DE KUILEN RESORT

KAMIESBERG NORTHERN CAPE

Freshwater Report

for the further development of De Kuilen Resort
on Portion 2 of Farm De Kuilen 451 Kamieskroon

A requirement in terms of the National Environmental Management Act 107 of 1998
as well as the
National Water Act 36 of 1998

July 2023

Index

Abbreviations

Critical Biodiversity Area	CBA
Department of Fisheries, Forestry and the Environment	DFFE
Department of Water and Sanitation	DWS
Ecological Importance	EI
Ecological Importance and Sensitivity Class	EISC
Ecological Sensitivity	ES
Ecological Support Area	ESA
Existing Legal Use	ELU
Environmental Impact Assessment	EIA
Electronic Water Use License Application (on-line)	eWULAAS
Government Notice	GN
Metres Above Sea Level	masl
National Environmental Management Act (107 of 1998)	NEMA
National Freshwater Environment Priority Area	NFEPA
National Water Act (36 of 1998)	NWA
Present Ecological State	PES
Section of an Act of Parliament	S
South Africa National Biodiversity Institute	SANBI
Water Use License Application	WULA

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1 Introduction

The owners of Portion 2 of the Farm De Kuilen 451 Kamieskroon in the Northern Cape want to construct a number of dwellings as well as a wedding and conference facility on the property. The town and regional planning company Macroplan of Upington was appointed to plan and draft the project, along with the legally required listings and registrations.

Macroplan appointed Enviro Africa of Somerset West to undertake the environmental impact assessment in terms of the NEMA. This process is currently underway. It involves a public participation process. The prescribed notices were put up and various places, among other on the farm's gate (Figure 1).

The proposed buildings and facilities are within the controlled zone of a river and of drainage lines, which are listed as legitimate water resources and for which a Water Use License Application (WULA) is required in terms of the NWA.

Dr Dirk van Driel of WATSAN Africa in Knysna was appointed to undertake the WULA. This includes one or more site visits, a Freshwater Report and the lodging of an application on the eWULAAS online facility. The aim is to have the proposed development approved with a General Authorization issued by the DWS.

The Freshwater Report must include adequate information to allow for informed decision-making. The report has developed over literally hundreds of reports into a set format and content. The report must include a Risk Matrix that is available on the DWS webpage. This document must be completed and the signed by a SACNASP registered scientist.

The Freshwater Report is not only meant to satisfy the WULA information needs, but also that of the EIA. Hence, more aspects were added, such as the prescribed Impact Assessment.

The aquatic features on the property as well as on the adjacent property are listed as NFEPA's. Some existing and proposed buildings are within the 500m controlled zone, but outside of the 100m controlled zone for rivers and streams. These alleged wetlands are mostly dry drainage lines rather than wetlands.

The proposed development has a very low environmental impact with little environmental risk, as the current study pointed out. It is expected that the GA will be granted, provided that the Freshwater Report proves to be adequate and that the eWULAAS application forms are properly completed.

MACROPLAN

NEMA AND NWA PUBLIC PARTICIPATION PROCESS

The proposed establishment of a wedding and conference facility, accommodation and associated infrastructure on Portion 2 of the Farm De Kuilen No. 451, near Kamieskroon, Kamiesberg Municipality, Northern Cape

Notice is hereby given of the intention to submit an application for environmental authorisation and the public participation process, in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended ("NEMA"), Environmental Impact Assessment Regulations 2014, as well as a Water Use License Application (WULA) in terms of the National Water Act (Act 36 of 1998)(NWA). The wedding and conference facility, accommodation and associated structures includes activities listed in terms of the NEMA EIA Regulations 2014.

EnviroAfrica cc has been appointed by Macroplan to undertake a NEMA application process for Environmental Authorisation for the proposed wedding and conference facility and accommodation.

Application for environmental authorization to undertake the following listed activities* in terms of NEMA EIA Regulations 2014:

Government Notice R327 (Listing Notice 1): Activity No. **12, 19, 24, 27, 67**
Government Notice R324 (Listing Notice 3): Activity No. **4, 5, 6,12, 14, 26**

Application in terms of NWA: Sections 21 (c) and (i)*.

**Please note that the listed activities above may change during the course of the NEMA Application process. Registered I&APs will be notified of any changes.*

Project Description & Location: It is proposed that accommodation units and an area of commercial nature with associated infrastructure, that can be used to cater weddings and conferences be developed on Portion 2 of the Farm De Kuilen No. 451. The structures will be placed within the demarcated resort area of approximately 110 ha. The accommodation units may include a guest house, a restaurant, a café, camping site, caravan park, holiday flats or built units. The weddings and conference facility may include a restaurant/catering facilities to serve guests and any other ancillary use linked to the accommodation. The proposed site is located on the eastern side of the N7, approximately 10.5 km east of Kamieskroon.

Site co-ordinates (approximate central point): 30°10'53.667"S 18°2'32.801"E

Public Participation: Interested and Affected Parties (I&APs) are hereby notified of the applications and invited to register (in writing) and/or provide initial comments and identify any issues, concerns or opportunities relating to either, or all of, the projects to the contact details provided below, on or before **15 August 2023** in terms of the environmental aspects (NEMA Application) and on or before **14 September 2023** for water related issues (NWA WULA Application). In order to register or submit comment, I&APs should refer to the project name/s, and provide their name, address & contact details (*indicating your preferred method of notification)* and an indication of any direct business, financial, personal, or other interest which they have in the application. You are also requested to pass this information to any person you feel should be notified.

Please note that only Registered I&APs will be notified of the availability of reports and other written submissions made (or to be made) to the Department by the applicant, and be entitled to comment on these reports and submissions; will be notified of the outcome of the application, the reasons for the decision, and that an appeal may be lodged against a decision; and will be notified of the applicant's intention to appeal the decision, and where and for what period the appeal submission will be available for inspection.

Consultant: EnviroAfrica CC. P.O. Box 5367, Helderberg, 7135 / Fax: 086 512 0154 / Tel: 021 8511616 / E-mail: maboee@enviroafrica.co.za

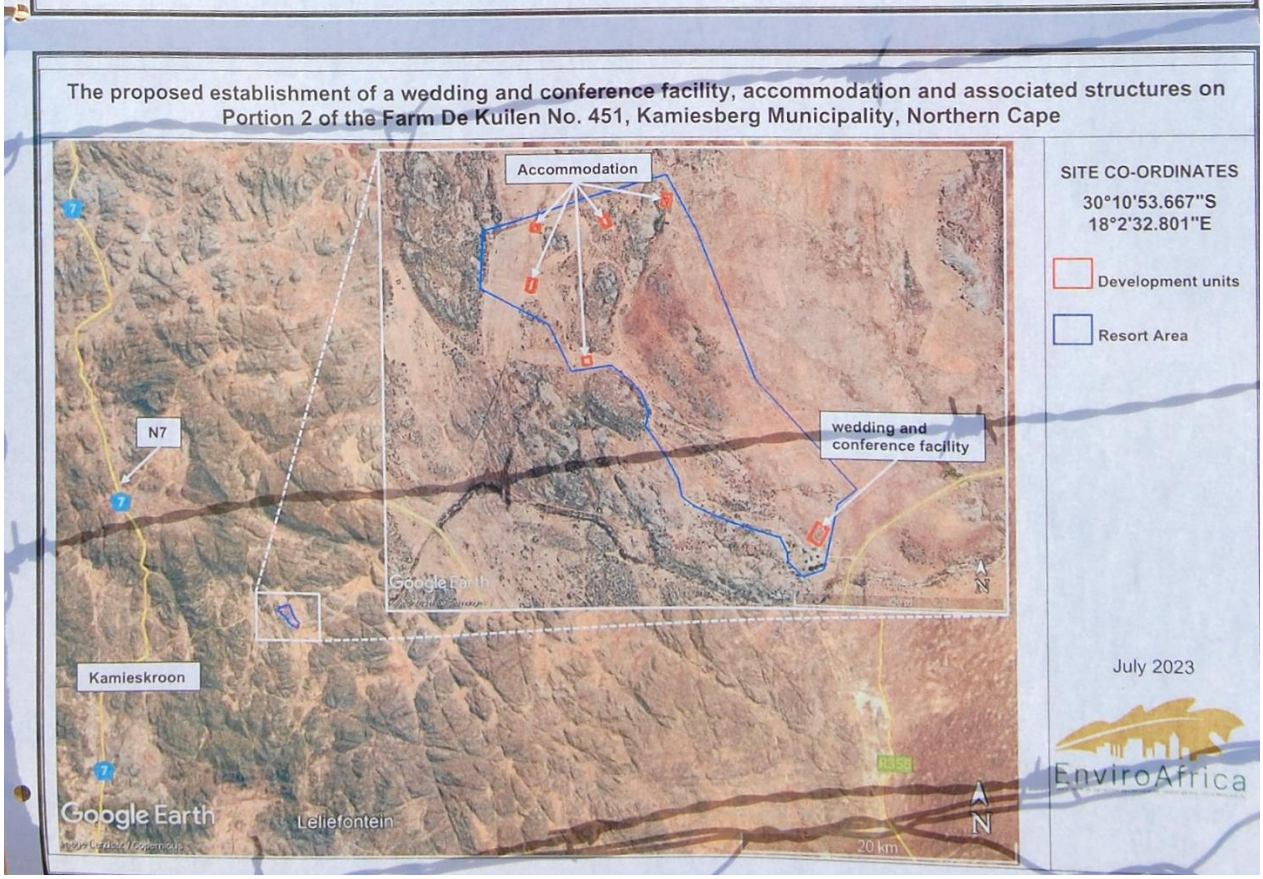


Figure 1 Public Participation

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 adjacent to natural water courses, the upper tributary of the Buffels River in the Northern Cape. The water courses could possibly be impacted, should the development go ahead.

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

The proposed development may alter the characteristics of the water courses, should the development go ahead.

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. Likewise, no development may take place within 500m of a wetland without the consent of the DWS. Parts of the proposed development are indeed within this regulated zone.

National Environmental Management Act (107of 1998)

NEMA and regulations promulgated in terms of NEMA determines that no development without the consent and permission of the DEA and its regional agencies, in this case the DEA&DP of the Western Cape Provincial Government, may take place within 32m of a water course.

3 Locality

Figure 2 Locality

The farm De Kuilen is situated 11.2 km to the east of Kamieskroon up the Kamiesberg Pass on an elevation of 1007masl in the Northern Cape. The coordinates are as follows:

30°11'08.21"S and 18°02'51.20"E

4 Quaternary Catchment

De Kuilen Farm is in the F40A quaternary catchment.

5 Climate Kamieskroon

https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/kamieskroon_south-africa_3366233

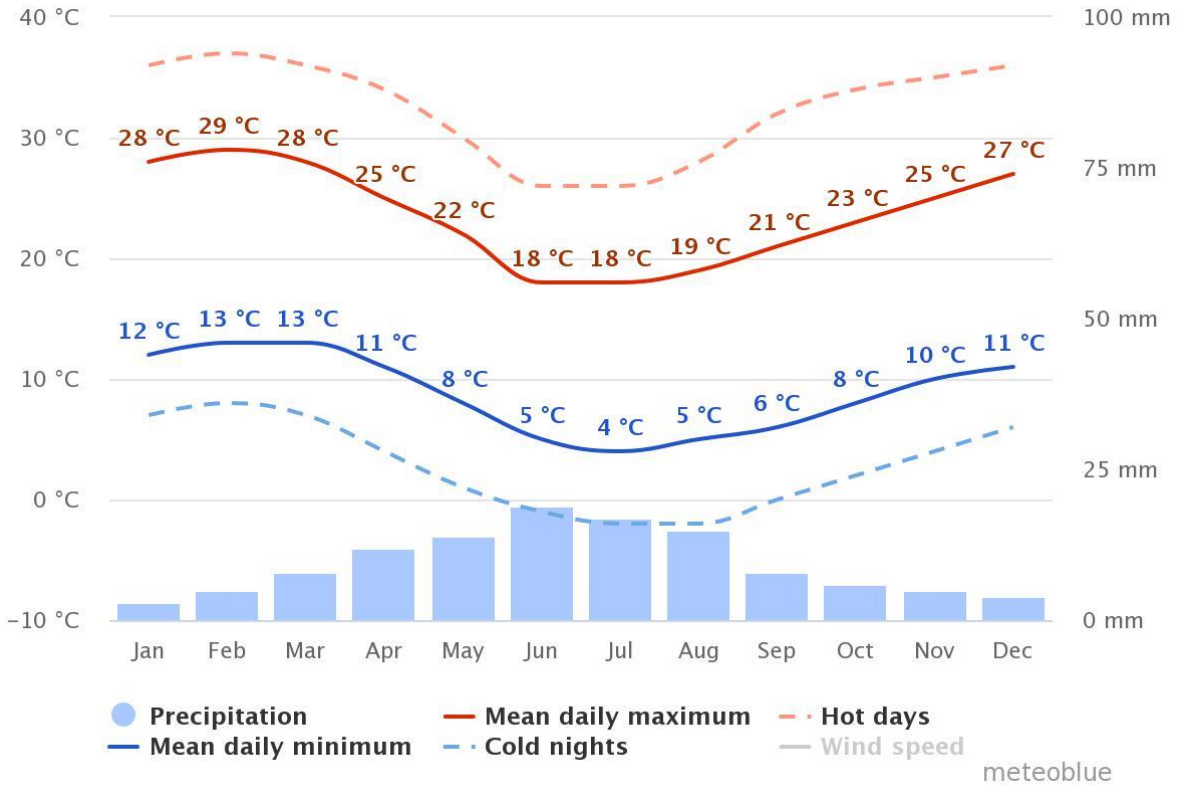


Figure 3 Climate Kamieskroon

Kamieskroon is the closest locality to the envisaged resort for which rainfall data is available online. The mean annual precipitation is 77mm.

https://www.weather-atlas.com/en/south-africa/kamieskroon-climate

This is an arid region, the semi-desert of the Northern Cape.

However, during the site visit on 5 July 2023, runoff was flowing out of the Kamiesberg in substantial quantities because of the ample recent rains. This was an unusual, once in a lifetime event.

6 Conservation Status

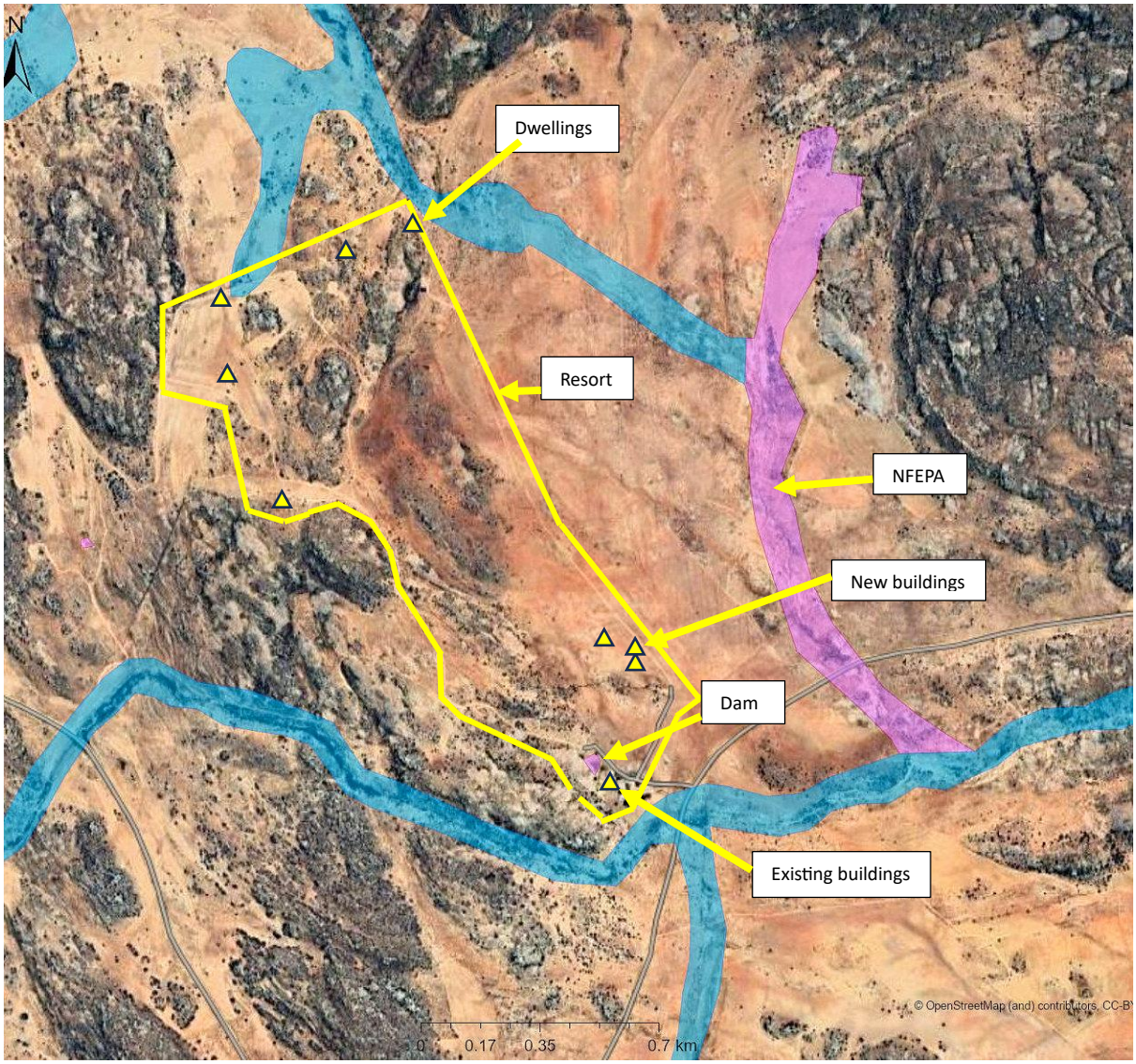


Figure 4 NFEPA Wetland

6.1 NFEPA

The Cape Farm Mapper lists the river and the drainage lines as wetland NFEPA's (Figure 4). There is a small farm dam in the southern corner of the property that is listed as well. Some of the existing as well as the planned buildings are within the 500m controlled zone, as stipulated in GN509 in terms of the NWA.

6.2 DFFE Screening Tool

Table 1 Screening Tool Results

Theme	Sensitivity
Animal species Aquatic biodiversity Plant species Terrestrial biodiversity	High Very High Medium Very High

The animal species theme is rated as High because of the presence of bird species such as raptors, a bustard and a korhaan as well as several insect species. There is an unnamed numbered species of concern.

The aquatic biodiversity is rated as Very High because of the proximity to a NFEPA wetland.

The plant species theme is rated as medium because of a long list of plants species present, many of which are unnamed numbered species. The names of these plants may not be published.

The terrestrial biodiversity is rated as very high because of the CBA and because the proposed resort is in expansion zones of protected areas.

For these themes, specialist reports must be generated according to the DFFE specifications. This Freshwater Report can serve as the DFFE specialist report, or at least provide the details for the DFFE specialist report.

6.3 Vegetation

The rocky part of the proposed resort is listed as Namaqualand Granite Renosterveld. Despite that none of it is statutory conserved, it is listed as of Least Concern. Overgrazing is the single most threat to this veldt type (Mucina & Rutherford, 2006).

The level ploughed over land between the rocky outcrops is listed as Namaqualand Blomveld. This is an unnatural, human-induced veldt type and is not of any concern for conservation purposes.

Because of the low impact, the proposed resort is not expected to change any aspect of the conservation status. To the contrary, the low-density development and low occupation rate would rather contribute to conserve the demarcated area.

7 The Resort and Surrounds

Figure 5 Terrain

The proposed resort is located at the top of the Kamiesberg Pass to the east of Kamieskroon on the N7 trunk road in Namaqualand of the Northern Cape. To the east is the wide expanses of the arid Boesmanland and to the west the Kamies Mountains.

The topography (Figure 5) is made up of granite outcrops, the upper ridges of the Kamies Mountains at an elevation of between 1000 and 1300masl. In between these rocks are patches of level ground that have been ploughed over for farming of rooibos tea and wheat. The land was barren during the site visit, with no new crops planted.

The main tourist attraction are the dense stands of wildflowers following the winter rainy season and for which Namaqualand is revered.

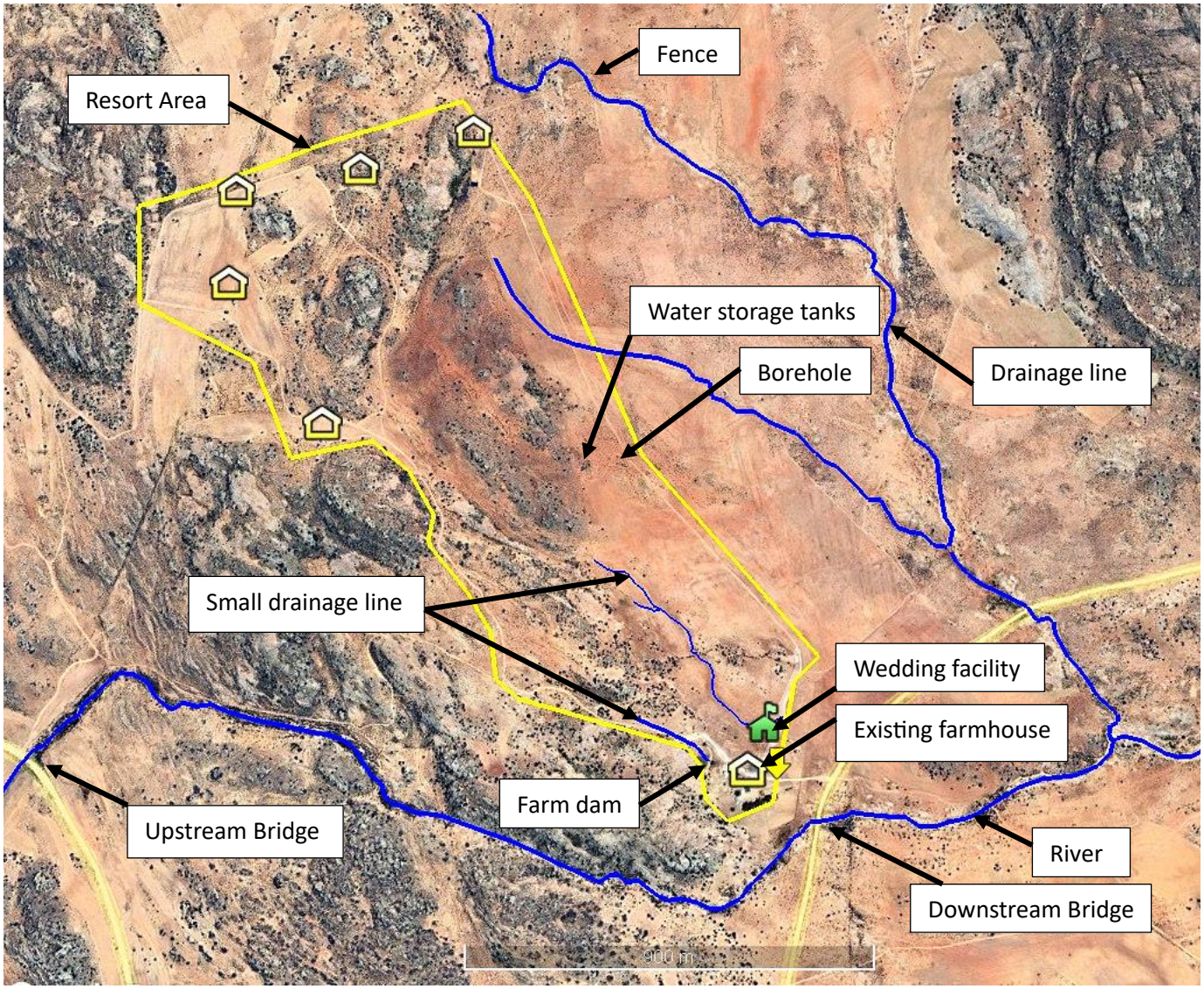


Figure 6 Resort Area Lay-Out

The resort area (Figure 6) is 100 ha in size and has been demarcated from the rest of the farm.

To the south is the very upper tributary of the Buffels River. It flows to the west, bends to the north and then to the west to open in the Atlantic Ocean at the coastal town of Kleinzee. Its flow path is undulated as it curves around the many mountains and hills. The river is mostly dry and only runs during and shortly after heavy rains.

During the site visit on 5 July, the river was flowing strongly because of the recent rainfall that resulted in a large flood with a recurrence of perhaps once in 100 years. The flow was observed at the upstream bridge as well as at the downstream bridge (Figure 7).

Water was running in the otherwise dry drainage line next to the fence (Figure 8) as well. The pool here had many tadpoles.

Figure 7 Flow at the upstream bridge and the downstream bridge

Figure 8 Flow at the fence

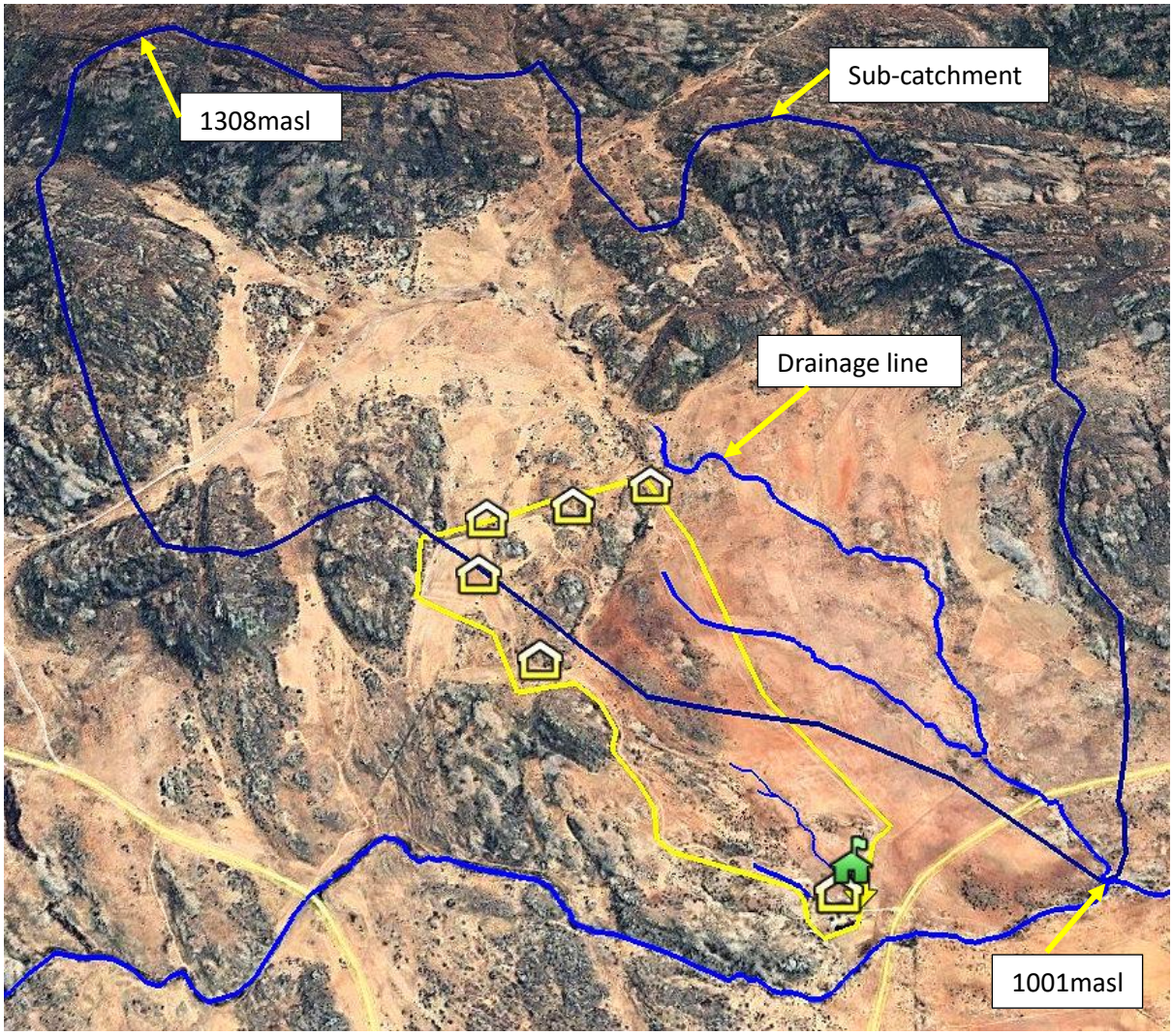


Figure 9 Sub-Catchment

The sub-catchment area of this larger drainage line (Figure 9) is 836 ha. This was established by connecting the highest points around the drainage line using Google Earth's polygon function. The distance from the highest to the lowest point of this sub-catchment is 5.1km, with a mean slope of 6 vertical meters in every 100 horizontal meters. Despite of the steep slope and potentially fast runoff, there were no signs of serious erosion during the site visit.

The level areas between the rocky outcrops have been utilised as rooibos tea fields for many generations of farmers. A faint drainage line is visible of Google Earth right through such a field (Figure 9). During the site visit water was running down this drainage line (Figure 10).

Figure 10 Small drainage line

Likewise, there was a small drainage line emanating from the rocks that ended up in a small farm dam (Figure 11). This drainage line carved itself a new flow path down a farm road (Figure 12). The flow was swiftly and manually redirected into the dam (Figure 13) instead of running down the farm road.

Figure 11 Farm dam

Figure 12 Flow down the farm road

Figure 13 Redirected flow into the farm dam

The ample rains brought a fountain (Figure 14) back to life, with a trickle of water flowing out of it. Previous farmers of this land dug a pit to get to the to this sparce underground water.

Figure 14 Fountain

8 The Project

Existing infrastructure includes a dwelling at the southern corner of the property (Figure 15 & 16).

Figure 15 Existing dwelling

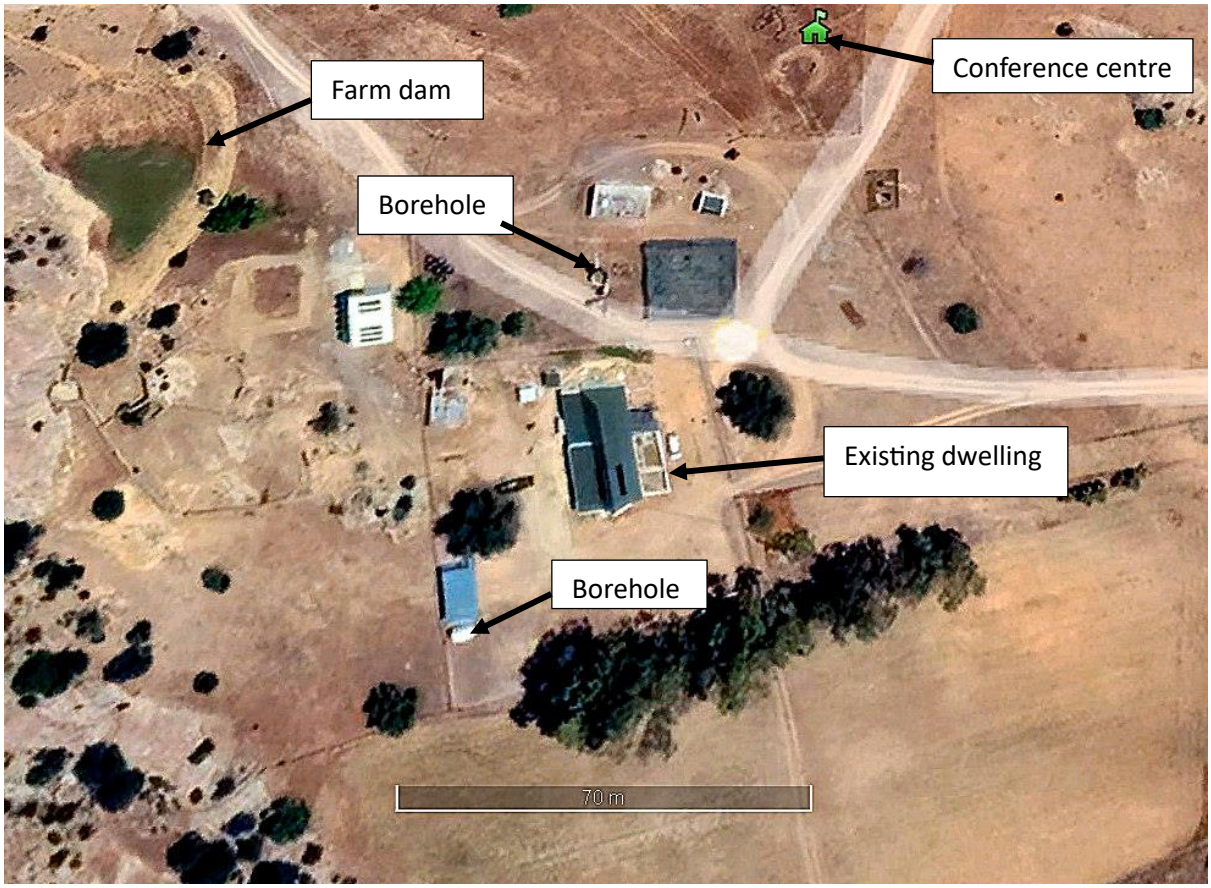


Figure 16 Existing dwelling

Figure 17 Borehole

Figure 17 depicts the borehole and windmill to the north of the farmhouse.

The borehole to the south of the farmhouse is shown on the front page of the report.

The farm dam is listed as an NFEPA.

There are some log homes as well (Figure 18).

Figure 18 Log Home

According to plan 7 or 8 of these homes will be added. There will be a wedding and conference facility in the far southern part of the demarcated area. This represents the entire project as no more homes are to be constructed.

The water provisioning consists of 3 boreholes provided with windmills. Two of them are of either side of the existing home and on is next to the eastern boundary (Figure 19).

Figure 19 Borehole

This borehole is equipped with solar energy and a submersible pump that replaced the windmill. The abstracted water is pumped into storage tanks (Figure 20), from where it is distributed over the property. Houses are provided each with their own storage tank.

Apart from water for domestic use, a little water is used for livestock watering. None of it is used for irrigation or other farming purposes.

Figure 20 Tanks

Figure 21 Buffels River at De Kuilen Farm

9 Present Ecological State

The PES and EIS are protocols that have been produced by Dr Neels Kleynhans (Table 2 and 3) in 1999 of the then DWAF to assess river reaches. The scores given are solely that of the practitioner and are based on expert opinion.

Table 2 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

The Buffels River at De Kuilen was flowing strongly (Figure 21) during the site visit on 5 July 2023, which deviates from the usually dry condition. The riparian vegetation is generally higher than that of the immediate terrestrial surroundings to form an ecological corridor along the river. This vegetation is supported by shallow ground water that seems to persist over the dry period. Higher up the catchment sedges are present as well as a stand of exotic grey poplar trees (*Populus* hybrid).

There is a larger dam much lower down the river that was not included for this PES. The river vegetation is extensively used for the grazing of livestock such as sheep and goats.

The Upper Buffel River is largely natural, with the ecosystem function still intact.

Table 3 Present Ecological State of the Upper Buffels River at Farm De Kuilen

Instream	Score	Weight	Product	Maximum score
Water abstraction	21	14	294	350
Flow modification	22	13	286	325
Bed modification	23	13	299	325
Channel modification	22	13	286	325
Water quality	24	14	336	350
Inundation	22	10	220	250
Exotic macrophytes	23	9	207	225
Exotic fauna	15	8	120	200
Solid waste disposal	24	6	144	150
Total		100	2192	2500
% of total			87.7	
Class			B	
Riparian				
Water abstraction	22	13	286	325
Inundation	23	11	253	275
Flow modification	23	12	276	300
Water quality	23	13	299	325
Indigenous vegetation removal	24	13	312	325
Exotic vegetation encroachment	21	12	252	300
Bank erosion	20	14	280	350
Channel modification	22	12	264	300
Total			2222	2500
% of total			88.9	
Class			B	

Die upper part on the drainage line on the property among the rocky ridges was almost pristine, with the only impact occasional grazing. Most of the lower part was heavily impacted by agriculture and ploughed-over lands. The riparian vegetation was similar

than that of the surroundings, with shrub and open ground. It did not resemble the obvious river corridor. These level parts were grazed more than the rocky parts.

Table 4 Present Ecological State of the Drainage line on Farm De Kuilen

Instream	Score	Weight	Product	Maximum score
Water abstraction	24	14	336	350
Flow modification	15	13	195	325
Bed modification	15	13	195	325
Channel modification	16	13	208	325
Water quality	23	14	322	350
Inundation	22	10	220	250
Exotic macrophytes	23	9	207	225
Exotic fauna	11	8	88	200
Solid waste disposal	24	6	144	150
Total		100	1915	2500
% of total			76.6	
Class			C	
Riparian				
Water abstraction	24	13	312	325
Inundation	22	11	242	275
Flow modification	14	12	168	300
Water quality	23	13	299	325
Indigenous vegetation removal	21	13	273	325
Exotic vegetation encroachment	24	12	288	300
Bank erosion	16	14	224	350
Channel modification	15	12	180	300
Total			1986	2500
% of total			79.4	
Class			C	

The drainage line is moderately modified, with some ecosystem loss.

The two smaller drainage lines were not assessed. These were merely and mostly stormwater running down farm roads and a wash through a ploughed-over land. Every bit of moist in this otherwise arid land has ecological significance, but in the case of these two drainage lines, there was too little of it to assess.

Importantly, because of the benign nature of the proposed development, the PES of the river and the drainage line is not about to change.

10 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 (Table 5).

Table 5 Ecological Importance according to endangered organisms (Kleynhans,1999).

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)

There is no permanent water in and around De Kuilen Farm and therefore there cannot be any fish. From this perspective, the river and the drainage line are not ecologically important.

This, however, cannot be true, as the riparian vegetation provides a corridor and ecologically connectivity that is of extreme ecological importance, especially in these arid regions where such corridors are few and far between.

The riparian vegetation of the drainage line does not differ from that of the surrounding vegetation and is therefore less important.

11 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.

Vegetation regrowth is extremely slowly in these arid parts. It is doubtful if the natural vegetation in the denuded rooibos tea field will recover within the next millennium. The river's riparian vegetation is largely intact, but if ever removed, it predictably won't restore itself in a very long time. The same can be predicted for the drainage line.

For this reason, the water courses in and around De Kuilen farm can be considered as ecologically sensitive.

12 EISC

The EISC is an index that was devised by Dr Neels Kleynhans of the then Institute of Water Quality Studies of the Department of Water Affairs and Forestry. It is obligatory to add the value to the Risk Matrix.

Again, the values given are entirely according to the knowledge and experience of the assessor.

According to Helme & Desmet (2006), the botanical biodiversity is exceptionally high in the Kamiesberg uplands. The riparian zones of the river and the drainage line cannot be an exception from this finding. This elevates the EISC score.

Again, because of the proposed development's low impact, the EISC is not about to change.

Table 6 EISC

Determinant	Upper Buffels River	Drainage line
Rare and endangered species	3	3
Populations of unique species	3	3
Species / Taxon richness	3	3
Diversity of habitat	2	2
Migration Route/ Breeding and feeding site for wetland species	3	1
Sensitivity to water quality changes	1	1
Flood storage, energy dissipation, particulate / element removal	1	1
Protection status	0	0
Ecological integrity	3	2
Average	2.1	1.8
Score	High	Moderate

Score guideline:

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

Confidence Rating

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

13 Possible Impacts

The scope of the proposed project is limited, with 8 or 9 new houses spread out over a large area and a conference and wedding centre.

It is not foreseen that the construction of new dwellings and buildings would have a negative impact, as there is adequate land between the building activities and the water courses. It is nevertheless mentioned that building material and rubble must be kept away from the water courses, even the two very small ones.

It is doubtful if the abstraction of groundwater for household use would have any impact on the water levels in the river and the drainage line.

A possible impact is the release of sewage and wastewater in the water courses on the property. If the septic tanks and soakaway systems are properly constructed and dug in deep enough for the wastewater to remain underground, the likelihood of surface water contamination is remote. The grounds of the farm are large, large enough to treat and contain household sewage. The distance to the Kamieskroon

wastewater treatment works is too large and the terrain down the pass too rough for wastewater to be delivered and treated there and this is entirely not a viable option.

It is advised to limit livestock to the numbers intended for the De Kuilen Retreat's intended purpose and not for large-scale farming. The riparian zones would benefit from keeping down the numbers and not to allow overgrazing.

The household and solid waste on the property must be collected, separated and the non-recyclable portion must be taken to the municipal waste disposal site. A burning pit on the grounds where the left-over bits are buried is probably not the indicated method of final disposal.

The roads on the farm crossing water ways or new roads that can act as preferential stormwater flow paths must be kept to a minimum or must be avoided altogether.

It is unlikely that people will add to the trampling of the grounds and the water ways, but as with farm roads, the creation of new footpaths must be avoided.

14 Impact Assessment

Some of the authorities, such as the DFFE and its provincial offices prescribe an impact assessment according to a premeditated methodology.

The main benefit of this exercise is that it allows for the evaluation of mitigation measures. Later follows a Risk Assessment. This is different from the Impact Assessment as it does not attempt to weigh the success of mitigation measures.

The methodology is set out in the Appendix.

The impact assessment follows the stages in the life cycle of a project. These stages include planning, construction, operation, decommissioning and rehabilitation.

The implementation of mitigating measures is straight forward, simple and easily obtainable. It comes down to good management.

The construction and operation of the resort is not expected to have any undue impacts on the watercourses on the property.

Table 7 Impact Assessment

Description of impact: Construction Phase

Transport and storage of building material
Digging of trenches for foundations
Construction of buildings

Mitigation measures

Prevent loose soil, sediments and debris from moving down the Upper Buffels River and the drainage line.
Keep footprint as small as possible.
Do not create more access routes. Use the existing ones.

Type Nature	Spatial Extent	Severity	Duration	Significance	Probability	Confidence	Reversibility	Irreplaceability
Without mitigation								
Direct	Local	Medium	Short term	Medium	Definite	Certain	Reversible	Replaceable
With mitigation measures								
Negative	Local	Low	Short term	Low	Definite	Sure	Reversible	Replaceable

Description of impact: Operational phase

Habitation of dwellings
Receiving guests in conference and wedding venue
Operation of the de Kuilen Retreat

Mitigation measures

Maintain sewage and wastewater systems.
Prevent trampling of the water courses on the property.
Practice proper solid waste management

Type Nature	Spatial Extent	Severity	Duration	Significance	Probability	Confidence	Reversibility	Irreplaceability
Without mitigation								
Direct	Local	Medium	Long term	Medium	Definite	Certain	Reversible	Replaceable
With mitigation measures								
Negative	Local	Low	Long term	Low	Definite	Sure	Reversible	Replaceable

15 Risk Matrix

The purpose of the Risk Matrix is to determine if a General Authorisation of a License is applicable.

The assessment was carried out according to the interactive Excel table that is available on the DWS webpage. Table 8 is a replica of the Excel spreadsheet that has been adapted to fit the format of this report. The numbers in Table 10 (continued) represent the same activities as in the Impact Assessment, with sub-activities added.

The methodology is tabled in the Appendix.

Table 8 Risk Matrix

No.	Activity	Aspect	Impact	Significance	Risk Rating
1	Transport and storage of building material Digging of trenches for foundations Construction of buildings	Mobilisation of soil	Soil and debris washing down the Upper Buffels River and the drainage line Destruction of aquatic habitat	24	Low
2	Habitation of dwellings Receiving guests in conference and wedding venue Operation of the de Kuilen Retreat	Production of waste and sewage	Pollution of aquatic habitat	28	Low

Table 8 Continued Risk Matrix

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

No	Frequency of activity	Frequency of impact	Legal issues	Detection	Likelihood	Significance	Risk Rating
1 2	1 2	1 2	5 5	1 1	8 10	24 40	Low Low

The environmental risks are small, even negligible, because of the low-impact nature of the project.

The Risk Matrix indicates that a General Authorisation is the correct level of approval. A License is not called for.

16 Numerical Significance

Decision-makers often press on a numerical score for Significance**.** The score takes into consideration both the environmental value of the site and the degree of impact.

Table 26.4, p52, Appendix provides a system for allocation values for each of the parameters Conservation Value, Extent, Duration, Severity and Likelihood with regard to possible impacts These values are then entered into the equation on p53 to derive at a value for Significance. The value for Significance can subsequently be evaluated according to Table 26.4.2.

Table 26.4.2 provides a yardstick for decision-making to allow or disallow a development with its concomitant impact on the environment.

The scores that were given are entirely those of the specialist (Table 11), 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.

From a conservation point of view, a combination of the impacts and the value of the habitat, the significance demands to almost nothing. This analysis shows that the proposed development should go ahead.

Table 9 Significance Score

Parameter	Upper Buffels River	Drainage line
Conservation value	3	2
Likelihood	1	1
Duration	3	3
Extent	1	1
Severity	1	1
Significance	18	12
	Insignificant	Insignificant

17 Resource Economics

The goods and services delivered by the environment 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 river, the goods and services delivered are particularly applicable and important, hence it was decided to include it in the report.

The diagram (Figure 22 and 23) is an accepted manner to visually illustrate the resource economic footprint the drainage line, from the data in Table 10.

Table 10. Goods and Services

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

0	Low
5	High

Figure 22. Resource Economics Footprint of the Upper Buffels River

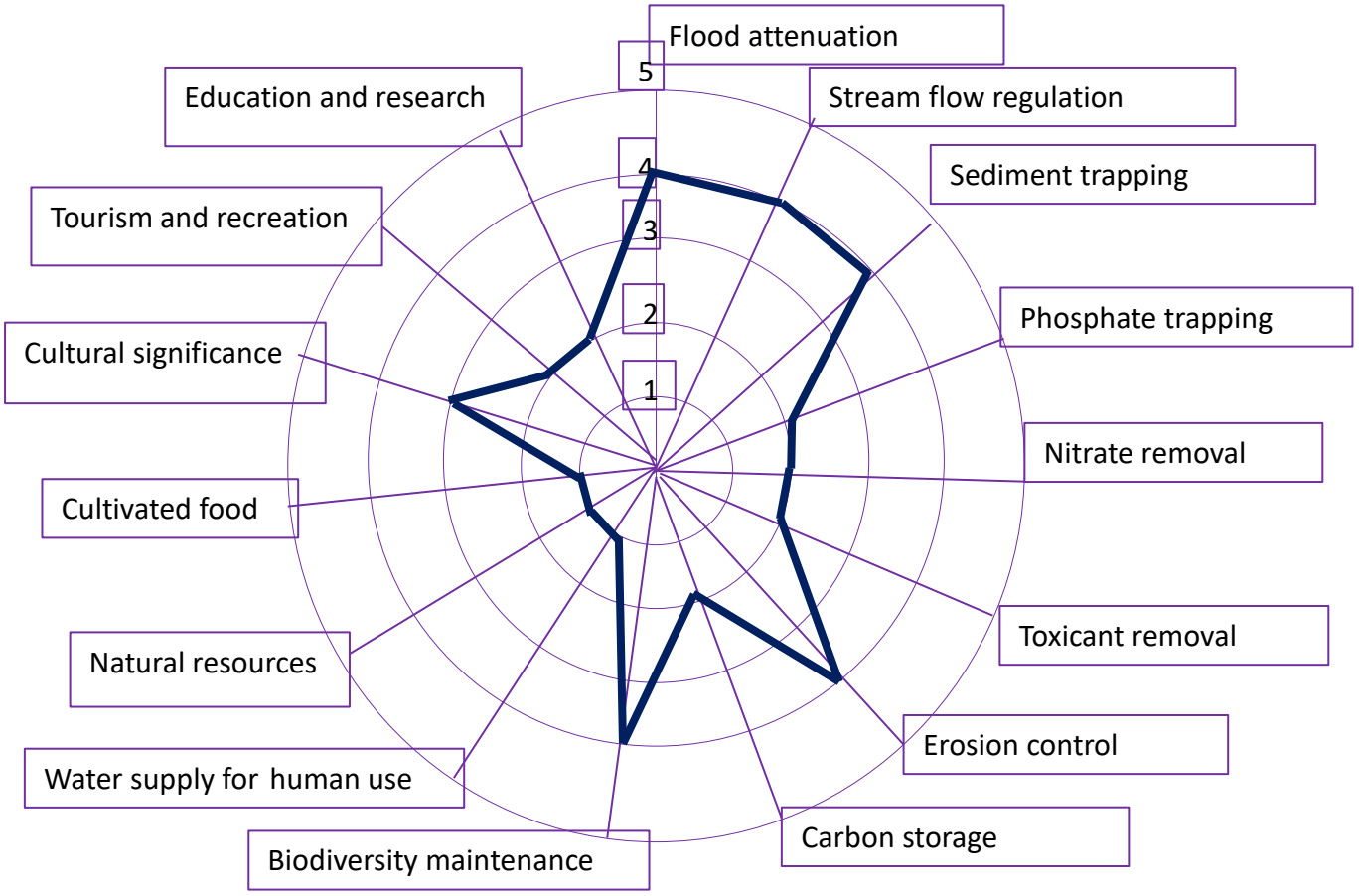
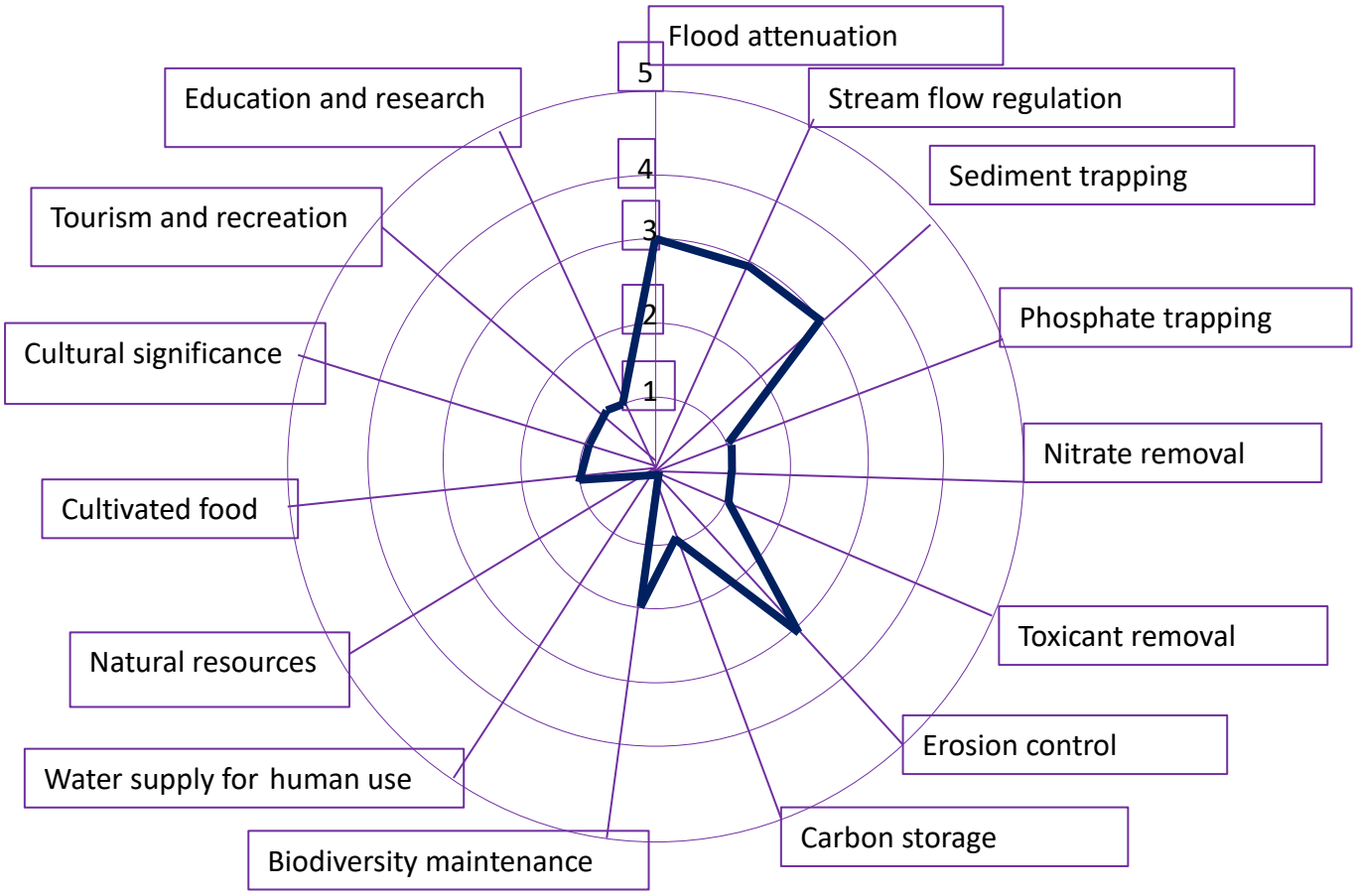


Figure 23. Resource Economics Footprint of the drainage line



A large star shape for the drainage lines combined would attract decision-maker's attention. The spider diagram of the Upper Buffels River at De Kuilen is bigger that of the drainage line, but none are big enough to draw the attention of the authorities.

The proposed development would not change the shape of dimensions of the spider diagrams.

Resource Economics do not provide any reason not to go ahead with the project.

18 Summary

Table 11 Summary of evaluations

Aspect	Status
DFFE Screening Tool	High and Very High
Western Cape Biodiversity Spatial Plan	CBA
Priority Areas	NFEPA
Vegetation	Least Concern
PES of the Upper Buffels River	Instream B, Riparian B
PES of the drainage line	Instream C, Riparian C
Ecological Importance Upper Buffels River	Important
Ecological Importance drainage line	Not Important
Ecological Sensitivity Upper Buffels River	Sensitive
Ecological Sensitivity drainage line	Sensitive
EISC Upper Buffels River	Low
EISC drainage line	Low
Impact assessment	Mitigation readily implementable
Risk Matrix	General Authorization
Numerical Significance	Insignificant
Resource Economics	Small footprint

Table 11 gives an overall and much condensed view of the assessments and methodologies that have been applied to the drainage line.

Like many of similar summaries it is a mixed bag ranging from not important to important. Nevertheless, the proposed development would not change any of these outcomes.

The NFEPA wetlands have liberal buffer zones (Figure 4). The existing buildings and some of the proposed new buildings and dwellings are in the 500m controlled zone. These wetlands are mostly dry drainage lines, according to observations during site visits. A 100m controlled zone is therefore indicated. Only the existing buildings are in this controlled zone, next to the small farm dam.

Nevertheless, for whatever width of controlled zone, official approval is sought for the ongoing operation of the resort and for the construction of new buildings.

19 Discussion and Conclusions

Figure 24 has been adapted from one of the DWS policy documents.

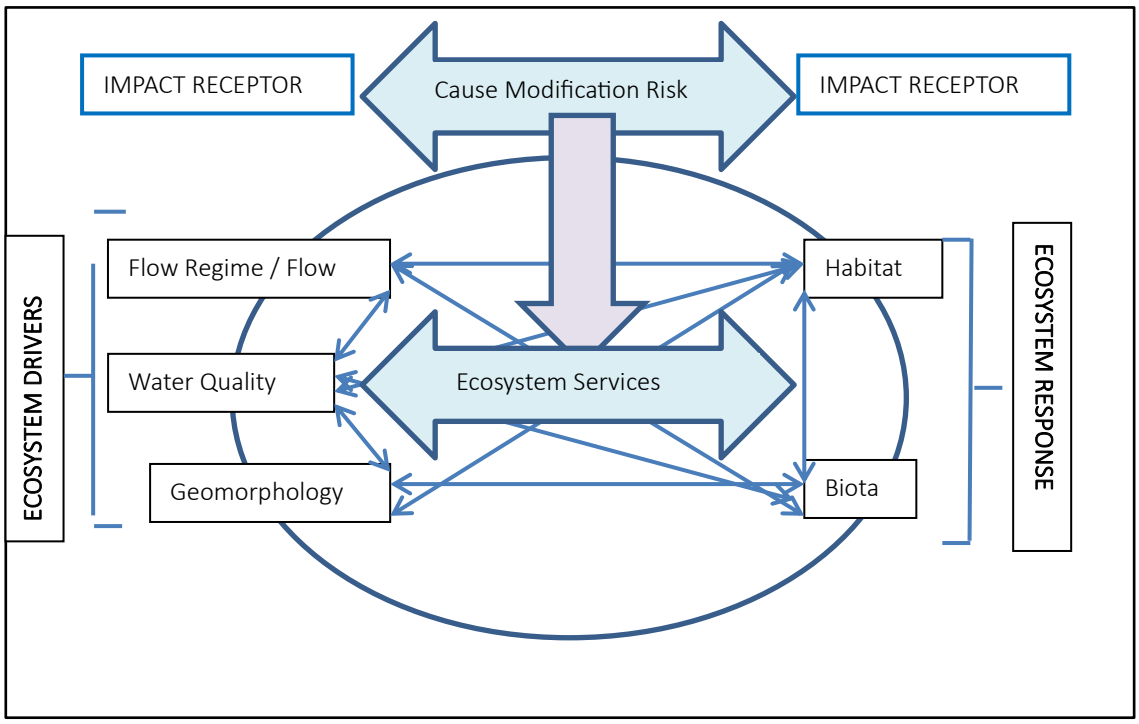


Figure 24 Minimum Requirements for a S21(c) and (i) Application.

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

The conclusions can be structured along the outline that is provided by Figure 24.

The driver of the river and the drainage line obviously is the rain, mostly in winter. The annual rain is not guaranteed to get the water courses on De Kuilen Farm to run. Some years there may be no flow at all. It is the occasional flood that maintains the integrity of the water courses, once in several years.

Along with the rain, the groundwater is as important. There may not be any water visible on the surface, but below may be a constant flow, however small, of shallow groundwater that trickles down the riverbed to keep the riparian vegetation and the ecological corridor alive.

The next driver is the drought. These droughts can be prolonged, even several years. Droughts determine the characteristics of the area as well as that of the water courses.

The proposed development on De Kuilen Farm is of a low density and a low impact nature and would have little if any impact on the water courses on the farm. Mitigating measures can be readily and successfully implemented.

It is strongly recommended that the proposed development in approved in terms of a General Authorisation.

20 References

Helme, N &P. Desmet. 2006. *A description of the endemic flora and vegetation of the Kamiesberg uplands, Namaqualand, South Africa.* Critical Ecosystem Partnership Fund of Conservation International, Washington, DC.

Kleynhans, C.J. 1999. *Assessment of Ecological Importance and Sensitivity*. Department of Water Affairs and Forestry. Pretoria.

Kotze, G., G. Marneweck, A. Batchelor, D. Lindley & Nacelle Collins. 2009. *A technique for rapidly assessing ecosystem services supplied by wetlands.* Water Research Commission, Pretoria.

Mucina, L. & M.C Rutherford. 2006. The vegetation of South Africa, Lesotho and Swaziland. SANBI, Pretoria.

21 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:  12 July 2023

22 Résumé

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Water Scientist

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Experience

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 (Past Deputy Chairperson): Grotto Bay Homeowner's Association
- Past 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 Wastewater 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
- Fresh Water Report, Marksman's Nest Rifle Range, Malmesbury
- Biodiversity Report, Muggievlak Storm Water Canal, Vredenburg
- Strategic Planning Report, Sanitation, Afghanistan Government, New Delhi, India
- Fresh Water Report, Potable Water Pipeline, Komaggas
- Fresh Water Report, Wastewater Treatment Works, Kamieskroon
- Fresh Water Report, Turksvy Farm Dam, Upington
- Fresh Water Report, Groblershoop Urban Development, IKheis Municipality
- Fresh Water Report, Boegoeberg Urban Development, IKheis Municipality
- Fresh Water Report, Opwag Urban Development, IKheis Municipality
- Fresh Water Report, Wegdraai Urban Development, IKheis Municipality
- Fresh Water Report, Topline Urban Development, IKheis Municipality
- Fresh Water Report, Grootdrink Urban Development, IKheis Municipality
- Fresh Water Report, Gariep Urban Development, IKheis Municipality
- Fresh Water Report, Bonathaba Farm Dam, Hermon
- Botanical Report, Sand Mine Greystone Trading, Vredendal
- Botanical Report Namakwa Klei Stene, Klawer
- Fresh Water Report Buffelsdrift Quarry, George
- Fresh Water Report Styerkraal Agricultural Development, Onseepkans.
- Technical Report Arabella Country Estate Wastewater Treatment Works, Kleinmond
- Fresh Water Report Calvinia Bulk Water Supply
- Fresh Water Report Swartdam Farm Dams, Riebeeck Kasteel
- Fresh Water Report Erf 46959, Gordon's Bay
- Fresh Water Report Melkboom Farm Dam, Trawal
- Stormwater Management Plan, Bot River Bricks
- Freshwater Report, Bot River Bricks
- Freshwater Report Sanddrif Farm, Joubertina
- Freshwater Report Zouterivier Cell phone tower, Atlantis
- Biodiversity Report Birdfield Sandmine, Klawer
- Freshwater Report New Wave Dam, Klawer
- Freshwater Report Harvard Solar Energy Plant, Bloemfontein
- Freshwater Report Doorn River Solar Energy Plant, Virginia
- Freshwater Report Kleingeluk Farm, De Rust
- Freshwater Report, Solar Energy Plant, Klein Brak River
- Site Verification Report Laaiplek Desalination Plant
- Freshwater Report, CA Bruwer Quarry, Kakamas
- Freshwater Report, Orren Managanese Mine, Swellendam
- Wetland Delineation, Klipheuvel ZCC Solar Energy
- Freshwater Report Delville Park, George
- Freshwater Report Wolseley bulk water pipeline
- Freshwater Report Urban Settlement No.1 Pababello Upington
- Freshwater Report Urban Settlement No.2 Pababello Upington

23 Appendix

23.1 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 23.1.1 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 23.1.2 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 23.1.3 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 23.1.4 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.

23.2 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

Table 23.3 Numerical Significance

Table 23.3.1 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 23.3.2 Significance

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.

Table 23.3.3 Scoring system

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)