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Transportation \ Water \ Infrastructure Advisory \ Infrastructure Planning \ Structures \ Project Management

Installing of gabions for erosion protection at and the periodic maintenance of

Bridge 0496 and **Culvert 10432**

over the Hex River and a tributary of the Hex River at
De Doorns, Western Cape

Freshwater Report

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

Revised July 2028

EnviroAfrica
Environmental Management and Impact Assessment | Omgewingsbestuur en Impakbeoordeling

watsan AFRICA

Executive Summary

The company Mariswe (Pty) Ltd of Cape Town was appointed to instal gabion baskets for erosion protection at and to undertake maintenance work on roads, a bridge and a culvert in the Hex River Valley near the town of De Doorns. Among other, accumulations of rocks and stones must be removed from the river at Bridge 0496 and Culvert 10432 to the west of De Doorns.

According to the National Environmental Management Act and the Nation Water Act, official authorization is required prior to the commencement of this work. Enviro Africa of Somerset West was appointed to undertake the Environmental Impact Assessment in terms of the National Environmental Management Act. Likewise, WATSAN Africa of Knysna was appointed to undertake the Water Use License Application in terms of the National Water Act.

A Freshwater Report must support the Water Use License Application. This report must be compiled according to a predetermined content and format. It must contain premeditated and standardised assessments. The report must contain adequate information to support official decision-making. The Water Use License application must be lodged on the official online eWULAAS facility.

The assessments indicated that the Hex River and its tributaries are in a poor ecological condition. The proposed maintenance work in the Hex River and its tributary will not further deteriorate the state of the river.

The Risk Matrix indicates that the proposed work is Generally Authorised. A Licence is not required.

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Abbreviations

Critical Biodiversity Area	CBA
Department of Environment Affairs and Development Planning	DEA&DP
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
Environmental Impact Assessment	EIA
Electronic Water Use License Application (on-line)	eWULAAS
Existing Water Use	ELU
Government Notice	GN
Hectares	Ha
International Union for the Conservation of Nature	IUCN
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 African Council of Natural Scientific Professions	SACNASP
South Africa National Biodiversity Institute	SANBI
Water Use License Application	WULA
Western Cape Biodiversity Spatial Plan	WCBSP

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1 Introduction

Ongoing maintenance work must be undertaken on bridges over the Hex River and its tributaries downstream of the town of De Doorns in the Hex River Valley. This valley is a renowned export grape producing area along the N1 main truck road between towering mountains in the picturesque Cape Folded Mountains if the Western Cape.

The rivers here have been engineered and landscaped into straight channels to effectively deal with the fierce stormwater events as well as the agricultural return flow. The roads and bridges must be meticulously maintained to maintain access to the many farm estates to keep the local and the regional economy going.

Mariswe (Pty) Ltd has been appointed to install erosion protection measures and maintain these roads and bridges. Two bridges are of interest for this report, Bridge 0496 over the Hex River and Culvert C10432 over the Rooielskloof River, a tributary of the Hex River.

Subsequently, Enviro Africa of Somerset West was appointed to undertake the EIA in terms of the NEMA for the maintenance of these two bridges. The EIA public participation process is currently underway (Figure 1).

Likewise, WATSAN Africa of Knysna has been appointed to deal with the WULA.

A Freshwater Report must support the WULA. The Freshwater Report must contain adequate information to allow for informed decision-making. The decision to approve the proposed development rests with BOCMA officials, in terms of S21 of the NWA. The Fresh Water Report must contain specified information according to a set profile, which has been developed over several years over many such reports. The Freshwater Report must contain an array of premeditated assessments.

The BAR in terms of the NEMA and other supporting reports will draw on the information supplied in the Freshwater Report and addition assessments have been added for this purpose.

NEMA PUBLIC PARTICIPATION PROCESS

THE PROPOSED MAINTENANCE AND CONSTRUCTION OF EROSION PREVENTION INFRASTRUCTURE ON CULVERT C10432 AND BRIDGE 0496, ON DR1489, DE DOORNS.

Notice is hereby given of the intention to submit an application for environmental authorisation that includes the adoption of a Maintenance Management Plan, 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 in terms of the National Water Act (Act 36 of 1998)(NWA). The proposed maintenance and construction activities includes activities listed in terms of the NEMA EIA Regulations 2014 (as amended).

EnviroAfrica cc has been appointed by Mariswe (Pty) Ltd, on behalf of the Western Cape: Department of Infrastructure to undertake the NEMA application process for Environmental Authorisation.

Application for environmental authorisation to undertake the following activities*:
Government Notice R327 (Listing Notice 1): Activity No. **12 and 19**
Government Notice R324 (Listing Notice 3): Activity No. **14**

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

**Please note that should the listed activities above change or additional activities be identified during the course of the NEMA Application process, registered I&APs will be notified of any changes.*

Project Description & Location: The proposed maintenance and construction work includes the following:
Culvert C10432: Remove approximately 20m³ of accumulated material from culvert inlet and culvert chambers and install a gabion basket of approximately 10m³ in size to extend existing retaining wall in an upstream direction for further erosion protection of outer stream bank at the culvert.
Bridge 0496: Install a gabion basket of approximately 8m³ in size to protect the Pier 1 footing of the bridge from further erosion.

The culvert and bridge are located along DR1489, approximately 4km west of De Doorns, Western Cape.
Approximate centre-point site co-ordinates: Culvert C10432: 33°28'41.29"S, 19°37' 06.22"E. Bridge 0496: 33°28'56.58"S, 19°37'16.69"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 **04 March 2026** in terms of the environmental aspects (NEMA Application) and on or before **08 April 2026** for water related issues (NWA 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 / E-mail: admin@enviroafrica.co.za / Tel: 021 8511616 / Postnet Suite 341, Private Bag X29, Somerset West, 7129

By registering as an I&AP, you hereby give EnviroAfrica cc the permission to circulate your name and contact details to the relevant stakeholders as stated, per statutory requirements, in line with the Protection of Personal Information (POPI) Act No. 4 of 2013 (as amended), unless otherwise informed, in writing to us. Please note a full list of registered I&APs, as well as all correspondence with I&APs, will be submitted to the competent authority.

THE PROPOSED MAINTENANCE AND CONSTRUCTION OF EROSION PREVENTION INFRASTRUCTURE ON CULVERT C10432 AND BRIDGE 0496, DR1489, DE DOORNS

SITE COORDINATES:
(approximate centre-point)

Culvert C10432:
33°28'41.29"S,
19°37'6.22"E.

Bridge 0496:
33°28'56.58"S,
19°37'16.69"E

Bridge 0496
Culvert C10432

ENVIROAFRICA
January 2026

Figure 1 Public Participation

2 Methodology

A site visit is mandatory. The site visit was conducted on 14 February 2026.

This report contains a:

- Description of the project.
- Description of the aquatic habitat.
- Selected assessments such as:
    - Present Ecological Status
    - Ecological Importance
    - Ecological Sensitivity
    - Ecological Importance and Sensitivity Class (EISC)
    - Significance (dubbed Numerical Significance)
    - Impact Assessment
    - Risk Matrix
    - Resource Economics

The Significance assessment and the Impact Assessment are included for the benefit of the EIA and the requirements of the NEMA. The rest of the assessments are for the WULA and the requirements of the NWA.

The methodologies for these assessments are explained in the Appendix. These are conveniently but adequately explained in tables.

The methods solely rest on the knowledge and experience of the assessor. The values and classes assigned are the result of the assessor's insight. The values provide a basis for further discussion and adjustment, should it become necessary.

- Mitigating Measures. Essentially this report contains mitigating measures to address any deleterious impacts on the aquatic environment.
- Recommendations. Finally, the report must make recommendations if the proposed project should be officially authorised or not.

3 Legal Framework

NWA (36 of 1998)

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

The proposed establishment of the proposed weir may impede the flow of the river.

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

The proposed establishment of a new weir may alter the bank of the river.

Government Notice 4167 of 8 December 2023 in terms of the NWA

Section 2

The regulated area of a water course means:

Section 2 (xiv) (a)

The outer edge of the 1 in 100-year flood line or delineated riparian habitat, whichever is the greatest distance, measure from the middle of a river, spring, natural channel, dams and lakes.

Section 2 (xiv) (b)

In the absence of the determined 1 in 100-year flood line or riparian area habitat, as contemplated in (a) above the area within a 100m distance from the edge of a water course (excluding flood plains) is the first identifiable annual bank fill flood bench….

Government Notice 1180 of 6 November 2015.
Government Notice 509 of 26 August 2016
Government Notice 267 of 24 March 2017
Government Notice 4167 of 8 December 2023 *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 a General Authorization or a License is required.

Section 5 (iii)

Section 5 (iii) states that S21(c) and S21(i) water uses for which a “Low” risk is determined through the Risk Matrix are excluded from having to apply for a License. A suitably qualified SACNASP professional must complete the Risk Matrix.

Section 5(iv)

Section 5(iv) states that Section 21(c) and S21(i) with a “Low” risk rating according to the Risk Matrix pertaining to maintenance work is excluded from having to apply for a License. The same holds for Existing Legal Water Uses.

The planned instalment of erosion protection measures and maintenance to the bridge and the culvert falls under under the section of GN4167. A License will not be required depending on the outcome of the Risk Matrix.

Section 7(a)

This Government Notice demands that an applicant (termed a water user) must submit completed application forms to the responsible authority. This effectively means that an application must be lodged on the online application system, the eWULAAS. This requirement is legally compulsory for a General Authorisation, a License or for the registration of a water use.

NEMA (107 of 1998)

NEMA and regulations promulgated in terms of NEMA (GN R985 of 2014, Activities 12, 14, 48 and 50) determines that no development without the consent and permission of the DFFE 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, measured from the edge of a water course. The regulated zone is on both sides of a river or stream.

4 Locality

Figure 2 De Doorns Locality

The bridge and the culvert that must be repaired are adjacent and to the west of De Doorns in the Hex River Valley to the north of the N1 trunk road.

The coordinates of Bridge 0496 are:

33°28’55.62”S and 19°37’17.05”E at an elevation of 405masl.

The coordinates of the nearby Culvert 10432 are:

33°28’40.49”S and 19°37’06.54”E at an elevation of 406masl.

5 Quaternary Catchment

De Doorns and surrounds are in the H20B quaternary catchment.

6 De Doorns Rainfall

https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/de-doorns_south-africa_3368906

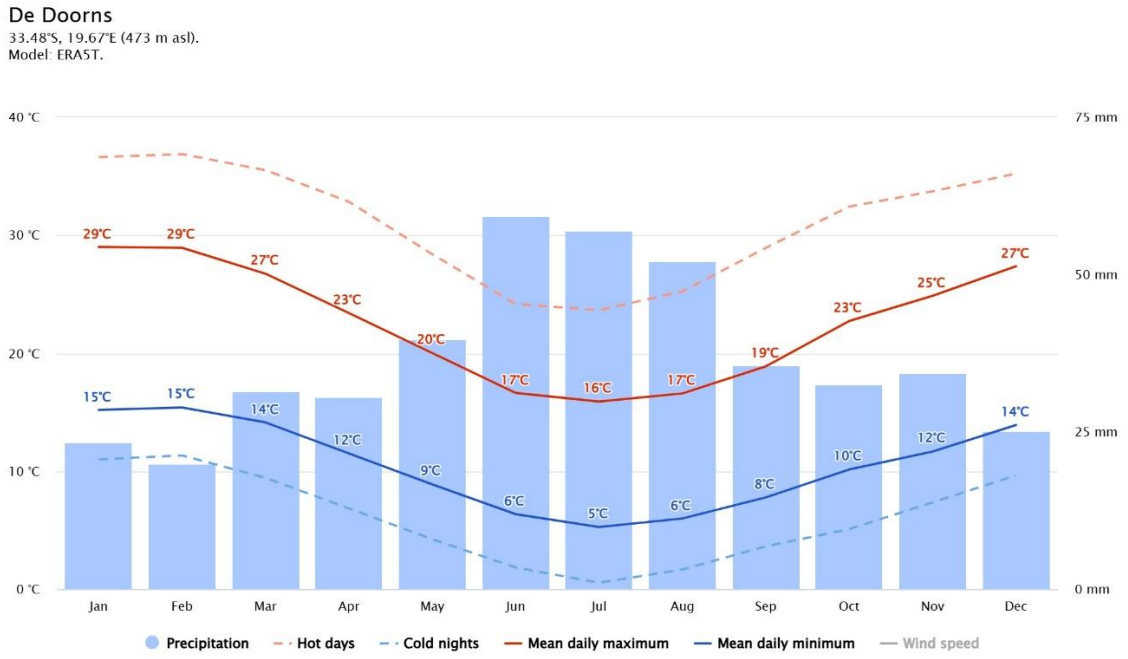


Figure 3 De Doorns Climate

Most of the rainfall in De Doorns is during the winter (Figure 3), with the summers hot and dry with desiccating winds. This is a Mediterranean climate.

The average annual rainfall is only 254mm. This is an arid climate, such as the Karoo, a semi-desert region.

https://www.saexplorer.co.za/south-africa/climate/de_doorns_climate.html

SeaExplore sets the rainfall during summer even lower, with no rain at all for at least 2 months.

The Hex River valley is one of the most prominent table grape export districts in the country, with large-scale agriculture. The rainfall is not nearly enough to support such a massive industry.

Rainfall on the high mountain ridges and the peaks to the north of the valley have a rainfall of up to 2000mm per year. The Matroosberg Mountain is a towering landmark in the district, with regular snow during winter. Massive volumes of water come down the mountainside and down the Hex River and its many tributaries during and after these high rainfall events on the mountains.

The river may stop flowing during summer, with only some stagnant pools left.

The original natural river scenario during winter prior to human impact probably flooded the valley, with temporary wetlands spreading over the valley. The river now is deeply entrenched, engineered, straightened, with steep banks, with lower flow resistance to keep flood water out of the vineyards. The floodplain is transformed into vineyards and numerous farm dams big and small to store water pumped out of the river for irrigation during the dry summer months.

7 Conservation Status

Western Cape Biodiversity Spatial Plan

The Hex River is listed as a perennial river and as a CBA, NFEPA. The riparian zone is listed as a wetland.

Parts of Rooielskloof River are listed as CBAs.

8 The Project

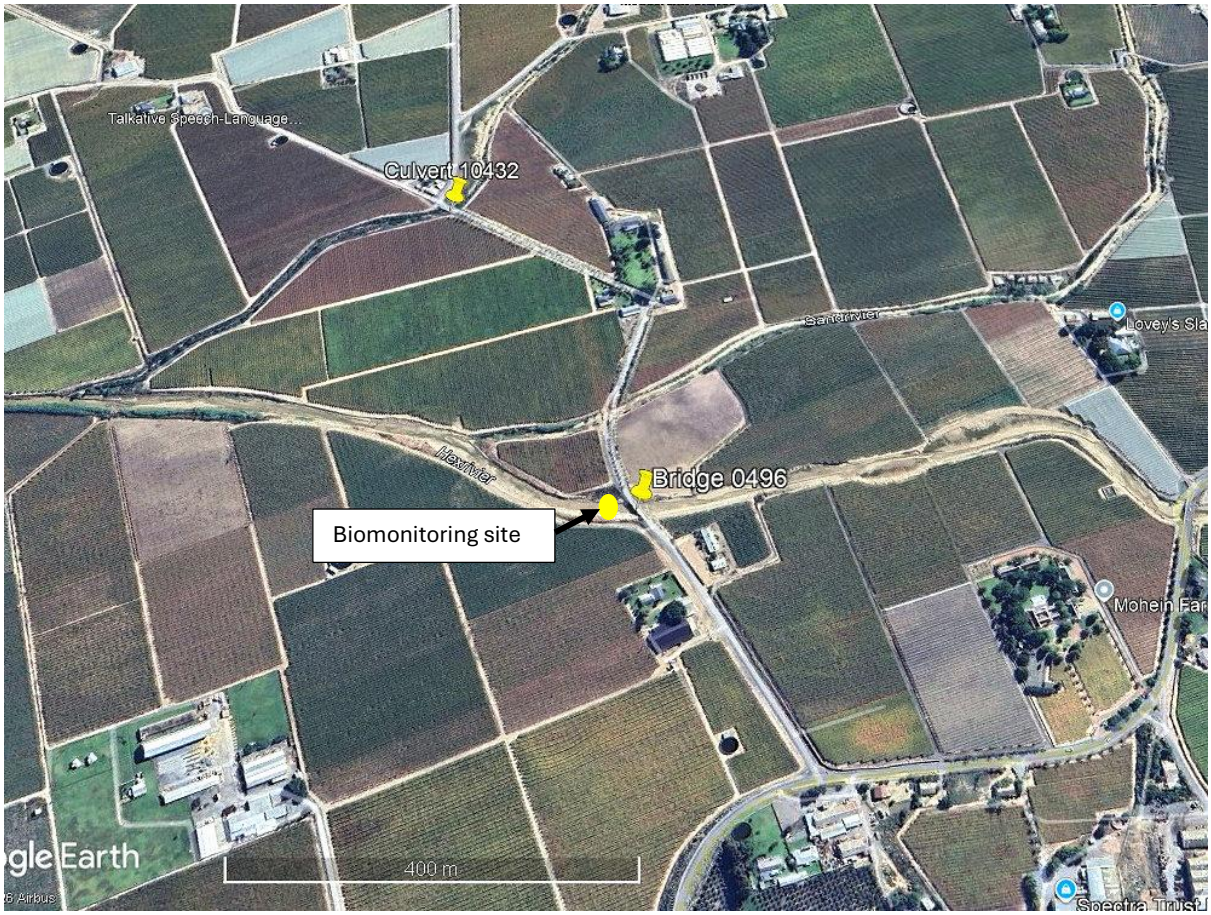


Figure 4 Project

Figure 5 Hex River upstream of Bridge 0496

Figure 6 Bridge 0496 over the Hex River at De Doorns

Figure 7 Rooielskloof River Culvert 10432 (Photo Enviro Africa)

A bridge and a culvert are of interest (Figure 6 and Figure 7).

The rivers at De Doorns are deeply incised (Figure 5). The rivers are engineered, straightened, manicured and smoothed over to act as drainage for the large-scale agriculture in the Hex River Valley, as is the case in most of the fruit-producing districts of the Western Cape. The river acts as a conduit for agricultural return flow, runoff because of over-irrigation.

A gabion of $8m^3$ will be constructed next to Bridge 0496 (Figure 6) to protect the bridge's foot from further erosion when the river comes down during peak flow events. Other general maintenance work will also be undertaken.

The insignia on the bridge indicates that it was built in 1954, this prior to the promulgation of the NWA and is thus an ELU.

Rocks and stones are washed down the river during large storm events. These stones accumulate on the bridges upstream side as well as inside the chambers underneath the bridges. These must be removed to ready the drainage for the next storm events.

Some $20m^3$ of debris will be removed from Culvert 10432 (Figure 7). A gabion of $10m^3$ will be constructed on the upstream side of the culvert to protect the outer bank and the culvert from further erosion during peak flow events. Again, general maintenance will be undertaken as well.

9 The Sub-Catchments

For a WULA, for the PES assessment and a better understanding for the hydraulic forces at play at the bridges it may be beneficial to draft the sub-catchment area upstream of the bridge and the culvert (Figure 8). The surface areas were roughly estimated by connecting the highest points around the rivers with Google Earth's polygon function.

The Rooielskloof River sub-catchment upstream of Culvert 10432 covers an area of 1525ha. The highest point in the mountains above is 2244masl. The culvert is at 406masl. Over 9600m these numbers translate into an average slope of 19.1 vertical metres in every 100 horizontal metres. This is a very steep slope that gives rise to a fast runoff velocity. From the high mountain ridge to the foot of the mountain is nearly vertical. From there the slope evens out. Even so, the velocity down the Rooielskloof River to the bridge is likely to carry stones and rocks that now must be removed.

The Hex River sub-catchment is much bigger. It covers an area of an estimated 27125ha above the No. 0496 Bridge (Figure 8). The highest point in this sub-catchment is 2083masl. From this point to the bridge is 17km. This translates into an

average slope of 8.8 vertical metres in every 100 horizontal metres, which again result in high runoff velocities and the transport of rocks, stones and debris that can collect against bridges. The runoff velocity and the sheer winter volume of water can damage the bridges and the protective structures around the bridges.

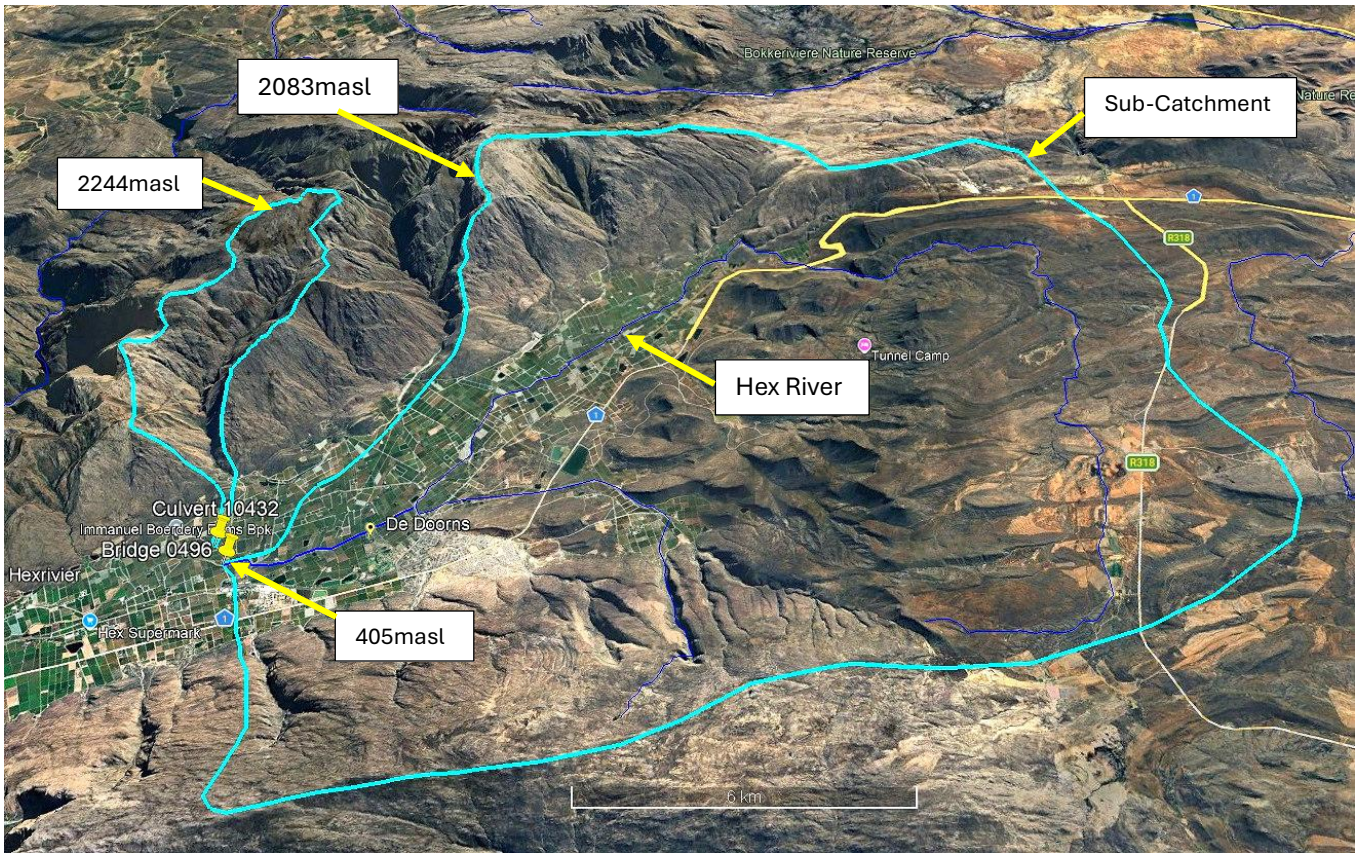


Figure 8 Sub-Catchments

10 Biomonitoring

The site was right next to the Hex River Bridge 0496, downstream of the bridge (Figure 9).

The site comprised of a riffle with lots of stones-in-current (Figure 9). The larger rocks were construed as bedrock. The shallow stream of only 10 to 20 centimetres deep. The stream flowed a velocity of around half a metre per second. The banks were overgrown with patches of kikuyu grass with long stalks in the slower moving, pool-like water. This was taken as submerged vegetation.

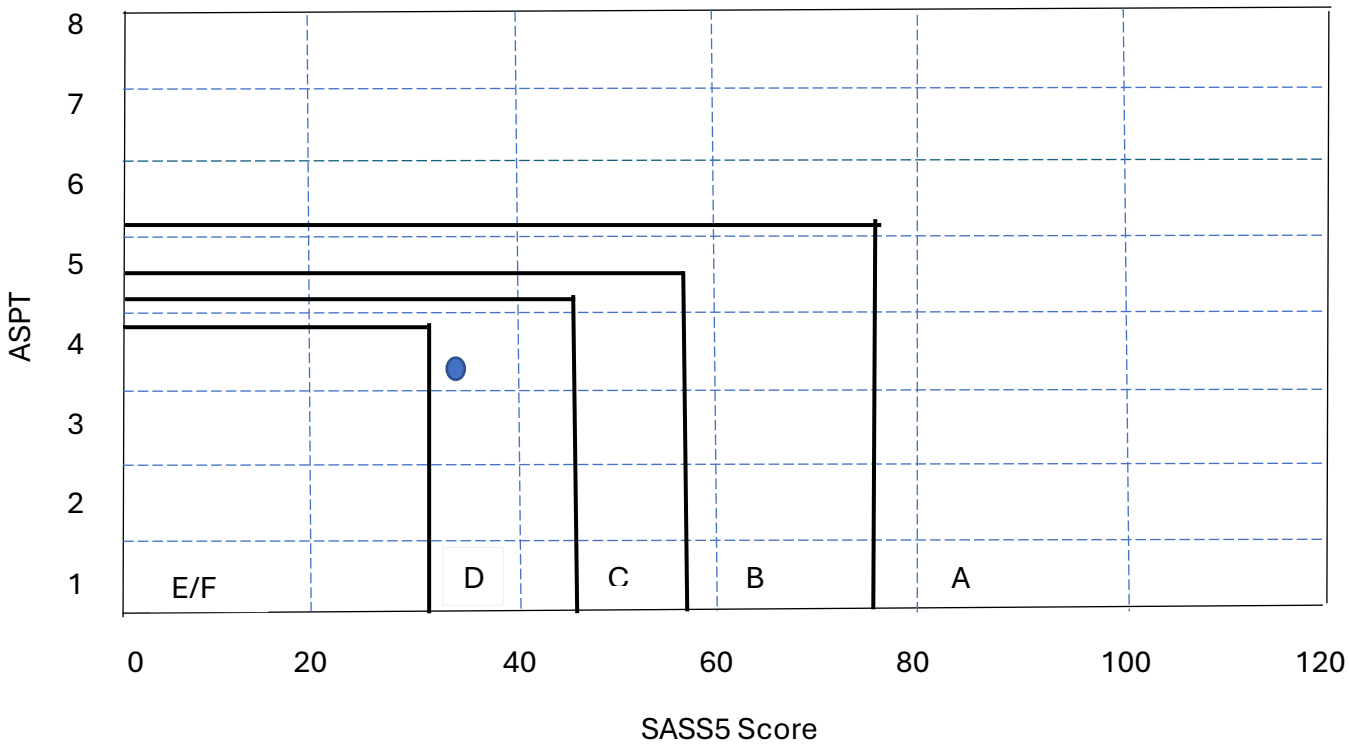
The stones were covered with thread-like algae posing as a biofilm.

The water was clear, unlike the tea-coloured water of Fynbos streams that can be expected in the region. Likewise, the water here was alkaline, not the acidic water of the Fynbos mountain foothill streams as can be expected in the region. The electric conductivity, an indication of saltiness, was elevated as well.

It seems that much of the water in the stream comprised of agricultural return flow containing agrichemicals from the large-scale viticulture along the Hex River in the valley. The water is no longer that of the typical runoff from the Fynbos-covered Western Cape mountains.

The biomonitoring results (Table in the Appendix) confirm these findings. The SASS5 score of only 33 and a ASPT of 3.7 (Figure 10) indicate that the river is impacted with a loss of ecosystem functioning.

Figure 9 Biomonitoring sampling site in the Hex River



Integrity Class	Description
A	Pristine; not impacted
B	Very Good; slightly impacted
C	Good; measurably impacted with most ecological functioning intact
D	Fair; impacted with some loss of ecological functioning
E	Poor; loss of most ecological function
F	Very Poor; loss of all ecological function

Figure 10 Hex River at De Doorns Biomonitoring Results

11 Present Ecological State

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 and 2) 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.

The Hex River at Hex River Bridge 0496

It would take a major effort to collect abstraction data upstream of the Bridge 0496 to express as a percentage of the mean annual runoff. For a run-of-the-mill WULA such as this one, a guestimate must suffice to arrive at the PES. Water quality will be at is best during winter's peak flow and worse during the hight of the irrigation season. The values given here are purely according to the experience of the freshwater specialist. To verify the numbers with proper research and laboratory analysis is beyond the financial and practical scope of this WULA.

The instream habitat Hex River at the site of the bridge is highly modified with an extensive loss of aquatic habitat. It scores a "D".

The riparian habitat is nothing more than a steep wall of packed stones and gabions devoid of aquatic vegetation. It scores an "E".

If compared to similar rivers in the Western Cape, where connectivity with riparian wetlands is still intact, these scores are justified. The current departure from a visualised situation prior human impact is vast.

Table 2 Present Ecological State combined for the Hex and Rooielskloof River

Instream				
	Score	Weight	Product	Maximum score
Water abstraction	12	14	168	350
Flow modification	8	13	104	325
Bed modification	7	13	91	325
Channel modification	6	13	78	325
Water quality	13	14	182	350
Inundation	5	10	50	250
Exotic macrophytes	9	9	81	225
Exotic fauna	20	8	160	200
Solid waste disposal	23	6	138	150
Total		100	1052	2500
% of total			42.1	
Class			D	
Riparian				
Water abstraction	11	13	143	325
Inundation	6	11	66	275
Flow modification	6	12	72	300
Water quality	13	13	169	325
Indigenous vegetation removal	3	13	39	325
Exotic vegetation encroachment	10	12	120	300
Bank erosion	19	14	266	350
Channel modification	5	12	60	300
Total			935	2500
% of total			37.4	
Class			E	

The Rooielskloof River at Culvert 10432

Figure 11 Rooielskloof River Culvert 10432

Figure 12 Rooielskloof River

Culvert 10432 is shown in Figure 11. The Rooielskloof River at the culvert (Figure 12) was dry during the site visit, with litter in the river.

12 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 3).

Table 3. 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 following indigenous fish species occur in the Breede River system:

https://fynbosfishtrust.org/fynbos-fish-river-systems/

Cape kurper	*Sandelia capensis*
Cape galaxias	Galaxias zebratus
Breede River redfin	*Pseudobarbus burchelli*
Breede River whitefish	*Cheilobarbus capensis*
Longfin eel	*Anguilla mossabbica*
Freshwater mullet	*Myxus capensis*

The redfins and whitefish are critically endangered.

At least some of these would have occurred in the Hex River at Doorns. Currently it seems unlikely to find any of these fish there. Perhaps there are still some of them lower down in the river. There was a single Mossambique kurper *Oreochromis mossambica* in the biomonitoring net.

The Hex River at De Doorns probably was very important and still is potentially important. Because of the current state of the river, it is no longer important.

The Rooielskloof River at the culvert is, according to this assessment, ecologically unimportant because there is no permanent water that can provide habitat for fish.

13 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.

Rivers do bounce back if left alone. The Hex River at De Doorns won't recover as long as human impact and large-scale agriculture persist in the valley. From this perspective, the river must be viewed as ecologically sensitive

The Rooelskloof River, prior to human impact, probably was a densely overgrown drainage line that served as a corridor for numerous species of wildlife. Again, as long as viticulture persists, this ecological function won't be back. Therefore, the river is deemed as ecologically sensitive.

14 EISC

Table 4 EISC

Determinant	Score
Rare and endangered species	0
Populations of unique species	0
Species / Taxon richness	1
Diversity of habitat	2
Migration Route, breeding and feeding site for wetland species	2
Sensitivity to water quality changes	2
Flood storage, energy dissipation, particulate / element removal	2
Protection status	4
Ecological integrity	2
Average	1.7
Score	Low

Score guideline:
Very High 4, High 3, Moderate 2, Low 1, None 0
Confidence Rating
Very High 4, High 3, Moderate 2, Low 1

The DWS demand that the river be placed in a category according to the EISC methodology (Table 4). The EISC is one of the essential items that is required for the Risk Matrix.

The EISC for the Hex River and the Rooielskloof River combined is Low.

15 Numerical Significance

"Significance" is an environmental management technical term with a specific meaning. To distinguish this term from the everyday meaning, the numerical aspect was added, as indeed "significance" is portrayed as a number.

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 25.2, p37, 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 p38 to derive at a value for Significance. The value for Significance can subsequently be evaluated according to Table 25.2.2.

Table 25.2.2 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 5), 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.

Table 5 Significance Score

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

The impact of the proposed installing of gabion baskets and the maintenance to the bridge and the culvert will be small and localised. The overall significance for the Hex River and the Rooielskloof River at the bridges is Low.

16 Impacts and Mitigating Measures

Sand, mud and debris can move down the river along with the current when the accumulated stones and rock underneath and upstream of the bridge and culvert are removed. This will probably involve heavy earth-moving machinery, scooping material out of the river to put it on a waiting tipper truck. Straw bales can by placed across the stream to trap sand and mud moving down the river. There may be more contemporary materials that can be used as sediment traps.

The work must be undertaken during low flow periods, probably at the end of summer.

This work must be hurried, to reduce the risks of unexpected downpours and elevation of water levels in the river.

The placement of the new gabions poses less of a risk. Again, mitigating measures must be taken to reduce the chances of sediments washing down the river.

The instalment of gabion baskets for erosion protection and general maintenance work on the bridge and culvert is unlikely to have a significant impact on the river.

Diesel fuel, lubricants and other pollutants emanating from machinery and vehicles must be prevented from entering the river.

17 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 Matrix. 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 planning phase does not have any impact for which a Risk Matrix can be completed, as during this phase nothing is happening on the ground. It is nevertheless worth mentioning, regarding the aquatic environment, that plans must be drafted to keep sediment out of the aquatic habitat during construction.

The mitigating measures can readily be implemented, with a reasonable chance of success for both the Hex River and the Rooielskloof River.

Table 6 Impact Assessment

Description of hydrological impact: Construction Phase. Placing earthmoving machine next to the river Removing stones and rocks from the river Placement and repair of gabions **Mitigation measures** Prevent sediments moving down the river Placement of bales to contain sediments Work during the dry season Limit timespan of working in the river Limit the footprint to work area.								
Type Nature	Spatial Extent	Severity	Duration	Significance	Probability	Confidence	Reversibility	Replaceability
Without mitigation								
Direct	Local	Low	Temporary	Low	Definite	Certain	Irreversible	Irreplaceable
With mitigation measures								
Negative	Local	Very low	Temporary	Very low	Definite	Sure	Irreversible	Irreplaceable

Description of impact: Operational Phase.

Daily use of the bridges
Traffic and farm produce

Mitigation measures
Monitor the site for repeated build-up of rocks and stones
Monitor the gabions for flood damage

Type Nature	Spatial Extent	Severity	Duration	Significance	Probability	Confidence	Reversibility	Replaceability
Without mitigation								
Indirect	Local	Low	Temporary	Low	Definite	Certain	Irreversible	Irreplaceable
With mitigation measures								
Indirect	Local	Very low	Temporary	Very low	Definite	Sure	Irreversible	Irreplaceable

18 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.

The methodology is tabled in the Appendix.

The Risk Matrix indicates that the installing of gabion baskets and the maintenance of the bridge and the culvert, the work in the river, is already Generally Authorised. A License is not called for.

Table 7 Risk Matrix

Phase	Activity	Impact	Potentially affected watercourses			Intensity of Impact on Resource Quality				
						Abiotic Habitat (Drivers)			Biota (Responses)	
			Name/s	PES	Overall Watercourse Importance	Hydrology	Water Quality	Geomorph	Vegetation	Fauna
CONSTRUCTION	Placement of earthmoving machine in or next to the river, removal of stones and rocks accumulation from the river, placement and repair of gabions	Mud and sand washing down the river, altering of aquatic habitat	Hex river	D	Low / Very low	3	2	2	1	2
OPERATIONAL	Use of the bridge for traffic and produce	Liter and rubish along with stormwater	Hex River	D	Low / Very low	1	1	1	1	1

Overall Intensity (max = 10)	Spatial scale (max = 5)	Duration (max = 5)	Severity (max = 20)	Importance rating (max = 5)	Consequence (max = 100)	Likelihood (Probability) of impact	Significance (max = 100)	Risk Rating	Confidence level
6	1	1	8	2	16	100%	16	L	High
2	1	5	8	2	16	100%	16	L	High

19 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 13) is an accepted manner to visually illustrate the resource economic footprint rivers and streams, from the data in Table 8.

The diagram is spiky, indicative of a stream with limited value, but with some of the indicators of high value, because water is used from a much-impacted river for the irrigation of crops.

Table 8. Goods and Services of the Hex River and the Rooielskloof River combined

Goods & Services	Score
Flood attenuation	4
Stream flow regulation	4
Sediment trapping	4
Phosphate trapping	1
Nitrate removal	1
Toxicant removal	1
Erosion control	4
Carbon storage	1
Biodiversity maintenance	2
Water supply for human use	5
Natural resources	1
Cultivated food	5
Cultural significance	1
Tourism and recreation	3
Education and research	1

0	Low
5	High

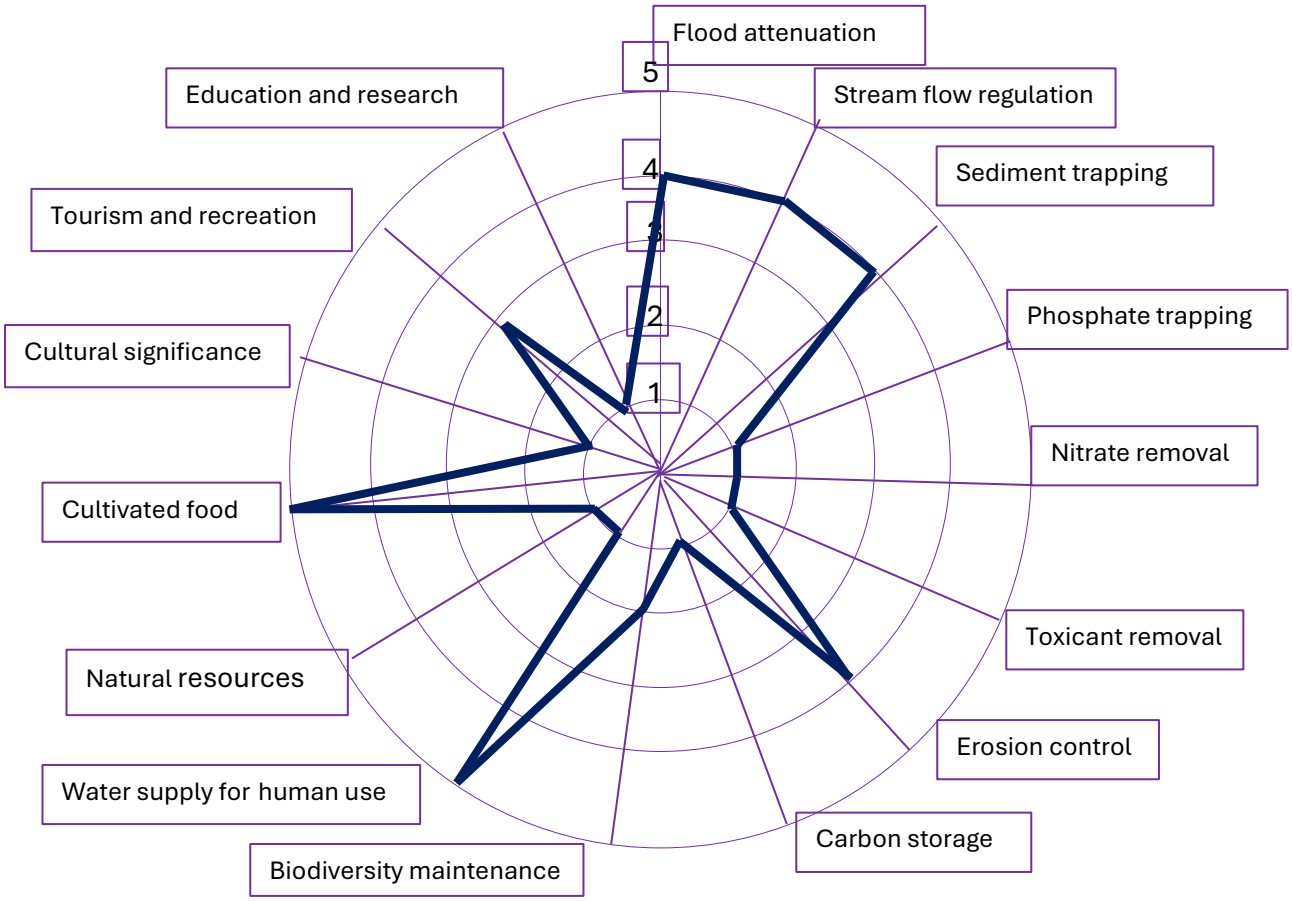


Figure 13. Resource Economics Footprint of the Hex and Rooielskloof River

20 Summary

Table 9 Summary of the Assessments for the Hex and Rooielskloof River at the bridges

Aspect	Status
Conservation status PES Hex and Rooielskloof River combined Ecological Importance Ecological Sensitivity EISC Impact Assessment Risk Matrix Resource Economics	CBA, NFEPA, perennial river Impacted, loss of ecological functioning Not ecologically important Sensitive Low Mitigating measures readily implementable Generally Authorised Spiky footprint

The installing of gabion baskets and the maintenance of the bridge and the culvert will not change the outcome of the assessments listed in the summary table.

21 Conclusions

Despite the GN 4167 exclusions, a Risk Matrix must still be submitted, along with a Freshwater Report to motivate the values entered in the Risk Matrix. These documents can be circulated along with the EIA's BAR to the DWS officials, as is often standard practice and await their decisions pertaining to the further handling of this case. Alternatively, the WULA can be uploaded on the eWULAAS to follow the steps, as they are made available as the WULA progresses through the stages, if indeed the relevant officials allow progression.

The rivers in the Hex River valley are prone to high-velocity runoff during the rainy season, with stones and rock washing down the incline to accumulate against the bridges and culverts. There is a threat of erosion as well. These accumulations must be removed, mostly with heavy earthmoving machinery.

The Hex River and its tributaries at De Doorns are in a poor ecological state.

The installing of gabion baskets and removal of these stones at Bridge 0496 in the Hex River and Culvert 10432 in the Rooielskloof River, a tributary of the Hex River to the west of De Doorns, will not contribute to the further deterioration of the river.

The Risk Matrix indicates that the proposed work in the river is Generally Authorised. A License application is not required. This project must be registered on the national river database, for which the process on the eWULAAS online facility must be followed.

22 References

Dickens, CWS & PM Graham. 2002. *The South African Scoring System (SASS) Version 5 Rapid Bioassessment.* African Journal of Aquatic Science 2002, 27: 1–10.

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

Rountree, M., A. L. Batchelor, J. MacKenzie and D. Hoare. 2008. Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas. Department of Water Affairs and Forestry, Pretoria.

23 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;
- 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 National Environmental Management Act, 1998 (Act No. 107 of 1998), the Environmental Impact Assessment Regulations, 2014 (as amended), and any specific environmental management Act;
- Have and will not have any vested interest in the proposed activity;
- Have disclosed to the applicant, Environmental Assessment Practitioner (EAP), and the competent authority any material information that has or may have the potential 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, 2014 (as amended), and any specific environmental management Act;
- Am fully aware of and meet the responsibilities in terms of the NEMA and the Environmental Impact Assessment Regulations, 2014 (as amended) (specifically in terms of Regulation 13), and that failure to comply with these requirements may constitute and result in disqualification;
- Have ensured that information containing all relevant facts in respect of the specialist input/study was made available to the EAP, interested and affected parties, and the competent authority, and that participation by interested and affected parties was facilitated in such a manner that all parties were provided with a reasonable opportunity to participate and provide comments on the specialist input/study;
- Have ensured that all comments received from 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 interested and affected parties who participated in terms of the specialist input/study were recorded in the register of interested and affected parties;
- Have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable or not; and
- Am aware that a false declaration is an offence in terms of Regulation 71 of the Environmental Impact Assessment Regulations, 2014 (as amended).

Signature of the specialist:  26 February 2026

24 Résumé

Dr Dirk van Driel
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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 (Deputy Chairperson): Grotto Bay Homeowner'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

Dr Dirk van Driel produced more than 150 reports on aquatic related issues since 2013. These include Freshwater Reports for Water Use License Applications for wastewater treatment works, mining, roads, power lines, pipelines, agricultural developments, water abstractions, dams, canals, irrigation, urban developments and industry. Other reports include wetland delineations, biodiversity and botanical assessments and on a wide range of environmental matters from small to mega developments.

25 Appendix

25.1 Biomonitoring

SASS% Score		Hex River Bridges				D van Driel 40041/96				
Date	13-Feb-26	**Taxon**	**Weight**	**Score**	**Taxon**	**Weight**	**Score**	**Taxon**	**Weight**	**Score**
Locality	Hex River	Porifera	5		**Hemiptera**			**Diptera**		
		Coelenterata	1		Belostomatidae	3		Athericidae	10	
		Turbellaria	3		Corixidae	3	3	Blepharoceridae	15	
		Oligochaeta	1		Gerridae	5		Ceratopogonidae	5	
Coordinates	33°28' 56.70"S	Huridinea	3	3	Hydrometridae	6		Chironomidae	2	2
	19°37'15.67"E	**Crustacea**			Naucoridae	7		Culicidae	1	
		Amphipodae	13		Nepidae	3		Dixidae	10	
DO mg/l	8.1	Potamonautidae	3		Notonectidae	3		Empididae	6	
Temperature °C	24.0	Atyidae	8		Pleidae	4		Ephydridae	3	
pH	7.79	Palaemonidae	10		Veliidae	5		Muscidae	1	
EC mS/m	150	Hydracarina	8		**Megaloptera**			Psychodidae	1	
		Plecoptera			Corydalidae	10		Simuliidae	5	5
SASS5 Score	33	Notonemouridae	14		Sialidae	8		Syrphidae	1	
Number of Taxa	9	Perlidae	12		**Trichoptera**			Tabanidae	5	
ASPT	3,7	**Ephemeroptera**			Dipseudopsidae	10		Tipulidae	5	
		Baetidae 1 sp	4	4	Ecnomidae	8		**Gastropoda**		
Other Biota	Algae on rocks	Baetidae 2 sp	6		Hydropsychidae 1 sp	4		Ancylidae	6	
	Oreochrimis	Baetidae >3 sp	12		Hydropsychidae 2 sp	6		Bulinidae	3	
	mossambica	Caenidae	6		Hydropsychidae <2 sp	12		Hydrobiidae	3	
		Ephemeridae	15		Phylopotamidae	10		Lymnaeidae	3	
		Heptageniidae	13		Polycentropodidae	12		Physidae	3	3
		Leptophlebiidae	9		Psychomyidae	8		Planorbidae	3	
		Oligoneuridae	15		**Cased Caddis**			Thiaridae	3	
Comments		Polymitarcyidae	10		Barbarochthonidae	13		Viviparidae	5	
		Prosopistomatida	15		Calamoceratidae	11		**Pelecipoda**		
		Teloganodidae	12		Glossostomatidae	11		Corbiculidae	5	
		Trichorythidae	9		Hydroptilidae	6		Sphariidae	3	
		Odonata			Hydrosalpingidae	15		Unionidae	6	
		Calopterygidae	10		Leptostomatidae	10				
		Clorocyphidae	10		Leptoceridae	6				
		Chorolestidae	8		Petrothrincidae	11				
		Coenagrionidae	4	4	Pisulidae	10				
		Lestidae	8		Sericostomatidae	13				
		Platycnemidae	10		**Coleoptera**					
		Protoneuridae	8		Dyticidae	5	5			
		Aesthnidae	8		Elmidae Dryopidae	8				
		Corduliidae	8		Gyrinidae	5				
		Gomphidae	6		Haliplidae	5				
		Libellulidae	4	4	Helodidae	12				
		Lepidoptera			Hydraenidae	8				
		Pyralidae	12		Hydrophilidae	5				
					Limnichidae	10				
					Psephenidae	10				
Score				15			8			10

Table 25.2 Numerical Significance

Table 25.2.1 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 25.2.2 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 25.2.3 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)

25.3 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 25.3.1 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 25.3.2 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 25.3.3 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 25.3.4 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.

25.4 Risk Matrix Methodology

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

Negative Rating

TABLE 1- SEVERITY

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

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

TABLE 2 – SPATIAL SCALE

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

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

TABLE 3 – DURATION

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

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

TABLE 4 – FREQUENCY OF THE ACTIVITY

How often do you do the specific activity?

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

TABLE 5 – FREQUENCY OF THE INCIDENT/IMPACT

How often does the activity impact on the environment?

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

TABLE 6 – LEGAL ISSUES

How is the activity governed by legislation?

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

TABLE 7 – DETECTION	
How quickly can the impacts/risks of the activity be observed on the environment (water resourc	
Immediately	
Without much effort	
Need some effort	
Remote and difficult to observe	
Covered	

TABLE 8: RATING CLASSES		
RATING	**CLASS**	**MANAGEMENT DESCRIPTION**
1 – 55	(L) Low Risk	Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated. Wetlands may be excluded.
56 – 169	M) Moderate Risk	Risk and impact on watercourses are notably and require mitigation measures on a higher level, which costs more and
170 – 300	(H) High Risk	Always involves wetlands. Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale
A low risk class must be obtained for all activities to be considered for a GA		

TABLE 9: CALCULATIONS

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