VENTURA ENERGY (PTY) LTD

Fresh Water Report

Proposed Visserspan Solar Plant

Project 1

A requirement in terms of National Environmental Management Act

January 2020

EnviroAfrica

Environmental Management and Impact Assessment

Omgewingsbestuur en Impakbepaling

WATSAN Africa

Index

Abbreviations

Critical Biodiversity Area	CBA
Department of Environmental, Forestry & Fisheries	DEFF
Department of Water and Sanitation	DWS
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

Ventura Renewable Energy (Pty) Ltd 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 100MV. The generated

Mr Wyers Janse van Rensburg of Ventura 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 are wetlands on the Visserspan property, that can be more closely defined as NFEPAs. 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.

According to NEMA developments within 32m of any water course, including wetlands, can go ahead pertinently subject to official approval and permission. All of the envisaged developments on Visserspan are further away than the legal limit of 32m, some of them only just. It was decided to nevertheless submit Fresh Water Reports for NEMA approval, for the eventuality that the DEFF and its provincial agency in the Orange Free State, the Department of Economic Development, Tourism and Environmental Affairs, would want to adjust the 32m buffer zone.

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

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 located within 500m of wetlands. The development may alter the flow pattern into the wetland, but will not impede flow in the wetlands.

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

The proposed development is within 500m of wetlands. According to the definition in GN509, the banks of these wetlands may be altered.

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.

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 32m of a water course without the consent of the Department of Environmental Affairs and its provincial representatives. This envisaged development is just outside of the 32m buffer zone. The width of the buffer zone may need to be adjusted, depending the outcome of the environmental impact, as assessed in this report.

3 Location

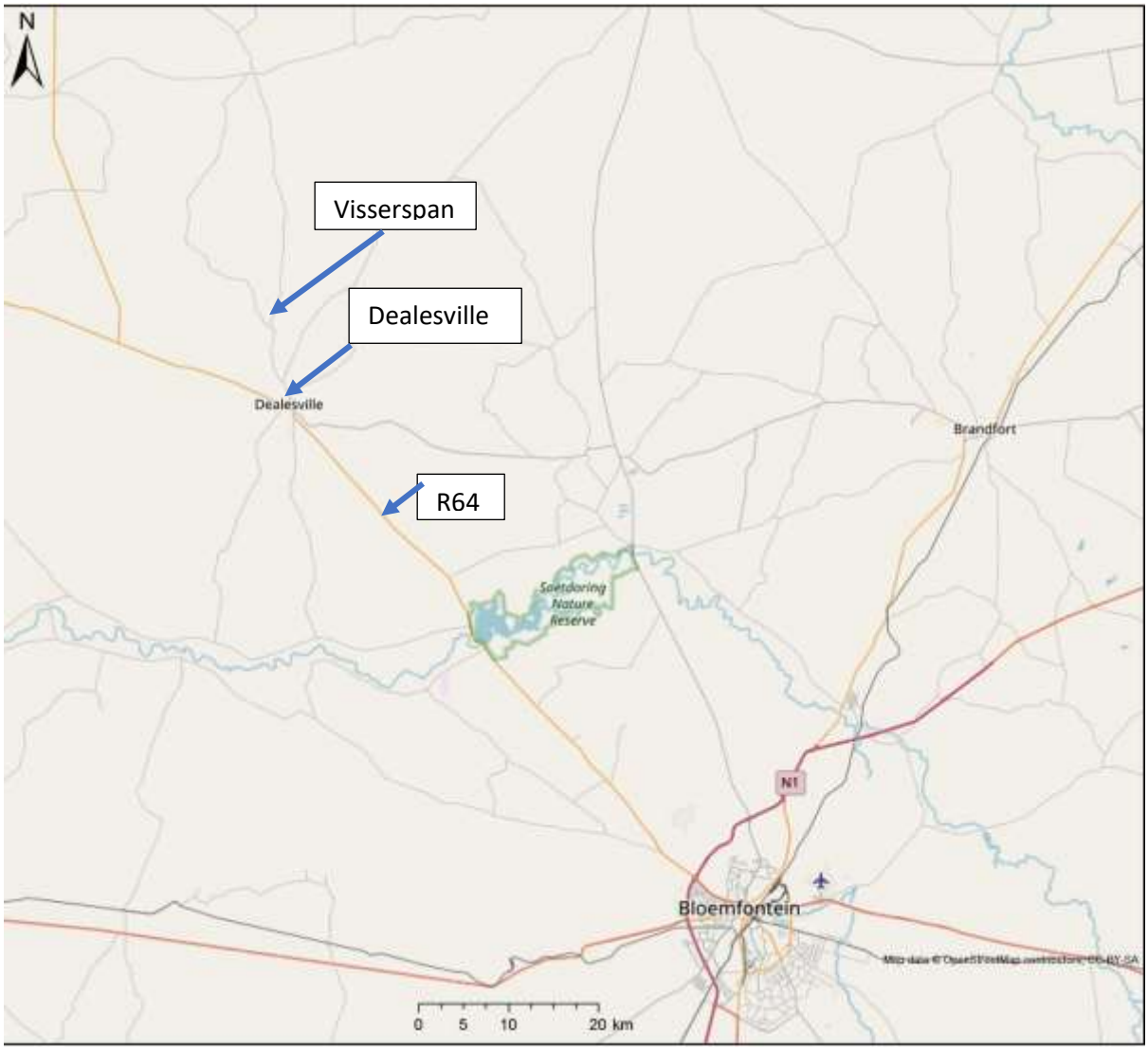

Figure 1 Visserspan Location

Visserspan is located on the central Orange Free State highveld approximately 70km to the north west of Bloemfontein on the R64 trunk road (Figure 1).

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 2). 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.

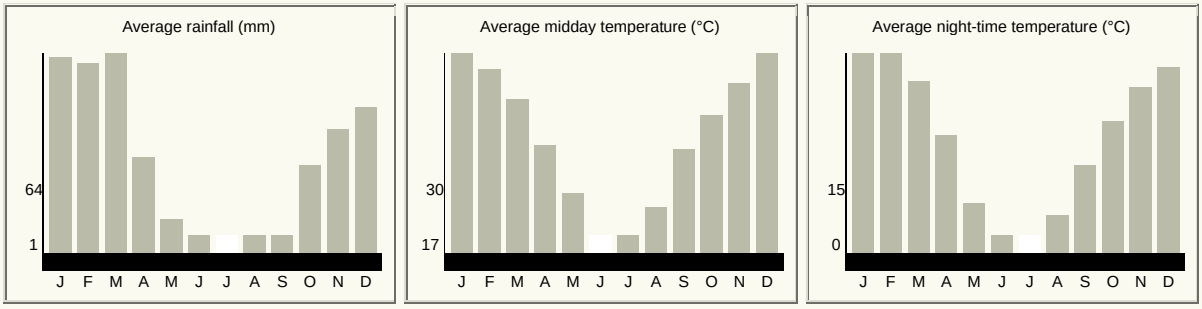

Figure 2 Dealesville Climate

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 resulted in 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 EIA's and WULA's in terms of current legislation.

8 The Pans Ecological Significance

When flooded 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 pans dry up as suddenly as it is flooded. As the last of the moisture 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 plant 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. It was 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 it is necessary this level of knowledge is available. Meanwhile the need to assess the pans of the Orange Free State remains and assumptions will have to be made. 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 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 in size as time went on.

These pans are mostly endorheic, only with an inflow of storm water during infrequent fierce and sudden summer thunder storms, 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 Fresh Water Report, the classification of Geldenhuys is useful.

11 Project 1

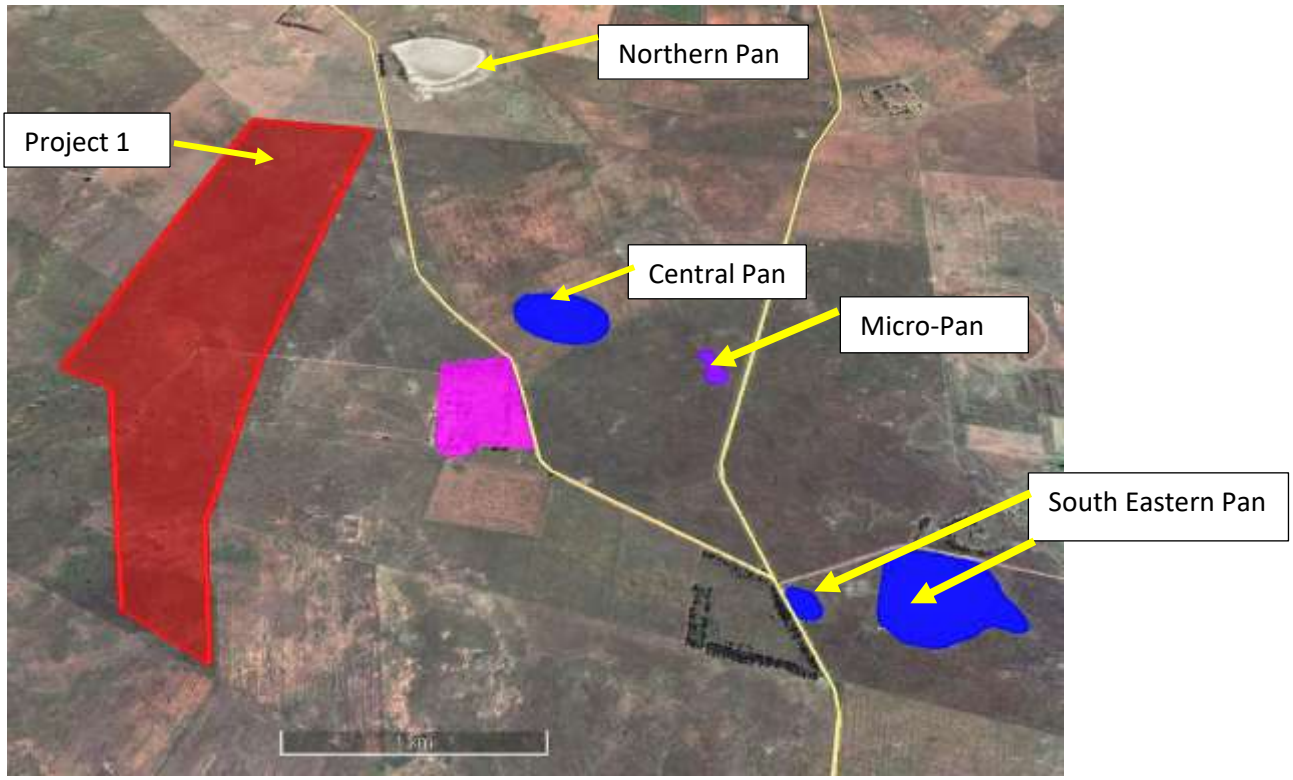

Figure 3 Project 1

The area that is to be developed into Project 1 is indicated by the red areas on Figure 3.

Four projects are envisaged in the Visserpan property. These can have a cumulative impact, which is further discussed in the Appendix.

The blue areas on Figure 3 indicate the areas that have been marked as NFEPAs on the SANBI BGIS webpage. The NFEPAs are to be excluded from the proposed development.

The pans on the Vissershok property are included in these NFEPAs.

The Central Pan and its associated Micro Pan, as well as the South Eastern Pan are within these NFEPAs.

The Northern Pan has not been included into and NFEPA, but clearly, it has similar geomorphological characteristics and probably should have been included as well.

12 Classification of the Visserspan Pans

The central pan seemed to be a mixed grass pan (Figure 4), 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 6) 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 7), with obvious cracks because of the prolonged current drought.

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.

There is a very small bare pan (Figure 3) 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.

The other two pans, the one along the northern boundary and in the south western corner (Figure 5), can be classified as bare pans, with a secondary tendency becoming scrub pans.

Figure 4 Central Pan

Figure 5 Northern Pan

Figure 6 Dolerite

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

13 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 7 Dry clayey soil with cracks

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

Wetness
Land Form
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 land form did not suggest that there should be a wetland. Its catchment area was limited, small. Roundtree *et al* (2008) would classify it as a “depression”.

It was obvious that soils were saturated the previous season, judging from the cracks in the clayey soils (Figure 9). These were obviously hydromorphic soils, verifying its wetland status.

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 10), re-affirming the presence of temporary wetland conditions in hydromorphic soils.

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

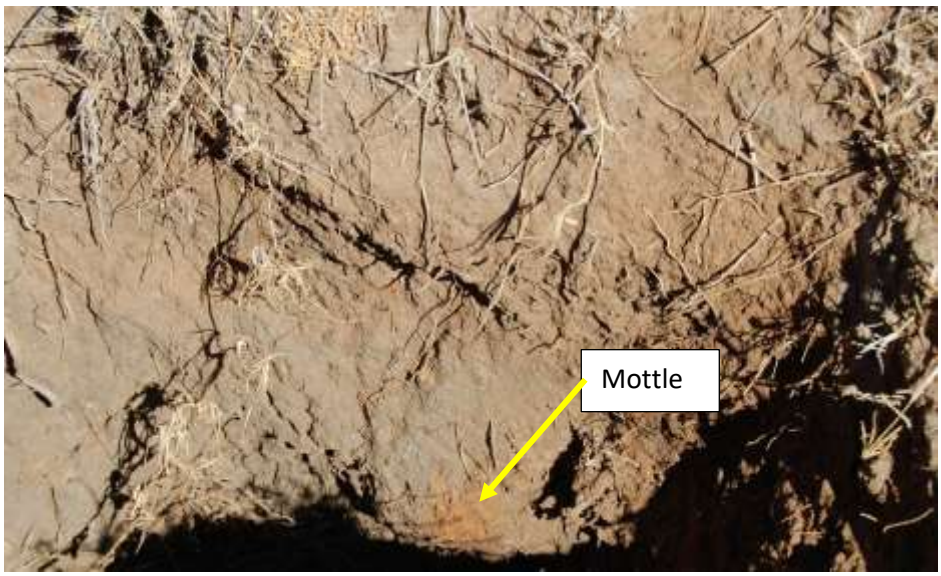

Figure 8 Mottle in hydromorphic soil

14 Central Pan Catchment Area

The central pan is roughly demarcated in Figure 11, 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 is still present and it is included in the NFEPA. It is cut out from the area that is to be developed (Figure 10).

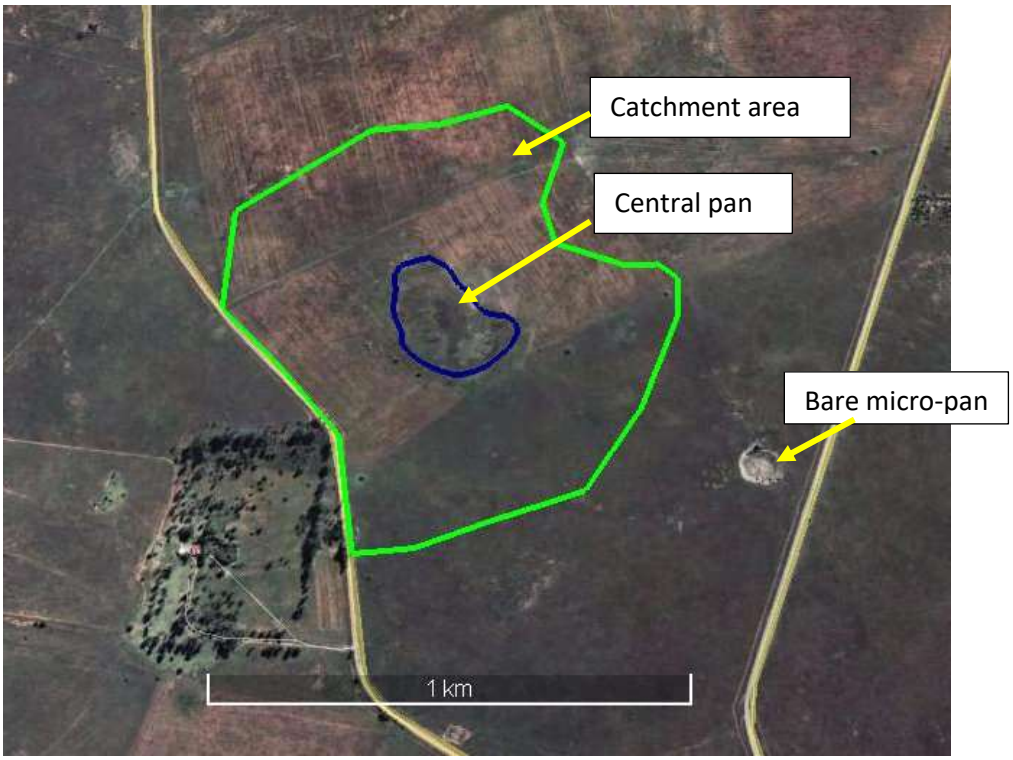

Figure 9 Central pan & catchment

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 remain unpaved. Apart from the concrete anchors of the panel's upright supports, the runoff and the penetration of rain water 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 PV 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.

16 Possible Impact of Project 1

The runoff from Project 1 flows in the direction of the northern pan.

There is a slight elevation between the area of Project 1 and the central pan and therefore it is improbable that any of the runoff will ever reach the central pan.

17 Present Ecological State

The PES is a protocol that has 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, because both methods will render similar results.

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 pans.

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 Northern Bare Pan

Pan Floor	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 pan floor 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.

18 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 3).

There are no indigenous fish in any of the pans and surrounds, as there is no permanent water. Likewise, no surface water was detected up the incline from the pan floor. 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 3. 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 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.

19 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.

It has already been stated that the northern and the south eastern bare pans are highly ecologically sensitive.

20 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 4). The criteria and the description for scoring the impacts during the successive phases of the PV development are listed in the appendix.

Table 4 Impact Assessment

Description of impact Construction of the PV Installation Construction of access roads **Impact** Sediments in northern bare pan **Mitigation measures** Keep sediments out of the 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	Low	Short term	Low	Unlikely	Certain	Reversable	Replaceable
With mitigation measures								
Negative	Site specific	Very Low	Short term	Very Low	Unlikely	Certain	Reversible	Replaceable

Description of impact
Operation of the PV Installation

I**mpact**
Runoff and wash water in the northern bare pan

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

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

Description of impact
Maintenance of the PV Installation

I**mpact**
Repair defect solar panels

Mitigation measures
Rubble in aquatic environment, northern bare pan

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. Project 1 is far away from the northern bare pan and hence it is unlikely that there will be any impact.

21 Risk Matrix

The assessment was carried out according to the interactive Excel table that is available on the DWS webpage. Table 5 is a replica of the Excel spreadsheet that has been adapted to fit the format of this report. The numbers in Table 5 (continued) represent the same activities as in Table 5, with sub-activities added.

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 5 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 northern bare pan	Pollutants in aquatic habitat	24	Low
3	Operation of PV installation	Runoff in northern bare pan	Loss of current ecological integrity	24	Low
4	Maintenance of PV installation	Rubble in aquatic environment	Downgrading of aquatic environment	24	Low

Table 5 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.

22 Resource Economics

The goods and services delivered by the environment, in this case the Visserspan northern bare, 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 12) is an accepted manner to visually illustrate the resource economic footprint the drainage line, from the data in Table 6.

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 6. Goods and Services

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

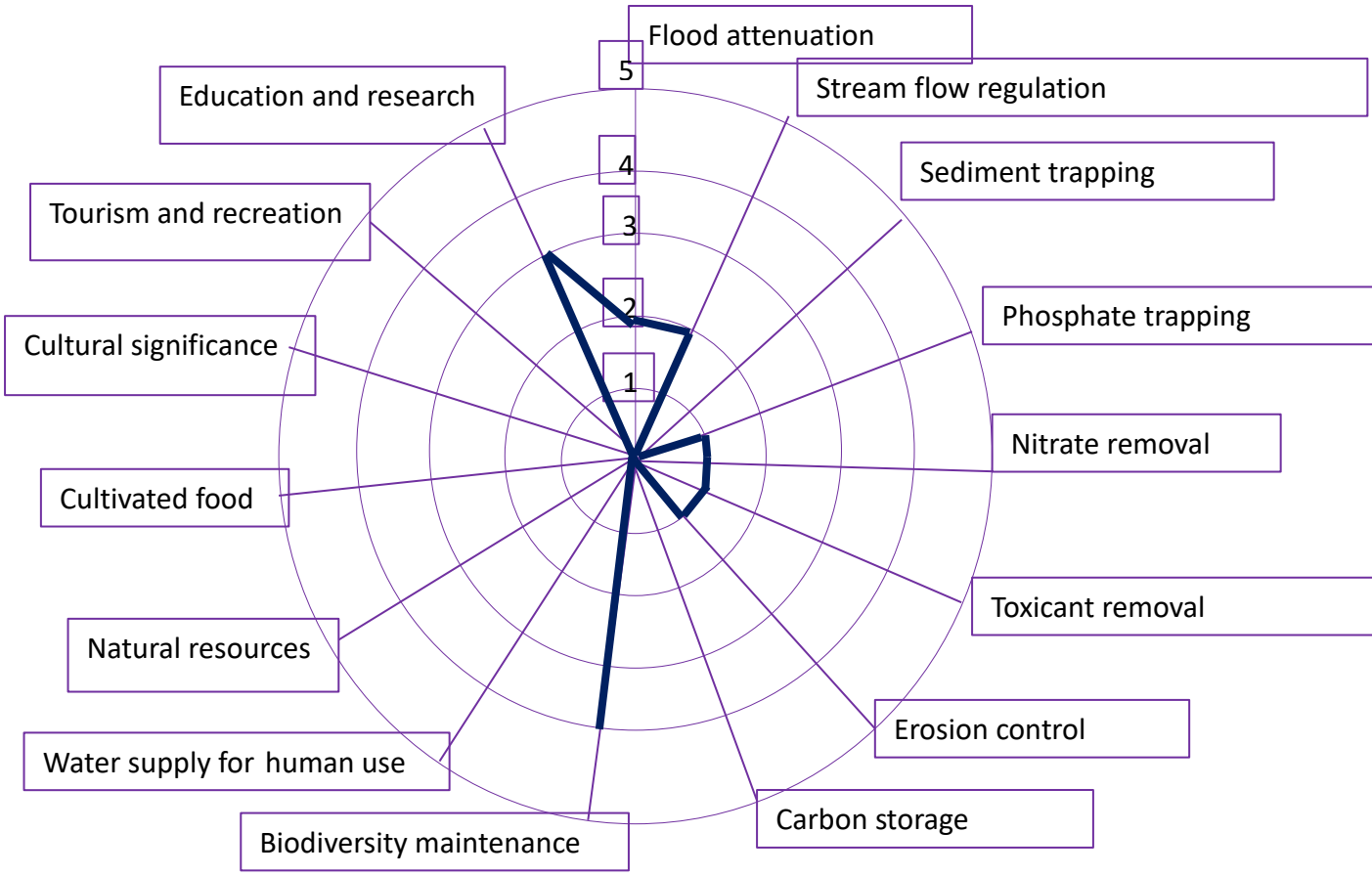

Figure 10. Resource Economics Footprint of the Visserspan Northern Bare Pan

23 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 13). The WULA and the EAI must provide mitigation measured for these impacts.

Figure 13 has been adapted from one of the most recent DWS policy documents.

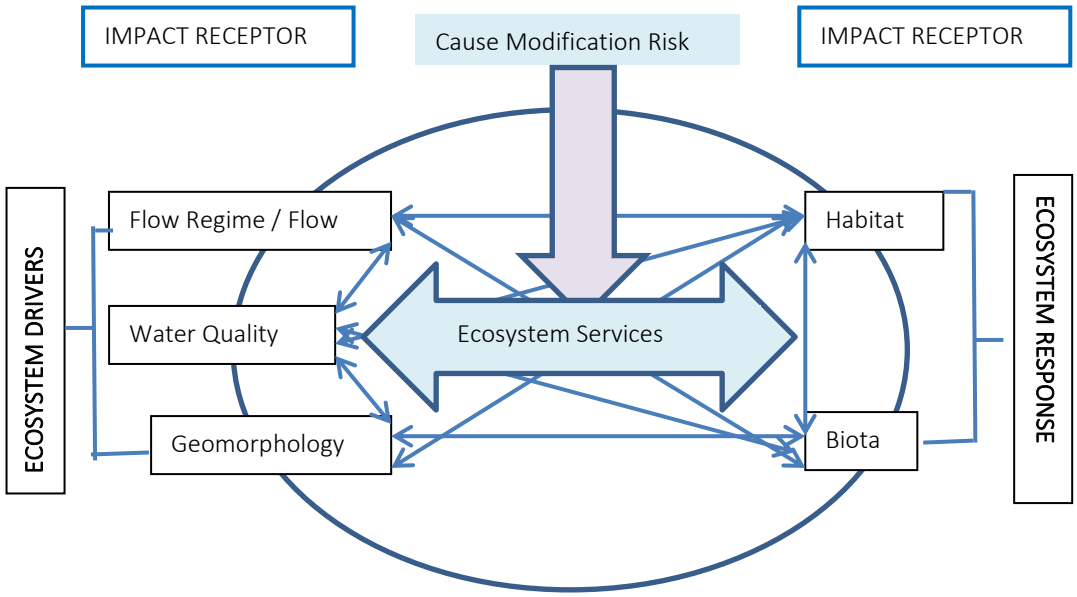

Figure 11 Minimum Requirements for a S21(c) and (i) Application

The ecological driver of the pan is the summer rain that comes infrequently in electric thunderstorms. The runoff contains dissolved salts that accumulate in the pan, following successive rainy seasons and the drying out of the pans because of evaporation, leaving the salts behind on the dry and barren pan's floor. The salty crust prevents vegetation from recolonizing the pan and supresses biodiversity.

The environmental goods and services are limited, mainly because of the small size of the northern bare pan.

The environmental risks are low, even though the pans are ecologically important and ecologically sensitive. Because of the long distance between Project 1 and the Northern Bare Pan, the environmental risks are extremely low. It is therefore recommended that a General Authorization be issued.

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25 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:  9 January 2020

26 Résumé

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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

27 Appendix

27.1 SANBI BGIS Report

Gh 10 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).

27.2 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 26.2.1 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 27.2.2 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 27.2.3 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 27.2.4 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.

27.3 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

27.4 Cumulative Impact

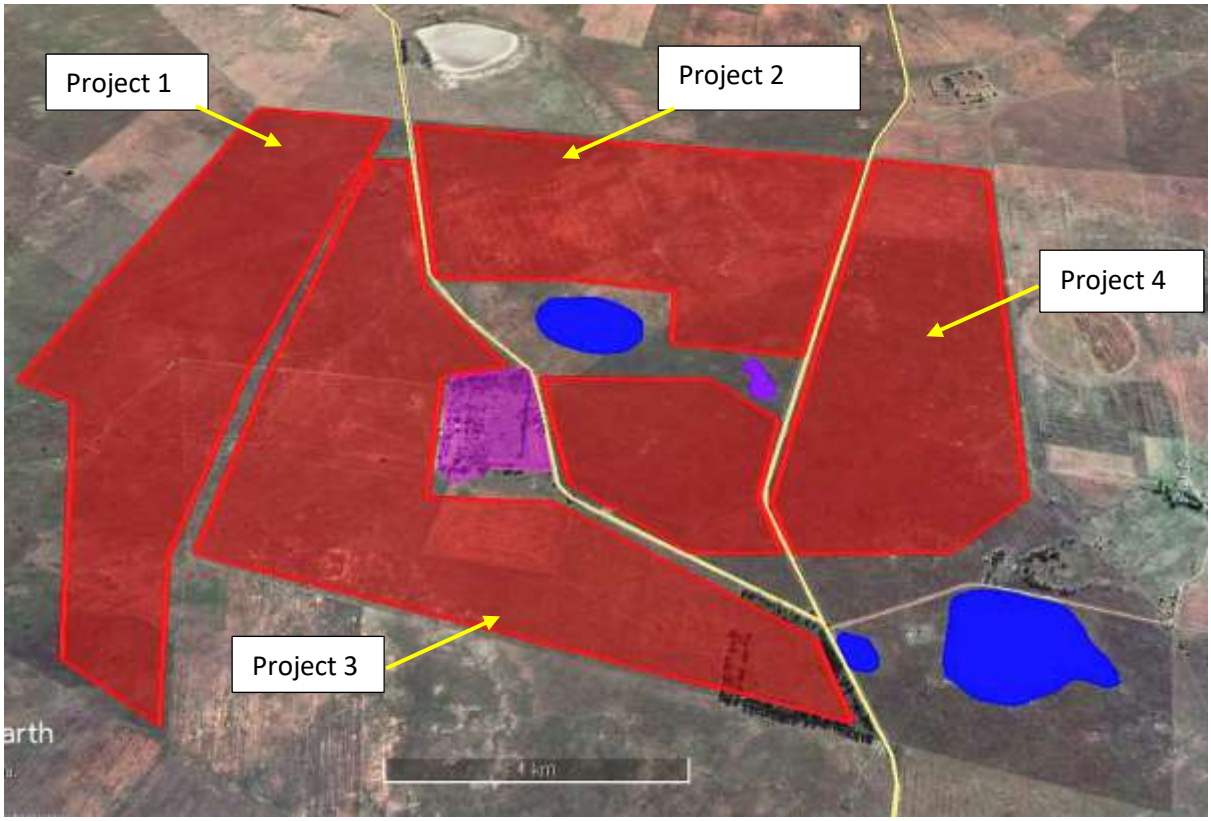

Figure 12 Projects 1 – 4

Project 3 is one of 4 proposed projects on the property of Visserspan. These projects are independent and each is an entity on its own. Eventually they may have different owners and operated by different companies. At this stage of the development it is not known who the owners are going to be.

It is therefore of primary importance that each of these projects have its own, separate Fresh Water Report.

For informed decision-making it is imperative to note the cumulative impacts of all of these 4 projects on the Visserpan pans.

Project 1 and 2 may have an impact on the Northern Pan.
Project 2, 3 and 4 can have an impact on the Central Pan.
Project 3 and 4 can have an impact on the South Eastern Pan.