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**WATER USE LICENSE APPLICATION FOR PORTION 17 AND 19 OF  
AVONTUUR 166, HOEKWIL, WESTERN CAPE**

**Technical Report**

**Prepared for Turvey Broers (Pty) Ltd**

**by**

**Confluent Environmental**



**September 2020**

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## 1. INTRODUCTION

### 1.1 Activity Background

Turvey Broers (Pty) Ltd (hereafter referred to as the applicant) enlarged an existing instream dam (Dam 1) on Portion 19 of Avontuur 166 without acquiring the necessary environmental or water use authorisation (Figure 1). The dam has been enlarged, increasing its footprint and water storage capacity from approximately 25 000 m<sup>3</sup> up to 75 000 m<sup>3</sup> (see APPENDIX A for dam survey drawings). Water passing through the spillway of Dam 1 is diverted via a channel into the adjacent Dam 2 (also located on Portion 19 of Avontuur 166). In its current configuration, no water therefore flows from Dam 1 into the drainage line below the dam. The design specifications of Dam 1 are described in detail in APPENDIX B. The storage capacity of Dam 2 is approximately 20 000 m<sup>3</sup> and has not been modified since before 1998.

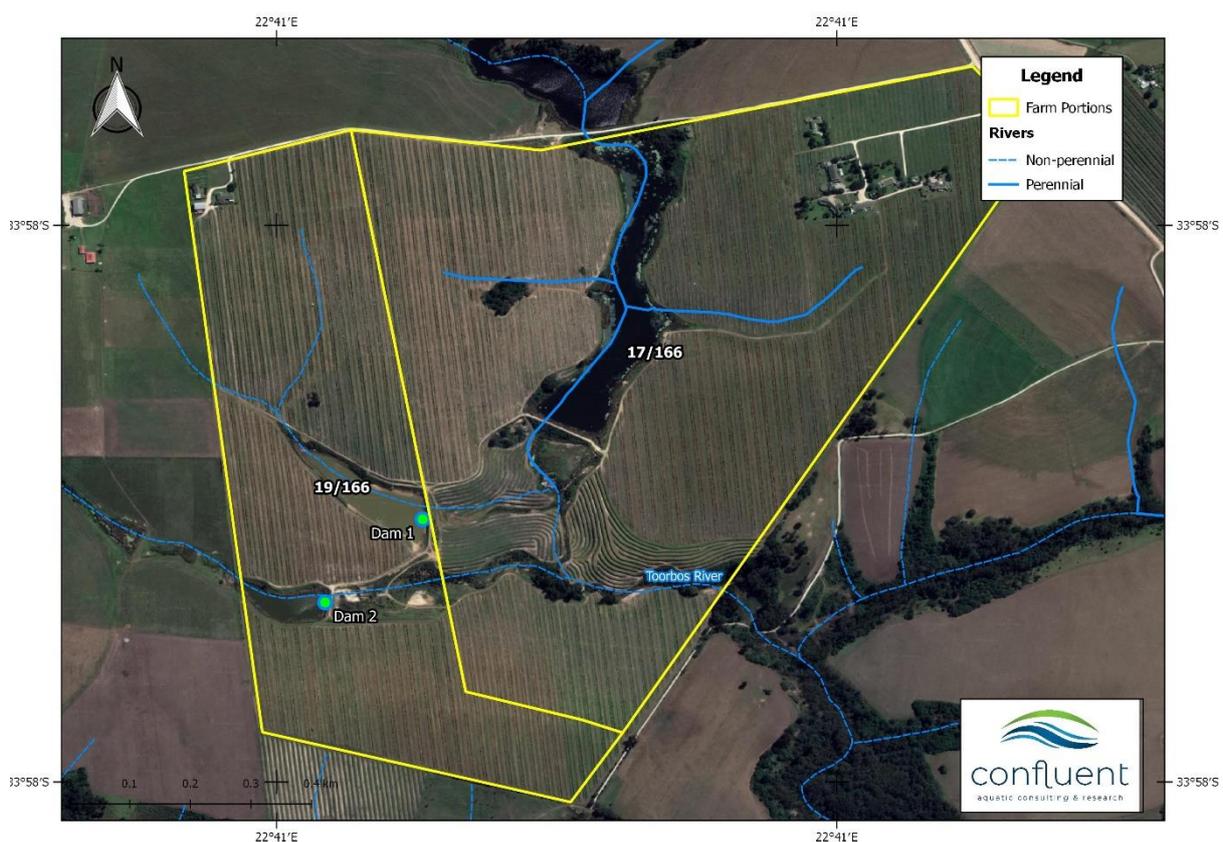


Figure 1: Map indicating farm portions and the location of Dam 1 and Dam 2.

In addition, the applicant cleared a large amount of natural and alien invasive vegetation (approximately 10 ha) in watercourses (drainage lines and wetlands) located downstream of Dam 1 and Dam 2, which fall within Portion 19 and 17 of Avontuur 166 (Figure 2). Excavation and infilling of parts of the wetland area occurred and has resulted in channel straightening, modification of the watercourses bed and banks, and removal of wetland habitat. The clearing of vegetation was done to expand the area of macadamia orchards, mainly on Portion 17. Further details of the affected watercourses can be viewed in APPENDIX C.



Figure 2: Aerial image indicating the enlargement of Dam 1 and clearing of vegetation downstream of Dam 1 and Dam 2.

## 1.2 Property Description

A copy of the title deeds for Portion 17 and 19 of Avontuur 166, has been submitted as part of the WULA pre-application. All relevant property information is included in (Table 1).

Table 1: Property and owner details of Portions 17 and 19 of Avontuur 166.

<b>Company Name:</b>	Turvey Broers Pty Ltd
<b>Trading Name:</b>	Turvey Broers (Pty) Ltd
<b>Company Registration Number:</b>	2014/109208/07
<b>Date Company Established:</b>	05/06/2014
<b>Company Contact Person:</b>	Mr. Petrus Willem Turvey
<b>Contact Number (cell):</b>	0826739194
<b>Title Deed No. (Portion 17)</b>	T69160/2016 (88 Hectares)
<b>Title Deed No. (Portion 19)</b>	T28681/2016 (42 Hectares)

## 2. CATCHMENT DESCRIPTION

The affected properties are located in quaternary catchment K30D (Figure 3) which falls in the Breede-Gouritz Water Management Area (WMA). The site is situated within a River FEPA (Figure 4). The enlarged dam (Dam 1) and a smaller dam (Dam 2) are both located within non-perennial drainage lines, which flow into the Toorbos River, a tributary of the Bo-Langvlei System. The Toorbos River flows into Bo-Langvlei approximately 2 km downstream from the site.

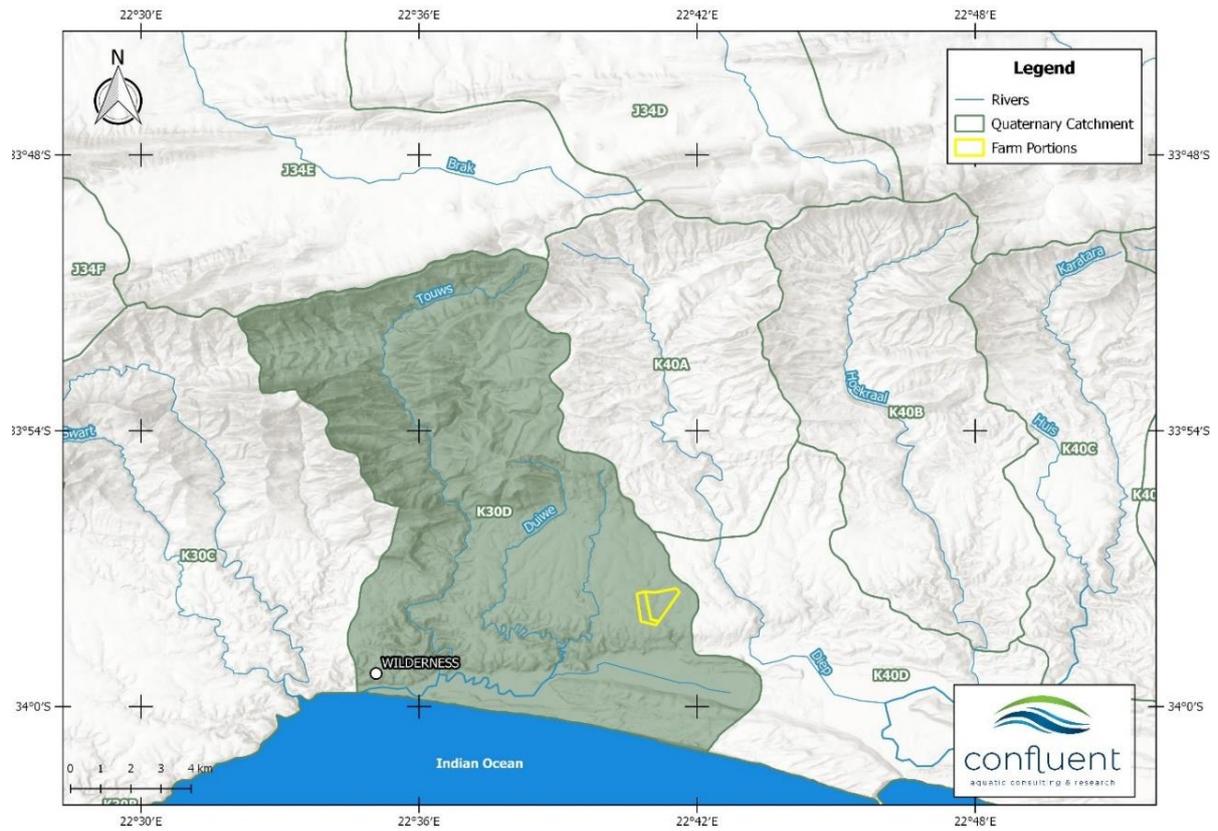


Figure 3: Location of Portion 17 and 19 of Avonturr 166 in quaternary catchment K30D.

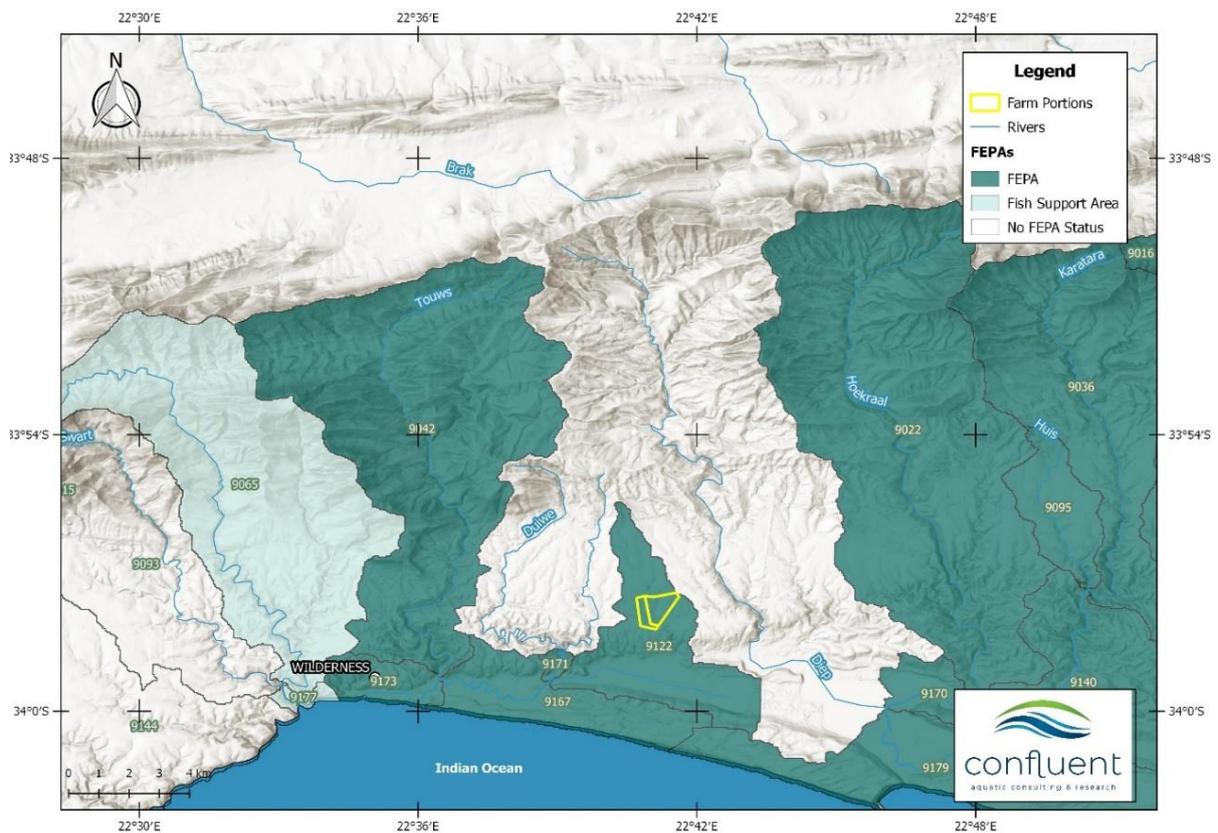


Figure 4: National Freshwater Ecosystem Priority Atlas

The property is zoned as Agriculture and Cultivated Area and borders the Wilderness Protected Environment. The sensitivity of the study area is described in context of previously or existing agricultural land use; instream water storage development; and remaining natural habitat. The property, prior to clearing and the planting of a macadamia orchard in 2017, was used for irrigation of perennial pastures and grazing livestock. The site falls within an Ecological Support Area (ESA) which are important for supporting Critical Biodiversity Areas (CBAs) and delivering ecosystem services.

## 2.1 Freshwater Features

Main freshwater features impacted on by the unlawful activity include the Toorbos River and two associated tributaries/drainage lines located downstream of Dams 1 and 2, as well as a broader wetland area associated with the confluence of the Toorbos River with the two tributaries (Figure 5). The main area where unlawful activity took place falls within the confluence of these three streams and has seriously to critically modified the state of these freshwater features.



Figure 5: Map from the freshwater assessment indicating freshwater features affected by the unlawful activities (Note: Dam 1 and Dam 2 were referred to as Dam 2 and Dam 3 in the Freshwater Assessment Report).

### 2.1.1 Streams

The freshwater assessment study (APPENDIX C) was done for the Toorbos River together with the two small drainage lines (located downstream of Dam 1 and Dam 2, respectively) flowing into the Toorbos River. As the clearing of vegetation took place at the confluence of three watercourses, the Index of Habitat Integrity (IHI) assessment was determined for the system as a whole at the confluence as well as further downstream just before meeting the Bo-Langvlei. The Toorbos River originates approximately 5 km north of the study area and flows in a southerly direction to where it eventually flows into the Bo-Langvlei. The Toorbos River can be classified as a small perennial stream that flows mostly after precipitation events, although it does seem that some groundwater also contributes to flow. Some wet areas were identified around the streams during the site assessment and are discussed under the wetland assessment. During the site assessment, which took place in the middle of summer, there was

a low flow within the Toorbos River. Upstream of the study site, the Toorbos River switches from a natural to a moderately/largely modified state, with the largest impacts being due to instream dams and farming activities encroaching on the riparian area. At the study site, the stream condition seriously deteriorates due to the unlawful activity, which removed most instream and riparian vegetation, changed the bed and banks of the streams as well as modified the channels.

### 2.1.2 Wetland

Several small channelled-valley bottom wetland areas were found along the confluence of the three streams, being fed largely by groundwater inflow as well as overland flow. From the Wetland IHI assessment, the present ecological state of the larger wetland area was found to be in a seriously modified state, where a large loss of natural habitat, biota and basic ecosystem functions has occurred. The main impact on this section of the wetland, is the major loss of natural vegetation due to the excavation and infilling of some parts, together with the construction of the new dam wall, reducing water supply down the stream channel. The Ecological Importance and Sensitivity (EIS) score for the wetland unit on site was found to be Low and could largely be attributed to the fact that this wetland area has been significantly transformed. In its natural, pristine state, it would probably have scored a Moderate to High EIS score. The key services provided by the wetland area includes limited maintenance of biodiversity, carbon storage, phosphate trapping and streamflow regulation.

## 2.2 Present Ecological State

From the IHI assessment, both the riparian and instream integrity of the freshwater system as well as the wetland area at the confluence was found to be in a seriously to critically modified state, improving further downstream towards the Bo-Langvlei to Largely Natural/Moderately modified state. The degraded state at the study site can be attributed to both upstream impacts as well as that caused by the unlawful activities. Upstream from the dam several instream dams occur within the stream channel, abstracting a significant amount of the flow that would naturally exist in the stream together with farm-lands adjacent to the stream often encroaching onto the little riparian area still left. At the study site, unlawful activity has led to the complete modification of the streams and their associated wetlands, where most vegetation has been removed, the stream channels and banks modified and wet areas filled in at places. The enlargement of Dam 1 and redirection of overflow towards Dam 2, has also led to no release down drainage line A and thus a cessation of this stream towards the confluence. The improvement of the IHI further downstream towards the Bo-Langvlei can largely be attributed to an intact riparian zone, with no channel, bed or bank modification. The largest impact in this section would be due to alien invasive species within the riparian area.

## 2.3 Ecological Importance and Sensitivity

The EIS for the quaternary catchment area K30D is 3.5 (Very High) and considered unique on a national and international level based on unique biodiversity (habitat diversity, species diversity, unique species, rare and endangered species). These rivers (in terms of biota and habitat) are usually very sensitive to flow modifications and have no or only a small capacity for use. This score differs significantly from the score found for the unnamed stream as well as wetland areas and could be attributed to the fact that this score applies largely to the Klein Keurboom- and Duiwe Rivers, together with the coastal lakes forming the main freshwater

features within this catchment area. In its natural, pristine state, it would have probably have scored a Moderate to high EIS score.

## 2.4 Hydrology

Avontuur is located within a rainfall region that receives its annual rainfall almost evenly distributed throughout the year. DWA rainfall station K3E003 was used to estimate the average mean annual precipitation (MAP) for the site. The rainfall station is located 4.5 km to the south-east of Avontuur. The monthly averages ranged from 35 mm to 70 mm. The rainfall from this station was measured on a daily basis for a period of more than 30 years. The mean annual precipitation (MAP) for the measured period is 630 mm/a.

Based on this, and other data, the hydrological assessment (APPENDIX D) made the following findings:

- The Toorbos River catchment size is approximately 6.2 km<sup>2</sup> in size, while the catchments of Dam 1 and Dam 2 are 0.34 km<sup>2</sup> and 0.48 km<sup>2</sup>, respectively.
- The combined catchment size of Dam 1 and 2 is less than 1 km<sup>2</sup> in size, which represents approximately 12 % of the larger Toorbos catchment.
- The mean annual runoff (MAR) from the Toorbos Catchment was estimated to be approximately 978 000 m<sup>3</sup>, while the MAR for catchments of Dam 1 and Dam 2 were calculated at 60 000 m<sup>3</sup> and 85 000 m<sup>3</sup> respectively.

The following impacts were estimated for the Wilderness Lakes area:

- The full catchment area for the Wilderness Lakes is in the order of 175 km<sup>2</sup>.
- The combined catchment size for Dam 1 and Dam 2 represents 0.47 % of the catchment supplying water to the Wilderness Lakes;
- The action of increasing the size of Dam 1 from 25 000 m<sup>3</sup> to 75 000 m<sup>3</sup> in size, represents an additional 32 000 m<sup>3</sup>/a of water more than the pre-existing lawful use of 65 000 m<sup>3</sup>; and
- The increase in the combined storage in Dam 1 and Dam 2 by 32 000 m<sup>3</sup> will cause an additional 0.11 % reduction in flow to the Wilderness Lakes area.

The negative impact on the fresh water supply to the lakes as a direct result of the increased dam size is thus considered to be negligible.

## 3. HISTORICAL AND CURRENT WATER USE

### 3.1.1 Historical Water Use

As indicated previously, the storage capacity of Dam 1 has been increased from approximately 25 000 m<sup>3</sup> to 75 000 m<sup>3</sup>. The storage capacity of Dam 2 is approximately 20 000 m<sup>3</sup> and has not been enlarged or modified since at least 1991 (Table 2).

The most recent water uses registered for Portion 19 of Avontuur 166 are included in Table 3. The historical registration is for a combined annual storage of 65 000 m<sup>3</sup> and a taking of 65 000 m<sup>3</sup> per annum. Based on the area and type of crops (perennial pastures) produced at the time of registration, the actual irrigation requirement is estimated to be considerably higher, at approximately 400 000 m<sup>3</sup> per annum.

Table 2: Historical imagery of Dam 1 and Dam 2.

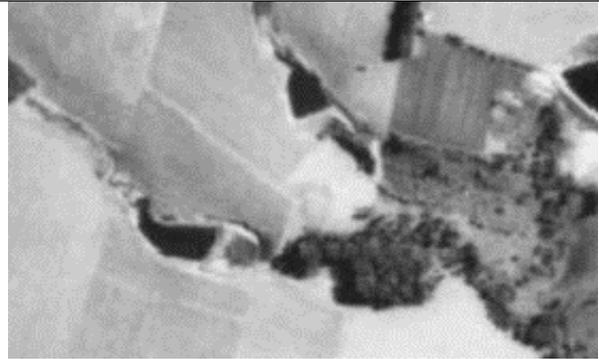
	<b>1991</b>
	<b>2020</b>

Table 3: Historical and current water use for Portion 19 of Avontuur 166.

	<b>Portion 19/166</b>
<b>WARMS REGISTRATION</b>	
<b>Taking of water (m<sup>3</sup>) per annum</b>	65 000 m <sup>3</sup> (combined abstraction from Dam 1 and Dam 2)
<b>Storing of water (m<sup>3</sup>) per annum</b>	65 000 m <sup>3</sup> (combined storage in Dam 1 and Dam 2)
<b>HISTORICAL WATER USE</b>	
<b>Crop</b>	Perennial Pastures
<b>Area</b>	38 hectares
<b>Irrigation System</b>	Micro-sprinklers
<b>Estimated Irrigation Requirement (SAPWAT)</b>	400 000 m <sup>3</sup>
<b>CURRENT WATER USE</b>	
<b>Crop</b>	Macadamia
<b>Area</b>	40 hectares
<b>Irrigation System</b>	Drip
<b>Estimated Irrigation Requirement (SAPWAT)</b>	68 000 m <sup>3</sup>
<b>Estimated Irrigation Requirement (Applicant)</b>	290 000 m <sup>3</sup>

### 3.1.2 Current & Future Water Requirements

The applicant intends to apply for an increase in the registered volume for storage and taking of water. The applicant intends to irrigate approximately 40 ha of macadamia trees on Portion 19 of Avontuur 166.

The SAPWAT v.4.0 model estimated an annual irrigation requirement of approximately 68 000 m<sup>3</sup> (Table 3). It must however be noted that the MAP of the rainfall station included in the model for catchment K30D is 730 mm, which is considerably higher than the actual MAP (630 mm) that has been measured in the catchment over the past 30 years (see APPENDIX D). The SAPWAT estimate is therefore considered to under-estimate the actual irrigation requirement.

According to the applicant, each hectare is estimated to support 375 trees and each tree is estimated to use approximately 87 litres of water per day (at maturity). Taking these figures into consideration, and MAP of 630 mm the irrigation requirement is estimated to be approximately 250 000 m<sup>3</sup> per year (see Box 1 for calculations).

#### Box 1: Irrigation Requirement Calculations (according to applicant)

The following calculation is based on 375 trees planted per hectare and a daily water requirement of 87 litres per day at maturity.

##### *Water Requirement:*

- 375 trees x 87 L per day = 32 625 L (32.6 m<sup>3</sup>/ha)
- 32.6 m<sup>3</sup> /ha x 365 = 11 908 m<sup>3</sup>/ha/yr
- 11 908 x 40 ha = 500 141 m<sup>3</sup>

##### *Water Availability:*

- 630 mm = 0.63 m (rainfall)
- 0.63 m x 10 000 m<sup>2</sup> = 6 300 m<sup>3</sup>/ha
- 6 300 x 40 ha = 252 000 m<sup>3</sup>/yr

##### *Irrigation Requirement:*

- 500 141 - 252 000 = 248 141 m<sup>3</sup>/yr for Portion 19.

## 4. SUMMARY OF WATER USES INCLUDED IN APPLICATION

Water use activities included in the WULA are listed in Table 4. The primary objective of the increase in combined storage capacity is to ensure an increase in assured yield and the assurance of supply for the irrigation of macadamias. The storage capacity of Dam 1 (75 000 m<sup>3</sup>) exceeds the estimated MAR (60 000 m<sup>3</sup>) for its catchment. The purpose of the dam is therefore to store water originating from its own catchment area as well as from the catchment area for Dam 2 (MAR of 80 000 m<sup>3</sup>). Excess water will therefore be pumped from Dam 2 to Dam 1.

The application for taking is a combined abstraction of 100 000 m<sup>3</sup> per annum from Dam 1 and Dam 2 (split into 41 000 m<sup>3</sup> and 59 000 m<sup>3</sup>, respectively). While this is higher than the volume currently registered for this property, it is likely to be considerably lower than volumes that were actually used for the irrigation of perennial pastures prior to the establishment of macadamias. It is also lower than the value calculated by the applicant (see Box 1) and also takes the combined estimated MAR of both catchments (145 000 m<sup>3</sup>) into account. Furthermore, the estimated irrigation requirement of 68 000 m<sup>3</sup> as estimated by SAPWAT is based on a MAR of 730 mm for K30D. According to the hydrological assessment, the actual measured rainfall over the last 30 years is 630 mm, and the SAPWAT estimate is therefore likely to under-estimate the actual irrigation requirements, hence the application for 100 000 m<sup>3</sup>.

In addition, the applicant modified freshwater habitats downstream of Dam 1 and Dam 2 on Portion 17 of Avontuur 166 in order to clear land and expand their macadamia orchard. This activity has resulted in alterations to the bed, banks, course and characteristics of the affected watercourses. These activities formed the basis of a Section 24 G application, which resulted in the development of a Freshwater Rehabilitation Plan (APPENDIX C) and a River Management and Maintenance Plan (APPENDIX E).

Table 4: Water uses included as part of the WULA

Water Use	Description	Property
21 (a): Taking of Water	Abstraction of 41 000 m <sup>3</sup> from Dam 1	Portion 19 of Avontuur 166
	Abstraction of 59 000 m <sup>3</sup> from Dam 2	Portion 19 of Avontuur 166
21 (b): Storing Water	Storage of 75 000 m <sup>3</sup> in Dam 1	Portion 19 of Avontuur 166
	Storage of 20 000 m <sup>3</sup> in Dam 2	Portion 19 of Avontuur 166
21(c): Impeding or diverting the flow of water in a watercourse	Instream storage of 75 000 m <sup>3</sup> in Dam 1	Portion 19 of Avontuur 166
21(i): Altering the Bed, Banks, Course or Characteristics of a Watercourse	Clearing of vegetation for macadamia orchards	Portion 17 & 19 of Avontuur 166

## 5. IMPACTS & MITIGATION

As the increase in dam size is expected to have a negligible impact on the quantity of flows into the Toorbos River and into the Wilderness Lakes, the greatest impacts caused by the unlawful activities are loss of habitat, flow modification and erosion and sedimentation issues in the watercourses immediately downstream of Dam 1 and Dam 2. As indicated in the freshwater assessment, all disturbed areas surrounding the freshwater features downstream of Dam 1 and Dam 2 should immediately be rehabilitated and re-vegetated with appropriate vegetation according to the Freshwater Rehabilitation Plan (see APPENDIX C).

In addition to the rehabilitation activities, future maintenance activities related to the project would include regular monitoring and maintenance of the stream channels and river-banks falling within the properties as well as at the existing spillways and abstraction points. Potential maintenance activities include:

- Protection and maintenance of the stream corridors, wetland areas and proposed 30m buffer zone to prevent further degradation of these freshwater features and their riparian zones;
- Removal and control of alien vegetation;
- Removal of blockages caused by vegetation debris, nuisance growth and sediment deposits at the existing abstraction points; and
- Monitoring and maintenance of the proposed spillway outlets, remedying any sign of erosion downstream thereof.

### 5.1 Rehabilitation Plan

From the freshwater assessment, the desired outcome of the rehabilitation plan, is to restore the freshwater features to near natural ecological processes and ecological infrastructure functioning. This includes the main wetland functions such as maintenance of biodiversity,

carbon storage, phosphate trapping and streamflow regulation. The Recommended Ecological Category (REC) deemed appropriate for the watercourse/wetland features is a C.

The following objectives were identified in order to meet this goal:

- Restore some flows into the drainage line downstream of Dam 1;
- Erosion control and stabilisation of all stream banks; and
- Maintenance and after care, ensuring the re-establishment of the native plant community, and limiting the presence of non-native or invasive plant species.

The greatest impact caused by the unlawful activity, is that of loss of habitat and biodiversity, with some flow modification and some erosion and sedimentation issues. Recommendations made in order to mitigate these impacts include the following:

- A natural buffer should be re-established along watercourses located downstream of Dam 1 and Dam 2. According to the Buffer Zone Tool for the Determination of Aquatic Impact Buffers, a 30 m buffer area is proposed for all freshwater features found on site;
- The whole freshwater system falling within the buffer areas (unnamed stream, drainage lines and wetland areas), are to be properly rehabilitated and re-vegetated with appropriate vegetation. This is to be done according to a formal rehabilitation plan as prepared by a botanical or freshwater specialist;
- A guided alien vegetation removal plan should be followed for removal of the remaining alien vegetation on site;
- The dam capacity of Dam 1 should be calculated in order to determine an EWR (if required) which should then be addressed on a practical level. It might be sufficient that the spillway be redirected into the drainage line below Dam 1;
- All future agricultural practices should be kept outside of the 30 m buffer area, and if the dam walls are to be repaired in future, an EWR should be determined for these as well; and
- It is proposed that a River Maintenance and Management Plan (RMMP) be followed for any future work in this area.

## 5.2 River Management and Maintenance Plan

In addition to the rehabilitation activities, future maintenance activities related to the project would include regular monitoring and maintenance of the stream channels and river-banks falling within the property as well as at the existing spillways and abstraction points. Potential maintenance activities include:

- Protection and maintenance of the stream corridors, wetland areas and proposed 30 m buffer zone to prevent further degradation of these freshwater features and their riparian zones;
- Removal and control of alien vegetation;
- Removal of blockages caused by vegetation debris, nuisance growth and sediment deposits at the existing abstraction points; and
- Monitoring and maintenance of the proposed spillway outlets, remedying any sign of erosion downstream thereof.

In this respect a detailed RMMP has been compiled and is included as APPENDIX E.

## 6. RECOMMENDED LICENSE CONDITIONS

The application for increased storage and abstraction is supported by the outcome of the hydrological assessment given the low impacts on flows into the Toorbos River and the Bo-Langvlei Lake. Irrigation requirements are also likely to be substantially less than required under the previous crop/land use.

Clearing of vegetation downstream of Dam 1 and Dam 2 to expand the area of macadamia orchards on Portion 17 of Avontuur has resulted in significant modifications to freshwater habitat. These areas must be rehabilitated and maintained following the Freshwater Rehabilitation Plan and RMMP that were developed as part of the Section 24 G application.

It is therefore recommended that the application be granted subject to the following conditions:

- The Freshwater Rehabilitation Plan (APPENDIX C) must be implemented, including the establishment of a 30 m buffer for watercourses located downstream of Dam 1 and Dam 2;
- Overflow through the spillway at Dam 1 must be re-directed into the drainage line below Dam 1. This diversion must include appropriate erosion control methods as specified in Section 3.2.2 of the Freshwater Rehabilitation Plan (see APPENDIX C).
- Any future maintenance activities in the affected watercourses must be implemented under the RMMP (APPENDIX E);
- Meters should be installed at all pumps on Dam 1 and Dam 2 to measure abstraction volumes and ensure that approved abstraction volumes are adhered to. The following volumes should be measured:
  - Water pumped out of Dam 1 directly onto fields for irrigation;
  - Water pumped out of Dam 2 directly onto fields for irrigation; and
  - Water pumped out Dam 2 and transferred into Dam 1 for storage.

**APPENDIX A – DAM SURVEY DRAWINGS**

**APPENDIX B – DAM SAFETY CLASSIFICATION REPORT**

**APPENDIX C – FRESHWATER ASSESSMENT AND REHABILITATION REPORT**

**APPENDIX D – HYDROLOGICAL ASSESSMENT**

**APPENDIX E – RIVER MANAGEMENT AND MAINTENANCE PLAN**