WATER USE LICENSE APPLICATION
FRESH WATER REPORT
PROPOSED DEVELOPMENT OF ERF 4440
KURUMAN

A requirement in terms of Section 21 (c) and (i) of the
National Water Act (36 of 1998)
June 2020

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Abbreviations

Critical Biodiversity Area	CBA
Department of Water and Sanitation	DWA
Ecological Importance	EI
Ecological Sensitivity	ES
Ecological Support Area	ESA
Environmental Impact Assessment	EIA
Electronic Water Use License Application (on-line)	eWULAA
Government Notice	GN
Hectares	ha
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
Non-government organization	NGO
Present Ecological State	PES
South Africa National Biodiversity Institute	SANBI
Section of an Act of Parliament	S
Water Use License Application	WULA

1 Introduction

The Sishen Iron Ore Company Community Development Trust is contemplating the development of Erf 4440 in Kuruman located in the Ga-Segonyana Municipality in the Northern Cape.

The Trust appointed Macroplan of Kimberley to draft the lay-out of the proposed development, as well as to direct and manage the legally required EIA.

The Trust subsequently appointed Enviro Africa of Somerset West to carry out the EIA in terms of NEMA and its regulations. The EIA includes a public participation process (Figure 1).

Erf 4440 is located right on a mostly dry drainage line. It is located within the 100m buffer zone of the Upper Kuruman River. In terms of the NWA, this drainage line is a legitimate water resource. If development is to take place here, official approval is required, which includes a WULA, a Fresh Water Report and an on-line registration on the eWULAA system.

Subsequently Enviro Africa appointed Dr Dirk van Driel of WATSAN Africa in Cape Town to produce the Fresh Water Report and to officially register the project.

The Fresh Water Report must supply adequate information for the decision-makers to arrive at informed decision. It has to be written according to a fixed and established outline and contents. It must contain a Risk Matrix, according to which it is decided if a License of General Authorisation is the indicated level of authorisation.

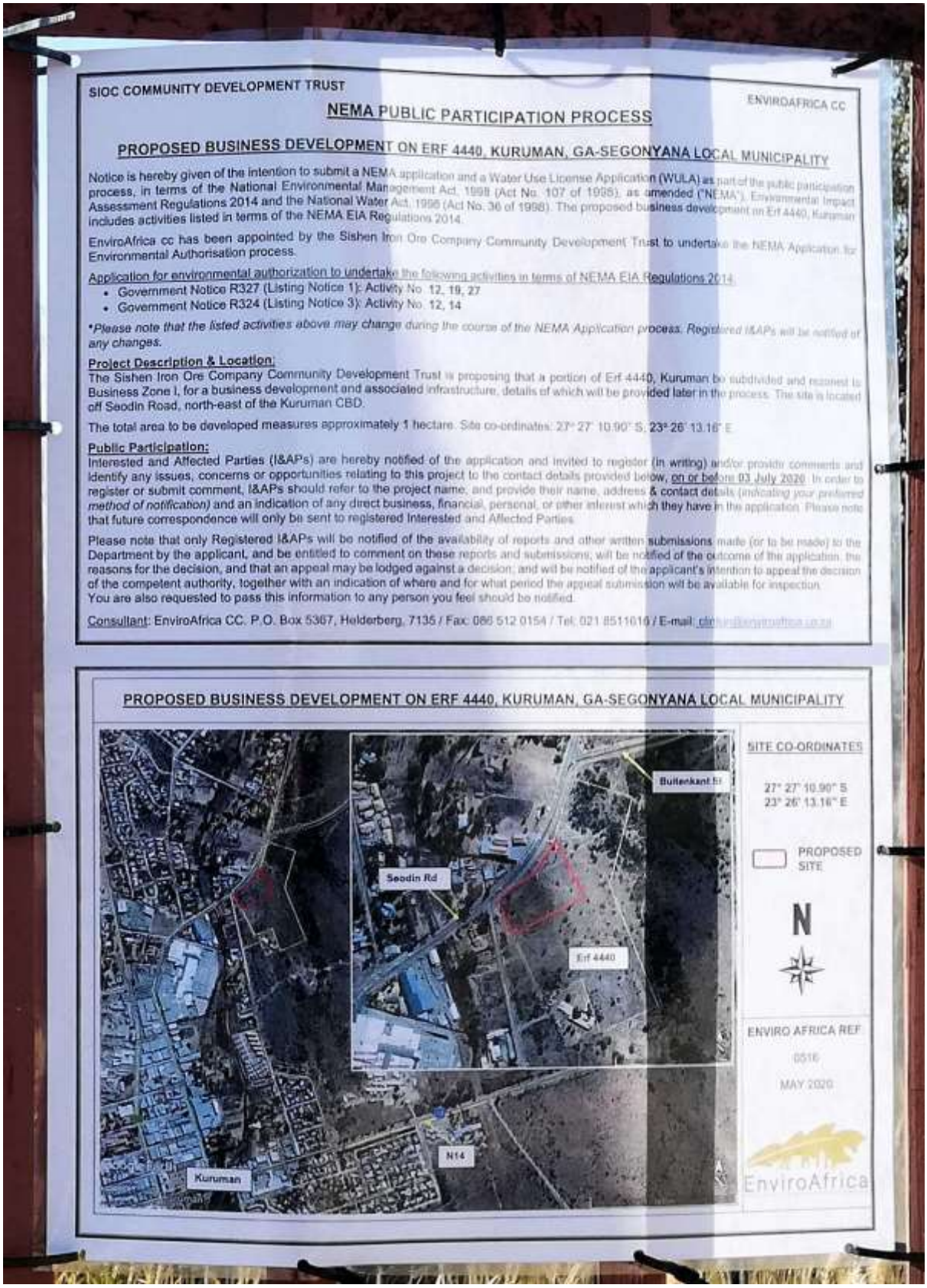

Figure 1 Public participation

2 Quaternary Catchment

Kuruman is in the D41L quaternary catchment.

3 Vegetation

Mucina and Rutherford (2006) listed the vegetation type as Kuruman Thornveld. It is listed as “Least Concern”. None of this is endangered in any way.

4 Conservation status

The Kuruman River is listed as a NFEPA and the Eye is listed as a NFEPA wetland.

5 Kuruman Climate

https://weather-and-climate.com/average-monthly-Rainfall-Temperature-Sunshine,Kuruman,South-Africa

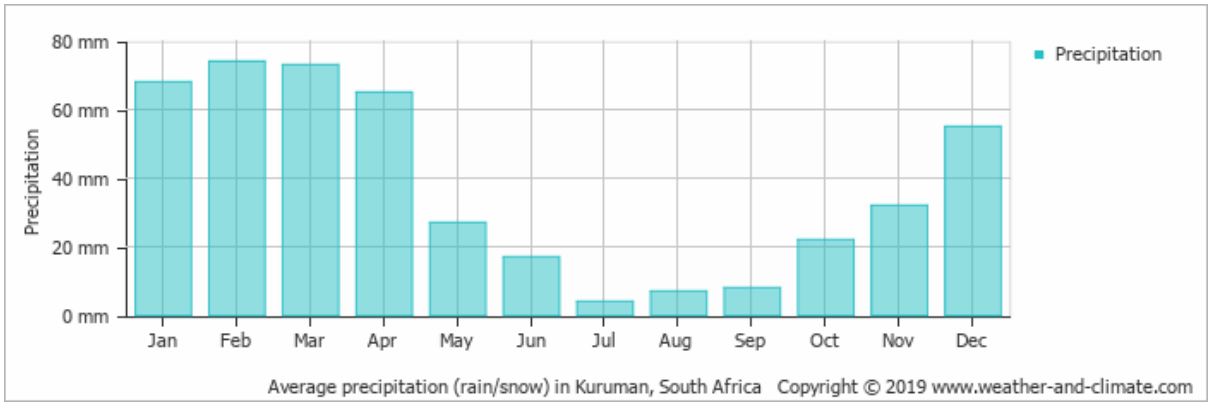

Figure 2 Kuruman average rainfall

Kuruman is in the summer rainfall area (Figure 2)**,** with an average annual rainfall of 472mm. Rainfall is variable, with long period of drought. Rain often comes with violent electric afternoon thunderstorms.

The summer is hot, with temperatures rising to the high thirties and even to the forties (Figure 2).

The annual evaporation outstrips the annual rainfall sever times over. This accounts for the drainage lines that are mostly dry.

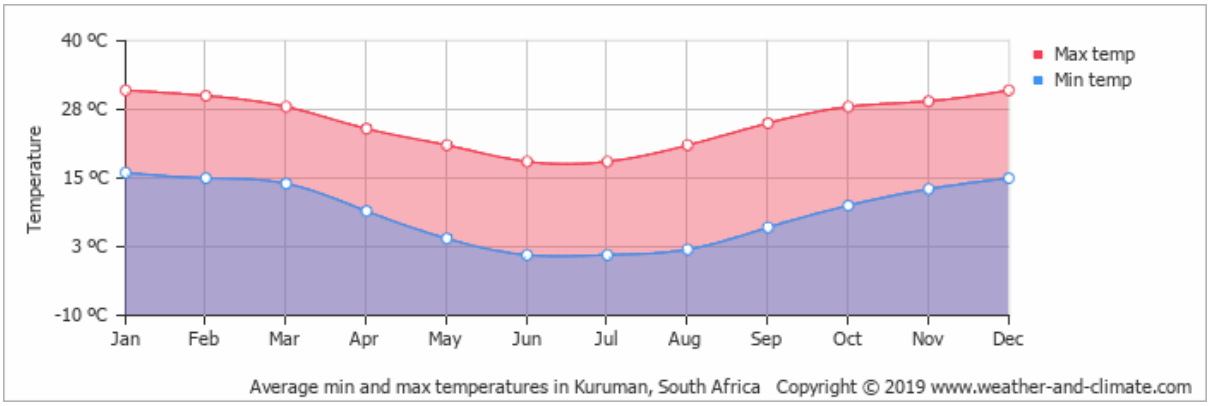

Figure 3 Kuruman Average temperature

6 Legal Framework

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

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

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

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

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

Government Notice 267 of 24 March 2017

Government Notice 1180 of 2002. *Risk Matrix.*

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

Government Notice 509 of 26 August 2016

An extensive set of regulations that apply to any development in a water course is listed in this government notice in terms of Section 24 of the NWA. No development take place within the 1:100 year-flood line without the consent of the DWS. If the 1:100-

year flood line flood line is not known, no development may take place within a 100m from a water course without the consent of the DWS. The development is adjacent to drainage lines, which are defined as legitimate water resources.

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

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

This Fresh Water Report is exclusively focussed in S21 (c) and (i) of the NWA

7 Sub-Catchment

Figure 4 Erf 4440

Figure 5 Sub-catchment

Erf 4440 is depicted in Figure 4. It is located in the sub-catchment shown in Figure 5.

The sub-catchment of the drainage line is very small at only 27 hectares. This was established by using the elevations on Google Earth as well as the polygon function. The sub-catchment is only 723m long. This was measured from the culvert in the north west corner of the sub-catchment to the south east boundary.

The Kuruman River rises out of the “Eye”, which is a fountain in the middle of town, which renders 20 megalitres of water per day and which is the source of the town’s domestic water supply. This part of the Northern Cape has several springs that rises from the underlying dolomite.

The corner of Erf 4440 (Figure 4) on Seodin Road and Cunningham Avenue is 70m away from the Kuruman River. This is within the 100m buffer sone, which “triggers” the need for a WULA. If this corner of Erf 4440 is above the 1:100 year-flood line, to override the 100m buffer requirement, there is a drainage line in the northern corner of Erf 4440, which is regarded as a legitimate water resource and for which a WULA is required.

This drainage line is marked by a culvert on the corner of Buitekant Street and Seodin Road (Figure 6 and 7). There is another culvert underneath Seodin Road, through which this drainage line passes on its way to the Kuruman River.

The drainage line is densely overgrown with mainly sweet thorn trees (*Vachellia karoo*, Figure 8). There was a camel thorn tree (*Vachellia erioloba*) as well.

Figure 6 Position of culverts

Figure 7 Culvert

Figure 8 Overgrown drainage line

Figure 9 Drainage line

Figure 10 Dumping site

At the time of the site visit on 22 May 2020, the drainage line was dry, as it usually is.

The drainage line has two legs towards the south and south east, where it frizzles out, probably because the shallow groundwater is too little to support a stand of trees (Figure 9).

There is a dumping site in the drainage line, with building rubble and domestic waste (Figure 10).

8 Kuruman River

The closest point of the Kuruman River to Erf 4440 is at the bridge in Barnard Street. The river here has been transformed into a narrow and straightened canal. The one bank is right up the back of a commercial building (Figure 11).

The culvert serves as an indication for the size of a flood that the city planning has allowed for (Figure 12).

The water here was fast flowing, at an estimated rate of $100ls^{-1}$, the water was clear but really smelly. It was decided not to attempt biomonitoring, because of the possible health risk.

The other bank was strewn with litter and domestic waste.

It seemed as if the riparian zone of the river on the left bank (looking upstream, is rather wide, perhaps 20m, but entirely transformed, away from a natural condition.

Looking downstream, the river has been limited to a narrow canal, suited to urban drainage, but not for allowing ecological functioning (Figure 13).

Further downstream, the river still has been shaped into a narrow channel, overgrown with reeds and with little open water Figure 14). The riparian sones has been transformed into pastures and residential plots (Figure 15).

Figure 11 Kuruman River in Barnard Street

Figure 12 Culvert in Barnard Street

Figure 13 Kuruman River downstream from Barnard Street Culvert

Figure 14 Kuruman River Poolman Street

Figure 15 Pasture

9 **Present Ecological State** (PES)

Table 1 Habitat Integrity according to Kleynhans, 1999

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 PES and EIS are protocols that have been produced by Dr Neels Kleynhans (Table 1, 2 and 3) in 1999 of the then DWAF to assess river reaches. The PES is one of the evaluations that is prescribed for S21 (c) and (i) WULA's. The scores given are solely that of the practitioner and are based on expert opinion.

Table 2 Present Ecological State of the Erf 4440 Drainage Line

Instream	Score	Weight	Product	Maximum score
Water abstraction	24	14	336	350
Flow modification	18	13	234	325
Bed modification	12	13	208	325
Channel modification	12	13	208	325
Water quality	14	14	196	350
Inundation	16	10	160	250
Exotic macrophytes	19	9	171	225
Exotic fauna	21	8	168	200
Solid waste disposal	6	6	36	150
Total		100	1717	2500
% of total			68.7	
Class			C	
Riparian				
Water abstraction	24	13	312	325
Inundation	18	11	198	275
Flow modification	18	12	216	300
Water quality	14	13	182	325
Indigenous vegetation removal	21	13	273	325
Exotic vegetation encroachment	19	12	228	300
Bank erosion	22	14	308	350
Channel modification	12	12	144	300
Total			1861	2500
% of total			74.4	
Class			C	

Table 3 Present Ecological State of the Kuruman River at Erf 4440

Instream	Score	Weight	Product	Maximum score
Water abstraction	10	14	140	350
Flow modification	8	13	104	325
Bed modification	7	13	91	325
Channel modification	6	13	78	325
Water quality	12	14	168	350
Inundation	9	10	90	250
Exotic macrophytes	8	9	72	225
Exotic fauna	6	8	48	200
Solid waste disposal	13	6	78	150
Total		100	869	2500
% of total			34.8	
Class			E	
Riparian				
Water abstraction	10	13	130	325
Inundation	9	11	99	275
Flow modification	8	12	96	300
Water quality	12	13	156	325
Indigenous vegetation removal	6	13	78	325
Exotic vegetation encroachment	8	12	96	300
Bank erosion	12	14	168	350
Channel modification	4	12	48	300
Total			871	2500
% of total			34.8	
Class			E	

The drainage line, even though the last reach has been entirely altered, and even though a lot of rubble has been dumped in the upper reach, it still is in a reasonable state, with most ecological functioning still intact. This will probably change with the proposed development. A lower ecological class seem to be inevitable, should the development go ahead.

The narrow and straightened Kuruman River is overgrown with *Phragmitis* reeds, while the original natural condition would have been a dense cover of bushveld trees, with only reeds where the canopy was open. These reeds are not exotic, as in Table 3, but do not belong there, so they were regarded as exotic for the purpose of this evaluation.

Further downstream, in the townships up north, the river is denaturalised as well, with no flow at all except during heavy rain, where trampling and overgrazing are the prominent impacts.

It is therefore not surprizing that the river only scored an “E”, with much of the original ecological functioning lost.

The new development on Erf 4440 is expected to release even more urban runoff into the river, as the hardening of surfaces progresses, but it would not really matter, as the river already has been degraded. It can get a lot worse, because many urban rivers have been transformed into concrete lined storm water canals. As much as possible of the ecological functioning should be preserved, despite of future urban development.

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).

There are no fish in the drainage line, as there is no permanent water. According to this assessment, which is prescribed for WULA’s, the drainage line is not important.

No other endangered species, either plant or animal, were detected in or near the drainage line. The camel thorn trees are protected, which significantly raises the ecological importance of the very small drainage line.

Table 4 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)

The upper reach of the Kuruman River is ecologically important.

The following fish species occur here:

Carp *Cyprinys carpio*
Blue kurper *Oreochromis mosambicus*
Barbel *Clarias gariepinus*
A variety of aquarium gold fish
Rare cichlid *Pseudocrenilabrus philander*

Carp is an exotic fish from Asia and an aggressive invader. Kurper and barbel were probably translocated from other rivers such as the Orange River and East African rivers.

The rare cichlid (Figure 16) is present in other African inland water bodies (Skelton, 1993), such as the isolated Wondergat in North West Province. It is nevertheless listed as an IUCN endangered species, which renders the Kuruman Eye as ecologically important. There is no reason to believe that this fish was present downstream from the Eye in the Kuruman River as well. Perhaps some of these fish are still to be found, despite the transformed aquatic habitat.

Figure 16 *Pseudocrenilabrus philander*
https://www.google.com/search?q=pseudseudocrenilabrus+philander+image&rlz=1C1CHZL_enZA722ZA722&sxsrf=ALeKk00Kvgxi86j2pziR-ubkqtjJJoevLQ:1593001943919&tbm=isch&source=iu&ictx=1&fir=ukqZRh5zchlOZM%252

An investigation is required to establish the status of the *P. philander* population in the Eye. There is reason to believe that there are still some left.

This renders the upper reach of the Kuruman River as most important.

Therefore, this aquatic habitat is worthy of restoration. The cichlid should be protected from predation by introduced fish such as barbels, as well as from competition by other fish such as carp and kurper. The municipality maintains a ban on fishing in the Eye,

but from a conservation point of view, it could be beneficial if barbels, kurpers and carps are targeted by anglers.

The new development on Erf 4440, the resulting increased urban runoff into the upper Kuruman River does not bode well for this important aquatic habitat. Runoff is channelled straight into the river (Figure 17). Further deterioration can be limited if a River Maintenance Plan is to be compiled, preferably by qualified and experienced specialists in this area of expertise, which includes a habitat restoration program.

Figure 17 Stormwater infrastructure in Barnard Street

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.

11.1 Ecological Sensitivity Drainage Line

The question arises**,** according to the ES definition, if the drainage line and especially its riparian sone is rehabilitated, would it recover to its original ecological state prior to any human impact? If the roads and buildings that are going to be constructed on Erf 4440, one day in the future, are to be removed, would the drainage line recover? The answer is probably yes, even though the drainage line would find new routes and even though it would take many decades, perhaps more than a century. The rehabilitation

process can be expedited if helped along by specialists in this field. However, this is not a realistic scenario. Development is here to stay, together with its impacts. From this point of view the drainage line can be considered as ecologically sensitive.

11.2 Ecological Sensitivity of the Kuruman River

The upper Kuruman River currently is entirely denaturalised. The question now is: will the river and its riparian zone come back to a state closer to its original condition if rehabilitated? Moreover, will the river to such an extent that the cichlid population will establish itself and grow in the newly available aquatic habitat? Again, the answer is probably it would, especially if the process is helped along by experts in the field of river rehabilitation. There are plenty of examples were rivers were successfully brough back to life.

The question is if the decision-making authorities, on a provincial and local level, will find the enthusiasm, energy and necessity for such an environmentally lofty venture.

From this point of view, the upper Kuruman River is not ecologically sensitive. It is, however, dreaded that on account of sensitivity, that the Kuruman River is yet to take any more impacts.

12 Possible Impacts

The trees of drainage line riparian zone will be removed and replaced with buildings. This is a direct and deleterious impact.

Should there be a major thunder storm during the construction phase, soil and building rubble can be washed down the drainage line and into the river.

The runoff from the newly hardened urban surfaces will find its way into the Upper Kuruman River, with the negative impacts on the water quality.

During the operational phase of the new complex, litter can wash down the drainage line and into the river.

13 Mitigation Measures

There are no mitigating measures available for saving the drainage line from development. Wherever possible, depending on the lay-out and design of the new complex, some of the trees may be saved, especially the big ones closer to the culvert. The camel thorn tree must be saved, according to national legislation, and the complex must be designed around these trees. Alternatively, official permission must be obtained before these trees can be touched.

The building phase would probably last longer than a year and would span over at least one rainy season. The sub-catchment is very small to produce much runoff and

it is unlikely that sediments and building rubble will wash down the drainage line. The two downstream culverts would help to prevent downstream contamination. Due vigilance is required, should the worst loom, and measures should be taken to contain any contaminated runoff from reaching the river.

The impact on the water quality of the river can be partially mitigated by allowing the very last reach of the drainage line next to the river to overgrow even more, like a reedbed, for “polishing” runoff before entering the river. This last reach is on private land, which would pose its own challenges, if the land use is to be changed.

Proper solid waste management would prevent any trash reaching the drainage line, or what remained of it following the development of Erf 4440.

14 Impact Assessment

Table 5 Impact Assessment

Description of impact Construction of the new urban complex. Destruction of the drainage line. **Mitigation measures** Leave trees, wherever possible.								
Type Nature	Spatial Extent	Severity	Duration	Significance	Probability	Confidence	Reversibility	Irreplaceability
Without mitigation								
Direct	Local	High	Long term	High	Certain	Certain	Irreversible	Irreplaceable
With mitigation measures								
Negative	Local	Medium	Short term	Low	Unlikely	Sure	Irreversible	Irreplaceable

The methodology of the impact assessment is set out in the Appendix.

Description of impact

Construction of the new urban complex. Contaminated runoff reaching the river

Mitigation measures

Due vigilance. Prevent rubble and pollutants reaching the river.
Develop the last reach of the drainage line as a biological filter.

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

Description of impact

Operation of the new complex. Litter down the drainage line and into the river.

Mitigation measures

Proper solid waste management

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

Unfortunately, the drainage line can probably not be saved, apart from some of the trees. Apart from this, mitigation measures can readily be implemented and can be effective to limit the impact on the drainage line and the river.

15 Risk Matrix

Table 6 Risk Matrix

No.	Activity	Aspect	Impact	Significance	Risk Rating
1.1	Construction of the new urban complex	Destruction of the drainage line	Loss of aquatic habitat	38	Low
1.2		Runoff from the construction site	Pollution of the drainage line and river	45	Low
2	Operation of the new complex	Runoff from the new complex	Pollution of the river	45	Low

Table 7 Continued Risk Rating

No	Flow	Water Quality	Habitat	Biota	Severity	Spatial scale	Duration	Conse-quence
1.1	1	2	4	4	2.75	1	1	4.75
1.2	1	2	1	1	1.25	1	2	4.5
2	1	2	1	1	1.25	1	2	4.5

No	Frequency of activity	Frequency of impact	Legal issues	Detection	Likelihood	Significance	Risk Rating
1.1	1	1	5	1	8	38	Low
1.2	2	2	5	1	10	45	Low
2	2	2	5	1	10	45	Low

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 6 is a replica of the Excel spreadsheet that has been adapted to fit the format of this report. The numbers in Table 7 (continued) represent the same activities as in Table 6, with sub-activities added.

The methodology is tabled in the Appendix.

For this evaluation it should be kept in mind that runoff is produced from a very small catchment area only during very large rainfall events. The Kuruman Bushveld is a low-rainfall area. The risk of runoff reaching the river is low.

The risk of losing a part of the drainage line is real. Because it is such a small drainage line, the risk to the aquatic environment was rated as low.

To put it differently, from the opposite angle, to rate the risk high because an insignificant length of mostly dry and already impacted drainage line is about to be lost to urban development, or at least partly lost, if some of the trees are to be saved, would not realistically or even rationally reflect the situation.

It is recommended that the proposed development is allowed in terms of a General Authorisation. A License is not called for.

16 Resource Economics

The goods and services delivered by the environment, in this case the drainage line at the new Erf 4440 development, 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 18) is an accepted manner to visually illustrate the resource economic footprint the drainage line, from the data in Table 7.

Table 7. Goods and Services

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

0	Low
5	High

Drainage lines in arid regions often are marked by a conspicuous tree line, higher vegetation that distinguishes the mostly dry drainage line from the otherwise barren surroundings. This renders these drainage lines important as it adds to biodiversity. At Erf 4440, the trees are higher that the direct grassy surroundings, but this has to be viewed against the bushveld of the region, where there are plentiful high trees over the wide landscape. Against this background, the trees on the Erf 4440 drainage line do not contribute all that much towards habitat variability and towards biodiversity.

The size of the star shape (spider diagram) signifies the importance of the economic footprint. A large star shape attracts the attention of the decision-making authorities. The star shape of Figure 18 is small. The Erf 440 drainage line does not deliver much towards environmental goods and services and not much is lost if a part of it is altered into an urban development.

However, cumulatively, along with the existing city of Kuruman, the loss of goods and services is significant. This is not enough reason for disallowing the development, because Kuruman is here to stay.

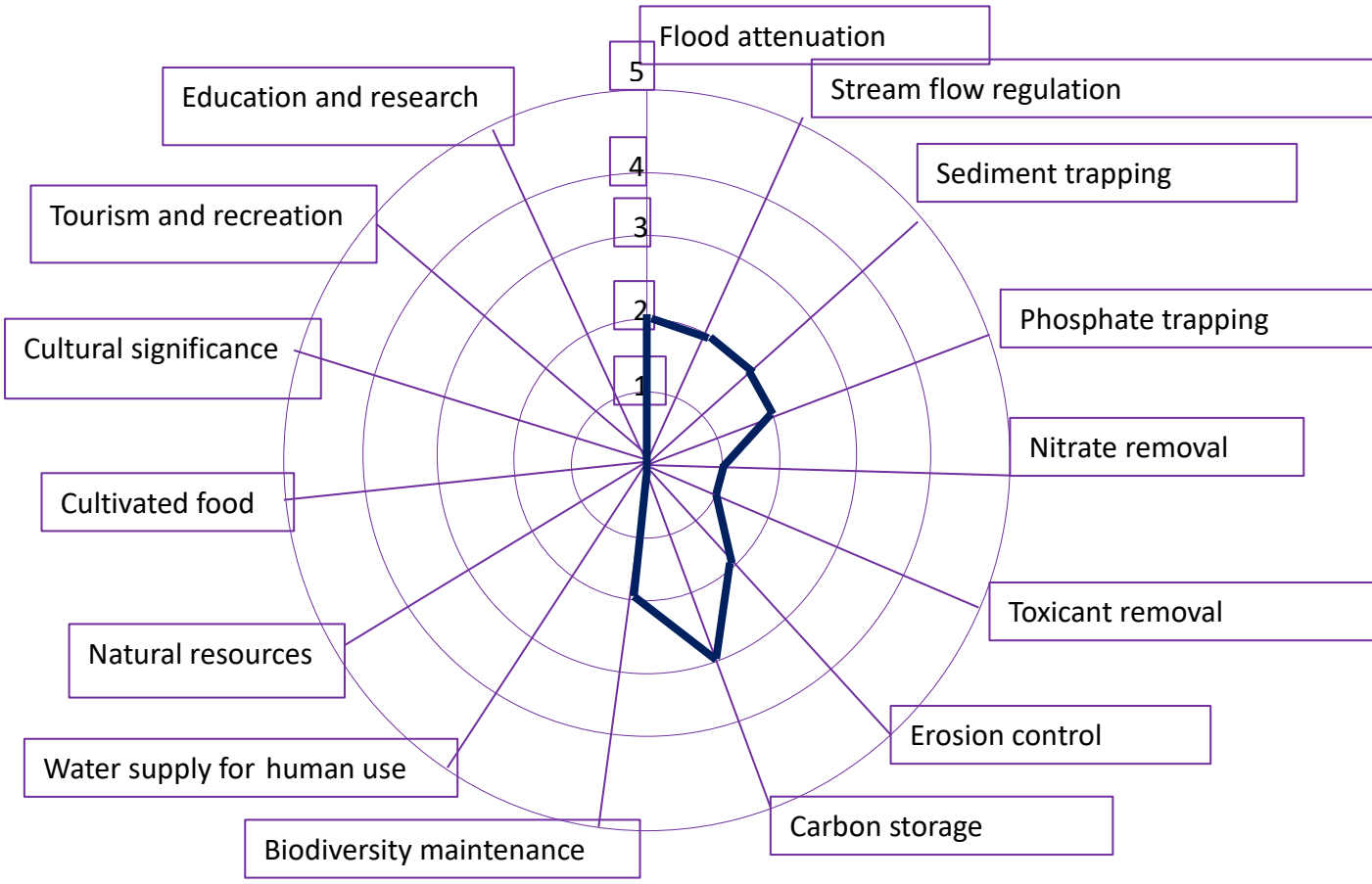

Figure 18. Resource Economics Footprint of the Drainage Line

17 Conclusions

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

Figure 26 has been adapted from one of the most recent DWS policy documents.

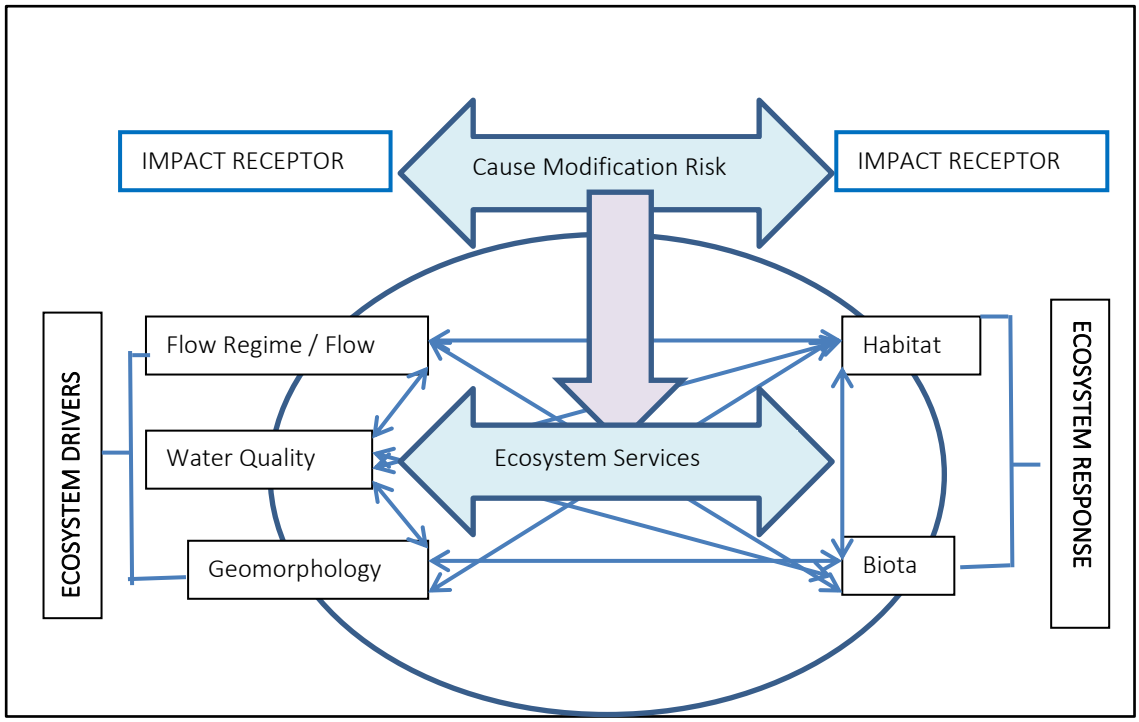

Figure 19 Minimum Requirements for a S21(c) and (i) Application.

The driver of the Erf 440 drainage line is the occasional and sudden summer thunder storm that can, in rare event, send a pulse of storm water down the drainage line. The catchment area is very small, with only a small potential volume of runoff, that is produced from time to time. The next driver is the drought; long periods with little or no rain. This is a summer rainfall area, with winter rains being scarce. This prevents the drainage line from developing aquatic habitat. It is surmised that the riparian mature trees on Erf 4440 are maintained by the shallow dolomitic ground water rather than rainfall.

The proposed development will inevitably lead to the removal of some of these trees. However, the loss of part of the tree line will not result in a significant loss of environmental goods and services.

Perhaps the developers, land owners, NGO's and the authorities combined would think about the restoration of aquatic habitat in the Upper Kuruman River and the plea of the endangered cichlid. Should this transpire, much good will come out of the proposed development.

It is recommended that the proposed development should go ahead in terms of a General Authorisation.

18 References

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19 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:  25 June 2020

20 Résumé

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Water Scientist

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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, Muggievlag 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 Dam, Riebeeck West

21 Appendix

21.1 Kuruman Thornveld

VT 16 Kalahari Thornveld and Shrub Bushveld (98%) (Acocks 1953). LR 30 Kalahari Plains Thorn Bushveld (67%) (Low & Rebelo 1996).

Distribution North-West and Northern Cape Provinces: On flats from the vicinity of Postmasburg and Danielskuil (here west of the Kuruman Hills) in the south extending via Kuruman to Tsineng and Dewar in the north. Altitude 1 100–1 500 m.

Vegetation & Landscape Features Flat rocky plains and some sloping hills with very well-developed, closed shrub layer and well-developed open tree stratum consisting of *Acacia erioloba*.

Geology & Soils Some Campbell Group dolomite and chert and mostly younger, superficial Kalahari Group sediments, with red wind-blown (0.3–1.2 m deep) sand. Locally, rocky pavements are formed in places. Most important land types Ae, Ai, Ag and Ah, with Hutton soil form.

Climate Summer and autumn rainfall with very dry winters. MAP about 300–450 mm. Frost frequent in winter. Mean monthly maximum and minimum temperatures for Kuruman 35.9°C and –3.3°C for January and June, respectively. See also climate diagram for SVk 9 Kuruman Thornveld.

Important Taxa Tall Tree: *Acacia erioloba* (d). Small Trees: *Acacia mellifera* subsp. *detinens* (d), *Boscia albitrunca* (d). Tall Shrubs: *Grewia flava* (d), *Lycium hirsutum* (d), *Tarchonanthus camphoratus* (d), *Gymnosporia buxifolia*. Low Shrubs: *Acacia hebeclada* subsp. *hebeclada* (d), *Monechma divaricatum* (d), *Gnidia polycephala*, *Helichrysum zeyheri*, *Hermannia comosa*, *Pentzia calcarea*, *Plinthus sericeus*. Geoxylic Suffrutex: *Elephantorrhiza elephantina*. Graminoids: *Aristida meridionalis* (d), *A. stipitata* subsp. *stipitata* (d), *Eragrostis lehmanniana* (d), *E. echinochloidea*, *Melinis repens*. Herbs: *Dicoma schinzii*, *Gisekia africana*, *Harpagophytum procumbens* subsp. *procumbens*, *Indigofera daleoides*, *Limeum fenestratum*, *Nolletia ciliaris*, *Seddera*
capensis, *Tripteris aghillana*, *Vahlia capensis* subsp. *vulgaris*.

Biogeographically Important Taxa ([GW]Griqualand West endemic, [K]Kalahari endemic, [S]Southernmost distribution in interior of southern Africa) Small Trees: *Acacia luederitzii* var. *luederitzii*[K], *Terminalia sericea*[S]. Tall Shrub: *Acacia haematoxylon*[K]. Low Shrub: *Blepharis marginata*[GW]. Graminoid: *Digitaria polyphylla*[GW]. Herb: *Corchorus pinnatipartitus*[GW].

Endemic Taxon Herb: *Gnaphalium englerianum*.

Conservation Least threatened. Target 16%. None conserved in statutory conservation areas. Only 2% already transformed. Erosion is very low.

Remark Disturbed areas north of Kuruman are characterised by *Aristida adscensionis*, *A. congesta*, *Enneapogon scoparius*, *Geigeria ornativa*, *Melhania rehmanii*, *Rhigozum trichotomum* and *Sericorema remotiflora* and the absence of *Acacia erioloba*, *A. haematoxylon* and *Grewia flava*.

Reference Smit (2000).

21.2 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 21.2.1 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 21.2.2 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 21.2.3 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 21.2.4 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.

21.3 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	1
Fully covered by legislation (wetlands are legally governed)	5

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