Appendix G3 – Freshwater Impact Assessment

WATER USE LICENSE APPLICATION

Fresh Water Report

Proposed Visserspan Solar Plant V2.0

A requirement in terms of Section 21 (c) and (i) of the National Water Act (36 of 1998).

August 2021

EnviroAfrica

WATSAN Africa

Index

Abbreviations

Critical Biodiversity Area	CBA
Department of Environmental Affairs	DEA
Department of Environmental Affairs and Development Planning	DEA&DP
Department of Water and Sanitation	DWA
Ecological Importance	EI
Ecological Sensitivity	ES
Environmental Impact Assessment	EIA
Government Notice	GN
Metres Above Sea Level	masl
Megavolt	MV
National Environmental Management Act (107 of 1998)	NEMA
National Fresh Water Environment Priority Area	NFEPA
National Water Act (36 of 1998)	NWA
Present Ecological State	PES
Photovoltaic	PV
South Africa National Biodiversity Institute	SANBI
Water Use License Application	WULA

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1 Introduction

The Keren Energy Group is planning a solar plant for the generation of electricity on Visserspan near Dealesville in the Orange Free State. This is a large plant of photovoltaic cells that will eventually generate at least 400MV. The generated electricity will find its way into the national grid.

Mr Riaan van Rensburg of Keren Energy appointed Mr Bernard de Witt of Enviro Africa in Somerset West to conduct the EIA, as is required for such a development, in terms of the NEMA. The EIA is underway, with the mandatory advertisements published and the public participation process ongoing.

There is a wetland on the Visserspan property, that can be more closely defined as an NFEPA. In terms of the NWA, no development can take place within 500m of a wetland, unless official approval is granted. For this approval a WULA is required, including a completed Risk Matrix, it mandatory.

Subsequently Dr Dirk van Driel of WATSAN Africa in Cape Town has been appointed to produce the Freshwater Report to motivate the values that are to be assigned in the Risk Matrix. The Freshwater Reports is to include all of the elements that are required for informed decision-making by DWS and DEA officials.

Since impacts on the aquatic environment by similar plants have been rated as extremely low, it is expected that this Fresh Water Report will indicate that the plant at Dealesville should be given official go-ahead, having followed due procedures.

The PV power plant was divided into four units, each separate and independent. Four Freshwater reports were required, one for each of the units. Subsequently, these reports were produced and submitted. However, since these PV plants are on a single property, the DWS requires only one integrated Freshwater Report.

The first version of this Fresh Water Report was published in November 2019. A power line is to be added to the project, to connect the PV plant to the national power grid. A second version became necessary to make provision for this power line. The second version is dated August 2021.

As was the case with the PV plant on Visserpan, the power line project has gone through a public participation process (Figure 1).

The added power line crosses several properties. On some of these, the power line is closer than 500m to a wetland, for which a separate Freshwater Report will have to be produced, apart from the overall report that spans the whole of the project.

Figure 1 Public participation

2 Legal Framework

The proposed development "triggers" sections of the National Water Act. These are the following:

S21 (c) *Impeding or diverting the flow of a water course*

The proposed development is spanning the banks of a drainage line. The drainage line would be altered, should the development go ahead.

S21 (i) *Altering the bed, bank, course of characteristics of a water course.*

Some part of the proposed development will alter the characteristics of the banks of the drainage line.

Government Notice 267 of 24 March 2017

Government Notice 1180 of 2002. *Risk Matrix.*

The Risk Matrix as published on the DWS official webpage must be completed and submitted along with the Water Use Licence Application (WULA). The outcome of this risk assessment determines if a letter of consent, a General Authorization or a License is required.

Government Notice 509 of 26 August 2016

An extensive set of regulations that apply to any development in a water course is listed in this government notice in terms of Section 24 of the NWA. No development take place within the 1:100 year-flood line without the consent of the DWS. If the 1:100-year flood line flood line is not known, no development may take place within a 100m from a water course without the consent of the DWS. No development without official approval shall take place within 500m of a wetland.

Likewise, the development triggers a part of the National Environmental Management Act, NEMA, 107 of 1998).

The EIA Regulations of 2014 No.1 Activity 12 states that no development may take place within 32 m of a water course without the consent of the Department of Environmental Affairs and its provincial representatives. A part of the development is in the river and the river bed. Consequently, this regulation is relevant to this application.

3 Location

Figure 2 Visserspan Location

Visserspan is located on the central Orange Free State highveld approximately 70km to the north west of Bloemfontein on the R64 trunk road (Figure 2).

4 Quaternary Catchment

Dealesville is in the C91C quaternary catchment.

5 Vegetation

The vegetation has been classified as Vaal-Vet Sandy Grassland. This veldt type is endangered because of large-scale agriculture and grazing (see SANBI-BGIS report in the Appendix).

The area of the proposed development has been ploughed over before, is heavily utilized by farm animals and is not in a pristine condition.

6 Climate Dealesville

Dealesville normally receives about 357mm of rain per year, with most rainfall occurring mainly during summer (Figure 3). The chart below (lower left) shows the average rainfall values for Dealesville per month. It receives the lowest rainfall (1mm) in July and the highest (64mm) in March. The monthly distribution of average daily maximum temperatures (centre chart below) shows that the average midday temperatures for Dealesville range from 17°C in June to 30°C in January. The region is the coldest during July when the mercury drops to 0.2°C on average during the night.

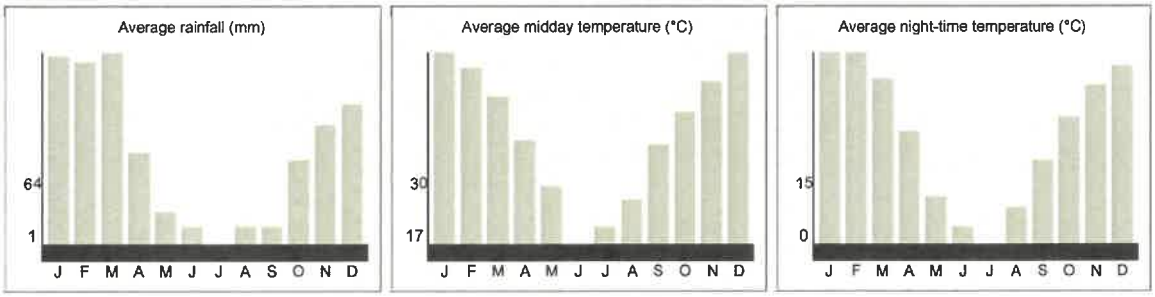

Figure 3 Dealesville Climate

According to Schultze & Maharaj (2018), the average annual evaporation rate in the Orange Free State demands to 2233mm. This outstrips the annual rainfall by more than 6 times. This adequately explains why the pans dry out so quickly.

7 The Pans

There are literally hundreds of pans in the central and western Orange Free State, varying from less than a hectare in size to over 3000ha. The water salinity in the pans vary from brackish to salty. The salt in some of these pans are commercially harvested. Geldenhuys (1982) gives a detailed account of the number, size and nature of the pans in the Orange Free State.

The pans are subject to varying rainfall. Reportedly, the larger pans around Dealesville were last full, with several metres of water, in 1988. The water remained for a year and longer but evaporated to give rise to the pans usual parched and arid state.

Since that time the pans received water of a couple of centimetres most years, that evaporated in the intense summer heat in a few short months, the hydroperiod mostly lasts from February to April.

These pans. From small to large, have been identified as NFEPA's and are valued by the South African environmental authorities as valuable. Likewise, the DWS value the pans as legitimate water resources. Development on and around these pans are subject to WULA's in terms of current legislation.

8 The Pan's Ecological Significance

When flooded, so is surmised, an entire ecology springs to life. Micro-algae (primary producers) reproduce rapidly in the nutrient-laden water to form a source of food for the microbial grazers (secondary producers) and a complicated chain of microbial predators, with macro-invertebrates at the top of the food chain. These may be dense clouds of swimming fairy shrimps (Crustacea, Anacostraca).

The pan dries up as suddenly as it flooded. As the last of the moist evaporates, the planktonic organisms perish, but leaving behind a wealth of spores and eggs. These sink into the soil, in among the cracks that typically develop in these drying pans, to sub- terraneously withstand the scorching temperatures of the harsh sun and the sub-zero temperatures of winter nights for months and even years on end.

These are very special organisms with highly adapted life cycles. They successfully survive in their dormant state under extreme conditions on the floor of the pan, ready to explode into life at the next flood event.

Salt pans in the western Free State where studied by Janecke *et al* (2003), but information about the riparian vegetation and specifically indicator species were not given.

The comprehensive work of McCulloch (2008) and his co-workers on Sua Pan in Botswana sets the standard for the scope and depth of the biological research that is

needed on the Free State pans for the facilitation of informed decision-making. It links the fluctuations of aquatic invertebrates in this saline pan to the change in salinity as the pan floods and subsequently dries out, as these pans do in arid regions. It can be expected that the aquatic fauna in the Orange Free State pans follows a similar pattern.

The community structures of pans on the Mpumalanga Highveld have been studied by Ferreira *et al* (2012). It was indicated that community structures are complex with a large number of species and that each of these pans is to a variable degree different from one another. It can be expected that the same level of uniqueness exists among the pans in the Orange Free State.

Australians have collected much more information on their ephemeral pans. As long ago as 1983 De Decker published an account on the vast body of basic research on Australia's saline pans.

(http://people.rses.anu.edu.au/dedeckker_p/pubs/120.pdf).

From this it is clear that the driver that sets the food web going when flooded is phytoplankton. This is followed by microbial grazers and planktonic predatory organisms on various trophic levels.

From then research developed into population dynamics. They determined that the number of predatory invertebrate species increases as flood water recedes and that more trophic levels are introduced into the food web. The food web becomes more complicated as the hydroperiod nears its end. Community structure is determined by the frequency of flooding and the depth of the pan.

There is no reason to believe that the population dynamics of the Free State pans is any different from that of the Australian situation. In order to assess any impact on the ecosystem is necessary this level of knowledge is available. Meanwhile the need to assess the pans of the Orange Free State remains and we will have to do with assumptions. Future research can prove these right or erroneous.

Most pans in South African are geographically isolated, with a long geological, zoogeographical and evolutionary history, each with a unique and current set of ambient climatological and other environmental circumstances and as a result with an expected high degree of endemism. Consequently, a myriad of species can be expected in each of these pans that are all worthy of conservation. Hence these pans can all rightly be branded as ecologically sensitive.

9 Origins of the Free State Salt Pans

De Klerk *et al* (2016) provides an account of the formation of pans in the Free State. There is no single theory that can explain the formation of pans, but a popularised version would probably put the very origins of a pan to the gathering of wild animals such as black wildebeest, blesbuck and other angulates that naturally occurred in the

area during historic times. These angulates gathered, huddle together, often at night, repeatedly in the same spot, as these animals do, to denude a patch of land from vegetation.

Another condition for the formation of pans is that the substrate must be sandy, loosened by animal hooves. Loose red sands abound in the central and western Free State.

The Free Sate is known for its fierce winds. The loose sands were easily removed, blown away. The pans grew as time went on.

These pans are mostly endorheic, only with an inflow of storm water during infrequent fierce and sudden summer thunderstorms, but with no way out. Salts leached out from the surrounding soils collected in the pans and as the water evaporated in subsequent dry periods and prolonged droughts, intense summer heat, suppressed the growth of vegetation and consequently promoted the growth of a dry salt pans with bare, flat bottoms.

These pans are up to this day strongly demarcated from its grassland surroundings, mostly without any discernible riparian vegetation.

10 Classification of Free State Pans

Geldenhuys (1982) classified the Free Sate pans

Bare pans
Sedge pans
Scrub pans
Mixed grass pans
Closed *Diplachne* pans
Open *Diplachne* pans

For the sake of this WULA, the classification of Geldenhuys is useful.

The groundwater level of some of these pans have been drawn down, probably because of groundwater abstraction for irrigation purposes. Blue gum trees have been planted around some of these pans, which evapotranspirated much of the groundwater, with the result that the groundwater table dropped. The trees that could not reach the lowered groundwater with their taproot died. The remaining trees are stunted. This is all too evident during site visits.

Consequently, bare pans regressed into sedge pans, then into scrub pans and from there into grass pans. Eventually these pans become grasslands that can hardly be distinguished from the surrounding areas.

Pans can evolve in both directions, from grassland into a bare pan and back from a bare pan into grassland. It seems as if the regression of a bare pans is because of human impact.

11 The Project

11.1 PV Plant

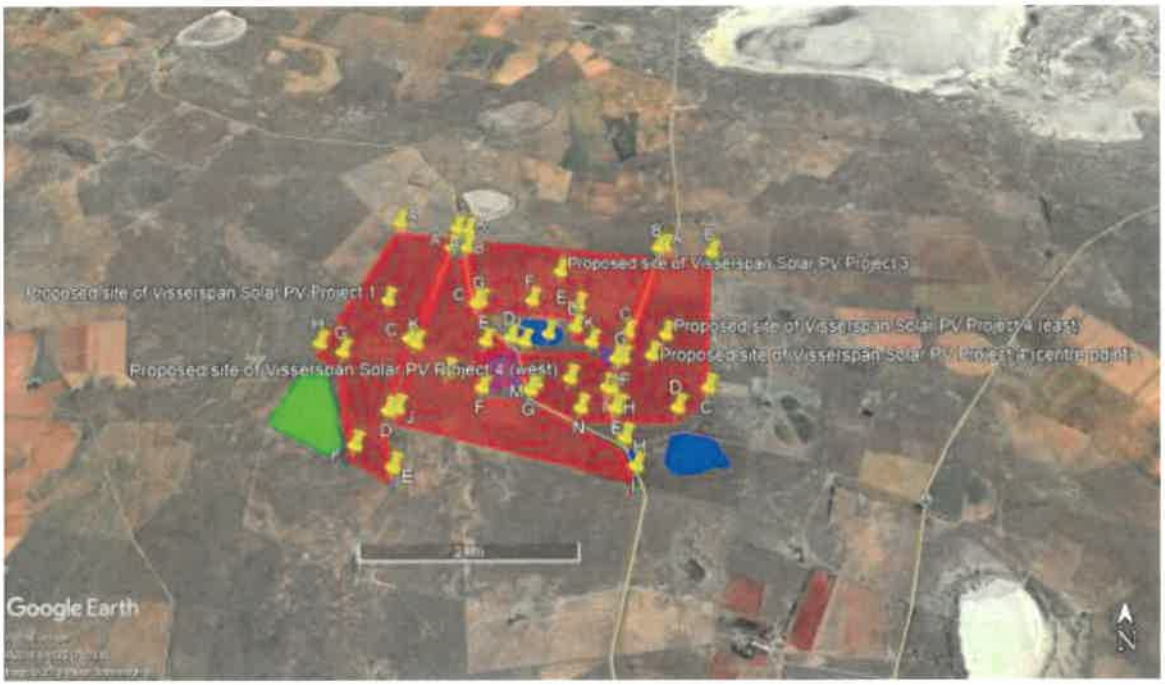

Figure 4 The PV Plant Project

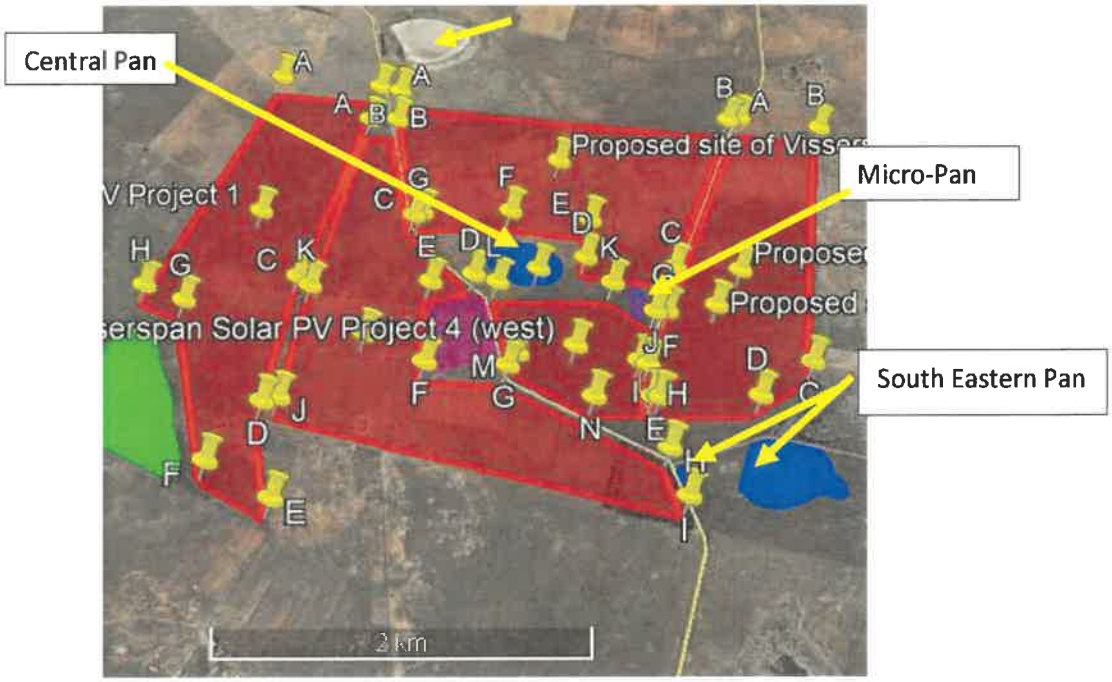

Figure 5 Enlarged Copy

Figure 5 is an enlarged copy to more clearly show the areas that have been placed around the spot that has been marked as a NFEPA on the SANBI BGIS webpage. This marked spot is excluded from the development. This spot will be surrounded by the fields of PV panels.

On the northern boundary as well as on the south-eastern corner of the PV plant, NFEPA's have been mapped. These are outside of the area that is to be developed.

Both of these NFEPA's are 100m and more away from the closest PV panel. However, they are a metre or more lower than the closest PV panel and it is likely that in there is any runoff, it will move in the direction of the NFEPA's. It is unlikely that runoff will ever reach the NFEPA's as the norther one in more than 450m away and the southwestern on is cut off by a road that is likely to divert the flow further south.

The central NFEPA in among the PV panels is likely to be affected by runoff from the developed area.

There is a very small bare pan in the south-eastern corner of the land that is to be excluded from the PV development. It is so small that it was termed a micro-pan. It is nevertheless marked as a separate NFEPA. A thick grass cover obscured this micro-pan from view during the site visit. This pan is most likely to be affected by runoff from the PV installation.

11.2 Power Line

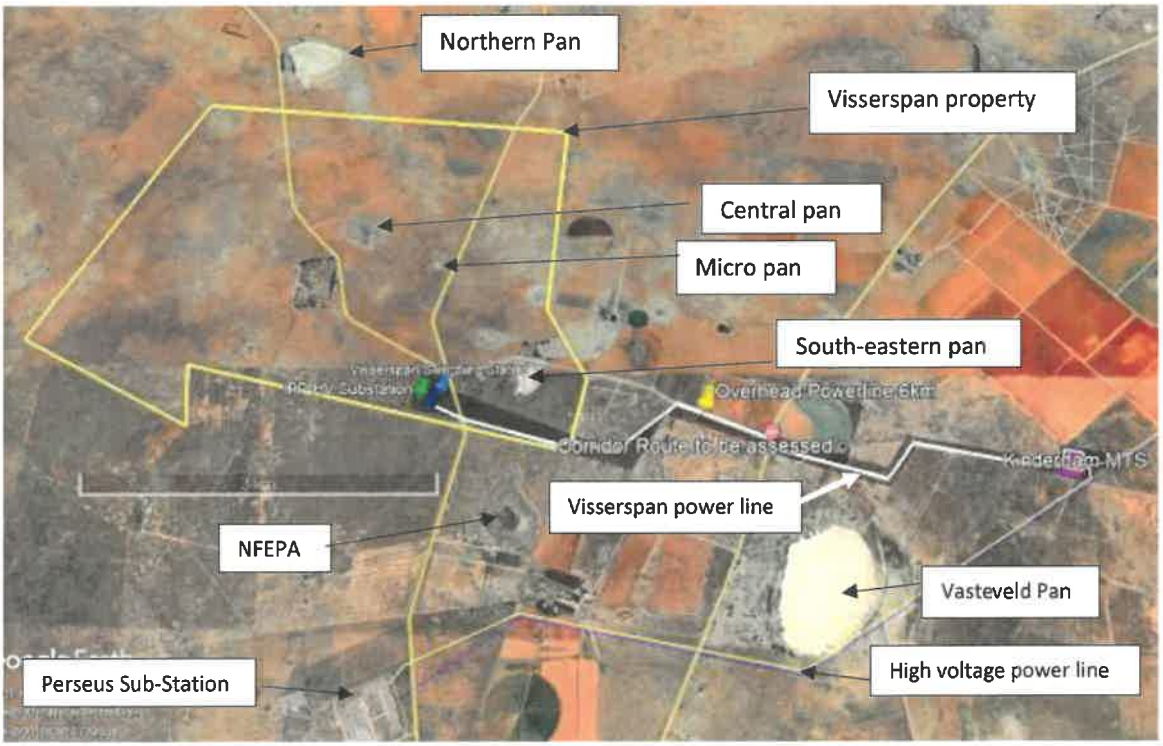

Figure 6 Power Line

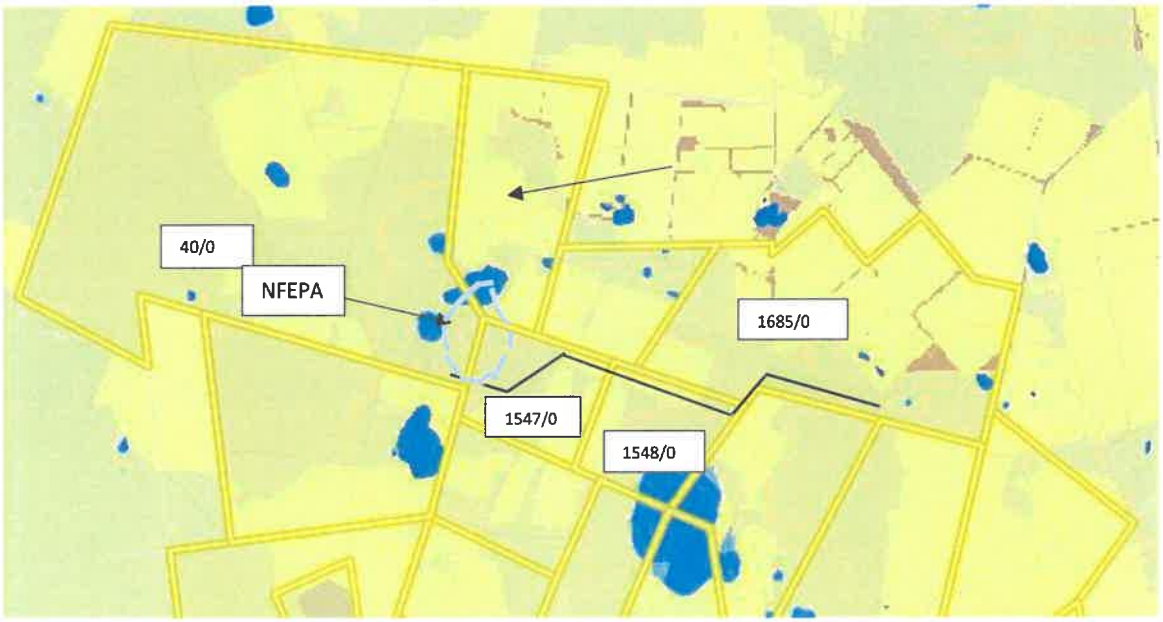

Figure 7 Power line properties

The power line connects the PV plant on Visserspan Farm to the national grid. The power line will stretch from the PV plant for 6km to the west over several properties to connect to the high voltage line to the west at Kinderdam Farm (Figure 6). The power line will, as far as possible, follow the boundaries of the farms, rather than crossing farmland (Figure 7).

12 The Visserspan Pans

12.1 Central Pan

The central pan, the one that is going to be surrounded by the PV panels, seemed to be a mixed grass pan (Figure 8), on the day of the site visit on 27 November 2019. There was no distinct margin, the floor was thickly overgrown with a variety of grasses, there was no barren patch of pan floor and was without any sedges or scrub.

A dolerite intrusion intersects the central pan, with only a couple of dolerite boulders and stones (Figure 9) on the ground's surface. Dolerite weathers into several fractions, the one being a Montmorillonite swelling clay. The central pan consists of this swelling clay (Figure 14), with obvious cracks because of the prolonged current drought.

The dolerite rock was conspicuously subject to long-term erosion, with outer layers peeling of like shells, which is often seen in dolerites.

The presence of this swelling clay is the reason for the existence of a mixed grass pan, without a barren patch, as the clay is too cohesive and heavy to be blown away by the Free State's stormy winds. The central pan developed into a consistent marshy area and not into a bare pan, as is evident in many places all over the western Free State.

The central pan was heavily grazed, with the grasses trimmed of short in most placed. There were lots of animal hooves imprints in the clay that has probably been there since the previous rainy season.

Figure 8 Central pan mixed grass

Figure 9 Dolerite

12.2 Northern Pan

The pan along the northern boundary can be classified as a bare pan, with a secondary tendency becoming a scrub pan. (Figure 6).

12.3 South-eastern Pan

This pan can be divided into two parts.

The southern part is a small bare pan (Figure 10).

The much larger separate northern part is in an advanced state of reverting back to grassland, with a stance of stunted blue gum trees advancing the process. During the August 2021 site visit, it was well overgrown with grass, with little pan signs apart from a topographical depression (Figure 11).

Figure 10 South-eastern bare pan

Figure 11 Upper part of the south-eastern pan

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Judging from the termite mounds, the grassland status has been established years ago, if not decades ago.

12.4 Vasteveld Pan

Some of the pans have names, as indicated on Google Earth. By lack of a name, it was dubbed Vasteveld Pan, after the property on which a part of it is located. The pan is approximately 365m to the south of the envisaged connecting power line (Figure 12) is a large bare pan. It covers and are of 67ha and has a circumference of 3.1km.

The pan is on an elevation of 1260masl. The pan is level, as pans are, with the flow from east to west, as the eastern bank is 10m higher than the floor of the pan and the western bank 3m lower. Slopes are gentle. The eastern shore is marked with a band of what resembles a series of small deltas, a result of the transported and deposited sediments from the higher ground on the east (Figure 12).

12.5 Altered NFEPA

An NFEPA is indicated on the SANBI BGIS webpage approximately 300m south of the proposed power line (Figure 13). This alleged wetland was photographed from many angles during the August 2021 site visit. At this point in time, apart from an indication of Google Earth of a depression, nothing remains. It has been altered into farmland. Hence, it is omitted from any further discussion, as the proposed power line cannot possibly have any further deleterious impact.

Figure 12 Vasteveld Pan

Figure 13 Altered NFEPA

12.6 Other wetlands

Three very small wetlands are indicated on the SANBI BGIS map on Farm Kinderdam 1685/0 (Figure 7). During the August 2021 site visit, these were overgrown with tall grass and were not observed.

13 Central Pan Wetland

The central pan is named a NFEPA wetland. The question now arises if this is a wetland that can be verified with ground truthing observations.

Figure 14 Dry clayey soil with cracks

According to the DWS webpage, wetland can be demarcated according to the following criteria:

Wetness
Landform
Hydromorphic soils
Vegetation

During the site visit, the central pan was bone dry, with drought-parched soils, that was at the time of the site visit, starting to be most worrisome. Although the land has been prepared, no grain has been planted yet in the entire district.

The central pan is shallow, with only a slight incline towards the boundaries, perhaps a metre, but little more, on a flat landscape. There was no incurrent stream. There was no flow out of the pan. This is an endorheic pan without any form of channel. The featureless landform did not suggest that there should be a wetland. Its catchment area was limited, small. Roundtree *et al* (2008) would classify as a "depression".

It was obvious that soils were saturated the previous season, judging from the cracks in the clayey soils (Figure 14). These were obviously hydromorphic soils, verifying its wetland status. This was in contrast with the August 2021 site visit, following good rains, when cracks were less obvious.

No test holes were dug to look for mottles, as are present in hydromorphic soils. Instead, a handy test hole was provided by an aardvark, of which there are plenty in the district. The burrow was approximately 800mm deep, on one side of which was a discernible brown-red mottle (Figure 15), re-affirming the presence of temporary wetland conditions in hydromorphic soils.

There was no indication of any wetland indicator plants, no sedges or rushes.

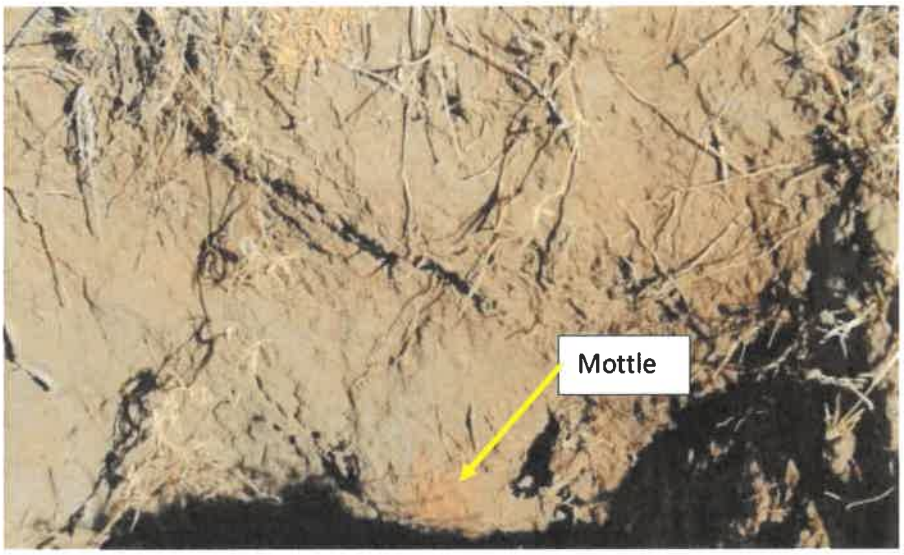

Figure 15 Mottle in hydromorphic soil

14 Central Pan Catchment Area

The central pan is roughly demarcated in Figure 16, according to the faint difference in the pan's grasses and that of the surrounding area. The central pan is approximately 6ha in size, with a circumference of 980m.

The pan's catchment area can be demarcated by connecting the highest points around the pan with Google Earth's polygon function. The pan's elevation is 1284masl. The

catchment's northern and western boundary is at 1290masl to 1291masl and the southern and south-western boundary at only one metre higher than the pan at 1285masl.

The catchment is 83ha in size, with a circumference of 3.7km.

Note the bare micro-pan to the south-west of the central pan. This micro-pan was not observed during the site visit, as the area was densely overgrown with grasses. The Google Earth image was taken on 5/9/2018. Nevertheless, reportedly the micro-pan was still present and it is included in the NFEPA. It was cut out from the area that is to be developed (Figure 5).

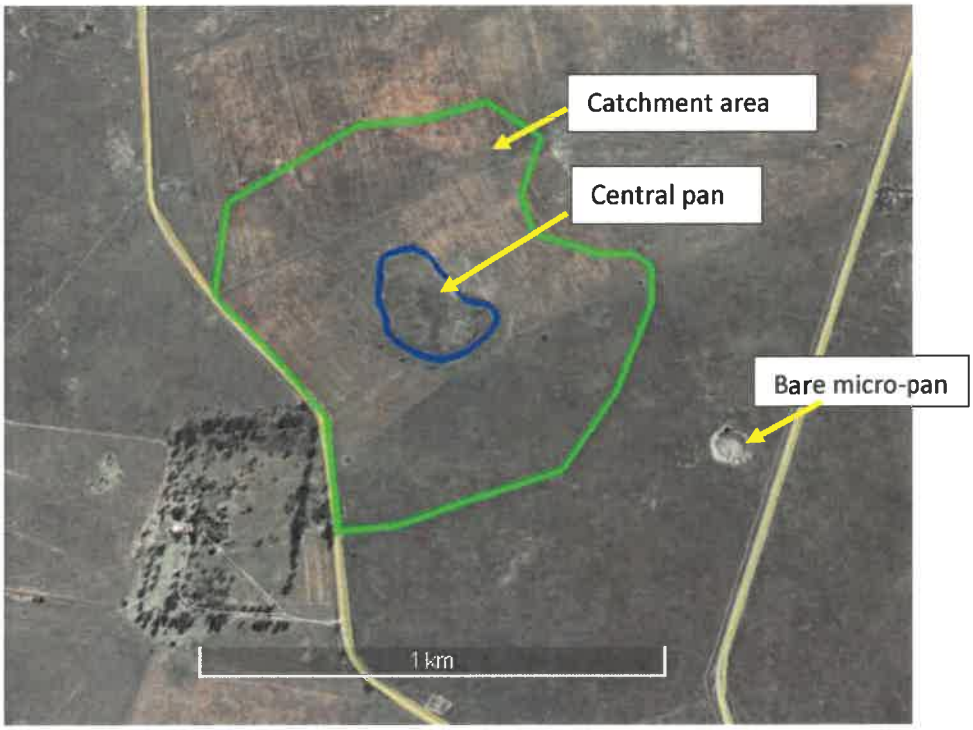

Figure 16 Central pan & catchment

15 Possible Impacts

Dickens *et al* (2003) lists a number of possible impacts on wetlands. The possible listed impacts of proposed PV installation on the central pan and adjacent bare micro-pan are discussed as follows:

Flow modification

The panels act like hard surfaces. The ground between the panels remains unpaved. Apart from the concrete anchors of the panel's upright supports, the runoff and the penetration of rainwater will not be affected. It is therefore not expected that the flow into the central pan will be modified.

The access roads will create preferential flow paths. This should be prevented by proper drainage infrastructure around all of the roads in and around the PV units.

There already is a flow modification with the current roads and paths in and around the central pan and its catchment.

The flow in and around the central pan and the catchment area has already been modified because it has been ploughed over.

Permanent inundation

The PV panels and other infrastructure will not dam the flow of storm water. No pooling or damming will occur on the entire PV installation. The inundation regime will not be affected.

Water quality modification

The PV panels are to be regularly cleaned from time to time. The panels are washed with water according to a schedule and standard operating procedures. It is not foreseen that the washing of the PV panels will result in any runoff. For this the volume of wash water is too little and the evaporation rate too high. No detergents of chemicals will be released into the central pan area, not on the short or longer term.

Sediment load modification

Soil will be disturbed during the construction phase and it is possible that storm water can wash sand and mud into the central pan area. Construction of access roads can contribute to the mobilisation of sediments. The construction time frame spans over many months and cannot practically be limited to the dry season. It is therefore necessary that measures are taken to prevent the washing of sediments into the central pan area, such as immediate stabilisation and rehabilitation of disturbed areas.

Canalization

The access roads can create preferential flow paths. No canals of other storm water infrastructure are required on the construction site. Moreover, none of this infrastructure is to be allowed in the central pan area.

Topographic alteration

The PF installation is not about to alter the topography of the landscape in any way.

Terrestrial encroachment

The central pan is already overgrown with terrestrial grasses. The PV installation will not add to any further encroachment.

Indigenous vegetation removal

The PV installation will not remove any of the existing vegetation in the central pan area. There is no sign of the maize and wheat that was there when the area was cultivated. It has all been replaced with indigenous grasses.

Invasive vegetation encroachment

Invasive vegetation will be controlled on the PV installation site as an ongoing standard operating procedure.

Alien fauna

At present the original wild angulates are replaced with cattle. The one positive change will be that livestock will not be permitted to graze on the site of the PV installation.

Over-utilization

The central pan area is currently utilized as cattle grazing but does not seem to be overly grazed. The vegetation was dry during the site visit, but in a reasonable condition. There will be no utilization at all once the installation is up and running.

Isolation

The one aspect that is added to the list is isolation. In theory only large mammals will be kept out of the central pan area, while small mammals, reptiles and birds can move freely in and out of the central pan area. In practice, the large-scale PV installation will probably be intimidating, preventing or at least limiting most faunal movement in and out of the pan.

Ground water table

Water for the construction and operation of the envisaged PV plant will be sourced from boreholes on the property. Eight of these boreholes have been located. Some

are equipped with windmills. Currently, Visserspan is not connected to the national electricity grid.

During the construction phase, 10 500m^3 of water per year will be required. In the years to follow, when operational, the PV plant will only require 2 100m^3 of water per year from these boreholes. This is much less than the groundwater yield and much less than can be generally authorized.

The envisaged PV plant will do much less towards the lowering of the groundwater table and subsequent dehydration of wetlands than irrigation or large-scale farming.

Waste

Portable toilets will be serviced by a reputable company and wastewater will be discharged in the municipal wastewater treatment works. Litter will be collected in household wheelie bins and it will be disposed of on the municipal waste disposal site. These housekeeping issues will not be allowed to have any impact on the natural environment at Visserspan.

16 Present Ecological State

The PES is a protocol that have been produced by Dr Neels Kleynhans (Table 1 and 2) in 1999 of the then DWAF to assess river reaches. Another slightly different protocol has been devised for wetlands, very much along the same principles and contents than that of rivers. It was decided to use the familiar format for rivers is this instance.

The scores given are solely that of the practitioner and are based on expert opinion.

The riparian zone is seen as the 5 to 10 meter-strip of catchment directly around the central pan.

Table 1 Habitat Integrity according to Kleynhans, 1999

Category	Description	% of maximum score
A	Unmodified, natural	90 – 100
B	Largely natural with few modifications. A small change in natural habitats and biota, but the ecosystem function is unchanged	80 – 89
C	Moderately modified. A loss and change of the natural habitat and biota, but the ecosystem function is predominantly unchanged	60 – 79
D	Largely modified. A significant loss of natural habitat, biota and ecosystem function.	40 – 59
E	Extensive modified with loss of habitat, biota and ecosystem function	20 – 39
F	Critically modified with almost complete loss of habitat, biota and ecosystem function. In worse cases ecosystem function has been destroyed and changes are irreversible	0 - 19

Table 2 Present Ecological State of the Central Pan

Instream	Score	Weight	Product	Maximum score
Water abstraction	25	14	350	350
Flow modification	23	13	299	325
Bed modification	24	13	312	325
Channel modification	24	13	312	325
Water quality	24	14	336	350
Inundation	24	10	240	250
Exotic macrophytes	22	9	198	225
Exotic fauna	5	8	40	200
Solid waste disposal	25	6	150	150
Total		100	2237	2500
% of total			89.5	
Class			B	
Riparian				
Water abstraction	25	13	325	325
Inundation	24	11	264	275
Flow modification	23	12	276	300
Water quality	24	13	312	325
Indigenous vegetation removal	19	13	247	325
Exotic vegetation encroachment	23	12	276	300
Bank erosion	24	14	336	350
Channel modification	24	12	288	300
Total			2324	2500
% of total			93.0	
Class			A	

It is with reluctancy that the central pan and surrounds is classified as "B" for instream and "A" for riparian since the place was ploughed over before. Apart from the faint lines of ploughed furrows that are visible on Google Earth, there is little if any evidence on the ground that the place was ploughed over before. It certainly looks natural.

It can be expected that the construction and long-term operation of the PV installation will cause a downgrade, if not with a category, then with a lowered score.

Table 3 Present Ecological State of the Northern Bare Pan

Instream	Score	Weight	Product	Maximum score
Water abstraction	25	14	350	350
Flow modification	24	13	312	325
Bed modification	24	13	312	325
Channel modification	24	13	312	325
Water quality	24	14	336	350
Inundation	24	10	240	250
Exotic macrophytes	15	9	135	225
Exotic fauna	5	8	40	200
Solid waste disposal	25	6	150	150
Total		100	2017	2500
% of total			81.5	
Class			B	
Riparian				
Water abstraction	25	13	325	325
Inundation	24	11	264	275
Flow modification	24	12	288	300
Water quality	24	13	312	325
Indigenous vegetation removal	23	13	299	325
Exotic vegetation encroachment	15	12	180	300
Bank erosion	24	14	336	350
Channel modification	24	12	288	300
Total			2292	2500
% of total			91.7	
Class			A	

Perhaps the high score of a B for instream and A for riparian is not quite realistic, as the area is grazed by farm animals such as cattle and sheep. Nevertheless, the pastures were in a reasonable shape, despite of the drought.

It is not foreseen that the PV installation will alter the classification of the northern bare pan, as it is too far away and the runoff will be too small.

Table 4 Present Ecological State of the South-Eastern Bare Pan

Instream	Score	Weight	Product	Maximum score
Water abstraction	25	14	350	350
Flow modification	18	13	234	325
Bed modification	24	13	312	325
Channel modification	24	13	312	325
Water quality	24	14	336	350
Inundation	24	10	240	250
Exotic macrophytes	18	9	162	225
Exotic fauna	5	8	40	200
Solid waste disposal	25	6	150	150
Total		100	2136	2500
% of total			85.4	
Class			B	
Riparian				
Water abstraction	25	13	325	325
Inundation	24	11	264	275
Flow modification	18	12	216	300
Water quality	24	13	312	325
Indigenous vegetation removal	23	13	299	325
Exotic vegetation encroachment	18	12	216	300
Bank erosion	24	14	336	350
Channel modification	24	12	288	300
Total			2256	2500
% of total			90.2	
Class			A	

Only the bare pan has been assessed. The larger, separated grown-over pan was not included as any more impacts can hardly deprive it any more from its pan status.

The south-eastern bare pan is located closer to roads and the flow because of these roads have been modified. The runoff from the PV installation will probably never reach the pan as the runoff will be diverted away from the pan by the road. The presence of the installation will hardly have an effect on the pan.

For the rest the situation is much same as with the northern pan (Table 4).

Table 5 Present Ecological State of the Vasteveld Bare Pan

Instream	Score	Weight	Product	Maximum score
Water abstraction	25	14	350	350
Flow modification	16	13	208	325
Bed modification	24	13	312	325
Channel modification	24	13	312	325
Water quality	22	14	308	350
Inundation	24	10	240	250
Exotic macrophytes	18	9	162	225
Exotic fauna	10	8	80	200
Solid waste disposal	25	6	150	150
Total		100	2122	2500
% of total			84.9	
Class			B	
Riparian				
Water abstraction	25	13	325	325
Inundation	24	11	264	275
Flow modification	18	12	216	300
Water quality	24	13	312	325
Indigenous vegetation removal	20	13	260	325
Exotic vegetation encroachment	18	12	216	300
Bank erosion	23	14	322	350
Channel modification	24	12	288	300
Total			2203	2500
% of total			88.1	
Class			B	

This assessment is indicated because of the passing of the power line some 350 to the north.

The land to the east of the pan has been ploughed over, probably to grow maize. Currently it is overgrown with indigenous grasses. Cattle has been noticed on the property, along with game such as blesbuck, which is indigenous to the region. There were springbuck as well. This was taken into consideration when assessing the pan, particularly the riparian part.

It is not foreseen that the power line will have anu effect on the PES score of this bare pan.

Table 6 PES summary

Pan	Pan floor	Riparian
Northern bare pan	B	A
Central pan	B	A
South-eastern bare pan	B	A
Vasteveld bare pan	B	B

The scores are similar because the impacts are the same (Table 6). Except for the Central Pan, it is not foreseen that the classification will change because of the impacts from the PV plant and the associated power line. That of the Central Pan will probably lower because of the impact from the surrounding PV plant.

17 Ecological Importance

The Ecological Importance (EI) is based on the presence of especially fish species that are endangered on a local, regional or national level (Kleynhans, 1999, Table 7).

There are no indigenous fish in the central pan and surrounds, as there is no permanent water. Likewise, no surface water was detected upstream of the site According to this assessment, which is prescribed for WULA's, the site and surrounds are not important.

No other endangered species, either plant or animal, were detected in or near the drainage line, apart from the most important situation that the vegetation type has been classified as endangered. From this perspective every unimpacted patch of land is most important and calls for preservation. This land has been ploughed over before.

Table 7. Ecological Importance according to endangered organisms.

Category	Description
1	One species or taxon are endangered on a local scale
2	More than one species or taxon are rare or endangered on a local scale
3	More than one species or taxon are rare or endangered on a provincial or regional scale
4	One or more species or taxa are rare or endangered on a national scale (Red Data)

The northern and south-eastern bare pans probably as well as the Vasteveld bare pan are, as has been stated before, each unique in their ecological functioning, but to an unknown and yet to be researched degree. It is not understood what will be lost if the pans were to be impacted. From this angle the bare pans are ecologically important, taking the precautionary principal into account.

18 Ecological Sensitivity

Ecological Sensitivity (ES) is often described as the ability of aquatic habitat to assimilate impacts. It is not sensitive if it remains the same despite of the onslaught of impacts. Put differently, sensitive habitat changes substantially, even under the pressure of slight impacts.

The Ecological Sensitivity also refers to the potential of aquatic habitat to bounce back to an ecological condition closer to the situation prior to human impact. If it recovers, it is not regarded as sensitive.

The central pan, once a maize field, has bounced back to a state very much closer to its original, unimpacted state. In this respect it is not considered to be sensitive. Likewise, if the PV installation is to be removed, whenever in the distant future, when a new technology yet to be discovered renders PV installations redundant, the central pan would probably recover, given that the landscape still retains its current characteristics.

It has already been stated that the northern and the south-eastern bare pans as well as the Vasteveld bare pan are ecologically highly sensitive.

19 Impact Assessment

The impact assessment is required for the EIA and will be included in the EIA documentation. The impact assessment follows a predetermined methodology (Table 8). The criteria and the description for scoring the impacts during the successive phases of the PV development are listed in the appendix.

This assessment is focussed on the Central Pan and the South-eastern Bare Pan. It is not foreseen that the PV plant and its associated power line will have any impact on the Northern Pan and the Vasteveld Bare Pan at all. These pans were therefore excluded from this assessment.

Table 8 Impact Assessment

Description of impact
Construction of the PV Installation
Construction of access roads

Impact
Sediments in central pan

Mitigation measures
Keep sediments out of central pan
Construct storm water diversion infrastructure
Keep construction footprint within designated area

Type Nature	Spatial Extent	Severity	Duration	Significance	Probability	Confidence	Reversibility	Irreplaceability
Without mitigation								
Negative	Site specific	High	Short term	Low	Probable	Certain	Reversable	Replaceable
With mitigation measures								
Negative	Site specific	Low	Short term	Very Low	Unlikely	Certain	Reversible	Replaceable

Description of impact
Operation of the PV Installation

Impact
Runoff and wash water in the central pan

Mitigation measures
Keep runoff out of the central pan
Prevent wash water from polluting central pan

Type Nature	Spatial Extent	Severity	Duration	Significance	Probability	Confidence	Reversibility	Irreplaceability
Without mitigation								
Negative	Site specific	High	Long term	Low	Probable	Certain	Reversable	Replaceable
With mitigation measures								
Negative	Site specific	Low	Long term	Very Low	Unlikely	Certain	Reversible	Replaceable

Description of impact
Maintenance of the PV Installation

Impact
Repair defect solar panels

Mitigation measures
Rubble in aquatic environment, central pan

Type Nature	Spatial Extent	Severity	Duration	Significance	Probability	Confidence	Reversibility	Irreplaceability
Without mitigation								
Negative	Site specific	High	Long term	Low	Probable	Certain	Reversable	Replaceable
With mitigation measures								
Negative	Site specific	Low	Long term	Very Low	Unlikely	Certain	Reversible	Replaceable

Description of impact
Maintenance of the PV Installation

Impact
Runoff in northern and south-eastern bare pans

Mitigation measures
Prevent runoff from PV installation from entering bare pans

Type Nature	Spatial Extent	Severity	Duration	Significance	Probability	Confidence	Reversibility	Irreplaceability
Without mitigation								
Negative	Site specific	Low	Long term	Low	Unlikely	Certain	Reversable	Replaceable
With mitigation measures								
Negative	Site specific	Very low	Long term	Very Low	Unlikely	Certain	Reversible	Replaceable

The mitigation measures boil down to good management, vigilance and foresight. They are readily implementable and stand a good chance of being successful. The central pan area will prevail, as it is today, despite of the presence of a large-scale PV installation.

20 Numerical Significance

Decision-makers often press on a numerical score for Significance, in this event the significance of the impact that the sinking of the new borehole had on the local and regional aquatic environment. This evaluation is an attempt to put a numerical value to an Impact Assessment. The score takes into consideration both the environmental value of the site and the degree of impact.

Table 28.3, p57, Appendix provides a system for allocation values for each of the parameters Conservation Value, Extent, Duration, Severity and Likelihood with regard to possible impacts on the aquatic environment. These values are then entered into the equation on p58 to derive at a value for Significance. The value for Significance can subsequently be evaluated according to Table 81.3.2.

Table 25.4.2 provides a yardstick for decision-making to allow or disallow a development with its concomitant impact on the aquatic environment.

The scores that were given are entirely those of the specialist, based on his or her knowledge and experience. These scores form a bases for debate and consensus, should contemporaries and decision-makers wish to add to the process.

The scores apply under the assumption that mitigation measures will be in place.

Central Pan

The impact under discussion is solely that of the construction and operation of the proposed PV plant on the central pan.

The scores given were as follows:

Table 9 Significance Score Central Pan

Parameter	Score
Conservation value	1
Likelihood	5
Duration	5
Extent	1
Severity	1
Significance	12

The score is insignificant, because of the low intrinsic conservation value of the pan and the low impact nature of the PV plant. Keeping cattle out would probably benefit the ecological condition.

Bare Pans

Table 10 Significance Score of the Bare Pans Combined

Parameter	Score
Conservation value	3
Likelihood	1
Duration	5
Extent	1
Severity	1
Significance	24

The score was set as "Medium to Low", which does not provide adequate reason for disallowing the project.

21 EISC

The DWS demand that wetland be placed in a category according to the EISC methodology (Table 13). The EISC is one of the essential items that is required for the Risk Matrix.

Table 11 EISC for the Central Pan

Determinant	Score	Confidence
Rare and endangered species	0	4
Populations of unique species	0	3
Species / Taxon richness	2	3
Diversity of habitat	1	4
Migration Route/ Breeding and feeding site for wetland species	1	4
Sensitivity to water quality changes	1	4
Flood storage, energy dissipation, particulate / element removal	1	4
Protection status	1	4
Ecological integrity		
Average	0.9	4

Table 12 EISC for the Bare Pans combined

Determinant	Score	Confidence
Rare and endangered species	3	3
Populations of unique species		3
Species / Taxon richness	3	2
Diversity of habitat	1	4
Migration Route/ Breeding and feeding site for wetland species	1	4
Sensitivity to water quality changes	3	3
Flood storage, energy dissipation, particulate / element removal	1	4
Protection status	3	3
Ecological integrity		
Average	2.25	3.25

The classification for the Central Pan was set as "Low".

Score guideline:

Very High 4, High 3, Moderate 2, Low 1, None 0

Confidence Rating

Very High 4, High 3, Moderate 2, Low 1

The EISC can then be determined in Table 6, according to the score of Table 5.

The classification for the Central Pan was set as a "D". This pan is ecologically not important.

To the contrary, for the bare pans, the classification was set as a "B". Once scientific research proves that there are invertebrate species new to science, as there often are in these isolated pans with their specific environmental characteristics, the classification will move to an "A".

Table 13 EISC for biotic and habitat determinants

EISC	Range of median	Recommended Ecological Management Class
Wetlands that are considered to be ecologically important and sensitive on a national or even international scale	>3 ≤ 4	A
Wetlands that are considered to be ecologically important and sensitive	>2 ≤ 3	B
Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale	>1 ≤ 2	C
Wetlands that are not ecologically important and ecologically important on any sale	>0 ≤ 2	D

22 Risk Matrix

The assessment was carried out according to the interactive Excel table that is available on the DWS webpage. Table 14 is a replica of the Excel spreadsheet that has been adapted to fit the format of this report. The numbers in Table 14 (continued) represent the same activities as in Table 7, with sub-activities added.

The original risk assessment as on the DWS webpage has been submitted on the eWULAA on-line system.

This assessment has been designed to assist in the decision if a General Authorisation or a License is required, should the development be allowed.

The risk assessment covers the same impacts as that of the Impact Assessment.

For the risk assessment it is assumed that all mitigation measures are in place.

Table 14 Risk Matrix

No.	Activity	Aspect	Impact	Significance	Risk Rating
1	Construction of PV installation	Digging of holes for anchors Construction of roads	Sediments in aquatic habitat	24	Low
2	Operation of PV installation	Wash water in central pan and northern bare pan	Pollutants in aquatic habitat	24	Low
			Loss of current ecological integrity	24	Low
3	Operation of PV installation	Runoff in northern and south-eastern bare pans	Downgrading of aquatic environment	24	Low
4	Maintenance of PV installation	Rubble in aquatic environment			

Table 14 Continued Risk Rating

No	Flow	Water Quality	Habitat	Biota	Severity	Spatial scale	Duration	Conse-quence
1	1	1	1	1	1	1	1	3
2	1	1	1	1	1	1	1	3
3	1	1	1	1	1	1	1	3
4	1	1	1	1	1	1	1	3

No	Frequency of activity	Frequency of impact	Legal issues	Detection	Likelihood	Significance	Risk Rating
1	1	1	5	1	8	24	Low
2	1	1	5	1	8	24	Low
3	1	1	5	1	8	24	Low
4	1	1	5	1	8	24	Low

There is not going to be any impact if the mitigation measures are properly implemented, so the frequency of the activity and frequency of impact cannot be rated as high (score of 3 to 5). This renders the risk rating as very low. A score of 24 is the lowest score that possibly can be given, given the machinations of the scoring system.

This speaks to the nature of the development, a PV installation, which is by its nature a low to very low impact activity.

It can be confidently recommended that a General Authorization should be issued. A License is not necessary.

23 Resource Economics

The goods and services delivered by the environment, in this case the Visserspan central pan and associated bare micro-pan, is a Resource Economics concept as adapted by Kotze *et al* (2009). The methodology was designed for the assessments of wetlands, but in the case of the drainage line the goods and services delivered are particularly applicable and important, hence it was decided to include it in the report.

The diagram (Figure 17 and 18) is an accepted manner to visually illustrate the resource economic footprint the drainage line, from the data in Table 15.

The size of the star shape is an indication of the central pan and associated very small bare pan value. The star shape is small and therefore it cannot be regarded as important for the rendering of goods and services. It is unlikely to attract the attention of the decision-makers, who are looking for larger star shapes.

The construction of the PV installation is not likely to subtract from the goods and services that the pan is currently rendering.

Table 15. Goods and Services

Goods & Services	Central Pan Score	Bare Pans Score
Flood attenuation	3	2
Stream flow regulation	3	2
Sediment trapping	2	0
Phosphate trapping	2	1
Nitrate removal	2	1
Toxicant removal	2	1
Erosion control	2	1
Carbon storage	1	0
Biodiversity maintenance	2	4
Water supply for human use	0	0
Natural resources	0	0
Cultivated food	3	0
Cultural significance	0	0
Tourism and recreation	0	0
Education and research	2	3

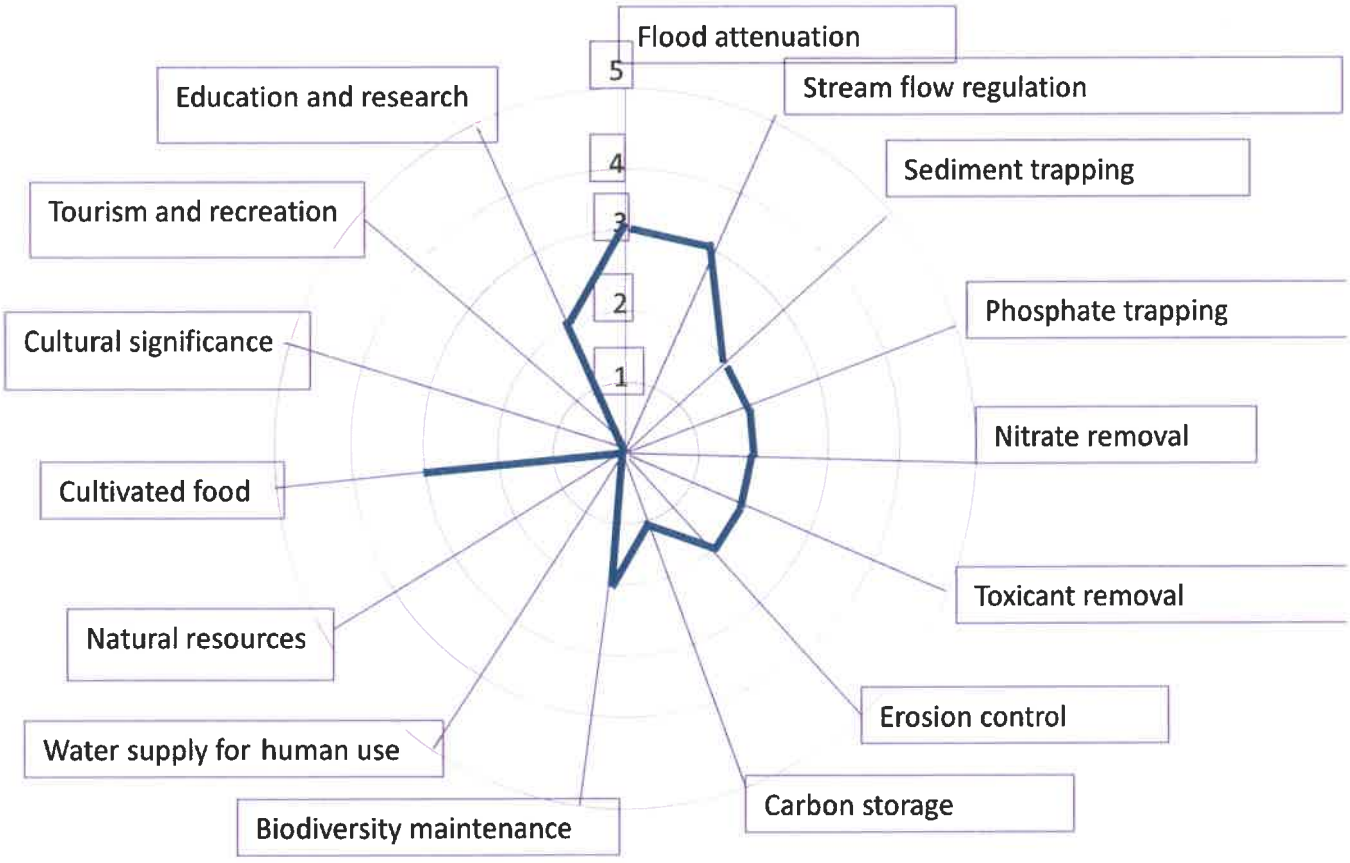

Figure 17. Resource Economics Footprint of the Visserspan central pan

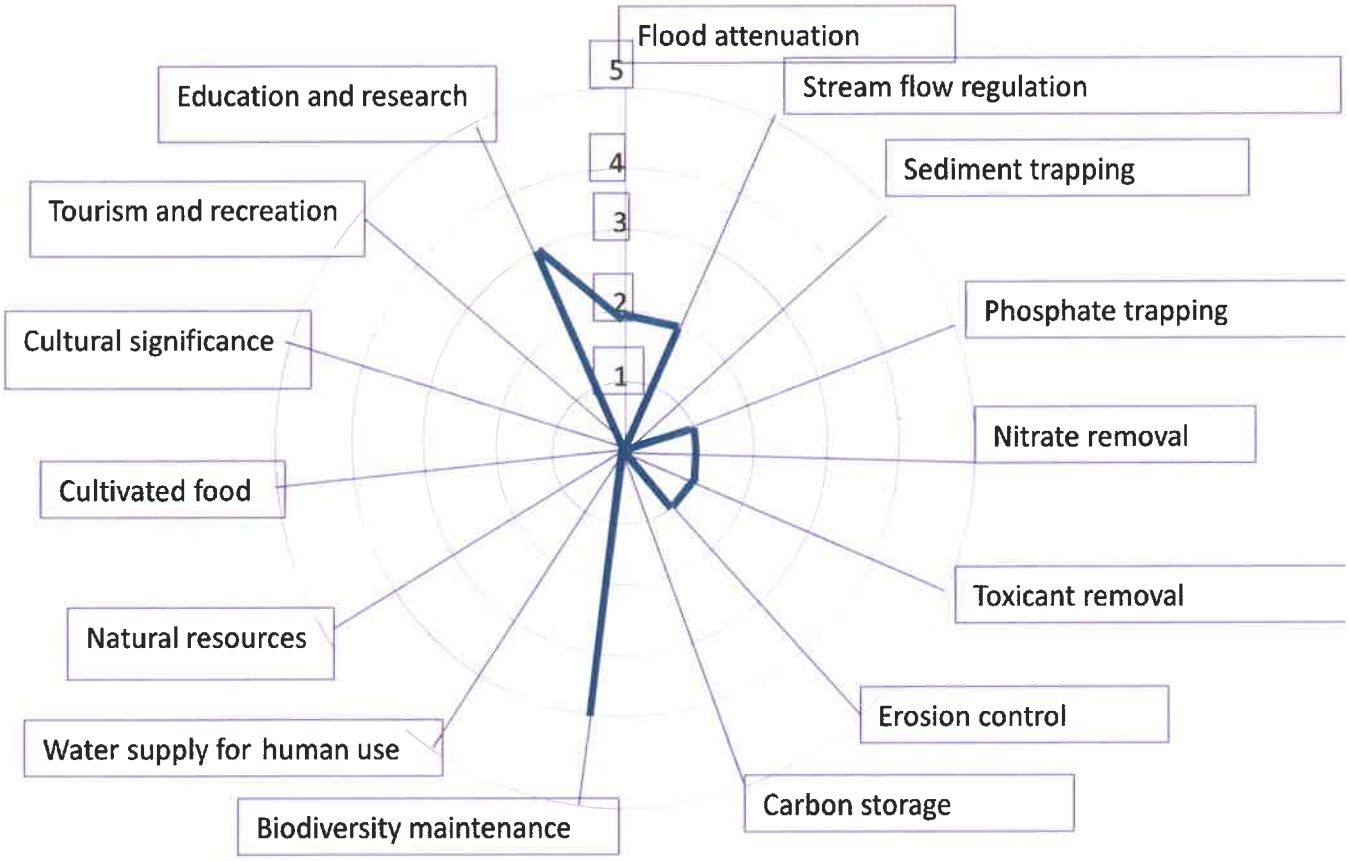

Figure 18. Resource Economics Footprint of the Visserspan and Vasteveld Bare Pans combined

24 Conclusions

An anthropogenic activity can impact on any of the ecosystem drivers or responses and this can have a knock-on effect on all of the other drivers and responses. This, in turn, will predictably impact on the ecosystem services (Figure 19). The WULA and the EAI must provide mitigation measured for these impacts.

Figure 19 has been adapted from one of the most recent DWS policy documents.

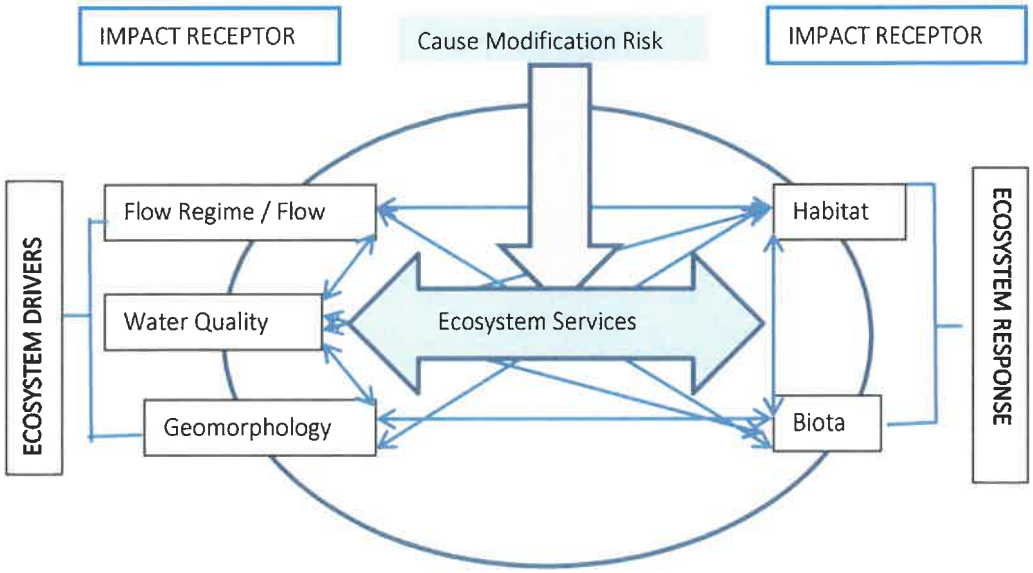

Figure 19 Minimum Requirements for a S21(c) and (i) Application

The ecological driver of the central pan is the summer rain that comes infrequently in electric thunderstorms. The pan's hydromorphic soils swell out with moisture and retains it for a longer period of time, perhaps well into the winter dry season, to maintain vegetation that would have been dried out as elsewhere in the grassy habitat. Reportedly there are geophytes growing there that are absent elsewhere. The long dry and frosty winter prevents this depression from developing into the next higher level of biodiversity.

Grazing cattle is a limiting factor. At least this would stop modifying the environment once the PV installation is up and running.

The environmental goods and services are limited, mainly because of the small size of the depression.

The main challenge from an environmental point of view is to maintain the integrity of the central pan and surrounds during the life cycle of the PV installation. It would be all too tempting to create short cuts through the NFEPA from one part of the installation to the next. People, material and vehicles should be kept out of the central pan.

The environmental risks are low, even though the pans are ecologically important and ecologically sensitive. It is therefore recommended that a General Authorization be issued.

It is also recommended, since impacts are insignificant and environmental risks are low, that the installation be officially allowed to be developed within 7m of the demarcated central pan, as was the case with a number of previous WULA's for similar solar plants.

The bare pans have much to offer in terms of scientific research, with a potential for new species and unique ecological energy pathways. As research reveals new knowledge, the significance of the pans will grow.

The impacts of the PV plant and the associated power line are insignificant. It is not expected that the scores of the various assessments would change because of the envisaged PV plant.

It is therefore recommended that the Visserspan PV plant and the power line be authorized with a General Authorization. A License is not the indicated.

25 References

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26 Declaration of Independence

I, Dirk van Driel, as the appointed independent specialist hereby declare that I:

- Act/ed as the independent specialist in this application
- Regard the information contained in this report as it relates to my specialist input/study to be true and correct and;
- Do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management act;
- Have and will not have vested interest in the proposed activity;
- Have disclosed to the applicant, EAP and competent authority any material information have or may have to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the environmental Impact Assessment Regulations, 2010 and any specific environmental management act.
- Am fully aware and meet the responsibilities in terms of the NEMA, the Environmental Impacts Assessment Regulations, 2010 (specifically in terms of regulation 17 of GN No. R543) and any specific environmental management act and that failure to comply with these requirements may constitute and result in disqualification;
- Have ensured that information containing all relevant facts on respect of the specialist input / study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties facilitated in such a manner that all interested and affected parties were provided with reasonable opportunity to participate and to provide comments on the specialist input / study;
- Have ensured that all the comments of all the interested and affected parties on the specialist input were considered, recorded and submitted to the competent authority in respect of the application;
- Have ensured that the names of all the interested and affected parties that participated in terms of the specialist input / study were recorded in the register of interested and affected parties who participated in the public participation process;
- Have provided the competent authority with access to all information at my disposal regarding the application, weather such information is favourable or not and;
- Am aware that a false declaration is an offence in terms of regulation 71 of GN No. R543.

Signature of the specialist: 23 August 2021

27 Résumé

Dr Dirk van Driel
PhD, MBA, PrSciNat, MWISA
Water Scientist

PO Box 681
Melkbosstrand 7437
seligna2030@gmail.com
079 333 5800 / 022 492 2102

Experience

WATSAN Africa, Cape Town. Scientist **2011 - present**

USAID/RTI, ICMA & Chemonics. Iraq & Afghanistan **2007 -2011**
Program manager.

City of Cape Town **1999-2007**
Acting Head: Scientific Services, Manager: Hydrobiology.

Department of Water & Sanitation, South Africa **1989 – 1999**
Senior Scientist

Tshwane University of Technology, Pretoria **1979 – 1998**
Head of Department

University of Western Cape and Stellenbosch University 1994- 1998 part-time
- Lectured post-graduate courses in Water Management and Environmental Management to under-graduate civil engineering students
- Served as external dissertation and thesis examiner

Service Positions
- Project Leader, initiator, member and participator: Water Research Commission (WRC), Pretoria.
- Director: UNESCO West Coast Biosphere, South Africa
- Director (Deputy Chairperson): Grotto Bay Home Owner's Association
- Member Dassen Island Protected Area Association (PAAC)

Membership of Professional Societies
- South African Council for Scientific Professions. Registered Scientist No. 400041/96
- Water Institute of South Africa. Member

Reports

- Process Review Kathu Wastewater Treatment Works
- Effluent Irrigation Report Tydstroom Abattoir Durbanville
- River Rehabilitation Report Slangkop Farm, Yzerfontein
- Fresh Water and Estuary Report Erf 77 Elands Bay
- Ground Water Revision, Moorreesburg Cemetery
- Fresh Water Report Delaire Graff Estate, Stellenbosch
- Fresh Water Report Quantum Foods (Pty) Ltd. Moredou Poultry Farm, Tulbagh
- Fresh Water Report Revision, De Hoop Development, Malmesbury
- Fresh Water Report, Idas Valley Development Erf 10866, Stellenbosch
- Wetland Delineation Idas Valley Development Erf 10866, Stellenbosch
- Fresh Water Report, Idas Valley Development Erf 11330, Stellenbosch
- Fresh Water Report, La Motte Development, Franschhoek
- Ground Water Peer Review, Elandsfontein Exploration & Mining
- Fresh Water Report Woodlands Sand Mine Malmesbury
- Fresh Water Report Brakke Kuyl Sand Mine, Cape Town
- Wetland Delineation, Ingwe Housing Development, Somerset West
- Fresh Water Report, Suurbraak Wastewater Treatment Works, Swellendam
- Wetland Delineation, Zandbergfontein Sand Mine, Robertson
- Storm Water Management Plan, Smalblaar Quarry, Rawsonville
- Storm Water Management Plan, Riverside Quarry
- Water Quality Irrigation Dams Report, Langebaan Country Estate
- Wetland Delineation Farm Eenzaamheid, Langebaan
- Wetland Delineation Erf 599, Betty's Bay
- Technical Report Bloodhound Land Speed Record, Hakskeenpan
- Technical Report Harkerville Sand Mine, Plettenberg Bay
- Technical Report Doring Rivier Sand Mine, Vanrhynsdorp
- Rehabilitation Plan Roodefontein Dam, Plettenberg Bay
- Technical Report Groenvlei Crusher, Worcester
- Technical Report Wiedouw Sand Mine, Vanrhynsdorp
- Technical Report Lair Trust Farm, Augrabies
- Technical Report Schouwtoneel Sand Mine, Vredenburg
- Technical Report Waboomsrivier Weir Wolseley
- Technical Report Doornkraal Sand Mine Malmesbury
- Technical Report Berg-en-Dal Sand Mine Malmesbury
- Wetland Demarcation, Osdrif Farm, Worcester
- Technical Report Driefontein Dam, Farm Agterfontein, Ceres
- Technical Report Oewerzicht Farm Dam, Greyton
- Technical Report Glen Lossie Sand Mine, Malmesbury
- Preliminary Report Stellenbosch Cemeteries
- Technical Report Toeka & Harmony Dams, Houdenbek Farm, Koue Bokkeveld
- Technical Report Kluitjieskraal Sand & Gravel Mine, Swellendam
- Fresh Water Report Urban Development Witteklip Vredenburg
- Fresh Water Report Groblershoop Resort, Northern Cape
- Fresh Water Report CA Bruwer Quarry Kakamas, Northern Cape
- Fresh Water Report, CA Bruwer Sand Mine, Kakamas, Northern Cape
- Fresh Water Report, Triple D Farms, Agri Development, Kakamas
- Fresh Water Report, Keren Energy Photovoltaic Plant Kakamas
- Fresh Water Report, Keren Energy Photovoltaic Plant Hopetown
- Fresh Water Report Hopetown Sewer
- Fresh Water Report Hoogland Farm Agricultural Development, Touws River

- Fresh Water Report Klaarstroom Waste Water Treatment Works
- Fresh Water Report Calvinia Sports Grounds Irrigation
- Fresh Water Report CA Bruwer Agricultural Development Kakamas
- Fresh Water Report Zwartfontein Farm Dam, Hermon
- Statement Delsma Farm Wetland, Hermon
- Fresh Water Report Lemoenshoek Farms Pipelines Bonnyvale
- Fresh Water Report Water Provision Pipeline Brandvlei
- Fresh Water Report Erf 19992 Upington
- Botanical Report Zwartejongensfontein Sand Mine, Stilbaai
- Fresh Water Report CA Bruwer Feldspath Mine, Kakamas
- Sediment Yield Calculation, Kenhardt Sand Mine
- Wetland Demarcation, Grabouw Traffic Center
- Fresh Water Report, Osdrift Sand Mine, Worcester
- Fresh Water Report Muggievlak Storm Water Canal, Vredenburg

28 Appendix

28.1 SANBI BGIS Report

Vaal-Vet Sandy Grassland

VT 50 Dry *Cymbopogon–Themeda* Veld (47%), VT 48 *Cymbopogon–Themeda* Veld (sandy) (24%) (Acocks 1953). LR 37 Dry Sandy Highveld Grassland (74%) (Low & Rebelo 1996).

Distribution North-West and Free State Provinces: South of Lichtenburg and Ventersdorp, stretching southwards to Klerksdorp, Leeudoringstad, Bothaville and to the Brandfort area north of Bloemfontein. Altitude 1 220–1 560 m, generally 1 260–1 360 m.

Vegetation & Landscape Features Plains-dominated landscape with some scattered, slightly irregular undulating plains and hills. Mainly low-tussock grasslands with an abundant karroid element. Dominance of *Themeda triandra* is an important feature of this vegetation unit. Locally low cover of *T. triandra* and the associated increase in *Elionurus muticus*, *Cymbopogon pospischilii* and *Aristida congesta* is attributed to heavy grazing and/or erratic rainfall.

Geology & Soils Aeolian and colluvial sand overlying sandstone, mudstone and shale of the Karoo Supergroup (mostly the Ecca Group) as well as older Ventersdorp Supergroup andesite and basement gneiss in the north. Soil forms are mostly Avalon, Westleigh and Clovelly. Dominant land type Bd, closely followed by Bc, Ae and Ba.

Climate Warm-temperate, summer-rainfall climate, with overall MAP of 530 mm. High summer temperatures. Severe frost (37 days per year on average) occurs in winter. See also climate diagram for Gh 12 Vaal-Vet Sandy Grassland (Figure 8.23).

Important Taxa Graminoids: *Anthephora pubescens* (d), *Aristida congesta* (d), *Chloris virgata* (d), *Cymbopogon caesius* (d), *Cynodon dactylon* (d), *Digitaria argyrograpta* (d), *Elionurus muticus* (d), *Eragrostis chloromelas* (d), *E. lehmanniana* (d), *E. plana* (d), *E. trichophora* (d), *Heteropogon contortus* (d), *Panicum gilvum* (d), *Setaria sphacelata* (d), *Themeda triandra* (d), *Tragus berteronianus* (d), *Brachiaria serrata*, *Cymbopogon pospischilii*, *Digitaria eriantha*, *Eragrostis curvula*, *E. obtusa*, *E. superba*, *Panicum coloratum*, *Pogonarthria squarrosa*, *Trichoneura grandiglumis*, *Triraphis andropogonoides*. Herbs: *Stachys spathulata* (d), *Barleria macrostegia*, *Berkheya onopordifolia* var. *onopordifolia*, *Chamaesyce inaequilatera*, *Geigeria aspera* var. *aspera*, *Helichrysum caespititium*, *Hermannia depressa*, *Hibiscus pusillus*, *Monsonia burkeana*, *Rhynchosia adenodes*, *Selago densiflora*, *Vernonia oligocephala*. Geophytic Herbs: *Bulbine narcissifolia*, *Ledebouria marginata*. Succulent Herb: *Tripteris aghillana* var. *integrifolia*. Low Shrubs: *Felicia muricata* (d), *Pentzia globosa* (d), *Anthospermum rigidum* subsp. *pumilum*, *Helichrysum dregeanum*, *H. paronychioides*, *Ziziphus zeyheriana*.

Endemic Taxon Herb: *Lessertia phillipsiana*.

Conservation Endangered. Target 24%. Only 0.3% statutorily conserved in the Bloemhof Dam, Schoonspruit, Sandveld, Faan Meintjies, Wolwespruit and Soetdoring Nature Reserves. More than 63% transformed for cultivation (ploughed for commercial crops) and the rest under strong grazing pressure from cattle and sheep. Erosion very low (85.3%) and low (11%).

References Louw (1951), Morris (1973, 1976), Bredenkamp & Bezuidenhout (1990), Kooij et al. (1990b, 1992), Bezuidenhout et al. (1994a).

28.2 Methodology used in determining significance of impacts

The methodology to be used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives is provided in the following tables:

Table 28.2.1 Nature and type of impact

Nature and type of impact	Description
Positive	An impact that is considered to represent an improvement to the baseline conditions or represents a positive change
Negative	An impact that is considered to represent an adverse change from the baseline or introduces a new negative factor
Direct	Impacts that result from the direct interaction between a planned project activity and the receiving environment / receptors
Indirect	Impacts that result from other activities that could take place as a consequence of the project (e.g. an influx of work seekers)
Cumulative	Impacts that act together with other impacts (including those from concurrent or planned future activities) to affect the same resources and / or receptors as the project

Table 28.2.2 Criteria for the assessment of impacts

Criteria	Rating	Description
Spatial extent of impact	National	Impacts that affect nationally important environmental resources or affect an area that is nationally important or have macro-economic consequences
	Regional	Impacts that affect regionally important environmental resources or are experienced on a regional scale as determined by administrative boundaries or habitat type / ecosystems
	Local	Within 2 km of the site
	Site specific	On site or within 100m of the site boundary
Consequence of impact/ Magnitude/ Severity	High	Natural and / or social functions and / or processes are severely altered
	Medium	Natural and / or social functions and / or processes are notably altered
	Low	Natural and / or social functions and / or processes are slightly altered
	Very Low	Natural and / or social functions and / or processes are negligibly altered
	Zero	Natural and / or social functions and / or processes remain unaltered
Duration of impact	Temporary	Impacts of short duration and /or occasional
	Short term	During the construction period
	Medium term	During part or all of the operational phase
	Long term	Beyond the operational phase, but not permanently
	Permanent	Mitigation will not occur in such a way or in such a time span that the impact can be considered transient (irreversible)

Table 28.2.3 Significance Rating

Significance Rating	Description
High	High consequence with a regional extent and long-term duration High consequence with either a regional extent and medium-term duration or a local extent and long-term duration Medium consequence with a regional extent and a long-term duration
Medium	High with a local extent and medium-term duration High consequence with a regional extent and short-term duration or a site-specific extent and long-term duration High consequence with either local extent and short-term duration or a site-specific extent with a medium-term duration Medium consequence with any combination of extent and duration except site-specific and short-term or regional and long term Low consequence with a regional extent and long-term duration
Low	High consequence with a site-specific extent and short-term duration Medium consequence with a site-specific extent and short-term duration Low consequence with any combination of extent and duration except site-specific and short-term Very low consequence with a regional extent and long-term duration
Very low	Low consequence with a site-specific extent and short-term duration Very low consequence with any combination of extent and duration except regional and long term
Neutral	Zero consequence with any combination of extent and duration

Table 28.2.4 Probability, confidence, reversibility and irreplaceability

Criteria	Rating	Description
Probability	Definite	>90% likelihood of the impact occurring
	Probable	70 – 90% likelihood of the impact occurring
	Possible	40 – 70% likelihood of the impact occurring
	Unlikely	<40% likelihood of the impact occurring
Confidence	Certain	Wealth of information on and sound understanding of the environmental factors potentially affecting the impact
	Sure	Reasonable amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact
	Unsure	Limited useful information on and understanding of the environmental factors potentially influencing this impact
Reversibility	Reversible	The impact is reversible within 2 years after the cause or stress is removed
	Irreversible	The activity will lead to an impact that is in all practical terms permanent
Irreplaceability	Replaceable	The resources lost can be replaced to a certain degree
	Irreplaceable	The activity will lead to a permanent loss of resources.

In the event of water courses, direct can mean that the impact is affected right on the water course, such as a structure or agriculture on the banks or in-stream.

Indirect can mean that the impact is away from the water course and its riparian zone, but that runoff from a development can reach the water course.

Local can mean in a water course or its riparian zone where the impact is taking place.

Site specific can mean 100m downstream of that impact.

Regional can mean further downstream and down the catchment past confluences into larger tributaries.

28.3 Significance

Table 28.3.1 Conservation Value

Conservation Value		
Refers to the intrinsic value of the area or its relative importance towards the conservation of an ecosystem or species or even natural aesthetics. Conservation status is based on habitat function, its vulnerability to loss and fragmentation or its value in terms of the protection of habitat or species	Low 1	The area is transformed, degraded not sensitive (e.g. Least threatened), with unlikely possibility of species loss.
	Medium / Low 2	The area is in good condition but not sensitive (e.g. Least threatened), with unlikely possibility of species loss.
	Medium 3	The area is in good condition, considered vulnerable (threatened), or falls within an ecological support area or a critical biodiversity area, but with unlikely possibility of species loss.
	Medium / High 4	The area is considered endangered or, falls within an ecological support area or a critical biodiversity area, or provides core habitat for endemic or rare & endangered species.
	High 5	The area is considered critically endangered or is part of a proclaimed provincial or national protected area.

Table 28.3.2 Scoring system

Significance	Score	Description
Insignificant	4 - 22	There is no impact or the impact is insignificant in scale or magnitude as a result of low sensitivity to change or low intrinsic value of the site.
Low	23 - 36	An impact barely noticeable in scale or magnitude as a result of low sensitivity to change or low intrinsic value of the site, or will be of very short-term or is unlikely to occur. Impact is unlikely to have any real effect and no or little mitigation is required.
Medium / Low	37 - 45	Impact is of a low order and therefore likely to have little real effect. Mitigation is either easily achieved. Impacts may have medium to short term effects on the natural environment within site boundaries.
Medium	46 - 55	Impact is real, but not substantial. Mitigation is both feasible and fairly easily possible, but may require modification of the project design or layout. These impacts will usually result in medium to long term effect on the natural environment, within site boundary.
Medium High	56 - 63	Impact is real, substantial and undesirable, but mitigation is feasible. Modification of the project design or layout may be required. These impacts will usually result in medium to long-term effect on the natural environment, beyond site boundary within local area.
High	64 - 79	An impact of high order. Mitigation is difficult, expensive, time-consuming or some combination of these. These impacts will usually result in long-term change to the natural environment, beyond site boundaries, regional or widespread.
Unacceptable	80 - 100	An impact of the highest order possible. There is no possible mitigation that could offset the impact. The impact will result in permanent change. Very often these impacts cannot be mitigated and usually result in very severe effects, beyond site boundaries, national or international.

Parameter	1	2	3	4	5
Conservation value Likelihood Duration Extent Severity	Low Unlikely Temporary Site specific Zero	Medium /Low Possible Short term Local Very low	Medium More possible Medium term Regional Low	Medium / High Probable Long term National Medium	High Definite Permanent International High

Significance = Conservation value (Likelihood + Duration + Extent + Severity)

28.4 Risk Matrix Methodology

RISK ASSESSMENT KEY (Referenced from DWA RISK-BASED WATER USE AUTHORISATION APPROACH AND DELEGATION GUIDELINES)

Negative Rating

TABLE 1- SEVERITY

How severe does the aspects impact on the environment and resource quality characterisitics (flow regime, water quality, geomorfology, biota, habitat)

Insignificant / non-harmful	1
Small / potentially harmful	2
Significant / slightly harmful	3
Great / harmful	4
Disastrous / extremely harmful and/or wetland(s) involved	5
Where "or wetland(s) are involved" it means	

TABLE 2 – SPATIAL SCALE

How big is the area that the aspect is impacting on?

Area specific (at impact site)	1
Whole site (entire surface right)	2
Regional / neighbouring areas (downstream within quaternary catch	3
National (impacting beyond seconday catchment or provinces)	4
Global (impacting beyond SA boundary)	5

TABLE 3 – DURATION

How long does the aspect impact on the environment and resource quality?

One day to one month, PES, EIS and/or REC not impacted
One month to one year, PES, EIS and/or REC impacted but no change in status
One year to 10 years, PES, EIS and/or REC impacted to a lower status but can be improved over this period through mitigation
Life of the activity, PES, EIS and/or REC permanently lowered
More than life of the organisation/facility, PES and EIS scores, a E or F

TABLE 4 – FREQUENCY OF THE ACTIVITY

How often do you do the specific activity?

Annually or less	1
6 monthly	2
Monthly	3
Weekly	4
Daily	5

TABLE 5 – FREQUENCY OF THE INCIDENT/IMPACT

How often does the activity impact on the environment?

Almost never / almost impossible / >20%	1
Very seldom / highly unlikely / >40%	2
Infrequent / unlikely / seldom / >60%	3
Often / regularly / likely / possible / >80%	4
Daily / highly likely / definitely / >100%	5

TABLE 6 – LEGAL ISSUES

How is the activity governed by legislation?

No legislation
Fully covered by legislation (wetlands are legally governed)
Located within the regulated areas

TABLE 7 – DETECTION

How quickly can the impacts/risks of the activity be observed on the environment (water resourc

Immediately
Without much effort
Need some effort
Remote and difficult to observe
Covered

TABLE 8: RATING CLASSES

RATING	CLASS	MANAGEMENT DESCRIPTION
1 – 55	(L) Low Risk	Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated. Wetlands may be excluded.
56 – 169	M) Moderate Risk	Risk and impact on watercourses are notably and require mitigation measures on a higher level, which costs more and
170 – 300	(H) High Risk	Always involves wetlands. Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale

A low risk class must be obtained for all activities to be considered for a GA

TABLE 9: CALCULATIONS

Consequence = Severity + Spatial Scale + Duration
Likelihood=Frequency of Activity + Frequency of Incident +Legal Issues + Detection
Significance \Risk= Consequence X Likelihood