveloped areas were 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.

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.

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

Extent of Positive or Negative Impact	<p>5 - International: Impact will extend beyond National boundaries.</p> <p>4 - National: Impact will extend beyond Provincial boundaries but remain within National boundaries.</p> <p>3 - Regional: Impact will extend beyond 5 km of the development footprint but remain within Provincial boundaries.</p> <p>2 - Local: Impact will not extend beyond 5 km of the development footprint.</p> <p>1 - Site-specific: Impact will only occur on or within 200 m of the development footprint.</p> <p>0 – No impact.</p>
Irreplaceability of Natural Resources being impacted upon	<p>5 – Definite loss of irreplaceable natural resources.</p> <p>4 – High potential for loss of irreplaceable natural resources.</p> <p>3 – Moderate potential for loss of irreplaceable natural resources.</p> <p>2 – Low potential for loss of irreplaceable natural resources.</p> <p>1 – Very low potential for loss of irreplaceable natural resources.</p> <p>0 – No impact.</p>
Reversibility of Impact	<p>5 – Impact cannot be reversed.</p> <p>4 – Low potential that impact may be reversed.</p> <p>3 – Moderate potential that impact may be reversed.</p> <p>2 – High potential that impact may be reversed.</p> <p>1 – Impact will be reversible.</p> <p>0 – No impact.</p>
Probability of Impact Occurrence	<p>5 - Definite: Probability of impact occurring is > 95 %.</p> <p>4 - High: Probability of impact occurring is > 75 %.</p> <p>3 - Medium: Probability of impact occurring is between 25 % - 75 %.</p> <p>2 - Low: Probability of impact occurring is between 5 % - 25 %.</p> <p>1 - Improbable: Probability of impact occurring is < 5 %.</p>
Cumulative Impact	<p>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.</p> <p>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.</p> <p>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.</p> <p>None: No cumulative impact.</p>

Once the Environmental Risk Ratings have been evaluated for each ecological impact, the Significance Score of each 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 ecological impact as per Table 4 below. The Environmental Significance rating process is completed for all identified 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/watercourses were identified and delineated on the 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.

The wetland delineation procedure identifies the outer edge of the temporary zone of the wetland, which marks the boundary between the wetland and adjacent terrestrial areas. This constitutes the part of the wetland that might remain 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 the locating of 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/watercourse and a protective buffer zone beginning from the outer edge of the wetland temporary zone, was designated as sensitive in a sensitivity map. The guidelines stipulate buffers to be delineated around the boundary of a wetland. An adequate protective buffer zone, beginning from the outer edge of the wetland temporary zone, was implemented and designated as sensitive within which no development must be allowed to occur.

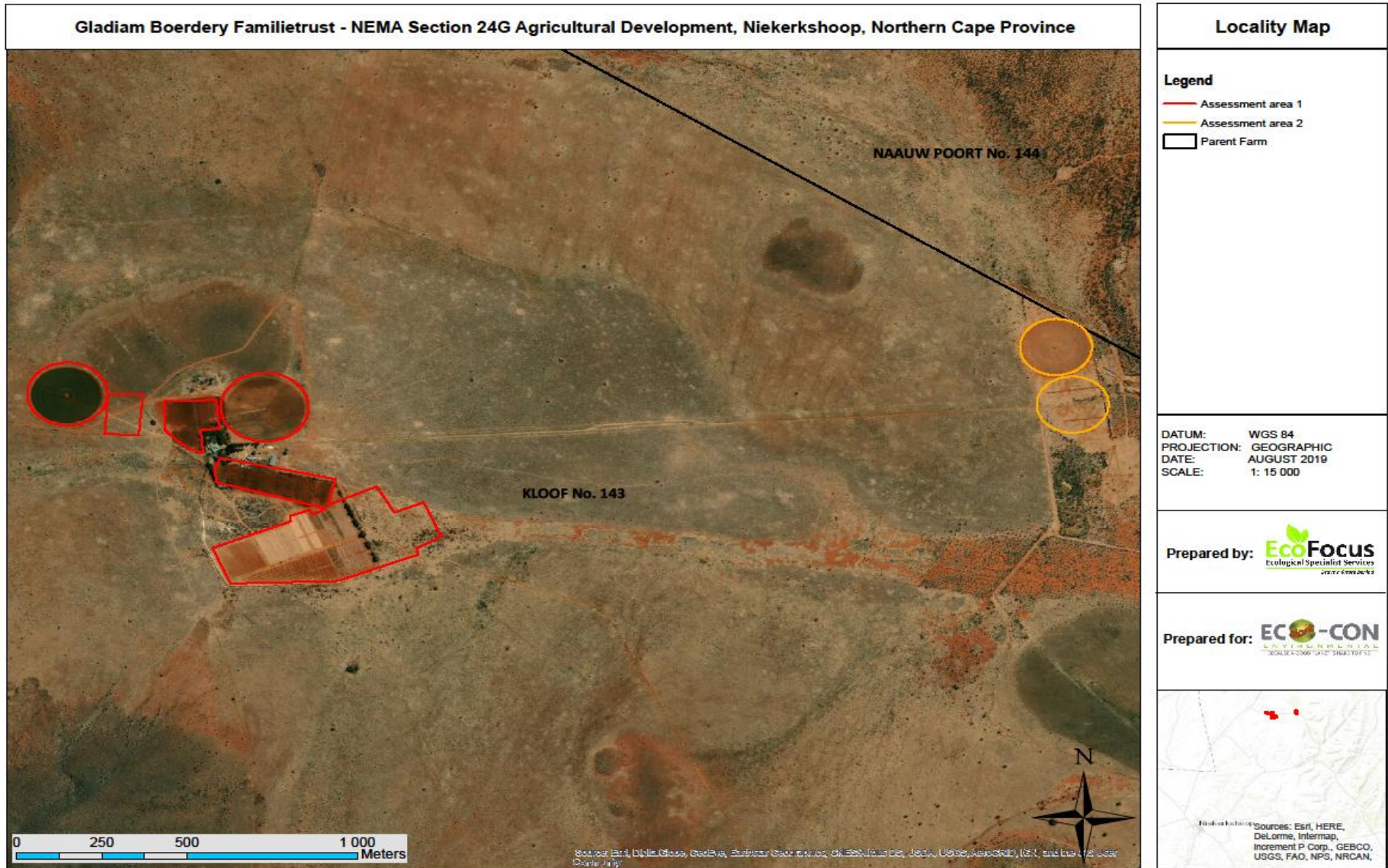
6. Study Area

The assessment areas consist of three separate portions namely Assessment areas 1, 2 and 3 which constitute cultivated irrigated centre pivot lands and irrigated rectangular lands. The assessment areas are situated on Portions 1 and 2 of the Farm Kloof no 143 (SG 21 Digit Codes: C0310000000014300001 and C0310000000014300002). The farm is situated approximately 12.5 km north-east of the town of Niekersknoop which forms part of the Pixley Ka Seme District Municipality, Northern Cape Province. Access to the assessment areas is obtained via the R 386 provincial road and subsequent dirt roads from the west.

The approximate sizes of the three separate areas are as follow:

- Assessment area 1 (Portion 2 of the Farm Kloof no 143) = 23.78 ha
- Assessment area 2 (Portion 2 of the Farm Kloof no 143) = 5.4 ha
- Assessment area 3 (Portion 1 of the Farm Kloof no 143) = 5.5 ha

See the two locality maps below.



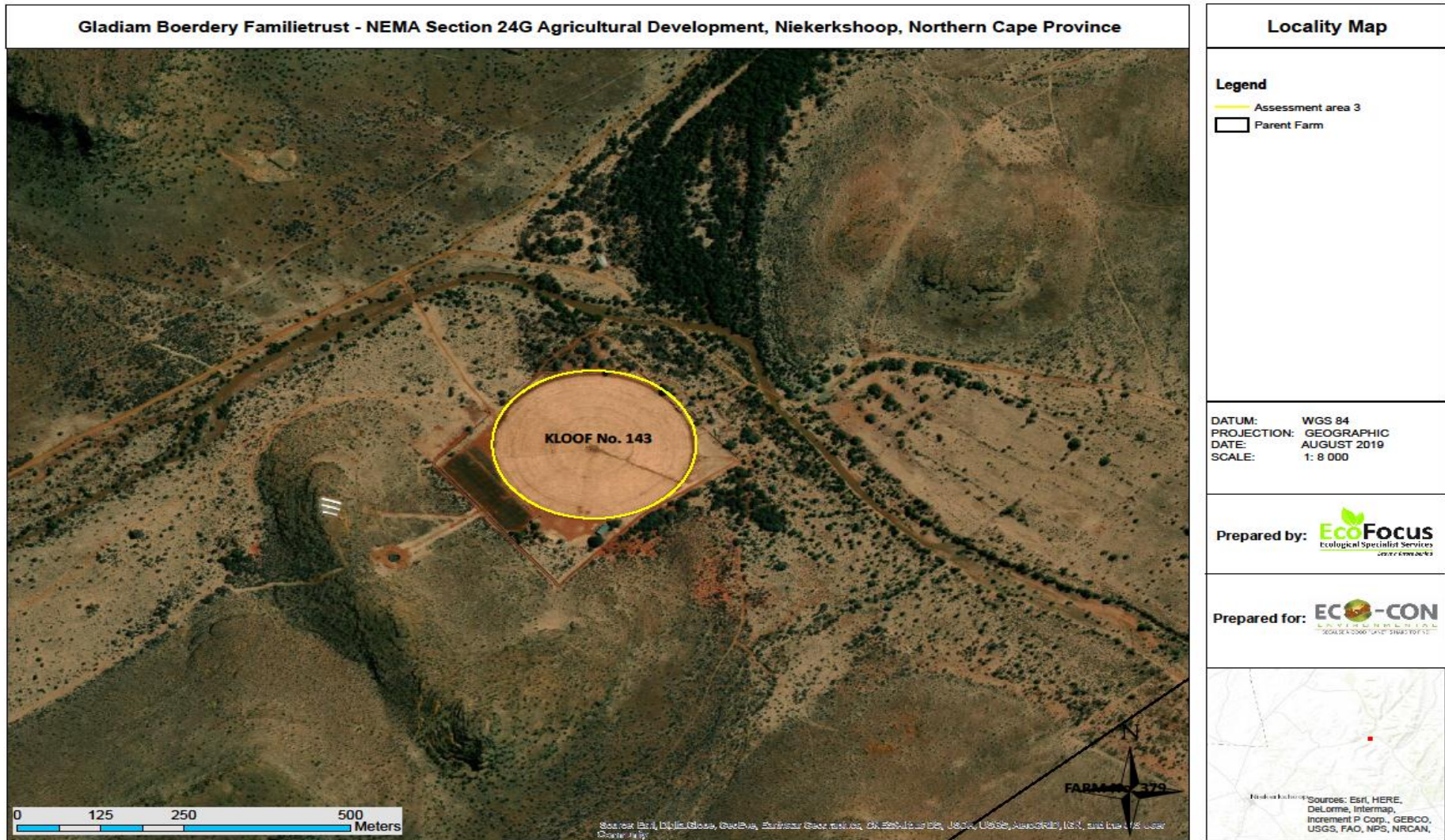


Figure 1: Two locality maps illustrating the assessment areas (see A3 sized map in the Appendices)

6.1. Climate

The rainfall of the region peaks during the summer months and the Mean Annual Precipitation (MAP) of the area is approximately 244 mm (www.climate-data.org). The highest average monthly temperature is approximately 26.9°C in the summer months while the lowest average monthly temperature is approximately 9.8°C during the winter. Maximum monthly temperatures can reach up to 34.6°C in the summer months and dip to as low as 1°C during the winter.

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:

The underlying geology is mainly formed by shales of the Volksrust Formation and to a lesser extent the Prince Albert Formation (both of the Ecca Group) as well as Dwyka Group diamictites. Broad areas are covered by superficial deposits including calcretes of the Kalahari Group. Soils are variable from shallow to deep, red-yellow apedal and freely draining with potential scattered rocky dolerite outcrops.

6.3. Vegetation and Conservation Status

According to SANBI (2006-), the three separate assessment areas all fall within the Northern Upper Karoo vegetation type (NKu 3) which mainly consists of flat to slightly sloping shrubland, dominated by dwarf karoo shrubs and sparse grasses. This vegetation type is classified as least threatened as very little has been transformed thus far (SANBI, 2006-).

The elevated hill complexes surrounding Assessment area 3, form part of the Kuruman Mountain Bushveld vegetation type (SVk 10) which is also classified as least threatened as very little has been transformed thus far (SANBI, 2006-). These hills have however not been directly or significantly impacted by the development of Assessment area 3.

Assessment area 1 is categorised as Other Natural Areas (ONA) in accordance with the Northern Cape Provincial Spatial Biodiversity Plan 2016 (NCPSBP), which sets out biodiversity priority areas in the province. Assessment areas 2 and 3 however fall within an Ecological Support Area (ESA). ESA's are areas that must be maintained in at least fair ecological condition (semi-natural/moderately modified state) in order to support the ecological functioning of a Critical Biodiversity Area (CBA) or protected area or that play an important role in delivering ecosystem services (Collins, 2017).

See vegetation and conservation status maps below.

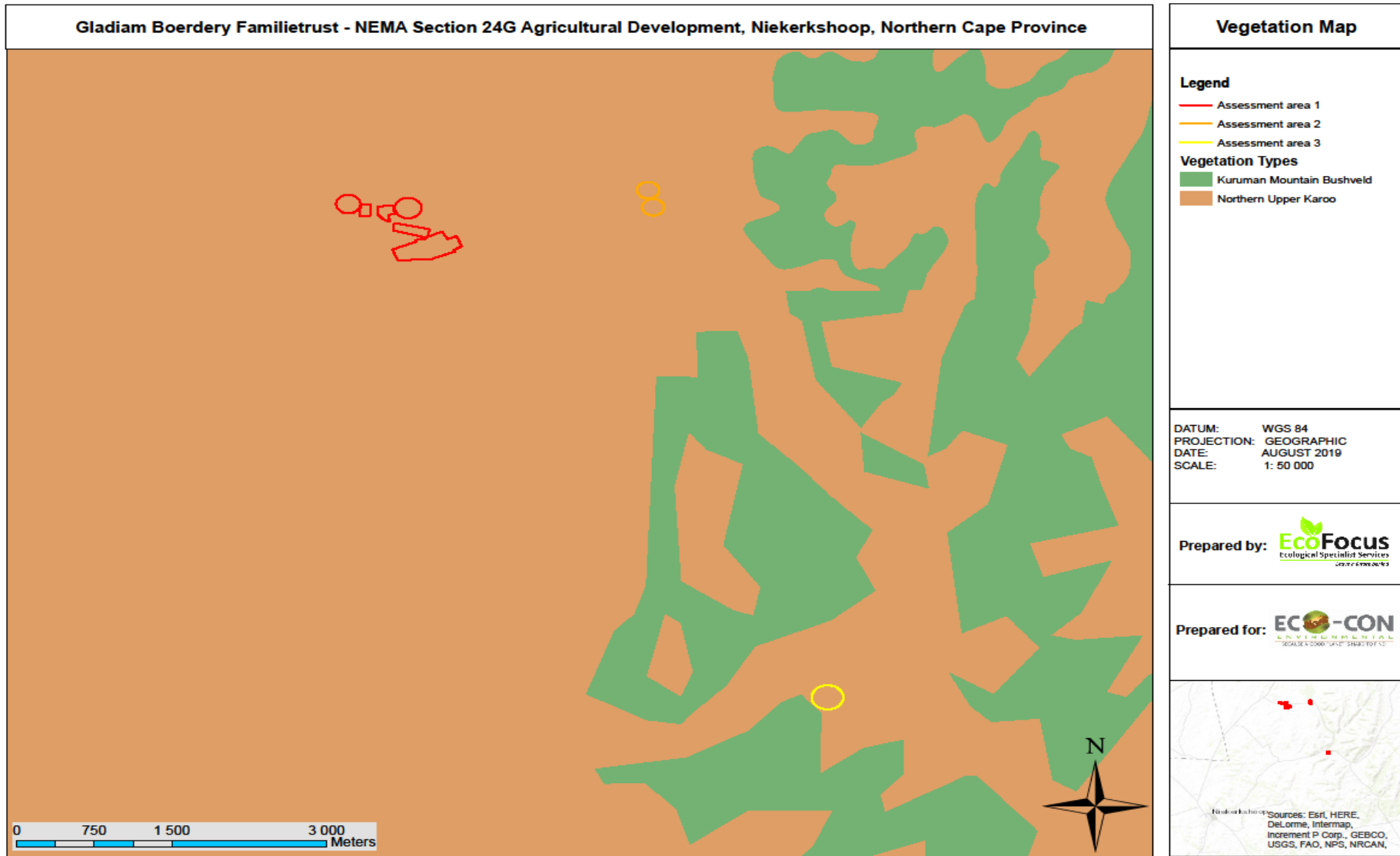


Figure 2: Vegetation map illustrating the vegetation type associated with the assessment areas (see A3 sized map in the Appendices)

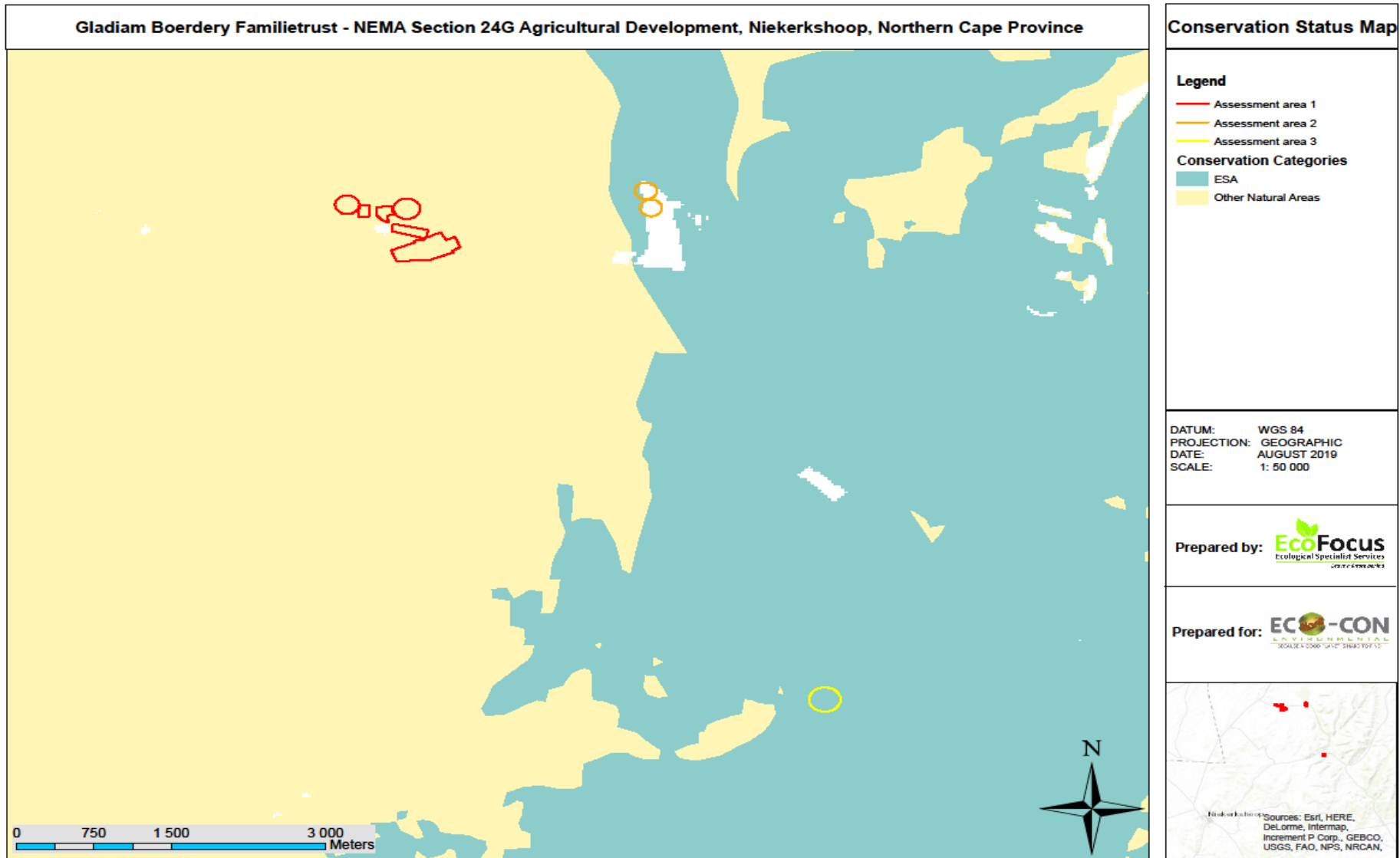


Figure 3: Conservation status map illustrating the conservation statuses associated with the assessment areas (see A3 sized map in the Appendices)

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 to the ecological specialist was correct and valid at the time that it was provided.
- the project areas as provided by the applicant are correct and will not be significantly deviated from as these were the only areas assessed.
- the public, local communities, relevant organs of state and landowners will receive a sufficient reoccurring opportunity to participate and comment on the project during the NEMA Section 24G rectification 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 NEMA Section 24G rectification process is a retrospective assessment process and the specialists are limited to assessing the anticipated historic condition of the project area based on the surrounding natural, undeveloped areas.
- 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.
- it is reasonably assumed that the historic ecology of the assessment areas prior to the agricultural transformation, would have been comparable to that of the surrounding undeveloped areas as they are situated directly adjacent to the assessment areas. No significant change in soil structure or landscape topography or features is evident between the assessment areas and these surrounding undeveloped areas which further supports this assumption.

Given that the NEMA Section 24G process involves prediction, the uncertainty factor forms part of the assessment process. Two types of uncertainty are associated with the 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. 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 Section 24G rectification 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 development and the subsequent public reaction/opinion which will be received during the Public Participation Process (PPP).

Gaps in knowledge can be attributed to:

- The ecological study process was undertaken retrospectively after the original surface vegetation had already been transformed by the developments. The anticipated historic conditions of the project sites are therefore purely based on the vegetation of the surrounding natural, undeveloped areas.
- The potential of future similar developments in the same geographical area which could lead to cumulative impacts cannot be meaningfully anticipated. It is however expected that further agricultural development is likely to take place in the broader area.

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 areas consist of three separate portions namely Assessment areas 1, 2 and 3. All three portions will be discussed separately.

8.1. Assessment area 1

Assessment area 1 is approximately 23.78 ha in size. The assessment area constitutes two cultivated centre pivot lands and a number of adjoining rectangular lands of which all previously existing natural surface vegetation on the cultivated land footprints has been completely transformed.

The broader areas surrounding the cultivated lands are in an undeveloped natural condition. It is reasonably assumed that the historic ecology of the assessment area prior to the agricultural transformation, would have been comparable to that of the surrounding undeveloped areas as they are situated directly adjacent to the assessment area. No significant change in soil structure or landscape topography or features is evident between the assessment area and these surrounding undeveloped areas which further supports this assumption. These surrounding undeveloped areas will therefore be discussed as reference areas representing the assumed historic ecology of the entire assessment area.

8.1.1. Current Existing Vegetation and Site Description

The localised surrounding undeveloped areas constitute flat to slightly sloping low growing grassland mainly dominated by 'white grasses'. The areas also possess a well-represented dwarf karroid shrub layer. Tree and shrub individuals of the nationally protected species *Vachellia erioloba* & *V haemataxylon* as well as the undesired indicator species of bush encroachment *Senegalia mellifera* are very sparsely present. The legally declared invasive species *Prosopis glandulosa* (Category 3) forms dense stands in areas where historic disturbance is evident.

The average density of *Vachellia erioloba* individuals within the surrounding undeveloped areas amounts to approximately 0.25 trees/ha. This therefore equates to a total estimate of approximately 6 individuals within the cultivated land footprints which are reasonably assumed to have been removed during the initial cultivation.

The average density of *Vachellia haemataxylon* individuals within the surrounding undeveloped areas amounts to approximately 0.05 trees/ha. This therefore equates to a total estimate of approximately 2 individuals within the cultivated land footprints which are reasonably assumed to have been removed during the initial cultivation.

The grass layer is mainly dominated by the species *Stipagrostis spp.* while the species *Aristida spp.* & *Schmidtia pappophoroides* were also found to be present but to a significantly lesser extent.

Dwarf karroid shrub species found to be well represented include *Phaeoptilum spinosum*, *Euryops multifidus*, *Peliostomum leucorrhizum*, *Pentzia spaeocephala*, *Chrysocoma obtusa* & *Pentzia globosa* while the species *Crotalaria orientalis*, *Felicia sp.*, *Monechma genistifolium* & *Lebeckia macrantha* were also found to be present but to a significantly lesser extent.

Forb species found to be well represented include *Senna italica*, *Acrotome inflata* and the provincially protected species *Oxalis semiloba*.

With the exception of the very sparsely represented nationally protected tree species and the provincially protected species *Oxalis semiloba*, no Red Data Listed-, other provincially protected species or any other species of conservational significance were found to be present within the localised surrounding undeveloped areas. It is therefore also not anticipated that the assessment area would necessarily have housed large numbers of any species of conservational significance. It must however be noted that the time of the assessment was not necessarily favourable for successful identification of all plant species individuals. It is therefore recommended that an additional ecological walkthrough be conducted during the flowering period of underground bulbous plant species, if deemed necessary by the competent authority. This will ensure that no provincially protected or significant species have potentially been omitted.



Figure 4: Image illustrating the low growing grassland mainly dominated by ‘white grasses’ associated with the undeveloped natural areas surrounding Assessment area 1

Due to the presence of the existing farm homestead infrastructure in-between the cultivated lands, the localised surrounding undeveloped areas are subjected to continued anthropogenic activity and disturbance. It is therefore not anticipated that any large or conservationally significant faunal species would utilise the localised surrounding undeveloped areas for breeding and/or persistence purposes or for that matter, would necessarily have historically utilised the assessment area.

Due to the natural pristine state of the broader surrounding undeveloped areas, the area is utilised by a wide variety of common and specialised small antelope as well as burrowing and predatory mammals for breeding, foraging and persistence purposes. The mobility of such faunal species along with the broad, continuous surrounding natural landscape however allows for individuals to simply leave an area where disturbance is taking place and disperse to other similar, adequate areas.

The assessment area and surrounding undeveloped areas do not fall within any Important Bird Area (IBA) as per the latest IBA map obtained from the Birdlife SA website (www.birdlife.org.za/conservation/important-bird-areas/iba-map). Small nests of common resident bird species were observed within some of the very sparsely represented shrub and tree individuals within the surrounding undeveloped areas, but no conservationally significant bird species, unique or specialised bird habitats were observed or are expected to utilise the areas for breeding and/or persistence purposes.

A distinct second order ephemeral water drainage line historically traversed the assessment area flowing in an easterly direction and discharging into a significant ephemeral watercourse located approximately 1.9 km east of the assessment area. This significant watercourse forms an important part of the mid portion of a quaternary surface water catchment and drainage area which drains towards the south-east.

The cultivation of the rectangular lands was however completed directly through the historic drainage line and the area was mechanically levelled for the lands. The original flow regime and - path of the drainage line towards the significant watercourse was therefore significantly altered and obstructed. Limited water flow however still takes place through the drainage line during rainfall events. It is recommended that the flow path of the drainage line be adequately diverted and channelled around the existing cultivated lands in order to ensure continued flow of surface water runoff during rainfall events, towards the significant ephemeral watercourse to the east.

The lack of continuous water flow through the assessment area, has resulted in the water drainage line not necessarily possessing any distinct riparian zones or significant variation in vegetation species composition relative to the surrounding areas.

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

The Present Ecological State (PES) of Assessment area 1 is classified as Class E as it is seriously modified. The loss of natural habitat, biota and basic ecosystem functionality is extensive due to the historic and continued cultivation activities. The basic ecosystem functionality has virtually been destroyed and sufficient ecological restoration will prove to be very difficult.

The Present Ecological State (PES) of the localised surrounding undeveloped areas is classified as Class B as they are largely natural. A small change in natural habitats and biota may have taken place mainly due to continued farm management practices, but the ecosystem functionality has remained essentially unchanged.

The historic Ecological Importance and Sensitivity (EIS) of Assessment area 1 and the localised surrounding undeveloped areas would probably have been classified as Class C (moderate) as these areas could have been viewed as being ecologically important and sensitive on local scale mainly due to the very sparse presence of nationally protected tree and shrub species individuals as well as the ephemeral water drainage line which historically traversed the assessment area. Biodiversity is however not unique and still relatively ubiquitous.

Assessment area 1 would therefore have been viewed as being of moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type, nationally protected tree and shrub species individuals as well as the quaternary surface water catchment and drainage area which drains towards the south-east.

8.2. Assessment area 2

Assessment area 2 is approximately 5.4 ha in size. The assessment area constitutes two cultivated centre pivot lands of which all previously existing natural surface vegetation on the cultivated land footprints has been completely transformed.

The broader areas surrounding the cultivated lands are mainly in an undeveloped natural condition with the exception of the localised area to the south which has been densely infested by the legally declared invasive species *Prosopis glandulosa* (Category 3). It is reasonably assumed that the historic ecology of the assessment area and the densely infested area to the south, prior to the agricultural transformation, would have been comparable to that of the surrounding undeveloped areas as they are situated directly adjacent to the assessment area. No significant change in soil structure or landscape topography or features is evident between the assessment area and these surrounding undeveloped areas which further supports this assumption. These surrounding undeveloped areas will therefore be discussed as reference areas representing the assumed historic ecology of the entire assessment area.

8.2.1. Current Existing Vegetation and Site Description

The areas surrounding Assessment area 2, form part of the same areas surrounding Assessment area 1 (discussed under heading 8.1.1). As was the case for Assessment area 1, the localised surrounding undeveloped areas also constitute flat to slightly sloping low growing grassland mainly dominated by 'white grasses'. The areas also possess a well-represented dwarf karroid shrub layer. Tree and shrub individuals of the nationally protected species *Vachellia erioloba* & *V haemataxylon* as well as the undesired indicator species of bush encroachment *Senegalia mellifera* are very sparsely present.

As was the case for Assessment area 1, the average density of *Vachellia erioloba* individuals within the surrounding undeveloped areas amounts to approximately 0.25 trees/ha. This therefore equates to a total estimate of approximately 2 individuals within the cultivated land footprints which are reasonably assumed to have been removed during the initial cultivation.

As was the case for Assessment area 1, the average density of *Vachellia haemataxylon* individuals within the surrounding undeveloped areas amounts to approximately 0.05 trees/ha. The likelihood of any individuals historically being present within the cultivated land footprints is therefore low.

The same grass, forbs and dwarf karroid shrub species as those identified within the undeveloped areas surrounding Assessment area 1 (discussed under heading 8.1.1), were also found to be present within the undeveloped areas surrounding Assessment area 2.

With the exception of the very sparsely represented nationally protected tree species and the provincially protected species *Oxalis semiloba*, no Red Data Listed-, other provincially protected species or any other species of conservational significance were found to be present within the localised surrounding undeveloped areas. It is therefore also not anticipated that the assessment area would necessarily have housed large numbers of any species of conservational significance. It must however be noted that the time of the assessment was not necessarily favourable for successful identification of all plant species individuals. It is therefore recommended that an additional ecological walkthrough be conducted during the flowering period of underground bulbous plant species, if deemed necessary by the competent authority. This will ensure that no provincially protected or significant species have potentially been omitted.



Figure 5: Image illustrating the low growing grassland mainly dominated by ‘white grasses’ associated with the undeveloped natural areas surrounding Assessment area 2

As mentioned earlier under heading 8.2, the localised area to the south of the assessment area has however been densely infested by the legally declared invasive species *Prosopis glandulosa* (Category 3) mainly due to historic cultivation disturbance. The area is virtually completely devoid of a grass and forbs layer while the only other species found to be present within the area are sparsely scattered individuals of the karroid shrub *Phaeoptilum spinosum*.

The applicant has however been actively implementing bush encroachment alleviation and management measures within the infested area over the past growing season and continues to do so, on a systematic basis. *Prosopis glandulosa* individuals are being actively cleared from the infested area. It is recommended that the applicant continue with this active bush encroachment alleviation and management approach.



Figure 6: Image illustrating the area to the south of Assessment area 2 which is densely infested by the legally declared invasive species *Prosopis glandulosa* (Category 3)



Figure 7: Image illustrating areas where active bush encroachment alleviation and management measures have been implemented

Due to the natural pristine state of the broader surrounding undeveloped areas, the area is utilised by a wide variety of common and specialised small antelope as well as burrowing and predatory mammals for breeding, foraging and persistence purposes. The mobility of such faunal species along with the broad, continuous surrounding natural landscape however allows for individuals to simply leave an area where disturbance is taking place and disperse to other similar, adequate areas.

As was the case for Assessment area 1, the assessment area and surrounding undeveloped areas do not fall within any Important Bird Area (IBA) as per the latest IBA map obtained from the Birdlife SA website (www.birdlife.org.za/conservation/important_bird_areas/iba-map). Small nests of common resident bird species were observed within some of the very sparsely represented shrub and tree individuals within the surrounding undeveloped areas, but no conservationally significant bird species, unique or specialised bird habitats were observed or are expected to utilise the areas for breeding and/or persistence purposes.

The same significant ephemeral watercourse located approximately 1.9 km east of Assessment area 1 (discussed under heading 8.1.1), also flows past Assessment area 2 directly adjacent east. As discussed, this significant watercourse forms an important part of the mid portion of a quaternary surface water catchment and drainage area which drains towards the south-east.

The watercourse has however seemingly not been directly or significantly impacted by the development of Assessment area 2. The original flow regime and -path of the watercourse has not been significantly altered or obstructed and unimpeded water flow still takes place through the watercourse during rainfall events. It is however recommended that a minimum approximate 40 m buffer zone should be implemented around the watercourse and no further development may take place within the buffered area.

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

The Present Ecological State (PES) of Assessment area 2 is classified as Class E as it is seriously modified. The loss of natural habitat, biota and basic ecosystem functionality is extensive due to the historic and continued cultivation activities. The basic ecosystem functionality has virtually been destroyed and sufficient ecological restoration will prove to be very difficult.

The Present Ecological State (PES) of the localised surrounding undeveloped areas, with the exception of the significantly infested area to the south, is classified as Class B as they are largely natural. A small change in natural habitats and biota may have taken place mainly due to continued farm management practices, but the ecosystem functionality has remained essentially unchanged.

The historic Ecological Importance and Sensitivity (EIS) of Assessment area 2 and the localised surrounding undeveloped areas would probably have been classified as Class C (moderate) as these areas could have been viewed as being ecologically important and sensitive on provincial scale mainly due to the very sparse presence of nationally protected tree and shrub species individuals as well as the significant ephemeral watercourse which forms an important part of the mid portion of a quaternary surface water catchment and drainage area towards the south-east. Biodiversity is however not unique and still relatively ubiquitous.

Assessment area 2 would therefore have been viewed as being of moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type, ESA, nationally protected tree and shrub species individuals as well as the quaternary surface water catchment and drainage area which drains towards the south-east.

8.3. Assessment area 3

Assessment area 3 is approximately 5.5 ha in size. The assessment area constitutes a single cultivated centre pivot land of which all previously existing natural surface vegetation on the cultivated land footprints has been completely transformed.

The broader areas surrounding the cultivated land are in an undeveloped pristine natural condition. Assessment area 3 is surrounded by elevated hill complexes and is situated within the lower flat valley bottom between these hills. These hills have therefore not been directly or significantly impacted by the development of the assessment area.

It is reasonably assumed that the historic ecology of the assessment area prior to the agricultural transformation, would have been comparable to that of the surrounding undeveloped valley bottom areas as they are situated directly adjacent to the assessment area. No significant change in soil structure or landscape topography or features is evident between the assessment area and these surrounding undeveloped valley bottom areas which further supports this assumption. These surrounding undeveloped valley bottom areas will therefore be discussed as reference areas representing the assumed historic ecology of the entire assessment area.

8.3.1. Current Existing Vegetation and Site Description

The localised surrounding undeveloped valley bottom areas constitute slightly sloping open savannah shrubland. The areas possess a relatively well-developed woody component which mainly consists of multi-stemmed shrubs with small single-stemmed trees also being sparsely present. The woody layer is mainly dominated by shrub individuals of the undesired indicator species of bush encroachment *Senegalia mellifera*. Tree and shrub individuals of the species *Ziziphus mucronata*, *Searsia lancea*, *Grewia flava* & *Ehretia rigida* were also found to be well represented while individuals of the nationally protected species *Vachellia erioloba* & *Boscia albitrunca* are merely sparsely present.

The average density of *Vachellia erioloba* individuals within the surrounding undeveloped valley bottom areas amounts to approximately 3 trees/ha. This therefore equates to a total estimate of approximately 17 individuals within the cultivated land footprint which are reasonably assumed to have been removed during the initial cultivation.

The average density of *Boscia albitrunca* individuals within the surrounding undeveloped valley bottom areas amounts to approximately 2 trees/ha. This therefore equates to a total estimate of

approximately 11 individuals within the cultivated land footprint which are reasonably assumed to have been removed during the initial cultivation.

The grass layer is mainly dominated by the species *Stipagrostis spp.* while the species *Aristida spp.*, *Schmidtia pappophoroides*, *Cenchrus ciliaris* & *Enneapogon cenchroides* were also found to be present but to a significantly lesser extent.

Dwarf karroid shrub species found to be well represented include *Phaeoptilum spinosum*, *Rhigozum trichotomum*, *Pentzia spaerocephala*, *Monechma incanum*, *Chrysocoma obtusa* & *Pentzia globosa* while the species *Crotalaria orientalis*, *Felicia sp.*, & *Monechma genistifolium* were also found to be present but to a significantly lesser extent.

Forb species *Senna italica* was found to be well represented.

With the exception of the sparsely represented nationally protected tree species, no Red Data Listed-, provincially protected species or any other species of conservational significance were found to be present within the localised surrounding undeveloped areas. It is therefore also not anticipated that the assessment area would necessarily have housed large numbers of any species of conservational significance. It must however be noted that the time of the assessment was not necessarily favourable for successful identification of all plant species individuals. It is therefore recommended that an additional ecological walkthrough be conducted during the flowering period of underground bulbous plant species, if deemed necessary by the competent authority. This will ensure that no provincially protected or significant species have potentially been omitted.



Figure 8: Image illustrating the open savannah shrubland associated with the undeveloped natural valley bottom areas surrounding Assessment area 3

Due to the natural pristine state of the broader surrounding undeveloped areas, the area is utilised by a wide variety of common and specialised small antelope as well as burrowing and predatory mammals for breeding, foraging and persistence purposes. The mobility of such faunal species along with the broad, continuous surrounding natural landscape however allows for individuals to simply leave an area where disturbance is taking place and disperse to other similar, adequate areas.

As was the case for Assessment area 1 & 2, the assessment area and surrounding undeveloped areas do not fall within any Important Bird Area (IBA) as per the latest IBA map obtained from the Birdlife SA website (www.birdlife.org.za/conservation/important_bird_areas/iba-map). Small nests of common resident bird species were observed within some of the sparsely represented shrub and tree individuals within the surrounding undeveloped areas, but no conservationally significant bird species, unique or specialised bird habitats were observed or are expected to utilise the areas for breeding and/or persistence purposes.

A significant ephemeral watercourse flows past Assessment area 3 approximately 100 m to the north. This watercourse joins the same significant watercourse associated with Assessment area 2 (discussed under heading 8.2.1), which also flows past Assessment area 3 directly adjacent east. As discussed, these significant watercourses form an important part of the mid portion of a quaternary surface water catchment and drainage area which drains towards the south-east.

The watercourses have however seemingly not been directly or significantly impacted by the development of Assessment area 3. The original flow regimes and -paths of the watercourses have not been significantly altered or obstructed and unimpeded water flow still takes place through the watercourses during rainfall events. It is however recommended that no further development may take place any closer to either of the watercourses within the localised area of Assessment area 3.



Figure 9: Image illustrating the presence of the significant ephemeral watercourses surrounding Assessment area 3

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

The Present Ecological State (PES) of Assessment area 3 is classified as Class E as it is seriously modified. The loss of natural habitat, biota and basic ecosystem functionality is extensive due to the historic and continued cultivation activities. The basic ecosystem functionality has virtually been destroyed and sufficient ecological restoration will prove to be very difficult.

The Present Ecological State (PES) of the localised surrounding undeveloped valley bottom areas is classified as Class A as they are unmodified, natural and pristine.

The historic Ecological Importance and Sensitivity (EIS) of Assessment area 3 and the localised surrounding undeveloped valley bottom areas would probably have been classified as Class C (moderate) as these areas could have been viewed as being ecologically important and sensitive on provincial scale mainly due to the sparse presence of nationally protected tree and shrub species individuals as well as the surrounding significant ephemeral watercourses which form an important part of the mid portion of a quaternary surface water catchment and drainage area towards the south-east. Biodiversity is however not unique and still relatively ubiquitous.

Assessment area 3 would therefore have been viewed as being of moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type, ESA, nationally protected tree and shrub species individuals as well as the quaternary surface water catchment and drainage area which drains towards the south-east.

8.4. Species List for the Assessment Areas

Table 5: Species list for the assessment areas (Provincially protected species highlighted in yellow; Nationally protected species highlighted in orange; Legally declared invasive species highlighted in pink)

Graminoids	Forbs	Shrubs & trees
<i>Aristida spp.</i>	<i>Acrotome inflata</i>	<i>Boscia albitrunca</i>
<i>Cenchrus ciliaris</i>	<i>Oxalis semiloba</i>	<i>Chrysocoma obtusa</i>
<i>Enneapogon cenchroides</i>	<i>Senna italica</i>	<i>Crotalaria orientalis</i>
<i>Schmidtia pappophoroides</i>	-	<i>Ehretia rigida</i>
<i>Stipagrostis spp.</i>	-	<i>Euryops multifidus</i>
-	-	<i>Felicia sp.</i>
-	-	<i>Grewia flava</i>
-	-	<i>Lebeckia macrantha</i>
-	-	<i>Monechma genistifolium</i>
-	-	<i>Monechma incanum</i>
-	-	<i>Peliostomum leucorrhizum</i>
-	-	<i>Pentzia globosa</i>
-	-	<i>Pentzia spaerocephala</i>
-	-	<i>Phaeoptilum spinosum</i>
-	-	<i>Prosopis glandulosa</i>
-	-	<i>Rhigozum trichotomum</i>
-	-	<i>Searsia lancea</i>
-	-	<i>Senegalia mellifera</i>
-	-	<i>Vachellia haemataxylon</i>
-	-	<i>Vachellia erioloba</i>
-	-	<i>Ziziphus mucronata</i>

8.5. Ecological Site Sensitivity Maps

The two site sensitivity maps below illustrate the presence of the water drainage line and significant watercourses as well as the recommended buffer zones to be implemented around them.

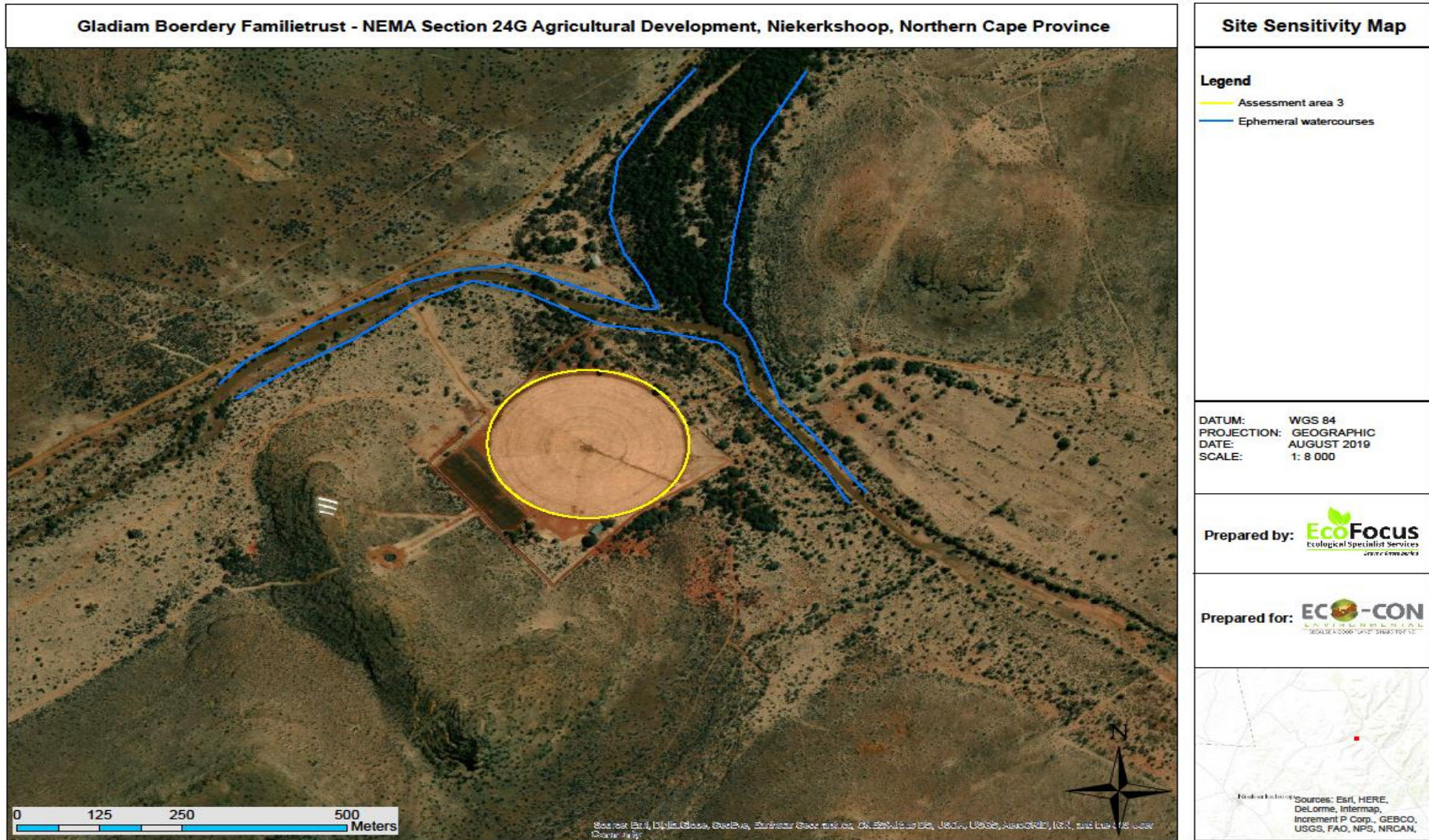


Figure 10: Two site sensitivity maps illustrating the presence of the water drainage line and significant watercourses as well as the recommended buffer zones to be implemented around them (see A3 sized map in the Appendices)

9. Ecological Impact Assessment

The following section identifies the ecological impacts (both positive and negative) caused by the project on the surrounding environment.

Once the 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 ecological impacts caused by the development and secondly to determine the significance of the impacts and how effective the recommended mitigation measures will be able to reduce their significance. The accepted Mitigation Hierarchy for assessing and managing potential ecological impacts as embedded within the principles of Section 2 of NEMA, implies that significant ecological impacts must firstly be avoided/prevented. If this is not entirely possible, ecological impacts must be minimised and then rehabilitated or restored. The ecological impacts which are still rated as highly significant, even after implementation of mitigations, can then be identified in order to specifically focus on implementation of effective management strategies for them.

9.1. Ecological Impacts Caused by the Project

Transformation of terrestrial vegetation on the three separate assessment areas associated with the Northern Upper Karoo vegetation type (NKu 3)

The approximate sizes of the three separate areas are as follow:

- Assessment area 1 (Portion 2 of the Farm Kloof no 143) = 23.78 ha
- Assessment area 2 (Portion 2 of the Farm Kloof no 143) = 5.4 ha
- Assessment area 3 (Portion 1 of the Farm Kloof no 143) = 5.5 ha

The assessment areas constitute cultivated centre pivot lands and a number of adjoining rectangular lands of which all previously existing natural surface vegetation on the cultivated land footprints has been completely transformed.

The broader areas surrounding the cultivated lands are in an undeveloped natural condition and the relevant vegetation type associated with the assessment areas is classified as least threatened (SANBI, 2006-). Based on the surrounding landscape, it is assumed that the assessment areas would have scored moderate historic EIS values. The assessment areas would therefore have been viewed as being of moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem and broader vegetation type.

The small sizes of the assessment areas relative to the broad, continuous surrounding natural landscape however decreases the significance of this identified impact.

The significance of this impact was medium.

Mitigation measures to reduce impacts are recommended under heading 9.3.

Transformation of an Ecological Support Area (ESA) associated with the Assessment areas 2 & 3

The assessment areas constitute cultivated centre pivot lands and a number of adjoining rectangular lands of which all previously existing natural surface vegetation on the cultivated land footprints has been completely transformed.

Assessment area 1 is categorised as Other Natural Areas (ONA) in accordance with the Northern Cape Provincial Spatial Biodiversity Plan 2016 (NCPSBP), which sets out biodiversity priority areas in the province. Assessment areas 2 and 3 however fall within an Ecological Support Area (ESA).

Based on the surrounding landscape, it is assumed that the Assessment areas 2 & 3 would have scored moderate historic EIS values. Assessment areas 2 & 3 would therefore have been viewed as being of moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type, ESA, nationally protected tree and shrub species individuals as well as the quaternary surface water catchment and drainage area which drains towards the south-east.

The significance of this impact was zero for Assessment area 1 but medium for Assessment areas 2 & 3.

Mitigation measures to reduce impacts are recommended under heading 9.3.

Destruction of-/damage to Red Data Listed, nationally or provincially protected species individuals/habitats associated with the assessment areas

The assessment areas constitute cultivated centre pivot lands and a number of adjoining rectangular lands of which all previously existing natural surface vegetation on the cultivated land footprints has been completely transformed.

With the exception of the sparsely represented nationally protected tree species and the provincially protected species *Oxalis semiloba*, no Red Data Listed-, other provincially protected species or any other species of conservational significance were found to be present within the localised surrounding undeveloped areas. It is therefore also not anticipated that the assessment areas would necessarily have housed large numbers of any species of conservational significance. It must however be noted that the time of the assessment was not necessarily favourable for successful identification of all plant species individuals.

The average density of *Vachellia erioloba* individuals within the surrounding undeveloped areas amounts to approximately 0.25 trees/ha. This therefore equates to a total estimate of approximately 6 and 2 individuals within the footprints of Assessment areas 1 & 2 respectively which are reasonably assumed to have been removed during the initial cultivation.

The average density of *Vachellia haemataxylon* individuals within the surrounding undeveloped areas amounts to approximately 0.05 trees/ha. This therefore equates to a total estimate of approximately 2 individuals within the footprint of Assessment area 1 which are reasonably assumed to have been removed during the initial cultivation. The likelihood of any individuals historically being present within the cultivated land footprints of Assessment area 2 is however low.

Due to the localised undeveloped valley bottom areas surrounding Assessment area 3 constituting slightly sloping open savannah shrubland, the density of nationally protected tree individuals is slightly higher relative to the other two assessment areas. The average density of *Vachellia erioloba* individuals within the surrounding undeveloped valley bottom areas amounts to approximately 3 trees/ha. This therefore equates to a total estimate of approximately 17 individuals within the footprint of Assessment area 3 which are reasonably assumed to have been removed during the initial cultivation.

The average density of *Boscia albitrunca* individuals within the surrounding undeveloped valley bottom areas amounts to approximately 2 trees/ha. This therefore equates to a total estimate of approximately 11 individuals within the footprint of Assessment area 3 which are reasonably assumed to have been removed during the initial cultivation.

Due to the natural pristine state of the broader surrounding undeveloped areas, the areas are utilised by a wide variety of common and specialised small antelope as well as burrowing and predatory mammals for breeding, foraging and persistence purposes. The mobility of such faunal species along with the broad, continuous surrounding natural landscape however allows for individuals to simply leave an area where disturbance is taking place and disperse to other similar, adequate areas.

The assessment areas and surrounding undeveloped areas do not fall within any Important Bird Area (IBA) as per the latest IBA map obtained from the Birdlife SA website (www.birdlife.org.za/conservation/important_bird_areas/iba-map). Small nests of common resident

bird species were observed within some of the very sparsely represented shrub and tree individuals within the surrounding undeveloped areas, but no conservationally significant bird species, unique or specialised bird habitats were observed or are expected to utilise the areas for breeding and/or persistence purposes.

The significance of this impact was low for Assessment areas 1 & 2 but medium for Assessment area 3.

Mitigation measures to reduce impacts are recommended under heading 9.3.

Terrestrial alien invasive species establishment

The assessment areas constitute cultivated centre pivot lands and a number of adjoining rectangular lands of which all previously existing natural surface vegetation on the cultivated land footprints has been completely transformed.

The legally declared invasive species *Prosopis glandulosa* (Category 3) forms dense stands in areas where historic disturbance is evident. The localised area to the south of Assessment area 2 has been densely infested by the legally declared invasive species *Prosopis glandulosa* (Category 3) mainly due to historic cultivation disturbance.

The applicant has however been actively implementing bush encroachment alleviation and management measures within the infested area over the past growing season and continues to do so, on a systematic basis. *Prosopis glandulosa* individuals are being actively cleared from the infested area.

No other significant alien invasive species establishments were found to be present within or around the assessment areas.

The assessment areas and surrounding areas could however potentially be prone to significant alien invasive species establishment due to surface disturbances and vegetation clearance caused by continued cultivation activities.

The significance of this impact was low for Assessment areas 1 & 3 but medium for Assessment area 2.

Mitigation measures to reduce impacts are recommended under heading 9.3.

Surface material erosion

No significant soil erosion is currently evident within or around the assessment areas indicating sufficient management and maintenance in this regard. The assessment areas are flat to slightly sloping and form part of the quaternary surface water catchment and drainage area which drains towards the south-east. The areas could therefore be prone to slight soil erosion due to the loosening of materials and vegetation clearance caused by continued cultivation activities.

The significance of this impact was low.

Mitigation measures to reduce impacts are recommended under heading 9.3.

Dust generation and emissions

No signs of significant dust pollution is currently evident within or around the assessment areas. Continued soil preparation and cultivation activities associated with the assessment areas could however potentially result in significant continual fugitive dust emissions during the cultivation season. Generated dust could spread into- and contaminate the surrounding undeveloped areas.

The significance of this impact is low.

Mitigation measures to reduce impacts are recommended under heading 9.3.

Impeding of the historic ephemeral water drainage line's and significant watercourses' flow regimes associated with the quaternary surface water catchment and drainage area towards the south-east

A distinct second order ephemeral water drainage line historically traversed Assessment area 1 flowing in an easterly direction and discharging into a significant ephemeral watercourse located approximately 1.9 km east of the assessment area. This significant watercourse forms an important part of the mid portion of a quaternary surface water catchment and drainage area which drains towards the south-east.

The cultivation of the rectangular lands associated with Assessment area 1, was however completed directly through the historic drainage line and the area was mechanically levelled for the lands. The original flow regime and -path of the drainage line towards the significant watercourse was

therefore significantly altered and obstructed. Limited water flow however still takes place through the drainage line during rainfall events.

This significant watercourse into which this drainage line flows, also flows past Assessment areas 2 & 3 directly adjacent east. The watercourse has however seemingly not been directly or significantly impacted by the development of Assessment areas 2 & 3. The original flow regime and -path of the watercourse has not been significantly altered or obstructed and unimpeded water flow still takes place through the watercourse during rainfall events.

The significance of this impact was medium for Assessment area 1 but low for Assessment areas 2 & 3.

Mitigation measures to reduce impacts are recommended under heading 9.3.

Alteration/contamination of soil and groundwater characteristics/quality

Operation of the pivot lands includes significant continual irrigation, chemical and organic fertilisation as well as herbicide/pesticide treatment. This continued irrigation, 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 has gradually commenced during the operational phase and will continue for the entire duration of the proposed project lifespan and significantly beyond.

The significance of this impact was medium.

Mitigation measures to reduce impacts are recommended under heading 9.3.

Over extraction of groundwater for irrigation purposes

Significant quantities of water are being extracted from the relevant existing boreholes for irrigation purposes within the three assessment areas. Geo-hydrological studies were conducted of the relevant boreholes which concluded that these boreholes are able to adequately provide a sustainable yield and supply the required volumes of water necessary for irrigation use within the three assessment areas.

Over extraction of ground water in excess of the allotted sustainable yield volumes could however potentially lead to and drying up of the underground aquifers if not adequately managed.

The significance of this impact was medium for Assessment area 1 but low for Assessment areas 2 & 3.

Mitigation measures to reduce impacts are recommended under heading 9.3.

9.2. Cumulative Impacts

The broader region surrounding the cultivated lands are in an undeveloped natural condition and there seem to be no other existing significant similar agricultural developments within the broader landscape. The small sizes of the assessment areas relative to the broad, continuous surrounding natural landscape, therefore decreases the likelihood of any of the identified ecological impacts resulting in potentially significant residual cumulative impacts.

All identified ecological impacts can be suitably reduced and mitigated to within acceptable residual levels and it is not anticipated that the developments pose any significant potential long term residual cumulative ecological impacts within the broader region.

9.3. Risk Ratings of Impacts

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

Table 6: Environmental Risk and Significance Ratings

	Assessment area 1	Assessment area 2	Assessment area 3
Identified Environmental Impact	Transformation of terrestrial vegetation on the three separate assessment areas associated with the Northern Upper Karoo vegetation type (NKu 3)		
Magnitude of Negative or Positive Impact	Low (4)	Low (4)	Low (4)
Duration of Negative or Positive Impact	Long term (4)	Long term (4)	Long term (4)
Extent of Positive or Negative Impact	Local (2)	Local (2)	Local (2)
Irreplaceability of Natural Resources being impacted upon	Low (2)	Low (2)	Low (2)
Reversibility of Impact	Low (4)	Low (4)	Low (4)
Probability of Impact Occurrence	High (4)	High (4)	High (4)
Cumulative Impact Rating prior to mitigation	Medium	Medium	Medium

Environmental Significance Score and Rating prior to mitigation	Medium (64)	Medium (64)	Medium (64)
Mitigation Measures to be implemented	<p>The basic ecosystem functionality has virtually been destroyed and sufficient ecological restoration of the relevant vegetation type and its functionality within the assessment area, will prove to be very difficult.</p> <p>It is recommended that the flow path of the water drainage line associated with Assessment area 1, be adequately diverted and channelled around the existing cultivated lands in order to ensure continued flow of surface water runoff towards the significant ephemeral watercourse to the east.</p> <p>It is recommended that a minimum approximate 40 m buffer zone should be implemented around the significant ephemeral watercourse associated with Assessment area 2 and no further development may take place within the buffered area.</p> <p>It is also recommended that no further development may take place any closer to either of the ephemeral watercourses within the localised area of Assessment area 3.</p> <p>The new project construction footprints must be kept as small as practicably possible to reduce the surface impact on surrounding vegetation and no unnecessary/unauthorised footprint expansion into the surrounding areas may take place.</p> <p>No new roads or tracks to be constructed or implemented within the surrounding natural, undeveloped areas.</p> <p>If rotational planting practices are utilised and cultivated lands are left dormant for an extended period or lands are</p>		

	<p>permanently decommissioned, these lands must be adequately rehabilitated.</p> <p>In such a case, an adequate rehabilitation management plan must be developed by a suitably qualified and experienced specialist and implemented.</p> <p>Emphasis must be placed on the re-establishment of local, indigenous species associated with the relevant vegetation type in order to attempt to return the area to an ecologically functional state.</p>		
Cumulative Impact Rating after mitigation implementation	Low	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Medium (60)	Medium (60)	Medium (60)
	Assessment area 1	Assessment area 2	Assessment area 3
Identified Environmental Impact	Transformation of an Ecological Support Area (ESA) associated with the Assessment areas 2 & 3		
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	-	Medium (3)	Medium (3)
Cumulative Impact Rating prior to mitigation	-	Low	Low
Environmental Significance Score and Rating prior to mitigation	-	Medium (54)	Medium (54)
Mitigation Measures to be implemented	<p>The basic ecosystem functionality has virtually been destroyed and sufficient ecological restoration of the relevant vegetation type and its functionality within the assessment area, will prove to be very difficult.</p> <p>It is recommended that the flow path of the water drainage line associated with Assessment area 1, be adequately diverted and channelled around the existing cultivated lands in order to ensure continued flow of surface water runoff towards the significant ephemeral watercourse to the east.</p> <p>It is recommended that a minimum approximate 40 m buffer zone should be implemented around the significant ephemeral</p>		

	<p>watercourse associated with Assessment area 2 and no further development may take place within the buffered area.</p> <p>It is also recommended that no further development may take place any closer to either of the ephemeral watercourses within the localised area of Assessment area 3.</p> <p>The new project construction footprints must be kept as small as practicably possible to reduce the surface impact on surrounding vegetation and no unnecessary/unauthorised footprint expansion into the surrounding areas may take place.</p> <p>No new roads or tracks to be constructed or implemented within the surrounding natural, undeveloped areas.</p> <p>If rotational planting practices are utilised and cultivated lands are left dormant for an extended period or lands are permanently decommissioned, these lands must be adequately rehabilitated.</p> <p style="padding-left: 40px;">In such a case, an adequate rehabilitation management plan must be developed by a suitably qualified and experienced specialist and implemented.</p> <p style="padding-left: 40px;">Emphasis must be placed on the re-establishment of local, indigenous species associated with the relevant vegetation type in order to attempt to return the area to an ecologically functional state.</p>		
Cumulative Impact Rating after mitigation implementation	-	Low	Low

Environmental Significance Score and Rating after mitigation implementation	-	Low (32)	Low (32)
	Assessment area 1	Assessment area 2	Assessment area 3
Identified Environmental Impact	Destruction of-/damage to Red Data Listed, nationally or provincially protected species individuals/habitats associated with the assessment areas		
Magnitude of Negative or Positive Impact	Very low (2)	Very low (2)	Low (4)
Duration of Negative or Positive Impact	Long term (4)	Long term (4)	Long term (4)
Extent of Positive or Negative Impact	Local (2)	Local (2)	Local (2)
Irreplaceability of Natural Resources being impacted upon	Moderate (3)	Moderate (3)	Moderate (3)
Reversibility of Impact	Irreversible (5)	Irreversible (5)	Irreversible (5)
Probability of Impact Occurrence	Medium (3)	Low (2)	Medium (3)

Cumulative Impact Rating prior to mitigation	Low	Low	Low
Environmental Significance Score and Rating prior to mitigation	Low (48)	Low (32)	Medium (54)
Mitigation Measures to be implemented	<p>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, if deemed necessary by the competent authority. This will ensure that no provincially protected or significant species have potentially been omitted.</p> <p>The new project construction footprints must be kept as small as practicably possible to reduce the surface impact on surrounding vegetation and no unnecessary/unauthorised footprint expansion into the surrounding areas may take place.</p> <p>No new roads or tracks to be constructed or implemented within the surrounding natural, undeveloped areas.</p> <p>If rotational planting practices are utilised and cultivated lands are left dormant for an extended period or lands are permanently decommissioned, these lands must be adequately rehabilitated.</p> <p style="padding-left: 40px;">In such a case, an adequate rehabilitation management plan must be developed by a suitably qualified and experienced specialist and implemented.</p> <p style="padding-left: 40px;">Emphasis must be placed on the re-establishment of local, indigenous species associated with the relevant vegetation type in order to attempt to return the area to an ecologically functional state.</p> <p>A suitable greening project could be opted for in order to attempt to mitigate the severity of the impacts. It is recommended that the Department of Agriculture, Forestry and Fisheries be informed of the application as an Interested & Affected Party</p>		

	during the Public Participation Process in order for them to provide comment and recommendations in this regard.		
Cumulative Impact Rating after mitigation implementation	Low	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (30)	Low (30)	Low (34)
	Assessment area 1	Assessment area 2	Assessment area 3
Identified Environmental Impact	Terrestrial alien invasive species establishment		
Magnitude of Negative or Positive Impact	Very low (2)	Low (4)	Very low (2)
Duration of Negative or Positive Impact	Long term (4)	Long term (4)	Long term (4)
Extent of Positive or Negative Impact	Local (2)	Local (2)	Local (2)
Irreplaceability of Natural Resources being impacted upon	Low (2)	Low (2)	Low (2)

Reversibility of Impact	High (2)	High (2)	High (2)
Probability of Impact Occurrence	Medium (3)	High (4)	Medium (3)
Cumulative Impact Rating prior to mitigation	Low	Low	Low
Environmental Significance Score and Rating prior to mitigation	Low (36)	Medium (56)	Low (36)
Mitigation Measures to be implemented	<p>Implement suitable alien invasive species management measures in order to prevent any significant establishment and spreading of alien invasive species.</p> <p>It is recommended that the applicant continue with this active <i>Prosopis glandulosa</i> (Category 3) bush encroachment alleviation and management approach being implemented around Assessment area 2.</p>		
Cumulative Impact Rating after mitigation implementation	Low	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (22)	Low (26)	Low (22)

	Assessment area 1	Assessment area 2	Assessment area 3
Identified Environmental Impact	Surface material erosion		
Magnitude of Negative or Positive Impact	Very low (2)	Very low (2)	Very low (2)
Duration of Negative or Positive Impact	Long term (4)	Long term (4)	Long term (4)
Extent of Positive or Negative Impact	Site specific (1)	Site specific (1)	Site specific (1)
Irreplaceability of Natural Resources being impacted upon	Low (2)	Low (2)	Low (2)
Reversibility of Impact	High (2)	High (2)	High (2)
Probability of Impact Occurrence	Medium (3)	Medium (3)	Medium (3)
Cumulative Impact Rating prior to mitigation	Low	Low	Low
Environmental Significance Score and Rating prior to mitigation	Low (33)	Low (33)	Low (33)

Mitigation Measures to be implemented	Implement suitable erosion and storm water management measures in order to prevent any significant soil erosion in and around the pivot lands from occurring.		
Cumulative Impact Rating after mitigation implementation	Low	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (11)	Low (11)	Low (11)
	Assessment area 1	Assessment area 2	Assessment area 3
Identified Environmental Impact	Dust generation and emissions		
Magnitude of Negative or Positive Impact	Very low (2)	Very low (2)	Very low (2)
Duration of Negative or Positive Impact	Medium term (3)	Medium term (3)	Medium term (3)
Extent of Positive or Negative Impact	Local (2)	Local (2)	Local (2)

Irreplaceability of Natural Resources being impacted upon	Low (2)	Low (2)	Low (2)
Reversibility of Impact	High (2)	High (2)	High (2)
Probability of Impact Occurrence	Medium (3)	Medium (3)	Medium (3)
Cumulative Impact Rating prior to mitigation	Low	Low	Low
Environmental Significance Score and Rating prior to mitigation	Low (33)	Low (33)	Low (33)
Mitigation Measures to be implemented	<p>Implement suitable dust management and prevention measures during the cultivation season.</p> <p>Pivot lands to be sufficiently irrigated prior to commencement of cultivation and planting activities in order to prevent significant fugitive dust emissions.</p>		
Cumulative Impact Rating after mitigation implementation	Low	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (10)	Low (10)	Low (10)

	Assessment area 1	Assessment area 2	Assessment area 3
Identified Environmental Impact	Impeding of the historic ephemeral water drainage line's and significant watercourses' flow regimes associated with the quaternary surface water catchment and drainage area towards the south-east		
Magnitude of Negative or Positive Impact	Medium (6)	Low (4)	Low (4)
Duration of Negative or Positive Impact	Medium term (3)	Medium term (3)	Medium term (3)
Extent of Positive or Negative Impact	Regional (3)	Regional (3)	Regional (3)
Irreplaceability of Natural Resources being impacted upon	High (4)	High (4)	High (4)
Reversibility of Impact	Moderate (3)	Moderate (3)	Moderate (3)
Probability of Impact Occurrence	Medium (3)	Low (2)	Low (2)
Cumulative Impact Rating prior to mitigation	Low	Low	Low
Environmental Significance Score and Rating prior to mitigation	Medium (57)	Low (34)	Low (34)

<p>Mitigation Measures to be implemented</p>	<p>It is recommended that the flow path of the water drainage line associated with Assessment area 1, be adequately diverted and channelled around the existing cultivated lands in order to ensure continued flow of surface water runoff towards the significant ephemeral watercourse to the east.</p> <p>It is recommended that a minimum approximate 40 m buffer zone should be implemented around the significant ephemeral watercourse associated with Assessment area 2 and no further development may take place within the buffered area.</p> <p>It is also recommended that no further development may take place any closer to either of the ephemeral watercourses within the localised area of Assessment area 3.</p> <p>Adequate storm water management measures must be implemented on the site in order to sufficiently manage storm water runoff and clean/dirty separation during the operational phase and allow natural flow to continue as far as practicably possible.</p>		
<p>Cumulative Impact Rating after mitigation implementation</p>	<p>Low</p>	<p>Low</p>	<p>Low</p>
<p>Environmental Significance Score and Rating after mitigation implementation</p>	<p>Low (32)</p>	<p>Low (14)</p>	<p>Low (14)</p>

	Assessment area 1	Assessment area 2	Assessment area 3
Identified Environmental Impact	Alteration/contamination of soil and groundwater characteristics/quality		
Magnitude of Negative or Positive Impact	Low (4)	Low (4)	Low (4)
Duration of Negative or Positive Impact	Long term (4)	Long term (4)	Long term (4)
Extent of Positive or Negative Impact	Regional (3)	Regional (3)	Regional (3)
Irreplaceability of Natural Resources being impacted upon	High (4)	High (4)	High (4)
Reversibility of Impact	Low (4)	Low (4)	Low (4)
Probability of Impact Occurrence	Medium (3)	Medium (3)	Medium (3)
Cumulative Impact Rating prior to mitigation	Low	Low	Low
Environmental Significance Score and Rating prior to mitigation	Medium (57)	Medium (57)	Medium (57)

Mitigation Measures to be implemented	Irrigation and fertilisation 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 agricultural specialist must be consulted in order to advise on appropriate management practices.		
Cumulative Impact Rating after mitigation implementation	Low	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (32)	Low (32)	Low (32)
	Assessment area 1	Assessment area 2	Assessment area 3
Identified Environmental Impact	Over extraction of groundwater for irrigation purposes		
Magnitude of Negative or Positive Impact	Low (4)	Very Low (2)	Very Low (2)
Duration of Negative or Positive Impact	Medium term (3)	Medium term (3)	Medium term (3)
Extent of Positive or Negative Impact	Regional (3)	Regional (3)	Regional (3)

Irreplaceability of Natural Resources being impacted upon	High (4)	High (4)	High (4)
Reversibility of Impact	Moderate (3)	Moderate (3)	Moderate (3)
Probability of Impact Occurrence	Medium (3)	Medium (3)	Medium (3)
Cumulative Impact Rating prior to mitigation	Low	Low	Low
Environmental Significance Score and Rating prior to mitigation	Medium (51)	Low (45)	Low (45)
Mitigation Measures to be implemented	<p>Irrigation and fertilisation practices must be adequately managed in order to prevent over-fertilisation or over-irrigation which could lead to over extraction of groundwater and subsequent drying up of aquifers. A suitably qualified and experienced agricultural specialist must be consulted in order to advise on appropriate management practices.</p> <p>Extraction of the allotted sustainable yield volumes as per the geo-hydrological studies of the relevant boreholes, may not be exceeded at any time.</p> <p>Follow up geo-hydrological studies should be conducted on a minimum bi-annual basis (every two years) in order to ensure the sustainability and integrity of the underground aquifers are not being significantly compromised.</p>		

	<p>A Water Use License Application (WULA) must be submitted to the Department of Water and Sanitation for the relevant existing boreholes in accordance with the National Water Act (Act 36 of 1998).</p> <p>Only the allotted water quantities as per the approved Water Use License are to be extracted.</p> <p>Flow meters are to be installed in order to enable monitoring and management water consumption.</p> <p>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.</p>		
Cumulative Impact Rating after mitigation implementation	Low	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (28)	Low (28)	Low (28)

10. Summary and Conclusion

The assessment areas constitute cultivated centre pivot lands and a number of adjoining rectangular lands of which all previously existing natural surface vegetation on the cultivated land footprints has been completely transformed.

The broader areas surrounding all three the assessment areas are mainly in an undeveloped natural condition and therefore scored high PES values. The localised undeveloped areas surrounding Assessment areas 1 & 2, constitute flat to slightly sloping low growing grassland mainly dominated by 'white grasses'. These areas also possess a well-represented dwarf karroid shrub layer while tree and shrub individuals are very sparsely present.

The localised undeveloped valley bottom areas surrounding Assessment area 3, constitute slightly sloping open savannah shrubland. The areas possess a relatively well-developed woody component which mainly consists of multi-stemmed shrubs with small single-stemmed trees also being sparsely present.

It is reasonably assumed that the historic ecology of the three assessment areas prior to the agricultural transformation, would have been comparable to that of their surrounding undeveloped areas as they are situated directly adjacent to the assessment areas. No significant changes in soil structure or landscape topography or features are evident between the assessment areas and their surrounding undeveloped areas which further supports this assumption.

The average density of the nationally protected species *Vachellia erioloba* individuals within the undeveloped areas surrounding Assessment areas 1 & 2 amounts to approximately 0.25 trees/ha. This therefore equates to a total estimate of approximately 6 and 2 individuals within the footprints of Assessment areas 1 & 2 respectively which are reasonably assumed to have been removed during the initial cultivation.

The average density of the nationally protected species *Vachellia haemataxylon* individuals within the undeveloped areas surrounding Assessment areas 1 & 2 amounts to approximately 0.05 trees/ha. This therefore equates to a total estimate of approximately 2 individuals within the footprint of Assessment area 1 which are reasonably assumed to have been removed during the initial cultivation. The likelihood of any individuals historically being present within the cultivated land footprints of Assessment area 2 is however low.

Due to the localised undeveloped areas surrounding Assessment area 3 constituting open savannah shrubland, the density of nationally protected tree individuals is slightly higher relative to the other two assessment areas. The average density of *Vachellia erioloba* individuals within the undeveloped valley bottom areas surrounding Assessment area 3 amounts to approximately 3 trees/ha. This therefore equates to a total estimate of approximately 17 individuals within the footprint of Assessment area 3 which are reasonably assumed to have been removed during the initial cultivation.

The average density of the nationally protected species *Boscia albitrunca* individuals within the undeveloped valley bottom areas surrounding Assessment area 3 amounts to approximately 2 trees/ha. This therefore equates to a total estimate of approximately 11 individuals within the footprint of Assessment area 3 which are reasonably assumed to have been removed during the initial cultivation.

With the exception of the sparsely represented nationally protected tree species and the provincially protected species *Oxalis semiloba*, no Red Data Listed-, other provincially protected species or any other species of conservational significance were found to be present within the localised surrounding undeveloped areas. It is therefore also not anticipated that the assessment areas would necessarily have housed large numbers of any species of conservational significance. It must however be noted that the time of the assessment was not necessarily favourable for successful identification of all plant species individuals.

Due to the natural pristine state of the broader surrounding undeveloped areas, the areas are utilised by a wide variety of common and specialised small antelope as well as burrowing and predatory mammals for breeding, foraging and persistence purposes. The mobility of such faunal species along with the broad, continuous surrounding natural landscape however allows for individuals to simply leave an area where disturbance is taking place and disperse to other similar, adequate areas.

The assessment areas and surrounding undeveloped areas do not fall within any Important Bird Area (IBA) as per the latest IBA map obtained from the Birdlife SA website (www.birdlife.org.za/conservation/important_bird_areas/iba-map). Small nests of common resident bird species were observed within some of the very sparsely represented shrub and tree individuals within the surrounding undeveloped areas, but no conservationally significant bird species, unique

or specialised bird habitats were observed or are expected to utilise the areas for breeding and/or persistence purposes.

A distinct second order ephemeral water drainage line historically traversed Assessment area 1 flowing in an easterly direction and discharging into a significant ephemeral watercourse located approximately 1.9 km east of the assessment area. This significant watercourse forms an important part of the mid portion of a quaternary surface water catchment and drainage area which drains towards the south-east.

The cultivation of the rectangular lands associated with Assessment area 1, was however completed directly through the historic drainage line and the area was mechanically levelled for the lands. The original flow regime and -path of the drainage line towards the significant watercourse was therefore significantly altered and obstructed. Limited water flow however still takes place through the drainage line during rainfall events. It is recommended that the flow path of the drainage line be adequately diverted and channelled around the existing cultivated lands in order to ensure continued flow of surface water runoff during rainfall events, towards the significant ephemeral watercourse to the east.

This significant watercourse into which this drainage line flows, also flows past Assessment areas 2 & 3 directly adjacent east. The watercourse has however seemingly not been directly or significantly impacted by the development of Assessment areas 2 & 3. The original flow regime and -path of the watercourse has not been significantly altered or obstructed and unimpeded water flow still takes place through the watercourse during rainfall events. It is however recommended that a minimum approximate 40 m buffer zone should be implemented around the watercourse portion which is adjacent to Assessment area 2 and no further development may take place within the buffered area. It is also recommended that no further development may take place any closer to either of the watercourses within the localised area of Assessment area 3.

The three assessment areas and localised surrounding undeveloped natural areas would probably have scored moderate historic EIS values as these areas could have been viewed as being ecologically important and sensitive on local or possibly provincial scale mainly due to the sparse presence of nationally protected tree and shrub species individuals as well as the ephemeral water drainage line and significant ephemeral watercourses which form an important part of the mid portion of a quaternary surface water catchment and drainage area towards the south-east.

The three assessment areas would therefore historically probably have been viewed as being of moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type, ESA, nationally protected tree and shrub species individuals as well as the quaternary surface water catchment and drainage area which drains towards the south-east.

It is the opinion of the specialist that the virtually complete loss and transformation of natural habitat, biota and basic ecosystem functionality within the three assessment areas is deemed irreversible. Sufficient ecological restoration of the relevant vegetation type and its functionality within the assessment areas, will therefore not be practicably feasible.

It is further the opinion of the specialist that the development should not pose any further potentially significant long term ecological impacts which cannot be suitably reduced and mitigated to within acceptable residual levels. The significant ecological impacts associated with the impeding of the historic ephemeral water drainage line's and significant watercourses' flow regimes and alteration/contamination of soil and groundwater characteristics/quality, can be suitably reduced and mitigated to within acceptable residual levels.

The project should therefore be considered by the competent authority for Environmental Authorisation and approval. All recommended mitigations measures as per this ecological report must be adequately implemented and managed for the remainder of the operational phase and subsequent future decommissioning phase. All necessary authorisations, licenses and permits must also be obtained as soon as reasonably and practicably possible.

11. References

Collins, N.B. 2017. Free State Province Biodiversity Plan: Technical Report v1.0. Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs. Internal Report.

Conservation of Agricultural Resources Act (Act 43 of 1983)

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

National Environmental Management Act (Act 107 of 1998)

National Environmental Management: Biodiversity Act (Act 10 of 2004)

National Environmental Management: Biodiversity Act (Act 10 of 2004); Alien and Invasive Species Regulations, 2014

National Forests Act (Act 84 of 1998)

National Water Act (Act 36 of 1998)

Northern Cape Nature Conservation Act (Act 9 of 2009)

Northern Cape Provincial Spatial Biodiversity Plan 2016 (NCPSBP)
<http://bgis.sanbi.org/Projects/Detail/203>

South African National Biodiversity Institute (2006-). The Vegetation Map of South Africa, Lesotho and Swaziland, Mucina, L., Rutherford, M.C. and Powrie, L.W. (Editors), Online, <http://bgis.sanbi.org/SpatialDataset/Detail/18>, Version 2012.*

www.climate-data.org

12. 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
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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

2019

- Completion of a Water Use License Application (WULA) Risk Assessment for a proposed Kopanong Local Municipality Bridge Upgrading development project in Philippolis, Free State Province.
- Completion of a specialist ecological assessment and report for a proposed 4.9 ha Royal Vision Developments Gravel Quarry development project outside Kroonstad, Free State Province.
- Completion of a specialist ecological assessment and report for a proposed 1262.7 ha Paul de Villiers NEMA Section 24G agricultural development project outside Douglas, Northern Cape Province.
- Completion of a specialist ecological assessment and report for a proposed 53 ha Arborlane Estates (Pty) Ltd agricultural development project outside Augrabies, Northern Cape Province.
- Completion of a specialist ecological assessment and report for a proposed 42.7 ha Arborlane Estates (Pty) Ltd NEMA Section 24G agricultural development project outside Augrabies, Northern Cape Province.
- Completion of a Water Use License Application (WULA) Risk Assessment for a proposed 53 ha Arborlane Estates (Pty) Ltd agricultural development project outside Augrabies, Northern Cape Province.

- Completion of a specialist ecological assessment and report for a proposed 20.2 km Water Pipeline Development from Lindley to Arlington, Free State Province.
- Completion of a specialist watercourse delineation and report for a proposed 5.36 ha Filling Station and Shopping Centre Development project in Thaba Nchu, Free State Province.
- Completion of a Water Use License Application (WULA) Risk Assessment for a proposed 20.2 km Water Pipeline Development from Lindley to Arlington, Free State Province.
- Completion of a specialist Grazing and Invasive Species Management Plan for the Farm Driefontein no 274, outside Ficksburg, Free State Province.
- Completion of a Water Use License Application (WULA) Risk Assessment for a proposed 1262.7 ha Paul de Villiers NEMA Section 24G agricultural development project outside Douglas, Northern Cape Province.
- Completion of a Rehabilitation and Alien Invasive Species Management Plan for a proposed 1262.7 ha Paul de Villiers NEMA Section 24G agricultural development project outside Douglas, Northern Cape Province.
- Completion of a Protected Species Relocation Management Plan for a proposed 1262.7 ha Paul de Villiers NEMA Section 24G agricultural development project outside Douglas, Northern Cape Province.
- Completion of a GIS Master Layout Plan for a proposed 1262.7 ha Paul de Villiers NEMA Section 24G agricultural development project outside Douglas, Northern Cape Province.
- Completion of a specialist ecological assessment and report for a proposed 535 ha Farms Bultfontein & Folmink agricultural development project outside Prieska, Northern Cape Province.
- Completion of a specialist ecological assessment and report for the proposed 6.42 ha Phokwane Local Municipality Residential development project in Jan Kempdorp, Northern Cape Province.
- Completion of a Stormwater Management Plan for a proposed 2 ha Chimoio Game Camp Lodging development project outside Kroonstad, Free State Province.
- Completion of a GIS Master Layout Plan for a proposed 2 ha Chimoio Game Camp Lodging development project outside Kroonstad, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 13.8 ha Phokwane Local Municipality Cemetery expansion project in Jan Kempdorp, Northern Cape Province.
- Completion of a specialist ecological assessment and report for a proposed 19.9 ha Vergenoeg NEMA Section 24G residential development project in Wesselsbron, Free State Province.

- Completion of a specialist ecological assessment and report for a proposed 20.5 ha Khalinkomo NEMA Section 24G residential development project in Wesselsbron, Free State Province.
- Completion of a specialist Erosion and Rehabilitation Monitoring Report for the Farms Die Kranse no 1174 and De Rotsen no 52 outside Vrede, Free State Province.
- Completion of a specialist Grazing and Invasive Species Management Plan for the Farm Zaaihoek no 1251, outside Vrede, Free State Province.
- Completion of a specialist Grazing and Invasive Species Management Plan for Plot 19 of the Farm Ballyduff no 1594, in Bethlehem, Free State Province.
- Completion of a specialist Grazing and Invasive Species Management Plan for the Farm Mooiuitzicht no 205, outside Bethlehem, Free State Province.
- Completion of a specialist Grazing and Invasive Species Management Plan for the Farm Rietfontein no 1457, outside Bethlehem, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed Gamagara Local Municipality Water Reticulation Development project in Olifantshoek, Northern Cape Province.
- Completion of a Rehabilitation and Alien Invasive Species Management Plan for a proposed Kopanong Local Municipality Bridge Upgrading development project in Philippolis, Free State Province.
- Completion of a Water Use License Application (WULA) Risk Assessment for a proposed Gamagara Local Municipality Water Reticulation Development project in Olifantshoek, Northern Cape Province.
- Completion of a Rehabilitation and Alien Invasive Species Management Plan for a proposed Gamagara Local Municipality Water Reticulation Development project in Olifantshoek, Northern Cape Province.
- Completion of a Protected Species Relocation Management Plan for a proposed Gamagara Local Municipality Water Reticulation Development project in Olifantshoek, Northern Cape Province.
- Completion of a specialist Grazing and Invasive Species Management Plan for the Farm Erfenis no 1014, outside Bethlehem, Free State Province.

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.
- Completion of a specialist ecological assessment and report for a proposed 135 ha agricultural development project outside Griekwastad, 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 Erosion Management Plan for the Retiefs Nek no 123, outside Bethlehem, Free State Province.
- Completion of a specialist Grazing and Erosion Management Plan for the Dekselfontein no 317, outside Bethlehem, Free State Province.
- Completion of a specialist ecological assessment and report for a proposed 12 ha agricultural development project in Petrusville, Northern Cape Province.
- Completion of a specialist ecological and wetland assessment and report for a proposed 270 ha industrial park development project in Secunda, Mpumalanga Province.
- Completion of a specialist ecological and wetland assessment and report for a proposed 233 ha industrial park development project in Sabie, Mpumalanga Province.
- Completion of a specialist ecological assessment and report for the proposed Dawid Kruiper Local Municipality Residential Development around Upington, Northern Cape Province.
- Completion of two specialist ecological assessments and reports for two proposed 15 ha agricultural development projects outside Hopetown, Northern Cape Province.
- Completion of two Alien Invasive Species Management Plans for two proposed 15 ha agricultural development projects outside Hopetown, Northern Cape Province.
- Completion of a Protected Species Relocation Management Plan for a proposed 15 ha agricultural development project outside Hopetown, Northern Cape Province.
- Completion of a specialist ecological and wetland assessment and report for a proposed 169 ha industrial park development project in Sabie, Mpumalanga Province.

- Completion of a specialist Grazing and Erosion Management Plan for the Farm Barnea no 231, outside Bethlehem, Free State Province.
- Compilation of a GIS locality, vegetation and sensitivity map for the proposed 7.13 ha Karoo Hoogland Local Municipality Residential Development project in Sutherland, Northern Cape Province.
- Completion of a specialist Erosion and Rehabilitation Monitoring Report for the Farms Die Kranse no 1174 and De Rotsen no 52 outside Vrede, Free State Province.
- Drafting of an official Environmental Policy for Teambo Facilitators (Pty) Ltd in Bloemfontein, Free State Province.
- Completion of a specialist ecological assessment and report for a proposed 11.6 ha COGHSTA NEMA Section 24G residential development project in Douglas, Northern Cape Province.
- Completion of a specialist ecological assessment and report for a proposed 3.26 ha COGHSTA NEMA Section 24G residential development project in Strydenburg, Northern Cape Province.
- Completion of a specialist ecological assessment and report for a proposed 25.6 ha COGHSTA NEMA Section 24G residential development project in Loxton, Northern Cape Province.
- Completion of a specialist biodiversity offset feasibility assessment and report for a proposed 805 ha agricultural development project outside Douglas, Northern Cape Province.
- Completion of a specialist ecological assessment and report for a proposed 2 ha Rouxville Waste Water Treatment Works expansion project in Rouxville, Free State Province.
- Completion of a specialist ecological exemption letter for the proposed Vanderkloof Tegnologie Chicken Abattoir development project in Petrusville, Northern Cape Province.
- Completion of a Protected Species Relocation Management Plan for a proposed 2 ha Rouxville Waste Water Treatment Works expansion project in Rouxville, Free State Province.
- Completion of a Rehabilitation and Alien Invasive Species Management Plan for a proposed 2 ha Rouxville Waste Water Treatment Works expansion project in Rouxville, Free State Province.
- Completion of a Stormwater and Erosion Management Plan for a proposed 2 ha Rouxville Waste Water Treatment Works expansion project in Rouxville, Free State Province.
- Completion of a Water Use License Application (WULA) Risk Assessment for a proposed 2 ha Rouxville Waste Water Treatment Works expansion project in Rouxville, Free State Province.
- Completion of a revised specialist ecological assessment and report for the proposed 17.7 ha Luckhoff Waste Facility development project in Luckhoff, Free State Province.
- Completion of a specialist ecological assessment and report for a proposed 113.3 ha Dawn Valley Estate development project in Bloemfontein, Free State Province.

- Completion of a specialist Grazing and Invasive Species Management Plan for the Farm Klipfontein no 71, outside Lindley, Free State Province.
- Completion of a specialist Grazing and Invasive Species Management Plan for the Farm Meyerskop no 1801, outside Bethlehem, Free State Province.
- Completion of a specialist ecological assessment and report for a proposed 2.24 ha Mullerstuine Cemetery development project in Vanderbijlpark, Gauteng Province.
- Completion of a specialist Species of Special Concern & Alien Invasive Species assessment and report for all the Transnet Engineering Group 5 Free State Province Sites.
- Completion of a specialist Species of Special Concern & Alien Invasive Species assessment and report for all the Transnet Engineering Group 6 Northern Cape Province Sites.
- Completion of a specialist ecological assessment and report for a proposed 80 ha agricultural development project outside Ritchie, Northern Cape Province.
- Completion of a specialist ecological and wetland assessment and report for a proposed 545 ha residential development project in Leandra, Mpumalanga Province.
- Completion of a specialist ecological assessment and report for a proposed 2 ha Chimoio Game Camp Lodging development project outside Kroonstad, Free State Province.
- Completion of a Water Use License Application (WULA) Risk Assessment for a proposed 2 ha Chimoio Game Camp Lodging development project outside Kroonstad, Free State Province.
- Completion of a Protected Species Relocation Management Plan for a proposed 80 ha agricultural development project outside Ritchie, Northern Cape Province.
- Completion of a Rehabilitation and Alien Invasive Species Management Plan for a proposed 80 ha agricultural development project outside Ritchie, Northern Cape Province.
- Completion of a Water Use License Application (WULA) Risk Assessment for a proposed 80 ha agricultural development project outside Ritchie, Northern Cape Province.
- Completion of a specialist Grazing Management Plan for the Farm Fairdale no 1048, outside Vrede, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 14.4 ha Frankfort Landfill Site expansion project in Frankfort, Free State 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 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.

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.