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March 2016

REPORT ON

ECOLOGICAL BASELINE AND IMPACT ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF A PHOTOVOLTAIC SOLAR FACILITY AND ASSOCIATED INFRASTRUCTURE ON THE FARM GROOTPOORT IN THE LETSEMENG MUNICIPAL AREA OF THE FREE STATE PROVINCE

Report Number: 2015/021/01/01

Submitted to:

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EXECUTIVE SUMMARY

Hudson Ecology (Pty) Ltd was commissioned by Environamics cc to conduct an ecological assessment of ecosystems associated with the proposed Grootpoort photovoltaic (PV) solar energy facility.

Pele Green Energy (Pty) Ltd. is proposing to develop an 84MW photovoltaic (PV) solar energy near Luckhoff situated in the Letsemeng Local Municipality in the Free State Province. The project will be known as the proposed Grootpoort Photovoltaic Solar Energy Facility near Luckhof, Free State Province.

Flora assessments were conducted during the wet season (November - December 2015) although, due to the drought, very dry conditions persisted during the study. The vegetation communities are decribed in this report, and named according to features such as dominant species, vegetation physiognomy and underlying substrate. Naming of the vegetation communities was made difficult due to the poor vegetation cover, during the dry season, and inability to identify dominant species with any confidence. Based on species composition, physiognomy, moisture regime, rockiness, slope and soil properties, four main communities were recognised. It must be noted that these vegetation communities may be regarded as subcommunities in some instances (as many of the dominant species are dominant throughout the study area), but due to the homogeneity of the karroid vegetation it was decided, for the purposes of this study, to describe them as separate vegetation communities. Based on the nomenclature system described above the vegetation species are:

- Chrysocoma – Aristida plains dwarf shrubland;
- Acacia – Chrysocoma Plains Shrubland;
- Acacia – Aristida Wash Shrubland; and
- Lycium – Crysocoma Hillside Shrubland.

A total of 44 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 and most of these species have a low probability of occurrence in the study area and none were found to occur in the study area during the 2015 study.

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. Reptile diversity in the area is high with approximately 47 reptile species occurring in the area and reptile endemism is especially high in the region with 21 species (42%) being endemic. Five were confirmed during the site visit). The number of species would certainly have been higher if the survey had been conducted during the summer months, especially after good rains. The three 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.

Only ten amphibian species are expected to occur in the study area, and during the study no amphibian species were recorded.

Of the 53 mammal species expected to occur in the study area, according to historic recordings, only 12 were confirmed during the site visit.

Of the 15 species of concern that may occur in the study area, all have a low or very low probability of occurrence on site and none were recorded during the 2015 study.

The ecological function of the study area can generally be described as moderate for the majority of the study area, although this does vary from low (in the highly transformed areas due to overgrazing) to high in the more inaccessible or unutilisable areas. Areas in which overgrazing and clearing have taken place, as well as areas in which settlements have been established are considered as areas where ecological function is reduced.

Areas that have been disturbed by farming are considered of moderate conservation importance due to the fact that rehabilitation of these areas is possible. The natural areas are considered of high conservation importance due to the presence of Red Data species in these areas and the intrinsic importance of these areas. In keeping with the Precautionary Principle (COMEST, 2005), we need to assume a higher conservation importance when in doubt.

Seven probable impacts, associated with the proposed project, on the ecology were identified during the study. All the impacts showed a low to moderate impact on the ecology of the area before mitigation, and all impacts are mitigable to some degree.

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1 INTRODUCTION

Hudson Ecology (Pty) Ltd was commissioned by Environamics cc to conduct an ecological assessment of ecosystems associated with the proposed Grootpoort photovoltaic (PV) solar energy facility.

Pele Green Energy (Pty) Ltd. is proposing to develop an 84MW photovoltaic (PV) solar energy near Luckhoff situated in the Letsemeng Local Municipality in the Free State Province. The project will be known as the proposed Grootpoort Photovoltaic Solar Energy Facility near Luckhof, Free State Province.

In order to obtain Environmental Authorisation for the proposed project, Pele Green Energy Pty Ltd 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 purpose of the proposed PV energy facility will be to evacuate the generated power into the Eskom Holdings SOC Ltd (Eskom) electricity grid. If successful, Grootpoort Solar Power Plant will be remunerated on a per kilowatt hour generated basis by Eskom in terms of a 20 year Power Purchase Agreement. Grootpoort Solar Power Plant will be required to apply for a generation license from the National Energy Regulator of South Africa (NERSA). Depending on the economic conditions following the lapse of this period, the facility can either be decommissioned or the power purchase agreement may be renegotiated and extended.

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;

(I) 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	South AfricanStatus

	conditions	
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 their survival.	Party to
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 description of the receiving ecological environment, which may be impacted upon by the proposed project, and identify possible impacts associated with the ecology of the study area and surrounds, as well as mitigation measures for the impacts identified

The objectives in this study can be summarised as follows:

- To give a description of the location of the proposed development;
- To give an outline of the policy and legislative context applicable to the proposed development;
- To give a description of the methodologies employed during the study;
- To give a decription and characterisation of the receiving ecological environment;
- To identify potential impacts identified during the study and provide likely significance of said impacts, and
- Propose mitigation measures for identified impacts.

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 a baseline ecological study (conducted from the 30th of November to the 3rd of December 2015); and
- Compilation of a report comprising of the information described in the aims and objectives section above.

5 STUDY AREA

The proposed development area (study area) covers approximately 225ha on portion 1 of the Farm Grootpoort 168. The study area is situated approximately 15km south-east of the town of Luckhoff, which occurs in the Letsemeng Local Municipality in the Free State Province. The study area is loacted along a minor road, in a west-north-west bearing from the R48 that connects Luckhof and the the R369. (Figure 1). The site falls within the 2429DC quarter degree grid square. No alternative site is currently being considered for the proposed photovoltaic solar energy facility.

Figure 1: Locality of the study area

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

Seven study sites were randomly selected within the regional 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.

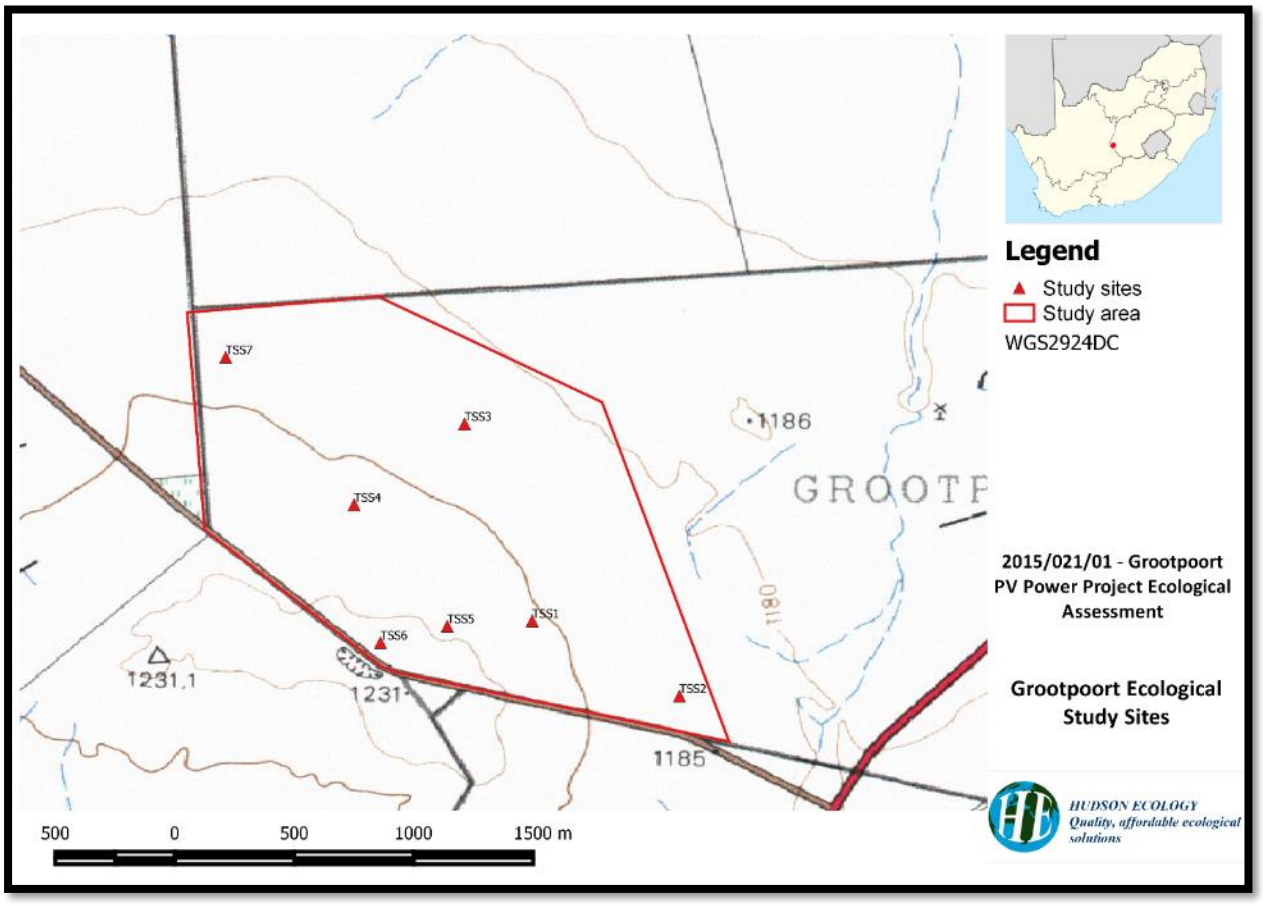

Figure 2: Terrestrial ecology study sites (TSS)

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 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 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.

6.2.4.2 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.

6.2.4.3 Aves

Avifauna were surveyed by means of transects and point counts (Bibby, et al., 1993) and visual identification and the calls of bird species were used to identify species. Wherever possible, visual identification was used to confirm call identifications. Bird ranges were confirmed using Harrison *et al* (1997). Other guides were also utilised (Hockey, et al., 2005) (BirdLife International, 2000) (Sinclair & Ryan, 2003)

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).

6.2.6 Impact Assessment

Direct, indirect and cumulative impacts of the issues identified through the scoping study, as well as all other issues identified in the EIA phase were assessed in terms of the following criteria:

- The nature, which includes a description of what causes the effect, what will be affected and how it will be affected.
- The extent, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 was assigned as appropriate (with 1 being low and 5 being high):
- The duration, wherein it was indicated whether:
  - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
  - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
  - medium-term (5–15 years) – assigned a score of 3;
  - long term (> 15 years) - assigned a score of 4; or
  - permanent - assigned a score of 5;
- The magnitude, quantified on a scale from 0-10, where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The probability *of occurrence*, which describes the likelihood of the impact actually occurring. Probability was estimated on a scale of 1–5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).
- the significance, was determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
- the status, which was described as either positive, negative or neutral.
- the degree to which the impact can be reversed.
- the degree to which the impact may cause irreplaceable loss of resources.
- the degree to which the impact can be mitigated.

The significance was calculated by combining the criteria in the following formula:

S=(E+D+M)P

Where:

S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

The significance weightings for each potential impact are as follows:

- < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

7 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;
- Avifauna surveys were not conducted and will be conducted in a separate study as per the Department of Environmental Affairs guidelines of 2014;
- 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;
- The avifaunal assessment is excluded from this study and will be undertaken by a separate specialist.
- 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; and
- Due to budget and subsequent time constraints, the results of this study are based on a literature review and a single wet season field survey, conducted in late November and early December 2015.

8 RESULTS

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

8.1 Physical Setting

8.1.1 Topography

The study area is located mostly on flat plains, located within a lattice of secondary, tertiary and quartanary drainage lines of the Orange/Senqu River system. The study area slopes at at an average of 0.4- 3.5:100 from the south-west to the north east (Figure 3). The high point of the site is on an elevated area to the south of the study area and reaces an altitude of 1230masl while the lowest point of the site is situated to the north at an elevation of 1179masl.

A number of washes (drainage lines) flow off the study area to the north and empty into the drainage lattice associated with the Orange/Senqu River system. (Figure 3).

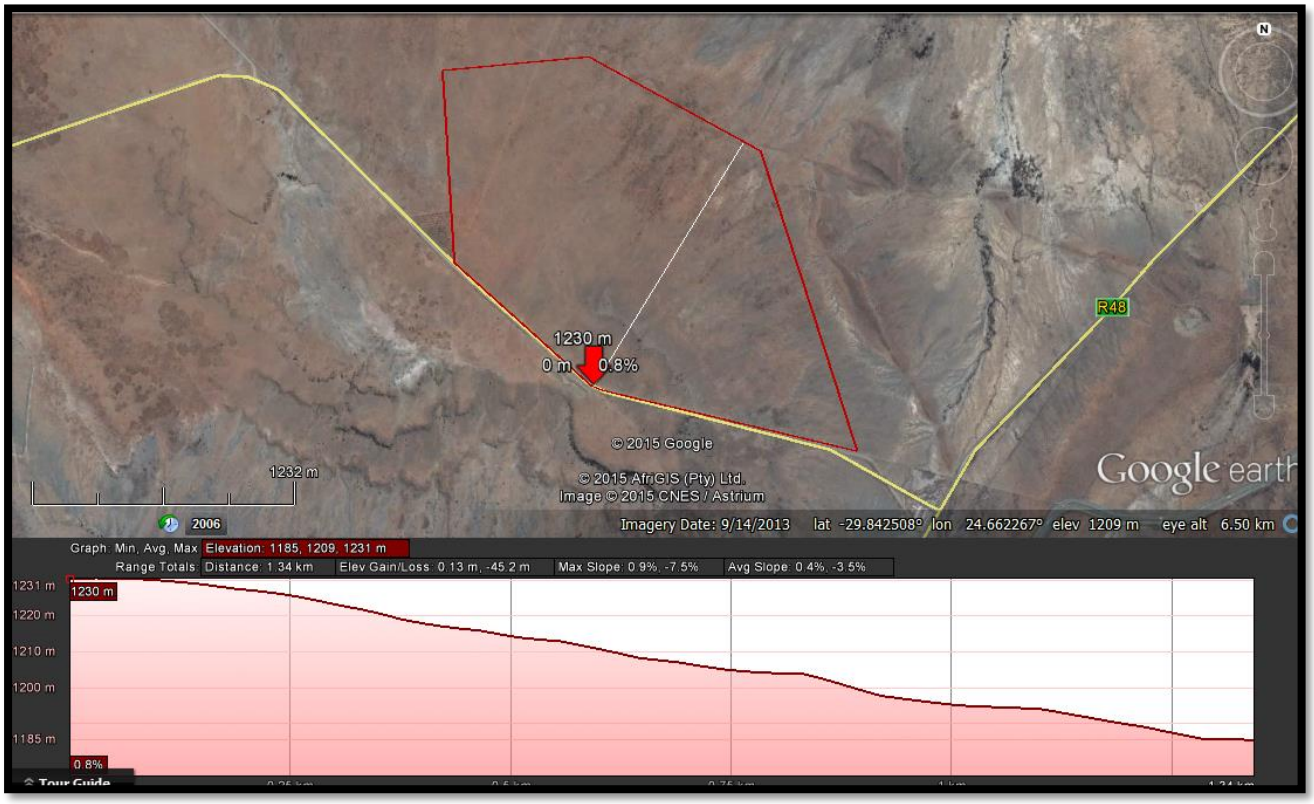

Figure 3: Gradient of the study area (reproduced from Google Earth)

8.1.2 Geology & Soils

The soils in this area area area primarily primitive, skeletal soils in rocky areas developing over sedimentary rocks such as mudstones and arenites of the Adelaide Subgroup of the Karoo Supergroup and to a lesser extent also the Ecca Group (Waterford and Volksrust Formations) as well as Jurassic dolerite sills and dykes and subsummit positions of mesas and butts with dolerite boulder slopes. Almost entirely Ib land type (Mucina & Rutherford, 2006). On site it was found that in areas where drainage lines run off the slope, shale and mudstones of the Adelaide Subgroup are exposed leading to the development of vegetation subcommunities. This varies slightly from the general geology of the vegetation type which area shales of the Volksrust Formation and to a lesser extent the Prince Albert Formation (both of the Ecca Group) as well as Dwyka Group diamictites form the underlying geology. Jurassic Karoo Dolerite sills and sheets support this vegetation complex in places. Wide stretches of land are covered by superficial deposits including calcretes of the Kalahari Group. Soils are variable from shallow to deep, red-yellow, apedal, freely drained soils to very shallow Glenrosa and Mispah forms. Mainly Ae, Ag and Fc land types.

8.1.3 Climate

In the western part of its area this unit experiences the same climate as the Western Upper Karoo. In the eastern part the climate is very close to that of Karoo Escarpment. The MAP ranges from about 150 mm in the northwest to 350 mm along some grassland margins on the Great Escarpment and in the east. Water concentrates between rocks as a result of rainfall runoff. Incidence of frost is relatively high, but ranging widely from <30 days per year at lower altitudes to >80 days at highest altitudes (Mucina & Rutherford, 2006).

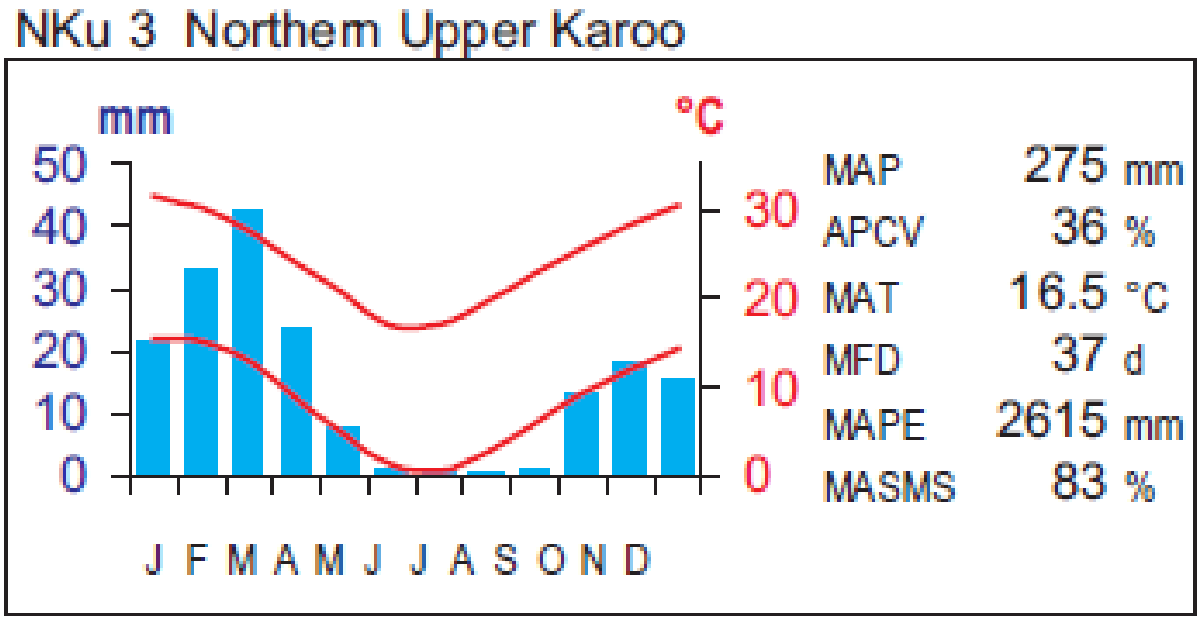

Figure 4: Climate of the Northern Upper Karoo (Reproduced from Mucina & Rutherford, 2006)

8.1.4 Biome and Vegetation Types

The study area falls within the Karoo Biome (Rutherford & Westfall 1986). The most recent and detailed description of the vegetation of this region is part of a national map (Mucina & Rutherford, 2006). This map shows two vegetation types occurring in the area. The vegetation type occurring in the study area is the Northern Upper Karoo vegetation type (Figure 5).

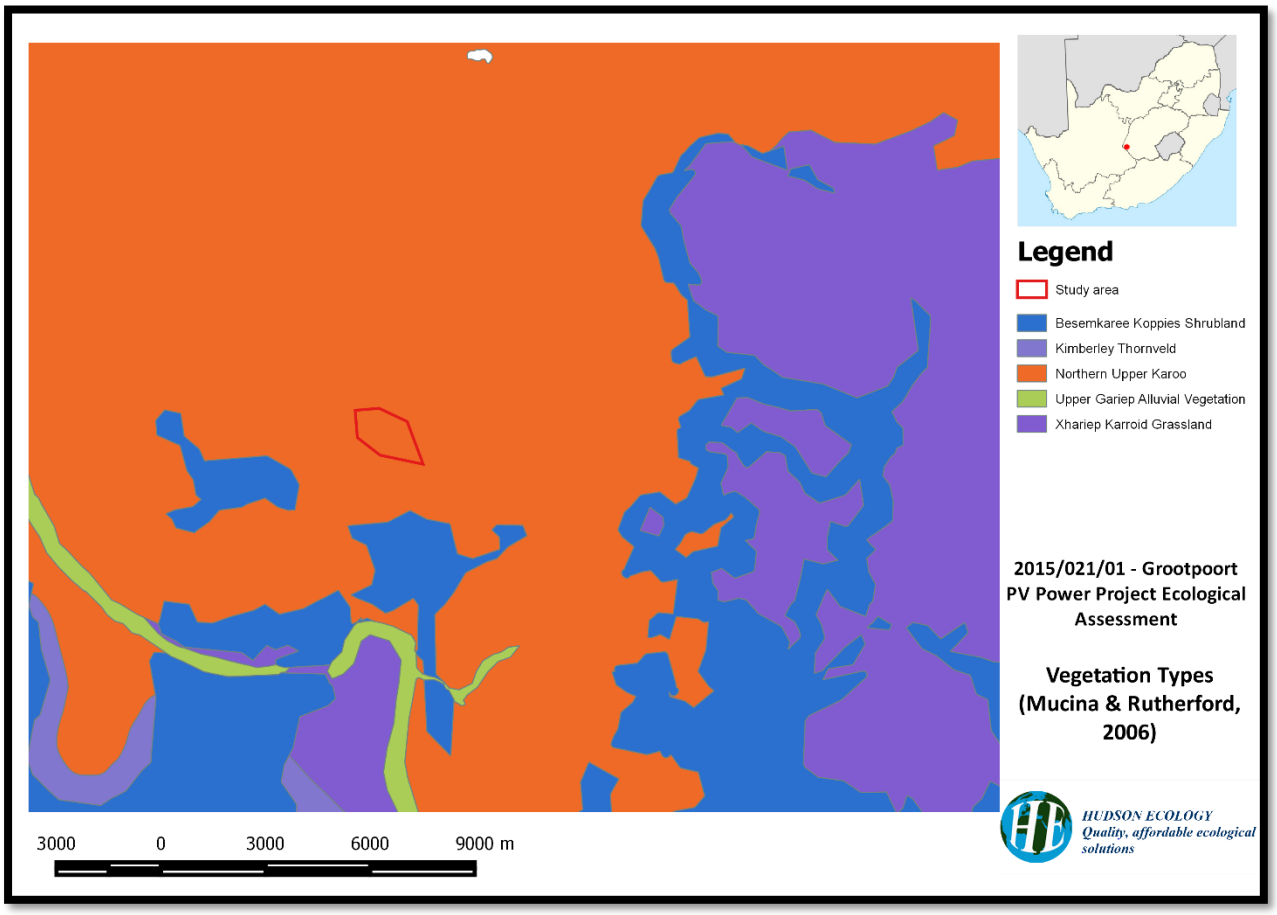

Figure 5: Vegetation types occurring in the study area (Mucina and Rutherford, 2006)

8.1.4.1 NKu 3 Northern Upper Karoo

VT 35 False Arid Karoo (35%), VT 36 False Upper Karoo (27%) (Acocks 1953). LR 50 Upper Nama Karoo (44%), LR 52 Eastern Mixed Nama Karoo (24%) (Low & Rebelo 1996).

Distribution

This vegetation type occurs in patches in the northern Cape and Free State Provinces: Northern regions of the Upper Karoo plateau from Prieska, Vosburg and Carnarvon in the west to Philipstown, Petrusville and Petrusburg in the east. Bordered in the north by Niekerkshoop, Douglas and Petrusburg and in the south by Carnarvon, Pampoenpoort and De Aar. A few patches occur in Griqualand West. Altitude varies mostly from 1 000–1 500 m. (Mucina & Rutherford, 2006).

Vegetation & Landscape Features

This vegetation type is typically characterised by shrubland dominated by dwarf karoo shrubs, grasses and *Acacia mellifera* subsp. *detinens* and some other low trees (especially on sandy soils in the northern parts and vicinity of the Orange River). Flat to gently sloping, with isolated hills of Upper Karoo Hardeveld in the south and Vaalbos Rocky Shrubland in the northeast and with many interspersed pans. (Mucina & Rutherford, 2006).

Important Taxa

Graminoids:

Aristida adscensionis (d), *A. congesta* (d), *A. diffusa* (d), *Enneapogon desvauxii* (d), *Eragrostis lehmanniana* (d), *E. obtusa* (d), *E. truncata* (d), *Sporobolus fimbriatus* (d), *Stipagrostis obtusa* (d), *Eragrostis bicolor, E. porosa, Fingerhuthia*

africana, Heteropogon contortus, Stipagrostis ciliata, Themeda triandra, Tragus berteronianus, T. koelerioides and *T. racemosus* (Mucina & Rutherford, 2006).

Small Trees:

Acacia mellifera subsp. *detinens*, *Boscia albitrunca* (Mucina & Rutherford, 2006).

Tall Shrubs:

Lycium cinereum (d), *L. horridum, L. oxycarpum, L. schizocalyx, Rhigozum trichotomum* (Mucina & Rutherford, 2006).

Low Shrubs:

Chrysocoma ciliata (d), Gnidia polycephala (d), Pentzia calcarea (d), P. globosa (d), P. incana (d), *P. spinescens* (d), *Rosenia humilis* (d), *Amphiglossa triflora, Aptosimum marlothii, A. spinescens, Asparagus glaucus, Barleria rigida, Berkheya annectens, Eriocephalus ericoides subsp. ericoides, E. glandulosus, E. spinescens, Euryops asparagoides, Felicia muricata, Helichrysum lucilioides, Hermannia spinosa, Leucas capensis, Limeum aethiopicum, Melolobium candicans, Microloma armatum, Osteospermum leptolobum, O. spinescens, Pegolettia retrofracta, Pentzia lanata, Phyllanthus maderaspatensis, Plinthus karooicus, Pteronia glauca, P. sordida, Selago geniculata, S. saxatilis, Tetragonia arbuscular* and *Zygophyllum lichtensteinianum* (Mucina & Rutherford, 2006).

Succulent Shrubs:

Hertia pallens, Salsola calluna, S. glabrescens, S. rabieana, S. tuberculata, Zygophyllum flexuosum (Mucina & Rutherford, 2006).

Herbs:

Chamaesyce inaequilatera, Convolvulus sagittatus, Dicoma capensis, Gazania krebsiana, Hermannia comosa, Indigofera alternans, Lessertia pauciflora, Radyera urens, Sesamum capense, Sutera pinnatifida, Tribulus terrestris and *Vahlia capensis* (Mucina & Rutherford, 2006).

Succulent Herb:

Psilocaulon coriarium (Mucina & Rutherford, 2006)

Geophytic Herb:

Moraea pallida (Mucina & Rutherford, 2006).

Biogeographically Important Taxa:

Herb (western distribution limit): *Convolvulus boedeckerianus*. Tall Shrub (southern limit of distribution): *Gymnosporia szyszylowiczii* subsp. *namibiensis* (Mucina & Rutherford, 2006).

Endemic Taxa:

Succulent Shrubs: *Lithops hookeri, Stomatium pluridens.* Low Shrubs: *Atriplex spongiosa, Galenia exigua.* Herb: *Manulea deserticola*. (Mucina & Rutherford, 2006)

Conservation

The Northern Upper Karoo is classified as Least threatened with a target conservation of 21%. None of this vegetation type is currently conserved in statutory conservation areas and about 4% has been cleared for cultivation (the highest proportion of any type in the Nama-Karoo) or irreversibly transformed by building of dams (Houwater, Kalkfontein and Smart Syndicate Dams). Areas of human settlements are increasing in the northeastern part of this vegetation type (Mucina & Rutherford, 2006). Erosion is moderate (46.2%), very low (32%) and low (20%). *Prosopis glandulosa*, regarded as one of the 12 agriculturally most important invasive alien plants in South Africa, is widely distributed in this vegetation type (Mucina & Rutherford, 2006). Prosopis occurs in generally isolated patches, with densities ranging from very scattered to medium (associated with the lower Vaal River drainage system and the confluence with the Orange River) to localised closed woodland on the western border of the unit with Bushmanland Basin Shrubland. (Mucina & Rutherford, 2006).

8.2 Flora Assessment

8.2.1 Vegetation Communities

Flora assessments were conducted during the wet season (November - December 2015) although, due to the drought, very dry conditions persisted during the study. The vegetation communities are decribed in this report, and named according to features such as dominant species, vegetation physiognomy and underlying substrate. Naming of the vegetation communities was made difficult due to the poor vegetation cover, during the dry season, and inability to identify dominant species with any confidence. Based on species composition, physiognomy, moisture regime, rockiness, slope and soil properties, four main communities were recognised. It must be noted that these vegetation communities may be regarded as subcommunities in some instances (as many of the dominant species are dominant throughout the study area), but due to the homogeneity of the karroid vegetation it was decided, for the purposes of this study, to describe them as separate vegetation communities. Based on the nomenclature system described above the vegetation species are:

- *Chrysocoma – Aristida* plains dwarf shrubland;
- *Acacia – Chrysocoma* Plains Shrubland;
- *Acacia – Aristida* Wash Shrubland; and
- *Lycium – Crysocoma* Hillside Shrubland.

These vegetation communities are shown in Figure 6 and the cover of each vegetation community is given in Table 2.

The total area of the study area was calculated to be 223ha. Table 2 gives the relative areas of each of the vegetation communities to the study area.

Table 2: Areas of vegetation communities at the Grootpoort study area

Vegetation Community	Area in ha	% of total study area
Chrysocoma – Aristida plains dwarf shrubland	131	59%
Acacia – Chrysocoma Plains Shrubland	56	25%
Acacia – Aristida Wash Shrubland	19	9%
Lycium – Crysocoma Hillside Shrubland	17	8%
Total	**223**	**100%**

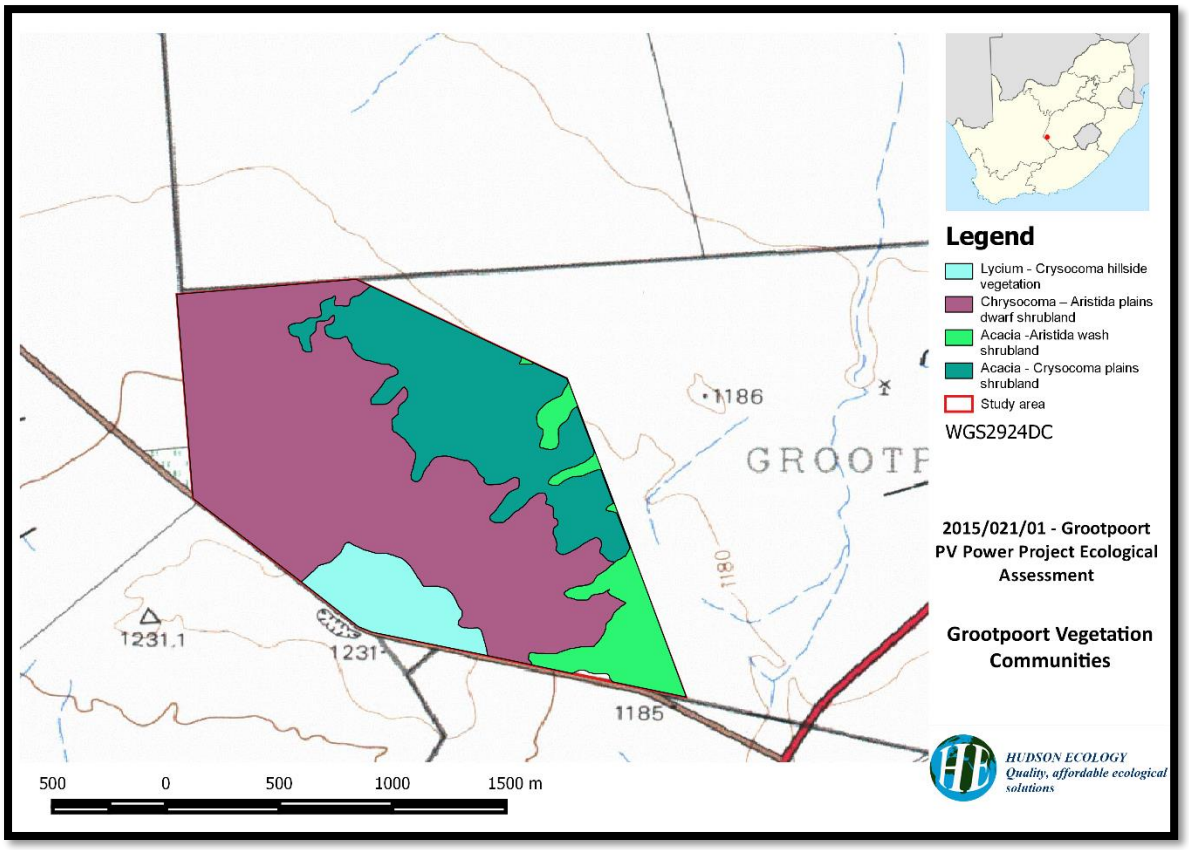

Figure 6: Grootpoort study area showing vegetation communities

A list of plant species known to occur in the region are given in APPENDIX.

8.2.1.1 Chrysocoma – Aristida plains dwarf shrubland

Chrysocoma – *Aristida* plains dwarf shrubland is the largest vegetation community on site covering approximately 131ha of the study area. This vegetation community is typical of vegetation communities in this vegetation type, dominated by karroid shrubs such as *Chrysocoma ciliata*, *Lycium* spp. and *Pentzia* spp. This vegetation community also hosts a relatively well defined grass layer dominated by *Aristida* spp. *Eragrostis* spp. and *Tragus* spp. (Table 3). In areas where the soil has been eroded, exposing the shale substrate the grass layer is greatly reduced or absent. Few trees occur in this vegetation community although *Acacia karoo* and *Searsia burchellii* dot the landscape. This vegetation community has historically been overgrazed, but shows only a low level of disturbance due to overgrazing.

Table 3: Plant species recorded in the Chrysocoma - Aristida plains dwarf shrubland vegetation community

Trees	Tall shrubs	Shrubs	Graminoids	Herbs
Searsia burchellii	*Rhigozum trichotomum*	*Asparagus capensis*	*Aristida adscensionis*	*Aptosimum elongatum*
Acacia karroo		*Chrysocoma ciliata*	*Aristida diffusa*	*Dicoma capensis*
		Lycium cinerium	*Cenchrus ciliaris,*	*Indigofera alternans*
		Lycium prunus-spinosa	*Enneapogon desvauxii*	*Berkheya annectens*

		Pentzia globose	*Eragrostis lehmanniana*	
		Pentzia incana	*Eragrostis obtusa*	
		Pentzia lanata	*Sporobolus iocladus*	
		Pentzia spinescens	*Stipagrostis obtusa*	
		Plinthus karooicus	*Tragus koeleroides*	
		Pteronia glomerata	*Tragus racemosus*	
		Pteronia sordida,		
		Rosenia oppositifolia		
		Salsola glabrescens		
		Salsola tuberculata		
		Selago saxatilis		

Sensitivity aspects

- This vegetation community has been mildly disturbed due to historical overgrazing;
- Vegetation in the Karoo biome is not easily rehabilitated due to the slow rate of growth of plants and the low rainfall in this region;
- Low - moderate species diversity;
- Floristic status of this variation is low - moderate;
- Suitability of the habitat for flora and fauna species of concern is low - moderate;
- Ecological integrity of this community is moderate; and
- The Conservation importance of this community is moderate.

8.2.1.2 Acacia – Chrysocoma Plains Shrubland

Acacia - Chrysocoma plains dwarf shrubland is the second largest vegetation community on site covering approximately 56ha to the northern part of the study area. This vegetation community is less typical of vegetation communities in this vegetation type, although it can be seen as a woody subcommununity of the *Chrysocoma – Aristida* plains dwarf shrubland vegetation community. Although dominated by karroid shrubs and grasses such as *Chrysocoma ciliata*, *Lycium* spp. *Pentzia* spp. *Aristida* spp. *Eragrostis* spp. and *Tragus* spp. this vegetation community also hosts a relatively well defined tree layer dominated by *Acacia karroo* growing along the wash drainage lines to the north (Table 4). In this vegetation community deposition of soil also occurs creating a more suitable substrate for grass species. This vegetation community has historically been overgrazed, but shows only a low level of disturbance due to overgrazing.

Table 4: Plant species recorded in the Acacia - Chrysocoma plains shrubland vegetation community

Trees	Tall shrubs	Shrubs	Graminoids	Herbs
Searsia burchellii	*Rhigozum trichotomum*	*Asparagus capensis*	*Aristida diffusa*	*Dicoma capensis*
Acacia karroo		*Chrysocoma ciliata*	*Cenchrus ciliaris,*	*Indigofera alternans*

		Lycium cinerium	*Enneapogon desvauxii*	*Trichogyne paronychioides*
		Pentzia globosa	*Eragrostis lehmanniana*	*Berkheya annectens*
		Pentzia incana	*Eragrostis obtusa*	
		Pentzia lanata	*Fingerhuthia africana*	
		Plinthus karooicus	*Sporobolus fimbriatus*	
		Pteronia glomerata	*Stipagrostis obtusa*	
		Rosenia oppositifolia	*Tragus koeleroides*	
		Selago saxatilis		

Sensitivity aspects

- This vegetation community has been mildly disturbed due to historical overgrazing;
- Vegetation in the Karoo biome is not easily rehabilitated due to the slow rate of growth of plants and the low rainfall in this region;
- Low - moderate species diversity;
- Floristic status of this variation is low - moderate;
- Suitability of the habitat for flora and fauna species of concern is low - moderate;
- Ecological integrity of this community is moderate; and
- The Conservation importance of this community is moderate.

8.2.1.3 Acacia – Aristida Wash Shrubland

Acacia – Aristida Wash Shrubland occurs to the eastern corner of the study area, this area is characterised by a sandy substrate formed by the deposition of silt carried down by runoff to the drainage lines draining to the Orange/Senqu River system. This silt deposition is further increased by the construction of roads in the area causing impoundments of the drainage lines. This vegetation community further grades into a man-made ephemeral wetland outside of the study area. Once again this vegetation community is less typical of vegetation communities in this vegetation type, increased grass growth and fewer shrub species has led to this area being denuded in some areas and colonised by the succulent shrub Euphorbia mauritanica, which dominated this vegetation community. Some karroid shrubs and grasses such as *Chrysocoma ciliata*, *Lycium* spp. *Pentzia* spp. do occur in this vegetation community, but are greatly reduced in abundance. Grass species especially *Aristida* spp. also occur in this area and, although more abundant than the karroid shrubs, are very sparse. The drainage lines in this vegetation community lined by a tree layer dominated by *Acacia karroo* growing along the edges of the wash drainage lines (Table 5). This vegetation community has historically been overgrazed, but shows only a low level of disturbance due to overgrazing. Because this vegetation community is so closely related

Table 5: Plant species recorded in the Acacia - Aristida wash shrubland vegetation community

Trees	Shrubs	Graminoids	Herbs
Acacia karroo	*Chrysocoma ciliata*	*Aristida adscensionis*	*Convolvulus sagittatus*
Ziziphus mucronata	*Pteronia glomerata*	*Aristida diffusa*	*Indigofera alternans*
	Pentzia globosa	*Cenchrus ciliaris,*	*Lessertia frutescens*
	Selago saxatilis	*Eragrostis lehmanniana*	*Berkheya annectens*
	Rhigozum trichotomum	*Fingerhuthia africana*	
	Euphorbia mauritanica	*Sporobolus fimbriatus*	
		Tragus koeleroides	

Sensitivity aspects

- This vegetation community has been mildly disturbed due to historical overgrazing and impoundment;
- Vegetation in the Karoo biome is not easily rehabilitated due to the slow rate of growth of plants and the low rainfall in this region;
- Due to legislature governing water bodies, drainage lines on site are classified as sensitive. From a sensitivity point of view, the main drainage lines are more sensitive and therefore important to protect than the very ephemeral ones;
- Low species diversity;
- Floristic status of this variation is low;
- Suitability of the habitat for flora and fauna species of concern is low;
- Ecological integrity of this community is high; and
- The Conservation importance of this community is high, due to the associated drainage lines.

8.2.1.4 Lycium – Crysocoma Hillside Shrubland

The *Lycium – Chrysocoma* Hillside Shrubland closely resembles the *Chrysocoma – Aristida* plains dwarf shrubland with a few important variations caused by the less sandy, rocky substrate occurring on the hillside and top of the hill. The grass cover in this vegetation community is greatly reduced due to less sand substrate and tree species are increase. This vegetation community is also typical of vegetation communities in this vegetation type, dominated by karroid shrubs such as *Chrysocoma ciliata*, *Lycium* spp. and *Pentzia* spp. Although this vegetation community hosts a poorly defined grass layer dominated by *Aristida* spp. and *Tragus* spp. (Table 3), tree species diversity is increased with *Ziziphus mucronata*, *Acacia* spp. and *Searsia* spp. all occurring in this vegetation community. This community also hosted the invasive exotic species *Opuntia ficus-indic*a. This vegetation community has historically been overgrazed, but shows only a low level of disturbance due to overgrazing.

Table 6: Plant species recorded in the Lycium – Crysocoma Hillside Shrubland vegetation community

Trees	Tall shrubs	Shrubs	Graminoids	Herbs
Searsia lancea	*Lycium cinereum*	*Chrysocoma ciliata*	*Aristida adscensionis*	*Aptosimum elongatum*
Searsia erosa	*Lycium horridum*	*Pentzia globosa*	*Eragrostis lehmanniana*	*Convolvulus sagittatus*

Searsia burchellii	*Lycium schizocalyx*	*Pentzia lanata*	*Fingerhuthia africana*	*Trichogyne paronychioides*
Acacia tortillis	*Rhigozum trichotomum*	*Pentzia spinescens*	*Stipagrostis obtusa*	*Berkheya annectens*
Acacia karroo		*Pteronia sordida,*	*Aristida diffusa*	
Ziziphus mucronata		*Salsola glabrescens*	*Kohautia cynanchica*	
		Pteronia glomerata	*Lessertia frutescens*	
		Rosenia oppositifolia	*Leysera tenella*	
		Nenax microphylla	*Sporobolus iocladus*	
		Asparagus capensis	*Tragus koeleroides*	
		Asparagus mucronatus		
		Pentzia incana		
		Selago saxatilis		

Sensitivity aspects

- This vegetation community has been mildly disturbed;
- Vegetation in the Karoo biome is not easily rehabilitated due to the slow rate of growth of plants and the low rainfall in this region;
- Moderate species diversity;
- Floristic status of this variation is moderate;
- Suitability of the habitat for flora and fauna species of concern is low;
- Ecological integrity of this community is low; and
- The Conservation importance of this community is high, due to the increased diversity in this vegetation community.

8.2.2 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 44 species were determined to possibly be occurring in the study area.

Details of the possibly occurring species of concern area given in Table 7. It is unlikely that any of these species occur on site but due to the very dry conditions occurring due to the drought this could not be confirmed, particularly with emergent species. It is suggested that the environmental control officer on site monitors ground clearing for any of these species.

Table 7: Red Data floral species possibly occurring in the area

Species	Status	Resident at study area
Kniphofia ensifolia subsp. ***autumnalis***	Endangered	**No**
Alepidea amatymbica	Vulnerable	**No**
Dioscorea sylvatica	Vulnerable	**No**
Protea subvestita	Vulnerable	**No**
Prunus africana	Vulnerable	**No**
Anemone fanninii	Near Threatened	**No**
Argyrolobium campicola	Near Threatened	**No**
Curtisia dentata	Near Threatened	**No**
Eucomis bicolor	Near Threatened	**No**
Gladiolus robertsoniae	Near Threatened	**No**
Hoodia officinalis subsp. officinalis	Near Threatened	**No**
Isoetes transvaalensis	Near Threatened	**No**
Kniphofia typhoides	Near Threatened	**No**
Lithops leslei subsp. leslei	Near Threatened	**No**
Sporobolus oxyphyllus	Near Threatened	**No**
Trachyandra erythrorrhiza	Near Threatened	**No**
Brachystelma dimorphum susbp. gratum	Rare	**No**
Calpurnia reflexa	Rare	**No**
Helichrysum haygarthii	Rare	**No**
Lotononis amajubica	Rare	**No**
Schizoglossum montanum	Rare	**No**
Searsia dracomontana	Rare	**No**
Selago longicalyx	Rare	**No**
Stipagrostis proxima	Rare	**No**
Acacia erioloba	Declining	**No**

Boophone disticha	Declining	**No**
Crinum bulbispermum	Declining	**No**
Crinum macowanii	Declining	**No**
Drimia altissima	Declining	**No**
Eucomis autumnalis	Declining	**No**
Gunnera perpensa	Declining	**No**
Hypoxis hemerocallidea	Declining	**No**
Ilex mitis	Declining	**No**
Pelargonium sidoides	Declining	**No**
Rapanea melanophloeos	Declining	**No**
Hoodia gordonii	Data Deficient	**No**
Lepidium mossii	Data Deficient	**No**
Manulea deserticola	Data Deficient	**No**
Manulea flanaganii	Data Deficient	**No**
Phyllobolus rabiei	Data Deficient	**No**
Acacia erioloba	Protected	**No**
Boscia albitrunca	Protected	**No**

8.3 Fauna Assessment

The faunal assessment was conducted in the wet season during November/December 2015.

8.3.1 Recorded Faunal Species

8.3.1.1 Arthropoda

A number of common and widespread arthropods were recorded during the site visit (Table 8). None of the species recorded are considered restricted in occurrence or population size and none are listed as Red Data species or protected species. Were this study to be repeated during more favourable weather conditions the number of species recorded are likely to be substantially more.

Table 8: Arthropod species recorded during the study

Order	Family	Species Name
Lepidoptera	NYMPHALIDAE	*Vanessa cardui*
		Danaus chrysippus aegyptius
		Acraea eponina eponina
		Junonia hierta cebrene
	PIERIDAE	*Mylothris rueppellii haemus*

		Eurema brigitta
Coleoptera	COCCINELLIDAE	*Henosepilachna bifasciata*
Thysanura	LEPISMATIDAE	1 species
Odonata	PROTONEURIDAE	1 species
	LIBELLULIDAE	1 species
Blattodea	BLATTIDAE	*Periplaneta americana*
Isoptera	TERMITIDAE	*Trinervitermes* sp.
Orthoptera	GRYLLIDAE	1 species
	ACRIDIDAE	1 species
Phasmatodea	BACILLIDAE	1 species
Diptera	MUSCIDAE	*Musca domestica*
Hymenoptera	VESPIDAE	*Belonogaster dubia*
	APIDAE	*Apis mellifera*
	ANTHOPHORIDAE	*Amegilla caelestina*
	FORMICIDAE	*Pachycondyla tarsata*
		Dorylus helvolus

8.3.1.2 Herpetofauna

Reptile diversity in the area is high with approximately 47 reptile species (APPENDIX B) occurring in the area and reptile endemism is especially high in the region with 21 species (42%) being endemic. Twelve species were confirmed during the site visit (**Table *9***). The number of species would certainly have been higher if the survey had been conducted during the summer months after good rains. The three Red Data reptiles which may occur on the study site are discussed below. No exotic herpetofauna species were found or are expected to occur on the study site.

Table 9: Reptile species recorded during surveys

ORDER	SUBORDER	FAMILY	SUBFAMILY	*GENUS + SPECIES*	COMMON NAME	ENDEMIC
Chelonii		Testudinae		*Psamobates tentorius*	Karoo Tent Tortoise	E
Squamata	Serpentes (Ophidia)	Colubridae	Boadontinae	*Lamprophis fuliginosus*	Brown House Snake	
			Psammophinae	*Psammophis notostictus*	Karoo Whip Snake	
			Atractaspidinae	*Dasypeltis scabra*	Rhombic Egg Eater	
		Elapidae	Najinae	*Naja nivea*	Cape Cobra	E
			Najinae	*Bitis arietans*	Puff Adder	
	Sauria (Lacertillia)	Scincidae	Lygosomatiinae	*Trachylepis capensis*	Cape Skink	
				Mabuya variegata	Variegated Skink	
		Lacertidae		*Pedioplanis laticeps*	Cape Sand Lizard	E
				Pedioplanis lineoocellata	Spotted Sand Lizard	E

		Cordylidae	Cordylinae	*Cordylus polyzous*	Karoo Girdled Lizard	E
		Gekkonidae		*Pachydactylus capensis*	Cape Gecko	

Most of the expected species in the area Appendix B are common and widespread. Species of concern are discussed further in section 6.2.5.

8.3.1.3 Amphibia

The study area is a fair distance from any permanent open water bodies and therefore, as expected amphibian diversity is low. Only ten species are expected to occur in the study area (APPENDIX C), and during the study no amphibian species were recorded. Due to the dry condictions, distance from any open water bodies and distance from the Orange River, the lack of amphibian species in the study area was expected. The study site area falls just outside the natural range of giant bullfrogs, desert rain frog and the Karoo caco, and these species should not occur on the study site.

8.3.1.4 Mammalia

Of the 53 mammal species expected to occur in the study area, according to historic recordings (APPENDIX D), only 12 were confirmed during the site visit (Table 10). A number of factors 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 was conducted during a very dry period. Note: The gemsbok (Oryx gazella), although recorded were not included in the species list as these are introduced species.

Table 10: Mammal species recorded during the study

FAMILY	BIOLOGICAL NAME	COMMON NAME
MACROSCELIDIDAE (Sengis/Elephant Shrews)	*Elephantulus rupestris*	Western Rock Sengi
CERCOPITHECIDAE (Baboons and Monkeys)	*Cercopithecus pygerythrus*	Vervet Monkey
LEPORIDAE (Hares and Rabbits)	*Lepus saxatillis*	Scrub Hare
HYSTRICIDAE (Porcupine)	*Hystrix africaeaustralis*	Cape Porcupine
MURIDAE (Rats and Mice)	*Gerbillurus paeba*	Hairy-footed Gerbil
MURIDAE (Rats and Mice)	*Rhabdomys pumilio*	Four-striped Grass Mouse
MURIDAE (Rats and Mice)	*Mastomys natalensis*	Natal Multimammate Mouse
CARNIVORA: Canidae	*Otocyon megalotis*	Bat-eared Fox
MUSTELIDAE (Otters, Badger, Weasel and Polecat)	*Cynictis penicillata*	Yellow Mongoose
MUSTELIDAE (Otters, Badger, Weasel and Polecat)	*Suricata suricatta*	Suricate (Meerkat)
ORYCTEROPODIDAE	*Orycteropus afer*	Aardvark
BOVIDAE	*Sylvicapra grimmia*	Common Duiker

Mammals reliant on wetland and arboreal habitats were a priori omitted from the list of occurrences since these habitat-types are absent from the study site. As such a species richness of 53 species in an area with average habitat diversity and a low carrying capacity is high.

All 16 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 persecution all species are capable of maintaining their presences in remote areas such as the site and surrounding properties. The

nearby roads are obviously a main source of fatalities – several carcasses were recorded during transit to and from the study area.

8.3.2 Red Data Faunal Species

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

Species	Red list status	Likelihood of being resident at the site
Felis nigripes	Vulnerable	Unlikely
Mystromys albicaudatus	Endangered	Highly Unlikely
Amblysomus septentrionalis	Near Threatened	Highly Unlikely
Manis temminckii	Near Threatened	Highly Unlikely
Smaug giganteus)	Vulnerable	Highly Unlikely
Tetradactylus breyeri	Vulnerable	Highly Unlikely
Bradypodion dracomontanum	Near Threatened	Highly Unlikely
Chamaesaura aenea	Near Threatened	Highly Unlikely
Homoroselaps dorsalis	Near threatened	Unlikely
Pseudocordylus langi	Near Threatened	Highly Unlikely
Tropidosaura cottrelli	Near Threatened	Highly Unlikely
Lepidochrysops praeterita	Endangered	Highly Unlikely
Orachrysops mijburghi	Vulnerable	Highly Unlikely
Orachrysops montanus	Vulnerable	Highly Unlikely
Thestor protumnus terblanchei	Vulnerable	Highly Unlikely

Of the 15 species of concern that may occur in the study area, all have a low or very low probability of occurrence on site.

8.4 Ecological Integrity

The ecological function of the study area can generally be described as moderate for the majority of the study area, although this does vary from low (in the highly transformed areas due to overgrazing) to high in the more inaccessible or unutilisable areas. Areas in which overgrazing and clearing have taken place, as well as areas in which settlements have been established are considered as areas where ecological function is reduced. The

ecological function of the study area is indicated in

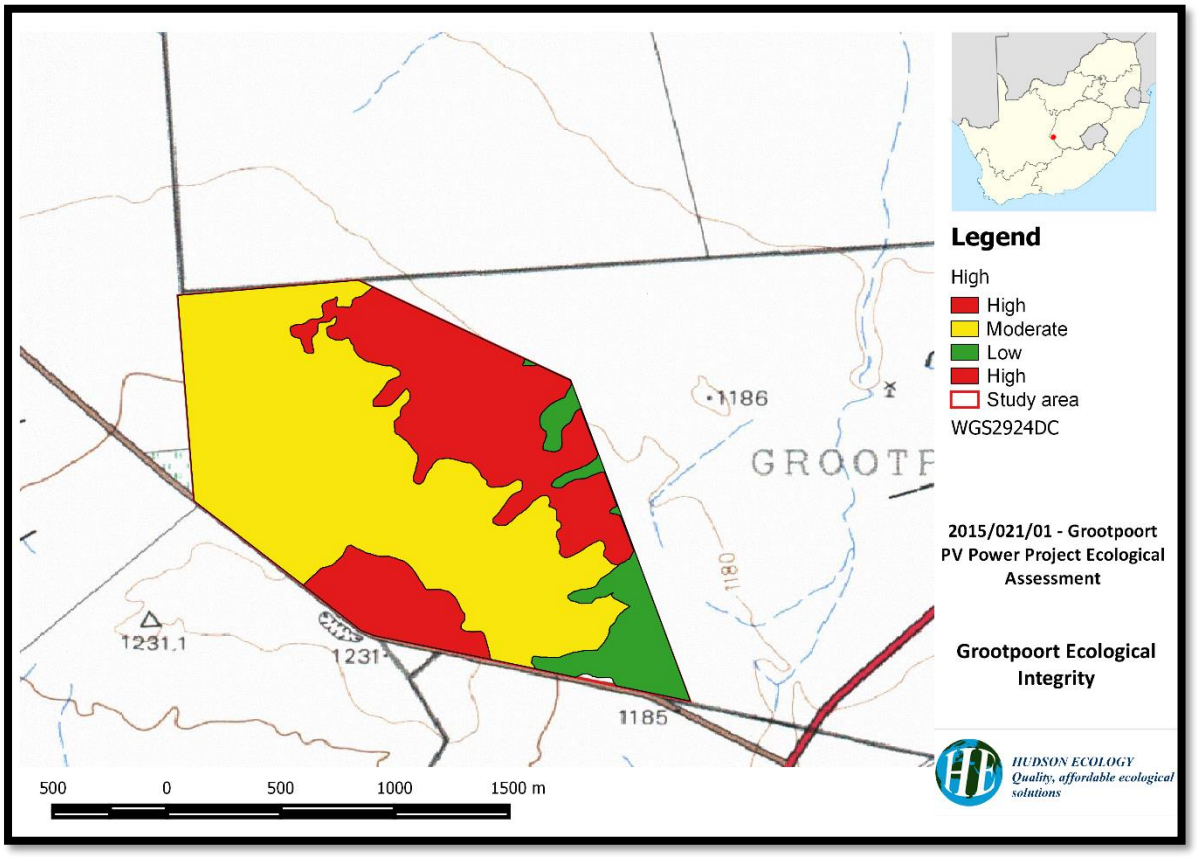

Figure 7.

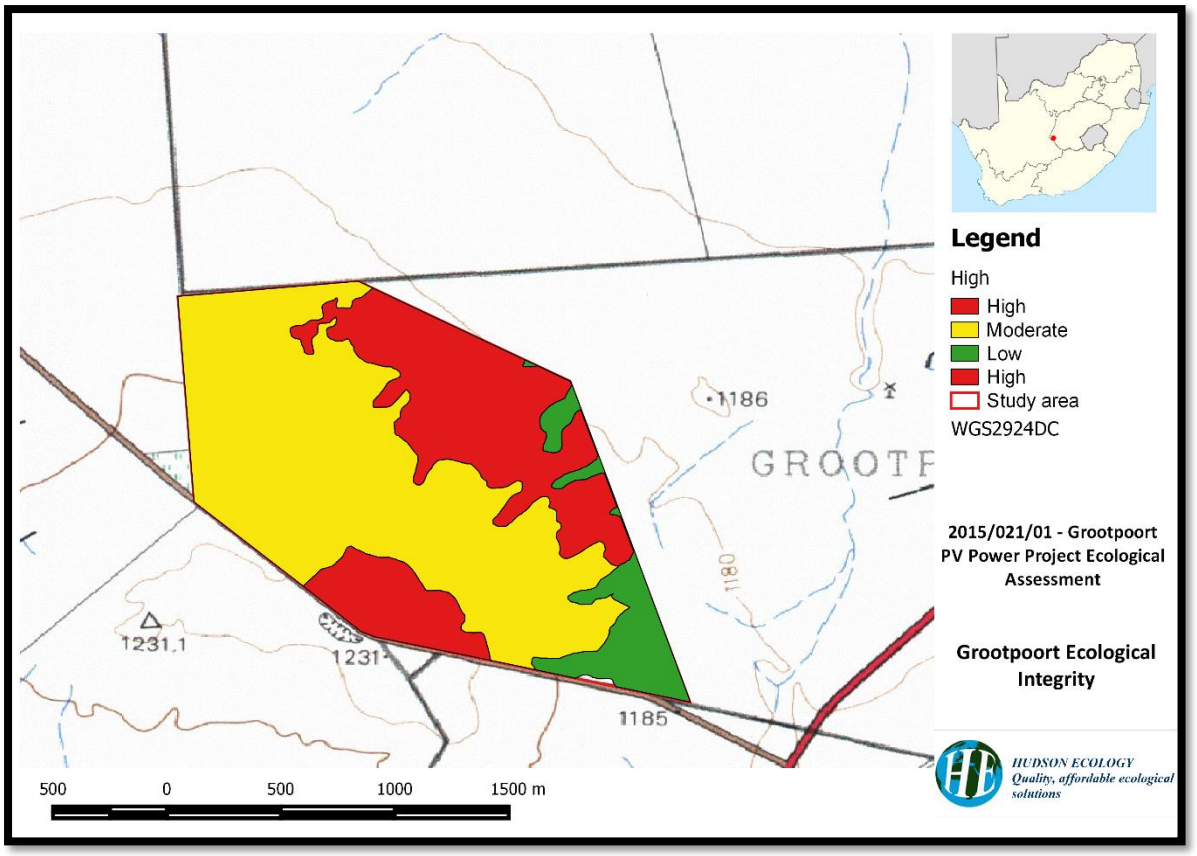

Figure 7: Ecological integrity within the study area

8.5 Conservation Importance

Areas that have been disturbed by farming are considered of moderate conservation importance due to the fact that rehabilitation of these areas is possible. The natural areas are considered of high conservation importance due to the presence of Red Data species in these areas and the intrinsic importance of these areas. In keeping with the Precautionary Principle (COMEST, 2005), we need to assume a higher conservation importance when in doubt.

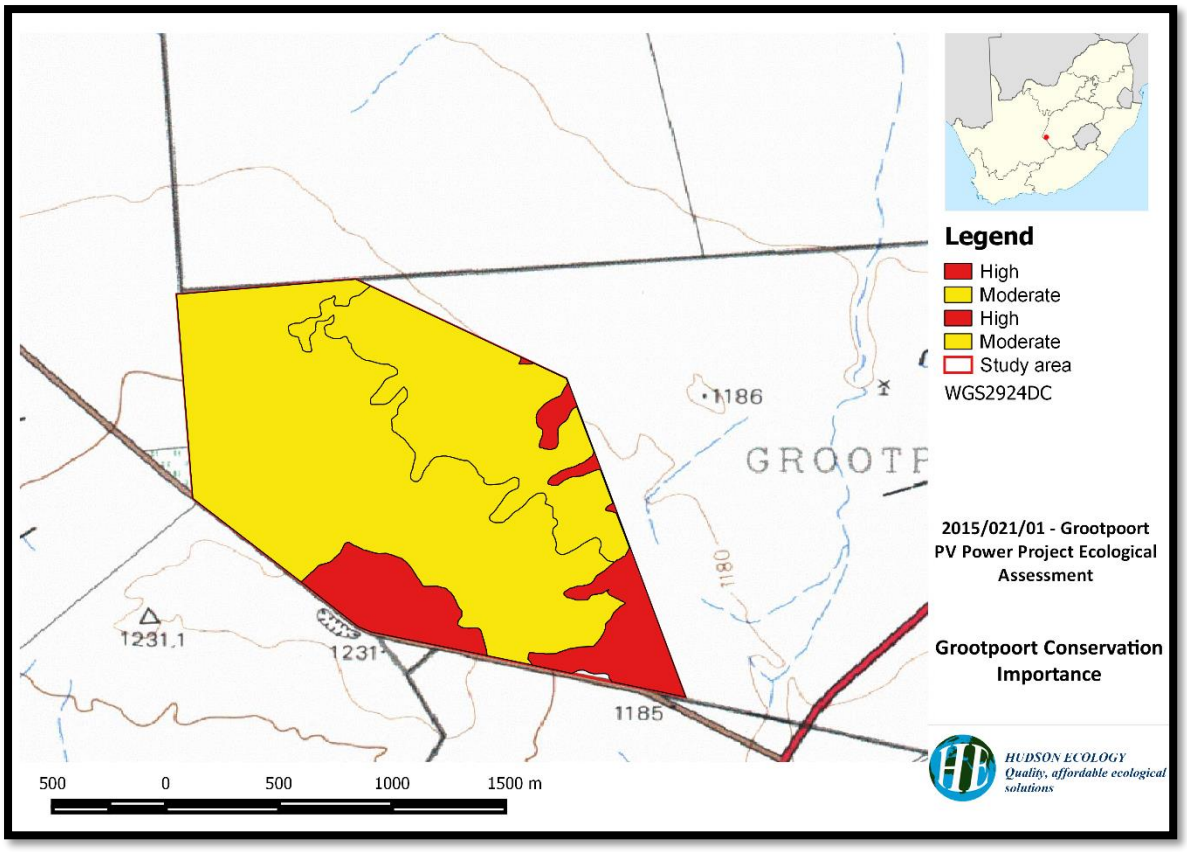

Figure 8: Conservation importance within the study area

9 IMPACT ASSESSMENT

9.1 Impact Assessment discussion

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 communities affected by the proposed mining activities. All vegetation communities are likely to be affected by this impact, with the vegetation community 4 area being the vegetation community with the most vegetation cleared.

Desktop Sensitivity Analysis of the Site:

Both ecological integrity and conservation importance of the areas that will be impacted by this impact are low to moderate, however species of concern may be impacted upon.

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Habitat loss through vegetation clearing	A large area of vegetation will be cleared for the construction of the heliostat field and power block.	Local	Areas of high conservation importance and/or ecological integrity should be avoided.

Mitigations: 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. Impacts and mitigations will be further refined after the wet season survey.

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.

Desktop Sensitivity Analysis of the Site:

Both ecological integrity and conservation importance of the areas that will be impacted by this impact are low to moderate, however species of may be impacted upon.

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Pollution by harmful or toxic substances and subsequent toxicity in biota.	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.	Local	Areas of high conservation importance and/or ecological integrity should be avoided.

Mitigation: 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.

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.

.**Desktop Sensitivity Analysis of the Site:**

Both ecological integrity and conservation importance of the areas that will be impacted by this impact are low to moderate, however species of concern may be impacted upon.

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Disturbance due to vibration and noise	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	Local	Areas of high conservation importance and/or ecological integrity should be avoided.

Mitigation: 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.

Impacts 4: Habitat degradation due to dust

Increased dust will occur in all areas where vegetation is cleared.

Desktop Sensitivity Analysis of the Site:

Both ecological integrity and conservation importance of the areas that will be impacted by this impact are low to moderate, however species of concern (such as Hoodia spp. and Aloe

dichotoma) may be impacted upon.			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Disturbance to dust	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.	Local	Areas of high conservation importance and/or ecological integrity should be avoided.

Mitigation: 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.

Impact 6: 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.

Desktop Sensitivity Analysis of the Site:

Desert animals are particularly migratory due to variations in food and water availability, and species of concern may be affected by this impact.

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Disturbance due to effects on local migrations	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.	Local	Areas of high conservation importance and/or ecological integrity should be avoided.

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.

Impact 5: Increased prevalence of exotic invasive species

The fact that the area will be cleared for construction created 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.

Desktop Sensitivity Analysis of the Site:

Desert and semi-desert areas are very susceptible to invasion by exotic species due to the slow growth rate of indigenous vegetation due to low rainfall and this impact needs to monitored and

mitigated.			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Disturbance due to propagation of exotic/invasive species	The fact that the area will be cleared for construction created 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 specie.	Local	Areas of high conservation importance and/or ecological integrity should be avoided.

Mitigation: An exotic/invasive species monitoring and management plan should be put in place to manage exotic and invasive species.

Impact 7: Increased erosion

Increased erosion can eventually lead to the loss of vegetation and habitats for further species.

Desktop Sensitivity Analysis of the Site:

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.

Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Disturbance due to 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. .	Local	Areas of high conservation importance and/or ecological integrity should be avoided.

Mitigation: An erosion monitoring and mitigation plan should be put in place.

9.2 Impact Assessment table

Construction Phase												
Impact	Probability	Scale	Duration	Magnitude	Total	Impact before mitigation	Probability	Scale	Duration	Magnitude	Total	Impact after mitigation
Habitat loss through vegetation clearing	5	1	5	4	50	Moderate	5	1	4	2	35	Moderate
Pollution by harmful or toxic substances and subsequent toxicity in biota.	3	2	5	2	27	Low	1	1	4	2	7	Low
Disturbance due to vibration and noise	5	2	5	2	45	Moderate	3	1	4	2	21	Low
Disturbance to dust	5	2	5	4	55	Moderate	2	1	4	2	14	Low
Disturbance due to effects on local migrations	5	1	5	2	40	Moderate	1	1	4	2	7	Low
Disturbance due to propagation of exotic/invasive species	5	2	5	4	55	Moderate	1	1	4	2	7	Low
Disturbance due to increased	5	2	5	4	55	Moderate	2	1	4	2	14	Low

erosion												
Operational Phase												
Impact	Probability	Scale	Duration	Magnitude	Total	Impact before mitigation	Probability	Scale	Duration	Magnitude	Total	Impact after mitigation
Habitat loss through vegetation clearing	5	1	5	4	50	Moderate	5	1	4	2	35	Moderate
Pollution by harmful or toxic substances and subsequent toxicity in biota.	3	2	5	2	27	Low	1	1	4	2	7	Low
Disturbance due to vibration and noise	5	2	5	2	45	Moderate	3	1	4	2	21	Low
Disturbance to dust	5	2	5	4	55	Moderate	2	1	4	2	14	Low
Disturbance due to effects on local migrations	5	1	5	2	40	Moderate	1	1	4	2	7	Low
Disturbance due to propagation of exotic/invasive species	5	2	5	4	55	Moderate	1	1	4	2	7	Low
Disturbance due to increased erosion	5	2	5	4	55	Moderate	2	1	4	2	14	Low

Decommissioning Phase

Impact	Probability	Scale	Duration	Magnitude	Total	Impact before mitigation	Probability	Scale	Duration	Magnitude	Total	Impact after mitigation
Pollution by harmful or toxic substances and subsequent toxicity in biota.	3	2	5	2	27	Low	1	1	4	2	7	Low
Disturbance due to vibration and noise	5	2	5	2	45	Moderate	3	1	4	2	21	Low
Disturbance to dust	5	2	5	4	55	Moderate	2	1	4	2	14	Low
Disturbance due to effects on local migrations	5	1	5	2	40	Moderate	1	1	4	2	7	Low
Disturbance due to propagation of exotic/invasive species	5	2	5	4	55	Moderate	1	1	4	2	7	Low
Disturbance due to increased erosion	5	2	5	4	55	Moderate	2	1	4	2	14	Low

10 DISCUSSION AND CONCLUSIONS

Based on species composition, physiognomy, moisture regime, rockiness, slope and soil properties, four main communities were recognised. It must be noted that these vegetation communities may be regarded as subcommunities in some instances (as many of the dominant species are dominant throughout the study area), but due to the homogeneity of the karroid vegetation it was decided, for the purposes of this study, to describe them as separate vegetation communities. Based on the nomenclature system described above the vegetation species are:

- Chrysocoma – Aristida plains dwarf shrubland;
- Acacia – Chrysocoma Plains Shrubland;
- Acacia – Aristida Wash Shrubland; and
- Lycium – Crysocoma Hillside Shrubland.

A total of 44 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 and most of these species have a low probability of occurrence in the study area and none were found to occur in the study area during the 2015 study.

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. Reptile diversity in the area is high with approximately 47 reptile species occurring in the area and reptile endemism is especially high in the region with 21 species (42%) being endemic. Five were confirmed during the site visit). The number of species would certainly have been higher if the survey had been conducted during the summer months, especially after good rains. The three 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.

Only ten amphibian species are expected to occur in the study area, and during the study no amphibian species were recorded.

Of the 53 mammal species expected to occur in the study area, according to historic recordings, only 12 were confirmed during the site visit.

Of the 15 species of concern that may occur in the study area, all have a low or very low probability of occurrence on site and none were recorded during the 2015 study.

The ecological function of the study area can generally be described as moderate for the majority of the study area, although this does vary from low (in the highly transformed areas due to overgrazing) to high in the more inaccessible or unutilisable areas. Areas in which overgrazing and clearing have taken place, as well as areas in which settlements have been established are considered as areas where ecological function is reduced.

Areas that have been disturbed by farming are considered of moderate conservation importance due to the fact that rehabilitation of these areas is possible. The natural areas are considered of high conservation importance due to the presence of Red Data species in these areas and the intrinsic importance of these areas. In keeping with the Precautionary Principle (COMEST, 2005), we need to assume a higher conservation importance when in doubt.

Seven probable impacts, associated with the proposed project, on the ecology were identified during the study. All the impacts showed a low to moderate impact on the ecology of the area before mitigation, and all impacts are mitigable to some degree.

11 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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APPENDIX A

Plant species recorded as occurring in the 2429DC QDS

Family	Naturalised	Species	Lifecycle	Growth forms
ACANTHACEAE		*Barleria rigida*	Perennial	Dwarf shrub
ACANTHACEAE		*Berkheya annectens*	Perennial	Dwarf shrub
ACANTHACEAE		*Monechma divaricatum*	Perennial	Shrub
AIZOACEAE		*Lithops hookeri*	Annual	Succulent
AIZOACEAE		*Plinthus cryptocarpus*	Perennial	Dwarf shrub
AIZOACEAE		*Plinthus karooicus*	Perennial	Dwarf shrub
AIZOACEAE		*Psilocaulon coriarium*	Annual	Dwarf shrub
AIZOACEAE		*Tetragonia arbuscular*	Perennial	Dwarf shrub
AIZOACEAE		*Tetragonia calycina*	Perennial	Dwarf shrub
AIZOACEAE		*Tetragonia fruticosa*	Perennial	Dwarf shrub
AMARYLLIDACEAE		*Nerine laticoma*	Perennial	Geophyte
APOCYNACEAE		*Microloma armatum*	Annual	Succulent
APOCYNACEAE		*Xysmalobium gomphocarpoides*	Perennial	Herb
ASPARAGACEAE		*Asparagus suaveolens*	Perennial	Shrub
ASPHODELACEAE		*Aloe broomii*	Perennial	Dwarf shrub
ASPHODELACEAE		*Aloe claviflora*	Perennial	Herb
ASPHODELACEAE		*Aloe hereroensis*	Perennial	Dwarf shrub
ASTERACEAE		*Chrysocoma ciliata*	Perennial	Shrub
ASTERACEAE		*Dicoma capensis*	Perennial	Herb
ASTERACEAE		*Eriocephalus ericoides subsp. ericoides*	Perennial	Shrub
ASTERACEAE		*Eriocephalus glandulosus*	Perennial	Shrub
ASTERACEAE		*Eriocephalus spinescens*	Perennial	Shrub

ASTERACEAE		*Felicia muricata*	Perennial	Dwarf shrub
ASTERACEAE		*Gazania krebsiana*	Annual	Herb
ASTERACEAE		*Helichrysum lineare*	Perennial	Herb
ASTERACEAE		*Helichrysum lucilioides*	Perennial	Herb
ASTERACEAE		*Hertia pallens*	Annual	Dwarf shrub
ASTERACEAE		*Osteospermum leptolobum*	Annual	Herb
ASTERACEAE		*Osteospermum spinescens*	Annual	Herb
ASTERACEAE		*Pegolettia retrofracta*	Perennial	Dwarf shrub
ASTERACEAE		*Pentzia calcarea*	Perennial	Shrub
ASTERACEAE		*Pentzia globosa*	Perennial	Shrub
ASTERACEAE		*Pentzia incana*	Perennial	Shrub
ASTERACEAE		*Pentzia lanata*	Perennial	Shrub
ASTERACEAE		*Pentzia spinescens*	Perennial	Shrub
ASTERACEAE		*Pteronia glauca*	Annual	Dwarf shrub
ASTERACEAE		*Pteronia sordida*	Annual	Dwarf shrub
ASTERACEAE		*Rosenia humilis*	Annual	Dwarf shrub
ASTERACEAE		*Tarchonanthus camphoratus*	Perennial	Shrub
AYTONIACEAE		*Plagiochasma rupestre var. rupestre*	Perennial	Bryophyte
AZIOACEAE		*Galenia exigua*	Perennial	Shrub
BIGNONIACEAE		*Rhigozum trichotomum*	Perennial	Shrub
BORAGINACEAE		*Heliotropium ciliatum*	Perennial	Herb
BRYACEAE		*Bryum pycnophyllum*	Perennial	Bryophyte
CACTACEAE	*	*Opuntia ficus-indica*	Perennial	Succulent
CAPPARACEAE		*Boscia albitrunca*	Perennial	Shrub
CAPPARACEAE		*Cleome gynandra*	Annual	Herb
CARYOPHYLLACEAE		*Pollichia campestris*	Perennial	Herb
CELASTRACEAE		*Gymnosporia szyszylowiczii subsp. namibiensis*	Perennial	Shrub

CHENOPODIACEAE	*	*Atriplex lindleyi subsp. Inflata*	Annual	Herb
CHENOPODIACEAE		*Atriplex spongiosa*	Annual	Herb
CHENOPODIACEAE		*Atriplex vestita var. inappendiculata*	Perennial	Shrub
CHENOPODIACEAE		*Salsola calluna*	Perennial	Dwarf shrub
CHENOPODIACEAE		*Salsola glabrescena*	Perennial	Dwarf shrub
CHENOPODIACEAE		*Salsola rabieana*	Perennial	Dwarf shrub
CHENOPODIACEAE		*Salsola tuberculata*	Perennial	Dwarf shrub
COMMELINACEAE		*Commelina africana var. barberae*	Perennial	Herb
CONVOLVULACEAE		*Convolvulus boedeckerianus*	Perennial	Herb
CONVOLVULACEAE		*Convolvulus sagittatus*	Perennial	Herb
CYPERACEAE		*Cyperus decurvatus*	Perennial	Cyperoid
CYPERACEAE		*Isolepis setacea*	Annual	Cyperoid
DRACAENACEAE		*Sansevieria aethiopica*	Perennial	Geophyte
ERIOSPERMACEAE		*Eriospermum corymbosum*	Perennial	Geophyte
EUPHORBIACEAE		*Euphorbia arida*	Perennial	Dwarf shrub
EUPHORBIACEAE		*Euphorbia mauritanica var. mauritanica*	Perennial	Shrub
EUPHORBIACEAE		*Euryops asparagoides*	Perennial	Shrub
FABACEAE		*Acacia mellifera subsp. detinens*	Perennial	Shrub
FABACEAE		*Acacia tortilis subsp. heteracantha*	Perennial	Shrub
FABACEAE		*Argyrolobium argenteum*	Perennial	Climber
FABACEAE		*Indigofera alternana*	Perennial	Dwarf shrub
FABACEAE		*Lessertia pauciflora*	Perennial	Shrub
FABACEAE		*Melolobium candicans*	Annual (occ. perennial)	Shrub
GISEKIACEAE		*Gisekia pharnacioides var. pharnacioides*	Annual	Herb
HYACINTHACEAE		*Albuca tortuosa*	Perennial	Geophyte
HYACINTHACEAE		*Ornithogalum flexuosum*	Perennial	Geophyte

HYDROCHARITACEAE		*Lagarosiphon muscoides*	Perennial	Herb
IRIDACEAE		*Gladiolus orchidiflorus*	Perennial	Geophyte
IRIDACEAE		*Gladiolus permeabilis subsp. edulis*	Perennial	Geophyte
IRIDACEAE		*Moraea pallida*	Perennial	Shrub
IRIDACEAE		*Moraea polystachya*	Perennial	Geophyte
LAMIACEAE		*Leucas capensis*	Perennial	Shrub
LAMIACEAE		*Salvia namaensis*	Perennial	Shrub
LAMIACEAE		*Stachys linearis*	Perennial	Dwarf shrub
MALVACEAE		*Hermannia comosa*	Perennial	Herb
MALVACEAE		*Hermannia modesta*	Perennial	Dwarf shrub
MALVACEAE		*Hermannia pulchella*	Perennial	Dwarf shrub
MALVACEAE		*Hermannia spinosa*	Perennial	Dwarf shrub
MALVACEAE		*Hibiscus pusillus*	Perennial	Herb
MALVACEAE		*Radyera urens*	Annual	Scrambling Herb
MARSILEACEAE		*Marsilea burchellii*	Perennial	Herb
MESEMBRYANTHEMACEAE		*Mesembryanthemum guerichianum*	Annual or biennial	Succulent
MESEMBRYANTHEMACEAE		*Prenia tetragona*	Perennial	Succulent
MESEMBRYANTHEMACEAE		*Stomatium pluridens*	Annual (occ. perennial)	Succulent
MOLLUGINACEAE		*Hypertelis salsoloides var. salsoloides*	Perennial	Dwarf shrub
MOLLUGINACEAE		*Limeum aethiopicum*	Perennial	Shrub
MOLLUGINACEAE		*Limeum aethiopicum var. intermedium*	Perennial	Shrub
MOLLUGINACEAE		*Limeum aethiopicum var. lanceolatum*	Perennial	Shrub
MOLLUGINACEAE		*Limeum viscosum subsp. viscosum var. viscosum*	Annual	Herb
OPHIOGLOSSACEAE		*Ophioglossum polyphyllum var. polyphyllum*	Perennial	Geophyte

OXALIDACEAE		*Oxalis lawsonii*	Perennial	Geophyte
OXALIDACEAE		*Oxalis smithiana*	Perennial	Geophyte
PEDALIACEAE		*Sesamum capense*	Annual	Dwarf shrub
PHYLLANTHACEAE		*Phyllanthus maderaspatensis*	Perennial	Shrub
PHYLLANTHACEAE		*Phyllanthus parvulus var. parvulus*	Perennial	Dwarf shrub
POACEAE		*Aristida adscensionis*	Perennial	Graminoid
POACEAE		*Aristida congesta*	Perennial	Graminoid
POACEAE		*Aristida diffusa*	Perennial	Graminoid
POACEAE		*Asparagus glaucus*	Perennial	Graminoid
POACEAE		*Cenchrus ciliaris*	Perennial	Graminoid
POACEAE	*	*Cymbopogon pospischilii*	Perennial	Graminoid
POACEAE		*Digitaria eriantha*	Perennial	Graminoid
POACEAE		*Enneapogon cenchroides*	Annual (occ. perennial)	Graminoid
POACEAE		*Enneapogon desvauxii*	Annual (occ. perennial)	Graminoid
POACEAE		*Enneapogon scaber*	Perennial	Graminoid
POACEAE		*Enneapogon scoparius*	Perennial	Graminoid
POACEAE	*	*Eragrostis barrelieri*	Annual	Graminoid
POACEAE		*Eragrostis bicolor*	Perennial	Graminoid
POACEAE		*Eragrostis cilianensis*	Annual	Graminoid
POACEAE		*Eragrostis homomalla*	Annual	Graminoid
POACEAE		*Eragrostis lehmanniana*	Perennial	Graminoid
POACEAE		*Eragrostis nindensis*	Perennial	Graminoid
POACEAE		*Eragrostis obtusa*	Perennial	Graminoid
POACEAE		*Eragrostis porosa*	Annual	Graminoid
POACEAE		*Eragrostis truncata*	Annual	Graminoid
POACEAE		*Eragrostis x pseud-obtusa*	Perennial	Graminoid
POACEAE		*Eustachys paspaloides*	Perennial	Graminoid

POACEAE		*Fingerhuthia africana*	Perennial (occ. annual)	Graminoid
POACEAE		*Heteropogon contortus*	Perennial	Graminoid
POACEAE		*Hyparrhenia hirta*	Perennial	Graminoid
POACEAE		*Melinis repens*	Annual (occ. perennial)	Graminoid
POACEAE		*Oropetium capense*	Perennial	Graminoid
POACEAE		*Panicum impeditum*	Annual	Graminoid
POACEAE		*Panicum maximum*	Perennial	Graminoid
POACEAE	*	*Polypogon monspeliensis*	Annual	Graminoid
POACEAE		*Schismus barbatus*	Annual	Graminoid
POACEAE		*Setaria lindenbergiana*	Perennial	Graminoid
POACEAE		*Sporobolus fimbriatus*	Perennial	Graminoid
POACEAE		*Sporobolus ioclados*	Perennial	Graminoid
POACEAE		*Stipagrostis ciliata*	Perennial	Graminoid
POACEAE		*Stipagrostis namaquensis*	Perennial	Graminoid
POACEAE		*Stipagrostis obtusa*	Perennial	Graminoid
POACEAE		*Themeda triandra*	Perennial	Graminoid
POACEAE		*Tragus berteronianus*	Annual	Graminoid
POACEAE		*Tragus koelerioides*	Perennial	Graminoid
POACEAE		*Tragus racemosus*	Annual	Graminoid
POLYGALACEAE		*Polygala leptophylla var. leptophylla*	Perennial	Dwarf shrub
POLYGALACEAE		*Polygala pungens*	Perennial	Dwarf shrub
POLYGALACEAE		*Polygala seminuda*	Perennial	Dwarf shrub
PORTULACACEAE		*Talinum arnotii*	Annual (occ. perennial)	Dwarf shrub
PORTULACACEAE		*Talinum caffrum*	Annual (occ. perennial)	Dwarf shrub
POTTIACEAE		*Trichostomum brachydontium*	Perennial	Bryophyte

RUBIACEAE		*Kohautia cynanchica*	Annual (occ. perennial)	Herb
SCROPHULARIACEAE		*Amphiglossa triflora*	Perennial	Dwarf shrub
SCROPHULARIACEAE		*Aptosimum marlothii*	Perennial	Dwarf shrub
SCROPHULARIACEAE		*Aptosimum spinescens*	Perennial	Dwarf shrub
SCROPHULARIACEAE		*Jamesbrittenia albiflora*	Perennial	Dwarf shrub
SCROPHULARIACEAE		*Manulea deserticola*	Annual	Herb
SCROPHULARIACEAE		*Peliostomum leucorrhizum*	Perennial	Dwarf shrub
SCROPHULARIACEAE		*Selago geniculata*	Annual	Dwarf shrub
SCROPHULARIACEAE		*Selago saxatilis*	Annual	Dwarf shrub
SCROPHULARIACEAE		*Sutera pinnatifida*	Annual	Dwarf shrub
SINOPTERIDACEAE		*Cheilanthes eckloniana*	Perennial	Geophyte
SOLANACEAE		*Lycium cinereum*	Perennial	Dwarf shrub
SOLANACEAE		*Lycium hirsutum*	Perennial	Dwarf shrub
SOLANACEAE		*Lycium horridum*	Perennial	Dwarf shrub
SOLANACEAE		*Lycium oxycarpum*	Perennial	Dwarf shrub
SOLANACEAE		*Lycium pumilum*	Perennial	Shrub
SOLANACEAE		*Lycium schizocalyx*	Perennial	Dwarf shrub
SOLANACEAE		*Solanum burchellii*	Perennial	Dwarf shrub
SOLANACEAE		*Withania somnifera*	Perennial	Dwarf shrub
THYMELAEACEAE		*Gnidia polycephala*	Annual	Herb

VAHLIACEAE		*Vahlia capensis*	Annual	Dwarf shrub
VERBENACEAE		*Chamaesyce inaequilatera*	Perennial	Herb
VERBENACEAE		*Chascanum pinnatifidum var. pinnatifidum*	Perennial	Herb
VERBENACEAE		*Lantana rugosa*	Perennial	Shrub
ZYGOPHYLLACEAE		*Tribulus terrestris*	Annual	Scrambling herb
ZYGOPHYLLACEAE		*Zygophyllum flexuosum*	Perennial	Dwarf shrub
ZYGOPHYLLACEAE		*Zygophyllum incrustatum*	Perennial	Dwarf shrub
ZYGOPHYLLACEAE		*Zygophyllum lichtensteinianum*	Perennial	Dwarf shrub

APPENDIX B

Reptile species occurring in the region of the study area

ORDER	SUBORDER	FAMILY	SUBFAMILY	*GENUS + SPECIES*	COMMON NAME	ENDEMIC
Chelonii		TESTUDINAE		*Homopus femoralis*	Greater Padloper	E
				Sigmochelys pardalis	Leopard Tortoise	
				Psammobates oculifer	Serrated or Kalahari Tent Tortoise	E
				Psamobates tentorius	Karoo Tent Tortoise	E
	Pleurodira	PELOMEDUSIDAE		*Pelomedusa subrufa*	Marsh or Helmeted Terrapin	
Squamata	Serpentes (Ophidia)	TRYPHLOPIDAE		*Rhinotyphlops lalandei*	Delalande's Blind Snake	E
		LEPTOTYPHLOPIDAE		*Leptotyphlops scutifrons*	Peter's Thread Snake	
		COLUBRIDAE	Boadontinae	*Lycodonomorphus rufulus*	Common Brown Water Snake	E
				Lamprophis fuliginosus	Brown House Snake	
				Lamprophis aurora	Aurora House Snake	E
				Lycophidion capense	Common Wolf Snake	
				Pseudoaspis cana	Mole Snake	
				Prosymna sundevali	Sundevall's Shovel-snout	E
			Psammophinae	*Dipsina multimaculata*	Dwarf Beaked Snake	E
				Psammophylax rhombeatus	Spotted Skaapsteker	
				Psammophis notostictus	Karoo Whip Snake	
				Psammophis trinasalis	Kalahari Sand Snake	

				Psammophis crucifer	Crossed Whip Snake	E
			Atractaspidinae	*Homoroselaps lacteus*	Spotted Harlequin Snake	E
				Dasypeltis scabra	Rhombic Egg Eater	
				Crotaphopeltis hotamboeia	Herald Snake	
				Dispholidus typus	Boomslang	
		ELAPIDAE	Najinae	*Aspidelaps lubricus*	Coral Shield Snake	
				Naja nivea	Cape Cobra	E
				Bitis arietans	Puff Adder	
	Amphisbaenia	AMPHISBAENIDAE		*Monopeltis capensis*	Cape Spade-snouted Worm Lizard	
	Sauria (Lacertillia)	SCINCIDAE	Acontiinae	*Acontophiops lineatus*	Woodbrush Legless Skink	E
			Lygosomatiinae	*Trachylepis capensis*	Cape Skink	
				Trachylepis sulcata	Western Rock Skink	
				Mabuya variegata	Variegated Skink	
		LACERTIDAE		*Nucras intertexta*	Spotted Sandveld Lizard	E
				Nucras taeniolata	Ornate Sandveld Lizard	
				Pedioplanis burchelli	Burchell's Sand Lizard	E
				Pedioplanis laticeps	Cape Sand Lizard	E
				Pedioplanis lineoocellata	Spotted Sand Lizard	E
				Pedioplanis namaquensis	Namaqua Sand Lizard	

		CORDYLIDAE	Gerrhosaurinae	*Gerrhosaurus flavigularis*	Yellow-throated Plated Lizard	
			Cordylinae	*Cordylus cordylus*	Cape Girdled Lizard	E
			Cordylinae	*Cordylus polyzous*	Karoo Girdled Lizard	E
		VARANIDAE		*Varanus albigularis*	Rock or White-throated Monitor	
				Varanus niloticus	Nile or Water Monitor	
		AGAMIDAE		*Agama aculeata*	Ground Agama	
				Agama atra	Southern Rock Agama	E
		GEKKONIDAE		*Chondrodactylis bibronii*	Bibron's Tubercled Gecko	
				Pachydactylus capensis	Cape Gecko	
				Pachydactylus mariquensis	Marico Gecko	E
				Ptenopus garrulus	Common Barking Gecko	E

APPENDIX C

Amphibian species occurring in the region of the study area

FAMILY	SPECIES		Endemic Status	Revised Status	Recorded
BUFONIDAE	*Amietophrynus gutteralis*	Gutteral Toad		NL	
	Poyntonophrynus vertebralis	Southern Pygmy Toad		NL	
	Vandijkophrynus gariepensis	Karoo Toad		Nl	
HYPEROLIIDAE	*Kassina senegalensis*	Bubbling Kassina	0	NL	
PIPIDAE	*Xenopus laevis*	Common Platanna	0	NL	
PYXICEPHALIDAE	*Cacosternum boettgeri*	Boettger's Caco		NL	
	Afrana fuscigula	Cape River Frog	1	NL	
	Tomopterna cryptotis	Tremolo Sand Frog	0	NL	
	Pyxicephalus adspersus	Giant Bulfrog	0	NT	
	Tomopterna tandyi	Tandy's Sand 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)

Shaded species indicate species known to occur within the study area

APPENDIX D

Mammal species occurring in the region of the study area

FAMILY	SUBFAMILY	BIOLOGICAL NAME	COMMON NAME
CHRYSOCHLORIDAE (Golden Moles)		*Chlorotalpa sclateri*	Sclater's Golden Mole
MACROSCELIDIDAE (Sengis/Elephant Shrews)		*Elephantulus rupestris*	Western Rock Sengi
ERINACEIDAE (Hedgehogs)		*Atelerix frontalis*	Southern African Hedgehog
SORICIDAE (Shrews)		*Crocidura cyanea*	Reddish-grey Musk Shrew
NYCTERIDAE (Slit-faced Bats)		*Nycteris thebiaca*	Egyptian Slit-faced Bat
RHINOLOPHIDAE (Horseshoe Bats)		*Rhinolophus clivosus*	Geoffrey's Horseshoe Bat
VESPERTILIONIDAE (Vesper Bats)	VESPERTILIONINAE	*Neoromicia capensis*	Cape Serotine Bat
MOLOSSIDAE (Free-tailed Bats)		*Tadarida aegyptiaca*	Egyptian Free-tailed Bat
CERCOPITHECIDAE (Baboons and Monkeys)		*Papio cynocephalus ursinus*	Savanna Baboon
		Cercopithecus pygerythrus	Vervet Monkey
LEPORIDAE (Hares and Rabbits)		*Lepus capensis*	Cape Hare
		Lepus saxatillis	Scrub Hare
		Pronolagus rupestris	Smith's Red Rock Rabbit
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)		*Malacothrix typica*	Gerbil Mouse
	GERBILLINAE	*Desmodillus auricularis*	Cape Short-tailed Gerbil
		Gerbillurus paeba	Hairy-footed Gerbil

		Tatera brantsii	Highveld Gerbil
		Michaelamys namaquensis	Namaqua Rock Mouse
		Michaelamys granti	Grant's Rock Mouse
		Aethomys chrysophilus	Red Veld Rat
		Rhabdomys pumilio	Four-striped Grass Mouse
		Mus minutoides	Pygmy Mouse
		Mus musculus	House Mouse
		Mastomys natalensis	Natal Multimammate Mouse
		Rattus rattus	House Rat
		Rattus norvegicus	Brown Rat
		Parotomys brantsii	Brants's Whistling Rat
		Otomys sloggetti	Sloggett's Rat
		Otomys irroratus	Vlei Rat
CARNIVORA: Canidae		*Vulpes chama*	Cape Fox
		Otocyon megalotis	Bat-eared Fox
		Canis mesomelas	Black-backed Jackal
MUSTELIDAE (Otters, Badger, Weasel and Polecat)		*Mellivora capensis*	Honey Badger
		Ictonyx striatus	Striped Polecat
		Galerella pulverulenta	Small Grey Mongoose
		Cynictis penicillata	Yellow Mongoose
		Suricata suricatta	Suricate (Meerkat)

VIVERRIDAE		*Genetta genetta*	Small-spotted Genet
PROTELIDAE		*Proteles cristatus*	Aardwolf
FELIDAE		*Felis sylvestris lybica*	African Wild Cat
		Felis nigripes	Small Spotted Cat
		Caracal caracal	Caracal
ORYCTEROPODIDAE		*Orycteropus afer*	Aardvark
PROCAVIIDAE		*Procavia capensis*	Rock Hyrax (Dassie)
BOVIDAE (Buffalo And Antelopes)		*Tragelaphus strepsiceros*	Greater Kudu
		Connochaetes gnou	Black Wildebeest
		Damaliscus pygargus dorcas	Bontebok
		Raphicerus campestris	Steenbok
		Sylvicapra grimmia	Common Duiker

APPENDIX E

Details of Specialist

Appointment of specialist

Hudson Ecology Pty Ltd was commissioned by Environamics CC to provide specialist consulting services for the Environmental Impact Assessment for the proposed Solar Thermal Plant near Luckhoff in the Free State. 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

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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 Pele Green Energy Pty Ltd. 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 CC 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

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APPENDIX G

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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