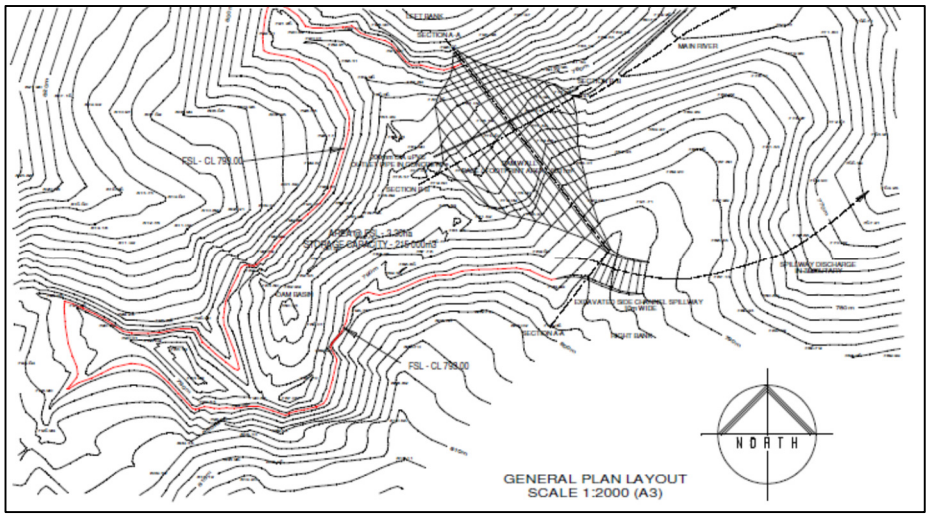
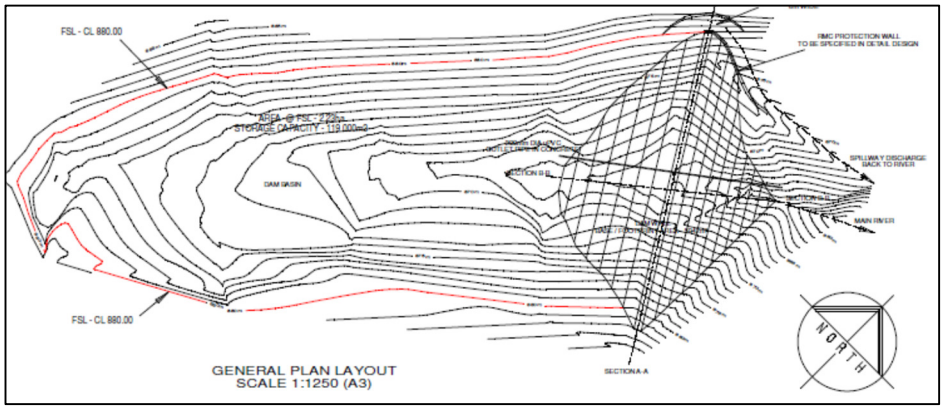
APPLICANT: FAEROES PROPERTIES (PTY) LTD

FINAL ENVIRONMENTAL IMPACT REPORT:

PROPOSED ESTABLISHMENT OF TWO DAMS ON THE REMAINING EXTENT OF THE FARM FAIRVIEW 605-LT, AGATHA, TZANEEN





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ACRONYMS AND ABBREVIATIONS:	
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMPR	Environmental Management Programme
ESR	Environmental Scoping Report
GTM	Greater Tzaneen Municipality
IBA	Important Bird Area
HIA	Heritage Impact Assessment
I&AP	Interested and/or Affected Party
LDEDET	Limpopo Department of Economic Development and Environmental Tourism
MAE	Mean Annual Evaporation
MAMSL	Metres Above Mean Sea Level
MAP	Mean Average Precipitation
NEMA	National Environmental Management Act (1998)
NWA	National Water Act (1998)
WUL	Water Use Licence
WULA	Water Use Licence Application

ASSUMPTIONS AND LIMITATIONS

The EIA process and this EIR are based on the assumption that all information supplied by the applicant and project team members is correct and complete.

Specialist studies were conducted in one season (summer 2016). Although a more complete picture of the receiving environment can be obtained by multi-season surveys, the studies that have been undertaken are felt to be sufficient given the extent of the proposed project, the significance of the anticipated impacts, and the sensitivity of the receiving environment. The fact that the investigations were conducted during summer (March 2016) means that ecological, wetland and riparian aspects could be investigated quite accurately, as opposed to winter surveys.

An aquatic ecological investigation was not undertaken, due to the fact that free-flowing water is mostly absent from the affected drainage lines, which means that the indicators which would be investigated during an aquatic ecological study would also be absent. This is not felt to be a material hindrance to the EIA, and it is felt that the potential impacts of the proposed dams were investigated adequately through the specialist investigations which were conducted.

The EIA focused on the proposed dams, which require Environmental Authorisation. Potential impacts of the associated agricultural activities which would be made possible by the establishment of the dams have been touched upon but not investigated in detail.

CONTACT DETAILS

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EAP's Qualifications (Louise Agenbag):

- BSc (Hons) Geography (*cum laude*), University of Pretoria
- BSc Environmental Sciences (*cum laude*), University of Pretoria
- Certificate in Environmental Management Systems (ISO14001:2004), North-West University, Potchefstroom campus
- Completed short courses in Water Use Authorisation and Project Management
- 12 years' experience in environmental impact assessment and management (2005 to current), 10 of which at management level (2007 to current)
- Member of IWMSA (Institute of Waste Management of Southern Africa) and IAIAsa (International Association for Impact Assessment, South African chapter)

Applicant and landowner

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1. INTRODUCTION

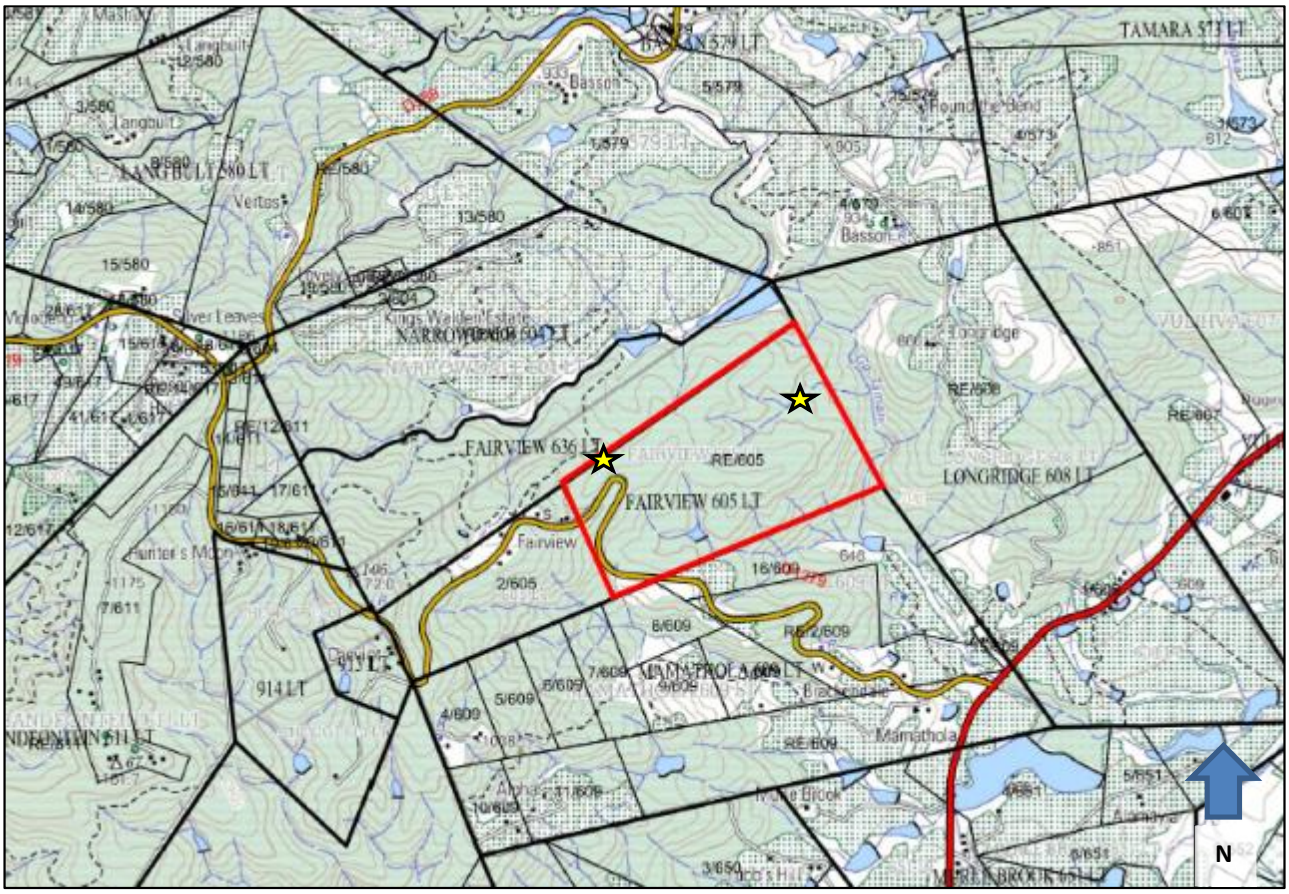
Polygon Environmental Planning has been appointed by Faroes Properties (Pty) Ltd to conduct an Environmental Impact Assessment (EIA) for the proposed establishment of two dams on the Remainder of the farm Fairview 605-Lt, Agatha, Tzaneen. This Environmental Impact Report (EIR) was compiled following various investigations and public participation.

2. SITE LOCATION AND DESCRIPTION

2.1. Location

The two proposed new dam sites are located on the Remaining Extent of the farm Fairview 650-LT, approximately 17 km south of Tzaneen, Limpopo Province (Figure 2.1).

Figure 2.1: 1:50 000 topocadastral map of the location (proposed dam sites indicated with yellow stars)



The approximate coordinates for the centre of property are 23° 55' 50.95" S and 30° 10' 23.58" E. The approximate coordinates for the two proposed dams are as follows (preferred sites):

- Upper dam: 23° 55' 47.11"S 30° 09' 58.94"E
- Lower dam: 23° 55' 35.3"S 30° 10' 41.99"E

The site is under the jurisdiction of the Greater Tzaneen Municipality. The property is approximately 190ha in extent.

2.2. Description

The property currently consists mostly of cleared Eucalyptus plantations. Some natural areas remain in the steep gorges on the property, although the majority of these areas have been heavily invaded by exotic vegetation. A small dam exists within the southernmost section of the property. The Old Coach Road, small gravel roads as well as small tributaries of the Ga-Tamari River all traverse the property.

Properties in the vicinity of the subject property are predominantly utilised for commercial timber and fruit plantations.

Figure 2.2: Aerial photograph (Google Earth 2016) showing the location and boundaries of the property and proposed dam sites

The following table provides general information pertaining to the site.

Table 1.1: General site information

District	Mopani District
Local Municipality	Greater Tzaneen Municipality
Property description	Remaining Extent of the farm Fairview 605-LT
Surveyor-General code	T00LT0000000060500000
Nearest town	Tzaneen
Coordinates	Upper Dam: 23° 55' 47.11"S 30° 09' 58.94"E Lower Dam: 23° 55' 35.3"S 30° 10' 41.99"E
Current land use	Forestry (Eucalyptus plantation) Pockets of indigenous vegetation with alien infestation
Surrounding land use	Agriculture and forestry Natural areas

3. PROJECT DESCRIPTION

3.1. Project background and overview

The owner and applicant has for decades been farming Avocado and Macadamia orchards on the neighbouring property (the Remainder of the farm Fairview 636-LT). The remainder of Fairview 605-LT was purchased by the applicant in 2015 with the aim of increasing avocado and macadamia nut production, and to link with the adjoining operational avocado and macadamia farm, where farming logistics are already in place.

It is the owner's intent to increase avocado and macadamia nut production by planting 130ha of orchards on this property, on areas until recently occupied by Eucalyptus plantations. These orchards will require irrigation, and while sufficient water abstraction allocation is available (confirmed ELU through the Validation and Verification process), there is insufficient storage capacity for this volume of water – there is currently only one very small dam on the property. The two currently proposed dams will address the need for additional storage capacity.

3.2. Project description

The two proposed dams are currently known as the "upper dam", situated in the higher-lying western part of the property, and the "lower dam" in the lower-lying eastern part.

(a) The **upper dam** is proposed to have a dam wall of maximum 16m high and an embankment length of 120m (excluding spillway). Gross storage capacity will be 119 000m^3 with a water surface area of 2,23ha at full supply level. An open side channel spill-way with a base width of 6m and available freeboard of 2m is proposed on the left bank, where suitable shallow rock was found.

(b) The **lower dam** is proposed to have a dam wall of maximum 20m high, and an embankment length of 158m (excluding spillway). Gross storage capacity will be 215 000m^3 with a water surface area of 3,3ha at full supply level. An open side channel spill-way with a base width of 10m and available freeboard of 2m is proposed on the right bank.

Both are proposed to be zoned earthfill embankments, as no suitable rock was found at either site for the foundation conditions required for construction of any other type of dam. Earthfill dams are built up by compacting successive layers of earth, using less permeable materials to form a core and more permeable materials on the upstream and downstream sides. Material for the walls is proposed to be excavated from within the dam basins (below the full supply line) and moved to the dam wall positions for use in construction.

Because of the sizes, heights and expected classifications of the dams, a chimney, blanket and toe drain system needs to be implemented within the embankments in order to manage seepage. It is furthermore recommended that proper toe drains with V-notch measuring structures be installed at the deepest section on the downstream sides. The expected length of the toe drain a both dams is estimated at approximately 80m.

Both dams will be equipped with a 200mm uPVC outlet pipe with a downstream gate valve closing mechanism to enable the release of water for downstream needs by other water users and ecological requirements that may be required by DWS (reserve determination still to be conducted by DWS to determine the volume required to be released). Both outlet pipes will be 72m long.

3.3. Project phases and work method statement

The activities are proposed to consist of the following:

(a) **Planning**, which has been mostly completed and consisted of the following:
- Survey (land surveyor) (completed)
- Selection of dam sites (completed)
- Preliminary engineering design and costing (completed)
- Environmental Impact Assessment and WULA (underway), including the following:
  - Assessment of the receiving environment. Topography, climate, visual and noise impacts and socio-economic impacts were assessed at desk-top level, whilst specialist ecological, heritage, wetland and soil studies were undertaken.
  - Identification of potential impacts and assessment of the significance thereof
  - Development of measures for the prevention or mitigation of impacts and the monitoring and reporting of compliance
  - Public participation process
- If and when Environmental Authorisation and a Water Use Licence have been obtained, detailed design will be done

(b) **Construction**, which is proposed to be carried out as follows:
- Excavation and backfilling of cut-off core trenches
- Forming of new embankments. Earth fill is proposed to be excavated from within the dam basin.
- Excavation and forming of flood spillways (open side channels)
- Installation of 200mm diameter uPVC outlet pipes encased in reinforced concrete, equipped with closing mechanisms on the downstream sides
- Installation of toe drains with V-notch measuring structures
- Grass establishment (hydro-seeding) on entire embankments after construction
- An Environmental Control Officer (ECO) will monitor compliance with the EMPR, WUL and EA during the construction phase and report to both LDEDET and DWS on compliance

(c) Operation and maintenance, which will be undertaken in accordance with an Operation and Maintenance (O&M) manual to be compiled by the engineers. This will include periodic inspections by the engineers to check aspects such as structural integrity, and repairs if necessary.

(d) **Potential decommissioning**, though the dams are planned as long-term to permanent structures. Should a decision be taken at a later stage to decommission the dams, the project team (including engineer, environmental consultant and any other relevant team member) will draw up a detailed decommissioning plan and accompanying Environmental Management Programme according to which the decommissioning will be undertaken.

Please refer to the attached preliminary design report and drawings, as compiled by Element Consulting Engineers (Appendix I).

4. PROJECT MOTIVATION, NEED AND DESIRABILITY

4.1. Motivation, need and desirability of the project

Avocado and macadamia orchards are planned to be established on the property to replace the previous Eucalyptus plantations. Both these crops rely on irrigation for optimal production, particularly during years with below-average rainfall, and during drought years irrigation may be needed to ensure the survival of the trees.

Currently there is only a single small dam on the property, which has insufficient storage capacity for the irrigation requirements of the planned 130ha of orchards. A sufficient surface water abstraction allocation is in place (confirmed Existing Lawful Use (ELU) by DWS through the Validation and Verification process), but with insufficient storage capacity it would be difficult to actually utilise this full allocation, due to the non-perennial flow in the watercourses onsite. Dam/s are required in order to capture water during wetter periods, for use during dryer periods.

Two dams are therefore proposed to be constructed in order to facilitate the water storage shortfall. Some of the water to be stored in the proposed dams is proposed to be pumped from the adjacent property, on which abstraction rights and storage have also already been confirmed as ELU, though instream run-off will also be captured in these dams.

Without the proposed dams, the commercial farming operations proposed on the property would not be viable, due to the dependence of avocado and macadamia cultivation on irrigation.

Establishment of the dams is not anticipated to harm downstream water users, as the applicant only proposes the abstraction of their existing water allocation as granted by DWS, and is not applying for any additional water abstraction. The design of the dams incorporates an outlet, so that the ecological reserve (as determined by DWS), as well as the volume of water required for meeting other water users' allocations downstream, can be released from the dams to meet those requirements and avoid impinging on the rights of either downstream water users or the downstream environment.

The motivation for replacing the Eucalyptus plantations on the property with avocado and macadamia nut orchards is that the local climatic and soil conditions are very well suited to these crops and there is currently a very high demand for both, locally and internationally. The applicant also has many years' experience with these particular crops in the Tzaneen area and is therefore well versed in their particular requirements; and all the necessary support infrastructure for both crops (e.g. packhouses, transportation, agricultural chemicals, etc) is readily available in the area, as both avocados and macadamia nuts are widely produced in the region.

Construction of the dams is anticipated to create approximately 10 temporary jobs, or contribute to supporting those jobs in companies supplying the construction services. The dams are also anticipated to contribute to the creation of 40 temporary jobs in terms of planting of the orchards. By enabling commercial agriculture on the site, the proposed dams are furthermore anticipated to contribute to the creation of approximately 50 new, permanent jobs on the farm, which will be dependent on these dams. Furthermore, the project is anticipated to contribute to the local economy, which in a large way is based on agriculture, by making use of locally based agricultural support services such as transport, and products such as agricultural chemicals and cartons for packaging.

4.2. Motivation for selected preferred alternatives

4.2.1. Site alternatives

The **property** was selected for its location directly adjacent to an existing farm already operated by this applicant, which means that the operations on the property could tie in with those on the existing, operational farm. Soil and climatic conditions are also very well suited to the proposed crops of Avocados and Macadamia nuts and there is an existing, sufficient water abstraction allocation on the property. Furthermore, the necessary agricultural support services are available in the area.

The selection of the **dam sites** on the property was based on the following considerations:

- **Upper Dam:** The preferred position provides more storage capacity than the alternative site (refer to Section 5 below). This results in a shallower slope in the dam basin and allows for the construction of a lower dam wall than would be required in the alternative position. Furthermore, better conditions for an overflow were found at the preferred site, as the overflow can be placed on a rocky layer, greatly reducing the risk of soil erosion.

- **Lower Dam:** The preferred position allows for construction of a relatively short dam wall, and the overflow can be placed over a natural "saddle" in the topography – almost a natural overflow. This overflow position will allow water to be discharged in a position that will not pose any danger to the toe of the dam wall. Furthermore, no large trees would need to be removed for construction of this wall. This position also allows for sufficient storage capacity for the applicant's irrigation requirements.

4.2.2. Technology alternatives

The type of dam – earthfill – was selected for both of the proposed dams, as no suitable rocky foundation conditions were found at either site for the establishment of any other type of dam. Earthfill is therefore the only available option.

5. INVESTIGATION OF ALTERNATIVES

5.1. Project Alternatives

No project alternatives were investigated within the ambit of this EIA, as the applicant's purpose with the project is to establish sufficient water storage for irrigation of his proposed orchards. The project proposal is furthermore in line with surrounding land use, which mostly consists of timber plantations, orchards and associated infrastructure.

5.2. Site Alternatives

No other **properties** were investigated as alternatives, as the applicant already owns this property and it is located adjacent to another property of his, on which agriculture is already practised and where logistical infrastructure such as storerooms and offices are already in place; farming on this property (the proposed development site) will therefore be able to easily tie into the existing neighbouring farming operation. Furthermore, a sufficient water abstraction allocation (Section 21(a) water use) is already in place for the property, the property was found to be suitable for dam construction from an engineering perspective, and no

environmental fatal flaws were found which would preclude dam construction. The proposed activities are also in line with surrounding land use. Furthermore, the necessary agricultural support services are available in the area. The investigation of location alternatives therefore focused on the selection of suitable dam sites on the subject property.

The option of establishing only **one, large dam** was considered but swiftly rejected, as no suitable position could be found onsite that could accommodate a single dam with sufficient storage capacity for the irrigation needs onsite, due *inter alia* to the slopes onsite and the positions of existing infrastructure – for instance, the secondary Agatha road (AH road) would be partially inundated if the Upper Dam were to be constructed larger than is currently proposed. The option of a single large dam was therefore not explored in detail, and was not investigated within the ambit of the EIA as it would not be technically feasible. It was then determined that **two separate dams** would be more feasible, and alternative positions for the dams were investigated on the property.

Site selection on the property was done firstly by a civil engineer (specialised as a dam engineer) based on available contour lines and a site inspection. Likely sites were then surveyed in detail by a land surveyor, and preliminary planning was done on the sites initially selected. It was then found that the site originally selected for the upper dam was not ideal, and the land surveyor proceeded to survey another site pinpointed by the engineer. This second site was found to be much better suited, as described below.

For the bottom dam, only one truly feasible option presented itself, but for the upper dam, two positions approximately 50m from each other were investigated, as indicated on the following aerial photograph.

Figure 5.1: Alternative "upper dam" sites investigated

The selection of the **dam sites** on the property was based on the following considerations:

- **Upper Dam:** The preferred position provides more storage capacity than the alternative site (refer to Section 5 below). This results in a shallower slope in the dam basin and allows for the construction of a lower dam wall than would be required in the alternative position. Furthermore, better conditions for an overflow were found at the preferred site, as the overflow can be placed on a rocky layer, greatly reducing the risk of soil erosion.

- **Lower Dam:** The preferred position allows for construction of a relatively short dam wall, and the overflow can be placed over a natural "saddle" in the topography – almost a natural overflow. This overflow position will allow water to be discharged in a position that will not pose any danger to the toe of the dam wall. Furthermore, no large trees would need to be removed for construction of this wall. This position also allows for sufficient storage capacity for the applicant's irrigation requirements.

5.3. Technology Alternatives

The type of dam – earthfill – was selected for both of the proposed dams, as no suitable rocky foundation conditions were found at either site for the establishment of any other type of dam. Earthfill is therefore the only available option.

5.4. No-go Alternative

The 'no-go' alternative refers to the scenario in which the proposed activity does not take place and the site remains as it is.

If the no-go alternative is taken, the impacts that can be anticipated to be associated with the proposed dams would not come to pass and the conditions and trends on the property can be expected to remain as per the status quo. Impacts that can be expected to be experienced in case of the no-go alternative being selected include the following:

Table 5.1: Potential impacts that may be associated with the no-go option

POTENTIAL IMPACT	STATUS	EXTENT	MAGNITUDE	LIKELIHOOD	SIGNIFICANCE
Bio-physical aspects					
Soil erosion and siltation remain the same	Neutral	Local	Medium	Highly probable	Low-medium
Topography remains unchanged	Neutral	Local	Low-Medium	Highly probable	Low
Unused agricultural potential	Neutral	Local	Medium	Highly probable	Medium
No compaction of wetland soil	Neutral	Local	Very low	Highly probable	Low
No disturbance of aquatic fauna and flora by construction activities	Neutral	Local	Low-medium	Highly probable	Low
No ingress of foreign matter into streams and wetlands, or concomitant impacts on fauna and flora	Neutral	Local	Unknown	Highly probable	Low

Water abstraction rates remain unchanged	Neutral	Local	Low	Highly probable	Medium
Wetland portions retain connectivity	Neutral	Local	Low	Highly probable	Medium
Habitat (aquatic, wetland and terrestrial) remains intact	Neutral	Local	Low	Highly probable	Medium
Hydrological and flow regime remain unchanged	Neutral	Local	Medium	Highly probable	Low-medium
Sediment movement / transportation within the system remains unchanged	Neutral	Local	Medium	Highly probable	Medium
No creation of habitat for water-loving birds and other fauna.	Neutral	Local	Low-medium	Highly probable	Low-Medium
Water quality remains unchanged	Neutral	Local	Unknown	Highly probable	Low-Medium
No veld fire risk associated with construction	Neutral	Local	Unknown	Definite	Low
Trends in infestation and spreading of alien invasive vegetation remain unchanged	Neutral	Local	Low	Definite	Low
No disruption of the activities of fauna on and around the site	Neutral	Local	Very low	Highly probable	Very low
Socio-economic aspects					
No supporting local businesses through local procurement of materials, equipment & services (construction phase)	Neutral	Local	Low	Definite	Low
No job creation (construction phase), whether direct or indirect	Neutral	Local	Low	Definite	Low
No contribution to operational-phase job creation and job security	Neutral	Local	Low	Definite	Low
No contribution to local economy (operational phase)	Neutral	Local	Low	Definite	Low-medium
No visual impact of construction activities and site clearing	Neutral	Local	Low	Definite	Very low
No visual impact of the dams	Neutral	Local	Very low	Definite	Very low
No visual impact of agricultural activities on the property	Neutral	Local	Medium	Highly probable	Low
No noise associated with construction activities and heavy vehicles during construction	Neutral	Local	Very low	Definite	Very low
No noise associated with vehicles used in agricultural activities associated with the dams	Neutral	Local	Very low	Highly probable	Very low
No risk to possible undetected / subterranean heritage resources	Neutral	Local	Unknown	Highly probable	Very low

6. APPLICABLE LEGISLATION

6.1. Environmental Legislation

6.1.1. National Environmental Management Act, EIA Regulations (2014)

The EIA Regulations (2014), published in terms of section 24(5) read with section 44 of the National Environmental Management Act (NEMA, Act No. 107 of 1998), stipulate the EIA process that is required to be undertaken for the proposed project (Table 6.1).

Table 6.1: Applicable Environmental Legislation

ACTIVITY NR.	ACTIVITY DESCRIPTION
Listing Notice 1	
12(iv)(a)	The development of dams where the dam, including infrastructure and water surface area, exceeds 100m^2 in size; where such development occurs within a watercourse. *For the establishment of two instream dams, taking up a total area of approximately 6,5ha including infrastructure and water surface area.*
19(i)	The infilling or depositing of any material of more than 5m^3 into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5m^3 from a watercourse. *For moving more than 5m^3 of material (mainly soil) from within the dam basins (below the full supply lines) to the dam wall positions for construction of two earthfill dam walls.*
27	The clearance of an area of 1ha or more, but less than 20ha, of indigenous vegetation, except where such clearance of indigenous vegetation is required for (i) the undertaking of a linear activity, or (ii) maintenance purposes undertaken in accordance with a maintenance management plan. *For the clearance of approximately 6,6ha of indigenous vegetation for establishment of two dams.*
Listing Notice 2	
16	The development of a dam where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5m or higher or where the high-water mark of the dam covers an area of 10ha or more. *For the establishment of two dams with walls of maximum 16m and 20m high, respectively. The water surface area will be less than 10ha (±5,6ha).*
Listing Notice 3	
12(a)ii	The clearance of an area of 300m^2 or more of indigenous vegetation in Limpopo Province, within critical biodiversity areas identified in bioregional plans, except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. *For the clearance of approximately 3,8 – 4 ha of indigenous vegetation in a CBA for the establishment of the "lower dam". (The "upper dam" site, which is anticipated to result in clearing of a further ±2,8ha, is in an ESA.)*

14(iv)(a)(a)ii(ff) 14(xii)(c)(a)ii(ff) 14(iv)(a)(a)ii(hh) 14(xii)(c)(a)ii(hh)	The development of dams, where the dam, including infrastructure and water surface area, exceeds 10m^2 in size; or infrastructure or structures with a physical footprint of 10m^2 or more; where such development occurs within a watercourse or (if no development setback has been adopted) within 32m of a watercourse. Applicable in Limpopo Province, outside urban areas, in critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans. *For development of two instream dams taking up a total of approximately 6,6ha, including water surface area and infrastructure, and one or two pump houses next to the dam(s) with a physical footprint which will likely slightly exceed 10m^2. The lower dam site is located in a CBA 1 and the upper dam site in an ESA2. The nearest points of the upper and lower dam basins will be 2.7km and 3.6km respectively from the boundary of what is indicated as a protected area (Wolkberg Wilderness Area).*

6.1.2. National Water Act (1998)

Water use authorisation is already in place for water abstraction, in the form of Existing Lawful Use (ELU) confirmed by DWS through the Validation and Verification process (refer to Appendix L). A volume of 206 721 m^3/year may be abstracted on this property (source: river) and a further 968 557 m^3/year of abstraction (source: river) on the applicant's adjoining property, some of which is proposed to be pumped into the currently proposed dams for use in irrigation on this site. The authorised volume is sufficient for the proposed new orchards.

A Water Use Licence Application (WULA) has been submitted to DWS in terms of the National Water Act (NWA, Act No. 36 of 1998) for the Section 21(b), (c) and (i) water uses triggered by the proposed dams, as highlighted below:

Table 6.2: Applicable water uses in terms of the National Water Act (1998)

Section	Description of Water Use	Relevant Activity
21(b)	Storage of water	The storing of water in the dams.
21(c)	Impeding or diverting the flow of water in a watercourse.	Impedance of the onsite streams by the establishment of the dams.
21(i)	Altering the beds, banks, course or characteristics of a watercourse.	Alteration of the bed, banks and characteristics of the streams by the establishment of the dams.

Please refer to Appendix L for proof of submission of the WULA to DWS, along with the attendance register from the meeting held with DWS to present the WULA to them, and a trail of e-mail communication with DWS regarding the WULA.

The engineers will also submit a dam safety application to DWS's Dam Safety Office in terms of Section 120 of the National Water Act, as the dam walls will exceed 5m and the capacity will exceed 50 000m^3 each. The dams are expected to be classified as medium size, Category II dams with a low hazard potential rating.

6.2. National Forests Act (1998) and Limpopo Environmental Management Act (2003)

Should specimens be destroyed of any plant species that are protected in terms of the National Forests Act and/or the Limpopo Environmental Management Act (LEMA), permits will be required from the Department of

Agriculture, Forestry and Fisheries (DAFF) and/or LDEDET for the destruction of these plants. This will include plants within the dam basin, as well as plants in other areas that will be disturbed, such as the dam wall, material lay-down areas, or other areas used during construction.

Protected species should be preserved as far as possible. For instance, material lay-down areas or vehicle / machinery access routes should be selected away from identified protected species and large trees.

6.3. Other Legislation

Table 6.3: Other applicable legislation

LEGISLATION	RELEVANT SECTIONS	PERTAINS TO
The Constitution Act (No 108 of 1996)	Chapter 2, Section 24	Bill of Rights: Environmental rights
Conservation of Agricultural Resources Act (1983)	Section 5	Prohibition of the spreading of weeds
Fencing Act (No 31 of 1963)	Section 17	Clearing of bush for fencing
Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (No 36 of 1947)	Sections 3 – 10	Control of the use of pesticides, herbicides and fertilizers, and precautions to protect workers in this regard
Limpopo Environmental Management Act	Schedule 2, 3, 11 and 12	Lists of protected animals and plants
National Environmental Management Act (No 107 of 1998) and regulations (2014)		
National Environmental Management: Air Quality Act (No 39 of 2004)	Section 32	Control of dust
	Section 34	Control of noise
	Section 35	Control of offensive odours
National Environmental Management: Biodiversity Act (No 10 of 2004)	Section 57	Restricted activities involving listed threatened or protected species
	Sections 65–69	Regulation of activities involving alien species
	Sections 71, 73 and 75	Regulation of activities involving invasive species
National Environmental Management: Waste Amendment Act (No 26 of 2014)	Chapter 4, Part 4	Waste management activities
	Chapter 5	Licensing of waste management activities
	Chapter 5	Institutional and planning matters
	Chapter 7	Compliance and enforcement
National Heritage Resources Act (No 25 of 1999)	Section 34	Protection of structures older than 60 years
	Section 35	Protection of archaeological and palaeontological sites and material as well as meteorites
	Section 36	Conservation of burial grounds and graves
National Forests Act (No 84 of 1998), as amended by the Forestry Laws Amendment Act	Section 7	Prohibition on destruction of trees in natural forests
	Sections 12–16	Declaration of trees, groups of trees, woodlands or tree species as protected
	Section 17	Declaration of controlled forest areas

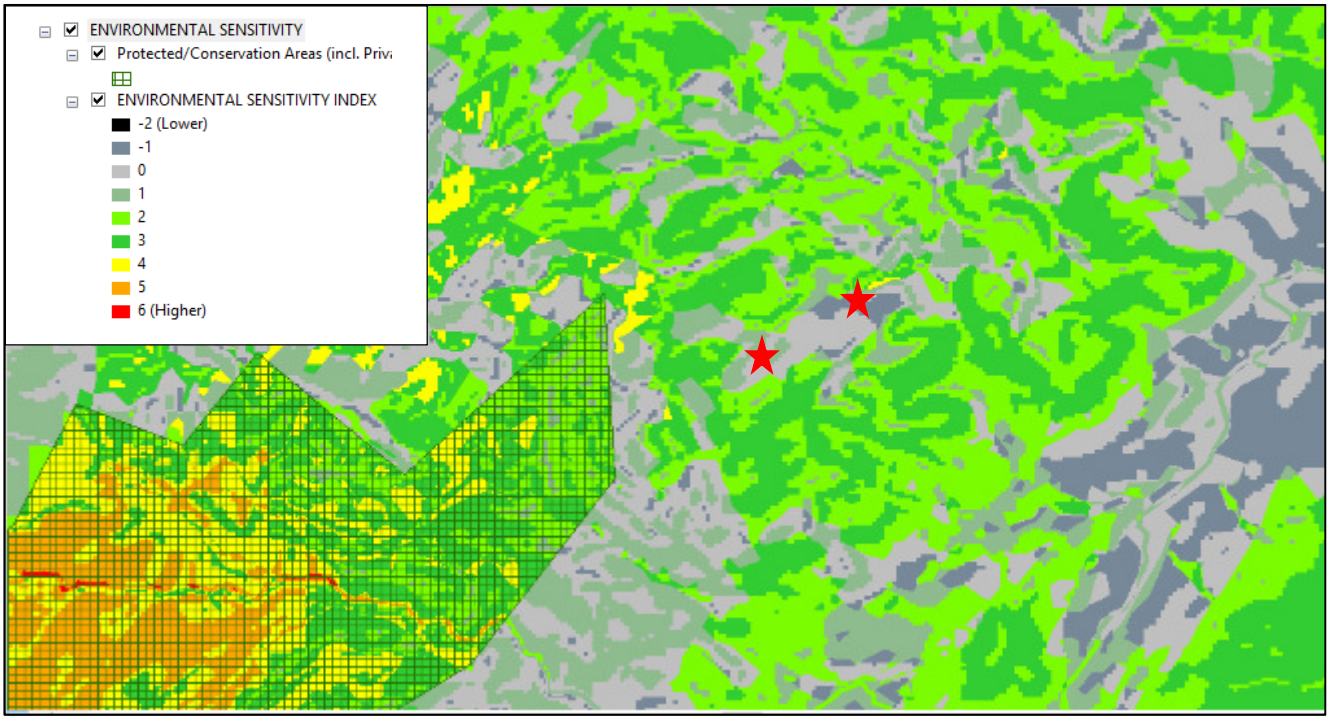
(No 35 of 2005) and Regulations (GN466 of 2009)		
National Water Act (No 36 of 1998)	Section 19	Prevention and remedying effects of pollution, particularly where pollution of a water resource occurs or might occur as a result of activities on land
	Section 20	Control of pollution of water resources following an emergency incident
	Chapter 4 (Sections 21-55)	Governs water use
Mineral and Petroleum Resources Development Act (No 28 of 2002), as amended	Chapter 4	Mining permits and licences; environmental management in borrow pits
Occupational Health and Safety Act (No 85 of 1993)	Section 8	General duties of employers to their employees
	Section 9	General duties of employers and self-employed persons to persons other than their employees

6.4. Municipal and provincial planning tools

6.4.1. Olifants-Letaba Environmental Management Framework

In terms of the Olifants-Letaba Environmental Management Framework (OLEMF) the proposed dam sites fall within an area of lower environmental sensitivity (refer to following map).

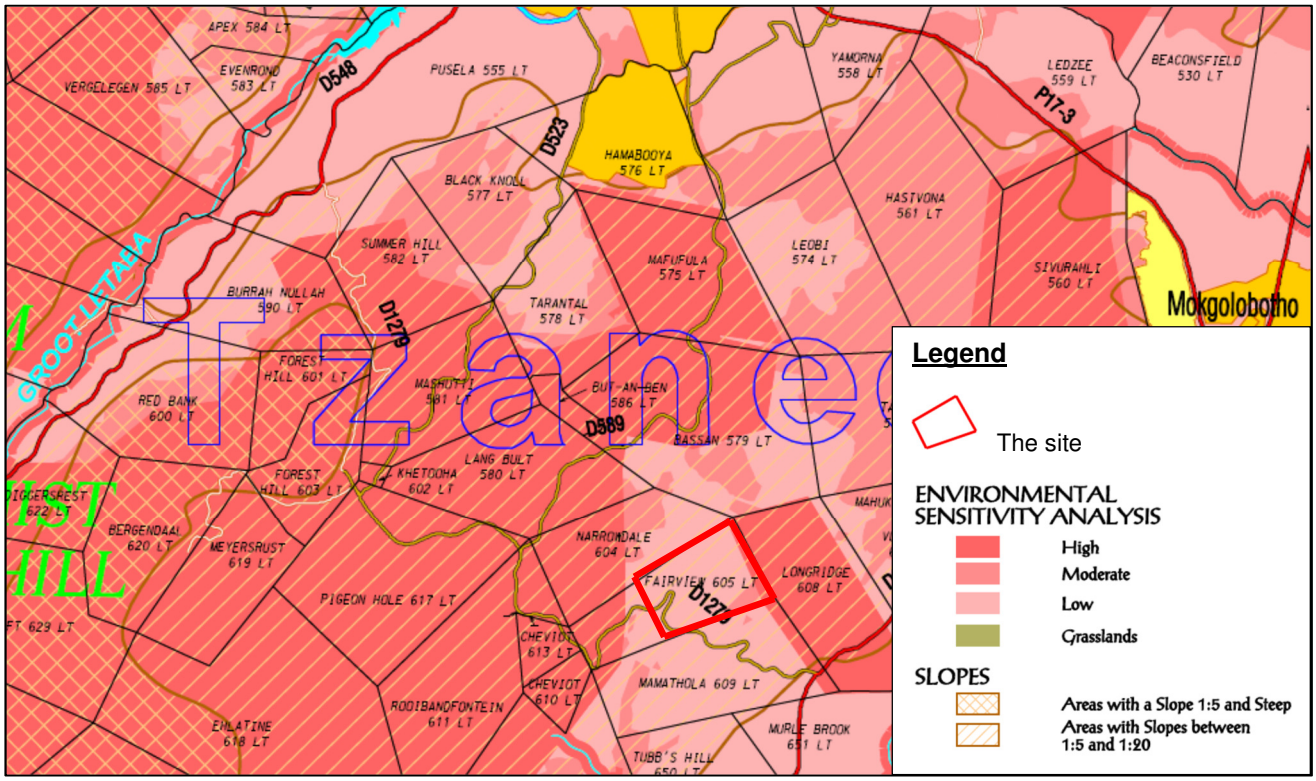
Figure 6.1: Extract from the OLEMF.



6.4.2. Greater Tzaneen Municipality – Integrated Development Plan and Spatial Development Framework

The GTM Spatial Development Framework (SDF, 2008) indicates the site as containing areas of low environmental sensitivity and areas of high sensitivity. It is also indicated as having areas with slopes between 1:5 and 1:20.

Figure 6.2: Extract from GTM SDF (2008)

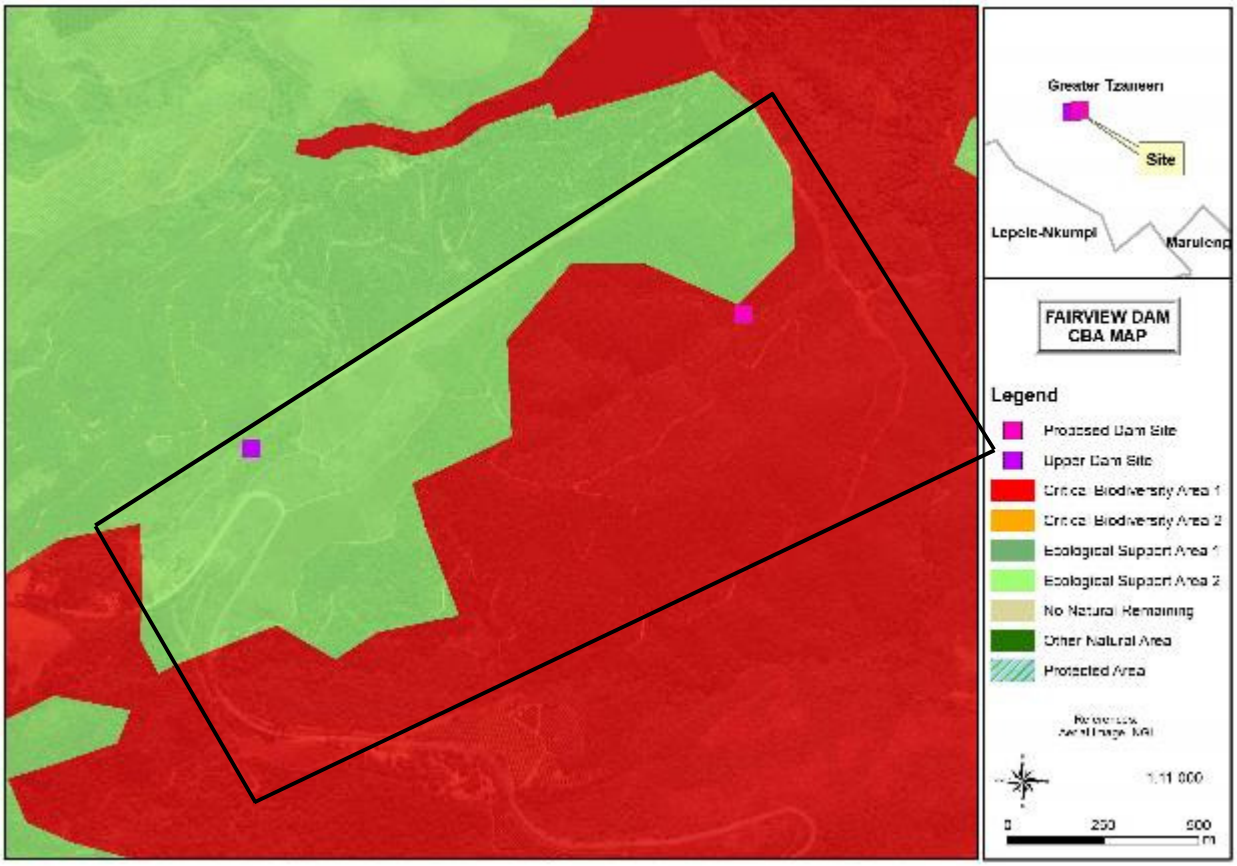


Agriculture forms a significant part of the municipal economy. The GTM Integrated Development Plan (IDP, 2014/2015) indicates that the GTM is the main contributor to the Mopani District's agricultural GDP (Gross Domestic Product), supplying 43% of the district's agricultural GDP.

6.4.3. Limpopo Conservation Plan version 2 (2013)

According to the Limpopo Conservation Plan version 2 (2013), the site is situated partly within an Ecosystem Services Area (ESA2) and partly within a Critical Biodiversity Area (CBA1). The proposed upper dam site is located within an ESA2 and the lower dam site within a CBA1.

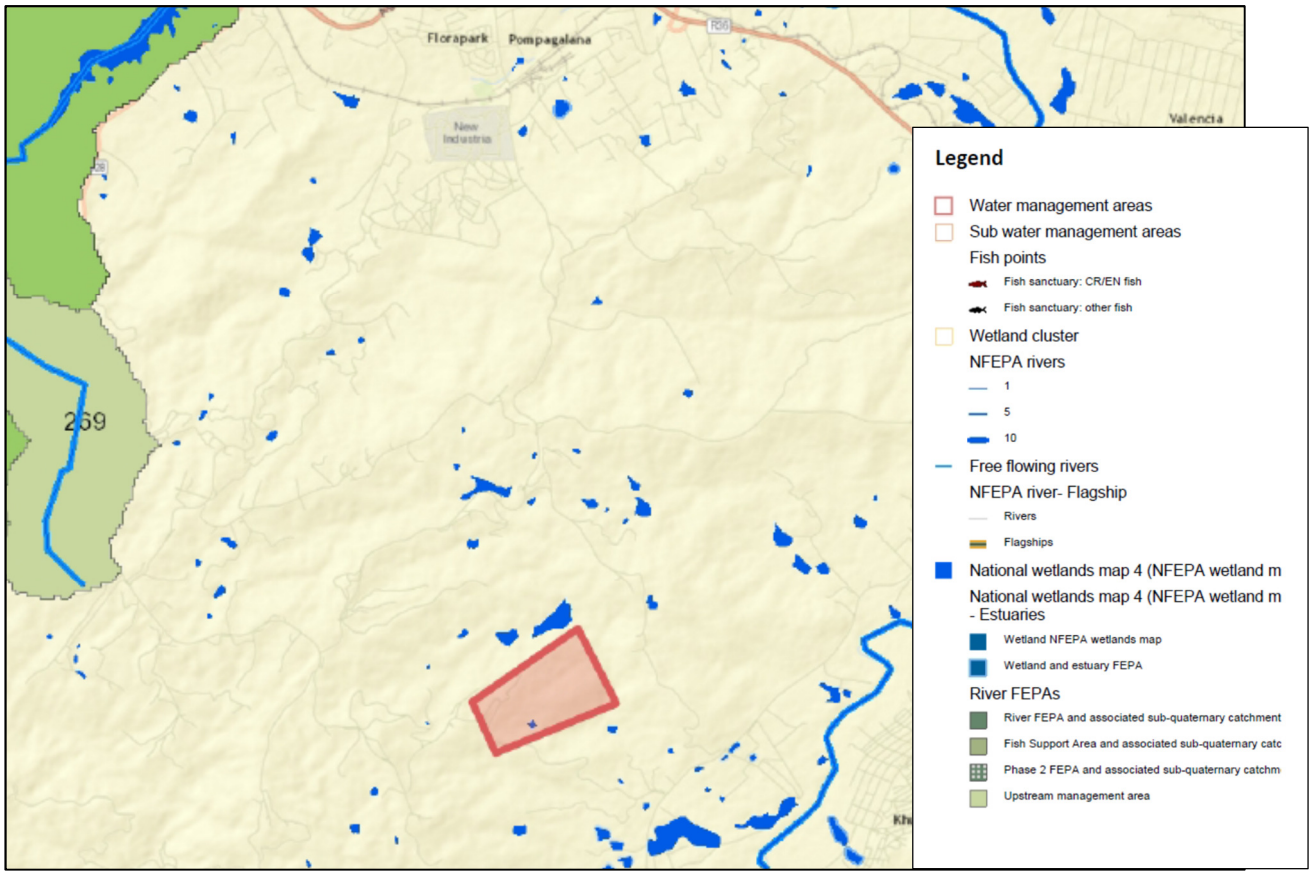
Figure 6.3: Extract from Limpopo Conservation Plan (image: Limosella Consulting, 2016)



6.4.4. National Freshwater Ecosystems Priority Areas

The site does not fall within any Freshwater Ecosystem Priority Areas (FEPAs), though it does contain a possible wetland (this will be investigated in more detail as part of the specialist wetland delineation and functional assessment that Limosella Consulting will be doing for this proposed project during the impact assessment phase).

Figure 6.4: Location of the site in the context of FEPAs



7. IMPACT ASSESSMENT METHODOLOGY

Potential impacts were scored on the following basis:

- **Status:**
  - *Positive* – the proposed project is to have a positive impact in terms of the particular parameter;
  - *Negative* – the proposed project is to have a negative impact in terms of the particular parameter;
  - *Neutral* – the proposed project is to have neither a positive nor a negative impact in terms of the particular parameter.

- **Extent:**
  - *Local* – the impact is to be felt on the site and in its immediate surroundings, up to a radius of 50km from the site;
  - *Sub-regional* – the impact is to be felt at a distance of up to 100km from the site;
  - *Regional* – the impact is to be felt in the Limpopo Province;
  - *National* – the impact is to be felt across provincial boundaries.

- **Duration:**
  Refers to the period of time over which impacts can be expected to be experienced.

  - *Short term* – 0 to 5 years;
  - *Medium term* – more than 5 years, up to 15 years;

- *Long term* – more than 15 years;
- *Permanent* – the impact is irreversible.

- **Magnitude:**
  Refers to the intensity of the potential impact, if it is experienced.

  - *Negligible* – the impact will barely be felt, if at all. No mitigation required;
  - *Low* – the parameter will only be affected to a small extent by the proposed project. No mitigation required, but monitoring is recommended;
  - *Medium* – the parameter will be affected by the proposed project, but functions in terms of the parameter can still continue. Mitigation and monitoring required;
  - *High* – functioning in terms of the parameter will be significantly affected by the impact. Extensive mitigation and long-term monitoring required.

- **Likelihood:**
  - *Improbable* – it is unlikely that the impact will be experienced;
  - *Possible* – the impact may be experienced. Monitoring required; mitigation may also be required based on the type of impact and its significance;
  - *Highly probable* – the impact will most likely be experienced. Monitoring and mitigation required based on the type of impact and its significance in order to reduce the probability of the impact occurring and/or to reduce the magnitude of the impact;
  - *Definite* – the impact will be experienced. Monitoring and mitigation required based on the type of impact and its significance in order to reduce the probability of the impact occurring and/or to reduce the magnitude of the impact.

- **Significance:**
  Significance is based on a consolidation of the anticipated extent, duration, magnitude and likelihood of the potential impact.

  - *Negligible* – The impact will barely be felt, if at all. No mitigation required;
  - *Low* – The parameter will only be affected to a small extent by the proposed project. No mitigation required, but monitoring is recommended;
  - *Medium* – The parameter will be affected by the proposed project, but functions in terms of the parameter can still continue. Mitigation and monitoring required;
  - *High* – Functioning in terms of the parameter will be significantly affected by the impact. Extensive mitigation and long-term monitoring required.

8. BIO-PHYSICAL INVESTIGATIONS

8.1. Climate

8.1.1. Status quo

The site is situated in a sub-tropical summer rainfall area with dry winters. Summers are hot and humid, with an average summer midday temperature of 29.1°C in Tzaneen in January; winters are mild with very rare frost, and the average winter midday temperature is 21.9°C in July. The region experiences its coldest temperatures during July when average evening temperature is 6.3°C.

Tzaneen receives its rainfall predominantly during summer months, averaging 781mm of rain per year. Mean annual rainfall for the catchment, based on the nearest rainfall station (New Agatha) is estimated at 1186mm (Element, 2016).

The average potential mean annual gross evaporation, as measured by A-pan, is about 1 800mm in the mountainous western section of the WMA, where this site is located. The highest A-pan evaporation occurs between October and January, and the lowest in June (Luvuvhu/Letaba ISP, 2004).

January is the month in which the highest rainfall is received, whilst on average in July the lowest rainfall is received. Frost is infrequent but may occur at higher altitudes (Mucina & Rutherford 2006, SA Explorer 2012). The area is not particularly windy.

8.1.2. Potential impacts

The proposed project is not anticipated to have any impact on the local climate, aside from micro-climatic impacts of negligible significance.

The climate may impact on the project in that rain during the construction phase can cause soil erosion, particularly on exposed slopes which have not been stabilised. Rainfall during the operation phase will also determine how quickly the dam will fill.

Table 8.1: Potential impacts in terms of climate

CONSTRUCTION PHASE						
Potential impact	**Status**	**Extent**	**Duration**	**Magnitude**	**Likelihood**	**Significance**
Rain during the construction phase can cause soil erosion, particularly on exposed, unstable slopes, which in turn may lead to siltation of the stream	Negative	Local	Short term	Medium	Highly probable	Low-medium, depending on timing of construction
OPERATIONAL PHASE						
Not anticipated	-	-	-	-	-	-

8.2. Topography, Soils, Agriculture and Geology

8.2.1. Status quo

Topography

The dam sites are located at 882m and 802m above mean sea level (mamsl) respectively, and are located within the steeply undulating Agatha area south of Tzaneen, which forms part of the Wolkberg Mountains. The topography is classified as “mountains and foothills” by the Olifants-Letaba Environmental Management Framework (OLEMF, 2010).

The dam sites are both located in valleys, on non-perennial drainage lines.

Soils

The dominant soil class associated with the study site is S2, Fa 301, Ea 87 and Ab 95, which may have restricted depth and excessive drainage. S2 soils have low natural fertility and high erosion potential (Limosella 2016). This soil class extends across approximately 55.5% of the Limpopo Province (Limosella 2016). The soil of the study area and surroundings are summarised in the table below:

Table 8.2: Soils associated with the proposed project site

Soil Class (ARC, 2013)	Soil Description (AGIS 2015; ENPAT 2015)	Relation to wetlands
Fa 301	Glenrosa and/or Mispah forms (other soils may occur), lime rare or absent in the entire landscape. Leucocratic biotite-granite.	Glenrosa soil form is described as a potential seasonal to temporary wetland soil. This soil form is characterised by a surface horizon which is maintained by biological activity and underlying rock or saprolite. Saprolite refers to a horizon of weathering rock which still has distinct affinities with the parent rock.
Ab 95	Red-yellow apedal, freely drained soils; red, dystrophic and/or mesotrophic as well as Pink and grey leucocratic biotite-granite; also granitic gneiss.	None.
Ea 87	One or more of: vertic, melanic, red structured diagnostic horizons, undifferentiated. Diorite and gabbro of the Rooiwater Complex.	None.

Agriculture

The Letaba River Catchment – and in particular the Groot-Letaba sub-area within which this site is located – is a highly productive agricultural area, and agriculture is the base of the regional economy. Permanent fruit crops (such as are planned for this site and is also prevalent in the surrounding area) constitute approximately 47% of cultivation (Luvuvhu/Letaba ISP, 2004).

The Agatha area around the site is widely used for commercial agriculture and timber. The affected property was previously utilised for timber production and is proposed in future to be utilised for avocado and macadamia nut production. The proposed dam sites are not agriculturally viable areas as they are located within and directly surrounding drainage areas, which are inaccessible for agriculture. The dams themselves would however contribute to agricultural production as they will play a crucial role in the irrigation of the orchards.

Geology

The area is generally underlain by the potassium-poor gneisses of the Goudplaats gneiss (Swazian Erathem) and an Archaean granite dyke underlies most of the area. Shales and quartzite of the Wolkberg Group are present but not common (Mucina & Rutherford, 2006).

The Olifants-Letaba EMF indicates the general area as being underlain by Archaean granite and Gneiss basalt complex, which are the oldest exposed rock formations in the area. It forms the basement rock complex for other rock systems, and consists mainly of old Granite and Gneis formations and primitive groups of schistose rocks including metamorphosed sediments such as phyllites, banded ironstone, quartzite, conglomerate and

limestone, together with rocks of igneous origin such as amphibolites, greenstone lavas, and chlorite-schists (Olifants-Letaba EMF, 2010).

8.2.2. Potential impacts

Topography

The topography will be slightly altered through the excavation of soil from within the dam basin for construction of the dam walls. This is anticipated to be of low significance, as the excavated area will in any case be inundated after completion of construction.

Soils

Potential acceleration of soil erosion is likely to occur on a short-term basis that is expected to be limited largely to the construction phase, when earthworks and clearing of vegetation takes place.

Agriculture

The inundation of the dam basins will make the affected areas unusable for agriculture. However, this area was not previously used for agriculture, and it is unlikely that it would be used for agriculture in future due to steep slopes, presence of watercourses and inaccessible terrain. The project is therefore *not* expected to sterilize usable agricultural land. Furthermore, the establishment of the proposed dam is anticipated to *improve* agricultural production on the rest of the property by ensuring greater security of irrigation water and thereby unlocking the agricultural potential of the property.

Geology

No geological impacts are anticipated.

Potential impacts that may be associated with topography, soils, agriculture and geology are summarised in the following table:

Table 8.3: Potential impacts in terms of topography, soils, agriculture and geology

CONSTRUCTION PHASE						
Potential impact	**Status**	**Extent**	**Duration**	**Magnitude**	**Likelihood**	**Significance**
Soil erosion and associated siltation downstream	Negative	Local	Short term	Medium	Highly probable	Low-medium (depending on timing of construction)
Alteration of topography within dam basins	Negative	Local	Long term	Low-Medium	Highly probable	Low
OPERATIONAL PHASE						
Contribution to unlocking the agricultural potential of the property by providing irrigation security	Positive	Local	Long term	Medium	Highly probable	Medium

8.3. Surface hydrology and wetlands

The following information was obtained from the wetland/riparian delineation and functional assessment report compiled by Limosella Consulting (2016).

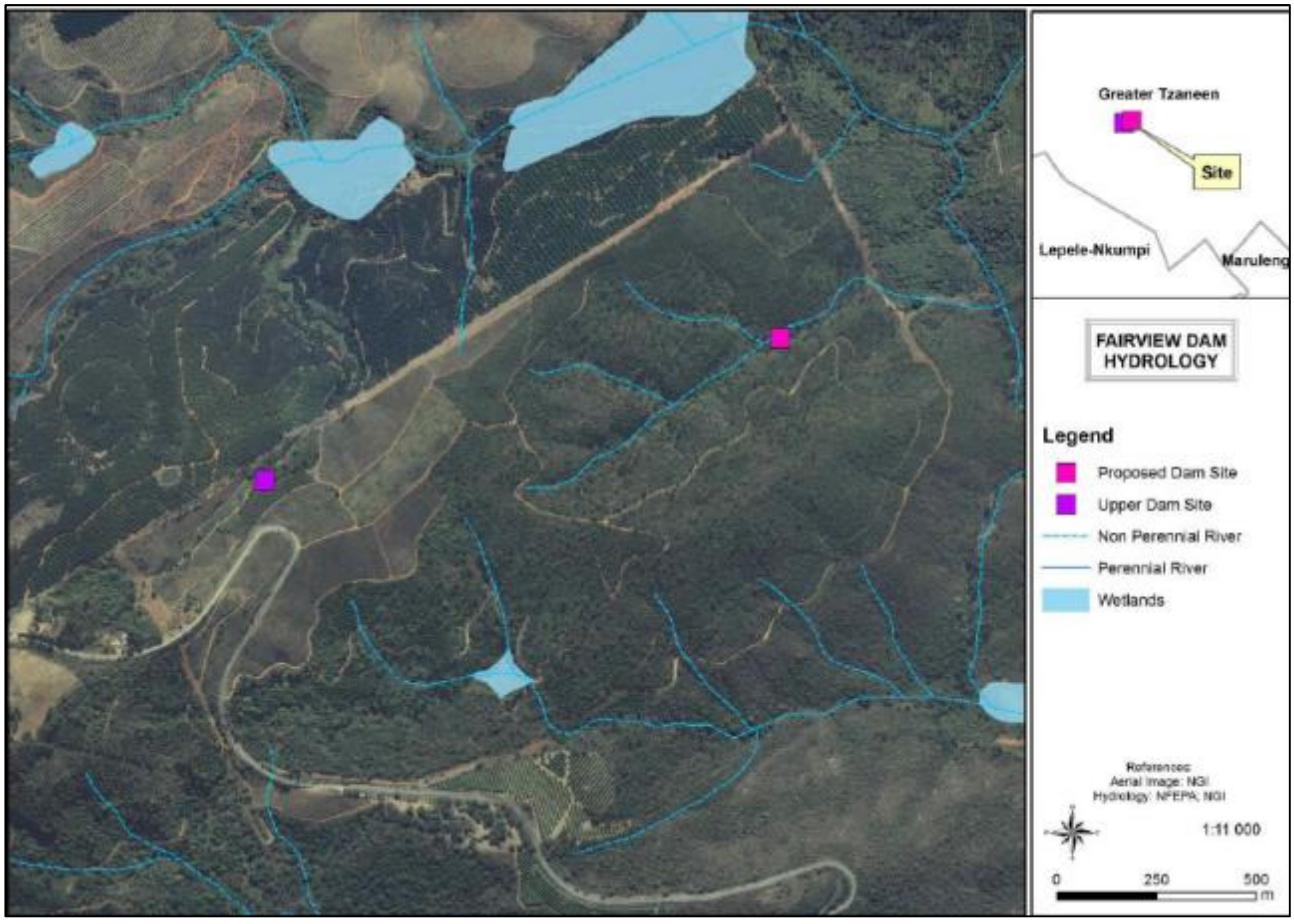
8.3.1. *Status quo*

Surface hydrology

The proposed project site is located in the upper slopes of the surrounding catchments within the B81D Quaternary Catchment which forms part of the Groot Letaba Sub Area of the Luvuvhu and Letaba Water Management Area (WMA). Major rivers within this WMA include the Mutale, Luvuvhu and Letaba Rivers. In this specific catchment, the precipitation rate is lower than the evaporation rate with a Mean Annual Precipitation (MAP) to Potential Evapotranspiration (PET) of 0.46. Consequently, watercourses in this area are sensitive to changes in regional hydrology, particularly where their catchment is transformed and the water available to sustain them becomes redirected.

Surface water spatial layers such as the National Freshwater Ecosystems Priority Areas (NFEPA) Wetland Types for South Africa (SANBI, 2010) reflect the presence of several perennial and non-perennial rivers on and around the proposed site. The proposed site of the Lower Dam is located within a non-perennial river whilst the proposed Upper Dam site is most likely located within a storm drainage area. The area is characterised by numerous non-perennial streams and farm dams (Figure 8.1.).

Figure 8.1: Hydrology of the proposed dam sites (Limosella 2016). Centres of dam walls indicated.



Wetlands

Numerous watercourses were recorded on the proposed project site and surroundings. The main focus of the wetland assessment was on the areas where the two dams are proposed to be constructed whilst extrapolation was used for the rest of the wetlands in the remaining area. Overall five seepage areas, one unchannelled valley bottom wetland and one perennial riparian area were recorded on the study site (Figure 8.2). The unchannelled valley bottom and seepage area 1 were the main focus of the study due to the proposed dams located in these two watercourses. The seepage areas in this area are the headwaters and the origin of the larger unchannelled valley bottom wetlands downstream. The seepage wetlands are located on steep slopes and some are only seasonally inundated. The watercourses are classified up to level 6 according to the SANBI guidelines (Ollis et al, 2013).

Table 8.4: Level 1- 4 classification of the wetlands recorded on the study site (adapted from Ollis *et al,* 2013).

Level 1: System Type	**Level 2: Regional Setting**	**Level 3: Landscape Setting**	**Level 4: HGM Unit**		
System	**DWA Ecoregion**	**Landscape Unit**	**Level 4A:Wetland Type**	**Level 4B: Longtitudinal zonation**	**Level 4C: Inflow drainage**
Inland	North Eastern Highlands	Valley Floor	Unchannelled Valley Bottom	n/a	n/a
		Slope	Seepage Area 1	Without Channelled Outflow	n/a
			Seepage Area 2	Without Channelled Outflow	n/a
			Seepage Area 3	Without Channelled Outflow	n/a
			Seepage Area 4	Without Channelled Outflow	n/a
			Seepage Area 5	Without Channelled Outflow	n/a
		Valley Floor	Perennial Riparian Area	Lower Foothills	n/a

Table 8.5: Level 5 classification of the wetlands recorded on the study site (adapted from Ollis *et al*, 2013).

Level5: Hydroperiod and depth of inundation							
Level 5A	**Proportional Rating (0-6) for wetlands on site**						
Inundation Peroid							
	Unchannelled Valley Bottom	Seepage Area 1	Seepage Area 2	Seepage Area 3	Seepage Area 4	Seepage Area 5	Perennial Riparian Area
Permanently Inandated	4	0	0	0	0	0	5
Seasonally Inandated	3	4	4	4	4	4	3
Intermittently Inandated	3	4	4	4	4	4	2
Never/Rarely Inandated	2	2	2	2	2	2	1
Unknown							
Level 5A	**Proportional Rating (0-6) for wetlands on site**						
	Saturartion periodicity (within 50 cm of the soil surface)						
Permanently Inandated	3	0	0	0	0	0	5
Seasonally Inandated	2	3	3	3	3	3	3
Intermittently Inandated	1	5	5	5	5	5	3
Never/Rarely Inandated		3	3	3	3	3	2
Unknown							
	Level 5C: Inundation depth-class						
	n/a	n/a	n/a	n/a	n/a		
							n/a

Table 8.6: Level 6 classification of the wetlands recorded on the study site (adapted from Ollis *et al,* 2013).

Component	Dominant categories for selected descriptorss (Level 6)							
	Natural vs Artificial		Substratum Type	Vegetation Cover, Form and Status				
	6A: NAtural vs Artificial	6B: Artificial Categories	6A: Primary Categories	6A: Vegetation Cover	6B: Primary Vegetation Cover	Detailed Vagetation From		6E: Vegetation Status
						6C: Herbaceous Vegetation	6D: Forest Vegetation	
Unchannelled Valley Bottom	Natural	N/A	Sandy Loam	Vegetated	Herbaceous	Grasses & sedges	n/a	Exotic
Seepage Area 1	Natural	N/A	Alluvial Deposits	Vegetated	Forest	Herbs/Forbs	Riparian Forest	Exotic
Seepage Area 2	Natural	N/A	Alluvial Deposits	Vegetated	Forest	Herbs/forbs	Riparian Forest	Exotic
Seepage Area 3	Natural	N/A	Alluvial Deposits	Vegetated	Forest	Herbs/forbs	Riparian Forest	Exotic
Seepage Area 4	Natural	N/A	Alluvial Deposits	Vegetated	Forest	Herbs/forbs	Riparian Forest	Exotic
Seepage Area 5	Natural	N/A	Alluvial Deposits	Vegetated	Forest	Herbs/forbs	Riparian Forest	Exotic
Perennial Riparian Area	Natural	Natural	Boulders & Bedrock	Vegetated	Forest	Reeds	Riparian Forest	Exotic

The combined **Present Ecological Status (PES)** score for the wetlands on the study site is **C – Moderately modified**. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact (Table 8.7).

Figure 8.2: The results of the wetland delineation of the proposed dam sites (Limosella 2016)

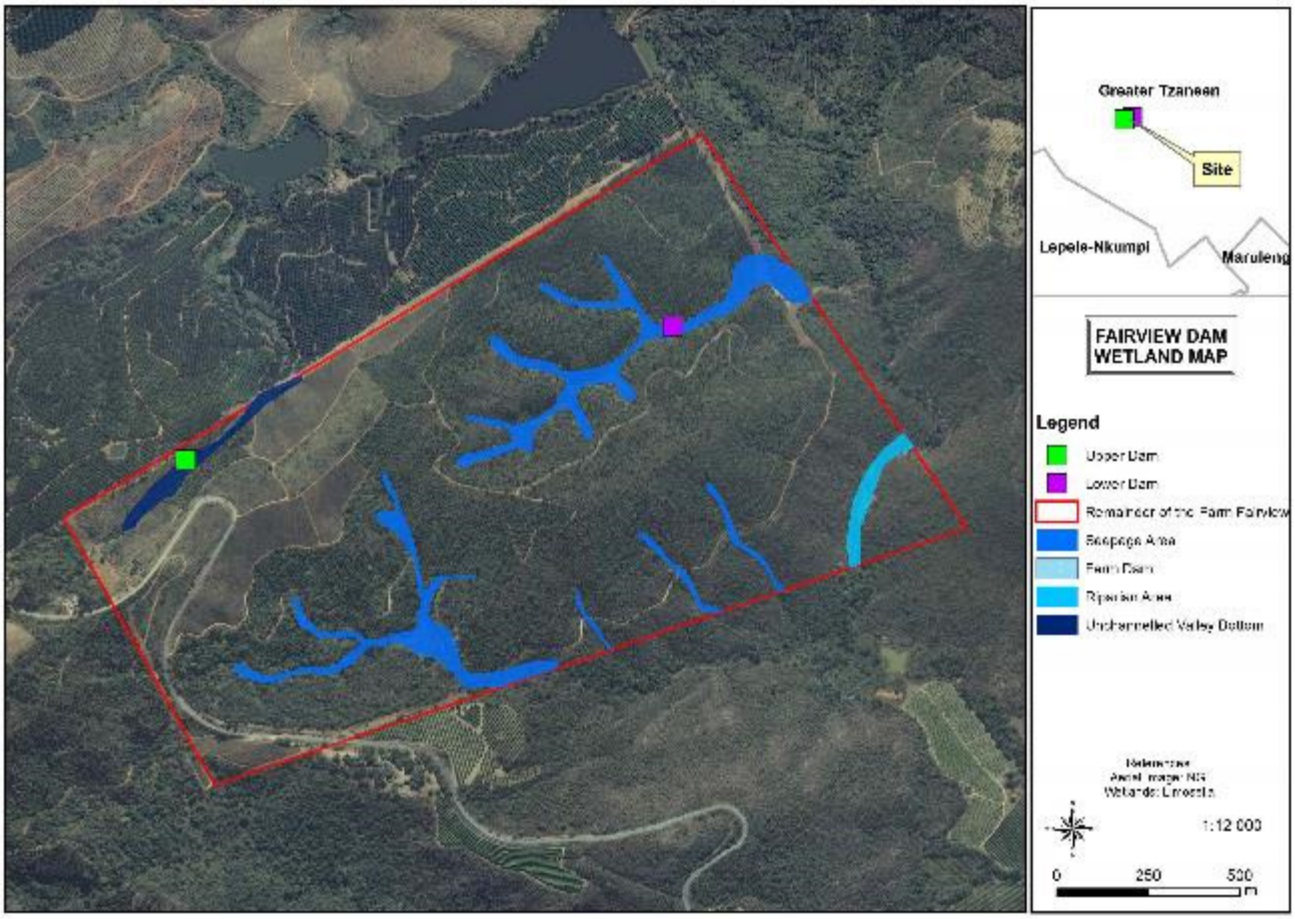


Table 8.7: Summary of hydrology, geomorphology and vegetation health assessment for the wetlands located on the proposed dam sites (Limosella 2016)

Wetland Unit	Ha	Hydrology		Geomorphology		Vegetation		Overall Health Score	
		Impact Score	Change Score	Impact Score	Change Score	Impact Score	Change Score	Impact Score	Change Score
Unchannelled Valley Bottom	1.89	3.2	0	3.9	0	4.9	0	3.9	0
PES Category and Projected Trajectory		C	→	C	→	D	→	C	→
Seepage Area 1	6.72	1.6	0	1.8	0	4.1	0	2.3	0
PES Category and Projected Trajectory		B	→	B	→	D	→	C	→

Table 8.8: Summary of the PES of the wetlands on site.

Score	Comment
C	• Reduction in flows due to plantations and fruit orchards • Eucalyptus plantations • Exotic shrubs and woody vegetation • Downstream dams • Increased hardened surfaces In catchment such as roads • Vegetation clearing • Increased bare soil in catchment • Some depositional features • Altered fire regime • Commercial plantations • Dense exotic vegetation patches • Sediment deposition • Old / abandoned lands
C	**Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact**

The **Ecological Importance and Sensitivity (EIS)** score is 1.6 for the unchannelled valley bottom wetland and 1.9 for the Seepage Area 1. Both wetlands thus fall into the Moderate EIS category. Wetlands in this category are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modification. They do however play a small role in moderating the quantity and quality of water in major rivers (DWAF, 1999). The Recommended Ecological Management Class for these wetlands is thus a C. Details for the components assessed in the combined EIS score are presented in the full wetland report under Appendix D.

Table 8.9: Combined EIS scores obtained for the wetland system on the study site. (DWAF, 1999).

WETLAND IMPORTANCE AND SENSITIVITY	Importance	Confidence
Ecological importance & sensitivity	2.3	3.0
Hydro-functional importance	1.6	2.5
Direct human benefits	0.8	3.0
Overall EIS score	**1.6**	

Table 8.10: Combined EIS scores obtained for the wetland system on the study site. (DWAF, 1999).

WETLAND IMPORTANCE AND SENSITIVITY	Importance	Confidence
Ecological importance & sensitivity	3.3	3.0
Hydro-functional importance	1.9	2.5
Direct human benefits	0.5	3.0
Overall EIS score	**1.9**	

It is recommended that aquatic and vegetation specialists provide baseline information regarding the risk of loss of conservation-worthy vegetation, or potential fish habitat, as well as providing input regarding mitigation and monitoring for potential water quality impacts.

8.3.2. *Potential impacts*

The construction of dams has numerous environmental impacts. According to Tahmiscioğlu *et al,* (2011) and Manatunge *et al,* (2010) (both quoted in Limosella 2016) the following positive and negative effects are associated with the construction of dams:

- Decreased sediment transfer within the wetland system.
- Decreased sediment transfer restricts the egg laying zone of fish
- Disruption of species migration within the stream.
- The areas that will be under water from the dam are lost.
- Deterioration of water quality due to the decomposition of fauna and flora in the water.
- Decreased water quantity downstream leading to biodiversity changes.
- Negative effects associated with the construction process.
- Narrowing of channel may lead to vegetation overgrowth.
- A rise in evaporation may be expected as a result of the increase in the water surface area.

Certain impacts can be seen as either positive or negative, depending on the perspective. Alteration of the hydrological regime from non-perennial to a more constant flow due to the dams may pose negative environmental impacts to a system adjusted to a non-perennial stream, but downstream water users may see it as a positive impact due to more reliable water availability throughout the year (flow from the dam will be maintained through outlet pipes, to ensure continued water availability to downstream registered water users and for the ecological reserve).

Similarly, inundation of areas of wetlands and free-flowing streams will bring about changes to the system, which may be negative to the local ecology which is adjusted to non-perennial water availability, but could pose positive impacts in terms of habitat creation for water-loving species such as birds, which may now be attracted to the site.

The agricultural development associated with the proposed dams may furthermore pose the following risks:

- Potential contamination of watercourses by agricultural chemicals, or eutrophication through runoff of excess nutrients.
- Soil erosion and siltation of watercourses, particularly during clearing and soil preparation, before orchards and vegetation between rows of trees have been established.
- Increased water abstraction – current abstraction is less than the volume authorised as ELU, but if and when the agricultural development is undertaken and the dams constructed (increasing onsite storage capacity) abstraction will increase, albeit only up to the authorised volume.

Recommended mitigation measures will also be incorporated into the detailed EMPR in the impact assessment phase.

Table 8.4: Potential impacts in terms of surface hydrology and wetlands

CONSTRUCTION PHASE						
Potential impact	**Status**	**Extent**	**Duration**	**Magnitude**	**Likelihood**	**Significance**
Compaction of wetland soil around the site if vehicles / machinery enter these areas	Negative	Local	Short term	Very low	Possible	Low
Disturbance of aquatic fauna and flora by construction activities	Negative	Local	Short term	Low-medium	Highly probable	Low
Ingress of foreign matter into streams and wetlands, with concomitant impacts on fauna and flora	Negative	Local	Short term	Unknown	Possible	Low
OPERATIONAL PHASE						
Increased water abstraction, though still within existing allocation from DWS	Negative	Local	Long term	Low	Highly probable	Medium
Fragmentation of wetland and destruction of portions thereof	Negative	Local	Long term to permanent	Low	Definite	Medium
Change in hydrological regime from non-perennial to a more constant stream flow released downstream of the dam, and conversion of streams at dam sites from free-flowing to standing water.	Negative / Positive	Local	Long term	Medium	Highly probable	Low-medium
Intercepting sediment load and preventing its transport downstream	Negative	Local	Long term	Medium	Highly probable	Medium
Creation of habitat for water-loving birds and other fauna.	Positive	Local	Long term	Low-medium	Highly probable	Low-Medium
Deterioration in water quality downstream due to associated agricultural activities	Negative	Local to sub-regional	Long term	Unknown	Possible	Low-Medium

8.4. Ecology

8.4.1. Status quo

The following information was gleaned from the ecological specialist report compiled by Bateleur Environmental Services (2016).

Vegetation type

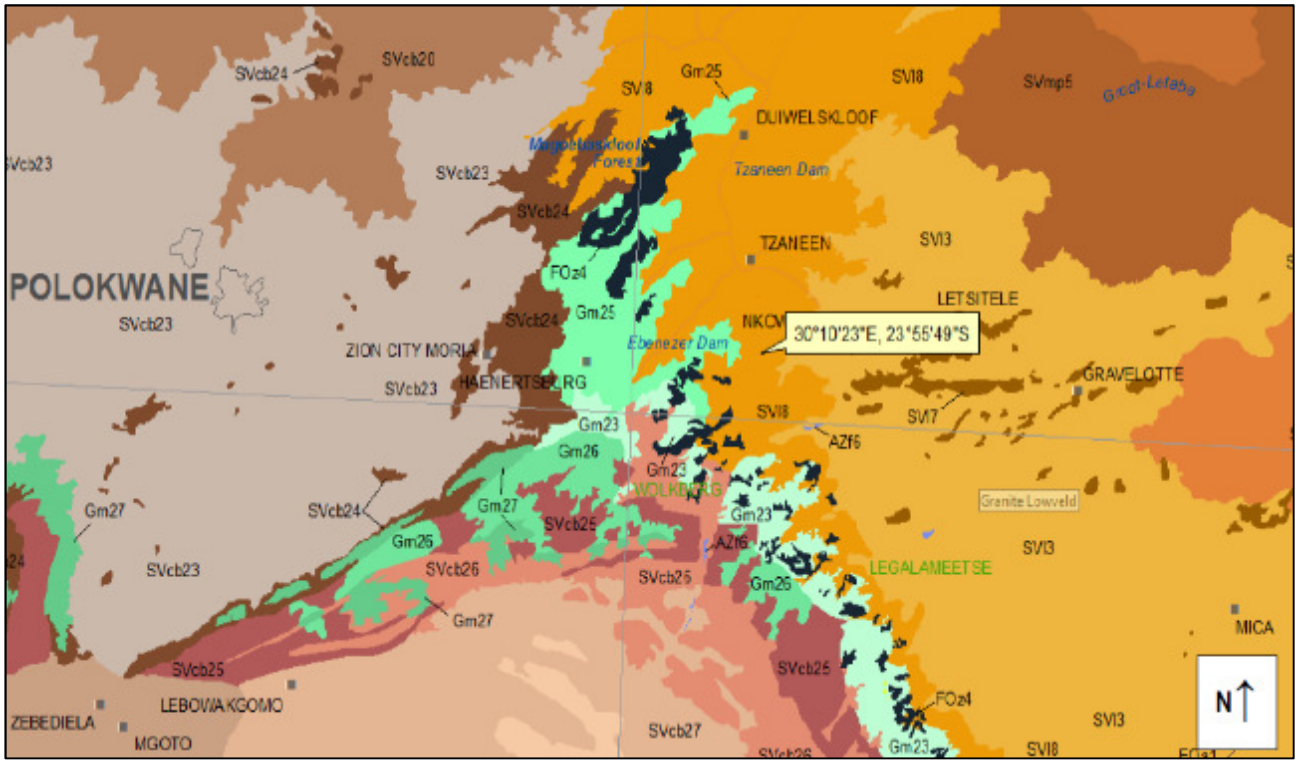
The proposed location forms part of the Savannah Biome and more specifically within the SVI 8 Tzaneen Sour Bushveld vegetation unit, according to Mucina and Rutherford (2006).

The Tzaneen Sour Bushveld forms a band extending along the foot-slopes and hills of the north-eastern escarpment, from the Soutpansberg Mountains in the north via Tzaneen and narrowing to the Abel Erasmus

Pass area in the south. It is characterised by deciduous, tall open bushveld (parkland) with a well-developed, tall grass layer, occurring on the low to high mountains with undulating plains mainly at the base of, and on the lower to middle slopes of the north-eastern escarpment (Mucina & Rutherford, 2006).

The vegetation unit has a conservation status of Endangered and a targeted conservation percentage of 19%. Only a little over 1% is statutorily conserved, almost all in the Lekgalameetse Nature Reserve, and about 2% conserved in private Nature Reserves such as the Selati Game Reserve and the Wolkberg (Serala) Wilderness Area. About 41% is transformed mainly because of cultivation (29%) and plantations (9%). The higher-lying parts of this unit have been heavily afforested with tree plantations while the lowerlying areas are under agricultural and horticultural crops. Scattered alien plants include *Solanum mauritianum, Melea azedarach* and *Caesalpinia decapetala*. The subtropical climate is conducive to the spread of *Cromolaena odorata, Lantana camara* and *Psidium guajava* (Mucina & Rutherford, 2006).

Figure 8.2: Reference map of site location within the Tzaneen Sour Bushveld (SVI 8) Vegetation Type (Mucina & Rutherford, 2006)



Important taxonomy within the vegetation includes (Mucina & Rutherford, 2006):

Tall Trees:
Pterocarpus angolensis, Sclerocarya birrea subsp. caffra.

Small Trees:
Acacia polyacantha, Albizia versicolor, Ficus sansibarica, Parinari curatellifolia, Piliostigma thonningii, Pterocarpus rotundifolius, Trichillia emetica, Acasia davyi, Acasia sieberiana var. woodii, Antidesma venosum, Catha edulis, Faurea richetiana, Faurea saligna, Ficus burkei, Ficus petersii, Heteropyxis natalensis, Peltrophorum africanum, Terminalia sericea, Vernonia colorata.

Tall Shrubs:
Olea europaea subsp. africana, Pseudarthria hookeri var. hookeri, Rhus pentheri, Triumfetta pilosa var. tomentosa.

Low Shrubs:
Agathisanthemum bojeri, Barleria elegans, Dicliptera clinopodia, Flemingia grahamiana, Indigofera filipes, Polygala producta.

Woody Climbers:
Bauhinia galpinii, Pterolobium stellatum.

Graminoids:
Cybopogon caesius, Cybopogon nardus, Hyparrhenia cymbaria, Hyparrhenia poecilotricha, Hyperthelia dissolute, Alloteropsis semialata subsp. semialata, Andropogon schirensis, Bothrocloa bladhii, Monocymbium ceresiiforme, Paspalum scrobiculatum, Schizachyrium sanguineum, Themeda triandra.

Herbs:
Waltheria indica.

Vegetation units on site

Five survey sites were identified according to the aerial photograph using the homogenous stratification method. The sites were assessed for floral species, tree, forbs, sedge, grass and aquatic species which were recorded. From this data the vegetation unit map was compiled for the study area. Please refer to the following figure, which should be read with the comments on the vegetation units below:

- *Vegetation Unit 1:* Site number one on the vegetation unit map of the area comprises of a mix of exotic invaders, escaped forestry species and indigenous vegetation. The site is severely transformed by the invasive exotic species, making the almost thicket like vegetation structure to be impenetrable. The undergrowth is covered by species such as *Lantana camara* and *Chromolaena odorata,* while the tree line is dotted with *Eucalyptus sp*. The grass layer in this site is non-existent with only certain species such as *Setaria megaphylla* found in higher frequencies on road verges and patched areas left open by alien invasives. The forbs layer is comprised of a large number of invasive species. One protected tree species *Catha edulis* / Bushman's tea was found within this site. The **lower dam** site is located within this unit.

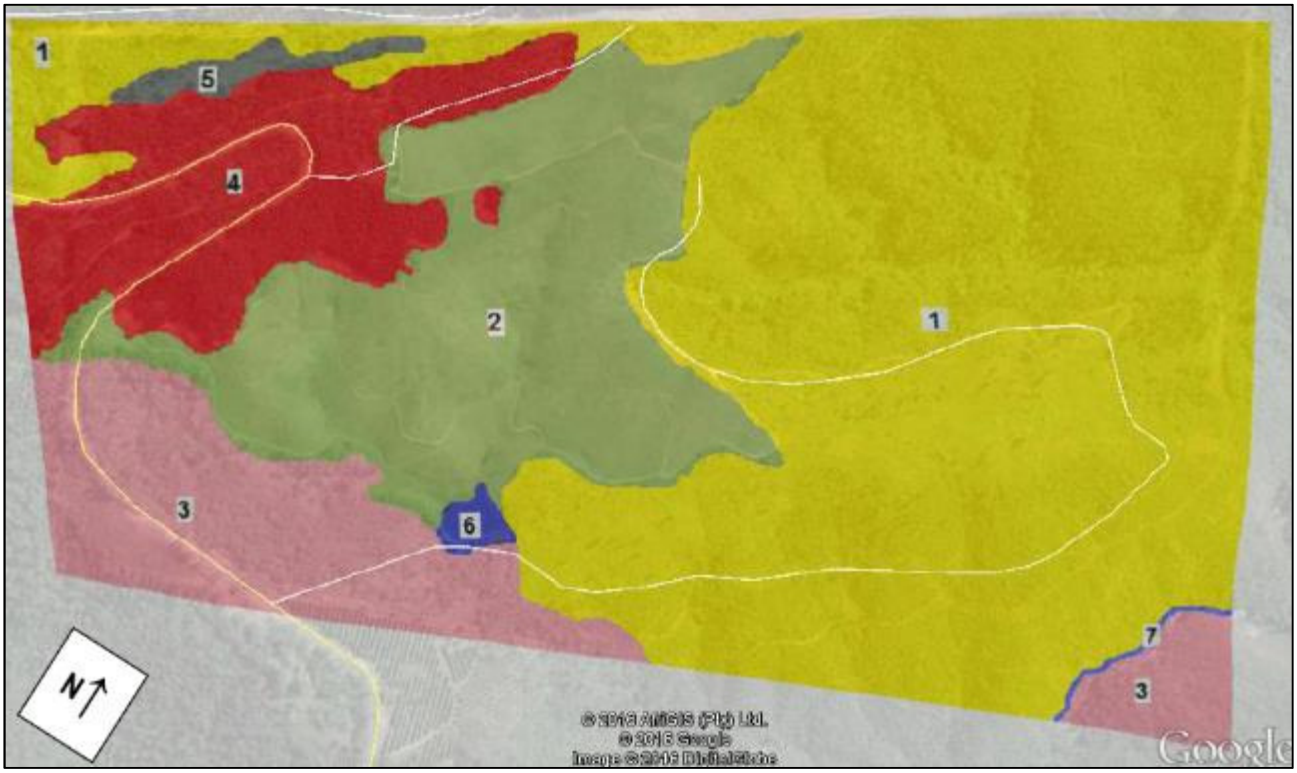
- *Vegetation Unit 2:* Site number two has been recently cleared using a bulldozer for the purpose of agriculture, thus the species recorded were very limited as the majority of this site was bare ground. Numerous newly germinating plants could be seen, but at the time of the study they were in an unidentifiable state.

- *Vegetation Unit 3:* Survey site number 5, which falls within vegetation unit number 3, represents the vegetation unit which is in the best ecological state of all the units in the study area. The frequency of invasive and exotics is low and these species are mainly confined to the road verges and disturbed areas on the borders of this vegetation unit. The vegetation can be described as a thicket and in some places almost forest like structure, with closed canopies and bare ground underneath. Limited sunlight penetration makes for low recordings of herbaceous species. This site is in a semi natural state.

- *Vegetation Unit 4:* This site was surveyed as site number three and falls within vegetation unit four. The vegetation on this site comprises of *Eucalyptus sp.* and is used for forestry (timber) farming purposes. The unit is a monoculture of Eucalyptus with only a small amount of other species being recorded as present; these other species represent themselves mainly in the form of young saplings and forbs.

- *Vegetation Unit 5:* Vegetation unit five was classified as a wetland, this vegetation unit starts off as a drainage line and the transforms into a wetland with water logged soils with sedge species *Cyperus dives* and *Schoenoplectus corymbosus* yielding the highest frequency of species recorded. The **upper dam** site is located within this unit.

Figure 8.4: Vegetation unit map of the Remainder of the farm Fairview 605-LT (Bateleur Environmental Services 2016)



The current state of the vegetation on site ranges from semi-natural to severely degraded, mostly attributed to the large area (site 2 as per the map above) which has already been cleared for agriculture, and the heavy infestation of alien invasive plants in sites 1 and 4 (as indicated on the map above). Only one protected tree (*Catha edulis* / Bushman's tea) was found at site 1, with no protected forb or grass species found on the site as a whole. Another protected tree (*Sclerocarya birrea* subsp. *caffra*, Marula) may also occur. Plant species onsite are on par with what could be expected in the area, with the exception of the abundant presence of alien invasive plants.

Table 8.12: List of protected plant species potentially occurring onsite

Scientific name	Common Name	Conservation Status	Probability of Occurrence
Catha edulis	Bushman's Tea	Protected	High (North-western corner of site)
Sclerocarya birrea	Marula	Protected	High (North-western corner of site)

Fauna

By studying the habitat of the site, one could with fair accuracy determine the species which would occur on site. Due to the site being somewhat degraded ecologically, no evidence of larger mammal species was found. The potential of any protected species occurring on site is very low, as the preferred habitat of these species has been largely fragmented and disturbed. Please refer to the more detailed species lists contained in the attached Ecological Assessment Report, which includes a probability rating regarding the occurrence of fauna species. Please refer to the table below for a list of protected faunal species that may occur onsite, although the likelihood of most of them occurring on this site is considered to be low.

Table 8.13: List of protected faunal species potentially occurring onsite

Scientific name	Common Name	Conservation Status	Probability of Occurrence
Invertebrates			
Harpactira spp.	Common Baboon Spider	Protected	Low
Opisthacanthus spp.	Creeping Scorpion	Protected	Low
Opistophthalmus spp.	Burrowing Scorpion	Protected	Low
Amphibians			
Pyxicephalus adspersus	Giant Bullfrog	Near threatened	Med - Low Prefers grassy pans, vleis and other depressions in open / flat areas
Mammals			
Mellivora capensis	Honey Badger	Protected	Low
Reptiles			
Python natalensis	African Rock Python	Protected	Low
Birds			
Necrosyrtes monachus	Hooded Vulture	Critically endangered	Low
Gyps coprotheres	Cape Griffon Vulture	Endangered	Low
Gyps africanus	White-backed Vulture	Critically endangered	Low
Aquila rapax	Tawny Eagle	Endangered	Low
Terathopius ecaudatus	Bateleur	Endangered	Low
Polemaetus bellicosus	Martial Eagle	Endangered	Low
Trigonoceps occipitalis	White-headed Vulture	Critically endangered	Low

Although the desktop study showed promise for a wide variety of faunal species to occur on site, very few signs were found of faunal species. This can be attributed to the already diminished habitat. Although some endangered / protected species may occur on the site, the habitat doesn't lend itself to the inhabitation of these species, which are mostly quite selective and particular, and prefer more pristine habitats. The likelihood of the protected species listed above actually occurring on the site is therefore low.

The site falls within the **Wolkberg Forest Belt Important Birding Area** (IBA), an internationally recognised IBA which is known to support species of conservation concern, such as the Bat Hawk (*Macheiramphus alcinus*), which breeds in plantations and forest reserves in the IBA. Peregrine Falcon (*Falco peregrinus*) occurs on the mountain cliffs. There are also resident populations of both the Martial Eagle (*Polemaetus bellicosus*) and the Crowned Eagle (*Stephanoaetus coronatus*) within the IBA (BirdLife SA, undated website).

The regions forests are also home to species such as the Black-fronted Bush-Shrike (*Chlorophoneus nigrifrons*), which inhabit forest and forest edges, as well as resident populations of Cape Parrot (*Poicephalus robustus*), Orange Ground Thrush (*Zoothera gurneyi*), Bush Blackcap (*Lioptilus nigricapillus*), Forest Buzzard (*Buteo*

trizonatus), Knysna Turaco (*Tauraco corythaix*), Chorister Robin-Chat (*Cossypha dichroa*), Brown Scrub Robin (*Erythropygia signata*), Grey Cuckooshrike (*Coracina caesia*), Olive Bush-Shrike (*Chlorophoneus olivaceus*), Green Twinspot (*Mandingoa nitidula*) and Forest Canary (*Serinus scotops*) (BirdLife SA, undated website).

Some of the local rivers, particularly those at lower altitude, hold African Finfoot (*Podica senegalensis*) and White-backed Night Heron (*Gorsachius leuconotus*). Marshy and open climax grasslands support Broad-tailed Warbler (*Schoenicola brevirostris*) and Striped Flufftail (*Sarothura affinis*). Blue Swallow (*Hirundo atrocaerulea*) has been recorded in the IBA and probably regularly uses the grasslands on migration (BirdLife SA, undated website).

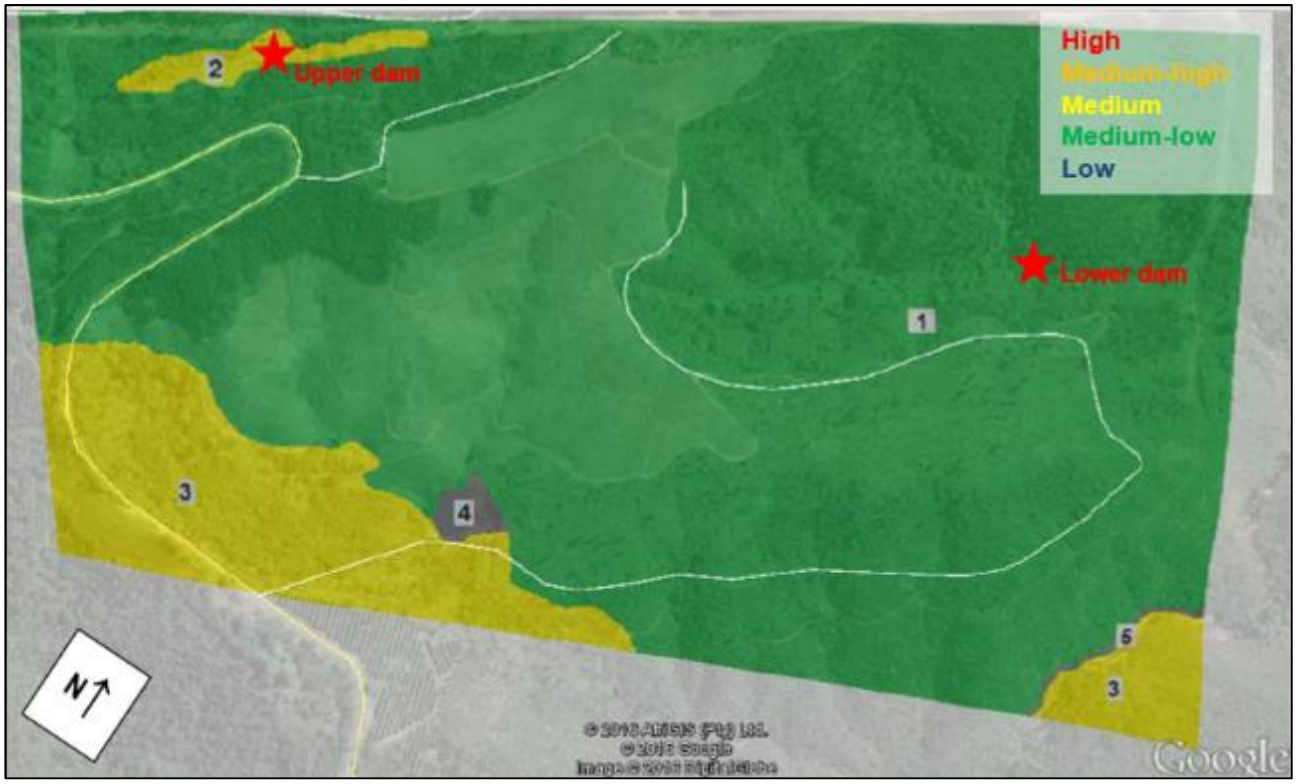
Ecological sensitivity

The site possesses only two areas which are still largely undisturbed, and the proposed dam sites are not within these areas. The riparian and wetland areas, which are to be affected by the proposed dams, are also relatively sensitive, even though they are not pristine.

Certain fauna which currently utilise the site, such as small antelope, rodents, birds, etc, are likely to continue using the site if and when the project is implemented, as species which were able to adapt to the plantations are likely to also be able to use a different type of transformed habitat, in the form of orchards, even though the faunal species composition found in the orchards may differ somewhat from that found in the previous timber plantations. Small antelope such as bushbuck are known to forage in avocado orchards in the region, particularly if areas of indigenous vegetation are available nearby for them to shelter in, as will be the case here. Similarly, a number of bird, insect and reptile species will likely forage or hunt in the orchards and retreat to the indigenous patches for nesting. Amphibians and birds are anticipated to be drawn to the dams, where habitat is expected to be improved for water-loving species.

The following figure shows the results of an ecological sensitivity study of the vegetation on the site. The ecological sensitivity map and associated categories below describe the current ecological health of the different areas on site while also giving an indication as to what extent the different areas will be affected by the proposed development as highly sensitive areas are more fragile and exposed to ecological disturbance and lower sensitivity areas less so as a general rule.

Figure 8.5: Ecological sensitivity of the site



8.4.2. Potential impacts

Dam construction will result in destruction of natural vegetation within the dam basins and in the footprint of the dam walls / embankments. However, these sections are already quite infested by alien invasive vegetation, and are not pristine.

Fauna are likely to be disturbed by construction-related activities, particularly noise, vibrations, human presence and of course the removal of sections of habitat. However, no negative long-term impacts on terrestrial fauna and birds are expected.

The presence of a year-round supply of surface water at the site (in the form of the dams) is likely to draw water-dependent fauna such as birds and provide foraging habitat for them, and in this way the dams may serve as a refuge for water-loving species, especially if fringes of indigenous habitat are left intact around the dams (or re-established) and managed properly to remove alien invasive species, etc.

Taking a holistic view on the proposed development, the impact on fauna and flora may actually have a net-positive effect, as it will make available the necessary onsite management, funds, skills and equipment necessary to properly manage the site and the remaining natural areas, on condition that the necessary mitigation is implemented, and that the remaining indigenous vegetation patches and the corridors along drainage lines be left natural / undeveloped and managed to improve habitat quality, e.g. through removal of alien invasive plants.

Table 8.5: Potential impacts in terms of **vegetation**

CONSTRUCTION PHASE						
Potential impact	**Status**	**Extent**	**Duration**	**Magnitude**	**Likelihood**	**Significance**
Veld fire risk associated with "hot" construction activities and workers smoking etc	Negative	Local	Short term	Very low	Possible	Very low
OPERATIONAL PHASE						
Habitat destruction in the areas to be inundated by dams or cleared for embankments	Negative	Local	Long term	Low	Definite	Medium
Possible further spreading of alien plant species or bush encroachment by indigenous trees due to disturbance of natural vegetation	Negative	Local	Long term	Low	Possible	Low
Possible reduction in infestation by alien invasive plants due to improved management thereof	Positive	Local	Long term	Low	Highly probable	Low
Changing the in-stream flow regime downstream of the dam, creating a steadier, more predictable flow, with concomitant impacts on ecology which may be positive, negative or neutral	Negative / Positive	Local	Long term	Low	Highly probable	Low-Medium

Table 8.6: Potential impacts in terms of **fauna**

CONSTRUCTION PHASE						
Potential impact	**Status**	**Extent**	**Duration**	**Magnitude**	**Likelihood**	**Significance**
Disruption of the activities of fauna on and around the site due to construction activities, and possible trapping / hunting / killing fauna by labourers	Negative	Local	Short term	Very low	Highly probable	Very low
OPERATIONAL PHASE						
Creation of habitat for water-dependent fauna, e.g. certain fish, amphibians and bird species	Positive	Local	Long term	Low	Highly probable	Low-Medium
Change in faunal species composition onsite through change in habitat types	Neutral	Local	Long term	Low	Possible	Low
Changing the in-stream flow regime downstream of the dam, with concomitant impacts on ecology which may be positive, negative or neutral	Negative / Positive	Local	Long term	Low	Highly probable	Low-Medium

9. SOCIO-ECONOMIC INVESTIGATIONS

The only specialist investigation conducted in terms of socio-economic aspects, consisted of a specialist heritage investigation conducted by Shasa Heritage Consultants. Other socio-economic parameters were investigated at a desktop level.

9.1. Heritage Assessment

A Phase 1 Heritage Impact Assessment (HIA) was undertaken by Shasa Heritage Consultants to determine the presence or absence of heritage resources and to submit appropriate recommendations with regard to the cultural resources management measures that may be required at affected sites / features. Such resources include archaeological and historical sites and features, graves and places of religious and cultural significance.

The source of information was primarily the field reconnaissance and referenced literary sources. A pedestrian survey of selected areas of the demarcated area was undertaken, during which standard methods of observation were applied.

9.1.1. Status quo

The area can be considered disturbed due to the fact that most of the area has been impacted on by commercial timber and agricultural activities.

According to the most recent archaeological cultural distribution sequences by Huffman (2007), this area falls within the distribution area of various cultural groupings originating out of both the Urewe Tradition (eastern stream of migration) and the Kalundu Tradition (western stream of migration). The facies that may be present are:

Urewe Tradition: Kwale branch -	Silver Leaves *facies*	AD 280-450 (Early Iron Age)
	Mzonjani facies	AD 450 – 750 (Early Iron Age)
Moloko branch -	*Icon facies*	AD 1300 - 1500 (Late Iron Age)
Kalundu Tradition: Happy Rest sub-branch -	*Doornkop facies*	AD 750 - 1000 (Early Iron Age)
	Letaba facies	AD 1600 - 1840 (Late Iron Age)

No archaeological or other heritage materials were recorded on site and no sites or areas related to socio-religious activities were recorded.

9.1.2. Potential impacts

As no sites or objects of heritage-related significance were found onsite thus no heritage-related impacts are anticipated to be associated with the project.

Should any previously undetected subterranean heritage remains however be found on site during the remainder of the construction phase, this must be reported to the Limpopo Heritage Resources Agency (LIHRA) or South

African Heritage Resources Agency (SAHRA) and work onsite halted until given the go-ahead by LIHRA and/or SAHRA.

Table 9.1: Potential heritage impacts

CONSTRUCTION PHASE						
Potential impact	**Status**	**Extent**	**Duration**	**Magnitude**	**Likelihood**	**Significance**
None expected	-	-	-	-	-	-
OPERATIONAL PHASE						
None expected	-	-	-	-	-	-

9.2. Social Aspects

9.2.1. *Status quo: Greater Tzaneen Local Municipality* (Information adapted from GTM IDP 2014/2015)

Location

The GTM forms part of the Mopani District in the Limpopo Province. The municipal area, which covers roughly 3 240 km^2, extends from Haenertsburg in the west to Rubbervale in the east (a distance of 85 km), and from just south of Modjadjiskloof in the north to Trichardtsdal in the south (47 km).

The GTM comprises the proclaimed towns of Tzaneen, Nkowankowa, Lenyenye, Letsitele and Haenertsburg, together with 125 rural villages. The municipal area is divided into 34 wards; this site is located within Ward 16.

Population

According to the South African Statistics Census 2011, the GTM has increased its population from 375 588 to 390 092 (an increase of 14 504) with females outnumbering males as they comprise 53% of the population. Young people between the ages of 14 –35 constitute 40% (156 900) of the total population of the municipality.

Income, employment and education

The latest labour force survey by Statistics South Africa (first quarter 2012) indicates that unemployment in Limpopo has deteriorated from 19.3% in March 2011 to 21.9% in March 2012. During this period the number of discouraged work seekers increased from 415,000 (March 2011) to 424,000 in March 2012. This is the strict definition of unemployment, which excludes discouraged work seekers. The unemployment rate will be worse if discouraged work seekers are included.

Unfortunately, these official statistics are not available at the district or the municipal level. The only estimates at the municipal level that are available until the 2011 census results are published, are from commercial statistical service providers, such as Quantec and Global Insight. Quantec estimated the unemployment rate in GTM at 37.1% for 2010. They have not yet made an estimate for 2011.

Economic activities and opportunities

The finance, insurance, real estate & business services is the main employer within the GTM, providing 27% of the available jobs within the GTM's area of jurisdiction. General governmental services supply 19% of jobs, followed by trade, catering and accommodation (15%), and transport, storage and communication (12%). Other economic sectors provide a minority of job opportunities.

The sector supplying the greatest proportion of the GTM's Gross Domestic Product (GDP) is Community Services (32%), followed by Finance (24%) and Trade (10%).

The GTM is the main contributor to the Mopani District's agricultural GDP (Gross Domestic Product), supplying 43% of the district's agricultural GDP.

Infrastructure and services

Water: The GTM has applied to the Department of Water and Sanitation (DWS) for an increased allocation to abstract raw water for purification and supply to residents. However, due to the pressure on the Ebenezer and Tzaneen Dams, DWS has not yet been able to grant such an increase, and hence water supply is a concern over the long term. Water supply challenges is being experienced in the entire municipality especially where boreholes are dysfunctional due to lack of regular maintenance, theft of electrical cables while others being that they never operated from the time of construction. Some water schemes initially designed to cater certain number of households are unable to supply due to increase in demand while those schemes were not upgraded. Certain infrastructural projects are in the pipeline, such as raising the Tzaneen Dam wall and establishing a new dam near Nwamitwa; however, it is not known if or when these projects will be implemented.

The GTM's drinking water quality is very good, and the GTM was awarded Blue Drop status by DWS in 2009 for the high quality of drinking water. Many of the rural areas are supplied by boreholes that are managed by the Mopani District Municipality (MDM).

Sanitation: Much of the municipal area, specifically in the extensive rural areas, relies on Ventilated Improved Pit (VIP) toilets. It is the MDM's responsibility to install these. Haenertsburg relies on individual septic tanks and French drains, whilst Tzaneen, Nkowankowa and Lenyenye have waterborne sewerage. Farms generally make use of septic tanks and French drains. Several villages have been, or are in the process of being, reticulated with waterborne sewerage.

Electricity: Electricity over most of the municipal area is provided by the GTM, but Nkowankowa, Lenyenye and the southernmost areas of the municipal area are supplied directly by Eskom. The GTM also supplies electricity to certain areas which do not fall within its area of jurisdiction, including Eiland and Gravelotte. Major investments have been made into electricity supply infrastructure in Tzaneen over the past approximately 2 years, which has improved the reliability and future capacity of electricity supply. The electrification backlog is estimated at 17.8%. Free basic electricity is provided to 7 306 households.

Housing: There is a backlog of more than 12 590 RDP houses and 1 563 middle income beneficiaries, but challenges are experienced in terms of the availability of land for the provision of these houses.

Health care: There are 29 clinics, 4 health centres and 165 visiting points within the municipal area, but only 16 of the visiting points have functioning structures, with the rest of the visiting points being community centres, day-care centres, farms or even just designated trees.

Waste management: Kerbside refuse removal is provided in Tzaneen, Lenyenye, Nkowankowa, Haenertsburg and Letsitele and disposal is done at the landfill site at Tzaneen; however, this constitutes only 11% of the households within the municipal area. Very little at-source recycling is done, but basic composting of garden waste is done adjacent to the landfill site.

9.2.2. Potential impacts

Construction is anticipated to extend over a period of a couple of months, and work will be done almost entirely by machinery. A contractor will be brought in to construct the dam using his/her machinery and staff, and no casual labourers are anticipated to be hired.

The following **short-term** socio-economic impacts may be expected during the construction phase of the proposed project:

- Support of local job opportunities through support of local businesses in the procurement of materials, equipment and services to be used in the construction phase;
- The possibility exists that the presence of construction activities may lead to an increase in criminal activity, trespassing and/or rowdiness;
- Construction-related noise resulting mostly from construction machinery (particularly during earthworks), offloading of materials, and the rumble of heavy construction vehicles / plant on the road.

Long-term socio-economic impacts during the operational phase may relate to the following:

- Greater job security at the farm, as the dam will lead to reduced vulnerability of agricultural production to drought conditions, and therefore less risk of retrenchments during times of below-average rainfall.
- Contribution to local economic development – the dams will facilitate commercial agriculture on the property, which in turn is anticipated to contribute to the secondary agriculture-based industries in the area, such as transport and packaging firms. Staff employed at the farm are also anticipated to spend most of their disposable income locally, which in turn will also stimulate the local economy.

Table 9.2: Potential socio-economic impacts

CONSTRUCTION PHASE						
Potential impact	**Status**	**Extent**	**Duration**	**Magnitude**	**Likelihood**	**Significance**
Supporting local businesses through local procurement of materials, equipment & services	Positive	Local	Short term	Low	Highly probable	Low
Direct and indirect job creation	Positive	Local	Short term	Low	Highly probable	Low
OPERATIONAL PHASE						
Contribution to job creation and job security by buffering the farm against drought	Positive	Local	Long term	Low	Highly probable	Low
Contribution to local economy	Positive	Local	Long term	Low	Highly probable	Low-medium

9.3. Visual Aspects

9.3.1. Status quo

The site has a visual appearance similar to surrounding natural vegetation, with riparian vegetation and large trees along the stream.

The dam sites are surrounded by a patchwork of timber plantations and natural bush. It has very low public visibility, being located in a valley on a private farm, surrounded by other farms. The proposed dam sites are somewhat visible from the public road that traverses the property.

9.3.2. Potential impacts

Construction-phase visual impacts can be expected in the form of site clearing, earthworks and construction activities themselves. In light of the short duration of the construction period and the limited visibility of the dam sites to the public or neighbours, construction activities are expected to have very low significance in terms of visual impacts.

Operational-phase impacts of the dams are anticipated to be **positive** – dams are usually regarded as aesthetically pleasing. The impacts are anticipated to have very low significance, though, as the sites are largely hidden from the public's or neighbours' view.

Operational-phase impacts of the associated agricultural activities – replacement of timber plantations by orchards – is expected to be larger in extent (covering a larger area), but still of only low significance, as the orchards will be in line with surrounding land use, and not a visual intrusion. Furthermore, the affected areas were already no longer natural, but were taken up by plantations.

Table 9.3: Potential visual impacts

CONSTRUCTION PHASE						
Potential impact	**Status**	**Extent**	**Duration**	**Magnitude**	**Likelihood**	**Significance**
Construction activities and site clearing	Negative	Local	Short term	Low	Definite	Very low
OPERATIONAL PHASE						
Visual impact of the new dams	Positive	Local	Long term	Very low	Definite	Very low
Visual impact of the associated agricultural activities	Negative	Local	Long term	Medium	Definite	Low

9.4. Noise

9.4.1. Status quo

The site is situated in an area where ambient noise levels are low, with sounds mostly associated with the voices of workers on surrounding farms and the sound of vehicles travelling on the nearby Old Coach Road. There are no sensitive noise receptors (e.g. schools or dwellings) in close proximity to the proposed dam sites; the dam sites are surrounded by forestry and agricultural areas.

9.4.2. Potential impacts

Construction-phase impacts are anticipated to be mainly associated with construction activities themselves, including earthworks, off-loading of material from trucks, etc., as well as with construction vehicles moving to and from the site, and vehicles transporting construction workers. These impacts will be short-term in duration,

occurring only whilst construction is underway, and will be very low in magnitude. The significance of the impacts will be further reduced by the absence of sensitive local noise receptors.

Given the short-term nature of construction phase noise impacts and the distance of the site from dwellings or other noise-sensitive receptors, noise impacts potentially associated with construction of the dam are anticipated to be of very low significance.

By its very nature, the dam will not generate any noise once completed. The associated agricultural activities are also anticipated to generate only a very low level of noise, mostly associated with vehicles for instance transporting workers into orchards or spraying pesticides, etc. Operational-phase noise impacts are expected to be of negligible significance.

Table 9.4: Potential impacts in terms of noise

CONSTRUCTION PHASE						
Potential impact	**Status**	**Extent**	**Duration**	**Magnitude**	**Likelihood**	**Significance**
Noise associated with construction activities and heavy vehicles during construction	Negative	Local	Short term	Very low	Highly probable	Very low
OPERATIONAL PHASE						
Noise associated with vehicles used in agricultural activities associated with the dams	Negative	Local	Long term	Very low	Highly probable	Very low

9.5. Indirect and cumulative impacts

The nature of the project is such that it is anticipated to result in various indirect impacts associated with the agriculture which it is proposed to support. Without the dams, large-scale commercial agriculture would not be possible on the site, hence the impacts associated with such agriculture can be indirectly linked to the proposed dams.

Furthermore, as is the case for any activity, impacts are not limited to those directly or even indirectly associated with the proposed activity – potential cumulative impacts need to be considered as well, so that activities can be seen not as stand-alone entities but as part of the larger picture.

The following tables highlight potential indirect and cumulative impacts of the proposed dams:

Table 9.5: Potential indirect and cumulative impacts – BIOPHYSICAL ASPECTS

CONSTRUCTION PHASE						
Potential impact	**Status**	**Extent**	**Duration**	**Magnitude**	**Likelihood**	**Significance**
Habitat loss and fragmentation, including wetlands	Negative	Local	Long term	Medium-High	Definite	Medium-High
OPERATIONAL PHASE						
Disruption of the stream's free flow, including disruption of movement of aquatic fauna	Negative	Local	Long term	Medium	Definite	Medium
Increased water abstraction, with reduced water availability downstream	Negative	Local	Long term	Low	Highly probable	Low-medium

Risk of contamination of water resources by agricultural chemicals in the associated farming operation	Negative	Local	Long term	Unknown	Possible	Medium

Table 9.6: Potential indirect and cumulative impacts – SOCIO-ECONOMIC ASPECTS

CONSTRUCTION PHASE						
Potential impact	**Status**	**Extent**	**Duration**	**Magnitude**	**Likelihood**	**Significance**
Job creation	Positive	Local	Short term	Medium	Definite	Low
Visual impacts	Negative	Local	Long term	Low	Definite	Low
Noise	Negative	Local	Short term	Very low	Highly probable	Very low
OPERATIONAL PHASE						
Job creation	Positive	Local- sub regional	Long term	Medium	Definite	Low-medium
Contribution to local economy	Positive	Local	Long term	Medium	Definite	Low-medium

10. PUBLIC PARTICIPATION PROCESS

10.1. Advertisement of initial public comment period

The commencement of the EIA process was advertised for a period of 30 days (19 February to 20 March 2016) in the following ways (please refer to Appendix E for copies of newspaper advertisements, photographs of site notices and the list of stakeholders who were directly notified):

- Publication of a notice (English and SePedi) in the local newspaper, the Letaba Herald, on 19 February 2016;
- Display of site notices (each containing both the English and the SePedi adverts) at and near the site;
- Direct notification of identified Interested and/or Affected Parties (I&APs) via fax, e-mail and/or post.

10.2. Public Meetings

10.2.1. Public Meeting #1 – 01 March 2016

A Public Meeting was held on 01 March 2016 at the Faeroes Properties office on the property neighbouring the site. The purpose of the Public Meeting was to afford stakeholders and members of the public the opportunity to interface with the project team to obtain information about the proposed project and to have their comments, queries and/or concerns addressed. The project team wanted to present the proposed project and the EIA process being followed. Unfortunately, the meeting had no attendees, thus no presentation could take place.

10.2.2. Public Meeting #2 – 01 November 2016

The second Public Meeting was held on 01 November 2016 at the Faeroes Properties office on the property neighbouring the site. The purpose of the meeting was to present the findings of the EIA process to I&APs and to afford them another opportunity to discuss any comments, queries or concerns with members of the project

team. The meeting was attended by the Chairman of the Agatha Community Forum, who was interested in more detail regarding the project. Please refer to the minutes under Appendix H.

10.3. Availability of consultative ESR for public review and comment

The consultative ESR was available for public review and comment for a period of 30 days, from 22 July to 22 August 2016. Copies of the report were available at the Faeroes Properties office adjacent to the site (entrance AH29 off the Agatha road) and Polygon's offices at 21C Peace Street, Tzaneen, during this period. Electronic copies on CD were also available from Polygon upon request and copies (whether in hard copy or on CD) were submitted directly to certain stakeholders for their comment (notably DWS, SAHRA and GTM).

The availability of the consultative ESR for public comment was advertised as follows:

- Publication of a notice (English and SePedi) in the local newspaper, the Letaba Herald, on 22 July 2016;
- Display of site notices (each containing both the English and the SePedi adverts) at and near the site;
- Direct notification of identified Interested and/or Affected Parties (I&APs) via fax, e-mail and/or post.

10.4. Issues raised

Comments centred mostly on more detailed information requested in terms of technical issues. The only comments received were those raised during the second public meeting. No objections were received.

10.5. Availability of consultative EIR for public review and comment

The consultative EIR was available for public review and comment from 21 October to 21 November 2016. Copies of the report were available at the Faeroes Properties office adjacent to the site and Polygon's offices at 21C Peace Street, Tzaneen, during this period. Electronic copies on CD are also available from Polygon upon request and copies (whether in hard copy or on CD) were submitted directly to DWS, SAHRA and GTM for their comment.

The availability of the consultative EIR for public comment was advertised as follows:

- Publication of a notice (English and SePedi) in the local newspaper, the Letaba Herald, on 21 October 2016;
- Display of site notices (each containing both the English and the SePedi adverts) at and near the site;
- Direct notification of identified Interested and/or Affected Parties (I&APs) via fax, e-mail and/or post.

10. ENVIRONMENTAL IMPACT STATEMENT

The following table summarises the impacts anticipated to be associated with the proposed project. Please refer to the attached EMPR, which contains recommended measures for the prevention, mitigation or management of these potential impacts.

Table 10.1: Summary of potential impacts

POTENTIAL IMPACT	STATUS	EXTENT	DURATION	MAGNITUDE	LIKELIHOOD	SIGNIFICANCE	CAN IMPACT BE REVERSED OR MITIGATED? WILL IT CAUSE IRREPLACE-ABLE LOSS OF RESOURCES?	REQUIREMENT FOR MITIGATION OF RESIDUAL IMPACTS
Bio-physical aspects								
Soil erosion and associated siltation downstream (construction phase)	Negative	Local	Short term	Medium	Highly probable	Low-medium, depending on timing of construction	- Partially preventable - Mitigable - **No** irreplaceable loss of resources	- Mitigation and monitoring required
Alteration of topography within dam basins	Negative	Local	Long term	Low-Medium	Highly probable	Low	- Not preventable, but can and should be minimised in extent - **No** irreplaceable loss of resources	- Construction-phase mitigation and monitoring required
Contribution to unlocking the agricultural potential of the property by providing irrigation security	Positive	Local	Long term	Medium	Highly probable	Medium	- No impact prevention or mitigation needed - Resource potential will be unlocked	- No mitigation or monitoring required
Compaction of wetland soil around the site if vehicles / machinery enter these areas	Negative	Local	Short term	Very low	Possible	Low	- Partially preventable - Mitigable - **No** irreplaceable loss of resources	- Mitigation and monitoring required
Disturbance of aquatic fauna and flora by construction activities	Negative	Local	Short term	Low-medium	Highly probable	Low	- Preventable and mitigable - **No** irreplaceable loss of resources	- Mitigation and monitoring required
Ingress of foreign matter into streams and wetlands, with	Negative	Local	Short term	Unknown	Possible	Low	- Preventable and mitigable	- Mitigation and monitoring required

concomitant impacts on fauna and flora							- **No** irreplaceable loss of resources	
Increased water abstraction, though still within existing allocation from DWS	Negative	Local	Long term	Low	Highly probable	Medium	- Mitigable - **No** irreplaceable loss of resources	- Monitoring required - Six-monthly reporting to DWS
Fragmentation of wetland and destruction of portions thereof; as well as fragmentation and destruction of terrestrial habitat	Negative	Local	Long term to permanent	Low	Definite	Medium	- Can be mitigated to some extent - Irreplaceable loss of small portions of wetland and seepage	- Mitigation and monitoring required
Change in hydrological regime from non-perennial to a more constant stream flow released downstream of the dam, and conversion of streams at dam sites from free-flowing to standing water. This will also impact on terrestrial ecology along the watercourse, which may be positive, negative or neutral	Negative / Positive	Local	Long term	Medium	Highly probable	Low-medium	-	-
Intercepting sediment load and preventing its transport downstream	Negative	Local	Long term	Medium	Highly probable	Medium	- Mitigable - **No** irreplaceable loss of resources	- Monitoring required
Creation of habitat for water-loving birds and other fauna.	Positive	Local	Long term	Low-medium	Highly probable	Low-Medium	- No prevention or mitigation required - **No** irreplaceable loss of resources	- No mitigation required
Deterioration in water quality downstream due to associated agricultural activities	Negative	Local to sub-regional	Long term	Unknown	Possible	Low-Medium	- Preventable and mitigable - **No** irreplaceable loss of resources	- Mitigation and monitoring required

Fire risk associated with "hot" construction activities and workers smoking etc	Negative	Local	Short term	Unknown	Possible	Low	- Preventable - **No** irreplaceable loss of resources	- Management and monitoring required during construction
Possible further spreading of alien plant species or bush encroachment by indigenous trees due to disturbance of natural vegetation	Negative	Local	Long term	Low	Possible	Low	- Preventable and mitigable - **No** irreplaceable loss of resources	- Mitigation and monitoring required
Possible reduction in infestation by alien invasive plants due to improved management thereof in remaining natural areas	Positive	Local	Long term	Low	Highly probable	Low	- No prevention or mitigation needed - **No** irreplaceable loss of resources	- Optimisation and monitoring required
Disruption of the activities of fauna on and around the site due to construction activities, and possible trapping / hunting / killing fauna by labourers	Negative	Local	Short term	Very low	Highly probable	Very low	- Preventable and mitigable - **No** irreplaceable loss of resources	- Mitigation and monitoring required
Change in faunal species composition onsite through change in habitat types	Neutral	Local	Long term	Low	Possible	Low	- Not preventable or mitigable, but not necessarily negative - **No** irreplaceable loss of resources	- Monitoring required
Socio-economic aspects								
Supporting local businesses through local procurement of materials, equipment & services	Positive	Local	Short term	Low	Highly probable	Low	- No prevention or mitigation required	- No mitigation or monitoring required
Direct and indirect job creation	Positive	Local	Short term	Low	Highly probable	Low	- No prevention or mitigation required	- No mitigation or monitoring required
Contribution to job creation and job security by buffering the farm against drought	Positive	Local	Long term	Low	Highly probable	Low	- No prevention or mitigation required	- No mitigation or monitoring required
Contribution to local economy	Positive	Local	Long term	Low	Highly probable	Low-medium	- No prevention or mitigation required	- No mitigation or monitoring required

Visual impact of construction activities and site clearing	Negative	Local	Short term	Low	Definite	Very low	- Mitigable - **No** irreplaceable loss of resources	- Mitigation and monitoring required
Visual impact of the new dams	Positive	Local	Long term	Very low	Definite	Very low	- Not preventable or mitigable, but not necessarily negative - **No** irreplaceable loss of resources	- No mitigation or monitoring required
Visual impact of the associated agricultural activities	Negative	Local	Long term	Medium	Definite	Low	- Mitigable - **No** irreplaceable loss of resources	- No mitigation or monitoring required
Noise associated with construction activities and heavy vehicles during construction	Negative	Local	Short term	Very low	Highly probable	Very low	- Mitigable - **No** irreplaceable loss of resources	- Monitoring required
Noise associated with vehicles used in agricultural activities associated with the dams	Negative	Local	Long term	Very low	Highly probable	Very low	- Mitigable - **No** irreplaceable loss of resources	- Monitoring required
Possible heritage impacts if sites or objects of heritage-related significance are found	Negative	Local	Long term to permanent	Unknown	Unlikely – none found during heritage assessment	Very low	- Preventable and mitigable - **No** irreplaceable loss of resources	- Monitoring required

11. CONCLUDING STATEMENT

11.1. Concluding statement

The EIA has identified no fatal flaw issues associated with the proposed project. From the investigations that have been conducted, it was determined that the proposed project, according to the preferred technology alternative (two earthfill dams) can potentially be supported on the identified site (Remainder of the farm Fairview 605-LT) and at the proposed positions as indicated on the aerial photograph below, on condition that the necessary impact mitigation and management measures are implemented and the relevant authorisations obtained prior to commencement of the project.

Figure 11.1: Preferred dam locations on the property

From an environmental perspective (particularly ecological, wetland and riparian aspects), it is felt that the preferred positions do not pose significantly greater impacts than alternative positions on the property would, and that the proposed positions, as indicated on the aerial photo, can therefore be supported, on condition that impact prevention and mitigation measures as stipulated in the EMPR are implemented.

Earthfill dams are the only feasible technological option, due to the lack of suitable founding conditions for other types of dams, but this type of dam can be supported from an environmental perspective.

No concerns or objections have been raised by Interested and/or Affected Parties during the public participation process thus far, and no issues have been highlighted which need further investigation or would require extraordinary impact mitigation measures.

It is therefore felt that Environmental Authorisation may be issued to the applicant, Faeroes Properties (Pty) Ltd, for the proposed project. The following section indicates **conditions** which are recommended for inclusion in such an authorisation, if issued.

11.2. Proposed conditions of authorisation

It is recommended that the following be included in any authorisation that may be granted by LDEDET in respect of the application:

a) Appointment of an independent Environmental Control Officer (ECO) to monitor implementation of the EMPR during the construction phase;
b) Submittal of an environmental compliance monitoring report to LDEDET by the ECO at the end of the construction phase (construction is not expected to take more than 6 months);
c) When employing workers during the construction phase, local labourers (within GTM's boundaries or within 50km of the site) must be given preference as far as availability of appropriate skills permit;
d) Local suppliers (within GTM's boundaries or within 50km of the site) must be given preference in the sourcing of services and materials as far as availability and quality permits;
e) A Water Use Licence (WUL) must be obtained from the Department of Water and Sanitation (DWS) for water uses to be triggered by the proposed dams (the application has been submitted to DWS);
f) The existing water allocation may not be exceeded. If more water is required than the allocation permits, a WUL must be obtained from DWS;
g) Should protected plants need to be removed, de-limbed or relocated, the required permits must first be obtained from the relevant authorities prior to such disturbance;
h) The impact mitigation measures in the EMPR as well as the conditions of the EA and WUL must be adhered to;
i) Should any changes to the project as described in this report be envisaged, these must be communicated to LDEDET, and if necessary an application must be lodged for amendment of the EA.

12. REFERENCES

Agricultural Research Council – Institute for Soil, Climate and Water. Climatic Data for Weather Station 30756, 2007 – 2010

Bateleur Environmental Services, 2016. *Proposed Construction of Two Dams and Associated Infrastructure on the Farm Fairview 650-LT, near Tzaneen, Limpopo Province.* Prepared for Polygon Environmental Planning

BirdLife South Africa, http://www.birdlife.org.za/conservation/important-bird-areas/iba-directory/item/146-sa005-wolkberg-forest-belt. Website accessed August 2016

Element Consulting Engineers, 2016. Preliminary Design Report: Upper Fairview Dam and Lower Fairview Dam (Farm: Fairview 605-LT). Prepared for Francolin Hill Trust

Envirosoil Consulting, 2015. *Soil and Land Delineation Survey for Fairview Farm (Rem Of Fairview 605 Lt).* Prepared for Faroes Properties

Google Earth; http://earth.google.com. Accessed 2016.

Greater Tzaneen Municipality, 2015. *Integrated Development Plan 2014/2015.*

Huffman, T.N., 2007. *Handbook to the Iron Age. The archaeology of Pre-colonial Farming Societies in Southern Africa.* University of KwaZulu-Natal Press.

Limosella Consulting, 2016. *Proposed Construction of Two Dams and Associated Infrastructure on the Farm Fairview 650-LT, near Tzaneen, Limpopo Province: Wetland/Riparian Delineation and Functional Assessment* . Prepared for Polygon Environmental Planning

Macfarlane D.M., Kotze D.C., Ellery W.N., Walters D, Koopman V, Goodman P and Goge C., 2008. *WET-Health: A technique for rapidly assessing wetland health.* Water Research Commission, Pretoria. WRC Rport TT340/08 February 2008

McCartney, P, M. and Sally H., 2003. *Managing the environmental impact of dams.* International Water Management Institute.

Mucina, L. and Rutherford, M.C. (eds) 2006. *The Vegetation of South Africa, Lesotho and Swaziland.* Strelitzia 19. South African National Biodiversity Institute, Pretoria.

Shasa Heritage Consultants, 2016. *Phase 1 Heritage Resourcing Scoping Report: Two dams and associated pipelines on Fairview 605-LT.* Prepared for Polygon Environmental Planning.