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Freshwater Report

for the further development of agricultural operations on

Farm 91, Riversdale

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

August 2024
Expanded and updated February 2025

HDL CONSULTING

EnviroAfrica
Environmental Management and Impact Assessment
Omgewingsbestuur en Impakbeoordeling

WATSAN Africa

Executive Summary

Farm 91 Riversdale RD is registered to the CJ Engebrecht Trust. The avocado and macadamia producing operation is directed at the export market and at discerning consumers. Orchards are under irrigation. This is a state-of-the-art operation utilising purpose-made technology.

A dairy farming operation is currently phased out and will eventually be replaced by permanent crops.

Water is abstracted from three abstraction points in the rivers on the property. The operation attracted the attention of BOCMA, the water authority in the region. Several aspects of the farming operation are still in need of official approval. One dam in particular, its construction and operation, must be officially approved. This dam was constructed in a regulated area and on an alleged wetland, for which a motivation for approval is pressing.

Dr D van Driel of WATSAN Africa in Knysna was appointed to produce a report known as the Freshwater Report along an established format and contents that would allow for informed decision-making. This report must include a completed Risk Matrix.

Mrs Hester Lyons of HDL Consulting in Cape Town was appointed to deal with the Water Use License Applications. The Freshwater Report must provide information for the successful Water Use License Application.

Two newly established orchards triggered a reaction from DEA&DP. Subsequently, in January 2025, the owner of Farm 91 instructed Enviro Africa of Somerset West to start a S24G application in terms of the NEMA. These orchards must be included in the Water Use License Application.

The land was found to be pristine up the slopes of the Langeberg, with prime Fynbos and natural rivulets. The lower two thirds of the farm is extensively farmed. It was found that the farming operation had no measurable impact on the river's water quality, as established by biomonitoring. Impacts will further be reduced as the irrigated pastures for dairy farming will be replaced by avocado trees. The single most deleterious impact on the rivers is the dense and mature stand of black wattle exotic invasives. The rivers were classified according to acknowledged methodology. The rivers were assessed to be impacted, with a loss of ecological functioning.

The dam under scrutiny was constructed on dairy cattle pasture, grasses under irrigation. The Renosterveld was removed and replaced with pastures over millennia and generation of farmers. The alleged wetland is no more, not since a very long time ago. The dam did not contribute to the wetland's demise.

It is recommended that the dam's continued operation is allowed in terms of a General Authorisation, as suggested by the complete Risk Matrix.

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Abbreviations

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

1 Introduction

Farm 91 Riversdale RD together with Portion 1 of Farm 80 Riversdale RD is registered to the CJ Engelbrecht Trust. The property is located on the southern slopes of the Langeberg to the north of Heidelberg on the N2 highway in the Western Cape. It is a family-run enterprise that previously focussed on dairy farming on irrigated pastures. Currently, a drive away from dairy to avocadoes and macadamia nuts proved to be most successful. This is a state-of-the-art operation utilising the latest farming technology and is focussed on the expert market to serve the most demanding and discerning consumers.

The rainfall in the area is inadequate to maintain such a fruit and nut faming operation. Water is abstracted from rivers at three abstraction points. From here it is stored in several farm dams. Water is then applied through an ultra-low pressure drip irrigation system, accurately measured to be just enough for each individual tree.

One of the abstraction points attracted the attention of the BOCMA (Appendix), the water authority in the region. A notice dated 21 May 2024 was directed at Mr Engelbrecht. The notice demanded the following:

- An impact assessment must be carried out by an independent SACNASP registered aquatic specialist. This must be focussed on the irrigation on the aquatic environment.
- The rivers and streams must be delineated.
- This assessment must address impacts because of the irrigation activities on the farm.
- One of the dams was constructed in a regulated area. It was constructed on a wetland. The impact of the dam must be assessed.
- Assessment must be carried out in terms of S21(c) and S21(i) of the NWA.

The owners of the farm appointed Dr D. van Driel of WATSAN Africa in Knysna to carry out this assessment.

The required assessment is not any different from the usual and the full Freshwater Report that is required for a WULA, including a completed Risk Matrix. Subsequently it was decided to produce such a report, given the legal requirement that several activities on the farm must still be officially approved in terms of the NWA, among other this particular dam.

Mrs Hester Lyons of HDL Consulting in Bellville, Cape Town was appointed to deal with the WULA's. This Freshwater Report is tailored to suit her needs as required for the WULA process.

2 Location

Figure 1 Location

Farm 91 is located 15km to the northeast of Heidelberg on the N2 highway (Figure 1). The farm is on the northern banks of the Duivenhoks River and on the southern slopes of the Langeberg.

The farm's coordinates are as follows:

35°59'13.33"S and 21°03'25.82"E

These are the coordinates of the dam now under discussion, Dam No.7.

To reach the farm, the road past the golf course and over the railway line out of Heidelberg must be taken. This road becomes a winding dirt road over mountainous terrain. It may take some time to reach the farm. It is best to contact the landowner

to ask for direction prior to embarking on the route to the farm. Keep contact while driving to avoid getting lost.

3 Quaternary Catchment

Farm 91 is in the H80A quaternary catchment.

4 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 rock quarry is adjacent to natural drainage lines that are identified in the NWA and its regulations as legitimate water resources. The drainage lines could possibly be altered, should the development go ahead.

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

The proposed pipeline may alter the characteristics of the drainage lines.

Government Notice 267 of 24 March 2017

Government Notice 1180 of 2002. *Risk Matrix.*

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

Government Notice 509 of 26 August 2016

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

National Environmental Management Act (107of 1998)

NEMA and regulations promulgated in terms of NEMA determines that no development without the consent and permission of the DEA and its regional agencies, in this case the DENC of the Northern Cape Provincial Government, may take place within 32m of a water course. The mostly dry drainage lines are perceived to be legitimate water courses.

5 Climate

Heidelberg is the closest town for which online climate data is readily available (Figure 2).

https://weather-and-climate.com/average-monthly-precipitation-Rainfall,heidelberg-western-cape-za,South-Africa

This data is not entirely applicable to Farm 91, as rainfall increases with elevation in this part of the Western Province. The high ridges of the Langeberg are from 600masl to 1000masl and the highest peak is 1263masl. The rainfall here varies between 1000 and 1500mm pear year and even more.

The town of Heidelberg on the coastal flats is at 97masl. The town receives on 366 mm per year.

https://www.saexplorer.co.za/south-africa/climate/heidelberg_(wc)_climate.html

Heidelberg is relatively dry, according to this rainfall figure.

The Western Cape is a winter rainfall area, with most rain during June and July. Heidelberg and surrounds differ from this pattern as rainfall is more or less evenly spread throughout the year (Figure 2).

Nevertheless, the rainfall on Farm 91 is too little to maintain permanent crops such as fruit and nut trees. Water must therefore be collected from the streams out of the mountains. Water must be stored in dams for the irrigation of these crops during these dryer times and warmer periods. The temperature during summer can rise to well in the 30's, during which addition water for irrigation is required.

Moreover, rainfall is highly variable, with period of abundance, but also with period of droughts. Some of these droughts predictably outlast the tolerance of permanent crops. The storage of water in farm dams when the rivers out of the mountains come down strongly is mandatory to outlast the times when the rivers run dry.

The establishment and maintenance of trees such as avocadoes are high. The risks of losing an orchard are high because of a lack of water are high as well. Production of produce for the export market is entirely impossible without the storage of water for irrigation.

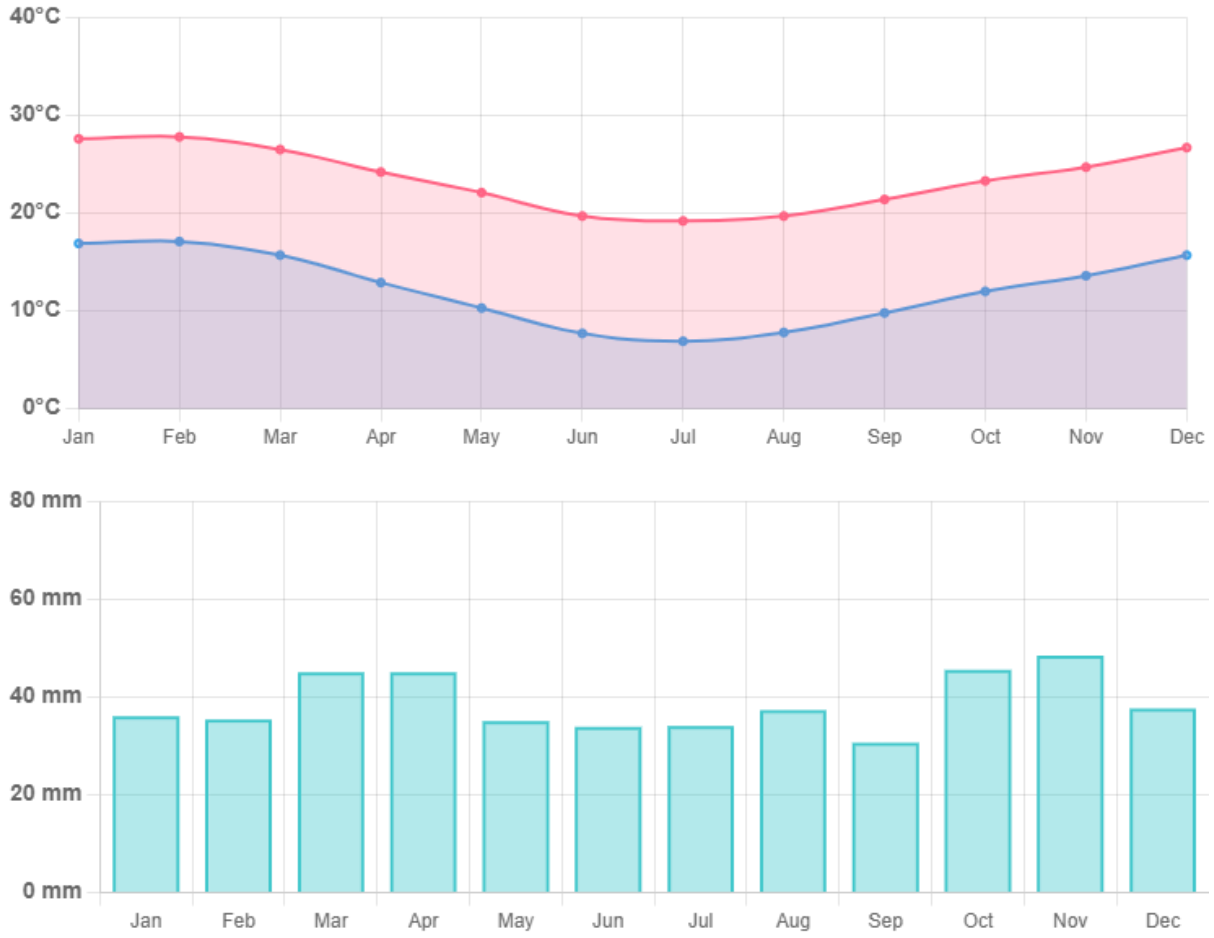


Figure 2 Heidelberg climate

6 Conservation Status

The conservation status of the lower half of Farm 91 was determined. The upper half against the mountain will not be developed and is set aside for conservation.

DFFE Screening Tool

Table 1 DFFE Screening Tool Results

Theme	Sensitivity
Animal species	Medium
Avian species	Not mentioned
Aquatic biodiversity	Very High
Plant species	Medium
Terrestrial biodiversity	Very High

Animal species

Neotis denhami	Denham's Bustard
Bradypterus sylvaticus	Knysna warbler
Aquilla verreauxii	Verreaux's eagle, black eagle
Vircus maurus	Marsh harrier
Circus ranivorus	Black harrier
Stephanoaetus coronatus	Crowned eagle

Aquatic biodiversity theme

The aquatic biodiversity theme is listed as "Very High" because of the presence of a CBA, even though most of it is degraded.

The rivers are listed as NFEPA's.

There are wetlands listed as Eastern Renosterveld Bioregion seeps as well as valley bottom wetlands.

Plant species theme

A long list of medium sensitivity plant species appeared on the DFFE screening tool results. Some of these are numbered species of which the names may not be published. The lower half of the property was screened on purpose, leaving out the top mountain part, because this is set aside for conservation and is not part of the development. If the mountainside was included, the list would have predictable been much longer.

Terrestrial biodiversity theme

The terrestrial biodiversity theme is indicated as “Very High” because the land is listed as a CBA as well as restorable CBA. Forest CBA is identified on the land, but none of this is left. All is replaced with black wattle.

The land is rated as a FEPA sub-catchment.

The sub-catchment is a SWSA, a strategic water resource area, which is the case for just about all mountain catchment areas.

The vegetation is named as endangered Garden Route Shale Fynbos. Nothing of this is left on the farm, as all has been turned into agricultural land. It has been farmed for many generations. This is not about to change.

Western Cape Biodiversity Spatial Plan

The alleged seeps and valley bottom wetlands are listed on the WCBSP. This is one of the aspects that triggered the BGCMA response on Dam No.7

7 Duivenhoks River

The river and its catchment (Figure 3) were adequately described in the Estuary Management Plan (2019) as well as by Adams *et al* (2014).

The Duivenhoks River rises on the high peaks and ridges of the Langeberg Mountains (Figure 3) from where it flows to the south into the Southern Indian Ocean on the southern seaboard of the Western Cape. The catchment area is 53 140km^2. From the peaks up to 1500masl and the high ridges at 900 to 1100masl to the mouth of the river is approximately 50km.

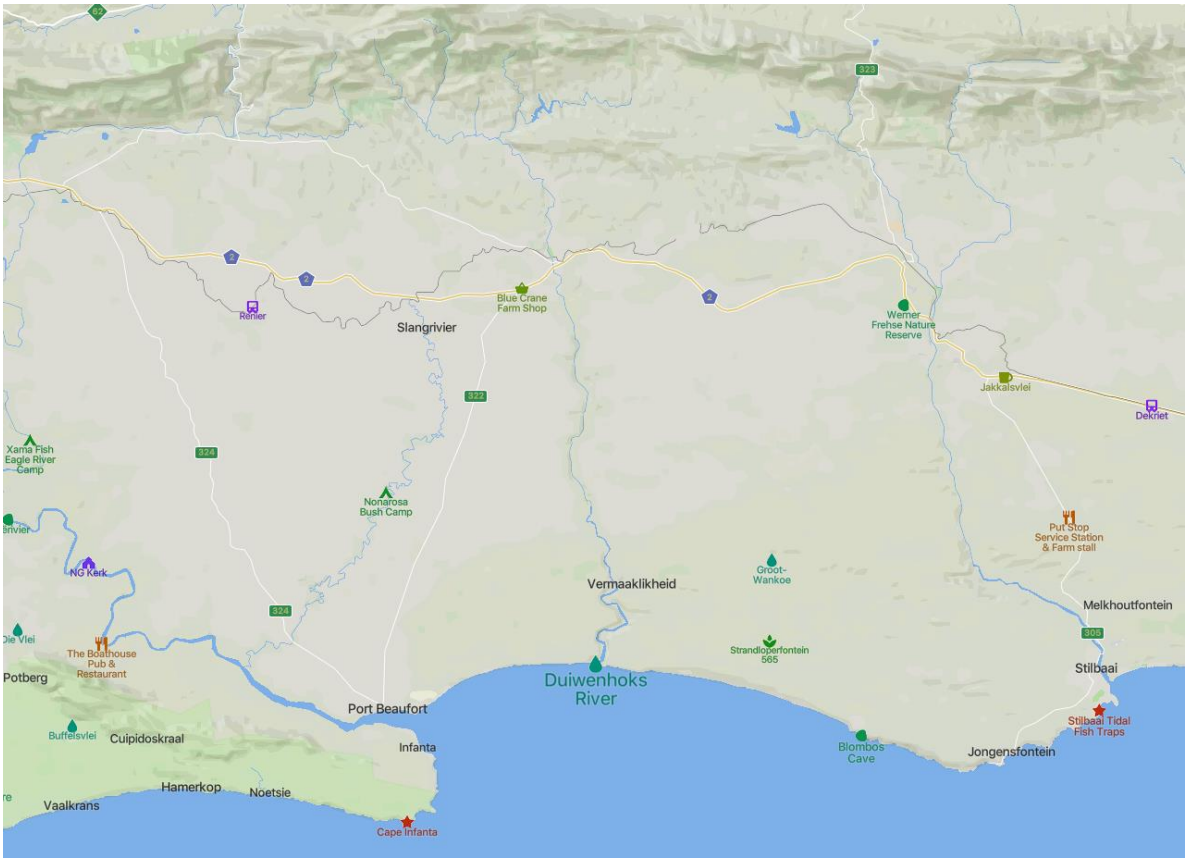


Figure 3 Duiverhoks River
https://mapcarta.com/14360682

Figure 4 Langeberg Mountains

Figure 5 Dairy in the upper catchment

Figure 6 Middle Catchment

Figure 7 Fynbos

The southern slopes of the mountains are proclaimed nature reserves and mountain catchment areas, with patches of Afromontane forests. The foothills and the upper catchment are heavily farmed with dairy (Figure 5), fruit and cash crops.

Downstream on the coastal flats the undulating landscape (Figure 6) has deeply incised valleys. The area is heavily farmed with wheat and canola. Farm animals such as sheep are prevalent on planted pastures. The valleys with bottom drainage lines are too steep to be ploughed over and may carry a dense stand of natural shrubland vegetation.

The catchment is heavily infested in many places with black wattle *Acacia mearnsii* (Figure 4).

Close to the ocean adjacent to the shore is a narrow strip of natural Fynbos, still well-preserved and mostly unimpacted (Figure 7). This strip is separated from the inland farming activities by land that is heavily infested by rooikrans *Acacia cyclops*.

The town of Heidelberg is located approximately halfway down the catchment, where the flow of the river is augmented by treated sewage effluent.

The Duivenhoks Dam in the upper catchment holds 6 million m^3 of water.

8 Farm 91

The Land

Figure 1 is a map of the property.

It consists of Farm 91 of 1179ha as well as Portion 1 of Farm 80 of 272ha. The Duivenhoks River forms its undulating southern boundary. The elevation along the southern boundary is from 281 to 245masl. The width of the property along the southern boundary, measured in a straight line is 2.9km.

The high ridges and peaks of the Langeberg Mountains form the property's northern boundary. The elevation here varies from 600 to 1000masl, with the highest peak at 1236masl.

The length of the property, from the mountains to the river is 8.4km.

The rivers.

The Plattekloof River rises on the high ground of the Langeberg Mountain (Figure 8) and flows to the south to its confluence with the Duivenhoks River. The Hottentotsbos River is the main tributary of the Plattekloof River. Its confluence is far down south on the property approximately a kilometre away from the Duivenhoks River. The sub-catchment area of the Plattekloof and Hottentotsbos River (Figure 9) combined is 2700ha.

At the time of the site visit, the Plattekloof River was flowing strongly as a roughly estimated rate of 0.5 m^3s^{-1}. It was typically tea-coloured, as most rivers out of Fynbos catchments.

The Sanddrift Stream (Figure 9) along the eastern boundary of the property is of interest since it has the dam that must now be assessed. It is a much smaller stream that the Plattekloof River, with a sub-catchment area of 848 ha. It was running at an estimated rate of $5ls^{-1}$.

The top end of the property, up against the slopes of the mountains, is pristine mountain Fynbos, not affected or impacted by any farming activities. The landowner takes care that this land remains pristine.

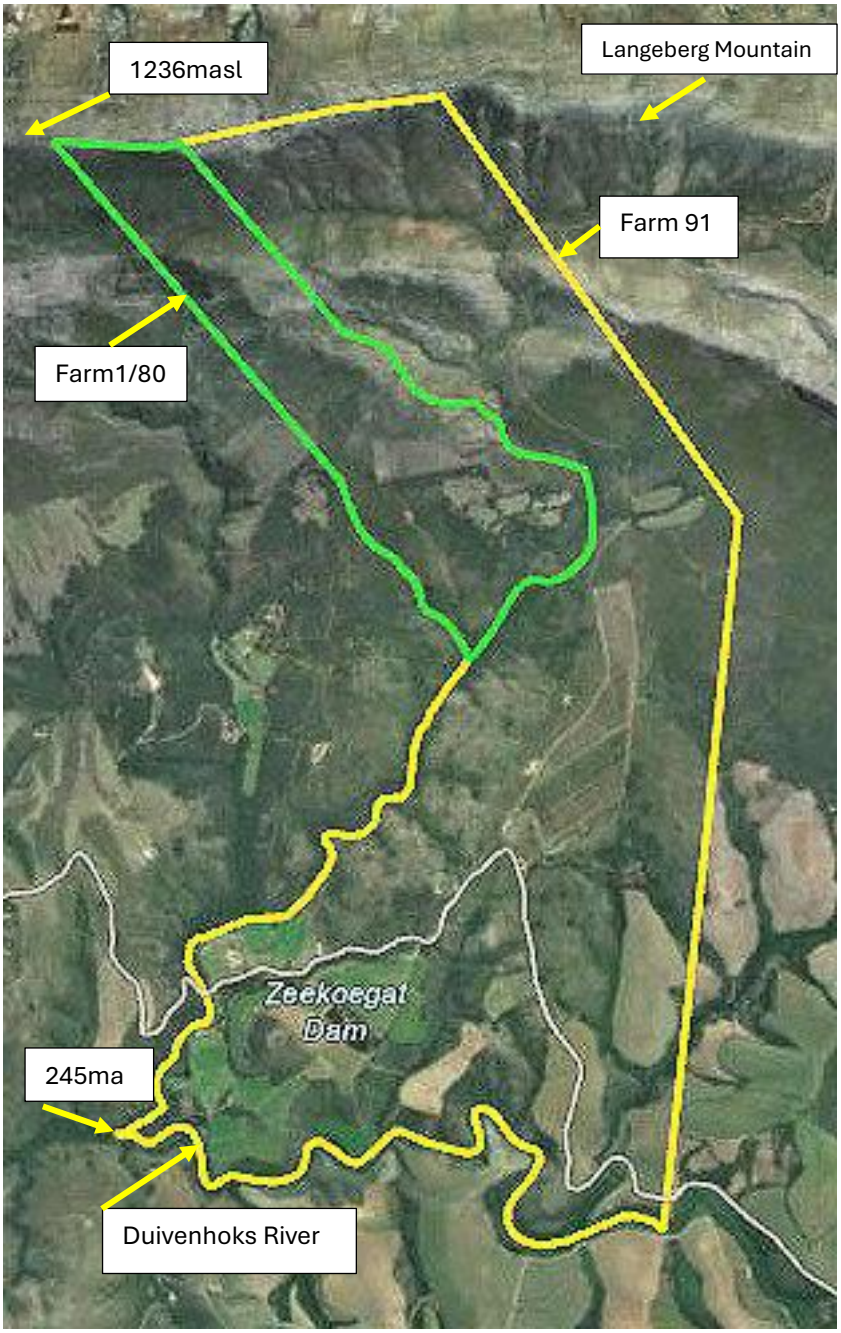


Figure 8 Farm 91

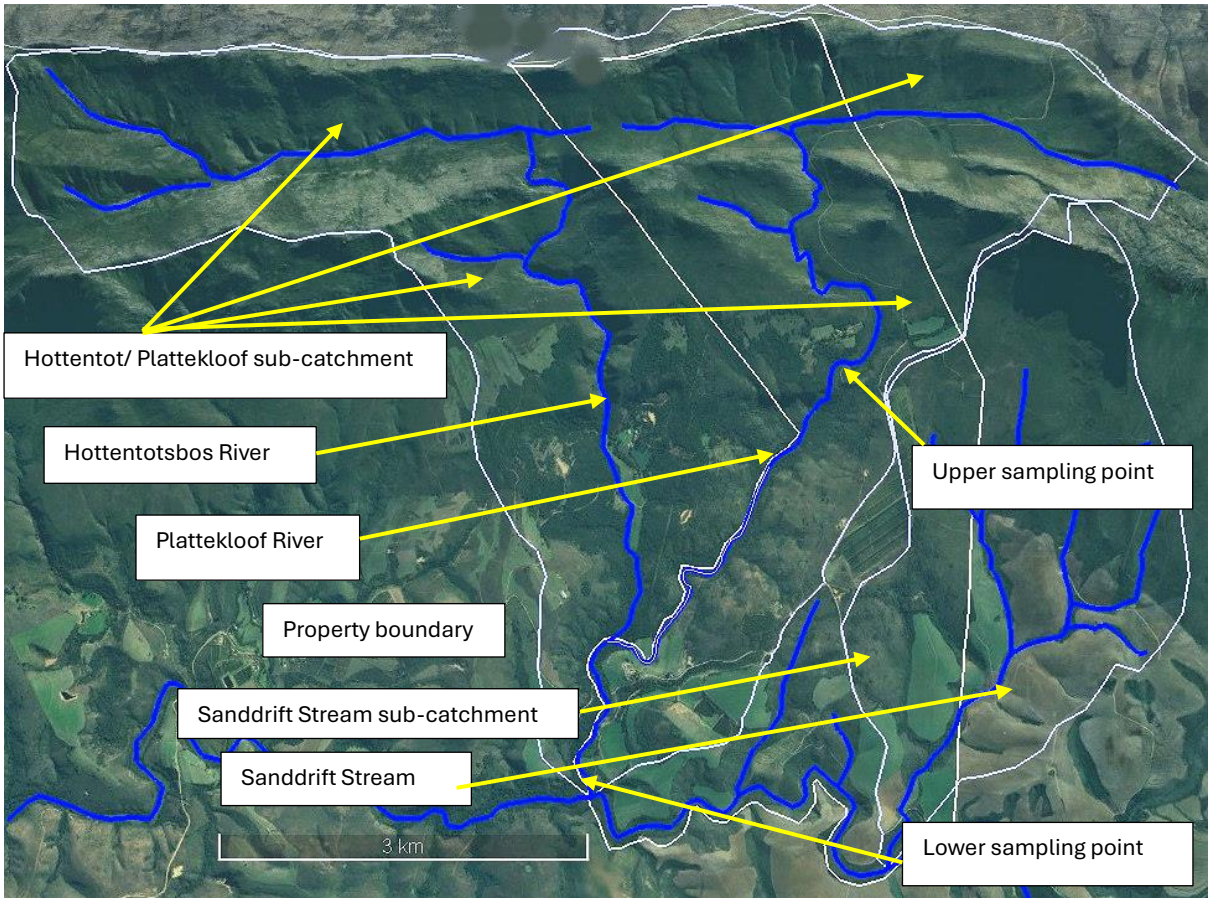


Figure 9 Farm 91 Sub-Catchments

Black Wattle

The rivers are in deep valleys, entirely overgrown with a dense and mature stand of black wattle. This is the same as the district, the Western Cape and much of the country, where black wattle has become a serious environmental impediment. The monostand of black wattle completely replaced river Fynbos (Figure 10). Wherever it takes hold, the riverbanks erode, with the riverbed deeply incised.

The landowner cleared large areas of land at great costs, only to lose it to black wattle once again within two seasons. Obviously, current clearing methods on the farm, as elsewhere in the district, are inadequate to control this pest. The community is, apart from vying for government assistance, is hoping for new research and new technology to overcome this problem.

Most of the photographs featured in this report show stand of black wattle, in valleys and on otherwise arable farmland. It is omnipresent, a persistent and deep-cutting lesion in contemporary agriculture.

Figure 10 Black wattle

Development

Farm 91 used to be a dairy farm where 250 cows were grazing on irrigated pasture. Almost a generation ago, flood irrigation was the only way the grass was kept growing. Pipes with sprinklers changed irrigation for the good, with reduced labour and increased milk production.

The landowner intimated that a small dairy operation that reached its optimum level of production with the land and resources available must change if growth and profitability were to be maintained. Following much deliberation and serious research, the first avocado trees were planted (Figure 11). The development of pastures for grazing cattle into orchards is now in full swing, with macadamia nuts added.

Drip irrigation significantly reduced the volume of water that is now applied to farming. This is a highly scientific and technical operation, uniquely developed and coded inhouse on the property, computerised and remotely controlled, with each tree receiving just enough water and fertilizer to maximise profitability. The elaborate system of pumps and conduits spread out all over the property bears testimony to the level of sophistication (Figure 12).

Figure 11 Development

Figure 12 Irrigation system

The landowner is adamant that dairy will be phased out altogether. A small-scale dairy operation will give way to a large-scale fruit and nut producing unit.

This development resulted in a zero-volume agricultural return flow. Agrichemicals do not end up in the river along with runoff from the orchards. Biomonitoring directly downstream of Farm 91 supports this notion.

Dairy

Currently much of the arable land on farm 91 is still irrigated pasture for dairy cattle. The land is irrigated with a system of sprinklers, as is much of the land in the district for cattle farming. There is a facility on the farm for milking the cows.

The effluent out of this facility is collected in a series of holding ponds, where it is partially treated. From here the treated effluent is irrigated on land. This land is now being transformed into orchards (Figure 13), in support of the development policy for Farm 91.

As has been stated before, it is eminent that the entire dairy operating is replaced with orchards.

Figure 13 Land irrigated with dairy effluent

A professional investigation was carried out on the quality of the effluent and the impact in the irrigated land. The impact proved to be acceptable. The report is available for official scrutiny and assessment.

Water Infrastructure

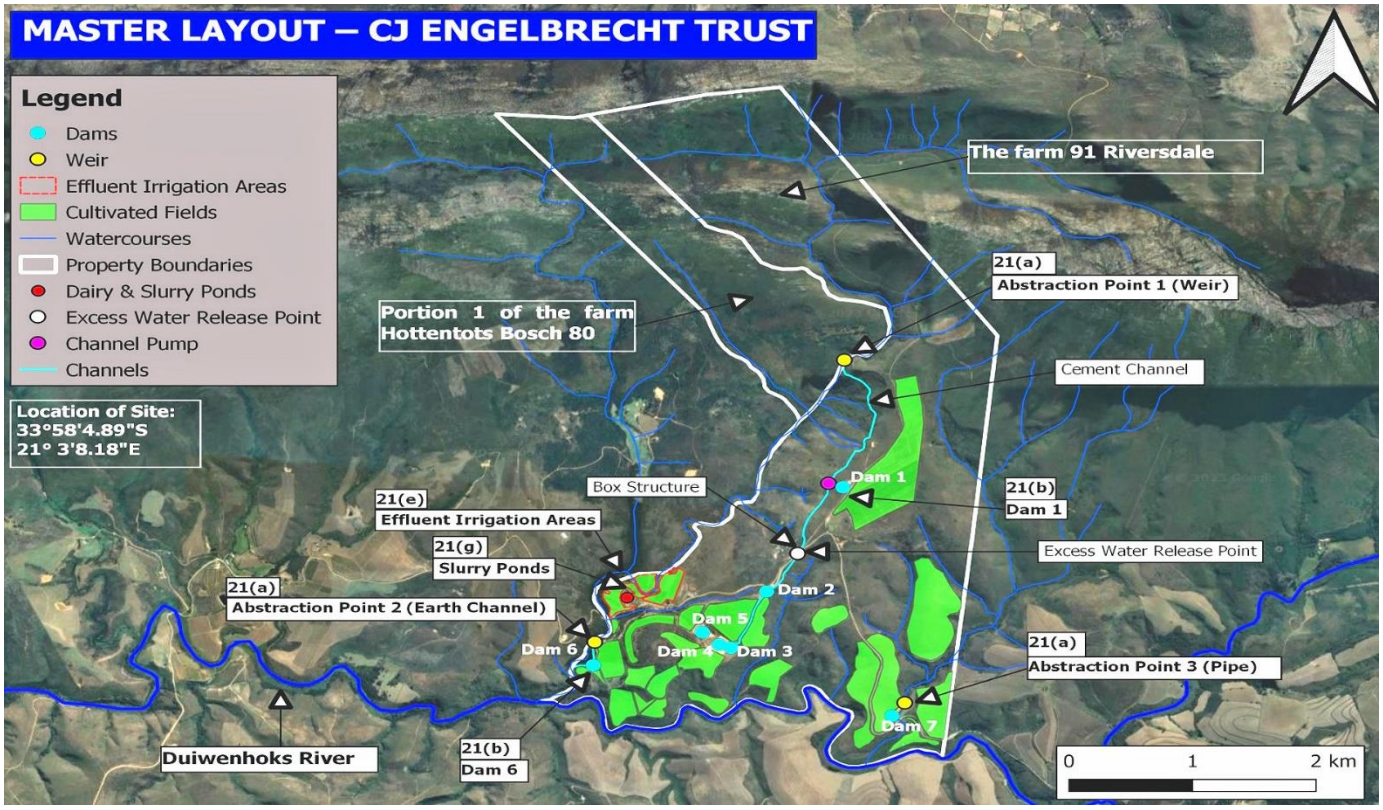


Figure 14 Water infrastructure (Mr Albert Engelbrecht)

The water infrastructure (Figure 14), consisting of a dams, conduits and pumps will be fully dealt with in the water balance, as the BGCMA required. As can be seen on the diagram, this is quite an involved and integrated system. Some of the features are photographically recorded to enable decision-makers and officials to form an impression prior to conducting site visits. Only Dam No.7 is under discussion in this report, in accordance with the BGCMA notice.

There are three points on Farm 91 where water is taken out of the rivers. The main one is in the middle Plattekloof River (Figure 14). Here is a prominent concrete weir and two large pipe conduits that take water down the incline all the way to Dam No. 3, 4 and 5 (Figure 15).

The next abstraction point is in the lower Plattekloof River (Figure 17) downstream of the confluence with the Hottentotsbos River (Figure 14). Downstream from the take-off point is a small dam (Dam No.6, Figure 18) that receives water form this take-off point and that serves as a reservoir for the pump that introduces this water into the irrigation system.

Figure 15 Weir and conduits in the middle Plattekloof River

Figure 16 Dam No.5

Figure 17 Lower Plattekloof River take-off.

Figure 18 Dam No.6

Figure 19 Sanddrift River abstraction point

Figure 20 Dam No. 7

Figure 21 Berm at Dam No.7

Figure 22 Valley at Dam No.7

Dam No.7

The third abstraction point is of importance to this report as it involves Dam No. 7 Figure 14), the subject of the BOCMA notice.

The abstraction point is in the lower Sanddrift River (Figure 19). It is a pipe with a screened opening lying in the river. Water entering the pipe is carried into Dam No. 7 (Figure 20). The pipe is dug in underground in the riverbank alongside the river. Water simply gravitates out of the river through the pipe into the dam.

From this dam, water is pumped into the rest of the irrigation system.

Previously, a pipe from the river entered the dam. This pipe is underground from the river to the dam. This proved to be less successful for filling the dam. The new pipe with the intake further upstream works much better, without any pumping costs, relying on only gravitation.

Electricity for the pumps at the abstraction points are provided from ESKOM transformers elevated high above ground level on poles located at the water's edge.

Figure 21 shows that the Sanddrift River at Dam No.7 is entirely overgrown with a mature and dense stand of black wattle. It shows that a new orchard was developed right next to the dam up the slope, with the samplings still small and with the ground still barren and devoid of cover.

A berm was constructed next to the new orchard (Figure 21) that follows the riverbank.

Across the river, on the opposite bank, is an irrigated pasture (Figure 22).

The valley here is narrow, with steep inclines that leaves little space for the alleged seeps and wetlands, as listed on the WCBSP. If ever there were wetlands up the slope along the Sanddrift River, these must have been small and limited to spaces where the valley levelled out.

Currently, these spaces are taken over with grasses, the same as that of the irrigated pastures. There was a small stand of sedges on the water's edge at the dam. Other than that, there were no wetland indicator species on the site.

The river at the site is now incised, dipping deeply into the channel, triggered by the inability of black wattle to bind and keep the ground, incision progressing deeper with each erosive flood over the years.

The Orchards

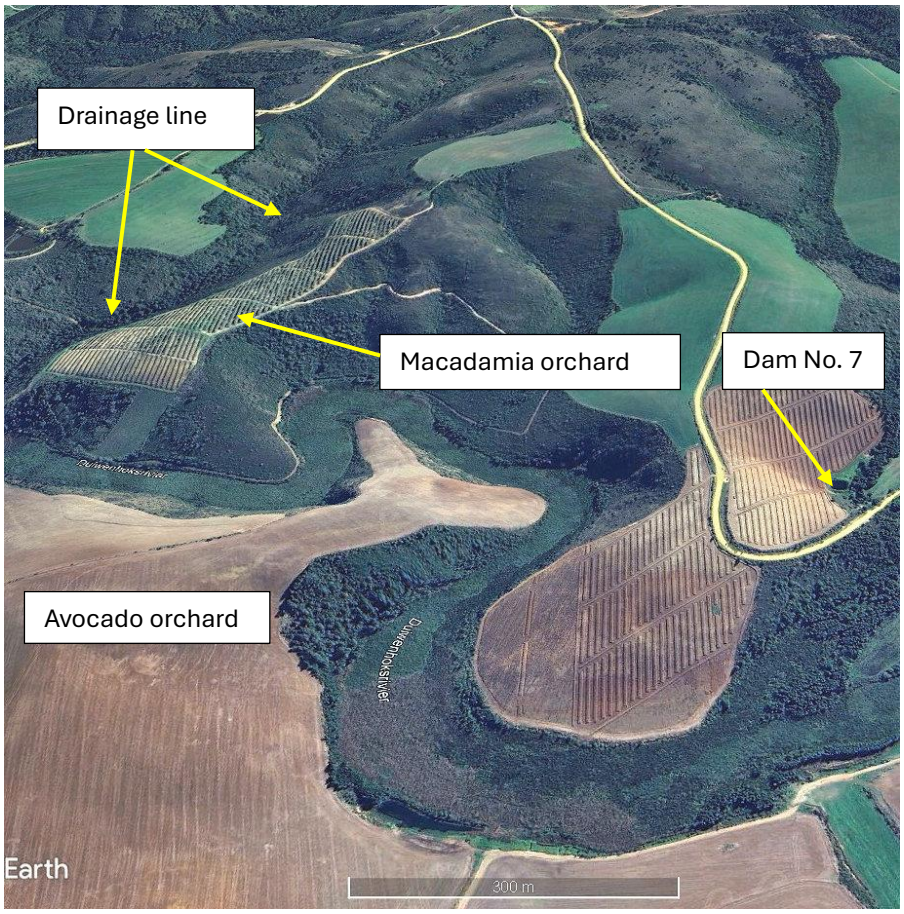


Figure 23 Orchards

The two orchards under discussion are indicated in Figure 23. They are located close to Dam No.7. The avocado orchard is on the banks of the Duivenhoks River. The macadamia orchard is 140m away from the river but is flanked by a drainage line along its western boundary.

Avocado Orchard

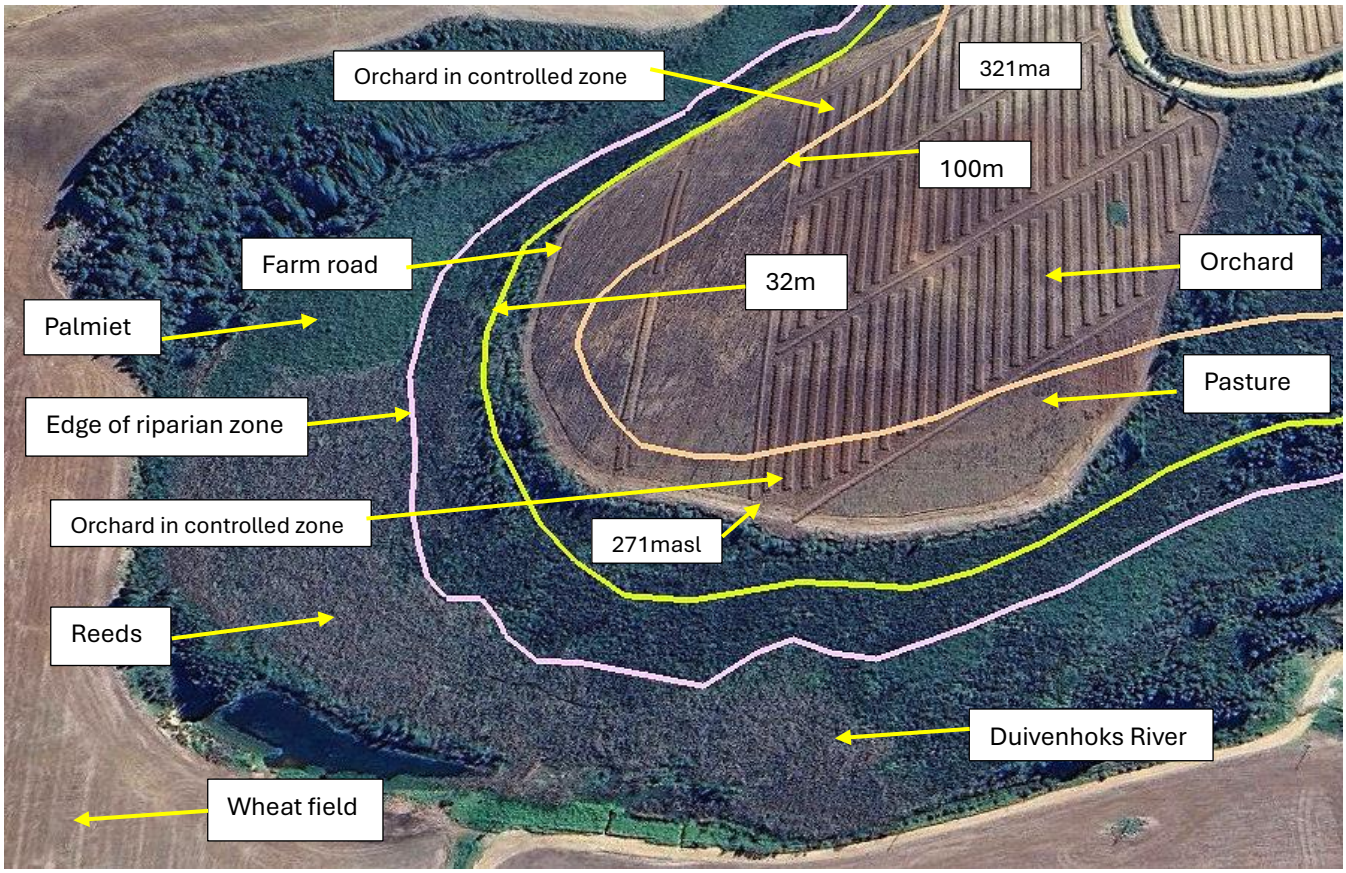


Figure 24 Avocado orchard 32m and 100m regulated zones

The agricultural land under discussion (Figure 24) first was a wheatfield of 8.9 hectares. This was put under irrigation to serve as pasture for dairy cows. Only 5.7 hectares of this land was development into avocado orchards started in 2022.

Only 0.5 hectare of the avocado orchards is within the 100m controlled zone.

None of the orchard is within the NEMA 32m controlled zone.

A very rocky, bumpy and most challenging farm road follows the old wheat field's perimeter. The northwestern stretch of this road touches upon but do not cross the 32m controlled zone's boundary.

Therefore, it is legally imperative that official approval is sought for the continuation of permanent crops farming within the NWA sanctioned controlled zone. No approval is required for farming activities within the NEMA 32m controlled zone as there are none.

Macadamia Orchard

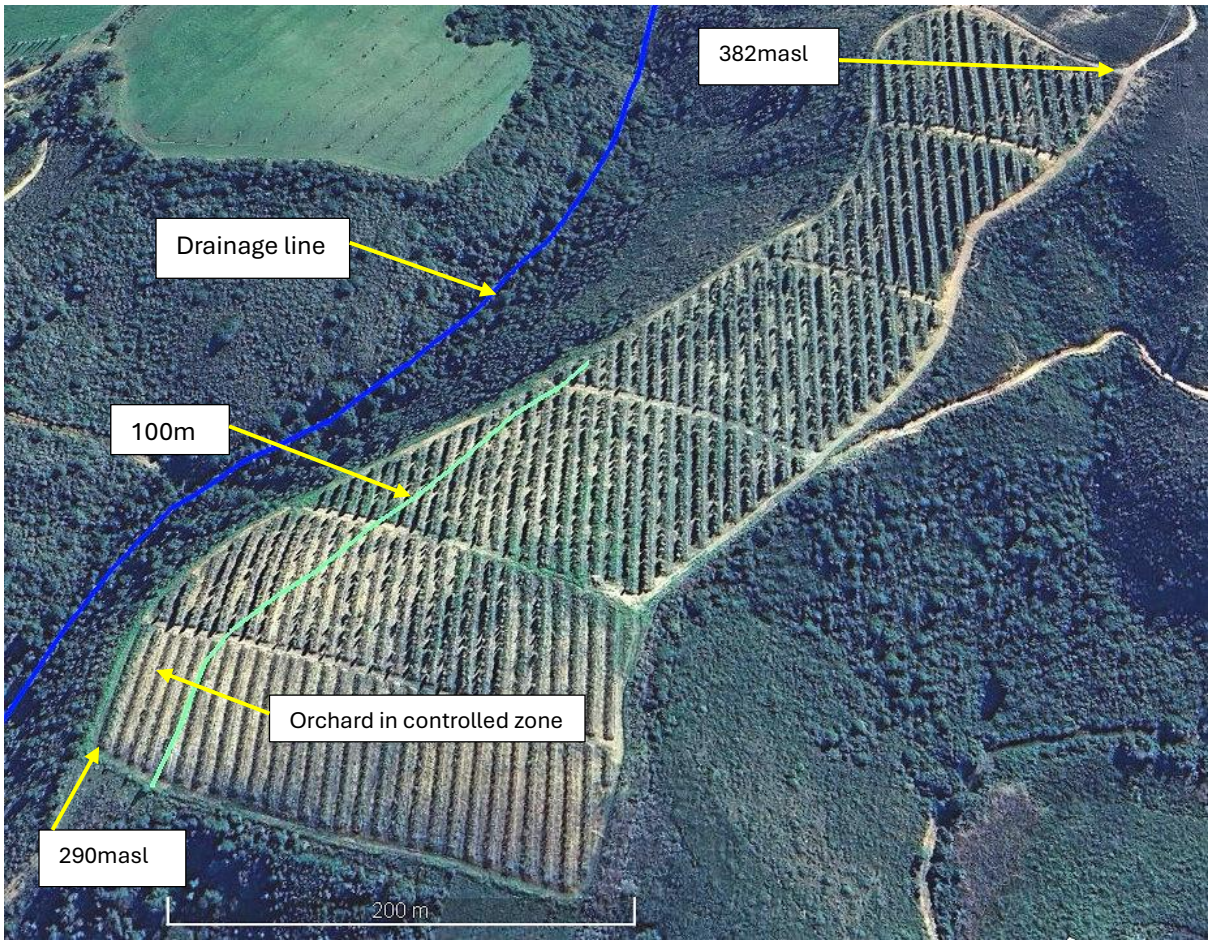


Figure 25 Macadamia orchard 100m regulated zone

The block of macadamias (Figure 25) covers an area of 9.3 hectares. Only 1.1 hectare is in the 100m controlled zone (Figure 1), close to the drainage line than is a small tributary of the Duivenhoks River of only 1,7km long.

Official authorisation must be acquired for the continued operation of the orchard's 1.1 hectare-portion.

The macadamia block is 623m long, from top to bottom, with the highest point in the north at 367masl and the lowest in the southwestern corner at 290masl. This translates into an average slope of 14.8 vertical metres in every 100 horizontal metres. This is extremely steep, like a mountain side, hardly fit for the establishment and operation of a commercial orchard. Yet, despite these difficulties, it is farmed successfully.

The drainage line is densely overgrown with a mature stand of mature black wattle (Figure 26). This stand obscures the real boundary of the natural riparian zone. The 100m controlled zone was measured from where the perceived middle of the steam ought to be.

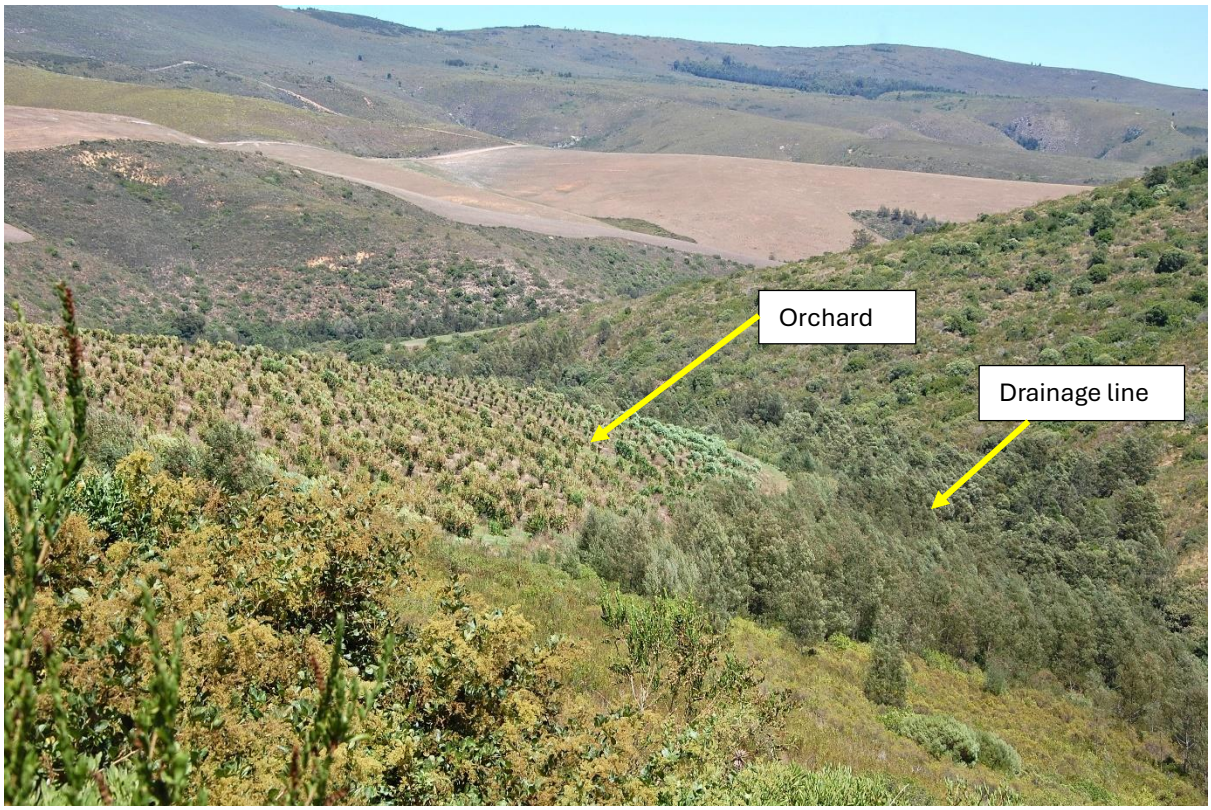


Figure 26 Macadamia orchard drainage line

9 Biomonitoring

The biomonitoring was carried out according to the description of Dickens & Graham (2002). Biomonitoring was done to measure the impact of agriculture on the aquatic environment. The positions of the sampling points are indicated in Figure 9 on p18.

The upper monitoring point in the Plattekloof River was chosen up the mountain side above any farming activities. This was to measure the quality of the river before agriculture had any impact. The river here flows in a deep valley with steep sides (Figure 27). The riparian vegetation is pristine Fynbos. It is higher than the surrounding vegetation, but other than that is does not differ much from the surrounding vegetation up the incline. A most notable difference is the clumps of palmiet *Prionium serratum*) in the river.

The river here was fast flowing (Figure 28), a metre wide, 30cm deep, with riffles and rapids, down the sharp incline of the mountain side. The water was tea coloured, as water is out of the Fynbos. There were many stones-in-current, with some plant roots offering habitat, with overhanging vegetation but other than that, the habitat was not much varied. Just upstream from where the photograph was taken was a clump of palmiet.

A shallow pool 20m downstream was sampled as well. Here was submerged vegetation, probably terrestrial grasses and bedrock. The habitat here was more varied, with gravel and a little sandy bottom.

The results were recorded in the SASS5 worksheet in the Appendix.

The lower sampling point (Figure 29) was chosen downstream and adjacent to Farm 91 and upstream of the Plattekloof River's confluence with the Duivenhoks River. The road together with the culvert over the river provided a break in the dense and mature stand of black wattle overgrowing the river. This allowed access to the river for sampling purposes.

The river here was fast flowing, tea-coloured, less than 2 metres wide, 40cm deep and with many-stones-in-current. The channel was straight, as if excavated, but probably only eroded in that way, with vertical muddy banks, with some overhanging vegetation but other than that, with no more variation. The bridge's wide and flat concrete slab provided bedrock habitat.

Figure 27 Upper Plattekloof River landscape

Figure 28 Upper Plattekloof River sampling point.

Figure 29 Lower Plattekloof River sampling point

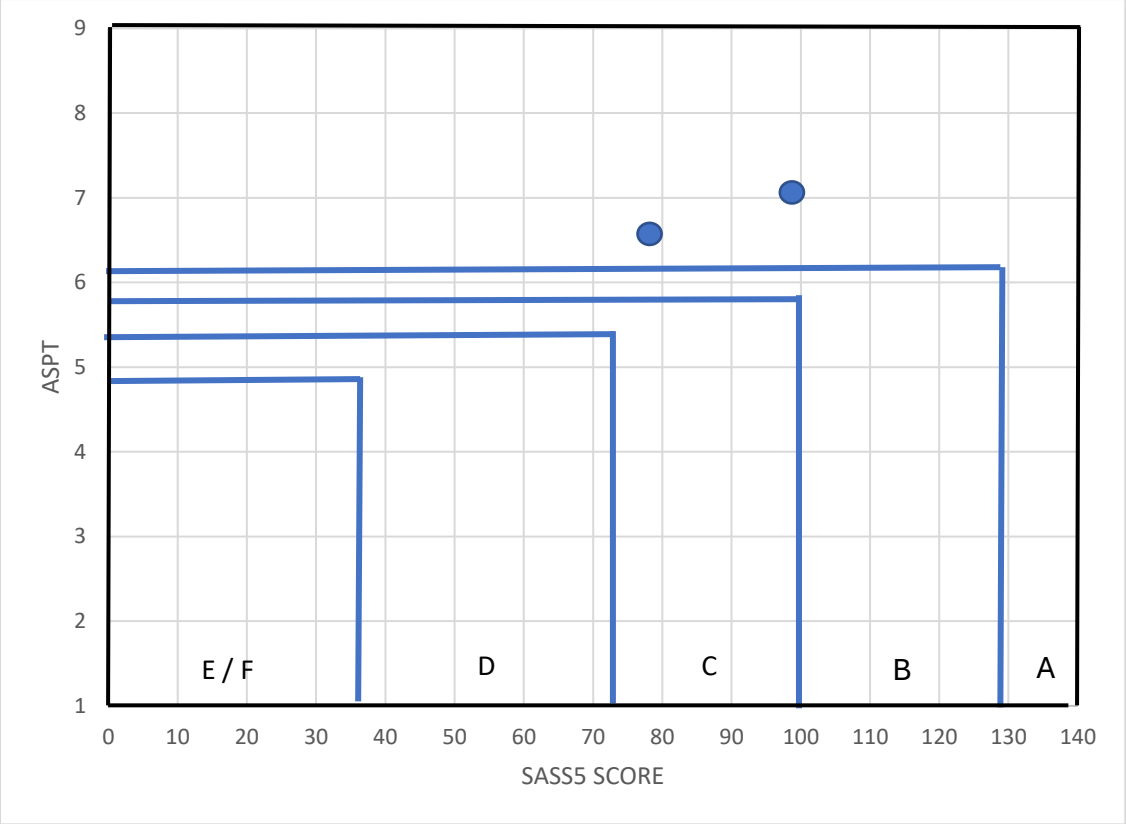
The results are shown in the SASS5 worksheets in the Appendix and summarised as follows:

Table 2 Biomonitoring results

Sampling point	SASS5 score	Number of taxa	ASPT
Upstream Downstream	78 96	12 13	6.5 7.4

The water at both sampling points were acidic and very high in dissolved oxygen, as can be expected in Fynbos runoff.

It was expected that the agricultural impact would show up in the lower sampling point. Much against expectation and surprisingly it did not. The lower sampling point had a significantly better score that the upper one. There was an improvement in the water quality, according to the biomonitoring results, despite the possible impacts of agriculture. It can only be deducted that the impact of agriculture on Farm 91 is negligible. The better score in the lower sampling point can be attributed to the addition of water out of the Hottentotsbos River, of which the confluence is just upstream of the lower sampling point.



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 30 Biomonitoring results

The of the water quality improvement is expected to continue as the dairy operation is scaled down and the fruit and nut venture is expanding. These better-than-expected results may also be the result of high-technology precision farming where agricultural return flow is minimised.

The biomonitoring results are depicted in Figure 30. Both the samples put the river in Class A, pristine and not impacted.

10 Rivers Present Ecological Status

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

The Plattekloof River's upper sub-catchment is pristine. The lower two thirds of the sub-catchment is heavily impacted. This stark contrast makes it difficult to come up with a realistic or acceptable assessment for the entire river.

The Plattekloof River came out as a Class D, highly modified with loss of ecological functioning. This is despite of the pristine upper catchment and despite of the high-scoring biomonitoring results. Obviously, water abstraction has a significant impact. So does agriculture. However, the greatest single impact is the black wattle infestation.

The Sanddrift Stream is much smaller, with a smaller catchment area. The pristine area up the mountain slope is smaller. It can be expected that the overall PES will be more impaired than that of the Plattekloof River. Water taken out of the Plattekloof River at the weir not used for irrigation is released into the lower reach of a Sanddrift River, an inter sub-catchment transfer. Surprisingly, the Sanddrift Stream came out as a Class D as well, with the riparian zone just making it into this class with a very narrow margin.

It is surmised that if the black wattle were to be removed, the score would jump with two classes. It is further postulated that if Dam No.7 were to be removed and the land restored to its status prior to the construction of Dam No.7, the classification would probably remain the same, as the land would be taken over with grasses, as are all the pastures on the farm.

Table 3 Present Ecological State of the Duivenhoks River

Instream

	Score	Weight	Product	Maximum score
Water abstraction	14	14	196	350
Flow modification	15	13	195	325
Bed modification	19	13	247	325
Channel modification	19	13	247	325
Water quality	21	14	294	350
Inundation	16	10	160	250
Exotic macrophytes	2	9	18	225
Exotic fauna	16	8	128	200
Solid waste disposal	20	6	120	150
Total		100	1575	2500
% of total			63.0	
Class			C	

Riparian

Water abstraction	13	13	139	325
Inundation	15	11	165	275
Flow modification	14	12	168	300
Water quality	21	13	273	325
Indigenous vegetation removal	11	13	143	325
Exotic vegetation encroachment	2	12	24	300
Bank erosion	19	14	266	350
Channel modification	18	12	216	300
Total			1412	2500
% of total			56.5	
Class			D	

Table 4 Present Ecological State of the Plattekloof River

Instream	Score	Weight	Product	Maximum score
Water abstraction	14	14	196	350
Flow modification	13	13	169	325
Bed modification	16	13	208	325
Channel modification	17	13	221	325
Water quality	21	14	294	350
Inundation	16	10	160	250
Exotic macrophytes	4	9	36	225
Exotic fauna	15	8	120	200
Solid waste disposal	25	6	150	150
Total		100	1434	2500
% of total			57.4	
Class			D	
Riparian				
Water abstraction	13	13	169	325
Inundation	15	11	165	275
Flow modification	10	12	120	300
Water quality	21	13	273	325
Indigenous vegetation removal	2	13	26	325
Exotic vegetation encroachment	2	12	24	300
Bank erosion	10	14	140	350
Channel modification	9	12	108	300
Total			1025	2500
% of total			41.0	
Class			D	

Table 5 Present Ecological State of the Sanddrift Stream

Instream	Score	Weight	Product	Maximum score
Water abstraction	16	14	224	350
Flow modification	13	13	169	325
Bed modification	13	13	169	325
Channel modification	12	13	156	325
Water quality	21	14	294	350
Inundation	16	10	160	250
Exotic macrophytes	3	9	27	225
Exotic fauna	18	8	144	200
Solid waste disposal	25	6	150	150
Total		100	1493	2500
% of total			59.7	
Class			D	
Riparian				
Water abstraction	16	13	208	325
Inundation	12	11	132	275
Flow modification	9	12	108	300
Water quality	21	13	273	325
Indigenous vegetation removal	2	13	26	325
Exotic vegetation encroachment	1	12	12	300
Bank erosion	9	14	126	350
Channel modification	8	12	96	300
Total			981	2500
% of total			39.2	
Class			D	

Table 6 Present Ecological State of the Macadamia orchard drainage line

Instream				
	Score	Weight	Product	Maximum score
Water abstraction	22	14	308	350
Flow modification	18	13	234	325
Bed modification	17	13	221	325
Channel modification	16	13	208	325
Water quality	17	14	238	350
Inundation	18	10	180	250
Exotic macrophytes	2	9	18	225
Exotic fauna	18	8	144	200
Solid waste disposal	25	6	150	150
Total		100	1557	2500
% of total			62.3	
Class			C	
Riparian				
Water abstraction	22	13	286	325
Inundation	16	11	176	275
Flow modification	15	12	180	300
Water quality	17	13	221	325
Indigenous vegetation removal	1	13	13	325
Exotic vegetation encroachment	1	12	12	300
Bank erosion	11	14	154	350
Channel modification	16	12	192	300
Total			1234	2500
% of total			49.4	
Class			D	

Table 7 Habitat Integrity according to Kleynhans, 1999

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

Table 8 Summary ecological status

	Instream	Riparian
Duivenhoks River Plattekloof River Sanddrif Stream Avo drainage line	C D D C	D D D D
Dam 7 wetland	E	

11 Wetland Present Ecological Status

To further advance the assessment, the alleged wetland on both sides of the river around Dam No.7 was demarcated (Figure 31). It covers 1.7 hectares. This demarcation is arbitrarily, as there was no vegetation or other indications on the ground to mark the edge of the alleged wetland.

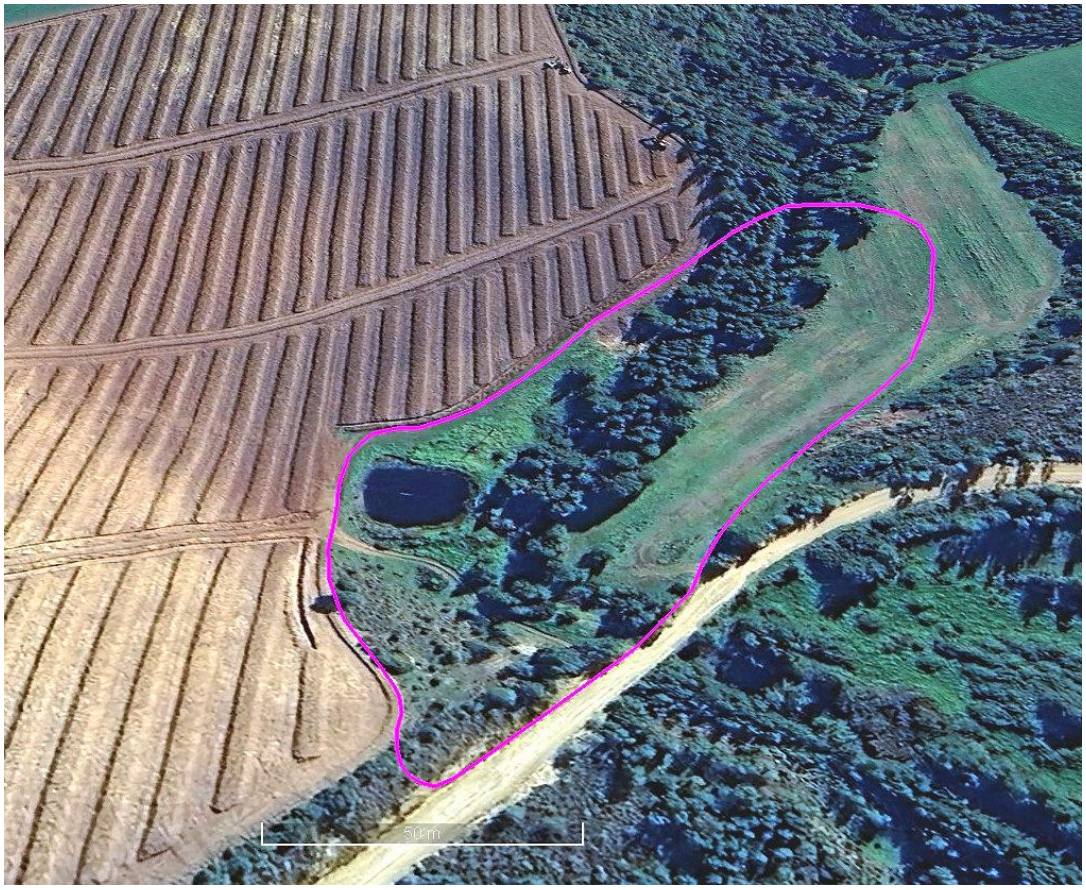


Figure 31 Wetland demarcation

According to the then DWAF guidelines for the demarcation of wetlands, several criteria must be employed. These are as follows:

Topography

There are some flatter patches of land around the Sanddrift River that could in the past retain runoff to justify the identification of a wetland, as is indicated in Figure 31. In the past, before the river became entrenched in a narrow channel, as it is today, it could have regularly burst its banks to flood these relatively level areas to maintain wetland conditions. These conditions have since then been altered to its current-day status of inability to maintain wetland conditions. The hydraulic continuity of the river and its banks have long been broken, ever since agriculture took root, along with the black wattle infestation.

Wetness

The dam held water. So did the river that cut through the alleged wetland. The wetland was somewhat wet because of the recent rain, as was the entire farm, its pastures, roads and orchards. This wetness was not enough to classify the demarcated area as a wetland. The demarcated land was, despite the rain, too dry to qualify as a wetland during the site visit.

Vegetation

Apart from some sedges along the water's edge at Dam No.7, there were no wetland indicator plant on the site that could assist with demarcation. The entire site was overgrown with grasses that invaded the land from the surrounding pastures that serves as fodder for dairy cows.

Soil Profile

No test pits were dug on site during the site visit to look for chroma mottles that could indicate temporary wetland conditions.

The land in and around the river was worked over, ploughed and dug up so many times since farming started a millenniums ago that the chances of finding a reliable soil profile record were remote.

Table 9 Habitat integrity assessment criteria for palustrine wetlands (DWAF,1999)

Criteria and attributes	Relevance	Score
Hydrology		
Flow modification.	Consequence of abstraction, regulation by impoundments or increased runoff from human settlements or agricultural land. Changes in flow regime (timing, duration, frequency), volumes, velocity which affect inundation of wetland habitats resulting in floristic changes or incorrect cues to biota. Abstraction of groundwater flows to the wetland.	**3**
Permanent Inundation	Consequence of impoundment resulting in destruction of natural wetland habitat and cues for wetland biota.	**1**
Water Quality		
Water Quality Modification	From point or diffuse sources. Measure directly by laboratory analysis or assessed indirectly from upstream agricultural activities, human settlements and industrial activities. Aggravated by volumetric decrease in flow delivered to the wetland.	**3**
Sediment load modification	Consequence of reduction due to entrapment by impoundments or increase due to land use practices such as overgrazing. Cause of unnatural rates of erosion, accretion or infilling of wetlands and change in habitats.	**1**
Hydraulic/ Geomorphic		
Canalization	Results in desiccation or changes to inundation patterns of wetland and thus changes in habitats. River diversions or drainage	**3**
Topographic Alteration	Consequence of infilling, ploughing, dykes, trampling, bridges, roads, railway lines and other substrate disruptive activity which reduces or changes wetland habitat directly or through changes in inundation patterns.	**1**
Biota		
Terrestrial Encroachment	Consequence of desiccation of wetland and encroachment of terrestrial plant species due to changes in hydrology or geomorphology. Change from wetland to terrestrial habitat and loss of wetland functions.	**1**
Indigenous Vegetation Removal	Direct destruction of habitat through farming activities, grazing or firewood collection affecting wildlife habitat and flow attenuation functions, organic matter inputs and increases potential for erosion.	**1**
Invasive plant encroachment	Affect habitat characteristics through changes in community structure and water quality changes (oxygen reduction and shading).	**1**
Alien fauna	Presence of alien fauna affecting faunal community structure.	**4**
Over utilisation of biota	Overgrazing, Over-fishing, etc.	**4**

Table 10 Scoring guidelines for the habitat integrity assessment for palustrine wetlands (DWAF, 1999).

Guideline	**Score**
Natural, unmodified Largely natural Moderately modified Largely modified Seriously modified Critically Modified	5 4 3 2 1 0
Confidence	
Very high confidence High confidence Moderate confidence Low confidence	4 3 2 1

Table 11 Category's assigned to the scores for wetland habitat assessment (Kleynhans, 1999; DWAF, 1999).

Category	Score	Description
A	>4	Unmodified or approximated natural condition.
B	>4 and ≤3	Largely natural with few modifications, but with some loss of natural habitats.
C	>2 and ≤3	Moderately modified, but with some loss of natural habitats.
D	2	Largely modified with a large loss of natural habitat and ecosystem function
E	>0 and ≤2	Seriously modified with extensive loss of habitat and ecosystem function
F	0	Critically modified with a near-complete loss of natural habitat

Subsequently, the alleged wetland was assessed using the prescribed DWAF methodology.

The mean of the score came to 2.1, which signifies a Class E wetland, seriously modified, with significant loss of ecological functioning. This score is somewhat complimentary for such a messed-up wetland.

The removal of the dam could do little to elevate the wetland into a higher class. Even if it did, the new class would still signify a broken wetland.

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 12).

Table 12 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 Duivenhoks River is home to several indigenous fish species:

Breede River redfin	*Pseudebarbus burchelii*
Cape kurper	*Sandelia capensis*
Cape Galaxias	*Galaxias zebratus*
Longfin eel	*Anguilla mossambica*
Freshwater mullet	*Pseudomyxis capensis*

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

This renders the Duivenhoks River and its tributaries extremely ecologically important, especially as some of these fish species are endangered.

Farm dams in these regions have been stocks with the exotic and invasive smallmouth black bass (*Micropterus dolomieu*), which involuntary ended up in the river, decimating the indigenous fish population.

The wetland at Dam No.7 and the avocado orchard drainage line is ecologically not important.

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.

If all traces of human habitation and large-scale agriculture were to, by some unlikely incidences vanish, the aquatic habitat in the Duivenhoks River system will bounce back, but only if exotic fish species disappear as well. This is not going to happen and certainly is not a realistic expectation. The system is not about to ever bounce back.

From this perspective, the Duivenhoks River and its tributaries are most sensitive.

14 EISC

Table 13 EISC

Determinant	Wetland	Sanddrift River	Duivenhoks River	Drainage line
Rare and endangered species	1	3	5	1
Populations of unique species	1	3	5	1
Species / Taxon richness	2	2	4	1
Diversity of habitat	2	2	4	2
Migration Route/ Breeding and feeding site for wetland species.	1	2	5	2
Sensitivity to water quality changes	1	3	3	2
Flood storage, energy dissipation, particulate / element removal	1	3	5	2
Protection status	4	4	4	1
Ecological integrity	1	2	3	2
Average	1.6	2.4	4.2	1.6
Score	Low	Moderate	Very High	Low

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

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

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

The removal of Dam No. 7 would marginally elevate the EISC score for the Sanddrift River and the alleged wetland at the dam's site.

15 Possible Impacts and Mitigating Measures

Dickens *et al* (2003) lists several possible impacts on wetlands.

Flow modification

The flow down the Sanddrift River and subsequently over the flanking wetlands has been significantly impacted. The flow down the Fynbos part of the sub-catchment is still the same, but agriculture has altered the flow. So did the black wattle infestation. The net effect is that peak flow is elevated, with a higher erosion potential. The river is deeply incised. The water level must come up higher now to submerge the adjacent wetlands. Consequently, the wetlands receive less water than during historic times.

Once the now barren orchard next to the wetland is overgrown with vegetation, the effect will be less, but still a significant deviation from the original. Keeping the black wattles away would do much to restore the river and its wetlands.

The flood lines are not known. It is not known if Dam No.7 and its associated wetland is below the flood line of a flood with a recurrence of once in 100 years. This is one of the criteria that triggers the interest of the authorities. The estimation of flood lines involves specialist applying numerical computer-based modelling that is generally far beyond the financial means of a run-of-the-mill WULA. Incision resulted in the retraction of flood lines. It seems unlikely that Dam No.7 would be inundated by a large flood, but should this happen, the damage to infrastructure and the ecology would be limited.

Permanent inundation

Dam No. 7 represents permanent inundation of a part of the wetland. If the dam is to remain, this situation is permanent.

Water quality modification

Biomonitoring in the Plattekloof River suggested that the practices on Farm 91 does not deleteriously affect water quality. Currently, the freshly developed orchards next to Dam No.7 will probably contribute to the river's sediment load. This will cease once the land is stabilised with vegetation. The wetland at the dam is likely affected in a similar way.

Sediment load modification

The disturbance of the soil during the development of the adjacent orchard caused a pulse of sediment washing down the river and over the wetland along with storm water. This impact will be reduced as vegetation take hold of the now barren ground. The dam can be removed but will probably do more damage than any good as a new load of sediments, sand and mud would be left to wash down the river.

Canalization

As previously explained, black wattle roots do not hold ground well. Barren ground under the infestation washes away with the typical trench form in the riverbed.

Topographic alteration

Dam No.7 has altered to local topography in a small way. This will remain unless the dam is removed. Removal is not on the cards.

Terrestrial encroachment

The river is overgrown with black wattle. The wetland is overgrown with grasses. There is no sign of the original renosterveld. It is not realistic to think that this land will ever be restored to something resembling renosterveld.

Indigenous vegetation removal

Except for a few stragglers, all the indigenous vegetation was removed. It is unthinkable that it would ever come back.

Invasive vegetation encroachment

The site is entirely taken over by black wattle and grasses. The streams on the farm would benefit if the black wattles were removed and replaced by the original Fynbos. This would bind the soil. It would prevent further incision. This is perhaps an unrealistic expectation, as this work for a team of funded experts and not for only a single landowner.

Alien fauna

There are dairy cattle on the farm. Some may graze on the wetland but that would be accidental. Cattle are kept to their pastures and are not allowed to roam freely.

Over-utilization

The farm is currently utilized as cattle grazing. This is very much controlled. Over-grazing is not a problem, even less so on the wetland.

Isolation / Migration

The flow path of the river system is still intact, with continuous migration routes. This will not change. Dam No.7 has little impact on migration of organisms. Aquatic organisms such as frogs may utilise Dam No.7. The dam may serve to isolate such organisms, but this is unlikely, as the river is there to offer the required connectivity.

Groundwater table

Dam No.7 is too small to have any marked effect on the ground water table. Besides, the river is still there and is likely to have a larger affect on the groundwater table.

Waste

Farming practices are of a high standard, as is required by a strict and discerning export market and end users demanding the very best. There is no trash or rubble lying about on the land.

Macadamia orchard drainage line.

This drainage line was added to the brief at a later stage and not included in the above possible impact discussion. It must now be included. The drainage line is heavily overgrown with a mature stand of black wattle, with little evidence of the historic renosterveld. The flow has been modified, along with the inundation pattern.

The valleys between the orchard's constructed contours act as preferential flow paths, with runoff directed towards the lowest point. This is in the orchard's very southern tip in the bend of the Duivenhoks River. Moreover, even though the irrigation system does not leave any irrigation return flow, unforeseen accidents and problems do happen, with leaky pipes resulting in a sogginess in this area. The landowner offered a solution. A small earthen retaining structure can be constructed, fitted with a pump and a pipe to re-use this accumulation of irrigation water below the orchard.

Underground perforated pipes are available in the trade that are purpose made for these situations, as an alternative solution.

All precautions must be taken to prevent any flow out of the irrigation system to end up in the river. Water out of the irrigation system has been provided with nutrients and elements for optimising the growth of avocado trees. If this ends up in the river, it will have ecological consequences. It can be expected that the *Phragmitis* reeds would benefit, with a rapid expansion in the riverbed. The palmiet would suffer, their area taken over by reeds (Figure 32), as has reportedly happened in many agricultural areas in similar upper catchments.

The macadamia orchard is much further away from the river, with a reduced risk of runoff ending up in the river. However, if return flow accumulates at the orchard's bottom end, similar measures must be taken as with the avocado orchard. This wetness must be collected in a suitable and adequate earthen structure and then pumped back into the irrigation system for re-use in the orchard. This wetness is more likely to be the result of leaky pipes than return flow. These pipes must be fixed and maintained.

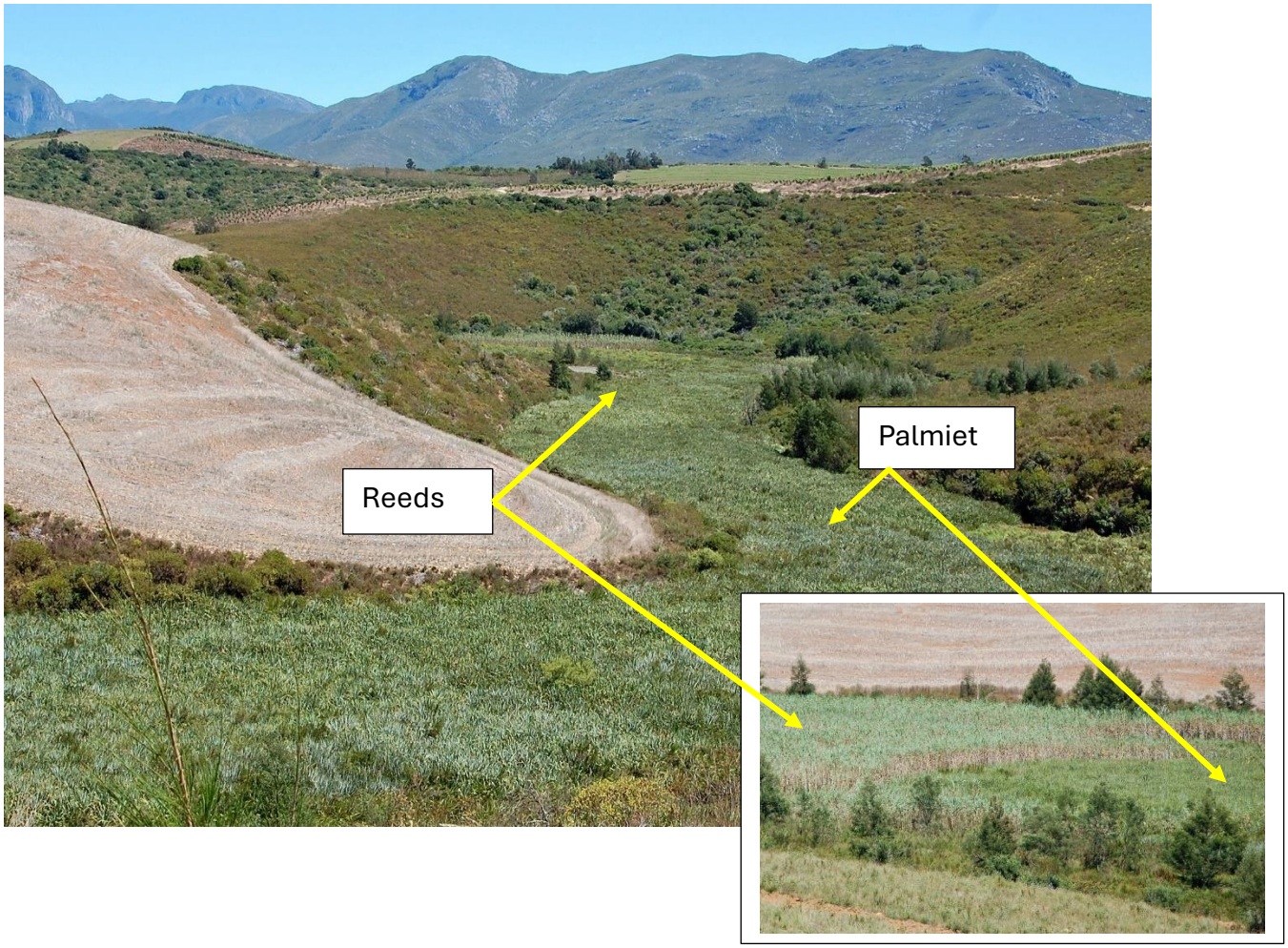


Figure 32 Reeds and Palmiet

16 Impact Assessment

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

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

The methodology is set out in the Appendix.

This impact assessment is only about the continued operation of Dam No.7, an integrated part of Farm 91's irrigation system. It is an established dam, so the construction of the dam is not a consideration. Neither is the removal of the dam and

subsequent rehabilitation of the site. The dam is here to stay, along with the farm and its current practices.

The dam has had a significant impact on the patch of land with the alleged wetland, together with the impact of the surrounding large-scale farming practices. The original landscape has been irrevocably and utterly changed, with the original ecology changed to a farmland ecology, reduced to something resembling the surrounding dairy cow pastures. If there ever was a wetland, it is now farmland with a small farm dam that serves as a reservoir for a pump to irrigate orchards.

The act of pumping water from the dam and of filling the dam through the pipe from the river has no impact on the remains of the alleged wetland around the dam. The impact already occurred when the renosterveld was turned into pasture. The impact probably worsened when the wetland was surrounded by large-scale farming. The impact has now stabilised, with no additional impacts.

Table 14 Impact Assessment

Description of impact

Continued operation of Dam No.7

I**mpact**

Taking of water from the Sanddrift Stream.
Reduction of the flow in the stream.
Lowering of the water level in the stream.

Mitigation measures

Only take the licensed volume of water and no more.
Keep the surrounds of the dam tidy, with a limited footprint
Prevent further disturbance of the alleged wetland

Type Nature	Spatial Extent	Severity	Duration	Significance	Probability	Confidence	Reversibility	Irreplaceability
Without mitigation								
Negative	Site specific	Medium	Long term	Low	Definite	Certain	Irreversible	Irreplaceable
With mitigation measures								
Negative	Site specific	Low	Long term	Very Low	Definite	Certain	Irreversible	Irreplaceable

Table 14 Impact Assessment

Description of impact

Continued operation of the orchards

Impact

Runoff and return flow ending up in streams and rivers
Alteration of aquatic habitat
Alteration of instream and riparian vegetation and biota

Mitigation measures

Collect accumulation of wetness at the bottom of orchards
Re-use the return flow.
Maintain irrigation system, pipes and connections

Type Nature	Spatial Extent	Severity	Duration	Significance	Probability	Confidence	Reversibility	Irreplaceability
Without mitigation								
Negative	Site specific	Medium	Long term	Low	Definite	Certain	Irreversible	Irreplaceable
With mitigation measures								
Negative	Site specific	Low	Long term	Very Low	Definite	Certain	Irreversible	Irreplaceable

17 Risk Matrix

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

The assessment was carried out according to the interactive Excel table that is available on the DWS webpage. Table 15 is a replica of the Excel spreadsheet that has been adapted to fit the format of this report. The numbers in Table 15 (continued) represent the same activities as in the Impact Assessment, with sub-activities added.

The methodology is tabled in the Appendix.

Table 15 Risk Matrix

No.	Activity	Aspect	Impact	Significance	Risk Rating
1	Continued operation of Dam No.7	Taking of water from the stream	Lowering of water level, reduction of flow	26.4	Low
2	Maintenance of Dam No. 7, the pump and water intake pipe	Disturbance of the alleged wetland	Altering of wetland habitat	4	Low
3	Continued operation of the avo orchard	Runoff and return flow into the river	Pollution, altering of aquatic habitat	24	Low
$4	Continued operation of the macadamia orchard	Runoff and return flow into the drainage line	Pollution, altering of aquatic habitat	2.4	Low

No	Hydrology	Water Quality	Geomorphology	Vegetation	Fauna	Overall intensity	Spatial scale	Duration
1	3	1	1	1	2	6	1	4
2	1	1	1	1	1	2	1	2
3	1	2	0	3	1	6	1	5
4	1	2	0	1	1	4	1	5

No	Severity	Importance rating	Consequence	Likelihood	Significance	Risk rating	Confidence level
1	11	4	44	60	26.4	Low	High
2	5	4	20	20	4	Low	High
3	12	5	60	40	24	Low	High
4	10	1	10	20	2.4	Low	High

The taking of water must be considered, as the pump at Dam No. 7 is not running all the time. It lets all the water through down the Sanddrift Stream when there is adequate water in the dams to irrigate for the foreseeable time ahead. It is assumed that the pump is running only 60% of the time. If it runs or not, it does not have an impact on the wetland.

Likewise, maintenance takes place only when needed, less than 20% of the time. The Risk Matrix was completed accordingly.

A General Authorisation is recommended for the ongoing operation of Dam No.7. Likewise, a General Authorisation is required for the continued operation of the avocado and macadamia orchards.

18 Numerical Significance

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

Table 25.5, p79, 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 p80 to derive at a value for Significance. The value for Significance can subsequently be evaluated according to Table 25.5.2.

Table 25.5.2 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 12), 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.

The significance for the continued operation of Dam No.7 on the alleged wetland on the banks of the Sanddrift Stream must be assessed.

It is unknown exactly how big the alleged wetland was prior to human impact. It probably stretched narrowly alongside the river. It enhanced the river's ecological significance. Small does not necessarily signify insignificance. Currently it is in a derelict ecological state, like the river, with a depleted conservation value. The impact of the dam is permanent, with a visible impact on the alleged wetland, but with an insignificant impact on the local aquatic landscape.

Because of its current derelict state, its significance was rated as Low or at most Medium / Low.

The low significance rating allows for the continuation of Dam No.7 and its operation on a depleted wetland next to a highly impacted stream.

Table 12 Significance Score

Parameter	Dam No.7 wetland	Avo orchard Duivenhoks River	Macadamia orchard Drainage line
Conservation value	2	5	1
Likelihood	5	1	1
Duration	5	5	5
Extent	3	1	1
Severity	5	2	1
Significance	36	45	8
	Low Medium/Low	Low Medium/Low	Low

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 33) is an accepted manner to visually illustrate the resource economic footprint the drainage line, from the data in Table 13.

The outer circle represents the Duivenhoks River, a full circle, as it delivers all imaginable resource economics, like most other rivers of similar size and larger.

The wetland is represented by the inner star shape. It is small and insignificant, almost negligible. It does not offer much resource economic services, apart from the Dam No.7 on its location that provides water for the farming operation.

The purple star diagram in the middle of these two extremes represent the Sanddrift Stream. It has a fair-sized star shape, large enough to attract the attention of the decision-making authorities and large enough to warrant conservation measures.

The resource economics diagram does not offer any reason for the calling an end to the existence of Dam No.7, as its removal would only serve to diminish the resource economics worth of the wetland. It would no longer render water for agriculture. Ecological services such as carbon storage and streamflow regulation won't increase.

Table 13 Goods and Services

Goods & Services	Sanddrift Stream	Duivenhoks River	Wetland	Drainage line
Flood attenuation	4	5	0	4
Stream flow regulation	4	5	0	4
Sediment trapping	2	5	0	4
Phosphate trapping	3	5	1	2
Nitrate removal	3	5	1	2
Toxicant removal	3	5	1	1
Erosion control	2	5	0	3
Carbon storage	3	5	0	3
Biodiversity maintenance	3	5	1	2
Water supply for human use	5	5	4	0
Natural resources	1	5	0	0
Cultivated food	4	5	4	1
Cultural significance	1	5	0	0
Tourism and recreation	0	5	0	0
Education and research	0	5	0	0

0	Low
5	High

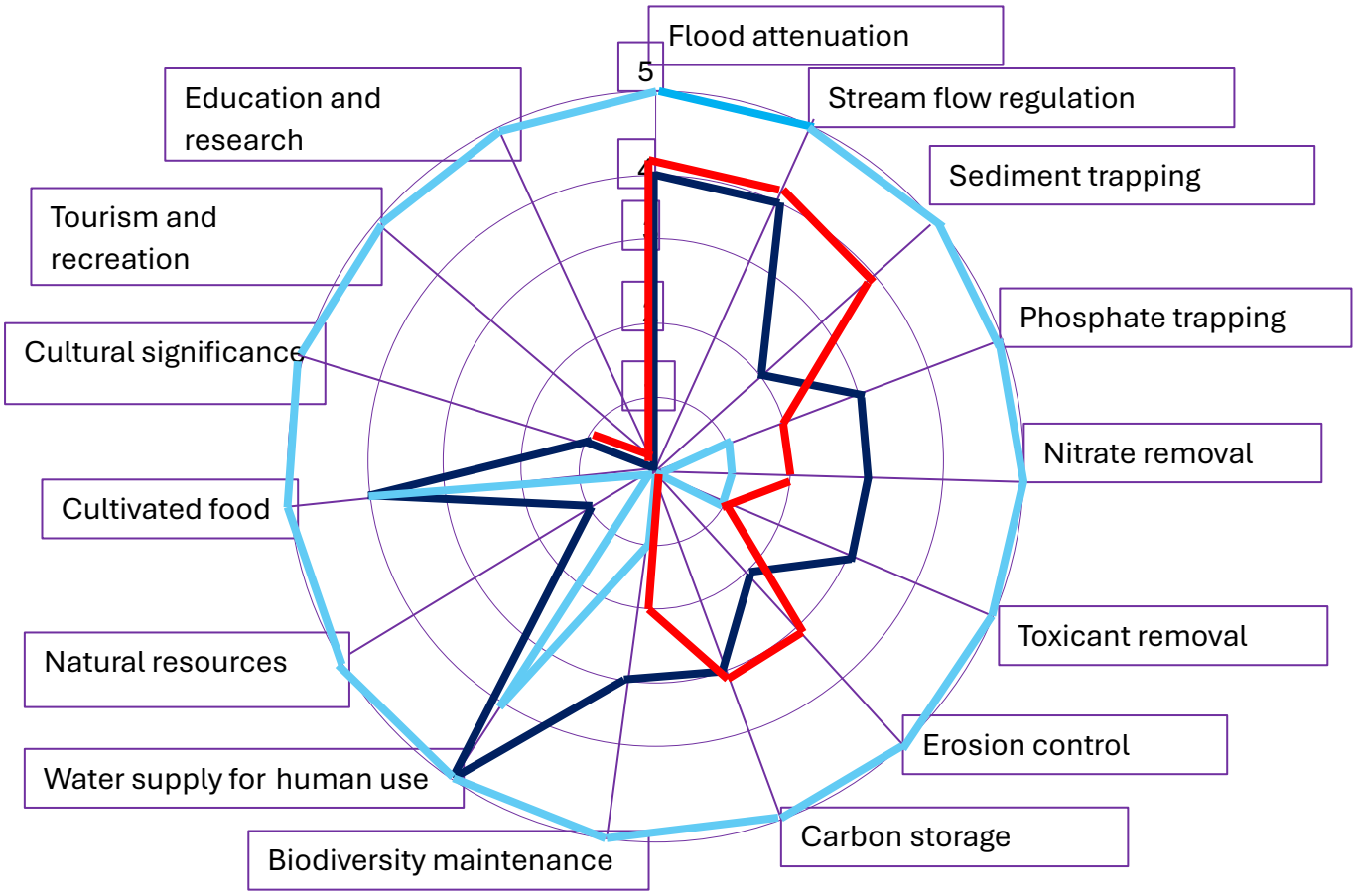


Figure 33. Resource Economics Footprint

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 28) is an accepted manner to visually illustrate the resource economic footprint the drainage line, from the data in Table 12.

The outer circle represents the Duivenhoks River, a full circle, as it delivers all imaginable resource economics, like most other rivers of similar size and larger.

The wetland is represented by the inner star shape. It is small and insignificant, almost negligible. It does not offer much resource economic services, apart from the Dam No.7 on its location that provides water for the farming operation.

The purple star diagram in the middle of these two extremes represent the Sanddrift Stream. It has a fair-sized star shape, large enough to attract the attention of the decision-making authorities and large enough to warrant conservation measures.

The red diagram is for the Macadamia drainage line. For is small size it has a large footprint on the right-hand side because of its stream regulation function. The left-hand side is supressed, non-existent, because of its little contribution to the economy.

The resource economics diagram does not offer any reason for the calling an end to the existence of Dam No.7, as its removal would only serve to diminish the resource economics worth of the wetland. It would no longer render water for agriculture. Ecological services such as carbon storage and streamflow regulation won't increase.

20 Summary

Table 18 Summary of evaluations

Aspect	Status
DFFE Screening Tool	Medium and Very High
Western Cape Biodiversity Spatial Plan	CBA, ESA, NFEPA
Vegetation	Critically Endangered
PES Duivenhoks River	Moderately modified, riparian largely modified
PES Sanddrif Stream	Largely modified
PES Dam No.7 wetland	Largely modified
PES drainage line	Moderately modified, riparian largely modified
Ecological Importance Duivenhoks River	Important
Ecological Importance Sanddrif Stream	Important
Ecological Importance Dam No.7 wetland	Not important
Ecological Importance drainage line	Not important
Ecological Sensitivity	Sensitive
EISC Duivenhoks River	Very High
EISC Sanddrift Stream	Moderate
EISC Dam No.7 wetland	Low
EISC drainage line	Low
Impact assessment river and drainage line	Mitigation attainable
Impact assessment Dam No.7 and wetland	Mitigation not attainable
Risk Matrix Dam No.7	General Authorization
Risk Matrix Orchards	General authorisation
Numeric Significance Duivenhoks River	High
Numeric significance Sanddrif Stream	Medium / Low
Numeric Significance Dam No.7 wetland	Low
Numeric Significance drainage line	Low
Resource Economics Duivenhoks River	Large footprint
Resource Economics Sanddrif Stream	Medium footprint
Resource Economics Dam No.7 wetland	Small footprint
Resource Economics drainage line	Small footprint

Table 18 gives an overall and much condensed view of the evaluations and methodologies that have been applied to the drainage line. Key words here such as critically endangered and ecologically important as well as ecologically sensitive may alert decision-makers. More words such as impaired ecological functioning gone so far that mitigating measures would probably be less than successful counter alertness levels. Moreover, Dam No.7 is to remain. It is one of the cogs, small as it may be, along with other such dams, of the local economy.

Table 1 does not provide enough impetus to the notion that Dam 7 should be removed.

Likewise, the avocado and macadamia orchards should remain.

21 Conclusions

A notice from the BGCMA about the legal status of a farming operation, its water supply and water use in particular, must be viewed in a seriously. The focus of this report is on the water use of the farm in general, but more specifically on Dam No. 7 and its associated alleged wetland.

The upper sub-catchment on the southern slopes of the Langeberg is environmentally pristine. Lower down, the lower two thirds of Farm 91, irrigated pastures for dairy cattle are replaced with orchards of avocados and macadamia nuts. This is an ongoing process. Dairy will be phased out in the foreseeable future.

Biomonitoring showed that farming does not have any deleterious impacts on the water quality of the rivers. The impact would be further reduced once sprinkler irrigation has been replaced with high-tech ultra-low pressure drip irrigation for trees. This system reduces agricultural return flow to virtually zero.

The alleged wetland (“alleged” because there is hardly any sign of it on the ground) was replaced with pasture for cattle many generations of farmers ago. The ecological functioning of what could have been aquatic habitat in the past was destroyed. Dam No.7 was constructed on this wetland. Water abstracted from the Sanddrift Stream gravitates into this dam through a pipe. The dam serves as a small reservoir for a pump that introduces the water into the rest of the irrigation system. The wetland is located withing the 100m controlled zone next to the Sanddrift Stream. This, among other, attracted BOCMA’s attention.

Next to large-scale farming and water abstraction, a heavy black wattle infestation has a deleterious impact on the rivers and the aquatic environment, not only on Farm 91, but in the district and many parts of South Africa. In fact, next to black wattles, Dam No.7 and its impaired wetland seems miniscule and insignificant.

It is therefore recommended that Dam No. 7 is duly authorised. A General Authorisation is the indicated level of Authorisation.

22 References

Anonymous. Date unknown. *A practical field procedure for identification and delineation of wetlands and riparian areas.* Department of Water Affairs and Forestry, Pretoria.

Dickens, CWS D Kotze, S Mashigo, H MacKay, M Graham. 2003. *Guidelines for integrating the protection, conservation and management of wetlands into catchment management planning.* Water Research Commission, Pretoria

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

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

Van Driel, D. 2023. *Thorn and Feather. Portion 9 of Farm 499, Vermaaklikheid. Aquatic Environment Reportand water related issues.* WATSAN Africa, Knysna.

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 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:  13 August 2024

24 Résumé

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

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Brenton-on-Lake 6571
saligna2030@gmail.com
079 333 5800

Experience

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

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

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

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

University of Western Cape and Stellenbosch University 1994 - 1998 part-time

- Lectured post-graduate courses in Water Management and Environmental Management to under-graduate civil engineering students
- Served as external dissertation and thesis examiner

Service Positions

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

Membership of Professional Societies

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

Reports

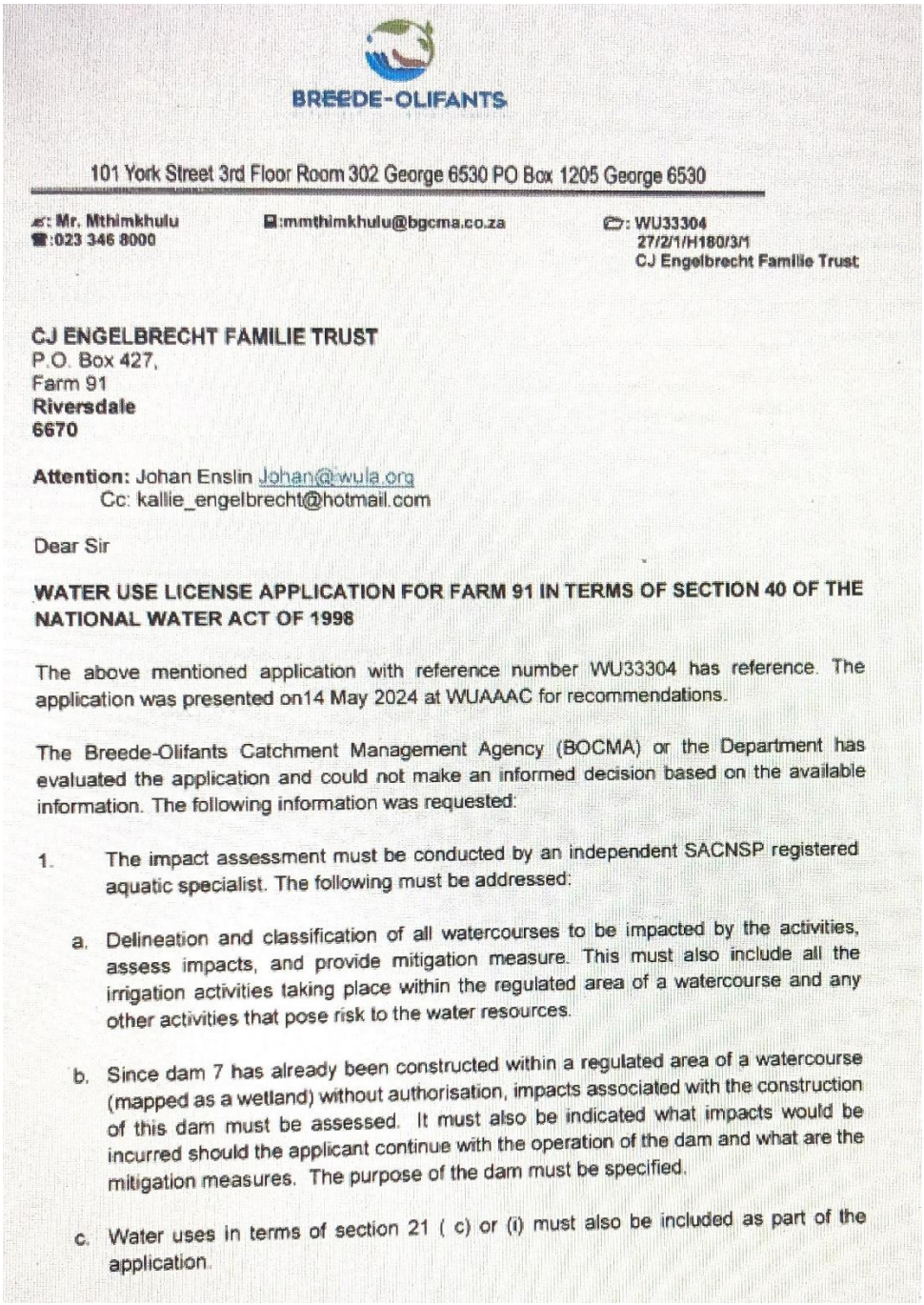
- Process Review Kathu Wastewater Treatment Works
- Effluent Irrigation Report Tydstroom Abattoir Durbanville
- River Rehabilitation Report Slangkop Farm, Yzerfontein
- Fresh Water and Estuary Report Erf 77 Elands Bay
- Ground Water Revision, Moorreesburg Cemetery
- Fresh Water Report Delaire Graff Estate,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

- Fresh Water Report Calvinia Sports Grounds Irrigation
- Fresh Water Report CA Bruwer Agricultural Development Kakamas
- Fresh Water Report Zwartfontein Farm Dam, Hermon
- Statement Delsma Farm Wetland, Hermon
- Fresh Water Report Lemoenshoek Farms Pipelines Bonnyvale
- Fresh Water Report Water Provision Pipeline Brandvlei
- Fresh Water Report Erf 19992 Upington
- Botanical Report Zwartejongensfontein Sand Mine, Stilbaai
- Fresh Water Report CA Bruwer Feldspath Mine, Kakamas
- Sediment Yield Calculation, Kenhardt Sand Mine
- Wetland Demarcation, Grabouw Traffic Center
- Fresh Water Report, Osdrift Sand Mine, Worcester
- Fresh Water Report, Muggievlak Storm Water Canal, Vredenburg
- Fresh Water Report, Marksman's Nest Rifle Range, Malmesbury
- Biodiversity Report, Muggievlak Storm Water Canal, Vredenburg
- Strategic Planning Report, Sanitation, Afghanistan Government, New Delhi, India
- Fresh Water Report, Potable Water Pipeline, Komaggas
- Fresh Water Report, Wastewater Treatment Works, Kamieskroon
- Fresh Water Report, Turksvy Farm Dam, Upington
- Fresh Water Report, Groblershoop Urban Development, IKheis Municipality
- Fresh Water Report, Boegoeberg Urban Development, IKheis Municipality
- Fresh Water Report, Opwag Urban Development, IKheis Municipality
- Fresh Water Report, Wegdraai Urban Development, IKheis Municipality
- Fresh Water Report, Topline Urban Development, IKheis Municipality
- Fresh Water Report, Grootdrink Urban Development, IKheis Municipality
- Fresh Water Report, Gariep Urban Development, IKheis Municipality
- Fresh Water Report, Bonathaba Farm Dam, Hermon
- Botanical Report, Sand Mine Greystone Trading, Vredendal
- Botanical Report Namakwa Klei Stene, Klawer
- Fresh Water Report Buffelsdrift Quarry, George
- Fresh Water Report Styerkraal Agricultural Development, Onseepkans.
- Technical Report Arabella Country Estate Wastewater Treatment Works, Kleinmond
- Fresh Water Report Calvinia Bulk Water Supply
- Fresh Water Report Swartdam Farm Dams, Riebeeck Kasteel
- Fresh Water Report Erf 46959, Gordon's Bay
- Fresh Water Report Melkboom Farm Dam, Trawal
- Stormwater Management Plan, Bot River Bricks
- Freshwater Report, Bot River Bricks
- Freshwater Report Sanddrif Farm, Joubertina
- Freshwater Report Zouterivier Cell phone tower, Atlantis
- Biodiversity Report Birdfield Sandmine, Klawer
- Freshwater Report New Wave Dam, Klawer
- Freshwater Report Harvard Solar Energy Plant, Bloemfontein
- Freshwater Report Doorn River Solar Energy Plant, Virginia
- Freshwater Report Kleingeluk Farm, De Rust
- Freshwater Report, Solar Energy Plant, Klein Brak River
- Site Verification Report Laaiplek Desalination Plant
- Freshwater Report, CA Bruwer Quarry, Kakamas
- Freshwater Report, Orren Managanese Mine, Swellendam
- Wetland Delineation, Klipheuvel ZCC Solar Energy
- Freshwater Report Delville Park, George
- Freshwater Report Wolseley bulk water pipeline
- Freshwater Report Urban Settlement No.1 Pababello Upington
- Freshwater Report Urban Settlement No.2 Pababello Upington
- Freshwater Report Pringle Rock Distillery, Rooiels

- Freshwater Report De Kuilen Resort, Kamiesberg
- Wetland Delineation, Klipheuvel ZCC Solar Energy
- Freshwater Report Delville Park, George
- Freshwater Report ZCC Akkerboom electric vehicle charging station, Keimoes
- Freshwater Report ZCC Piketberg electric automobile charging station
- Freshwater Report ZCC electric truck charging station Piketberg
- Freshwater Report ZCC electric truck charging station Prince Albert Weg
- Freshwater Report Vleesbaai Wastewater Treatment Works
- Freshwater Report ZCC Brandvlei electric vehicle charging station.
- Site Sensitivity Report desalination plant Velddrif
- Technical Report desalination plant Velddrif
- Freshwater Report Abbottsdale High Voltage Power Line
- Freshwater Report Darling Solar Energy Plan
- Freshwater Report Malmesbury Klipkoppie Solar Energy Plant
- River Rehabilitation Plan Louterwater, Langkloof
- River Rehabilitation Plan Kloof Please Krakeelrivier
- Freshwater Report ZZC Potchefstroom electric automobile charging station.
- Freshwater Report ZKA Information Centre Carnavon
- Freshwater Report ZCC Estcourt electric vehicle charging station
- Freshwater Report ZCC Kohler electric vehicle charging station
- Freshwater Report ZCC Harrismith electric vehicle charging station
- Wetland demarcation, Farm Gustrouw 918, Somerset West
- Freshwater Report, New vineyard, Plot 1181, Kakamas

25 Appendix

25.1 BOCMA Notice



BREEDE-OLIFANTS

101 York Street 3rd Floor Room 302 George 6530 PO Box 1205 George 6530

✍: Mr. Mthimkhulu
☎:023 346 8000

🖳:mmthimkhulu@bgcma.co.za

🗁: WU33304
27/2/1/H180/3/1
CJ Engelbrecht Familie Trust

CJ ENGELBRECHT FAMILIE TRUST
P.O. Box 427,
Farm 91
Riversdale
6670

Attention: Johan Enslin Johan@iwula.org
Cc: kallie_engelbrecht@hotmail.com

Dear Sir

WATER USE LICENSE APPLICATION FOR FARM 91 IN TERMS OF SECTION 40 OF THE NATIONAL WATER ACT OF 1998

The above mentioned application with reference number WU33304 has reference. The application was presented on14 May 2024 at WUAAAC for recommendations.

The Breede-Olifants Catchment Management Agency (BOCMA) or the Department has evaluated the application and could not make an informed decision based on the available information. The following information was requested:

1. The impact assessment must be conducted by an independent SACNSP registered aquatic specialist. The following must be addressed:

   a. Delineation and classification of all watercourses to be impacted by the activities, assess impacts, and provide mitigation measure. This must also include all the irrigation activities taking place within the regulated area of a watercourse and any other activities that pose risk to the water resources.

   b. Since dam 7 has already been constructed within a regulated area of a watercourse (mapped as a wetland) without authorisation, impacts associated with the construction of this dam must be assessed. It must also be indicated what impacts would be incurred should the applicant continue with the operation of the dam and what are the mitigation measures. The purpose of the dam must be specified.

   c. Water uses in terms of section 21 (c) or (i) must also be included as part of the application.

2. Kindly provide more detail with regards to the Water Balance submitted. Indicate the different sources of water , the lawful allocation per source, where, how and for what the water is used for. Indicate if the figures are actual measured figures or theoretical estimates.

3. Kindly indicate the impact of the water use activity (irrigation of land with wastewater) on the soil and groundwater resources.

   a. Indicate the condition of the soil as analysed and what the impact is in having and continuing to irrigate with wastewater. Kindly indicate the mitigation measures required and if soil rehabilitation is required, how this will be achieved.

   b. Kindly specify through an analysis, the impact on the groundwater resources and what mitigation and rehabilitation is required.

4. Impact of the water use (irrigation of land with wastewater) on surface water resources.

   a. Kindly confirm which sample points' water quality data must be used to assess compliance with the parameter limits.

   b. Kindly indicate through analysis the impact of the water use activities on the surface water resources.

   c. Kindly advise why sample point WDDS was selected as representation of the downstream water quality whereas the sample point is not located geographically downstream.

5. Kindly confirm the treatment process and description of the wastewater stream handling, kindly support with a process flow diagram.

6. Kindly confirm how solids and sludge will be disposed of.

7. Kindly provide historic water quality baseline data and reasons why only water quality results for one sample run was submitted in support of the Water Use License Application.

Please note that the next WUAAAC sitting is scheduled for the 5th of June 2024. Therefore, you are requested to review the requested information and provide feedback within the next seven (7) working days from the date of this letter. Should you not be able to provide this information within prescribe timeframe, you can withdraw the application and resubmit Water Use Licence Application.

If you have any questions please don't hesitate to contact the official at the above mentioned details.

MR. JAN VAN STADEN

2

CHIEF EXECUTIVE OFFICER
DATE: 21/05/2024

25.2 Biomonitoring Results

SASS5 Score Sheet		Plattekloof River			D van Driel SACNASP 400041/96					
Date	08-Aug-24	**Taxon**	**Weight**	**Score**	**Taxon**	**Weight**	**Score**	**Taxon**	**Weight**	**Score**
Locality	Plattekloof River	Porifera	5		**Hemiptera**			**Diptera**		
		Coelenterata	1		Belostomatidae	3		Athericidae	10	
		Turbellaria	3	3	Corixidae	3		Blepharoceridae	15	
		Oligochaeta	1	1	Gerridae	5		Ceratopogonidae	5	
Coordinates	33°56' 39.1"S	Huridinea	3		Hydrometridae	6		Chironomidae	2	
	21°03'00.0"E	**Crustacea**			Naucoridae	7		Culicidae	1	
		Amphipodae	13		Nepidae	3		Dixidae	10	
DO mg/l	10.0	Potamonautidae	3		Notonectidae	3		Empididae	6	
Temperature °C	9.8	Atyidae	8		Pleidae	4		Ephydridae	3	
pH	6.7	Palaemonidae	10		Veliidae	5		Muscidae	1	
EC mS/m	6.4	Hydracarina	8		**Megaloptera**			Psychodidae	1	
		Plecoptera			Corydalidae	10		Simuliidae	5	5
SASS5 Score	78	Notonemouridae	14		Sialidae	8		Syrphidae	1	
Number of Taxa	12	Perlidae	12	12	**Trichoptera**			Tabanidae	5	
ASPT	6,5	**Ephemeroptera**			Dipseudopsidae	10		Tipulidae	5	
		Baetidae 1 sp	4	4	Ecnomidae	8		**Gastropoda**		
Other Biota		Baetidae 2 sp	6		Hydropsychidae 1 sp	4		Ancylidae	6	
		Baetidae >3 sp	12		Hydropsychidae 2 sp	6		Bulinidae	3	
		Caenidae	6		Hydropsychidae <2 sp	12		Hydrobiidae	3	
		Ephemeridae	15		Phylopotamidae	10		Lymnaeidae	3	
		Heptageniidae	13		Polycentropodidae	12		Physidae	3	
		Leptophlebiidae	9	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	11	Corbiculidae	5	
		Trichorythidae	9		Hydroptilidae	6		Sphariidae	3	
		Odonata			Hydrosalpingidae	15		Unionidae	6	
		Calopterygidae	10		Leptostomatidae	10				
		Clorocyphidae	10		Leptoceridae	6	6			
		Chorolestidae	8		Petrothrincidae	11				
		Coenagrionidae	4	4	Pisulidae	10				
		Lestidae	8		Sericostomatidae	13				
		Platycnemidae	10	10	**Coleoptera**					
		Protoneuridae	8		Dyticidae	5				
		Aesthnidae	8		Elmidae Dryopidae	8	8			
		Corduliidae	8		Gyrinidae	5	5			
		Gomphidae	6		Haliplidae	5				
		Libellulidae	4		Helodidae	12				
		Lepidoptera			Hydraenidae	8				
		Pyralidae	12		Hydrophilidae	5				
					Limnichidae	10				
					Psephenidae	10				
Score				43			30			5

SASS5 Score Sheet		Plattekloof River			D van Driel SACNASP 400041/96					
Date	08-Aug-24	**Taxon**	**Weight**	**Score**	**Taxon**	**Weight**	**Score**	**Taxon**	**Weight**	**Score**
Locality	Plattekloof River	Porifera	5		**Hemiptera**			**Diptera**		
	on dirt road	Coelenterata	1		Belostomatidae	3		Athericidae	10	
	downstream	Turbellaria	3		Corixidae	3		Blepharoceridae	15	
		Oligochaeta	1		Gerridae	5		Ceratopogonidae	5	
Coordinates	33°58' 41.02"S	Huridinea	3		Hydrometridae	6		Chironomidae	2	2
	21°01'54.02"E	**Crustacea**			Naucoridae	7	7	Culicidae	1	
		Amphipodae	13		Nepidae	3		Dixidae	10	
DO mg/l	9.8	Potamonautidae	3		Notonectidae	3		Empididae	6	
Temperature °C	9.4	Atyidae	8		Pleidae	4		Ephydridae	3	
pH	6.0	Palaemonidae	10		Veliidae	5	5	Muscidae	1	
EC mS/m	5.6	Hydracarina	8		**Megaloptera**			Psychodidae	1	
		Plecoptera			Corydalidae	10	10	Simuliidae	5	5
SASS5 Score	96	Notonemouridae	14		Sialidae	8		Syrphidae	1	
Number of Taxa	13	Perlidae	12	12	**Trichoptera**			Tabanidae	5	
ASPT	7,4	**Ephemeroptera**			Dipseudopsidae	10		Tipulidae	5	
		Baetidae 1 sp	4	4	Ecnomidae	8		**Gastropoda**		
Other Biota		Baetidae 2 sp	6		Hydropsychidae 1 sp	4	4	Ancylidae	6	
		Baetidae >3 sp	12		Hydropsychidae 2 sp	6		Bulinidae	3	
		Caenidae	6		Hydropsychidae <2 sp	12		Hydrobiidae	3	
		Ephemeridae	15		Phylopotamidae	10		Lymnaeidae	3	
		Heptageniidae	13		Polycentropodidae	12		Physidae	3	
		Leptophlebiidae	9	9	Psychomyidae	8		Planorbidae	3	
		Oligoneuridae	15		**Cased Caddis**			Thiaridae	3	
Comments		Polymitarcyidae	10		Barbarochthonidae	13	13	Viviparidae	5	
		Prosopistomatida	15		Calamoceratidae	11		**Pelecipoda**		
		Teloganodidae	12		Glossostomatidae	11	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		Pisulidae	10				
		Lestidae	8		Sericostomatidae	13				
		Platycnemidae	10		**Coleoptera**					
		Protoneuridae	8		Dyticidae	5				
		Aesthnidae	8		Elmidae Dryopidae	8	8			
		Corduliidae	8		Gyrinidae	5				
		Gomphidae	6	6	Haliplidae	5				
		Libellulidae	4		Helodidae	12				
		Lepidoptera			Hydraenidae	8				
		Pyralidae	12		Hydrophilidae	5				
					Limnichidae	10				
					Psephenidae	10				
Score				31			58			7

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

Table 25.5 Numerical Significance

Table 25.5.1 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 25.5.2 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 25.5.3 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)