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March 2016

REPORT ON

ECOLOGICAL BASELINE AND IMPACT ASSESSMENT REPORT FOR THE PROPOSED 21.5HA EXTENTION OF THE WATERLOO PHOTOVOLTAIC POWER FACILITY NEAR VRYBURG IN THE NORTH WEST PROVINCE

Report Number: 2016/021/01/02

Submitted to:

Environamics

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EXECUTIVE SUMMARY

Flora assessments were conducted during the wet season (March 2016). Based on species composition, physiognomy, moisture regime, rockiness, slope and soil properties, it was found that the entire study area (21.5 ha) falls within a single vegetation community, namely the Tarchonanthus - Ziziphus Shrubland.

The tree layer in this vegetation community is dominated by Ziziphus mucronata and Searsia lancea with few Acacia species present. The shrub layer is well defined in this vegetation community and Tarchonanthus camphoratus is the dominant shrub species in higher lying areas of the study area, particularly on shallower soils underlain by dolomite. This vegetation community is typically covered by sparse open grassland.

Recorded species include two climber species, 12 dwarf shrub species, three geophyte species, 20 graminoid species, 23 herb species, one succulent species and two tree species. Although no species of concern were recorded within the study area itself, Acacia erioloba, Brunsvigia radula and Aloe grandidentata were found in other areas of the same vegetation community and therefore can be considered as having a high probability of occurrence in this vegetation community and the study area.

A list of plant species previously recorded in the quarter degree grid in which the study area is situated was obtained from the South African National Biodiversity Institute. Additional species that could occur in similar habitats, as determined from official database searches and reviewed literature, but not recorded in these grids are also listed. A total of 20 species were determined to possibly be occurring in the study area.

The species, listed as possibly occurring in the study area, were evaluated to determine the probability of occurrence in the study area based on habitat suitability. Of the species that are considered to occur within the area under investigation, there were five species that could occur in habitats that are available in the study area. Three of the species of concern, *Aloe grandidentata, Brunsvigia radula* and *Acacia eroloba*, were recorded in the study area and could occur anywhere within the study area.

Reptile diversity in the area is high with approximately 38 reptile species occurring in the area and reptile endemism is especially high in the region with 10 species (24%) being endemic. Nine were confirmed during the site visit. Most of the species in the area are common and widespread.

Only thirteen species are expected to occur in the study area, and during the study only four amphibian species were recorded. Due to the rainy conditions at the time, four species were recorded in the study area during the study, it is unlikely that all four these species would be present on site at drier times. All the recorded species were common species which are not listed or range restricted.

Of the 67 mammal species expected to occur in the study area, according to historic recordings, only nine were confirmed during the site visit. All nine mammal species recorded are robust and widespread, mostly with the proviso that suitable habitat and sufficient space to maintain home ranges / territories are available. Given no or lowkey prosecution, all species are capable of maintaining their presences in remote areas such as the site and surrounding properties. The nearby roads are a main source of fatalities – several carcasses were recorded during transit to and from the study area.

Of the seven fauna species of concern that may occur in the study area, 1 has low probability of occurrence, 5 have a medium probability of occurrence and one has a high probability of occurrence. Three of the species with a high probability of occurrence, the Black-necked spitting Cobra, Maccoa Duck and Lanner Falcon, were recorded during the study.

The study area consists of extensive areas of Terrestrial Critical Biodiversity Areas. More than half of the study site is covered by some sort of CBA. The largest portion of the CBA consists of Important Ecological Corridors (T2 CBA). Hill features in the study area have been classified as T2 CBA (Hills).

A site visit of the CBA areas falling within the proposed farm portions was conducted in March 2016. The purpose of the site visit was to determine the status, condition and capabilities of these areas to fulfil their respective ecological functions and to determine whether the proposed development will have a potential detrimental impact on these areas and their functions

The ecological function of the study area can generally be described as high for the study area, although in some parts of the study area trampling and some gully erosion is evident. In the vast majority of the study area ecological patterns and processes in the study area are intact and little impact on ecological integrity is evident.

The conservation importance of the study area can be described as moderate, due to the fact that there is a possibility of protected species occurring in this vegetation community some protected plant species (Acacia erioloba, Brunsvigia radula and Aloe grandidentata) were found in this vegetation community outside of the study area, although none were found at the study sites within the study area. In keeping with the Precautionary Principle (COMEST, 2005), we need to assume a higher conservation importance when in doubt. The ecological impact assessment yielded seven likely impacts namely:

- Vegetation Clearing
- Spillage of harmful or toxic substances
- Disturbance of biodiversity due to vibration and noise
- Habitat degradation due to dust
- Effects on local migrations
- Increased prevalence of exotic invasive species
- Increased erosion.

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1 INTRODUCTION

Hudson Ecology (Pty) Ltd was commissioned by Environamics to conduct an ecological assessment of ecosystems associated with the proposed 21.5ha extension of the proposed Waterloo photovoltaic (PV) power plant, south-east of Vryburg in the North West Province.

SunEdison is proposing to establish a new photovoltaic solar power facility on the Farm Waterloo in the North West Province, South Africa. The study area is situated approximately 4km south-east of the town of Vryburg.

In order to obtain Environmental Authorisation for the proposed project, SunEdison is required to conduct an Environmental Impact Assessment (EIA) in terms of GN R. 982 of the National Environmental Management Act, 1998 (Act 107 of 1998) (as amended).

The proposed Waterloo project will consist of a PV solar facility. The facility is likely to cover an area of approximately 170ha with a 7.5km associated132KVA transmission line. For the purposes of this study a survey of the 21.5ha extension was conducted, but the cumulative impacts determined will take into account the entire 170ha development.

2 LEGISLATIVE CONTEXT

This section provides a brief overview of both the national and international requirements that must be met by this report. It includes international conventions and agreements, as well as the IFC Standards and the Equator Principles.

2.1 National Environmental Management Act

This report has been prepared in terms the EIA Regulations 2014 (South Africa, 2014) promulgated under the National Environmental Management Act No. 107 of 1998 (NEMA) and is compliant with Regulation 982. Specialist reports and reports on specialised processes under the Act. Relevant clauses of the above regulation are quoted below and reflect the required information in the —Control sheet for specialist report given above.

Appointment of EAPs and specialists

12. (1) A proponent or applicant must appoint an EAP at own cost to manage the application.

(2) In addition to the appointment of an EAP, a specialist may be appointed, at the cost of the proponent or applicant, if the level of assessment is of a nature requiring the appointment of a specialist.

(3) The proponent or applicant mustThis

(a) take all reasonable steps to verify whether the EAP and specialist complies with regulation 13(1)(a) and (b); and

(b) provide the EAP and specialist with access to all information at the disposal of the proponent or applicant regarding the application, whether or not such information is favourable to the application.

General requirements for EAPs and specialists

13. (1) An EAP and a specialist, appointed in terms of regulation 12(1) or 12(2), must-

(a) be independent;

(b) have expertise in conducting environmental impact assessments or undertaking specialist work as required, including knowledge of the Act, these Regulations and any guidelines that have relevance to the proposed activity;

(c) ensure compliance with these Regulations;

(d) perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the application;

(e) take into account, to the extent possible, the matters referred to in regulation 18 when preparing the application and any report, plan or document relating to the application; and

(f) disclose to the proponent or applicant, registered interested and affected parties and the competent authority all material information in the possession of the EAP and, where applicable, the specialist, that reasonably has or may have the potential of influencing-

(i) any decision to be taken with respect to the application by the competent authority in terms of these Regulations; or

(ii) the objectivity of any report, plan or document to be prepared by the EAP or specialist, in terms of these Regulations for submission to the competent authority; unless access to that information is protected by law, in which case it must be indicated that such protected information exists and is only provided to the competent authority.

(2) In the event where the EAP or specialist does not comply with subregulation (1)(a), the proponent or applicant must, prior to conducting public participation as contemplated in chapter 5 of these Regulations, appoint another EAP or specialist to externally review all work undertaken by the EAP or specialist, at the applicant's cost.

(3) An EAP or specialist appointed to externally review the work of an EAP or specialist as contemplated in subregulation (2), must comply with subregulation (1).

In terms of Appendix 6 of the Regulations (South Africa, 2014) the specialist report must contain:

(a) details of-

(i) the specialist who prepared the report; and

(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;

(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;

(c) an indication of the scope of, and the purpose for which, the report was prepared;

(d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;

(e) a description of the methodology adopted in preparing the report or carrying out the specialised process;

(f) the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;

(g) an identification of any areas to be avoided, including buffers;

(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;

(i) a description of any assumptions made and any uncertainties or gaps in knowledge;

(j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;

(k) any mitigation measures for inclusion in the EMPr;

(l) any conditions for inclusion in the environmental authorisation;

(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;

(n) a reasoned opinion-

(i) as to whether the proposed activity or portions thereof should be authorised; and

(ii) if the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;

(o) a description of any consultation process that was undertaken during the course of preparing the specialist report;

(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and

2.2 Further South African legislation considered in the compilation of this report

2.2.1 National Environmental Management Act, Act No. 107 of 1998 (NEMA)

NEMA requires, inter alia, that:

- Development must be socially, environmentally, and economically sustainable;
- Disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied; and
- A risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions.

NEMA states that —the environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage.

2.2.2 Environment Conservation Act No 73 of 1989 Amendment Notice No R1183 of 1997 (ECA)

The ECA states that:

Development must be environmentally, socially, and economically sustainable. Sustainable development requires the consideration of inter alia the following factors:

- That pollution and degradation of the environment is avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- That the use and exploitation of non-renewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource;
- That the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised; and
- That negative impacts on the environment and on peoples'environmental rights be anticipated and prevented, and where they cannot be altogether prevented are minimised and remedied.

The developer is required to undertake Environmental Impact Assessments (EIA) for all projects listed as a Schedule 1 activity in the EIA regulations in order to control activities which might have a detrimental effect on the environment. Such activities will only be permitted with written authorisation from a competent authority.

2.2.3 National Forests Act (Act no 84 of 1998)

2.2.3.1 Protected trees

According to this act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister'.

2.2.3.2 Forests

Prohibits the destruction of indigenous trees in any natural forest without a licence.

2.2.4 National Environmental Management: Biodiversity Act (Act No 10 of 2004)

In terms of the Biodiversity Act, the developer has a responsibility for:

- The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations).
- Promote the application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all development within the area are in line with ecological sustainable development and protection of biodiversity.
- Limit further loss of biodiversity and conserve endangered ecosystems.

2.2.5 Conservation of Agricultural Resources (Act No. 43 of 1983) as amended in 2001

Declared Weeds and Invaders in South Africa are categorised according to one of the following categories:

- Category 1 plants: are prohibited and must be controlled.
- Category 2 plants: (commercially used plants) may be grown in demarcated areas providing that there is a permit and that steps are taken to prevent their spread.
- Category 3 plants: (ornamentally used plants) may no longer be planted; existing plants may remain, as long as all reasonable steps are taken to prevent the spreading thereof, except within the floodline of watercourses and wetlands.

2.2.6 National Water Act

Wetlands, riparian zones, and watercourses are defined in the Water Act as a water resource and any activities that are contemplated that could affect the wetlands requires authorisation (Section 21 of the National Water Act of 1998). A "watercourse in terms of the National Water Act (act 36 of 1998) means:

- River or spring;
- A natural channel in which water flows regularly or intermittently;
- A wetland, lake or dam into which, or from which, water flows; and

Any collection of water which the Minister may, by notice in the gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

2.3 Key authorities for the EIA application

The DEA will be the decision-making authority for the environmental authorisation process, which is being undertaken in terms of the NEMA.

The Department of Water and Sanitation (DWS) is the authority responsible for issuing WULs, however this EIA will not be integrated with a WUL process as specific detail on the solar development water uses will only be known once the applicant has completed the bidding process with the Department of Energy.

2.4 International Conventions and Agreements

Relevant environmental and social international conventions and agreements to which South Africa is a party are presented in Table 1.

Table 1: Relevant international conventions to which South Africa is a party Convention Summary of objectives or relevant conditions South African Status

Convention	Summary of objectives or relevant conditions	South AfricanStatus
CITES Convention (1 July 1975)	CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten	Party to

	their survival.	
Convention on Biological Diversity (29 December 1993)	Develop strategies, plans or programs for conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programs which shall reflect, inter alia, the measures set out in this Convention.	Party to.
Convention on Wetlands of International Importance (Ramsar) (21 December 1975)	To stem the progressive encroachment and loss of wetlands now and in the future.	Party to.
United Nations Convention to Combat Desertification (26 December 1996)	To combat desertification and mitigate the effects of drought through national action programs.	Party to.
Stockholm Convention on Persistent Organic Pollutants (POPs) (17 May 2004)	This convention seeks to ban the production and use of persistent organic chemicals but allow the use of some of these banned substances, such as DDT, for vector control.	Party to.

3 AIMS AND OBJECTIVES

The aim of this study was to provide a description of the receiving ecological environment, which may be impacted upon by the proposed project, and identify possible ecological issues and red flags associated with the ecology of the study area and surrounds.

The objectives in this study can be summarised as follows:

- Location of the proposed development;
- Description of the policy and legislative context applicable to the proposed development;
- Methodologies employed during the study;
- Description of the receiving ecological environment; and
- Description and mitigation of impacts associated with the development.

4 SCOPE OF WORK

The scope of work for this project includes:

- Review of existing literature on biodiversity of the area;
- A site investigation for the purposes of the study (conducted from the 1th to the 5th of March 2016); and
- Compilation of a baseline and impact assessment report comprising of the information described in the aims and objectives section above.

5 STUDY AREA

The proposed development area (study area) covers approximately 2.5ha of the farm Waterloo (Figure 1). The site falls within the 2724BB quarter degree grid square. No alternative route is currently being considered for the proposed transmission line. It must be noted that the entire development will include a further 150ha area, which will be included in the determination of the cumulative impacts.

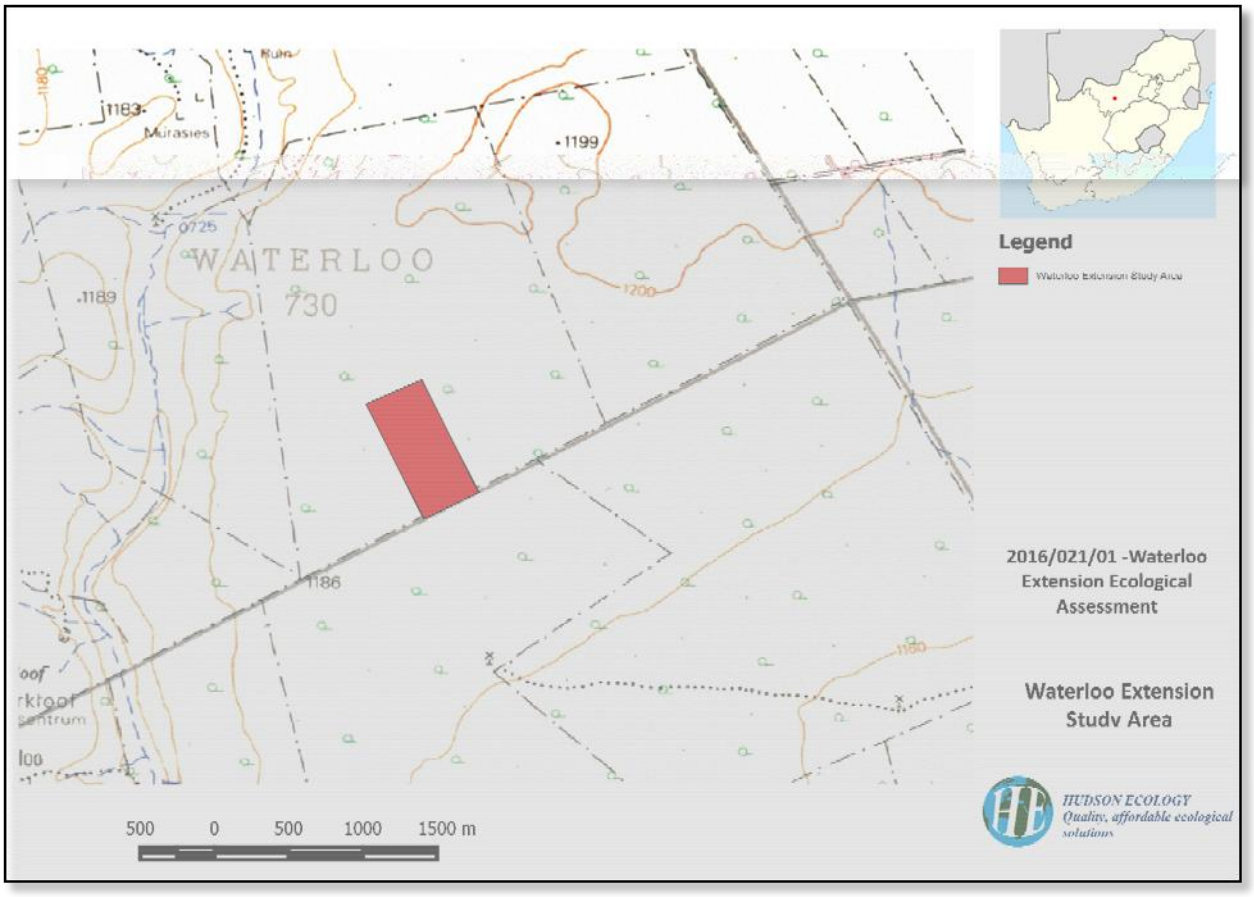

Figure 1: Locality of the study area

The study area is relatively isolated and is situated along a minor road Southeast of Vryburg, approximately 1km from the Dry Harts River.

6 METHODOLOGY

6.1 Desktop review of relevant documentation

A number of literature sources were reviewed for the purposes of this report. These include, *inter alia*, vegetation descriptions, field guides and atlases for the various flora and fauna taxa, and scientific articles in order to determine species lists for the area. Previous studies conducted in the area and scientific online literature.

6.2 Methodologies

Six study sites were selected within the study area (Figure 2). In order to enable a characterization of the environment, as well as floral and faunal species that may be impacted by the proposed construction activities, faunal and floral groups were investigated. These species were then used in order to determine the possible magnitude of the impact of the proposed activities. The following taxa were investigated:

- Vegetation;
- Arthropoda;
- Mammals;
- Herpetofauna (Reptiles); and

- Amphibia.

All methods implemented during this investigation are based on accepted scientific investigative techniques and principles, and were performed to accepted standards and norms, whilst taking the limitations of this investigation into consideration. The Precautionary Principle (COMEST, 2005) was applied throughout the assessments.

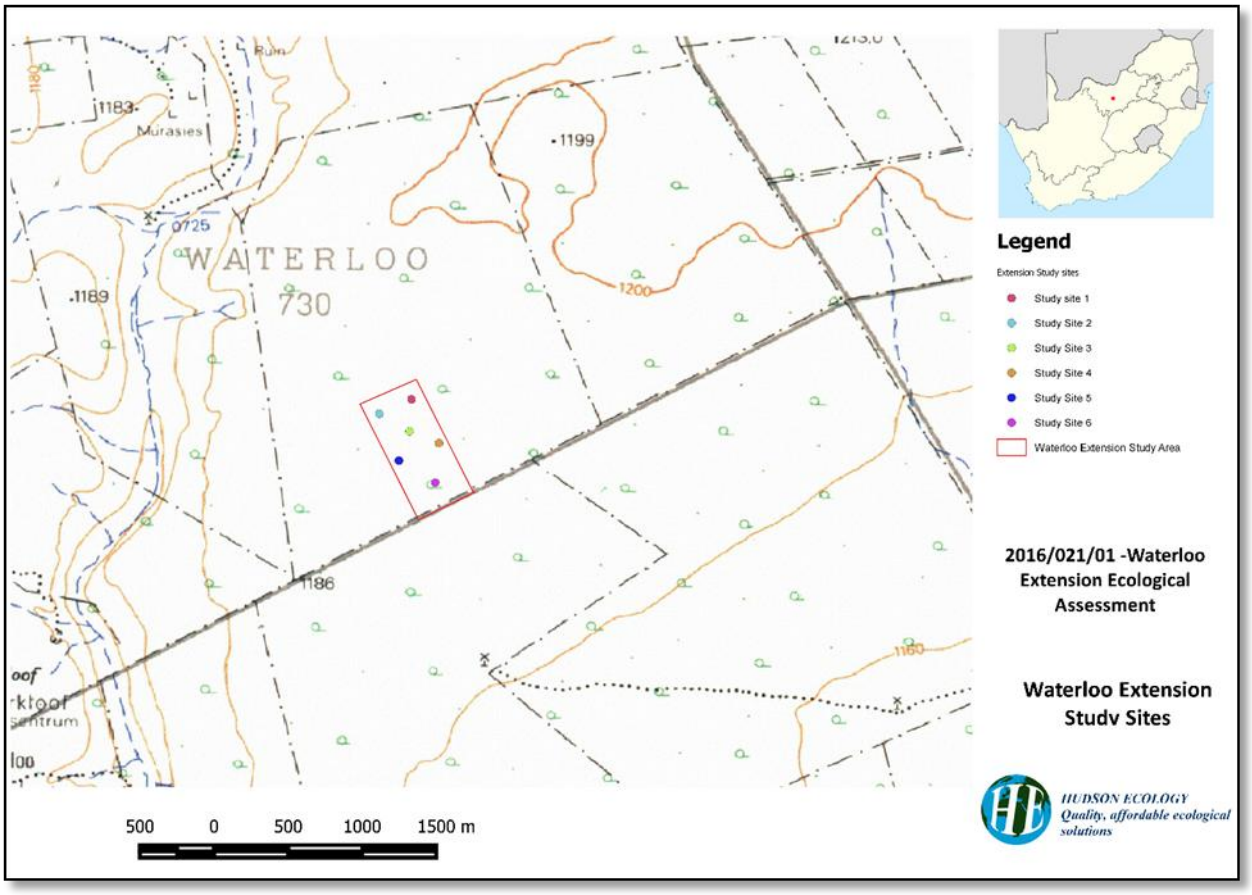

Figure 2: Terrestrial ecology study sites (TESS)

6.2.1 General Floristic Attributes

The vegetation assessment was based on a variation of the Braun-Blanquet method (Mueller-Dombois & Ellenberg, 1974; Westhoff & Van der Maarel, 1978) whereby vegetation is stratified, by means of aerial or satellite imagery with physiognomic characteristics as a first approximation. Stratification was further augmented by sites being selected to represent each of the areas that will be impacted by the current development footprint. Representative areas within these stratifications are then surveyed by means of line-point transects for grasses, sedges and forbs, as well as belt transects for shrubs and trees. Data obtained from these surveys are then subject to analysis to establish differences or similarities between observed units. Results and species lists provided should be interpreted with the above mentioned survey limitations in mind.

During the floral surveys conducted during the August 2015 survey, cognisance was taken of the following environmental attributes and general information:

- Biophysical environment (geology, topography, aspect, slope etc.);
- Regional vegetation;

- Current status of habitats;
- Red Data habitat suitability;
- Digital photographs; and
- GPS reference points.

Phytosociological data accumulated include the following:

- Plant species and growth forms;
- Dominant plant species;
- Cover abundance values; and
- Samples or digital images of unidentified plant species.

The desktop analysis of data was used to establish differences or similarities between vegetation communities, which were then described in terms of floristic species composition as well as driving environmental parameters. Results and species lists provided should be interpreted with the abovementioned survey limitations in mind.

6.2.2 Red Data Floral Assessment

- Compared data collected during the surveys and the IUCN Red Data plant species list and South African Threatened and Protected species (TOPS) list to compile a list of plant species of concern that may potentially occur within the study area and that were recorded in the study area.
- A survey of this kind (instantaneous sampling bout or "snapshot" investigations) poses limitations to the identification of Red Data plant species. Therefore, emphasis was placed on the identification of habitat that would be suitable for sustaining Red Data plant species, by associating available habitat to known habitat requirements of Red Data plant species.

6.2.3 Floristic Sensitivity Analysis

Floristic sensitivity analysis was determined by taking two factors into account namely ecological function and conservation importance. This sensitivity was quantified by subjectively assessing the ecological function and conservation importance of the vegetation. These were defined as follows:

Ecological Function:

- High ecological function: Sensitive ecosystems with either low inherent resistance or resilience towards disturbance factors or highly dynamic systems considered to be stable and important for the maintenance of ecosystems integrity (e.g. pristine grasslands, pristine wetlands and pristine ridges);
- Medium ecological function: Relatively important ecosystems at gradients of intermediate disturbances. An area may be considered of medium ecological function if it is directly adjacent to sensitive/pristine ecosystem; and
- Low ecological function: Degraded and highly disturbed systems with little or no ecological function.

Conservation Importance:

- High conservation importance: Ecosystems with high species richness and usually provide suitable habitat for a number of threatened species. Usually termed 'no-go' areas and unsuitable for development, and should be protected;

- Medium conservation importance: Ecosystems with intermediate levels of species diversity without any threatened species. Low-density development may be allowed, provided the current species diversity is conserved; and

- Low conservation importance: Areas with little or no conservation potential and usually species poor (most species are usually exotic).

The Precautionary Principle was applied throughout this investigation (COMEST, 2005).

6.2.4 General Faunal Attributes

6.2.4.1 Arthropoda

At each of the study sites holes were augered and five pitfall traps with an opening diameter of 100mm buried so that the opening was level with the ground surface. The pitfall traps were filled with a water and a surfactant to break surface tension. These pitfall traps were collected and new traps sunk every 24hrs. Furthrmore sweep netting and active searching for arthropods were conducted at each of the the study sites. Picker, et al. (2002) was used as a field guide for arthropod species.

6.2.4.2 Reptilia

Suitable areas were identified and sampled using active search and capture methods, searches were concentrated in rocky areas and disused ant hills were investigated for the presence of snakes. Snakes and other reptiles are identified visually and only captured if visual identification is hampered by swift-moving snakes or if the snake is obscured from view. Branch (1996) and Broadley (1971) were used as identification guides, where necessary.

6.2.4.3 Amphibia

Suitable areas for frogs were sampled by means of active search and capture and acoustic identification methods, especially at night when highest amphibian activity is expected. Areas were also netted for tadpoles and amphibian species identified by means of tadpoles. Du Preez and Carruthers (2009) was used to confirm identification where necessary.

6.2.4.4 Mammalia

Visual sightings and ecological indications were used to identify the small mammal inhabitants of the study area. Scats were also collected and used for identification of nocturnal small mammals. A number of reference sources *inter alia* Stuart and Stuart (2007) and Smithers (1983) were used for identification purposes.

6.2.5 Red Data Faunal Assessment

The following parameters were used to assess the Probability of Occurrence of each Red Data species:

- Habitat requirements (HR) – Most Red Data animals have very specific habitat requirements and the presence of these habitat characteristics in the study area was evaluated;

- Habitat status (HS) – The status or ecological condition of available habitat in the area is assessed. Often a high level of habitat degradation prevalent in a specific habitat will negate the potential presence of Red Data species (this is especially evident in wetland habitats); and

- Habitat linkage (HL) – Movement between areas for breeding and feeding forms an essential part of the existence of many species. Connectivity of the study area to surrounding habitat and the adequacy of these linkages are evaluated for the ecological functioning of Red Data species within the study area.

Probability of occurrence is presented in four categories, namely:

- Low;

- Medium;

- High; and

- Recorded.

In order to assess the status of fauna species of concern in the study area, the following sources were used:

- IUCN Red List Categories and Criteria (IUCN, 2001);
- IUCN Red List of Threatened Species (IUCN, 2011); and
- South African Threatened and Protected species (TOPS) list (Republic of South Africa, 2004).

7 IMPACT ASSESSMENT

The Environmental Impact Assessment methodology that has been used in the evaluation of the overall effect of a proposed activity on the environment includes an assessment of the significant direct, indirect, and cumulative impacts. The significance of environmental impacts is to be assessed by means of the criteria of extent (scale), duration, magnitude (severity), probability (certainty) and direction (negative, neutral or positive).

The nature of the impact refers to the causes of the effect, what will be affected and how it will be affected.

Extent (E) of impact

Local (site or surroundings) to Regional (provincial)

Rating = 1 (low) to 5 (high).

Duration (D) rating is awarded as follows:

Whether the life-time of the impact will be:

- Very short term – up to 1 year: Rating = 1
- Short term – >1 – 5 years: Rating = 2
- Moderate term - >5 – 15 years: Rating = 3
- Long term – >15 years: Rating = 4
  - The impact will occur during the operational life of the activity, and recovery may occur with mitigation (restoration and rehabilitation).
- Permanent: Rating = 5
  - The impact will destroy the ecosystem functioning and mitigation (restoration and rehabilitation) will not contribute in such a way or in such a time span that the impact can be considered transient.

Magnitude (M) (severity):

A rating is awarded to each impact as follows:

- Small impact – the ecosystem pattern, process and functioning are not affected
  Rating = 0
- Minor impact - a minor impact on the environment and processes will occur
  Rating = 2
- Low impact - slight impact on ecosystem pattern, process and functioning
  Rating = 4
- Moderate intensity – valued, important, sensitive or vulnerable systems or communities are negatively affected, but ecosystem pattern, process and functions can continue albeit in a slightly modified way
  Rating = 6

- High intensity – environment affected to the extent that the ecosystem pattern, process and functions are altered and may even temporarily cease. Valued, important, sensitive or vulnerable systems or communities are substantially affected
  Rating = 8
- Very high intensity – environment affected to the extent that the ecosystem pattern, process and functions are completely destroyed and may permanently cease
  Rating = 10

Probability (P) (certainty) describes the probability or likelihood of the impact actually occurring, and is rated as follows:

- Very improbable – where the impact will not occur, either because of design or because of historic experience
  Rating = 1
- Improbable – where the impact is unlikely to occur (some possibility), either because of design or historic experience
  Rating = 2
- Probable - there is a distinct probability that the impact will occur (<50% chance of occurring)
  Rating = 3
- Highly probable - most likely that the impact will occur (50 – 90% chance of occurring)
  Rating = 4
- Definite – the impact will occur regardless of any prevention or mitigating measures (>90% chance of occurring).
  Rating = 5

Significance (S) - Rating of low, medium or high. Significance is determined through a synthesis of the characteristics described above where:

$$S = (E + D + M) \times P$$

The significance weighting should influence the development project as follows:

- Low significance (significance weighting: <30 points)
  If the negative impacts have little real effects, it should not have an influence on the decision to proceed with the project. In such circumstances, there is a significant capacity of the environmental resources in the area to respond to change and withstand stress and they will be able to return to their pre-impacted state within the short-term.
- Medium significance (significance weighting: 30 – 60 points)
  If the impact is negative, it implies that the impact is real and sufficiently important to require mitigation and management measures before the proposed project can be approved. In such circumstances, there is a reduction in the capacity of the environmental resources in the area to withstand stress and to return to their pre-impacted state within the medium to long-term.
- High significance (significance weighting: >60 points)

The environmental resources will be destroyed in the area leading to the collapse of the ecosystem pattern, process and functioning. The impact strongly influences the decision whether or not to proceed with the project. If mitigation cannot be effectively implemented, the proposed activity should be terminated.

8 ASSUMPTIONS AND LIMITATIONS

- Accuracy of the maps, ecosystems, routes and desktop assessments were made using Google earth and converting the .kml files to .shp files and are subject to the accuracy of Google Earth imagery with some loss of accuracy during the conversion process;

- GPS co-ordinates are accurate to within 10m and lines drawn on maps can only be assumed to be accurate to within a distance of 100m;
- Data obtained from published articles, reference books, field guides, official databases or any other official published or electronic sources are assumed to be correct and no review of such data was undertaken by Hudson Ecology Pty Ltd;
- Satellite imagery obtained was limited to imagery on Google Earth, thus the ability to accurately map vegetation communities was limited;
- Time and budget constraints do not allow for an intensive survey of the entire study area, and as with any survey of this kind, rare and cryptic species may be overlooked during the study; and
- Every possible precaution was taken to reduce the effect of the above-mentioned limitations on the data collected for this study.
- The fact that a species or Red Data species is not recorded during a survey cannot support the assumption that the species in question does not occur in the area, it can only indicate a decreased probability of the species occurring in the area. This is particularly pertinent if the species has been recently or historically recorded in the area; and
- Ecological studies should be undertaken over a number of seasons in order to obtain long term ecological data. Studies are usually conducted in this way in order to eliminate the effects of unusual climatic conditions or other unusual conditions prevailing at the study area during the time of study. The results of this study are based on a literature review and a single wet season field survey, conducted in early March 2016.

9 RESULTS

This section provides a discussion of the terrestrial ecology baseline environment and context in which the proposed project will take place.

9.1 Physical Setting

9.1.1 Topography

The study area is largely on a flat plateau gently sloping slightly downwards from south to north, with a drop of only 2m from the southern to the northern parts of the study area (a distance of approximately 700m)(Figure 3). The highest point of the study area is at the southernmost point of the study area, which reaches a peak of 1203 m above sea level, while the northernmost section of the study area is approximately 1201m above sea level.

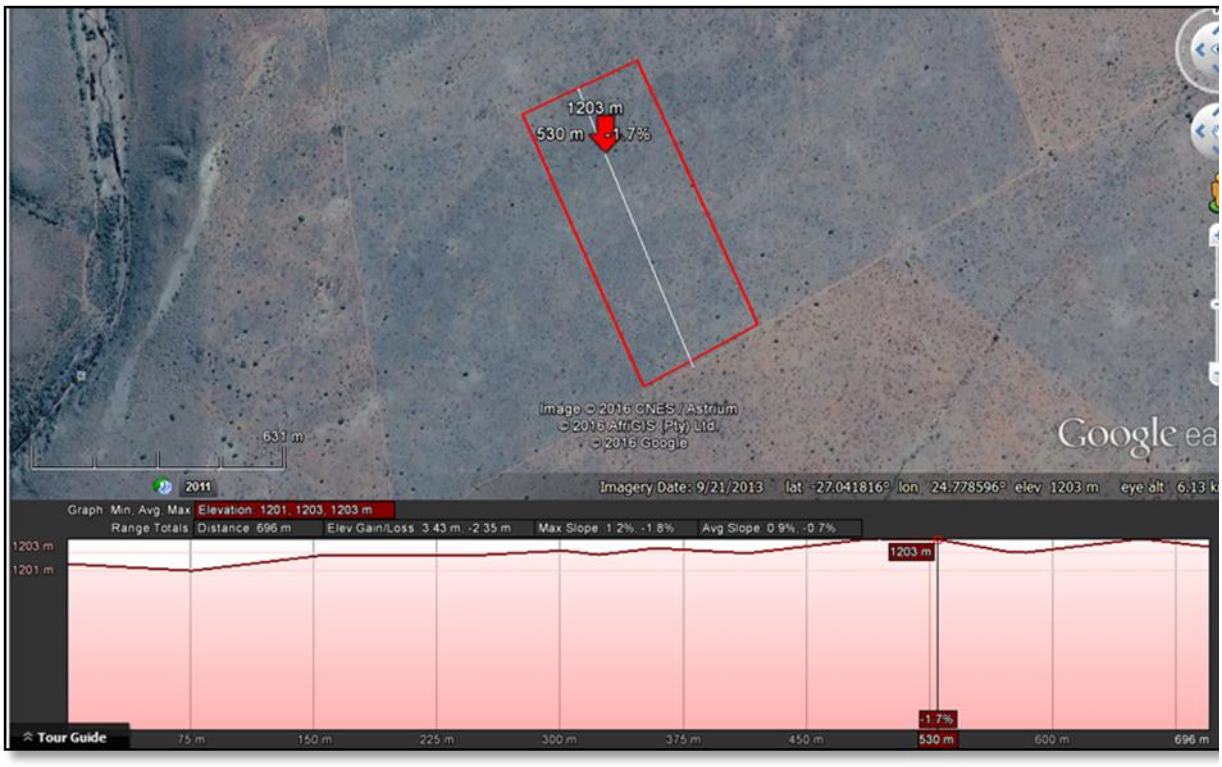

Figure 3: Gradient of the study area (reproduced from Google Earth)

9.1.2 Geology & Soils

Most of the area is covered by surface limestone of Tertiary to Recent age, and dolomite and chert of the Campbell Group (Griqualand West Supergroup, Vaalian Erathem) support shallow soils (0.1– 0.25 m) of Mispah and Hutton soil forms. Land types mainly Fc with some Ae and Ag. (Mucina & Rutherford, 2006)

9.1.3 Climate

This vegetation type experiences summer and autumn rainfall with very dry winters. Mean Annual Precipitation (MAP) is from approximately 300 mm in the southwest to approximately 500 mm in the northeast. Frost occurs frequently to very frequently in winter. Mean monthly maximum and minimum temperatures for Koopmansfontein are 36.3°C and –7.5°C for January and July, respectively. Corresponding values for Armoedsvlakte (near Vryburg) area 36.6°C and –5.5°C for December and July, respectively. See Figure 4 (Mucina & Rutherford, 2006)

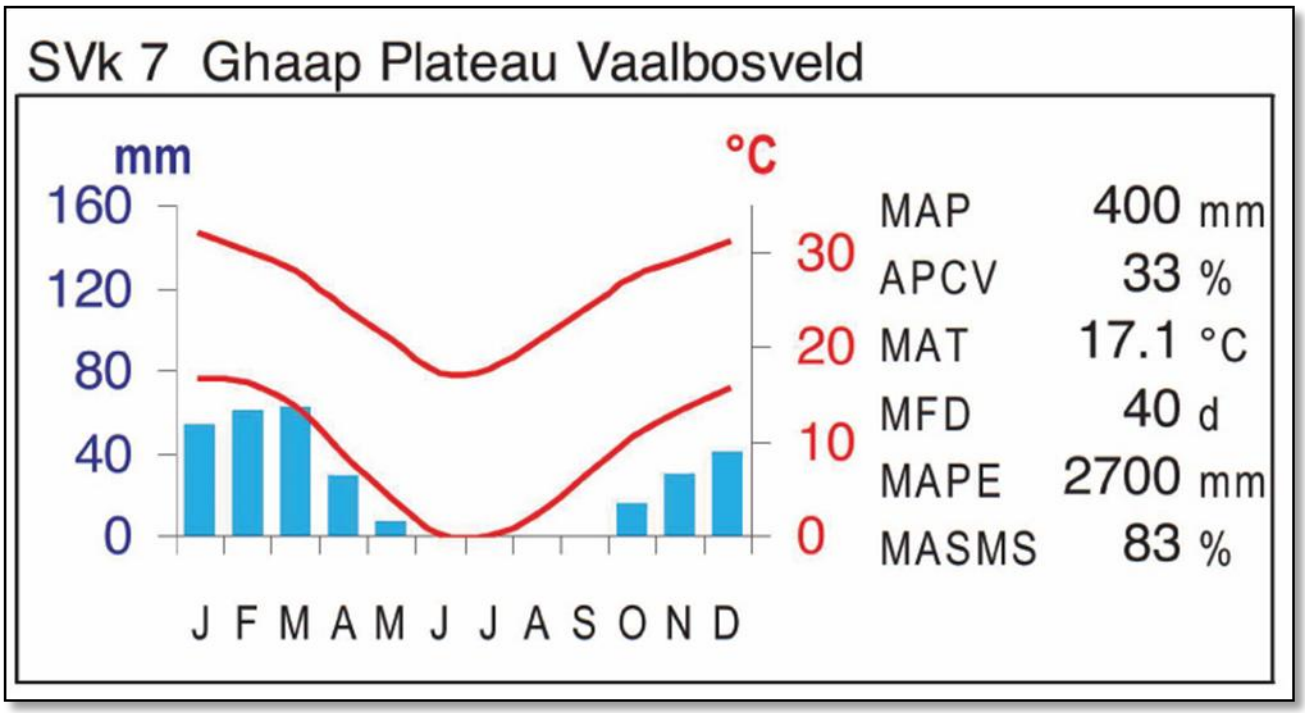

Figure 4: Climate for SVk 7 Ghaap Plateau Vaalbosveld (reproduced form Mucina and Rutherford (2006))

9.1.4 Biome and Vegetation Types

The study area falls within savanna vegetation biome of South Africa and Swaziland constitutes the southernmost extension of the most widespread biome in Africa. It represents 32.8% of South Africa (399 600 km2) and 74.2% of Swaziland (12 900 km2). It extends beyond the tropics to meet the Nama-Karoo Biome on the central plateau, the Grassland Biome at higher altitudes towards the east and extends down the eastern seaboard interior and valleys where it grades into Albany Thicket in the Eastern Cape. The most recent and detailed description of the vegetation of this region is part of a national map (Mucina & Rutherford, 2006).

9.1.4.1 Ghaap Plateau Vaalbosveld

Synonyms: VT 16 Kalahari Thornveld and Shrub Bushveld (74%) (Acocks 1953). LR 33 Kalahari Plateau Bushveld (86%) (Low & Rebelo 1996).

Distribution

Northern Cape and North-West Provinces: Flat plateau from around Campbell in the south, east of Danielskuil through Reivilo to around Vryburg in the north. Altitude 1 100– 1 500 m (Mucina & Rutherford, 2006).

Vegetation & Landscape Features

Flat plateau with well developed shrub layer with *Tarchonanthus camphoratus* and *Acacia karroo*. Open tree layer has *Olea europaea* subsp. *africana*, *A. tortilis, Ziziphus mucronata* and *Rhus lancea*. *Olea* is more important in the southern parts of the unit, while *A. tortilis, A. hebeclada* and *A. mellifera* are more important in the north and part of the west of the unit. Much of the south-central part of this unit has remarkably low cover of *Acacia* species for an arid savanna and is dominated by the non-thorny *T. camphoratus, R. lancea and O. europaea* subsp. *africana*. (Mucina & Rutherford, 2006).

Important Taxa

Graminoids:

Anthephora pubescens (d), *Cenchrus ciliaris* (d), *Digitaria eriantha subsp. Eriantha* (d), *Enneapogon scoparius* (d), *Eragrostis lehmanniana* (d), *Schmidtia pappophoroidesadscensionis, A. congesta, A. diffusa, Cymbopogon pospischilii, Enneapogon cenchroides, E. desvauxii, Eragrostis echinochloidea, E. obtusa, E. rigidior, E. superba, Fingerhuthia africana, Heteropogon contortus, Sporobolus fimbriatus, Stipagrostis uniplumis* and *Tragus racemosus* (Mucina & Rutherford, 2006).

Tall Trees:

Acacia erioloba (Mucina & Rutherford, 2006).

Small Trees: *Acacia mellifera* subsp. *detinens* (d), Searsia *lancea* (d), *Acacia karroo, A. tortilis* subsp. *heteracantha*, *Boscia albitrunca* (Mucina & Rutherford, 2006).

Tall Shrubs:

Olea europaea subsp. *africana* (d), *Rhigozum trichotomum* (d), *Tarchonanthus camphoratus* (d), *Ziziphus mucronata* (d), *Diospyros austro-africana*, *D. pallens*, *Ehretia rigida* subsp. *rigida*, *Euclea crispa* subsp. *ovata*, *Grewia flava*, *Gymnosporia buxifolia*, *Lessertia frutescens* and *Rhus tridactyla* (Mucina & Rutherford, 2006).

Low Shrubs:

Acacia hebeclada subsp. hebeclada (d), *Aptosimum procumbens, Chrysocoma ciliata, Helichrysum zeyheri, Hermannia comosa, Lantana rugosa, Leucas capensis, Melolobium microphyllum, Peliostomum leucorrhizum, Pentzia globosa, P. viridis* and *Zygophyllum pubescens* (Mucina & Rutherford, 2006).

Succulent Shrubs:

Hertia pallens, Lycium cinereum (Mucina & Rutherford, 2006).

Semiparasitic shrub:

Thesium hystrix (Mucina & Rutherford, 2006)

Woody climber:

Asparagus africanus (Mucina & Rutherford, 2006).

Herbs:

Barleria macrostegia, Geigeria filifolia, G. ornativa, Gisekia africana, Helichrysum cerastioides, Heliotropium ciliatum, Hermbstaedtia odorata, Hibiscus marlothianus, H. pusillus, Jamesbrittenia aurantiaca, Limeum fenestratum, Lippia scaberrima, Selago densiflora and *Vahlia capensis subsp. vulgaris* (Mucina & Rutherford, 2006).

Succulent Herbs:

([GW] Griqualand West endemic, [K] Kalahari endemic, [D] Broadly disjunct distribution)

Tall Shrubs*: Lebeckia macrantha*[GW], *Nuxia gracilis*[D]*. Low Shrubs: Blepharis marginata*[GW], *Putterlickia saxatilis*[GW], *Tarchonanthus obovatus*[GW] (Mucina & Rutherford, 2006).

Succulent Shrubs:

Euphorbia wilmaniae[GW], *Prepodesma orpenii*[GW] (endemic genus) (Mucina & Rutherford, 2006).

Graminoids:

Digitaria polyphylla[GW], *Panicum kalaharense*[K] (Mucina & Rutherford, 2006).

Herbs:

Corchorus pinnatipartitus[GW], *Helichrysum arenicola*[K] (Mucina & Rutherford, 2006).

Succulent Herb:

Orbea knobelii[K]*. Aloe grandidentata* (Mucina & Rutherford, 2006).

Endemic Taxon:

Herb*: Rennera stellata*. (Mucina & Rutherford, 2006)

Conservation

Least threatened. Target 16%. None conserved in statutory conservation areas. Only about 1% already transformed. Erosion is very low.(Mucina & Rutherford, 2006).

9.2 Flora Assessment

9.2.1 Vegetation Communities

Flora assessments were conducted during the wet season (March 2016). Based on species composition, physiognomy, moisture regime, rockiness, slope and soil properties, it was found that the entire study area (21.5 ha) falls within a single vegetation community, namely the *Tarchonanthus - Ziziphus* Shrubland.

A list of plant species known to occur in the region are given in APPENDIX recorded species are highlighted in the Appendix. A complete list of recorded species will be given after the wet season survey.

9.2.1.1 Tarchonanthus - Ziziphus Shrubland

The tree layer in this vegetation community is dominated by *Ziziphus mucronata* and *Searsia lancea* with few *Acacia* species present. The shrub layer is well defined in this vegetation community and *Tarchonanthus camphoratus* is the dominant shrub species in higher lying areas of the study area, particularly on shallower soils underlain by dolomite. This vegetation community is typically covered by sparse open grassland, with *Eragrostis lehmanniana, Themeda triandra, Aristida adscensionis, A. congesta, A, diffusa, Enneapogon cenchroides, Eragrostis superba, E. obtusa, Fingerhuthia africana, Heteropogon contortus, Sporobolus fimbricatus, Tragus racemosus, Geigera filifolia, Barleria macrostegia* (Figure 5).

Figure 5: Tarchonanthus - Ziziphus Shrubland within which the study area is situated

Recorded species

Plant species recorded in the study area are given in Table 2:

Table 2: Recorded species in the Tarchonanthus - Ziziphus Shrubland

FAMILY	NATURALISED	*SPECIES*	THREAT STATUS	SA ENDEMIC	LIFECYCLE	GROWTH FORMS
ACANTHACEAE		*Barleria macrostegia*	LC	No	Perennial	Herb
ACANTHACEAE		*Blepharis integrifolia*	LC	No	Perennial	Herb

ACANTHACEAE		*Dyschoriste transvaalensis*	LC	No	Perennial	Dwarf shrub
AMARANTHACEAE	*	*Gomphrena celosioides*	Not Evaluated	No	Perennial	Herb
AMARANTHACEAE		*Hermbstaedtia odorata var. odorata*	LC	No	Perennial	Herb
ANACARDIACEAE		*Searsia lancea*	LC	No	Perennial	Tree
ANTHERICACEAE		*Chlorophytum fasciculatum*	LC	No	Perennial	Herb
ASPARAGACEAE		*Asparagus suaveolens*	LC	No	Perennial	Shrub
ASTERACEAE	*	*Aster squamatus*	Not Evaluated	No	Annual	Herb
ASTERACEAE		*Dicoma macrocephala*	LC	No	Perennial	Herb
ASTERACEAE		*Pentzia calcarea*	LC	No	Perennial	Shrub
ASTERACEAE	*	*Pseudognaphalium luteo-album*		No	Annual	Herb
ASTERACEAE		*Tarchonanthus camphoratus*	LC	No	Perennial	Shrub
BORAGINACEAE		*Ehretia alba*	LC	No	Perennial	Shrub
CAMPANULACEAE		*Wahlenbergia denticulata*	LC	No	Perennial	Herb
COMMELINACEAE		*Commelina livingstonii*	LC	No	Perennial	Herb
CONVOLVULACEAE		*Ipomoea obscura*	LC	No	Perennial	Herb
CONVOLVULACEAE		*Ipomoea oenotheroides*	LC	No	Perennial	Shrub
CONVOLVULACEAE		*Xenostegia tridentata*	LC	No	Perennial	Herb
EUPHORBIACEAE		*Euphorbia inaequilatera*	LC	No	Annual	Dwarf shrub
FABACEAE		*Indigastrum costatum*	LC	No	Annual	Herb
FABACEAE		*Indigofera cryptantha*	LC	No	Perennial	Dwarf shrub
FABACEAE		*Indigofera heterotricha*	LC	No	Perennial	Dwarf shrub
FABACEAE		*Indigofera sessilifolia*	LC	No	Perennial	Dwarf shrub
FABACEAE		*Otoptera burchellii*	LC	No	Perennial	Climber
FABACEAE		*Rhynchosia totta*	LC	No	Perennial	Climber
FABACEAE		*Zornia milneana*	LC	No	Perennial	Herb
GENTIANACEAE		*Sebaea pentandra*	LC	No	Annual	Herb
HYACINTHACEAE		*Dipcadi viride*	LC	No	Perennial	Geophyte
IRIDACEAE		*Babiana bainesii*	LC	No	Perennial	Geophyte
IRIDACEAE		*Moraea polystachya*	LC	No	Perennial	Geophyte
JUNCACEAE		*Juncus exsertus*	LC	No	Perennial	Helophyte
LAMIACEAE		*Salvia disermas*	LC	No	Perennial	Herb
LAMIACEAE	*	*Salvia stenophylla*		No	Perennial	Herb
LAMIACEAE		*Teucrium trifidum*	LC	No	Perennial	Herb
LOBELIACEAE		*Lobelia erinus*	LC	No	Annual (occ. perennial)	Herb
MALVACEAE		*Grewia flava*	LC	No	Perennial	Shrub
MALVACEAE		*Hibiscus pusillus*	LC	No	Perennial	Herb

MALVACEAE	*	*Hibiscus trionum*		No	Annual	Herb
MALVACEAE		*Melhania prostrata*	LC	No	Perennial	Dwarf shrub
MALVACEAE		*Sida chrysantha*	LC	No	Perennial	Dwarf shrub
MOLLUGINACEAE		*Hypertelis salsoloides*	LC	No	Perennial	Dwarf shrub
MOLLUGINACEAE		*Limeum viscosum*	LC	No	Annual	Herb
NYCTAGINACEAE		*Commicarpus pentandrus*	LC	No	Perennial	Herb
OPHIOGLOSSACEAE		*Ophioglossum polyphyllum*	LC	No	Perennial	Geophyte
PHYLLANTHACEAE		*Phyllanthus incurvus*	LC	No	Perennial	Dwarf shrub
POACEAE		*Brachiaria marlothii*	LC	No	Annual (occ. perennial)	Graminoid
POACEAE		*Eragrostis curvula*	LC	No	Perennial	Graminoid
POACEAE		*Andropogon schirensis*	LC	No	Perennial	Graminoid
POACEAE		*Anthephora pubescens*	LC	No	Perennial	Graminoid
POACEAE		*Aristida canescens*	LC	No	Perennial	Graminoid
POACEAE		*Aristida congesta*	LC	No	Perennial (occ. annual)	Graminoid
POACEAE		*Brachiaria brizantha*	LC	No	Perennial	Graminoid
POACEAE		*Elionurus muticus*	LC	No	Perennial	Graminoid
POACEAE		*Enneapogon scoparius*	LC	No	Perennial	Graminoid
POACEAE		*Eragrostis gummiflua*	LC	No	Perennial	Graminoid
POACEAE		*Eragrostis lehmanniana*	LC	No	Perennial	Graminoid
POACEAE		*Eragrostis nindensis*	LC	No	Perennial	Graminoid
POACEAE		*Eragrostis rigidior*	LC	No	Perennial	Graminoid
POACEAE		*Fingerhuthia africana*	LC	No	Perennial (occ. annual)	Graminoid
POACEAE		*Panicum coloratum*	LC	No	Perennial	Graminoid
POACEAE		*Schizachyrium sanguineum*	LC	No	Perennial	Graminoid
POACEAE		*Schmidtia pappophoroides*	LC	No	Perennial	Graminoid
POACEAE		*Themeda triandra*	LC	No	Perennial	Graminoid
POACEAE		*Triraphis andropogonoides*	LC	No	Perennial	Graminoid
POACEAE		*Urochloa panicoides*		No	Annual	Graminoid
RUBIACEAE		*Anthospermum rigidum*	LC	No	Perennial	Dwarf shrub
SCROPHULARIACEAE		*Aptosimum elongatum*	LC	No	Perennial	Dwarf shrub
SOLANACEAE		*Solanum catombelense*	LC	No	Perennial	Dwarf shrub
VERBENACEAE		*Lantana mearnsii*	LC	No	[No lifecycle defined]	Shrub

VERBENACEAE		*Lantana rugosa*	LC	No	Perennial	Shrub
RHAMNACEAE		*Ziziphus mucronata*	LC	No	Perennial	Tree
CACTACEAE		*Opuntia ficus-indica*	LC	No	Perennial	Succulent

Recorded species include two climber species, 12 dwarf shrub species, three geophyte species, 20 graminoid species, 23 herb species, one succulent species and two tree species. Although no species of concern were recorded within the study area itself, *Acacia erioloba, Brunsvigia radula* and *Aloe grandidentata* were found in other areas of the same vegetation community and therefore can be considered as having a high probability of occurrence in this vegetation community and the study area.

Sensitivity aspects

- This vegetation community has been slightly disturbed, mainly due to herbivory;
- Depending on the severity of the vegetation clearing , which has taken place, rehabilitation of this vegetation community could be relatively easily conducted, but in more severely degraded areas rehabilitation will be more difficult;
- Moderate species diversity;
- Floristic status of this variation is moderate;
- Suitability of the habitat for flora and fauna species of concern is moderate;
- Ecological integrity of this community is high; and
- The Conservation importance of this community is moderate.

9.2.2 Flora species of concern

A list of plant species previously recorded in the quarter degree grid in which the study area is situated was obtained from the South African National Biodiversity Institute (APPENDIX A). Additional species that could occur in similar habitats, as determined from official database searches and reviewed literature, but not recorded in these grids are also listed. A total of 20 species were determined to possibly be occurring in the study area (Table 3).

The species, listed as possibly occurring in the study area, were evaluated to determine the probability of occurrence in the study area based on habitat suitability. Of the species that are considered to occur within the area under investigation, there were five species that could occur in habitats that are available in the study area. Three of the species of concern, *Aloe grandidentata, Brunsvigia radula and Acacia eroloba*, were recorded in the study area and could occur anywhere within the study area.

The quantity and quality of floristic data for the study area is poor. There are few taxonomic collections and relatively little floristic information for the area (Van Wyk & Smith, 2001). Areas associated with calcareous soils and heavy metals are likely to have high numbers of species of restricted distribution. There is also a high probability that there are previously undescribed species from the site or surrounding areas.

Table 3: Red Data floral species possibly occurring in the area

Species	Red Data Status	TOPS Status	Provicial Legislation	National Forestry Act
Gnaphalium nesonii	Rare	Critically Endangered	Protected	
Rennera stellata	Vulnerable			
Lithops lesliei	Near Threatened	Endangered	Protected	
Boscia albitrunca				Protected

Acacia erioloba				Protected
Ammocharis coranica			Protected	
Brunsvigia radulosa		Vulnerable	Protected	
Crinum crassicaule		Vulnerable	Protected	
Nerine frithii		Vulnerable	Protected	
Nerine hesseoides		Vulnerable	Protected	
Nerine laticoma		Vulnerable	Protected	
Brachystelma dimorphum subsp. dimorphum		Vulnerable	Protected	
Brachystelma foetidum		Vulnerable	Protected	
Ceropegia crassifolia var. crassifolia		Vulnerable	Protected	
Hoodia pilifera subsp. annulata		Vulnerable	Protected	
Stapelia grandiflora var. grandiflora			Protected	
Aloe grandidentata			Protected	
Aloe zebrina			Protected	
Chortolirion angolense			Protected	
Babiana bainesii			Protected	

9.3 Fauna Assessment

The faunal assessment was conducted in the dry season during the month of August 2015.

9.3.1 Recorded Faunal Species

9.3.1.1 Herpetofauna

Reptile diversity in the area is high with approximately 38 reptile species (APPENDIX B) occurring in the area and reptile endemism is especially high in the region with 10 species (24%) being endemic. Nine were confirmed during the site visit (Table 4). The Red Data reptiles which may occur on the study site are discussed below. No exotic herpetofauna species are expected to occur on the study site.

Table 4: Reptile species recorded during the March 2016 surveys

FAMILY	*BIOLOGICAL NAME*	COMMON NAME	ENDEMIC
Testudinae	*Psammobates oculifer*	Serrated or Kalahari Tent Tortoise	E
Colubridae	*Lamprophis fuliginosus*	Brown House Snake	
	Psammophylax tritaeniatus	Striped Skaapsteker	
Elapidae	*Naja nivea*	Cape Cobra	E
	Bitis arietans	Puff Adder	
Scincidae	*Mabuya striata*	Striped Skink	
	Mabuya varia	Variable Rock Skink	

	Agama aculeata	Ground Agama	
	Agama atra	Southern Rock Agama	E

Most of the expected species in the area (***Table 4***) are common and widespread. Species of concern are discussed further in section 9.3.2.

9.3.1.2 *Amphibia*

The study area is a fair distance from any permanent open water bodies, even the Dry Harts River is approximately a kilometre away, and therefore, as expected, amphibian diversity is low. Only thirteen species are expected to occur in the study area (APPENDIX C), and during the study only four amphibian species were recorded. Due to the rainy conditions at the time, four species were recorded in the study area during the study, it is unlikely that all four these species would be present on site at drier times. All the recorded species were common species which are not listed or range restricted (Table 5).

Table 5: Amphibian species recorded during the March 2016 Surveys

FAMILY	SPECIES	COMMON NAME	ENDEMIC STATUS	REVISED STATUS
Bufonidae	*Schismaderma carens*		0	NL
Bufonidae	*Amietophrynus gutteralis*	Gutteral Toad		NL
Microhylidae	*Breviceps adspersus*		0	NL
Pyxicephalidae	*Tomopterna cryptotis*	Tremolo Sand Frog	0	NL

9.3.1.3 *Mammalia*

Of the 67 mammal species expected to occur in the study area, according to historic recordings (APPENDIX D), only nine were confirmed during the site visit (Table 6). A number of species may contribute to the low species diversity and abundance recorded in the mammal population, these include overgrazing, local extinctions and the fact that the study has a very short wet season. The fact that the study area encompasses only one vegetation community may also influence species diversity on site, due to the homogenous nature of the single vegetation community when compared to sites that may encompass a number of vegetation communities.

Table 6: Mammal species recorded during the March 2016 surveys

Family	Biological Name	Common Name
LEPORIDAE (Hares and Rabbits)	*Lepus saxatillis*	Scrub Hare
HYSTRICIDAE (Porcupine)	*Hystrix africaeaustralis*	Cape Porcupine
MURIDAE (Rats and Mice)	*Saccostomus campestris*	Pouched Mouse
MURIDAE (Rats and Mice)	*Michaelamys namaquensis*	Namaqua Rock Mouse
MURIDAE (Rats and Mice)	*Rhabdomys pumilio*	Four-striped Grass Mouse
MURIDAE (Rats and Mice)	*Mastomys natalensis*	Natal Multimammate Mouse
ORYCTEROPODIDAE	*Orycteropus afer*	Aardvark
RUMINANTIA	*Raphicerus campestris*	Steenbok
RUMINANTIA	*Sylvicapra grimmia*	Common Duiker

All nine species recorded are robust and widespread, mostly with the proviso that suitable habitat and sufficient space to maintain home ranges / territories are available. Given no or lowkey prosecution, all species are capable of maintaining their presences in remote areas such as the site and surrounding properties. The nearby roads are a main source of fatalities – several carcasses were recorded during transit to and from the study area.

9.3.2 Red Data Faunal Species

Table 7 describes the habitat requirements and probability of occurrence of fauna species of concern identified as likely to occur in the study area.

Table 7: Red Data Faunal Species

Common name	Taxon	Habitat	Status	Likelihood of occurrence
African Hedgehog	*Atelerix frontalis*	Although these hedgehogs can be found in most environments, they prefer grass and Bushveld that is not too damp and with a good covering of leaves and other debris.	VU	**MEDIUM**, overall geographical distribution includes this area, habitat is suitable.
Honey badger	*Mellivora capensis*	Wide variety of habitats. Probably only in natural habitats.	NT	**MEDIUM**, overall geographical distribution includes this area, habitat is suitable.
Darling's horseshoe bat	*Rhinolophus darlingii*	Savanna, rossting in caves and sub-terranean habitats	NT	**MEDIUM**, recorded in nearby grid, on edge of distribution; suitable habitat may occur on site.
Dent's horseshoe bat	*Rhinolophus denti*	Savanna, nama-Karoo, succulent Karoo, distribution follows rivers. Caves and subterranean habitats. Aerial insectivore.	NT	**LOW**, on edge of distribution; suitable habitat may occur on site or may be vagrant from Orange River valley.
Reddish-grey musk shrew	*Crocidura cyanea*	Wide variety of habitats. Nocturnal, terrestrial.	DD	**MEDIUM**, previously recorded in nearby grid and geographical distribution includes this area.
Giant Bullfrog	*Pyxicephalus adspersus*	Widely distributed in southern Africa, mainly at higher elevations. Inhabits a variety of vegetation types where it breeds in seasonal, shallow, grassy pans in flat, open areas; also utilises non-permanent vleis and shallow water on margins of waterholes and dams. Prefer sandy substrates although they sometimes inhabit clay soils.	NT	**MEDIUM,** previously recorded in nearby grid and geographical distribution includes this area.**.**
African Rock Python	*Python sebae natalensis*	Occurs in most wet and dry woodland and tall shrubland communities.	NT	**HIGH,** overall geographical distribution includes this area; suitability of habitat on site appears favourable**.**

Of the 7 species of concern that may occur in the study area, 1 has low probability of occurrence, 5 have a medium probability of occurrence and one has a high probability of occurrence. Three of the species with a high probability of occurrence, the Black-necked spitting Cobra, Maccoa Duck and Lanner Falcon, were recorded during the study.

9.4 Critical Biodiversity Areas and Ecological Support Areas

Critical Biodiversity Areas (CBAs) are terrestrial and aquatic features in the landscape that are critical for retaining biodiversity and supporting continued ecosystem functioning and services. These form the key output of a systematic conservation assessment and are the biodiversity sectors inputs into multisectoral planning and decision making tools. The use of CBAs within the North West Province follows the definition laid out in the guideline for publishing bioregional plans.

The identification and mapping of CBAs form part of the biodiversity assessment of the North West Province which will be used to inform the development of the Provincial Biodiversity Sector plans, bioregional plans, and also be used to inform Spatial Development Frameworks (SDFs), Environmental Management Frameworks (EMFs), Strategic Environmental Assessments (SEAs) and in the Environmental Impact Assessment (EIA) process in the province.

Simply put the purpose of the CBA is to indicate spatially the location of critical or important areas for biodiversity in the landscape. The CBA, through the underlying land management objectives that define the CBA, prescribes the desired ecological state in which the province would like to keep this biodiversity. Therefore, the desired ecological state or land management objective determines which land-use activities are compatible with each CBA category based on the perceived impact of each activity on biodiversity pattern and process.

According to the guidelines for bioregional plans, three basic CBA categories can be identified based on three high-level and management objectives (Table 8).

Table 8: Definitions and framework for linking CBAs to land-use planning and decision-making guidelines based on a set of high-level land biodiversity management objectives

CBA category	Land Management Objective
Critical Biodiversity Areas (CBAs) Definition: CBAs are areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained in a natural or near-natural state then biodiversity conservation targets cannon be met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses.	
Protected Areas (PA) & CBA 1	**Natural landscapes:** Ecosystems and species fully intact and undisturbed. » These are areas with high irreplaceability or low flexibility in terms of meeting biodiversity pattern targets. If the biodiversity features targeted in these areas are lost then targets will not be met. » These are landscapes that are at or past their limits of acceptable change.
CBA 2	**Near-natural landscapes:** » Ecosystems and species largely intact and undisturbed. » Areas with intermediate irreplaceability or some flexibility in terms of area required to meet biodiversity targets. There are options for loss of some components of biodiversity in these landscapes without compromising the ability to achieve targets. » These are landscapes that are approaching but have not passed their limits of acceptable change.

Ecological Support Areas (ESAs) Definition: ESAs are areas that are not essential for meeting biodiversity representation targets/thresholds but which nevertheless play an important role in supporting the ecological functioning of critical biodiversity areas and / or in delivering ecosystem services that support socio-economic development, such as water provision, food mitigation or carbon sequestration. The degree of restriction on land use and resource use in these areas may be lower than that recommended for critical biodiversity areas.	
ESA	**ESA Functional landscapes:** » Ecosystem moderately to significantly disturbed but still able to maintain basic functionality. » Individual species or other biodiversity indicators may be severely disturbed or reduced. » These are areas with low irreplaceability with respect to biodiversity pattern targets only.
ONA (Other Natural Areas) and Transformed	**Production landscapes:** Manage land to optimize sustainable utilization of natural resources.

The high-level land management objectives (natural, near-natural and functional) can be further unpacked using the three ecosystem integrity indicators namely; ecosystem composition, structure and function. Composition relates to biodiversity pattern, whereas structure and function relate to ecological process and services Table 9).

Table 9: Land management Objectives

Land management objective	**Land Management Objective Biodiversity Indicators**			
	Component of Biodiversity	Biodiversity Pattern	Ecological Services and Processes	
	Indicator category	Composition	Structure	Functioning
	Specific Indicators	• Habitat types; • Species; • Populations; • Meta-populations; • Alien Plants	• Transformation • Fragmentation	• Fire; • Grazing regimes; • Biogeochemical processes; • Hydrological functioning; • Soil formation and erosion; • Biotic processes
	CBA Category	Limit of Acceptable Change (LAC): Permitted amount or degree of change in biodiversity indicator.		
Natural	PA / CA	None	None	None
	CBA1	None	None	None
Near Natural	CBA2	Some	Some	None
Functional	ESA1	Significant	Some	none
	ESA2	Significant	Some	Some

	ONA	Significant	Significant	Some
	Transformed	Significant	Significant	Significant

The study area consists of extensive areas of Terrestrial Critical Biodiversity Areas. More than half of the study site is covered by some sort of CBA. The largest portion of the CBA consists of Important Ecological Corridors (T2 CBA). Hill features in the study area have been classified as T2 CBA (Hills).

A site visit of the CBA areas falling within the proposed farm portions was conducted in March 2016. The purpose of the site visit was to determine the status, condition and capabilities of these areas to fulfil their respective ecological functions and to determine whether the proposed development will have a potential detrimental impact on these areas and their functions. The ecological sensitivity and potential classification as no-go areas will be discussed within Sections 9.5 and 9.6.

This site visit was a high-level visit with the aim of determining whether the CBA areas within the site should be considered as no go areas or not, and did not form part of the formal ecological field survey to be conducted during the EIA phase.

9.4.1 Terrestrial 1 CBA (Critical linkage and core corridor zone)

The dominance of *Eragrostis rigidor* in the area is an indication of past disturbance and overgrazing. Other disturbances within the area include the existing overhead power lines, gravel roads, border fences and the Bophirima Substation. The function of this area as a CBA is to provide a critical linkage and form a core corridor area between the upper dry Kalahari Bushveld and the lower lying Dry Harts River Valley. When taking into account the small size of the T1 CBA located within the proposed footprint area, the fractured nature of this area and the number of barriers isolating this section from the rest of the T1 CBA, including numerous fences, the provincial gravel road and the numerous smaller farm tracks and service roads traversing the area, the capabilities of this small portion of T1 CBA to contribute as an important linkage and corridor is considered to be extremely limited. Furthermore the loss of this small section of semi-natural T1 CBA as a result of development is expected to have an insignificant effect on the limit of acceptable change within this T1 CBA unit, as well as a on the potential loss of irreplaceable biodiversity patterns. Thus it is recommended that this area is excluded from the T1 CBA and rather be incorporated within the T2 CBA (Corridor).

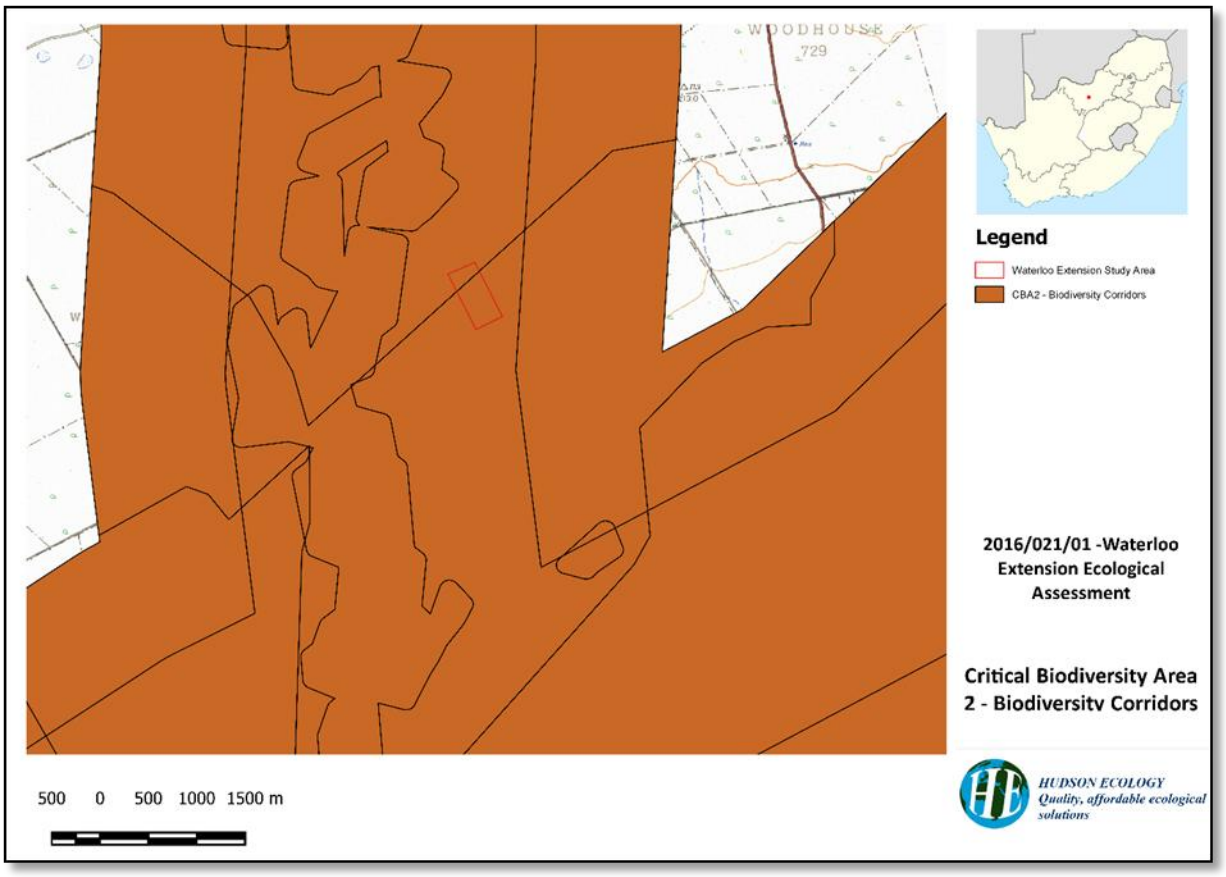

Figure 6: Map showing the T1 and T2 CBA Corridors

The majority of the T2 CBA areas within the farm portion are associated with corridor zones linking the lower lying valleys (Dry Harts- and Losase Rivers) with the higher lying dry bushveld. These areas also fall within A2 CBAs Most of the T2 CBA within the farm portion falls within a landscape similar to that described for the T1 CBA, namely a semi-natural dry Bushveld, moderately disturbed, mainly due to overgrazing. Furthermore, the landscape is highly fractured by access roads, fencing and the larger provincial gravel road as well as the R34 Road. Having said this, the area still provides habitat for numerous smaller mammals as well as reptile species. According to the description of a T2 Corridor Zone within the North West Province Biodiversity Conservation Assessment Technical Report, these corridor/sub-Quaternary catchment networks should focus on all biodiversity patterns and ecological processes. Taking this into account together with the field observations and the nature of the proposed development, the most significant impacts are expected to be during the construction phase. However with careful planning and the necessary mitigation measures in place, the affected footprint area can be restored and rehabilitated to an extent where ecological function and biodiversity is restored and maintained albeit in a slightly altered state. Thus although the area was confirmed as T2/A2 CBAs it can be concluded that the proposed development will not result in a severe alteration of the functionality of the area.

9.4.2 Terrestrial 2 CBA (Hills)

The ridges and hilly areas located mainly within the central portion of the study area differ in plant structure and species composition from the surrounding lower lying areas. The vegetation of these habitats can be described semi-natural to natural dry bushveld dominated by a more open taller woody layer consisting of very few *Acacia* species (*A. mellifera* subsp. *detinens*, *A. tortilis, A. erioloba* and *A. karroo*) and mainly broad-leaved shrubs such as *T. camphoratus, G. flava, Searsia lancea* and *Ziziphus muctronata*. Due to the change in landscape morphology, species composition and habitat structure, these areas contribute to biodiversity and subsequently these areas can be confirmed as T2 CBA areas.

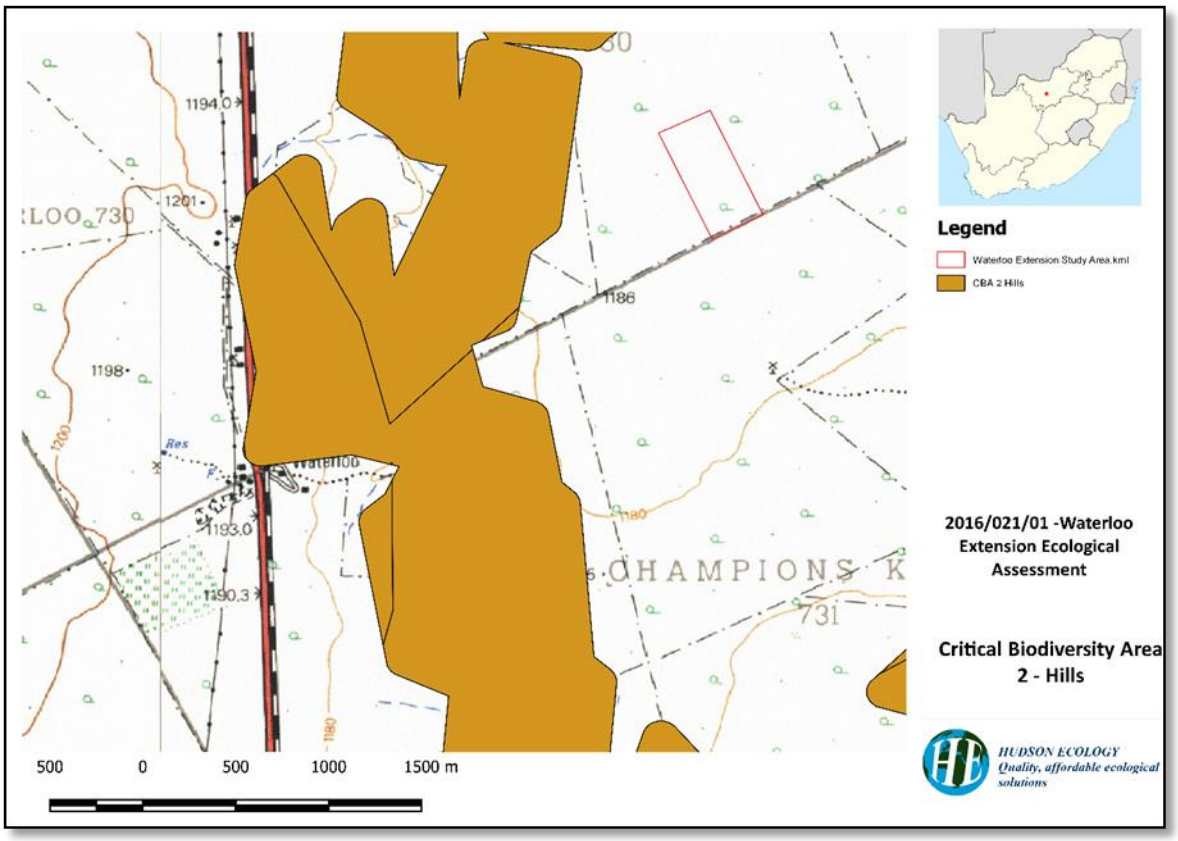

Figure 7: Map showing T2 CBA Hills

9.4.3 Aquatic 2 CBA (Wetlands) as well as Aquatic 1&2 ESAs (Wetland Buffer Areas)

The relatively large pan (depression) wetland classified as an A2 CBA as well as the small pan structures located in the south western eastern corner of the property classified as an A2 CBA has been confirmed during the scoping phase site visit. These alledged non-perennial "depression wetlands" contributes not only to habitat and species diversity but also alledgedly provides vital ecological functions such as:

- Accumulation and filtering of runoff before water seeps into ground water (although this will be conducted by the dolomite in the area as well).
- Possible seasonal surface water during periods of high rainfall (although this is very unpredictable if it ever happens).
- Seasonal availability of associated biota (most notably invertebrates) that serve as important food sources for especially reptiles and birds (although this is very unpredictable if it ever happens).
- Possible habitat for Giant Bullfrog (*Pyxicephalus adspersus*), a threatened species (the existence of this species in this area is questionable.
- Seasonal grazing during periods of higher moisture.
- Below-ground storage and channelling of water (this will need to be confirmed by a hydrogeologist).

In order to maintain their integrity and ecological functions, sufficient buffer areas around these wetland bodies should be maintained in natural or semi-natural condition. Currently the state of these allocated buffer areas (A1/A2 ESAs) can be confirmed as semi-natural and are vital for the maintenance of the "depression wetlands" themselves.

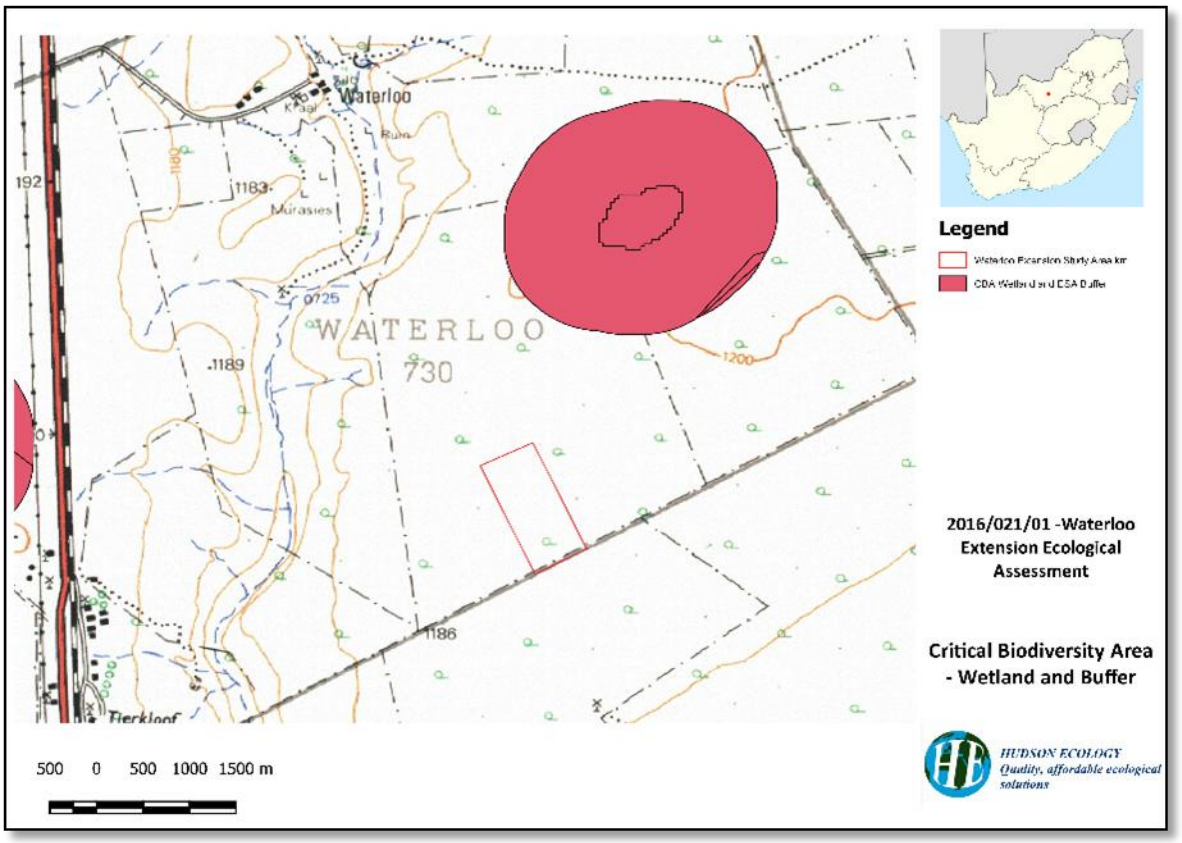

Figure 8: Map showing A2 CBA wetlands and A2 ESA buffers

These wetlands play an important role in biodiversity, hydrological as well geohydrological functioning of the landscape. Most of these pans are non-perennial, containing surface water only after sufficient precipitation and normally only for a short period of time.

9.5 Ecological Integrity

The ecological function of the study area can generally be described as high for the study area, although in some parts of the study area trampling and some gully erosion is evident. In the vast majority of the study area ecological patterns and processes in the study area are intact and little impact on ecological integrity is evident. The ecological function of the study area is indicated in Figure 9

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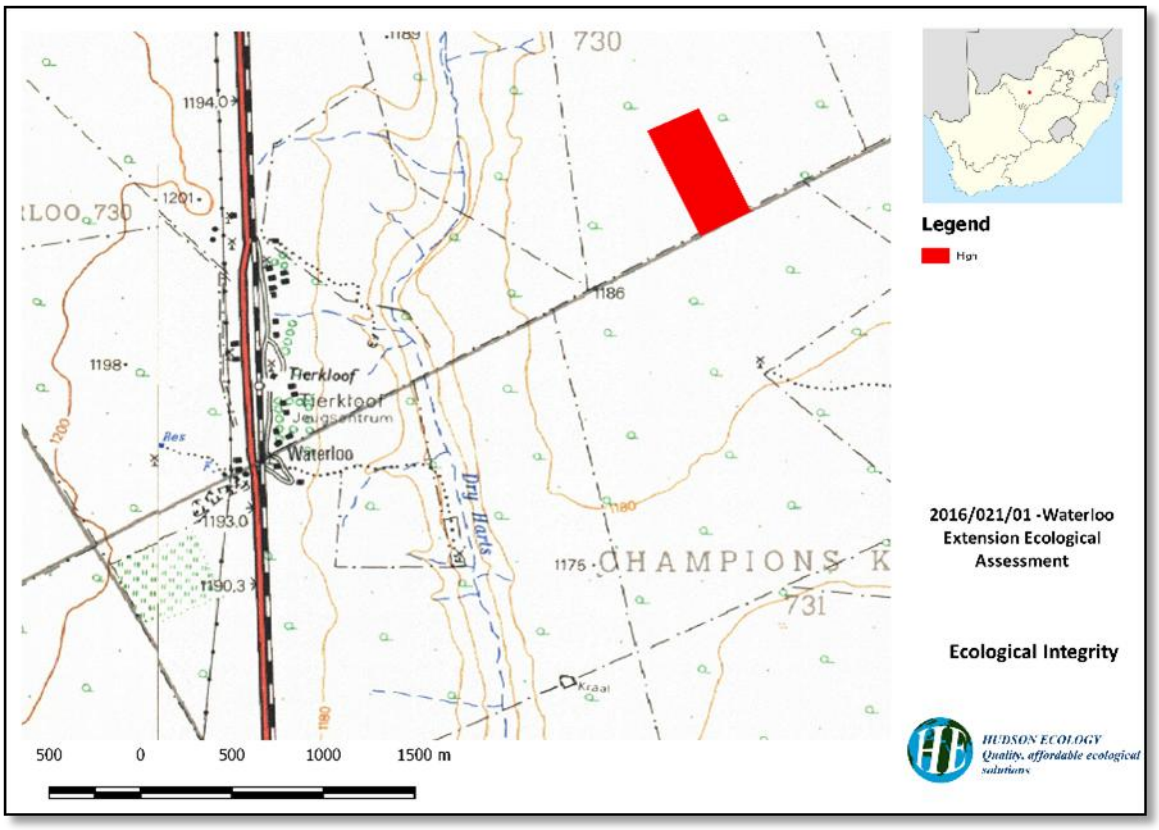

Figure 9: Ecological integrity within the study area

9.6 Conservation Importance

The conservation importance of the study area can be described as moderate (Figure 10), due to the fact that there is a possibility of protected species occurring in this vegetation community some protected plant species (*Acacia erioloba, Brunsvigia radula* and *Aloe grandidentata*) were found in this vegetation community outside of the study area, although none were found at the study sites within the study area. In keeping with the Precautionary Principle (COMEST, 2005), we need to assume a higher conservation importance when in doubt.

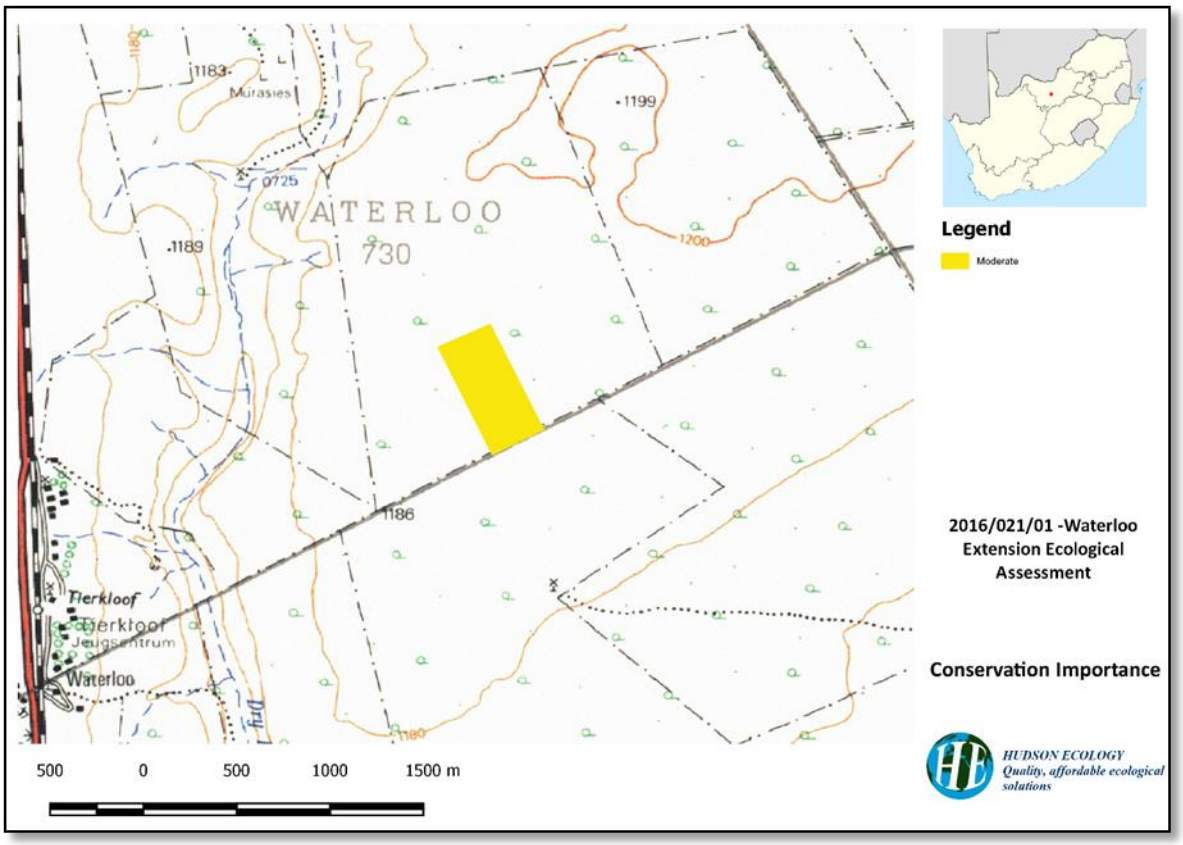

Figure 10: Conservation importance within the study area

10 ECOLOGICAL IMPACT ASSESSMENT

Preliminary impacts and mitigations are discussed in the tables below:

Impact 1: Vegetation Clearing				
Vegetation clearing is likely to be the greatest impact on the vegetation community affected by the proposed activities.				
	Without Mitigation		**With Mitigation**	
Extent (E)	2	Site only	2	Site only
Duration (D)	4	>15 years	4	>15 years
Magnitude (M)	6	Moderate Intensity	2	Minor Intensity
Probability (P)	4	Highly Probable	2	Improbable
Significance (S = [E+D+M]xP)	48	Moderate	16	Low

Status (Positive, negative or neutral)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources	Yes	Yes
Mitigability	Yes	Yes
Mitigation measures:		
Vegetation clearing is inevitable and unavoidable. Mitigation of this impact can, however, be implemented by keeping the area cleared to a minimum and careful removal and replanting of plants and trees of conservation importance. Seed collection, propagation and re-planting of saplings to make up for lost species should also be applied. A nursery should be started as a community project. The impact of vegetation clearing is likely to be a long term impact, but through careful planning and rehabilitation can be greatly reduced.		
Cumulative impacts:		
There are a number of solar facilities planned in the vicinity of Vryburg as well as throughout the province. All these areas have been cleared and servitudes are maintained and vegetation clearing conducted as fire breaks there will thus be a cumulative impact in the area.		
Residual impacts:		
Localised loss of vegetation		

Impacts 2: Spillage of harmful or toxic substances

Harmful or toxic substances that may affect the biota of the area if they were to enter the system include: diesel, hypoid oil, motor oil, polluted water used during the operations and chemicals transported to and from site and used in the operations. The spillage of harmful or toxic substances may impact on the fauna and flora of the area in a number of ways. Direct pathways include ingestion of the substances by fauna species resulting in toxicity in that individual, uptake of toxic chemicals by the roots plants which may lead to toxicity in the plants and the chemicals entering the plant or animals system due to contact (through the skin, leaves or stems). Indirect pathways include the ingestion of contaminated plants or animals by other herbivorous or predatory species. The predation of contaminated animals by both other animals and humans is a common occurrence during chemical contamination due to these animals being sluggish, and less likely to escape predation, due to chemical toxicity.

	Without Mitigation		**With Mitigation**	
Extent (E)	1	Low	1	Low
Duration (D)	4	>15 years	1	<5 years
Magnitude (M)	6	Moderate Intensity	4	Low Intensity
Probability (P)	4	Highly Probable	2	Improbable
Significance (S = [E+D+M]xP)	44	Moderate	12	Low

Status (Positive, negative or neutral)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources	Yes	Yes
Mitigability	Yes	Yes
Mitigation measures:		
The spillage of harmful or toxic substances can be mitigated by the implementation of a sound emergency spillage containment plan, which can be implemented as soon as a spill of harmful or toxic substances occurs.		
Cumulative impacts:		
None with mitigation		
Residual impacts:		
None with mitigation		

Impacts 3: Disturbance of biodiversity due to vibration and noise

Vibration and noise will have a significant effect mainly on fauna species in the immediate vicinity of the development, due to the heavy machinery utilised.Vibration can affect a number of subterranean fauna taxa, such as burrowing mammals, reptiles and arthropods. Vibration affects these animals by causing the collapsing of burrows, and causing these animals to leave the area due to the vibration. Noise will also affect a wide range of taxa including avifauna, mammals, reptiles, amphibians and arthropods. Avifauna, especially songbirds, and amphibians may find it difficult to find mates in areas of increased noise, mammals, reptiles and arthropods may find increased noise disturbing and therefore move away from the area

	Without Mitigation		**With Mitigation**	
Extent (E)	2	local	2	local
Duration (D)	4	>15 years	1	<5 years
Magnitude (M)	6	Moderate Intensity	4	Low Intensity
Probability (P)	4	Highly Probable	2	Improbable
Significance (S = [E+D+M]xP)	48	Moderate	14	Low

Status (Positive, negative or neutral)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources	Yes	Yes
Mitigability	Yes	Yes
Mitigation measures:		
Vibration and noise from heavy machinery can be kept to a minimum by reducing the movement of heavy vehicles to a minimum necessary for operations. Placing the vehicle yard as close to the construction area as possible will also reduce the scale of impact of vibration.		
Cumulative impacts:		
None with mitigation		
Residual impacts:		
None with mitigation		

Impacts 4: Habitat degradation due to dust				
Increased dust will occur in all areas where vegetation is cleared. Dust will be caused by excavation, and construction. Dust in the area will be greatly increased due to the dry weather conditions and the nature of the soil in the area. Dust settling on plant material can reduce the amount of light reaching the chlorophyll in the leaves, thereby reducing photosynthesis, which in turn reduces plant productivity, growth and recruitment.				
	Without Mitigation		**With Mitigation**	
Extent (E)	2	Local	2	Local
Duration (D)	3	5-15 years years	1	<5 years
Magnitude (M)	6	Moderate Intensity	2	Minor Intensity
Probability (P)	4	Highly Probable	2	Improbable
Significance (S = [E+D+M]xP)	44	Moderate	10	Low
Status (Positive, negative or neutral)	Negative		Negative	
Reversibility	Yes		Yes	

Irreplaceable loss of resources	Yes	Yes
Mitigability	Yes	Yes

Mitigation measures:

The following methods can be used to prevent conditions conducive to dust generation and suppress dust should it occur:
• Dust suppression on roads by water bowsers;
• Adjacent paved areas and roads used for construction traffic can be maintained free of tracked soil or fill materials. At minimum, paved traffic areas, can be cleaned on a daily basis by wet sweeping and/or washing. More frequent cleaning can be provided as necessary. Adjacent paved areas and roads can be left clean at the end of each day;
• Exposed excavations, disturbed ground surfaces, and unpaved traffic areas can be maintained in a moist condition;
• During non-working hours, the site can be left in a condition that will prevent dust from being generated. At the end of each work day, disturbed areas can be wetted down and security fencing can be installed and or inspected to prevent access and additional disturbance;
• Provide temporary cover and daily maintenance for soil stockpiles and keep active surfaces moist;
• A temporary decontamination pad and/or a stabilized construction entrance can be provided at active site entrance/egress locations to keep adjacent paved areas clean; and
• Construction activities should be conducted using methods that minimize dust generation.
The following Best Management Practices (BMPs) can also be followed to help minimize and control dust emissions at the Site to the greatest extent possible:
• All onsite traffic can be restricted to specific designated roads. Off-road travel can only be authorized on a case-by-case basis (e.g. access to a remote monitoring well, etc.). Traffic speed can also be restricted to an appropriate level on all designated roads. All designated roads can be considered as high potential dust source areas, and as such, can be a priority for dust controls utilizing water and/or gravel.
• This plan can be in effect during all hours of operation at the site. During non-business hours, there can be no activities generating dust; therefore, dust control actions can be restricted to hours of operation only. However, as a best management practice, if high winds are evident at the close of a business day (or immediately prior to a weekend, holiday, etc.), site personnel should evaluate vulnerable areas and implement controls, as appropriate, to minimize off-hours emissions.

Cumulative impacts:

None with mitigation

Residual impacts:

None with mitigation

Impact 5: Effects on local migrations

Local migrations of fauna in the area may be affected by linear infrastructure, fences and buildings, due to these areas forming a barrier to migrating animals or reducing the chance of an animal surviving its migration due to collisions with vehicles on roads. This impact is likely to be low due to the greatly reduced wildlife in the area due to previous disturbances in the area causing a greatly reduced species. Furthermore, many of the roads are already in use. The study area is recognised as an ESA due to being a migratory route, this requires further investigation.

	Without Mitigation		With Mitigation	
Extent (E)	1	Low	1	Low
Duration (D)	2	<5 years years	1	<5 years
Magnitude (M)	6	Moderate Intensity	2	Minor Intensity
Probability (P)	4	Highly Probable	2	Improbable
Significance (S = [E+D+M]xP)	22	Low	8	Low
Status (Positive, negative or neutral)	Negative		Negative	
Reversibility	Yes		Yes	
Irreplaceable loss of resources	Yes		Yes	
Mitigability	Yes		Yes	
Mitigation measures:				
The following methods can be used to prevent conditions conducive to dust generation and suppress dust should it occur: • Dust suppression on roads by water bowsers; • Adjacent paved areas and roads used for construction traffic can be maintained free of tracked soil or fill materials. Mitigation: The effects on local migrations can be mitigated in the following ways: • The construction area can be isolated by means of a chain link fence in order to prevent animals on local migrations entering the area and being killed; • The effect of roads on local migrations can be mitigated by the installation of culverts at regular intervals along the roads and the installation of drift fences towards the culverts , although these methods may not eliminate the mortalities among migrating animals, they should greatly reduce the number of animals killed on haul roads; and • A low speed limit can be strictly enforced in order to reduce collisions with animals on the roads.				
Cumulative impacts:				
None with mitigation				
Residual impacts:				
None with mitigation				

Impact 6: Increased prevalence of exotic invasive species
The fact that the area will be cleared for construction creates niches that can be colonised by exotic and/or invasive species. This is compounded by the fact that trucks and other heavy machinery often act as vectors for seeds of these species.

	Without Mitigation		With Mitigation	
Extent (E)	3	Regional	1	Site only
Duration (D)	4	>15 years years	4	<5 years
Magnitude (M)	8	Moderate Intensity	2	Minor Intensity
Probability (P)	4	Highly Probable	2	Improbable
Significance (S = [E+D+M]xP)	60	Moderate	14	Low
Status (Positive, negative or neutral)	Negative		Negative	
Reversibility	Yes		Yes	
Irreplaceable loss of resources	Yes		Yes	
Mitigability	Yes		Yes	
Mitigation measures:				
Mitigation: An exotic/invasive species monitoring and management plan should be put in place to manage exotic and invasive species.				
Cumulative impacts:				
None with mitigation				
Residual impacts:				
None with mitigation				

Impact 7: Increased erosion				
Increased erosion can eventually lead to the loss of vegetation and habitats for further species.Soils in the area are prone to erosion in areas where vegetation is cleared, this is further compounded by the fact that precipitation in the area occurs through heavy rainfall events in in the form of thundershowers in summer. Furthermore large areas will be cleared before construction leaving these areas prone to erosion.				
	Without Mitigation		**With Mitigation**	
Extent (E)	1	Low	1	Low
Duration (D)	4	>15 years	4	>15 years
Magnitude (M)	6	Moderate Intensity	2	Minor Intensity
Probability (P)	4	Highly	2	Improbable

		Probable		
Significance (S = [E+D+M]xP)	44	Low	14	Low
Status (Positive, negative or neutral)	Negative		Negative	
Reversibility	Yes		Yes	
Irreplaceable loss of resources	Yes		Yes	
Mitigability	Yes		Yes	
Mitigation measures:				
An erosion monitoring and mitigation plan should be put in place.				
Cumulative impacts:				
None with mitigation				
Residual impacts:				
None with mitigation				

11 DISCUSSION AND CONCLUSIONS

Flora assessments were conducted during the wet season (March 2016). Based on species composition, physiognomy, moisture regime, rockiness, slope and soil properties, it was found that the entire study area (21.5 ha) falls within a single vegetation community, namely the Tarchonanthus - Ziziphus Shrubland.

The tree layer in this vegetation community is dominated by Ziziphus mucronata and Searsia lancea with few Acacia species present. The shrub layer is well defined in this vegetation community and Tarchonanthus camphoratus is the dominant shrub species in higher lying areas of the study area, particularly on shallower soils underlain by dolomite. This vegetation community is typically covered by sparse open grassland.

Recorded species include two climber species, 12 dwarf shrub species, three geophyte species, 20 graminoid species, 23 herb species, one succulent species and two tree species. Although no species of concern were recorded within the study area itself, Acacia erioloba, Brunsvigia radula and Aloe grandidentata were found in other areas of the same vegetation community and therefore can be considered as having a high probability of occurrence in this vegetation community and the study area.

A list of plant species previously recorded in the quarter degree grid in which the study area is situated was obtained from the South African National Biodiversity Institute (APPENDIX A). Additional species that could occur in similar habitats, as determined from official database searches and reviewed literature, but not recorded in these grids are also listed. A total of 20 species were determined to possibly be occurring in the study area (Table 2).

The species, listed as possibly occurring in the study area, were evaluated to determine the probability of occurrence in the study area based on habitat suitability. Of the species that are considered to occur within the area under investigation, there were five species that could occur in habitats that are available in the study area. Three of the species of concern, Aloe grandidentata, Brunsvigia radula and Acacia eroloba, were recorded in the study area and could occur anywhere within the study area.

The quantity and quality of floristic data for the study area is poor. There are few taxonomic collections and relatively little floristic information for the area (Van Wyk & Smith, 2001). Areas associated with calcareous soils and heavy metals are likely to have high numbers of species of restricted distribution. There is also a high probability that there are previously undescribed species from the site or surrounding areas.

Reptile diversity in the area is high with approximately 38 reptile species (APPENDIX B) occurring in the area and reptile endemism is especially high in the region with 10 species (24%) being endemic. Nine were confirmed during the site visit. Most of the species in the area are common and widespread.

The study area is a fair distance from any permanent open water bodies, even the Dry Harts River is approximately a kilometre away, and therefore, as expected, amphibian diversity is low. Only thirteen species are expected to occur in the study area (APPENDIX C), and during the study only four amphibian species were recorded. Due to the rainy conditions at the time, four species were recorded in the study area during the study, it is unlikely that all four these species would be present on site at drier times. All the recorded species were common species which are not listed or range restricted.

Of the 67 mammal species expected to occur in the study area, according to historic recordings, only nine were confirmed during the site visit. All nine mammal species recorded are robust and widespread, mostly with the proviso that suitable habitat and sufficient space to maintain home ranges / territories are available. Given no or lowkey prosecution, all species are capable of maintaining their presences in remote areas such as the site and surrounding properties. The nearby roads are a main source of fatalities – several carcasses were recorded during transit to and from the study area.

Of the seven fauna species of concern that may occur in the study area, 1 has low probability of occurrence, 5 have a medium probability of occurrence and one has a high probability of occurrence. Three of the species with a high probability of occurrence, the Black-necked spitting Cobra, Maccoa Duck and Lanner Falcon, were recorded during the study.

The study area consists of extensive areas of Terrestrial Critical Biodiversity Areas. More than half of the study site is covered by some sort of CBA. The largest portion of the CBA consists of Important Ecological Corridors (T2 CBA). Hill features in the study area have been classified as T2 CBA (Hills).

A site visit of the CBA areas falling within the proposed farm portions was conducted in March 2016. The purpose of the site visit was to determine the status, condition and capabilities of these areas to fulfil their respective ecological functions and to determine whether the proposed development will have a potential detrimental impact on these areas and their functions

The ecological function of the study area can generally be described as high for the study area, although in some parts of the study area trampling and some gully erosion is evident. In the vast majority of the study area ecological patterns and processes in the study area are intact and little impact on ecological integrity is evident.

The conservation importance of the study area can be described as moderate, due to the fact that there is a possibility of protected species occurring in this vegetation community some protected plant species (Acacia erioloba, Brunsvigia radula and Aloe grandidentata) were found in this vegetation community outside of the study area, although none were found at the study sites within the study area. In keeping with the Precautionary Principle (COMEST, 2005), we need to assume a higher conservation importance when in doubt.The ecological impact assessment yielded seven likely impacts namely:

- Vegetation Clearing
- Spillage of harmful or toxic substances
- Disturbance of biodiversity due to vibration and noise
- Habitat degradation due to dust
- Effects on local migrations
- Increased prevalence of exotic invasive species
- Increased erosion

12 LIST OF ACRONYMS AND ABBREVIATIONS

BIL	Background Information Letter
CSP	Concentrated Solar Power
DEA	Department of Environmental Affairs
DNI	Direct Normal Irradiance
DoE	Department of Energy
DSR	Draft Scoping Report
DWS	Department of Water and Sanitation
EIA	Environmental Impact Assessment
EIA	Regulations National Environmental Management Act, 1998 (Act 107 of 1998) Environmental Impact Assessment Regulations, 2014
EMP	Environmental Management Programme
GN	General Notice
ha	Hectares
HTF	Heat Transfer Fluid
I&APs	Interested and affected parties
IFC	International Finance Corporation
km	Kilometre
m	metres
MW	Megawatt
MWe	Megawatt electrical
NEMA	National Environmental Management Act, 1998 (Act 107 of 1998)
PS	Performance Standards
PV	Photovoltaic
REIPPP	Renewable Energy Independent Power Producer Procurement Programme
SG	Surveyor General

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Adrian Hudson (Senior Ecologist)

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APPENDIX A

Plant species recorded as historically occurring in the 2724BB QDS according to the SANBI database

FAMILY	NATURALISED	SPECIES	THREAT STATUS	SA ENDEMIC	LIFECYCLE	GROWTH FORMS
ACANTHACEAE		Barleria macrostegia Nees	LC	No	Perennial	Herb
ACANTHACEAE		Blepharis integrifolia (L.f.) E.Mey. ex Schinz var. integrifolia	LC	No	Perennial	Herb
ACANTHACEAE		Crabbea angustifolia Nees	LC	No	Perennial	Herb
ACANTHACEAE		Dyschoriste transvaalensis C.B.Clarke	LC	No	Perennial	Dwarf shrub
ACANTHACEAE		Monechma divaricatum (Nees) C.B.Clarke	LC	No	Perennial	Shrub
ACANTHACEAE		Ruelliopsis setosa (Nees) C.B.Clarke	LC	No	Perennial	Herb
AMARANTHACEAE	*	Gomphrena celosioides Mart.	Not Evaluated	No	Perennial	Herb
AMARANTHACEAE		Hermbstaedtia odorata (Burch.) T.Cooke var. odorata	LC	No	Perennial	Herb
ANACARDIACEAE		Searsia leptodictya (Diels) T.S.Yi	Not Evaluated	No	Perennial	Tree
ANACARDIACEAE		Searsia pyroides (Burch.) Moffett var. pyroides	LC	No	[No lifecycle defined]	[No lifeform defined]
ANTHERICACEAE		Chlorophytum fasciculatum (Baker) Kativu	LC	No	Perennial	Herb
APIACEAE		Berula thunbergii (DC.) H.Wolff	LC	No	Perennial	Herb
APIACEAE	*	Cyclospermum leptophyllum (Pers.) Sprague ex Britton & P.Wilson	Not Evaluated	No	Annual	Herb
APOCYNACEAE		Gomphocarpus tomentosus Burch. subsp. tomentosus	LC	No	Perennial	Herb
APOCYNACEAE		Pentarrhinum insipidum E.Mey.	LC	No	Perennial	Climber
ASPARAGACEAE		Asparagus setaceus (Kunth) Jessop	LC	No	Perennial	Shrub
ASPARAGACEAE		Asparagus suaveolens Burch.	LC	No	Perennial	Shrub
ASPHODELACEAE		Trachyandra saltii (Baker) Oberm. var. saltii	LC	No	Perennial	Geophyte
ASTERACEAE	*	Aster squamatus (Spreng.) Hieron.	Not Evaluated	No	Annual	Herb
ASTERACEAE		Chrysocoma obtusata (Thunb.) Ehr.Bayer	LC	No	Perennial	Shrub
ASTERACEAE		Cineraria vallis-pacis Dinter ex Merxm.	LC	No	Perennial	Herb
ASTERACEAE		Dicoma anomala Sond. subsp. gerrardii (Harv. ex F.C.Wilson) S.Ortíz & Rodr.Oubiña	LC	No	Perennial	Herb
ASTERACEAE		Dicoma macrocephala DC.	LC	No	Perennial	Herb
ASTERACEAE		Geigeria ornativa O.Hoffm. subsp. ornativa	LC	No	Annual (occ. perennial)	Herb
ASTERACEAE		Pentzia calcarea Kies	LC	No	Perennial	Shrub
ASTERACEAE	*	Pseudognaphalium luteo-album (L.) Hilliard & B.L.Burtt		No	Annual	Herb
ASTERACEAE		Tarchonanthus camphoratus L.	LC	No	Perennial	Shrub
ASTERACEAE		Arctotis arctotoides (L.f.) O.Hoffm.	LC	No	Perennial	Herb
ASTERACEAE		Felicia muricata (Thunb.) Nees subsp. muricata	LC	No	Perennial	Shrub
ASTERACEAE		Helichrysum argyrosphaerum DC.	LC	No	Annual	Herb
ASTERACEAE		Lasiopogon muscoides (Desf.) DC.	LC	No	Annual	Herb
ASTERACEAE		Nolletia ciliaris (DC.) Steetz	LC	No	Perennial	Suffrutex

BORAGINACEAE		Ehretia alba Retief & A.E.van Wyk	LC	No	Perennial	Shrub
BURSERACEAE		Commiphora pyracanthoides Engl.	LC	No	Perennial	Shrub
CAMPANULACEAE		Wahlenbergia denticulata (Burch.) A.DC. var. denticulata	LC	No	Perennial	Herb
CAMPANULACEAE		Wahlenbergia undulata (L.f.) A.DC.	LC	No	Perennial	Herb
CAPPARACEAE		Boscia foetida Schinz subsp. minima Toelken	LC	No	Perennial	Dwarf shrub
CARYOPHYLLACEAE		Pollichia campestris Aiton	LC	No	Perennial	Herb
COLCHICACEAE		Colchicum melanthoides (Willd.) J.C.Manning & Vinn. subsp. melanthoides	LC	No	Perennial	Geophyte
COMMELINACEAE		Commelina livingstonii C.B.Clarke	LC	No	Perennial	Herb
CONVOLVULACEAE		Evolvulus alsinoides (L.) L.	LC	No	Annual (occ. perennial)	Herb
CONVOLVULACEAE		Ipomoea obscura (L.) Ker Gawl. var. obscura	LC	No	Perennial	Herb
CONVOLVULACEAE		Ipomoea oenotheroides (L.f.) Raf. ex Hallier f.	LC	No	Perennial	Shrub
CONVOLVULACEAE		Seddera suffruticosa (Schinz) Hallier f.	LC	No	Perennial	Dwarf shrub
CONVOLVULACEAE		Xenostegia tridentata (L.) D.F.Austin & Staples subsp. angustifolia (Jacq.) Lejoly & Lisowski	LC	No	Perennial	Herb
CYPERACEAE		Cyperus marginatus Thunb.	LC	No	Perennial	Cyperoid
CYPERACEAE		Cyperus sphaerospermus Schrad.	LC	No	Perennial	Cyperoid
CYPERACEAE		Scirpoides dioeca (Kunth) Browning	LC	No	Perennial	Cyperoid
CYPERACEAE		Bulbostylis burchellii (Ficalho & Hiern) C.B.Clarke	LC	No	Perennial	Cyperoid
CYPERACEAE		Cyperus bellus Kunth	LC	No	Perennial	Cyperoid
EUPHORBIACEAE		Acalypha segetalis Müll.Arg.	LC	No	Perennial (occ. annual)	Dwarf shrub
EUPHORBIACEAE		Euphorbia inaequilatera Sond. var. inaequilatera	LC	No	Annual	Dwarf shrub
FABACEAE		Acacia robusta Burch. subsp. robusta	LC	No	Perennial	Tree
FABACEAE		Indigastrum costatum (Guill. & Perr.) Schrire subsp. macrum (E.Mey.) Schrire	LC	No	Annual	Herb
FABACEAE		Indigofera cryptantha Benth. ex Harv. var. cryptantha	LC	No	Perennial	Dwarf shrub
FABACEAE		Indigofera heterotricha DC.	LC	No	Perennial	Dwarf shrub
FABACEAE		Indigofera sessilifolia DC.	LC	No	Perennial	Dwarf shrub
FABACEAE		Otoptera burchellii DC.	LC	No	Perennial	Climber
FABACEAE		Rhynchosia totta (Thunb.) DC. var. totta	LC	No	Perennial	Climber
FABACEAE		Zornia milneana Mohlenbr.	LC	No	Perennial	Herb
GENTIANACEAE		Sebaea pentandra E.Mey. var. pentandra	LC	No	Annual	Herb
HYACINTHACEAE		Dipcadi viride (L.) Moench	LC	No	Perennial	Geophyte
IRIDACEAE		Babiana bainesii Baker	LC	No	Perennial	Geophyte
IRIDACEAE		Moraea polystachya (Thunb.) Ker Gawl.	LC	No	Perennial	Geophyte
JUNCACEAE		Juncus exsertus Buchenau	LC	No	Perennial	Helophyte

LAMIACEAE		Salvia disermas L.	LC	No	Perennial	Herb
LAMIACEAE	*	Salvia stenophylla Burch. ex Benth.		No	Perennial	Herb
LAMIACEAE		Teucrium trifidum Retz.	LC	No	Perennial	Herb
LOBELIACEAE		Lobelia erinus L.	LC	No	Annual (occ. perennial)	Herb
MALVACEAE		Grewia flava DC.	LC	No	Perennial	Shrub
MALVACEAE		Hibiscus pusillus Thunb.	LC	No	Perennial	Herb
MALVACEAE	*	Hibiscus trionum L.		No	Annual	Herb
MALVACEAE		Melhania prostrata DC.	LC	No	Perennial	Dwarf shrub
MALVACEAE		Sida chrysantha Ulbr.	LC	No	Perennial	Dwarf shrub
MOLLUGINACEAE		Hypertelis salsoloides (Burch.) Adamson var. salsoloides	LC	No	Perennial	Dwarf shrub
MOLLUGINACEAE		Limeum viscosum (J.Gay) Fenzl subsp. viscosum var. viscosum	LC	No	Annual	Herb
NYCTAGINACEAE		Commicarpus pentandrus (Burch.) Heimerl	LC	No	Perennial	Herb
OPHIOGLOSSACEAE		Ophioglossum polyphyllum A.Braun var. polyphyllum	LC	No	Perennial	Geophyte
PHYLLANTHACEAE		Phyllanthus incurvus Thunb.	LC	No	Perennial	Dwarf shrub
POACEAE		Brachiaria marlothii (Hack.) Stent	LC	No	Annual (occ. perennial)	Graminoid
POACEAE		Eragrostis curvula (Schrad.) Nees	LC	No	Perennial	Graminoid
POACEAE		Leptochloa fusca (L.) Kunth	LC	No	Perennial	Graminoid
POACEAE	*	Polypogon monspeliensis (L.) Desf.	Not Evaluated	No	Annual	Graminoid
POACEAE		Andropogon schirensis Hochst. ex A.Rich.	LC	No	Perennial	Graminoid
POACEAE		Anthephora pubescens Nees	LC	No	Perennial	Graminoid
POACEAE		Aristida bipartita (Nees) Trin. & Rupr.	LC	No	Perennial	Graminoid
POACEAE		Aristida canescens Henrard subsp. canescens	LC	No	Perennial	Graminoid
POACEAE		Aristida congesta Roem. & Schult. subsp. barbicollis (Trin. & Rupr.) De Winter	LC	No	Perennial (occ. annual)	Graminoid
POACEAE		Aristida congesta Roem. & Schult. subsp. congesta	LC	No	Perennial	Graminoid
POACEAE		Aristida meridionalis Henrard	LC	No	Perennial	Graminoid
POACEAE		Aristida stipitata Hack. subsp. graciliflora (Pilg.) Melderis	LC	No	Perennial	Graminoid
POACEAE		Aristida vestita Thunb.	LC	No	Perennial	Graminoid
POACEAE		Brachiaria brizantha (A.Rich.) Stapf	LC	No	Perennial	Graminoid
POACEAE		Brachiaria deflexa (Schumach.) C.E.Hubb. ex Robyns	LC	No	Annual	Graminoid
POACEAE		Brachiaria nigropedata (Ficalho & Hiern) Stapf	LC	No	Perennial	Graminoid
POACEAE	*	Cymbopogon pospischilii (K.Schum.) C.E.Hubb.	Not Evaluated	No	Perennial	Graminoid
POACEAE		Digitaria eriantha Steud.	LC	No	Perennial	Graminoid
POACEAE		Diheteropogon amplectens (Nees) Clayton var. amplectens	LC	No	Perennial	Graminoid

POACEAE		Elionurus muticus (Spreng.) Kunth	LC	No	Perennial	Graminoid
POACEAE		Enneapogon scoparius Stapf	LC	No	Perennial	Graminoid
POACEAE	*	Eragrostis barrelieri Daveau	Not Evaluated	No	Annual	Graminoid
POACEAE		Eragrostis bicolor Nees	LC	No	Perennial	Graminoid
POACEAE		Eragrostis chloromelas Steud.	LC	No	Perennial	Graminoid
POACEAE		Eragrostis echinochloidea Stapf	LC	No	Perennial	Graminoid
POACEAE		Eragrostis gummiflua Nees	LC	No	Perennial	Graminoid
POACEAE		Eragrostis homomalla Nees	LC	No	Annual	Graminoid
POACEAE		Eragrostis lehmanniana Nees var. lehmanniana	LC	No	Perennial	Graminoid
POACEAE		Eragrostis nindensis Ficalho & Hiern	LC	No	Perennial	Graminoid
POACEAE		Eragrostis rigidior Pilg.	LC	No	Perennial	Graminoid
POACEAE		Eragrostis superba Peyr.	LC	No	Perennial	Graminoid
POACEAE		Eragrostis x pseud-obtusa De Winter	Not Evaluated	No	Perennial	Graminoid
POACEAE		Fingerhuthia africana Lehm.	LC	No	Perennial (occ. annual)	Graminoid
POACEAE		Heteropogon contortus (L.) Roem. & Schult.	LC	No	Perennial	Graminoid
POACEAE		Hyparrhenia hirta (L.) Stapf	LC	No	Perennial	Graminoid
POACEAE		Melinis repens (Willd.) Zizka subsp. repens	LC	No	Annual (occ. perennial)	Graminoid
POACEAE		Panicum coloratum L. var. coloratum	LC	No	Perennial	Graminoid
POACEAE		Panicum maximum Jacq.	LC	No	Perennial	Graminoid
POACEAE		Panicum stapfianum Fourc.	LC	No	Perennial	Graminoid
POACEAE		Pogonarthria squarrosa (Roem. & Schult.) Pilg.	LC	No	Perennial (occ. annual)	Graminoid
POACEAE		Schizachyrium sanguineum (Retz.) Alston	LC	No	Perennial	Graminoid
POACEAE		Schmidtia pappophoroides Steud.	LC	No	Perennial	Graminoid
POACEAE		Sporobolus fimbriatus (Trin.) Nees	LC	No	Perennial	Graminoid
POACEAE		Stipagrostis uniplumis (Licht.) De Winter var. neesii (Trin. & Rupr.) De Winter	LC	No	Perennial	Graminoid
POACEAE		Themeda triandra Forssk.	LC	No	Perennial	Graminoid
POACEAE		Trichoneura grandiglumis (Nees) Ekman	LC	No	Perennial	Graminoid
POACEAE		Triraphis andropogonoides (Steud.) E.Phillips	LC	No	Perennial	Graminoid
POACEAE		Urochloa panicoides P.Beauv.		No	Annual	Graminoid
POLYGONACEAE		Oxygonum alatum Burch. var. alatum	LC	No	Annual	Herb
PORTULACACEAE		Anacampseros filamentosa (Haw.) Sims subsp. filamentosa	LC	No	Perennial	Herb
POTTIACEAE		Didymodon tophaceus (Brid.) Lisa		No	Perennial	Bryophyte
POTTIACEAE		Syntrichia ammonsiana (H.A.Crum & L.E.Anderson) Ochyra		No	Perennial	Bryophyte

PTERIDACEAE		Actiniopteris radiata (J.König ex Sw.) Link	LC	No	Perennial	Geophyte
RICCIACEAE		Riccia argenteolimbata O.H.Volk & Perold		No	Perennial	Bryophyte
RUBIACEAE		Anthospermum rigidum Eckl. & Zeyh. subsp. rigidum	LC	No	Perennial	Dwarf shrub
RUBIACEAE		Kohautia cynanchica DC.	LC	No	Annual (occ. perennial)	Herb
SCROPHULARIACEAE		Selago albomarginata Hilliard	LC	No	Perennial	Herb
SCROPHULARIACEAE		Veronica anagallis-aquatica L.	LC	No	Annual (occ. perennial)	Herb
SCROPHULARIACEAE		Aptosimum albomarginatum Marloth & Engl.	LC	No	Perennial	Dwarf shrub
SCROPHULARIACEAE		Aptosimum elongatum Engl.	LC	No	Perennial	Dwarf shrub
SCROPHULARIACEAE		Peliostomum leucorrhizum E.Mey. ex Benth.	LC	No	Perennial	Dwarf shrub
SCROPHULARIACEAE		Selago mixta Hilliard	LC	No	Perennial	Herb
SINOPTERIDACEAE		Cheilanthes dolomiticola (Schelpe) Schelpe & N.C.Anthony	LC	No	Perennial	Herb
SINOPTERIDACEAE		Cheilanthes hirta Sw. var. brevipilosa W.& N.Jacobsen		No	[No lifecycle defined]	Herb
SINOPTERIDACEAE		Pellaea calomelanos (Sw.) Link var. calomelanos	LC	No	Perennial	Geophyte
SOLANACEAE		Solanum catombelense Peyr.	LC	No	Perennial	Dwarf shrub
VERBENACEAE		Lantana mearnsii Moldenke var. latibracteolata Moldenke	LC	No	[No lifecycle defined]	Shrub
VERBENACEAE		Lantana rugosa Thunb.	LC	No	Perennial	Shrub
VERBENACEAE		Lippia scaberrima Sond.	LC	No	Perennial	Herb
VERBENACEAE	*	Verbena officinalis L.	Not Evaluated	No	Annual	Her

APPENDIX B

Reptile species occurring in the region of the study area

ORDER	SUBORDER	FAMILY	FAMILY	*BIOLOGICAL NAME*	COMMON NAME	ENDEMIC
Chelonii	Pleurodira	Testudinae		*Psammobates oculifer*	Serrated or Kalahari Tent Tortoise	E
		Pelomedusidae		*Pelomedusa subrufa*	Marsh or Helmeted Terrapin	
Squamata	Serpentes (Ophidia)	Leptotyphlopidae		*Typhlops bibronii*	Bibron's Blind Snake	E
				Rhinotyphlops lalandei	Delalande's Blind Snake	E
				Leptotyphlops scutifrons	Peter's Thread Snake	
		Colubridae	Boadontinae	*Python sebae*	African Rock Python	
				Lamprophis fuliginosus	Brown House Snake	
				Lycophidion capense	Common Wolf Snake	
				Pseudoaspis cana	Mole Snake	
			Psammophinae	*Prosymna bivittata*	Two-striped Shovel-snout	E
				Psammophylax tritaeniatus	Striped Skaapsteker	
				Psammophis trinasalis	Kalahari Sand Snake	
				Psammophis siblians	Leopard and Short snouted Grass snakes	
				Psammophis crucifer	Crossed Whip Snake	E
				Atractaspis bibronii	Southern or Bibron's Burrowing Asp	
				Xenocalamus bicolor	Bicoloured Quill-snouted Snake	
				Dasypeltis scabra	Rhombic Egg Eater	
				Crotaphopeltis hotamboeia	Herald Snake	
				Telescopus semiannulatus	Eastern Tiger Snake	
		Elapidae	Najinae	*Naja nivea*	Cape Cobra	E

			Viperinae	*Bitis arietans*	Puff Adder	
	Sauria (Lacertillia)	Scincidae	Lygosomatiinae	*Monopeltis capensis*	Cape Spade-snouted Worm Lizard	
				Monopeltis sphenorhyncus	Slender Spade-snouted Worm Lizard	
				Dalophia pistillum	Blunt-tailed Worm Lizard	
				Acontias gracilicauda	Thin-tailed Legless Skink	E
				Trachylepis capensis	Cape Skink	
				Mabuya striata	Striped Skink	
				Mabuya varia	Variable Rock Skink	
				Ichnotropis squamulosa	Common Rough-scaled Lizard	
				Nucras intertexta	Spotted Sandveld Lizard	E
				Nucras taeniolata	Ornate Sandveld Lizard	
				Gerrhosaurus flavigularis	Yellow-throated Plated Lizard	
				Cordylus polyzous	Karoo Girdled Lizard	E
			Agamidae	*Agama aculeata*	Ground Agama	
				Agama atra	Southern Rock Agama	E
				Chamaeleo dilepis	Flap-neck Chamaeleon	
		Gekkonidae	Agamidae	*Lygodactylus capensis*	Cape Dwarf Gecko	
				Pachydactylus capensis	Cape Gecko	

APPENDIX C

Amphibian species historically occurring in the region of the study area

FAMILY	SPECIES	COMMON NAME	ENDEMIC STATUS	REVISED STATUS
Bufonidae	*Schismaderma carens*	Red Toad	0	NL
	Amietophrynus gutteralis	Gutteral Toad	0	NL
	Amietophrynus garmani	Eastern Olive Toad	0	NL
	Amietophrynus poweri	Western /olive Toad	0	NL
Hyperoliidae	*Kassina senegalensis*	Bubbling Kassina	0	NL
Microhylidae	*Breviceps adspersus*	Desert Rain Frog	0	NL
	Phrynomantis bifasciatus	Marbled Rubber Frog	0	NL
Pipidae	*Xenopus laevis*	Common Platana	0	NL
Pyxicephalidae	*Cacosternum boettgeri*	Boettger's Caco	0	NL
	Tomopterna cryptotis	Tremolo Sand Frog	0	NL
	Pyxicephalus adspersus	Giant Bulfrog	0	NT
	Tomopterna tandyi	Tandy's Sand Frog	0	NL
	Amieta angolensis	Common River Frog	0	NL

Species list for the region spanning South Africa, Lesotho and Swaziland. Endemic status:

0 indicates no endemism to southern Africa

1 indicates endemism to southern Africa;

2 indicates endemism to the region (South Africa, Lesotho and Swaziland).

The relevant IUCN status categories are:

Critically Endangered (CR)

Endangered (EN)

Vulnerable (VU)

Near Threatened (NT)

Data Deficient (DD)

Least Concern (LC)

All species without a category are shown as Not Listed (NL)

APPENDIX D

Mammal species occurring in the region of the study area

FAMILY	SUBFAMILY	BIOLOGICAL NAME	COMMON NAME
ERINACEIDAE (Hedgehogs)		*Atelerix frontalis*	Southern African Hedgehog
SORICIDAE (Shrews)		*Crocidura fuscomurina*	Tiny Musk Shrew
		Crocidura cyanea	Reddish-grey Musk Shrew
		Crocidura hirta	Lesser Red Musk Shrew
NYCTERIDAE (Slit-faced Bats)		*Nycteris thebiaca*	Egyptian Slit-faced Bat
RHINOLOPHIDAE (Horseshoe Bats)		*Rhinolophus clivosus*	Geoffroy's Horseshoe Bat
VESPERTILIONIDAE (Vesper Bats)	MINIOPTERINAE	*Miniopterus schriebersii*	Schrieber's Long-fingered Bat
	VESPERTILIONINAE	*Neoromicia capensis*	Cape Serotine Bat
		Tadarida aegyptiaca	Egyptian Free-tailed Bat
CERCOPITHECIDAE (Baboons and Monkeys)		*Papio cynocephalus ursinus*	Savanna Baboon
MANIDAE (Pangolins)		*Manis temminckii*	Ground Pangolin
LEPORIDAE (Hares and Rabbits)		*Lepus capensis*	Cape Hare
		Lepus saxatillis	Scrub Hare
SCIURIDAE (Squirrels)		*Xerus inauris*	Southern African Ground Squirrel
PEDETIDAE (Springhares)		*Pedetes capensis*	Springhare
BATHYERGIDAE (Rodent Moles / Mole Rats)		*Cryptomys hottentotus*	Common (African) Mole-rat
HYSTRICIDAE (Porcupine)		*Hystrix africaeaustralis*	Cape Porcupine
MURIDAE (Rats and Mice)		*Mystromys albicaudatus*	White-tailed Mouse
		Saccostomus campestris	Pouched Mouse
		Steatomys krebsii	Krebb's Fat Mouse
		Malacothrix typica	Gerbil Mouse

	GERBILLINAE	*Desmodillus auricularis*	Cape Short-tailed Gerbil
		Gerbillurus paeba	Hairy-footed Gerbil
		Tatera leucogaster	Bushveld Gerbil
		Tatera brantsii	Highveld Gerbil
		Michaelamys namaquensis	Namaqua Rock Mouse
		Aethomys chrysophilus	Red Veld Rat
		Rhabdomys pumilio	Four-striped Grass Mouse
		Mus musculus	House Mouse
		Thallomys paedulcus	Acacia Rat
		Thallomys nigricaudatus	Black-tailed Tree Rat
		Mastomys natalensis	Natal Multimammate Mouse
		Mastomys coucha	Southern Multimammate Mouse
		Rattus rattus	House Rat
		Otomys angoniensis	Angoni Vlei Rat
		Otomys irroratus	Vlei Rat
CARNIVORA: Canidae		*Vulpes chama*	Cape Fox
		Canis mesomelas	Black-backed Jackal
Mustelidae (Otters, Badger, Weasel and Polecat)		*Mellivora capensis*	Honey Badger
		Poecilogale albinucha	African Striped Weasel
		Ictonyx striatus	Striped Polecat
		Galerella pulverulenta	Small Grey Mongoose
		Gallerella sanguinea	Slender Mongoose

		Cynictis penicillata	Yellow Mongoose
Viverridae		*Genetta genetta*	Small-spotted Genet
Hyaenidae		*Parahayaena brunnea*	Brown Hyaena
Protelidae		*Proteles cristatus*	Aardwolf
Felidae		*Felis sylvestris lybica*	African Wild Cat
		Felis nigripes	Small Spotted Cat
		Caracal caracal	Caracal
Orycteropodidae		*Orycteropus afer*	Aardvark
		Connochaetes gnou	Black Wildebeest
		Damaliscus pygargus phillipsi	Blesbok
		Raphicerus campestris	Steenbok

APPENDIX E

Details of Specialist

Appointment of specialist

Hudson Ecology Pty Ltd was commissioned by Environamics to provide specialist consulting services for the Environmental Impact Assessment for the proposed Solar Plant near Vryburg in the North West Province. The consulting services comprise an assessment of potential impacts on the flora, fauna, vegetation and ecology in the study area by the proposed project.

Details of specialist

Adrian Hudson
Hudson Ecology Pty Ltd
P.O. Box 19287
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Potchefstroom
2522
Telephone: 018 294 5448
Cell: 082 344 2758
Email: adrian@hudsonecology.co.za

Summary of expertise

Adrian Hudson is the owner, director and senior ecologist Hudson Ecology Pty Ltd. In this role, he provides assessments which encompass all aspects of terrestrial and wetland ecological studies including (but not limited to) baseline ecological assessments, ecological impact assessments and biodiversity management plans. He also has considerable experience in conservation, and conducted studies in veld management, stocking rates (wildlife and domestic) for a number of companies and organisations. Projects, unless otherwise requested by the client, are conducted according to the IFC Performance standard 6 criteria and Adrian Hudson is, therefore, au fait with the requirements and criteria of the Standard. Adrian has reviewed a number of projects throughout Africa for IFC Performance Standard 6 compliance, including Hassai Gold Mine in Sudan and Konkola North Copper mine in Zambia.

Adrian Hudson is a qualified ecologist and ornithologist who holds a Master's of Science degree in Ecology from the North West University and is currently completing his PhD in Ecology at the same institution. Adrian is currently still closely associated with the university as a supervisor for Honours and Masters degree students, lecturing of short courses at the university and co-authoring of scientific articles with faculty members of the university. Adrian is a member of the Zoological Society of Southern Africa and the International Society of Conservation Biology. Adrian is also a member of the Department of Environmental Affairs and Tourism (South African Government Department) roster of experts on ecology and desertification and a reviewer for a number of internationally accredited scientific journals. He is also accredited with authorship of a number of articles published in scientific journals.

Before founding Hudson Ecology Pty Ltd. in September 2014, Adrian worked for 18 years for a diverse range of organizations, including Natal Parks Board, North West University, United Nations Environmental Program /Global Environment Facility, ECOSUN cc and Golder Associates Africa Pty Ltd. In these roles, Adrian was responsible for anti- poaching, lecturing, research and consulting respectively. Thus far Adrian has worked as a consulting ecologist on more than 90 projects in 20 countries, including projects in Angola, South Africa, Lesotho, Swaziland, Namibia, Botswana, Mozambique, Zambia, Tanzania, Central African Republic, Democratic Republic of Congo, Sudan, Guinea, Guinea-Bissau, Uzbekistan and Liberia.

Independence

Hudson Ecology Pty Ltd and its Directors have no connection with SunEdison. Hudson Ecology Pty Ltd is not a subsidiary, legally or financially, of the proponent. Remuneration for services by the proponent in relation to this project is not linked to approval by decision-making authorities responsible for authorising this proposed project and the consultancy has no interest in secondary or downstream developments as a result of the authorisation of this project. Adrian Hudson is an independent consultant to Environamics and has no business, financial, personal or other interest in the activity, application or appeal in respect of which he was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of this specialist performing such work. The percentage work received directly or indirectly from the proponent in the last twelve months is approximately 0% of turnover.

Scope and purpose of report

The scope and purpose of the report are reflected in the Terms of reference section of this report

Conditions relating to this report

This report as well as the information contained therein remains the property of Hudson Ecology Pty Ltd until such time as Hudson Ecology Pty Ltd has been remunerated in full for the report and preceding field investigation. As such, until payment is received this report may not be used for insertion in orther reports, placed in the public domain or be passed on to- or reproduced for any third party.

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. HudsonEcology Pty Ltd and its staff reserve the right to modify aspects of the report, including the recommendations, if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

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APPENDIX F

CONTROL SHEET FOR SPECIALIST REPORT

The table below lists the specific requirements for specialist studies, according to the 2014 EIA Regulations (South Africa, 2014)

Activity	Yes	No	Comment
Details of: i the peson who prepared the report; and ii the expertise of that person to carry out the specialist study or specialised process	√ √		
	√		
ii. the expertise of that person to carry out the specialist study or specialised process	√		
A declaration that the person is independent in a form as may be specified by the competent authority	√		
An indication of the scope of, and the purpose for which, the report was prepared	√		
A description of the methodology adopted in preparing the report or carrying out the specialised process	√		
A description of any assumptions made and any uncertainties or gaps in knowledge	√		
A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	√		
Recommendations in respect of any mitigation measures that should be considered by the applicant and the competent authority	√		
A description of any consultation process that was undertaken during the course of carrying out the study	√		
A summary and copies of any comments that were received during any consultation process	√		
Any other information requested by the competent authority	√		

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