Appendix D.1 Biodiversity and Ecology Impact Assessment Report

PDF file attached.

D1_Biodiversity and Ecology Impact Assessment Report.pdf

DRAFT SCOPING REPORT

BIODIVERSITY AND ECOLOGY; VALLEYDORA PV SITE, FREE STATE.

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Declaration of Consultants Independence

The authors of this report, do hereby declare that they are an independent consultant appointed by CSIR 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 the specialist performing such work. All opinions expressed in this report are their own.

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January 2012

Specialist Information

Simon Todd (sensitivity analysis and field assessment) and Andrew Skowno (desk top biodiversity analysis) of ECOSOL GIS conducted the study. Andrew and Simon both hold MSc. degrees in Botany from UCT and have combined 18 years of experience in conservation planning, biodiversity assessment and ecological research. Refer to www.ecosolgis.com for more details.

Contents

1 INTRODUCTION

In November 2011 EcoSol GIS was appointed by CSIR to conduct an ecological assessment of the proposed Valleydora solar PV installation as part of EIA process. The site is located near Springfontein and would have a peak generation capacity of 75 MW. The purpose of this report is to identify the likely ecological impacts of the development and identify development opportunities and constraints within the site as part of the Scoping Phase of the EIA process. The approach and terms of reference for the study are detailed below.

1.1 Terms of Reference

With regards to the flora of the site, the following terms of reference form the basis for this report:

- Describe the biodiversity and ecology at the site, develop a draft sensitivity map based on rapid field assessment and desktop study, and assess the potential impacts of the proposed development.
- Conduct vegetation and plant species surveys noting conservation significance and status.
- Identify and map vegetation habitats in the study area, paying careful attention to conservation constraints, threatened species that exist or may exist in the project area.
- Indicate presence of any seasonal wetlands, rivers, streams, dams etc.
- Provide photos illustrating any conservation action or plant species that may need special attention.
- Produce a vegetation sensitivity map of the project area which will be used to inform the layout of project infrastructure.

In terms of the terrestrial fauna of the site, the following terms of reference apply:

- A description of the occurrence and distribution of fauna (i.e. amphibians, reptiles and small-, medium- and large mammals) in the study area, which may be influenced by the proposed facility.
- The identification of Red Data species potentially affected by the proposed development.
- The identification of species-specific habitats in the study area, which may be influenced by the proposed development.
- An assessment of the potential impacts (positive, negative or cumulative if relevant) on fauna during the construction and operation of the proposed development.
- The identification of specific mitigating measures, for enhancing benefits and avoiding or mitigating negative impacts and risks, which should be implemented during design, construction and operation of the proposed development.

2 LEGISLATIVE OVERVIEW & PERMIT REQUIREMENTS

A summary of the relevant portions of the Acts which govern the activities and potential impacts to the environment associated with the development are listed below. Provided that standard mitigation and impact avoidance measures are implemented, not all the activities listed in the Acts below would actually be triggered.

National Environmental Management Act (NEMA) (Act No 107, 1998):

NEMA requires that measures are taken that "prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development." In addition:

- That the disturbance of ecosystems and loss of biological diversity are avoided, or where they cannot be altogether avoided, are minimised and remedied:
- That a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and
- Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

Environmental Conservation Act (ECA) (No 73 of 1989 Amendment Notice No. R1183 of 1997)

This Act provides for the effective protection and controlled utilisation of the environment. This Act has been largely repealed by NEMA, but certain provisions remain, in particular provisions relating to environmental impact assessments. The ECA requires that developers must undertake Environmental Impact Assessments (EIA) for all projects listed as a Schedule 1 activity in the EIA regulations.

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

The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The Draft National List of Threatened Ecosystems (Notice 1477 of 2009, Government Gazette No 32689, 6 November 2009) has been gazetted for public comment. The list of threatened terrestrial ecosystems supersedes the information regarding terrestrial ecosystem status in the NSBA 2004. In terms of the EIA regulations, a basic assessment report is required for the transformation or removal of indigenous vegetation in a critically endangered or endangered ecosystem regardless of the extent of transformation that will occur. However, all of the vegetation types within and surrounding the study site are classified as Least Threatened.

NEMBA also deals with endangered, threatened and otherwise controlled species. The Act provides for listing of species as threatened or protected, under one of the following categories:

- **Critically Endangered:** any indigenous species facing an extremely high risk of extinction in the wild in the immediate future.
- **Endangered:** any indigenous species facing a high risk of extinction in the wild in the near future, although it is not a critically endangered species.
- **Vulnerable:** any indigenous species facing an extremely high risk of extinction in the wild in the medium-term future; although it is not a critically endangered species or an endangered species.
- **Protected species:** any species which is of such high conservation value or national importance that it requires national protection. Species listed in this category include, among others, species listed in terms of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

Certain activities, known as Restricted Activities, are regulated by a set of permit regulations published under the Act. Those relevant to the current study are listed below.

Under the **Environmental Impact Assessment Regulations Listing Notice 1 of 2010** (No. R.544) the following activities are likely to be triggered:

Activity 1: The construction of facilities or infrastructure for the generation of electricity where:

ii. the output is 10 megawatts or less but the total extent of the facility covers an area in excess of 1 hectare.

Activity 11 (Xi): The construction of infrastructure or structures covering 50 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.

And, under **Environmental Impact Assessment Regulations Listing Notice 3** of 2010 *(R.546):*

Activity 14. The clearing of an area of 5 hectares or more of vegetation where 75% or more of the vegetation cover constitutes indigenous vegetation.

It is important to note that the above thresholds and activities also apply to phased developments "*where any phase of the activity may be below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold.*"

National Forests Act (No. 84 of 1998):

The National Forests Act provides for the protection of forests as well as specific tree species, quoting directly from the Act: "*no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner*

acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a licence or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated".

No protected tree species were observed at the site and as the site is quite small it is safe to conclude that no protected tree species occur within the study area.

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

The Conservation of Agricultural Resources Act provides for the regulation of control over the utilisation of the natural agricultural resources in order to promote the conservation of soil, water and vegetation and provides for combating weeds and invader plant species. The Conservation of Agricultural Resources Act defines different categories of alien plants and those listed under Category 1 are prohibited and must be controlled while those listed under Category 2 must be grown within a demarcated area under permit. Category 3 plants includes ornamental plants that may no longer be planted but existing plants may remain provided that all reasonable steps are taken to prevent the spreading thereof, except within the floodline of water courses and wetlands.

3 METHODOLOGY & APPROACH

This draft biodiversity and ecology scoping study is based on a field visit and desk-top assessment of available biodiversity and ecological information. A wide range of spatial data sets were interrogated and relevant information was extracted for the study site. A basic ecological sensitivity analysis was performed to identify areas of special interest or concern. The various approaches used and aspects taken into account are detailed below.

3.1 Site Visit

The site visit took place over two days, on 28 and 30 November 2011. During the site visit, the different biodiversity features, habitat and landscape units present at the site were identified and mapped in the field using a GPS and also onto satellite imagery of the site. Walk-through-surveys were conducted across the site and all plant and animal species observed were recorded. Searches for listed and protected plant species known to occur in the area were conducted and the location of any listed plant species observed was recorded using a GPS. Active searches for reptiles and amphibians were also conducted within habitats likely to harbour or be important for such species. The presence of sensitive habitats such as wetlands and unique edaphic environments such as gravel or quartz patches were noted in the field where present and their location recorded using a GPS. Photographs of any sensitive habitats and environments present were taken for documentation and illustration purposes.

The data collected during the site visit can be summarized as follows:

- A list of all plant species observed at the site
- Description and composition of the different habitats and plant communities observed on site.

- A list of all mammals, reptiles and amphibians directly or indirectly (spoor, scat, etc) observed at the site
- Maps of sensitive areas identified in the field and delineated on satellite imagery of the site
- GPS coordinates of significant point-location biodiversity features
- Photographs of the different habitats, environments and biodiversity features present.

3.2 Sensitivity Map

Following the site visit, an ecological sensitivity map of the site was generated by integrating the information collected on-site with the available ecological and biodiversity information available in the literature and various spatial databases as described above. The ecological sensitivity of the different units identified in the mapping procedure was rated according to the following scale:

- **Low** – Units with a low sensitivity where there is likely to be a negligible impact on ecological processes and terrestrial biodiversity. This category is reserved specifically for areas where the natural vegetation has already been transformed, usually for intensive agricultural purposes such as cropping. Most types of development can proceed within these areas with little ecological impact.
- **Medium**- Areas of natural or previously transformed land where the impacts are likely to be largely local and the risk of secondary impact such as erosion low. Development within these areas can proceed with relatively little ecological impact provided that appropriate mitigation measures are taken.
- **High** – Areas of natural or transformed land where a high impact is anticipated due to the high biodiversity value, sensitivity or important ecological role of the area. Development within these areas is highly undesirable and should only proceed with caution as it may not be possible to mitigate all impacts appropriately.
- **Very High** – Critical and unique habitats that serve as habitat for rare/endangered species or perform critical ecological roles. These areas are essentially no-go areas from a developmental perspective and should be avoided at all costs.

3.3 Data Sourcing and Review

- Information on animal and plant species recorded for the Quarter Degree Square (QDS) 3025BD & 3025BC was extracted from the SABIF/SIBIS database hosted by SANBI. This database includes the various botanical databases housed within SANBI as well as those from various herbaria and museums. The faunal data sources includes inter alia the SA Bird Atlas Project 1 and the SA Reptile Conservation Assessment (SARCA).
- Threatened Plant data was extracted from the Draft TSP and CREW data set (SANBI 2008, Raimondo 2009).
- Threatened Ecosystem data was extracted from the NEMBA listed ecosystems layer (SANBI 2008).
- Vegetation type conservation status was extracted from the South African National Vegetation Map (Mucina and Rutherford 2006).

- Freshwater and wetland information was extracted from the National Freshwater Ecosystems Protection Assessment, CSIR 2010 (NFEPA).
- Important catchments and protected areas expansion areas were extracted from National Protected Areas Expansion Strategy 2008 (NPAES).
- River and streams from the NGI 1:50 000 series were buffered by 100m using ARCGIS.
- Land Cover was mapped for the study area using 1:30 000 scale digital aerial photographs obtained from NGI. All roads, pans, dams, urban areas, buildings, river areas, severely degraded areas and areas with no natural vegetation cover (transformed areas) were mapped for the site.

3.4 Key Limitations & Assumptions

The key assumption for this study is that the existing datasets which were used to assess site sensitivity are correct and reliable. In most cases the data sets used were not intended for fine scale planning work at scales larger than 1:250 000.

A single, two-day site visit was conducted and no long-term studies have taken place, which imposes some limitations on the interpretation of the data collected in the field particularly with regards to the extent to which the species lists generated from the site visit can be considered comprehensive. However, these lists were augmented with species likely to occur at the site based on distribution records from the literature and various spatial databases (SANBI's SIBIS and BGIS databases). Literature consulted includes Branch (1988) and Alexander and Marais (2007) for reptiles, Du Preez and Carruthers (2009) for amphibians, Friendmann and Daly (2004) and Skinner and Chimimba (2005) for mammals. The lists provided are based on species which are known to occur in the broad geographical area as well as an assessment of the availability and quality of suitable habitat at the site. This represents a sufficiently conservative and cautious approach which takes account of the study limitations.

3.5 Relevant Aspects of the Development

A single site is being considered and alternative sites are not being assessed or compared to one another. Important aspects of the construction and infrastructure of the development which are potentially relevant to assessing the likely impacts of the activities associated with the development include the following:

- Rows of PV panels supported by steel supports would occupy approximately 130 ha of the site when the full 75 MW is installed. This includes gaps of approximately 10 m between the rows, part of which will be roads for operation and maintenance activities.
- One or more permanent meteorological stations
- A small site office and storage facility, including security and ablution facilities
- Site fencing
- Car park
- Temporary construction camp
- Permanent accommodation

- A lay-down area for the temporary storage of materials during the construction activities.

Extracted from another solar development, check against BID documents.

4 DESCRIPTION OF THE AFFECTED ENVIRONMENT

4.1 Vegetation

4.1.1 Fine-Scale Vegetation Patterns

Rocky Outcrops

The vegetation of the rocky outcrops of the site were highly distinct from the adjacent grasslands. As mentioned above the vegetation of the rocky outcrops corresponds to the Besemkaree Koppies Shrubland vegetation type and was characterised by the presence of large shrubs and small trees such as *Rhus erosa*, *R.burchellii*, *Diospyros lycioides*, *D.austro-africana* and *Aloe broomi*. Other species observed within the koppies which were not observed within the grassland habitat include *Euphorbia clavarioides*, *Pollichia campestris*, *Stomatium bolusiae* and *Dianthus caespitosus*. Due to the restricted nature and the presence of the low trees and various succulents within this habitat type it is ecologically sensitive from a flora perspective and should be avoided by the development on these as well as faunal grounds.

Photo 1. Rocky ridge towards the south-western extent of the site. The large shrub in the foreground is *Rhus incisa* and the darker shrub in the distance is *Diospyros lycioides*. The ground layer is dominated by widespread species such as *Chrysocoma ciliata* and *Eragrostis lehmanniana*.

Drainage Lines

Although there were not any well developed drainage lines within the boundaries of the site, there were nevertheless several areas present on the upper slopes which received relatively large amounts of runoff from areas upslope. The even slope and well vegetated nature of the receiving areas resulted in the dissipation of flow energy and the dispersal of the runoff into the veld. The site also forms a basin which collects runoff towards its lowest point west of the substation. The evidence from the site visit suggests that relatively large amounts of water occasionally move through this area and into the dam on the other side of the railway line. The vegetation within these areas was similar to the surrounding grassland in many respects but could be discerned based on the presence or higher abundance of species such as *Melicia decumbens*, *Digitaria argyrograpta*, *Sporobolus fimbriatus* and *Aristida diffusa*. These drainage areas are highly vulnerable to erosion and the maintenance of vegetation cover within these areas is essential. Development within these areas would be highly likely to result in erosion and degradation. As these areas important from the fauna and flora biodiversity as well as ecosystem service point of view, they should be a avoided.

Photo 2. Dense grassland consisting largely of *Themeda triandra* within the drainage area towards the low-lying southern boundary of the site. The culvert which allows runoff to flow beneath the railway line can be seen in the distance.

Photo 3. The drainage line which enters the top of site before becoming dispersed into the veld. Some erosion control has historically been carried out in this area suggesting that erosion remains a high risk in this area.

Karroid Grassland

The grasslands at the site are fairly homogenous except where shallow or rocky soils occur which are dominated by a larger proportion of woody shrubs. Common species within this vegetation type include shrubs such as *Chrysocoma ciliata*, *Rosenia oppositifolia* and *Asparagus capensis*, grasses such as *Eragrostis lehmanniana*, *E.curvula*, *Cynodon incompletus* and *Tragus koelerioides* with occasional low forbs and geophytes. The more heavily grazed areas such occurred around watering points, were dominated by a larger proportion or woody shrubs and grazing-tolerant species such as *Cynodon incompletus*, *Chrysocoma ciliata*, *Selago* sp. and *Phymaspermum parvifolium*. In general this plant community does not represent a

highly sensitive environment and should form the focus of the development. An exception is that in some areas some sheetwash had occurred and resulted in the banding of the vegetation which can readily be discerned on the satellite imagery of the site. Within these areas the erosion risk is higher and specific measures to reduce erosion potential will probably need to be implemented.

Overall the vegetation condition of the site can be considered to be in a poor to average condition. Although palatable grass species such as *Themeda triandra* were common within the run-on areas, unpalatable species such as *Chrysocoma ciliata* which increase as a result of overgrazing were dominant across large parts of the site.

Photo 4. Looking south over the site, illustrating the generally homogenous nature of the site. The preponderance of *Chrysocoma cilliata* which can be seen as the green hue within the grassland is indicative of poor veld condition.

4.2 Fauna

4.2.1 Mammals

The mammalian community at the site is likely to be of moderate to high diversity. As many as 55 terrestrial mammals and 5 bats potentially occur at the site. The limited extent and range of habitats available however implies that the actual number likely to be present is significantly less. Five species of conservation concern potentially occur at the site, these are the White-tailed Mouse *Mystromys albicaudatus* (Endangered), Brown Hyaena *Hyaena brunnea* (Near Threatened), Leopard *Panthera pardus* (Near Threatened), Black-footed Cat *Felis nigripes* (Vulnerable) and Schreibers' Long-fingered Bat *Miniopterus schreibersii* (Near Threatened). Of

these, the Leopard and Brown Hyaena are not likely to occur in the area as a result of the proximity of the site to urban areas and the high levels of human presence and agricultural activity which characterize the area. There is a good probability that the White-tailed Mouse occurs at the site as the habitat is broadly suitable. The Black-footed Cat is a secretive species which may well occur at the site given that it occurs within arid, open country. As the development occupies a very small area relative to the extensive range of these species, the impact of the development on habitat loss for these species would be minimal. Within the site itself there do not appear to be any specific habitats which are high sensitivity from a mammalian perspective. There were however two colonies of burrows at the site which were the occupied by Bat-eared Fox *Otocyon megalotis,* Yellow Mongoose *Cynictis penicillata* and South African Ground Squirrel *Xerus inauris.* These areas should not be disturbed during the development as such suitable burrow sites are not widely available within the landscape. The burrow two sites have been buffered and rated as being of high sensitivity in the sensitivity map.

4.2.2 Reptiles

The site lies in or near the distribution range of at least 40 reptile species (Appendix 3). This is a comparatively low total suggesting that the site has a relatively depauperate reptile assemblage. Based on distribution maps and habitat requirements, the composition of the reptile fauna is likely to comprise 1 terrapin, 23 snakes, 14 lizards and skinks and 2 geckos. This indicates an assemblage which is high in snakes relative to other reptiles. A single species of conservation concern may occur at the site, the Striped Harlequin Snake *Homoroselaps dorsalis* (Near Threatened). The rocky outcrops and drainage areas at the site are likely to represent the most important habitats for reptiles.

4.2.3 Amphibians

The site lies within or near the range of 12 amphibian species, which indicates that the site potentially contains quite a diverse frog community. Those that require permanent water are likely to be restricted to the vicinity of the dams to the south of the railway line. As such these species are not likely to be directly impacted by the development. The only species that was observed at the site was the Clawed Toad or Common Platanna *Xenopus laevis* which was observed in the dam across the railway line from the site. There are two small dams within the study area that hold water on a temporary basis and are probably important breeding habitat for most of the toad species which occur at the site. The only species of conservation concern which may occur at the site is the Giant Bullfrog *Pyxicephalus adspersus.* Within the boundaries of the site at least, there does not appear to be any suitable breeding habitat for this species and the site is probably not an important area for this species. Apart from the drainage areas which are recognized as sensitive habitats from a number of perspectives, the dams are the only other areas at the site which are specifically important habitat for amphibians.

4.3 Site Sensitivity Assessment

The extent of the different ecological sensitivity categories within the site is summarized below in Table 1. Of the 290 ha for which a sensitivity map was generated, just under 40 ha was classified as High and Very Sensitivity areas that should be avoided due to their biodiversity and ecological function value. These areas are the drainage areas and rocky ridges of the site, which are high biodiversity areas for all fauna as well as plants. The remaining 250 ha was classified as Medium and Medium-High sensitivity areas that are potentially suitable for development. From a biodiversity perspective, there is little difference between the areas that have been classified as Medium and Medium-High Sensitivity. The primary factor which relates to this differentiation is that the areas classified as Medium-High Sensitivity, lie within washes and other areas which are more vulnerable to erosion than the adjacent areas. As such, development within these areas should proceed with specific precautions to prevent and limit erosion.

Overall, the sensitive areas of the site are quite clearly defined and limited in extent. As such, these areas would be relatively easily avoided as there is more than sufficient space present to accommodate the development. From an ecological perspective, the site is not highly sensitive as the majority of the site has relatively low biodiversity and ecological function value. The primary risk associated with the development is the increased erosion risk that would occur as a result of the associated soil disturbance and construction activities.

Photo 5. An incised drainage line just upslope of the study area, illustrating the vulnerability of the site to erosion. This drainage line flows into the site, but the lower slope and some erosion control has resulted in the drainage line "opening out" towards the top of the site.

Table 1. Ecological sensitivity summary of the Valleydora site. The implications of the different sensitivity categories for the development potential of the site are listed along with the level of mitigation actions that would be required to effectively mitigate negative impacts within the different sensitivity classes. The residual impact reflects the post-mitigation impact that cannot be effectively mitigated and indicates the likely impact rating that would result from developing within that sensitivity class. .

Sensitivity	Area (Ha)	Development Potential	Mitigation Required	Residual Impact
Medium-Low	2.9	High	Low	Low
Medium	160.9	High	Low/Moderate	Low
Medium - High	89.0	Low	Moderate	Moderate/Low
High	29.8	Very Low	Very High	High
Very High	9.2	Very Low	Very High	Very High

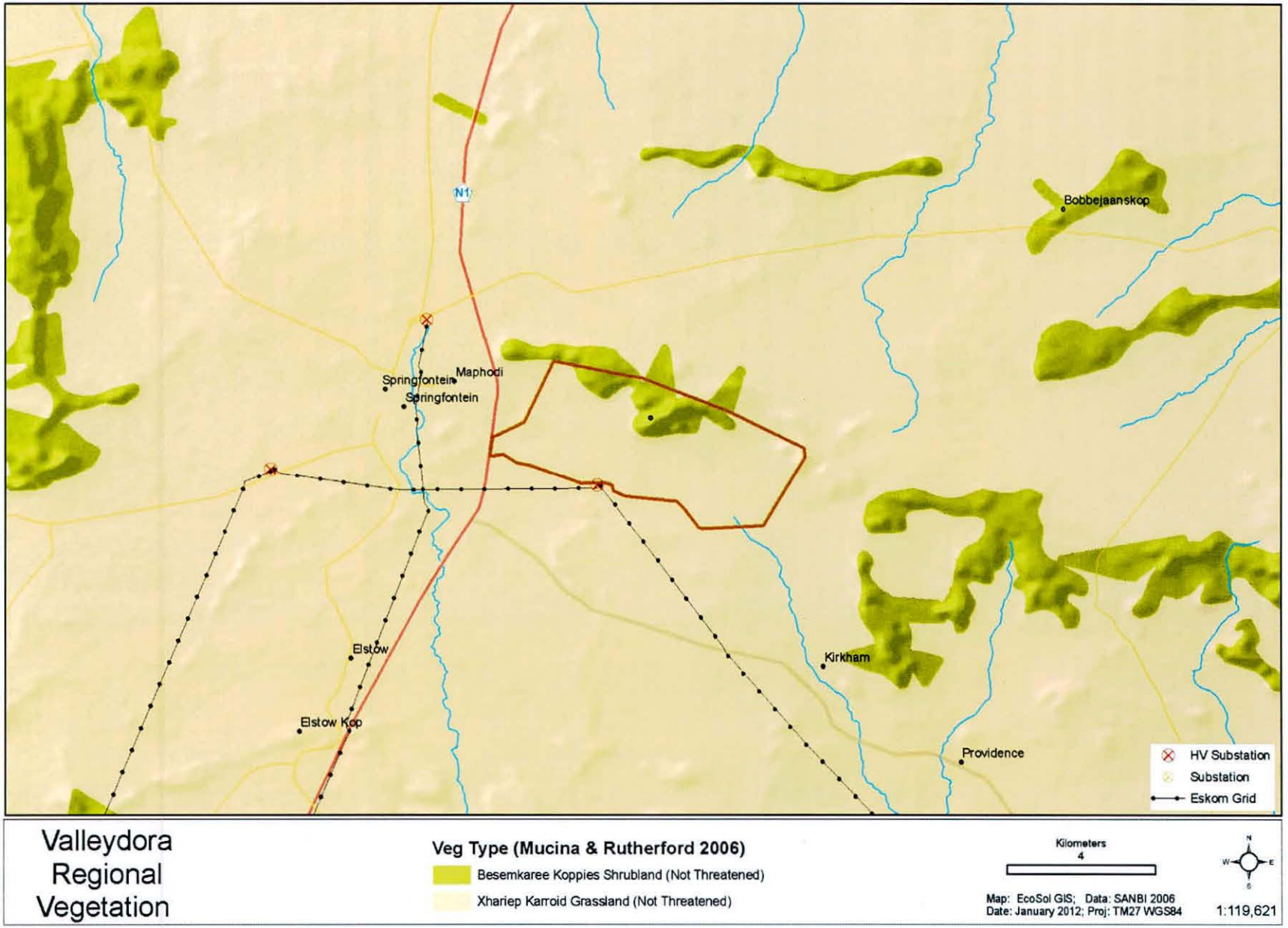

Figure 1. Regional vegetation map for proposed Valleydora PV site.

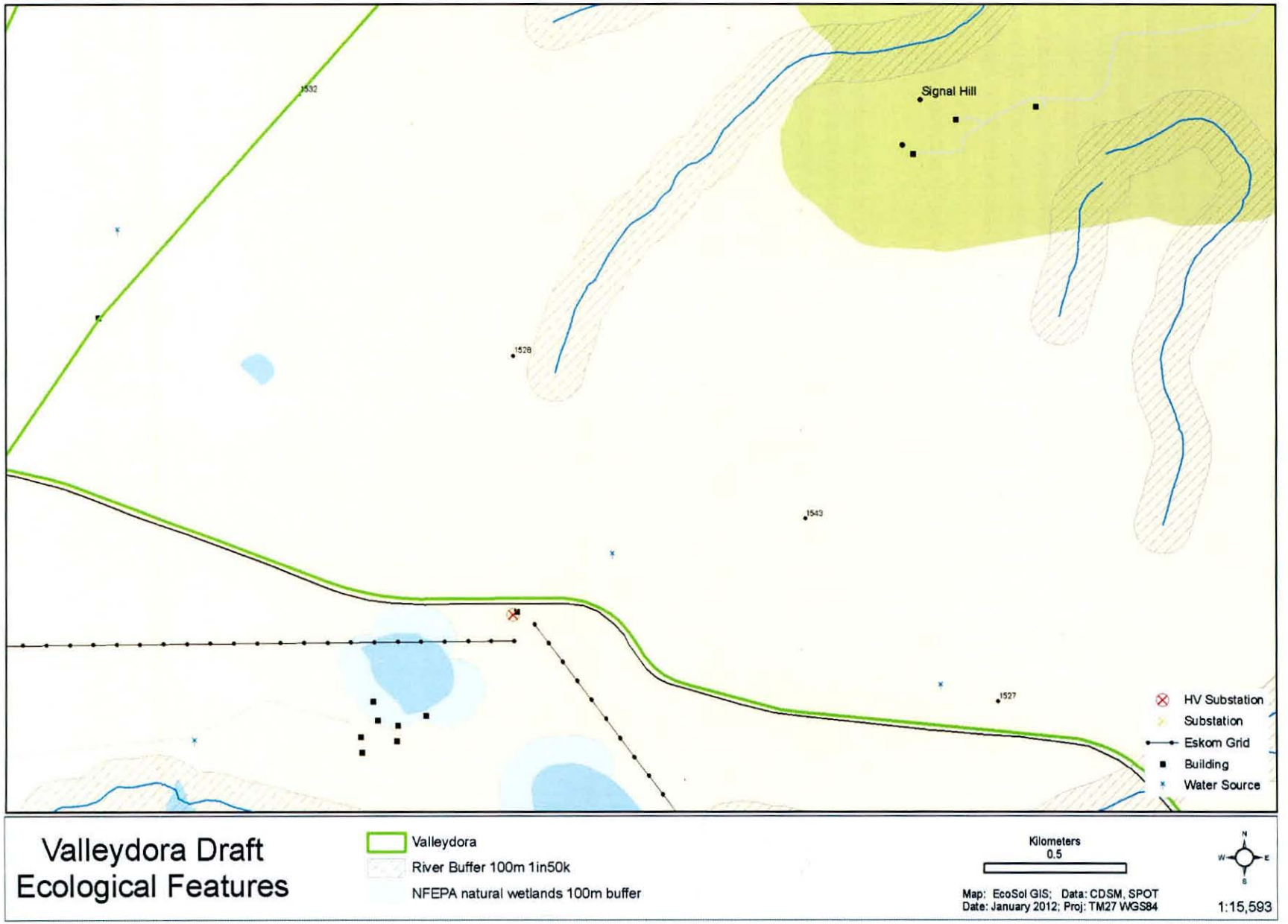

Figure 2. Biodiversity and ecological features of Valleydora proposed PV site.

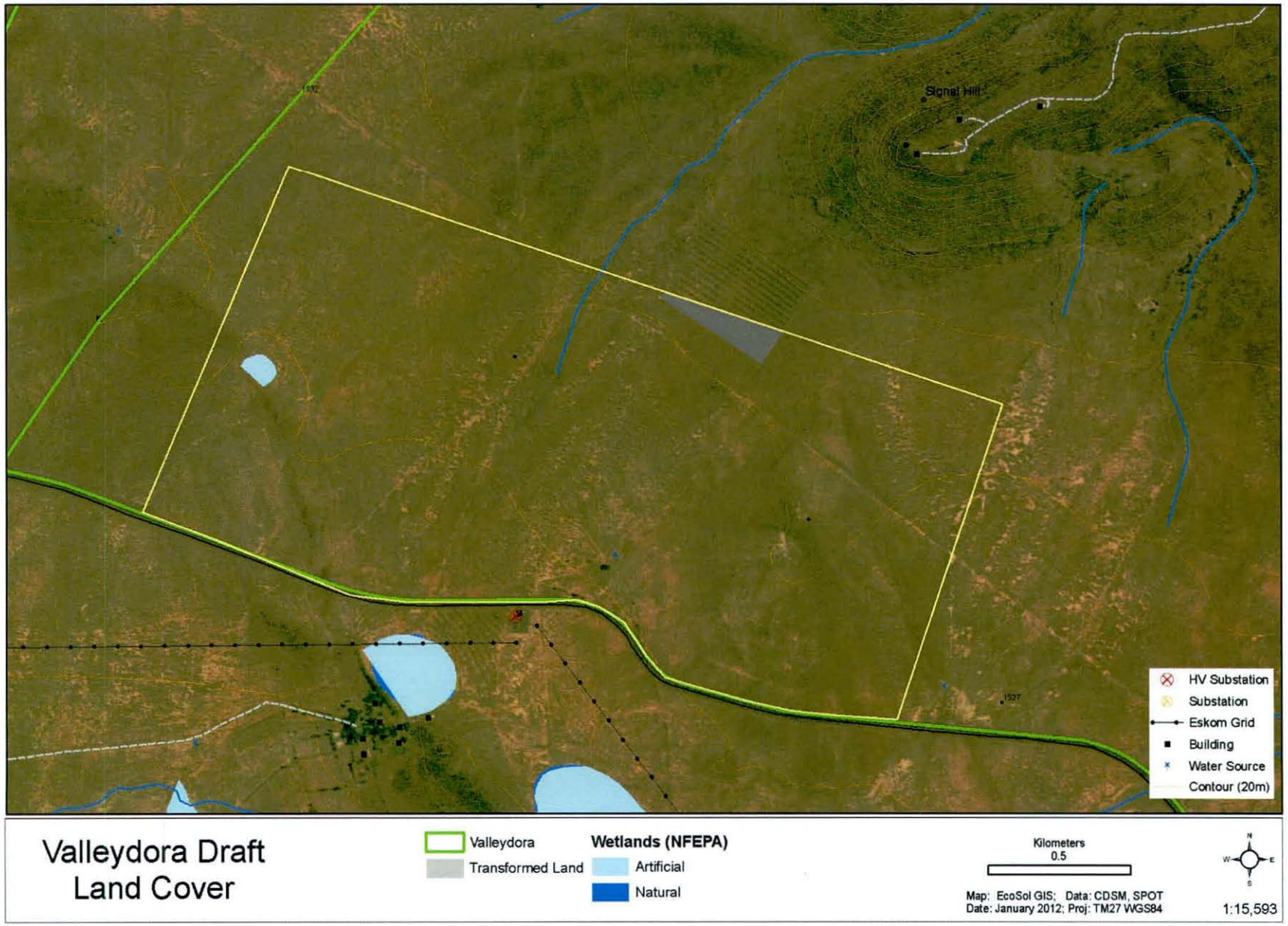

Figure 3. Land cover for proposed Valleydora PV site, mapped at scale of 1:10 000 using NGI aerial photos circa 2008.

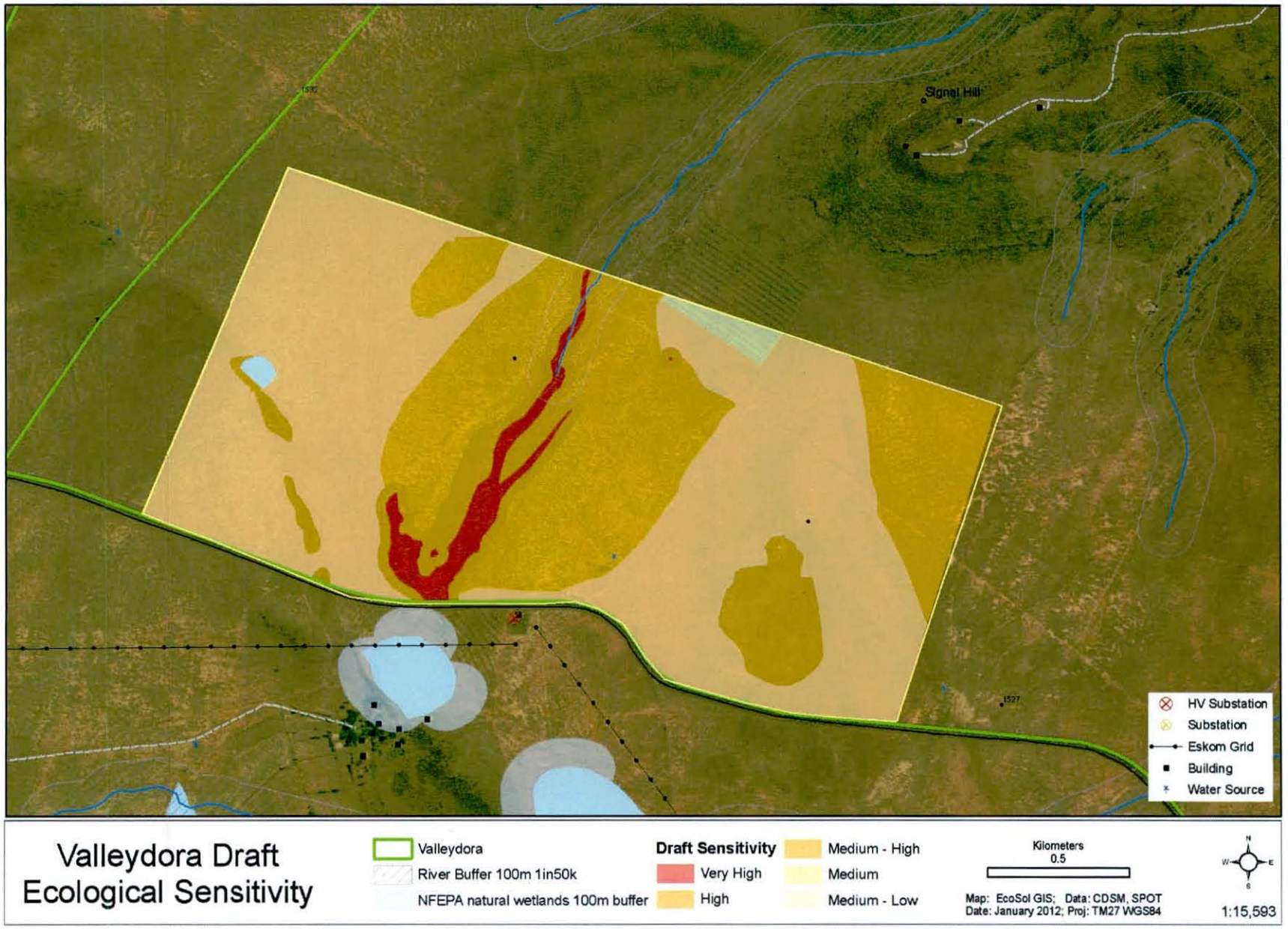

Figure 4. Draft sensitivity map developed for Valleydora proposed PV site; refer to Table 1 and Table 2.

5 IMPACT IDENTIFICATION & NATURE

Potential impacts on the terrestrial ecology of the site resulting from the development of the site as a renewable energy facility include the following

- **Biodiversity** – where biodiversity is taken to mean 1) the number of different species and individuals in a habitat or geographical area; 2) the variety of different habitats within an area; 3) the variety of interactions that occur between different species in a habitat; and 4) the range of genetic variation among individuals within a species.
- **Sensitive Habitats** – impacts to ecologically sensitive habitats such as riparian areas or edaphically unique areas such as quartz patches, or areas which are the habitat of rare or endangered species.
- **Ecosystem Function** - Impacts on ecosystem function such as the regulation of water flow and quality resulting from changes to the abiotic environment. Changes to disturbance regimes such as fire frequency may also result.
- **Connectivity** – Habitat fragmentation or a reduction in the ability of fauna to move about the landscape, this may impact ecosystem function as well as gene flow and other aspects of biodiversity.
- **Ecosystem Resilience** - Intact ecosystems are better able to recover from perturbations and resist invasion by alien plants.
- **Secondary/Cumulative Impacts** – When considered in isolation, the development of a single site may not be significant, however, when considered in light of similar actual or potential developments in the area, a greater concern for broader ecological processes may arise.

6 ASSESMENT OF RISKS AND POTENTIAL IMPACTS

Potential ecological impacts resulting from the development would stem from a variety of different activities and risk factors associated with the construction and operational phases of the project including the following:

Construction Phase

- **Vegetation Clearing** for PV arrays, roads, buildings etc will lead to habitat loss for fauna and potentially the loss of sensitive species, habitats and ecosystems.
- **High Erosion Risk** will result due to the loss of plant cover and disturbance created during the construction phase. Although the effects would probably only become apparent during the operational phase, the impact stems from the construction phase and suitable mitigation measures will also need to be applied at this stage.
- **Presence and operation of construction vehicles** on site. These create a physical impact as well as generate noise, pollution and other forms of disturbance at the site.
- **Increased human presence** can lead to poaching, illegal plant harvesting and other forms of disturbance such as fire.

Operational Phase

- Disturbance created during the construction phase will leave the site vulnerable to **alien plant invasion** for at least the first few years of the operational phase.
- The presence of the PV panels will **shade the soil** which will create a number of potential secondary impacts such as changes in plant and faunal community composition.
- **Maintenance activities** such as vegetation clearing will impact the biodiversity of the site if not conducted in a sensitive manner.
- **Loss of connectivity & habitat fragmentation** will result if the facility is **fenced-off** in a manner which limits the movement of fauna.

Impacts to be Assessed in the EIA Phase

Given the above activities and risk factors, impacts likely to result from the development that will be assessed during the EIA phase include the following:

- Loss of natural vegetation
- Alien plant invasion
- Loss of faunal habitat and disturbance
- Erosion Risk
- Loss of connectivity
- Cumulative Impacts

7 DISCUSSION AND CONCLUSIONS

Overall the site can be viewed as being favourable for the development of a solar energy facility. The sensitive parts of the site constitute a relatively small proportion of the site and would be relatively easily avoided. Within the remaining areas, the primary concern associated with the development of the site would be to ensure that erosion control measures are properly implemented. As the slope of the site is quite low, the probability that severe erosion problems would result from the development after suitable mitigation measures have put in place would be very low. Overall, the potential of the development to result in the degradation of the environment is low and the likely impact associated with the development would be assessed, after mitigation, as being low. Therefore there do not appear to be any significant obstacles to prevent the development from proceeding at the Valleydora site.

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9 Annex 1. Documented Sensitive Areas Checklist

- **NEMBA listed threatened ecosystems**; Habitats on site are listed as not threatened (Highveld Alluvial Vegetation).
- **Critical Biodiversity Areas or Ecological Support Areas (CBAs or ESAs):** No CBA areas defined for the Province.
- **Important Bird Areas (IBAs)**, None (nearest IBA = Soetdoring Nature Reserve which is 21 km north west of site).
- **NPAES priority areas outside protected areas**; Yes, western 1/3rd of study site falls within a priority area outside national parks identified in the National Protected Areas Expansion strategy 2008.
- **Proximity to National Parks or Provincial Reserves**: Not within 10km of NP or 5km or PR. Nearest Provincial Reserve = Soetdoring Nature Reserve which is 21 km north west of site. .
- **Proximity to water courses and wetlands:** Yes, portions of the site are within the 32m (NEMA List 1 Act 11) of water course and 100m (DWA guidelines) of water course or wetland.
- **NFEPA Priority Wetlands:** Riverine Wetland associated with the Modder Rivier, NFEPA rank of 6 (other wetlands) not a selected priority wetland.
- **NFEPA Priority River:** Modder River classified as D = Largely Modified; and does not contribute significantly to freshwater ecosystem targets. Not classified as flagship river reach,

Appendix D.2 Freshwater Ecosystem Impact Assessment Report

PDF files attached.

D2.A_Freshwater Ecosystem Impact Assessment Report

D2.B_Draft Plan for EMP

INPUTS INTO SCOPING REPORT FOR THE PROPOSED CONSTRUCTION OF A 75 MWP FACILITY AT the VALLEYDORA SITE, FREE STATE.

FRESHWATER ECOSYSTEMS

Comments provided by Liz Day, Freshwater Consulting cc (t/a FCG), Cape Town

Comments based on desk top assessment and site visit of 9th February 2012

Overview of findings

For the purposes of the scoping study, no fatal flaws are apparent at the Valleydora site from the perspective of freshwater ecosystems. However, the design and layout of the proposed solar facility would need to take cognisance of the presence of a number of drainage lines on the site, and the need to manage aspects such as erosion, which has been identified by this and other studies (e.g. EcosolGIS 2012 and Le Roux 2012) as a critical issue that needs to be addressed in development planning, and which is already present in some areas of the broader site, outside of the present development envelope.

Overview of freshwater ecosystems on the site

The proposed development envelope at the Valleydora site lies at the downstream end of an ephemeral stream/ water course that rises in the low-lying hills to the north of the site, and passes into the development envelope (hereafter referred to as the site) as a channelled system. Upstream of the northern site boundary, the passage of flows into the drainage line appear to have been concentrated by past diversion of the channel and infilling along its eastern edges, as well as by the construction of roads across the water course. Such activities have resulted in a water course that is down-cut and in places (e.g. downstream of the road crossing) actively eroding. Attempts to address erosion through the placement of rockfill piles on the channel bed have resulted in places in the passage of water out of the shallow channel, and the creation of short stretches of eroded access road, illustrating the vulnerability of the area to any changes in flow regime, and the high erosion potential.

Within the Valleydora site itself, upstream flows are initially concentrated into a single channel, through the creation of cut-off berms along the western side of the channel. Down-cutting to a defined clay layer has occurred in the channel in its upper reaches, and it continues some 115m downstream of the northern boundary fence, thereafter dissipating across the veld as multiple shallow braided channels that are quickly lost in the surrounding grassland. The drainage line is ephemeral, and does not support any plant species that are considered indicative of wetland conditions. It is however clearly subject to periodic large volumes of flow, which dissipate across the site, draining down towards the railway line at the southern end of the site, where they collect in an artificial excavation upstream of the culvert under the railway line, and pass from here into what at times is an extensively inundated dam. Past landuse practices, which include the planting of large stands of Sisal across major wash areas both upstream of the site and downstream of the railway line,

apparently to disperse runoff during flood events (J.P. Staples, pers. comm.), bear testimony to the extreme events that need to be considered in management of runoff from the site.

Although the site is too dry to support wetland habitats other than those encompassed in a number of shallow, artificial excavations and impoundments on the site, the shallow, clayey soils (identified by Le Roux 2012 as Swartland soils) that underlie much of the site are wetland prone. Areas where minor excavation has resulted in the creation of depressions where water can accumulate all show signs of wettedness, either in the soil profile, or in the vegetation. An example of this occurs along a flow diversion berm, which runs in a roughly south easterly direction towards the south eastern boundary of the site, channelling surface runoff into a small, artificial dam. Occasional depressions created along the upland side of the berm all support wetland vegetation, as does the dam itself.

From a legal perspective, the drainage line that disperses flows onto the site complies with the National Water Act (Act 36 of 1998) definition of a water course, which states that the term "water course" refers to:

- A 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.

The small dams on the site should also be considered water resources, albeit highly seasonal.

Implications of Scoping Phase findings for development proposals

The broad descriptions of drainage lines and wetland conditions outlined above suggest that further consideration of the Valleydora site for solar power development needs to take cognisance of the following issues:

- Development within 100m of any of the mapped drainage lines would require a Water Use Licence from the Department of Water Affairs;
- The clay soils of much of the development area are problematic, in that they promote rapid surface runoff, and if flows are concentrated through development hardening, these will be more prone to erosion and further concentration of flows.

In addition, any development that takes place in the proposed development envelope would need to ensure that, *inter alia*:

- It did not result in concentrated flows into natural drainage lines;
- Sufficient areas of unhardened space (i.e. vegetated land) were provided to allow for the adequate dispersal of flows across the site, without resulting in either erosion or the need to confine flows within hard-stabilised canal structures, with little capacity to perform ecological services such as the provision of ecological corridors, water quality amelioration, sediment removal or other functions;
- The development maintained hydrological and ecological connectivity through the site, linking the undeveloped high lying areas on Signal Hill and adjacent areas, with lower

lying areas downstream of the site, and including the artificial dams, which at times are likely to comprise the only significant sources of standing water in the area;

- It did not discharge polluted water into downstream areas –sources of potential pollution would include any grey water discharges, car park or road runoff, wash water when solar panels are periodically cleaned, and seepage or other waste water generated from outlets from ablution areas.

Mitigation measures would need to be developed with a detailed understanding of the proposed structures and their management on site (e.g. required washing regimes, spacing), but would be likely to require at least that:

- Water courses are protected by adequately sized buffer areas, sized and designed according to the actual functional requirements of the buffers, including maintenance of ecological connectivity through what would become an increasingly (ecologically) sterile site – the specific habitat requirements of key fauna would need to be considered in this regard;
- Water flows onto and across the site are managed so as to allow dissipation and filtration upstream of water courses;
- The alignment and design of all infrastructure, including roads, pylons and pipes, should take cognisance of natural drainage lines, and be designed such that they do not result in erosion as a result of concentration of flows or other causes for increased velocities;
- Water quality impacts are effectively mitigated;
- Stringent controls on the rate and volume of flow generated on the site during storm events and as a result of routine washing of panels would need to be implemented, and it is strongly recommended that a detailed stormwater management plan should be developed for consideration during the course of the EIA for this site.

Plan of Study (Methods) for the EIA

The following plan of study / terms of reference will inform additional input into the freshwater ecosystems EIA for this site:

- *Carry out fieldwork to locate and describe the freshwater features in the study area, with a key focus on the impact footprint for the site;*
- *Generate a map showing the sites in relation to any Critical Biodiversity Areas and links to ecological corridors and support areas;*
- *Provide a description of the current state of the wetland on site, supported by relevant photographs;*
- *Identify and describe the conservation value and conservation planning frameworks relevant to this site;*
- *Describe the areas where ecosystem conditions have been transformed;*
- *Determine recommended management actions to address potential impacts;*
- *Consider the risks of increased run-off from the solar panels and washing regimes;*
- *Provide a detailed sensitivity map of the site, including mapping of disturbance and transformation on site with respect to wetland ecosystems;*
- *Provide monitoring requirements as input into the construction and operational phase Environmental Management Plan (EMP), as well as generic rehabilitation guidelines.*

In addition to the triggering of an Environmental Impact Assessment Process, the proposed development would also be likely to trigger other legislation, from a freshwater ecosystems perspective. In particular, General and/or Special Authorisations may be required from the National Department of Water Affairs (DWA) if any activity of the proposed project entails:

Abstraction of water from a water resource;
Interruptions to the natural passage of water along a water course; and
Development within 500 m of a wetland.

Initial feedback from the Department of Water Affairs: Free State has however indicated that a setback or buffer of 100 m horizontal distance from watercourses would potentially be sufficient not to trigger the requirement for a Water Use Licence. Clearly, such criteria would also need to take cognisance of the kinds of impacts to aquatic systems / water resources that are anticipated.

The freshwater specialist would, during the course of the EIA for this project, be tasked with liaison with DWA to determine whether a WULA is applicable, and with the submission of such an application if necessary.

DRAFT PLAN FOR EMP: VALLEYDORA BA REPORT

ACTIVITY	POTENTIAL IMPACT	STATUS & SIGNIFICANCE WITHOUT MITIGATION	MITIGATION	STATUS & SIGNIFICANCE WITH MITIGATION	MONITORING FREQUENCY
Pre-construction activities	Potential disturbance and damage to freshwater features/ecosystems	High (Negative)	• Water courses and wetland areas should be protected by adequately sized buffer areas, sized and designed according to the actual functional requirements of the buffers, including maintenance of ecological connectivity through what would become an increasingly (ecologically) sterile site – the specific habitat requirements of key fauna would need to be considered in this regard. • It is recommended that hardened surfaces should be setback by at least 50m from all drainage lines / flow dissipation pathways • The alignment and design of all infrastructure, including roads, pylons and pipes, should take cognisance of natural drainage lines, and be designed such that they do not result in erosion as a	Low (Negative)	Restricted to the Planning and Design phase of the activity

ACTIVITY	POTENTIAL IMPACT	STATUS & SIGNIFICANCE WITHOUT MITIGATION	MITIGATION	STATUS & SIGNIFICANCE WITH MITIGATION	MONITORING FREQUENCY
			result of concentration of flows, bypassing of natural, dependent downstream water courses and /or shrinkage of downstream watercourses or wetlands as a result of narrowing of channels and flow corridors. It is recommended that a system of shallow depressions should be created within the developed portion of the site – that is, in the area across which the solar panels extend – and that these be used as part of the stormwater attenuation system. • The site design should allow for the retention or re-establishment of appropriate indigenous vegetation beneath the panels, as this will further reduce runoff rates • A detailed stormwater management system must be developed, that clearly indicates		

DRAFT PLAN FOR EMP: VALLEYDORA BA REPORT

ACTIVITY	POTENTIAL IMPACT	STATUS & SIGNIFICANCE WITHOUT MITIGATION	MITIGATION	STATUS & SIGNIFICANCE WITH MITIGATION	MONITORING FREQUENCY
			how attenuation of stormwater volumes and velocities is to be achieved upstream of existing water courses – these include the braided ephemeral streams mapped in the freshwater ecosystems report, which currently dissipate across disturbed agricultural areas		
Construction phase	• Disturbance of sensitive drainage lines, resulting in increased vulnerability to erosion • Contamination of downstream water bodies as a result of receipt of contaminated water from construction activities (e.g. runoff containing oils, sediments, cement)	Medium	• All ephemeral drainage lines (including the braided flow paths marked in the freshwater report) should be demarcated as no-go areas during construction; they should be marked with temporary fencing, located 50m from the edge of the drainage line • Construction design should seek to minimise disturbance of natural ground levels and to maintain, as far as possible, existing ground cover by	Low	Inspect weekly during construction

ACTIVITY	POTENTIAL IMPACT	STATUS & SIGNIFICANCE WITHOUT MITIGATION	MITIGATION	STATUS & SIGNIFICANCE WITH MITIGATION	MONITORING FREQUENCY
			vegetation • Temporary sediment collection ponds should be created between the construction zone and the demarcated ephemeral drainage lines, in which runoff from the disturbed site can collect before passing into the downstream catchment after • measures to dissipate the velocities of runoff from the site into adjacent water courses should be outlined in detailed Method Statements and implemented on site prior to the start of any activities that will disturb existing surface conditions • No wash water or water that is in any way contaminated by construction or other materials should be passed into natural watercourses – arrangements should be made for the containment and separate disposal		

ACTIVITY	POTENTIAL IMPACT	STATUS & SIGNIFICANCE WITHOUT MITIGATION	MITIGATION	STATUS & SIGNIFICANCE WITH MITIGATION	MONITORING FREQUENCY
			of water used for ablutions or cooking during construction I • A construction phase Environmental Management Programme should be compiled and implemented, such that it clearly addresses *inter alia* the above activities, as well as appropriate locations for construction camps, vehicle storage and parking areas, ablution facilities and waste management , such that these do not impact on sensitive or otherwise important terrestrial or wetland areas		
Operation Phase	• discharge of polluted water into downstream areas, or water with a different salinity to natural systems – sources of potential pollution would include any grey water	Medium to high (Negative)	• A stormwater management system must be designed, implemented and maintained so as to ensure that runoff from the site does not result in the passage of concentrated flows into drainage	Medium (Negative)	Annual inspection

ACTIVITY	POTENTIAL IMPACT	STATUS & SIGNIFICANCE WITHOUT MITIGATION	MITIGATION	STATUS & SIGNIFICANCE WITH MITIGATION	MONITORING FREQUENCY
	discharges, car park or road runoff, and wash water when solar panels are periodically cleaned; • affects on areas of recharge that would support wetlands / streams on the site.		lines, does not result in any bank or bed erosion in these systems, does not necessitate their being lined or otherwise artificially stabilised and does not result in droughting of natural systems through diversion of flows into adjacent water courses • the stormwater management plan should specifically address runoff from areas likely to generate high volumes of water during rainfall events, including car parks, roofs and the solar panels themselves • the use of measures that will contribute to the filtration of potentially contaminated water from car parks or other sources of contamination should be included in the stormwater management system; examples of appropriate measures include gravel filtration beds, vegetated swales (assuming		

DRAFT PLAN FOR EMP: VALLEYDORA BA REPORT

ACTIVITY	POTENTIAL IMPACT	STATUS & SIGNIFICANCE WITHOUT MITIGATION	MITIGATION	STATUS & SIGNIFICANCE WITH MITIGATION	MONITORING FREQUENCY
			that vegetation will be sustained, given the dry climate of the area) • wash water from the panels should be directed through settlement / filtration areas upstream of its passage into any watercourse, or ideally filtered, stored and recycled for subsequent washing activities • septic tanks should not be used for the management of sewage on site, given the close proximity of drainage lines and shallow subsurface systems directly into water courses		

Appendix D.3 Built Heritage and Archaeology Impact Assessment Report

PDF file attached.

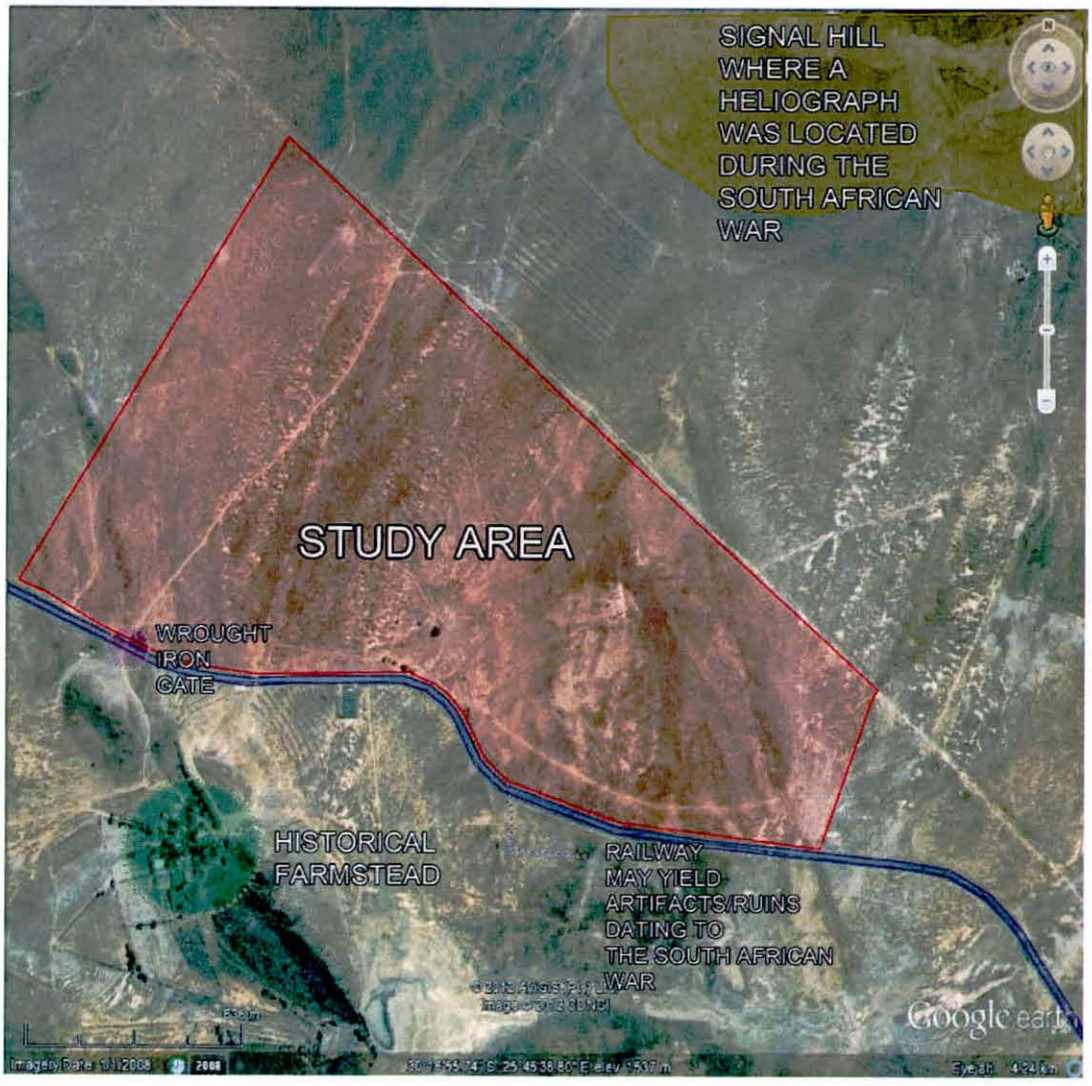
D3_Built Heritage and Archaeology Impact Assessment Report

BUILT HERITAGE IMPACT ASSESSMENT FOR THE CONSTRUCTION OF A PHOTOVOLTAIC POWER PLANT ON A PORTION OF THE FARM STAPLEHURST NEAR SPRINGFONTEIN, FREE STATE

DRAFT SCOPING REPORT 13 FEBRUARY 2012

ROODT

AERIAL VIEW OF SITE



Study area - Valleydora

ROODT

INTRODUCTION

The aim of this scoping report is to provide an informed opinion on the heritage and archaeological contexts of the study area.

HERITAGE CONTEXT

The study area is located approximately 5km east of Springfontein and directly adjacent and north of the Springfontein / Bethulie railway line.

Springfontein was established as a town in 1904 on the farm Hartleydale, part of the farm Springfontein. Initially, the town was governed by a Village Management Board, until the town attained municipal status in 1912 (Wikipedia). In all probability, some form of settlement existed here prior to 1904, as this area is well-known for the large concentration camp that was established here during the South African War. The site on which Springfontein was established, is probably not ideal for a town, but came about thanks to the important railway junction that occurs here. The Bloemfontein / Port Elizabeth railway line connects with the railway line that serves Bethulie and other towns in the south-eastern Free State.

View across the site to the north. Signal Hill is in the background.

Panorama from the north. In the background the trees at the farmstead are visible as the power and railway lines.

The British concentration camp at Springfontein was formed in January 1901 and was the largest camp of this nature in South Africa (BCCD: n.d.).

The concentration camp is approximately 4.5km from the farmhouse at Staplehurst.

Farms around Springfontein have been occupied more or less since 1854. The area was previously occupied by the Griquas, but they moved away after hostilities arose between them and the white settlers that were moving into the area. Many of these settlers were British and surnames like Butler, Willmot, Staples and Prior, are common to farm names and even descendents of original inhabitants still farm here (De Swardt 2012).

On the hill directly to the north of the study area known as Signal Hill, there was a heliograph during the South African War (De Swardt 2012). A cursory investigation near the railway line revealed a few remnants of pot shards and tins that could have been left there by British soldiers. According to De Swardt (2012) a number of block houses were located along this Bethulie railway line and it is to be expected that traces of the activities during this period might be unearthed.

The gates at the railway crossing into the study area are made of wrought iron and are a testament to the blacksmith's art. They should be preserved.

Gate at the railway crossing.

On the study area itself, no apparent traces of heritage worthy objects or activities were found. There is no evidence of any built structures or human settlements.

Prior to the establishment of the railway lines, the area was most probably thinly populated by subsistence farmers. No traces of the original Griqua farmers or settlements are to be found in the area under scrutiny. The activities of the British soldiers during the South African War probably had the biggest impact on the area where the town is situated and the immediate environs.

According to De Swardt (2012), he could not find any reference to South African War activities on the farm "Knapdaar" (the name of the farm prior to its renaming to "Staplehurst").

Although the farmhouse and outbuildings are not situated in the study area, the farmstead and some of the outbuildings are certainly older than 60 years and might even be older than 100 years. Although the main farmstead has been substantially altered over the years, the mature trees surrounding the farmstead are a sure indication of the age of the settlement here. The pepper tree alone at the farmstead is one of the biggest pepper trees that the author has encountered anywhere in the Free State.

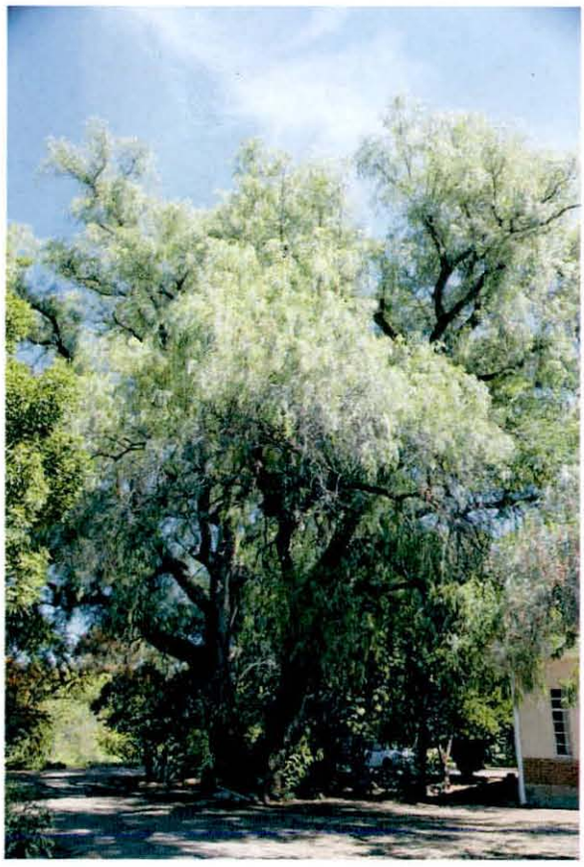
The farmhouse, probably extensively altered.

One of the outbuildings.

Therefore, should the developers contemplate utilizing the farmstead or outbuildings for other purposes, it is recommended that a thorough investigation of the construction and history of the site be compiled. The necessary permit for the changes, alterations or destruction of any buildings here, will have to be applied for at the Provincial Heritage Resources Authority of the Free State.

The developer is also further obliged to inform the Provincial Heritage Resources Authority of the Free State in writing of the intended development as is required according to Section 38 of the National Heritage Resources Act, No 25 of 1999 (National Heritage Resources Act 1999: 62 – 63). Should the Provincial Heritage Resources Authority deem it necessary, they could require an impact assessment report that has to contain specific information as set out in the relevant clause of the Act. In our opinion, however, this will not be necessary in this instance.

Should such an impact assessment, however, be required, the authors would be willing to assist in preparing and submitting the necessary information and/or applications.



Mature Pepper Tree at the homestead.

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11 FEBRUARY 2012

FIRST PHASE ARCHAEOLOGICAL & HERITAGE INVESTIGATION OF THE PROPOSED PV SOLAR INSTALLATION ON VALLEYDORA , SPRINGFONTEIN, FREE STATE

EXECUTIVE SUMMARY

A PV Solar installation is planned on the farm Knapdaar 14, near Springfontein, Free State. The farms Knapdaar 14, Kuilfontein 195 and Marmalo 488 are part the family company named Valleydora. The farm Knapdaar 14 is located near the N1 main road to the south east of Springfontein.

The land comprises a flat plain crossed by several drainage lines. The vegetation is described as Semi-arid Karoo Grassland with shrubs and bushes between the koppies and ridges. The land is also traversed by the railway line, an official water pipe line and several power lines.

No objects of archaeolical significance were found during the present survey.

Gates which appears to be hand made by a smithy protects the railway crossings on the farm. These features which bear witness of expert workmanship are of special interest, and should be protected and preserved in some way.

It is alleged that the original farm house was used as a hospital by the British Military Forces during the Anglo-Boer War (1899-1902).

A single tin can lid from the Anglo-Boer War (1899-1902) was found on the surface, but the solitary find is not considered as of much significance.

I recommend that further planning and development of the PV solar plant may continue.

INTRODUCTION & DESCRIPTION

Scope and Limitations

The Archaeological and Heritage Impact Assessment forms part of the Environmental Impact Assessment (EIA) undertaken by the CSIR on behalf of the applicant, who is planning to construct a 75MW Solar Energy Plant on about 150ha at the property.

The investigation provided an opportunity to examine the site proposed for the PV Solar installations. The area consists of a Semi-arid Karoo Grassland with shrubs and bushes. No limitations were experienced during site visit.

Methodology

Standard archaeological survey and recording methods were applied.

1. The proposed land was inspected on foot.
2. GPS points were taken and the surroundings and features were recorded on camera.

INVESTIGATION

The site proposed for the PV Solar installation on the farm Knapdaar 14, east of Springfontein, was inspected on 6 February 2012. Anton Roodt from the Roodt Partnership, Bloemfontein, took me to the site. At the farm we were directed by Mr. Staples, one of the land owners.

The CSIR has instigated the establishment of a number of solar farms to supplement the supply of electricity to the national power network. Solar power is considered a desirable energy producer without any adverse bi-products. The harnessing solar energy is relatively innocuous, compared to fossil fuel power production. It is also considered that most existing land use practices may continue with little interruption.

Photo voltaic (PV) cells will be mounted on frames placed above ground level. Rows of panels will be placed about 10m apart to allow for access during operation and maintenance. It is anticipated that minor surface related earthworks may have to be undertaken to accommodate the structures. The planning of the plant will provide for an access road, electricity distribution sub-station, offices, store rooms and ablution facilities. The installation will further include security fencing and lighting. Provision will also be made for a vehicle

parking area, a temporary construction camp and permanent staff accommodation.

The Iron Age archaeology of the Free State had been described by Maggs (1976) and was summarised by Dreyer (1996). Iron Age stone-walled sites are normally limited to the higher ground or hilly parts of the North and Eastern Free State and are not found in the low-lying open areas south of Bloemfontein.

Stone tools are likely to occur on these flat Karoo vegetation areas and along the foothills of mountains or against koppies and hills.

From previous Environmental Impact Assessments (EIA) in the Springfontein region, we have learnt that Anglo-Boer War remnants could be found in the vicinity of Springfontein. Some of the most possible finds could include fired cartridge shells and metal food containers displaying heavily soldered seams. Anglo-Boer War remains were found opposite the N1 and adjacent to the Kuilfontein farm stall (Dreyer 2010).

The area was examined for possible archaeological and historical material and to establish the potential impact on any cultural material that might be found. The Heritage Impact Assessment (HIA) is done in terms of the National Heritage Resources Act (NHRA), (25 of 1999) and under the Environmental Conservation Act, (73 of 1989).

The study aims to locate and evaluate the significance of cultural heritage sites, archaeological material, manmade structures older than 60 years, and sites associated with oral histories and graves that might be affected by the proposed developments. The study likewise aims to assess the potential impact on archaeological and historical material and to recommend specific mitigation measures to avoid the risk of any damage or destruction of the finds during the construction and operation of the proposed developments.

LOCALITY

The proposed site is located on the Remainder of the farm Knapdaar 14, near Springfontein, Free State. The farm is situated along the R715 turn-off from the N1 (Map 1) (Surveyor-General 1973).

The locality of the proposed development area is indicated on Map 2.

The land comprises a flat plain intersected by several flood water drainage lines. The vegetation is described as Semi-arid Karoo Grassland with shrubs and bushes between the koppies and ridges. The land is also traversed by the railway line, an official water pipe line (Fig.12) and several power lines (Figs.4&12).

The following GPS coordinates (Cape scale) were taken (3025BC&BD) (Map 4).

A	30°17'37"S 025°43'24"E Altitude 1481m (Fig.1).
B	30°17'00"S 025°44'57"E Altitude 1514m (Figs.2&3).
C	30°16'58"S 025°44'59"E Altitude 1514m (Figs.4&5).
D	30°16'34"S 025°45'32"E Altitude 1541m (Figs.6&7).
E	30°16'57"S 025°46'02"E Altitude 1544m (Figs.8&9).

RESULTS

FINDS

A single piece of a soldered tin canned milk container dating from the Anglo-Boer War (1899-1902) was found on the surface (Fig.13).

Over time the present farm house at Knapdaar (Fig.10) had been renovated and extended into a modern dwelling. It is alleged that the original farm house was used as a hospital by the British Military Forces during the Anglo-Boer War (1899-1902). Judging by the large size of the trees on the farm yard it is clear that the farm could be very old (Fig.11).

Gates which appears to be hand made by a smithy (Figs.14-16) protects the railway crossings on the farm. These features which bear witness of expert workmanship are of special interest, and should be protected and preserved in some way.

No other cultural and historical material or graves were found during the investigation, nor were there any stone tool material visible.

ASSESSMENT OF IMPACT

The land is traversed by a railway line, a water pipe line and several power lines.

The Anglo-Boer War finds are not considered as of much significance.

There will be no impact on any archaeological or heritage remains of the area.

RECOMMENDATIONS

I recommend that the planning of the proposed the PV Solar installation on the farm Knapdaar 14 outside Springfontein may proceed.

MITIGATION

No mitigation measures will be needed in this area of development.

ACKNOWLEDGEMENTS

I thank Anton Roodt from the Roodt Partnership, Bloemfontein, for taking me to the site.

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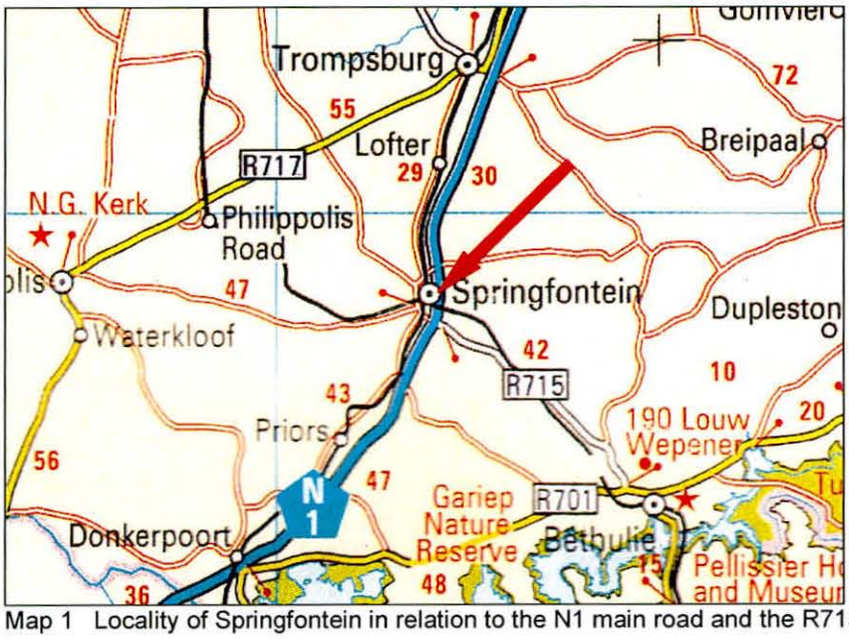
LIST OF ILLUSTRATIONS



Map 1 Locality of Springfontein in relation to the N1 main road and the R715 to Bethulie.

Map 2 Placing of the proposed developments on a land cover map of Knapdaar 14, Springfontein (3025BC).