



**SCIENTIFIC AQUATIC SERVICES**

## **AQUATIC BIODIVERSITY COMPLIANCE STATEMENT**

**FOR THE PROPOSED MOPANE SOLAR PV5  
FACILITY (PHASE 5) ON PORTION 2 OF THE  
FARMROODRAAI 85 IQ, NORTH WEST  
PROVINCE**

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## EXECUTIVE SUMMARY

Scientific Aquatic Services (Pty) Ltd. (SAS) was appointed by AGES Limpopo (PTY) Ltd (the Environmental Assessment Practitioner (EAP) on the project) to undertake a freshwater assessment to verify the presence of freshwater ecosystems within the area demarcated for a proposed Photovoltaic (PV) Power Plant (Phase 5) with associated infrastructure on Portion 2 of the farm Roodraai 85 IQ, located within the JB Marks Local Municipality, Dr Kenneth Kaunda District Municipality, North West Province.

Following on from desk-based investigation of possible freshwater features in the study area and investigation area (defined as a 500 m radius around the study area, in line with GN 509 as it relates to the National Water Act, 1998 (Act No. 36 of 1998) as amended), a field assessment was undertaken on the 10<sup>th</sup> of November 2022 to verify the presence of freshwater features. It was confirmed that no freshwater ecosystems occur in the study and investigation area.

The Department of Forestry, Fisheries and Environment (DFFE) National Web-based Environmental Screening Tool (2020), provides the criteria for the assessment and reporting of impacts on aquatic/freshwater biodiversity for activities requiring EA. The DFFE Web-based Environmental Screening Tool has designated the study area as being of very high aquatic biodiversity sensitivity. However, since the site survey confirmed that no natural freshwater ecosystems are located within the study or investigation area, and the proposed PV plant poses no significant quantum of risk to any freshwater ecosystems in the area, the study area has been assessed to have a low aquatic biodiversity sensitivity. Accordingly, an Aquatic Biodiversity Compliance Statement has been compiled.

Due to the closest freshwater ecosystem being at a distance of greater than 500 m from the study area, no Zones of Regulation, or the required GDARD buffers will apply to the study area and proposed PV plant, nor would the property be subject to a Water Use Authorisation in terms of Section 21 c and i of the National Water Act (Act No 36 of 1998). The proposed PV Power Plant poses no significant quantum of risk to existing freshwater ecosystems in the area and therefore no risk assessment is required in accordance with GN509 of 2016.



## GLOSSARY OF TERMS

<b>Alien vegetation:</b>	Plants that do not occur naturally within the area but have been introduced either intentionally or unintentionally. Vegetation species that originate from outside of the borders of the biome -usually international in origin.
<b>Alluvial Material / deposits</b>	Sedimentary deposits resulting from the action of rivers, including those deposited within river channels, floodplains, etc.
<b>Anaerobic</b>	The absence of molecular oxygen.
<b>Catchment:</b>	The area where water is collected by the natural landscape, where all rain and run-off water ultimately flow into a river, wetland, lake, and ocean or contributes to the groundwater system.
<b>Delineation (of a wetland):</b>	To determine the boundary of a wetland based on soil, vegetation, and/or hydrological indicators.
<b>Ecoregion:</b>	An ecoregion is a "recurring pattern of ecosystems associated with characteristic combinations of soil and landform that characterise that region".
<b>Hydromorphy</b>	A process of gleying and mottling resulting from intermittent or permanent presence of free water in soil. Results in hydromorphic soils.
<b>Landtype</b>	Distinct areas defined as part of the Land Type Survey of South Africa based on a unique combination of soil pattern, macroclimate and terrain form.
<b>Reach</b>	A longitudinal stretch of a river, wetland or watercourse
<b>Riparian Area /Zone</b>	The physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas
<b>Temporary zone of wetness:</b>	The outer zone of a wetland characterised by saturation within 50 cm of the surface for less than three months of the year.
<b>Wetland Vegetation (WetVeg) type:</b>	Broad groupings of wetland vegetation, reflecting differences in regional contexts, such as geology, climate, and soil, which may, in turn, influence the ecological characteristics and functioning of wetlands.



## ACRONYMS

<b>°C</b>	Degrees Celsius.
<b>BGIS</b>	Biodiversity Geographic Information Systems
<b>CBA</b>	Critical Biodiversity Area
<b>CSIR</b>	Council of Scientific and Industrial Research
<b>DFFE</b>	Department of Forestry, Fisheries and Environment
<b>DWA</b>	Department of Water Affairs
<b>DWAF</b>	Department of Water Affairs and Forestry
<b>DWS</b>	Department of Water and Sanitation
<b>EA</b>	Environmental Authorisation
<b>EAP</b>	Environmental Assessment Practitioner
<b>EIA</b>	Environmental Impact Assessment
<b>EIS</b>	Ecological Importance and Sensitivity
<b>EMPr</b>	Environmental Management Program
<b>ESA</b>	Ecological Support Area
<b>FEPA</b>	Freshwater Ecosystem Priority Areas
<b>GIS</b>	Geographic Information System
<b>GN</b>	Government Notice
<b>GPS</b>	Global Positioning System
<b>HGM</b>	Hydrogeomorphic
<b>m</b>	Meter
<b>MAP</b>	Mean Annual Precipitation
<b>NEMA</b>	National Environmental Management Act
<b>NFEPA</b>	National Freshwater Ecosystem Priority Areas
<b>NBA</b>	National Biodiversity Assessment
<b>NWA</b>	National Water Act
<b>PES</b>	Present Ecological State
<b>REC</b>	Recommended Ecological Category
<b>RMO</b>	Resource Management Objective
<b>SACNASP</b>	South African Council for Natural Scientific Professions
<b>SANBI</b>	South African National Biodiversity Institute
<b>SAS</b>	Scientific Aquatic Services
<b>subWMA</b>	Sub-Water Management Area
<b>WetVeg Groups</b>	Wetland Vegetation Groups
<b>WMA</b>	Water Management Areas



## DOCUMENT GUIDE

Table 1 below provides the specialist report requirements for the assessment and reporting of impacts to the aquatic biodiversity in terms of Government Notice 320 as promulgated in Government Gazette 43110 of 20 March 2020 in line with the Department of Environmental Affairs screening tool requirements, as it relates to the National Environmental Management Act, 1998 (Act No. 107 of 1998) as amended (NEMA). It is important to note that the aquatic biodiversity theme replaces Appendix 6 of NEMA.

**Table A: Specialist report requirements for the assessment and reporting of impacts to the aquatic biodiversity**

No.	Requirements	Section in Report
3.1	The compliance statement must be prepared by a suitably qualified specialist registered with the SACNASP, with expertise in the field of aquatic sciences.	Appendix C
3.2	The compliance statement must:	-
3.2.1	be applicable to the preferred site and the proposed development footprint;	Section 1, 2, 6
3.2.2	confirm that the site is of "low" sensitivity for aquatic biodiversity; and	Section 6.1
3.2.3	indicate whether or not the proposed development will have an impact on the aquatic features.	Section 8.2
3.3	The compliance statement must contain, as a minimum, the following information:	-
3.3.1	contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	Appendix B, C
3.3.2	a signed statement of independence by the specialist;	Appendix B
3.3.3	a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	Section 6
3.3.4	a baseline profile description of biodiversity and ecosystems of the site;	Section 6
3.3.5	the methodology used to verify the sensitivities of the aquatic biodiversity features on the site including the equipment and modelling used where relevant;	Section 1.1, 6.1
3.3.6	in the case of a linear activity, confirmation from the aquatic biodiversity specialist that, in their opinion, based on the mitigation and remedial measures proposed, the land can be returned to the current state within two years of completion of the construction phase;	N/A
3.3.7	where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr;	N/A
3.3.8	a description of the assumptions made as well as any uncertainties or gaps in knowledge or data; and	Section 1.1
3.3.9	any conditions to which this statement is subjected.	Section 6.1, 8.2, 8.3
3.4	A signed copy of the compliance statement must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	EAP to ensure this requirement is met.



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# 1. INTRODUCTION AND BACKGROUND SETTING

Scientific Aquatic Services (SAS) (Pty) Ltd. was appointed by AGES Limpopo (PTY) Ltd (the Environmental Assessment Practitioner (EAP) on the project) to prepare an aquatic biodiversity assessment. This aquatic biodiversity compliance statement was prepared as part of the requirements for the EIA process, for the proposed Photovoltaic (PV) Power Plant (Phase 5) with associated infrastructure on Portion 2 of the farm Roodraai 85 IQ, located within the JB Marks Local Municipality, Dr Kenneth Kaunda District Municipality, North West Province, hereafter referred to as the “study area”. The area of the proposed development is presented in Figures 1 and 2. A 500 m “zone of investigation” around the study area, (in accordance with General Notice (GN) 509 of 2016 (as it relates to the National Water Act (Act No. 36 of 1998) as amended), was generated to determine potential risks to possible freshwater ecosystems associated with the study area. This will henceforth be referred to as the “investigation area” (Figures 1 and 2).

The project site is located  $\pm 7$  km northwest of Carletonville, along the border between North West and Gauteng. The development is located 5.5km north of R501 with access from both the D859 (Preferred) and R501 (alternative).

## 1.1 Assumptions and limitations

The following assumptions and limitations are applicable to this verification report:

- It is assumed that all third-party information used (e.g., GIS data and satellite imagery) is correct at the time of generating this report;
- The survey was restricted to a single site visit (mid-summer), but due to the characteristics of the study area, undertaking additional surveys for the purposes of this compliance statement is not considered necessary; and
- Access to the study area was not restricted and data collected during the field survey is deemed adequate for the purposes of this report.
- This aquatic compliance statement has been prepared for the proposed Photovoltaic (PV) Power Plant (Phase 5) only. Separate reports have been prepared for the other PV development project phases and for the proposed power line connection to the grid.





## 2. PROJECT DESCRIPTION

The proponent Voltalia South Africa (Pty) Ltd is assessing the feasibility of an energy generation facility, consisting of the construction, operation, and maintenance of a Photovoltaic (PV) Power Plant with a maximum generation capacity of 120 MW at the point of connection. The total footprint of the facility is estimated at 182 ha. The facility will be connected to the existing Eskom Carmel Main Transmission Substation (MTS), which is located 16.4 km South-East of the project site.

The proposed development (the PV Power Plants and connection infrastructure) consists of the installation of the following equipment:

- Photovoltaic modules (mono-crystalline, poly-crystalline, or bi-facial modules)
- Mounting systems for the PV arrays (single-axis horizontal trackers or fixed structures) and related foundations
- Internal cabling and string boxes
- DC/AC inverters
- Medium voltage stations, hosting LV/MV power transformers
- Medium voltage receiving station(s)
- Workshops & warehouses
- One on-site high-voltage substation and one high-voltage busbar with metering and protection devices
- One on-site high-voltage substation with high-voltage power transformers, stepping up the voltage to 275kV and one high-voltage busbar with metering and protection devices
- One on-site switching station, with one high-voltage busbar with metering and protection devices
- Battery Energy Storage Systems (BESS), with a 5-hour storage capacity up to 1250 MWh, with a footprint up to 2 ha, next to the on-site high-voltage substation, within the PV plant footprint / fenced areas
- Electrical system and UPS (Uninterruptible Power Supply) devices
- Lighting system
- Grounding system
- Internal roads
- Fencing of the site and alarm and video-surveillance system
- Water access point, water supply pipelines, water treatment facilities
- Small scale patented wastewater treatment system.



During the construction phase, the site may be provided with additional facilities which will be removed at the end of construction:

- Water access point, water supply pipelines, water treatment facilities
- Prefabricated buildings
- Workshops & warehouses

### 3. ASSESSMENT APPROACH

- The desktop assessment, as presented in Section 5, reports on the findings from the relevant national, provincial and municipal datasets (such as the National Freshwater Ecosystem Priority Areas [NFEPA], 2011 database; The National Wetland Map 5 (2018), the North-West Biodiversity Spatial Plan (2015) and the Gauteng Conservation Plan (C-Plan) (2013)), which was undertaken to aid in identifying freshwater ecosystems;
- The national web based Environmental Screening Tool (DEA, 2020) was utilised to screen the study area and investigation area for any environmental sensitivity, with specific focus on aquatic biodiversity sensitivities. The results are presented in Section 4;
- Section 5 reports on the results of the desktop survey, whilst Section 6 reports on the outcome of the site investigation; and
- Section 7 provides a summary of the applicable legislative conditions that may be applicable.

#### 3.1 Freshwater Definition

The NWA is aimed at the protection of the country's water resources, defined in the Act as:

*“a watercourse, surface water, estuary or aquifer”*

According to the NWA a watercourse means:

- (a) a river or spring;*
- (b) a natural channel in which water flows regularly or intermittently;*
- (c) a wetland, lake or dam into which, or from which, water flows; and*
- (d) any collection of water which the Minister may, by notice in the Gazette, declare a watercourse.*

A 'Watercourse' as per the definition of the NWA, is referred to in this report as a “freshwater ecosystem”

The NWA further provides definitions of wetland and riparian habitats as follows:



**Wetland habitat** is “land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.”

Another widely used definition of wetlands is the one used under the **Ramsar Convention**; wetlands are defined as:

*“areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres”*

**However, the presence / absence of hydric soils is the primary determining factor used to define a freshwater feature as a wetland.**

This determining factor has been utilised in this assessment. Wetland soils can be termed hydric or hydromorphic soils. **Hydric soils** are defined by the United States Department of Agriculture’s Natural Resources Conservation Service as being:

*“soils that formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper part”.*

These anaerobic conditions would typically support the growth of hydrophytic vegetation (vegetation adapted to grow in soils that are saturated and starved of oxygen) and are typified by the presence of redoximorphic features.

**Riparian habitat** includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterized by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent area.

### **3.2 Freshwater Ecosystem Site Verification**

Verification of potential freshwater ecosystems took place according to the method presented in the “Updated manual for the identification and delineation of wetland and riparian resources” (DWAF, 2008). The foundation of the method is based on the fact that freshwater features have several distinguishing factors including the following:

- Landscape position;
- The presence of water at or near the ground surface;
- Distinctive hydromorphic soils;



- Vegetation adapted to saturated soils; and
- The presence of alluvial soils in stream systems.

A field assessment was undertaken on the 10<sup>th</sup> of November 2022 (mid-summer) during which the presence of any riparian or wetland characteristics as defined by DWAF (2008) and by the NWA, was investigated (please refer to Section 6 of this report).

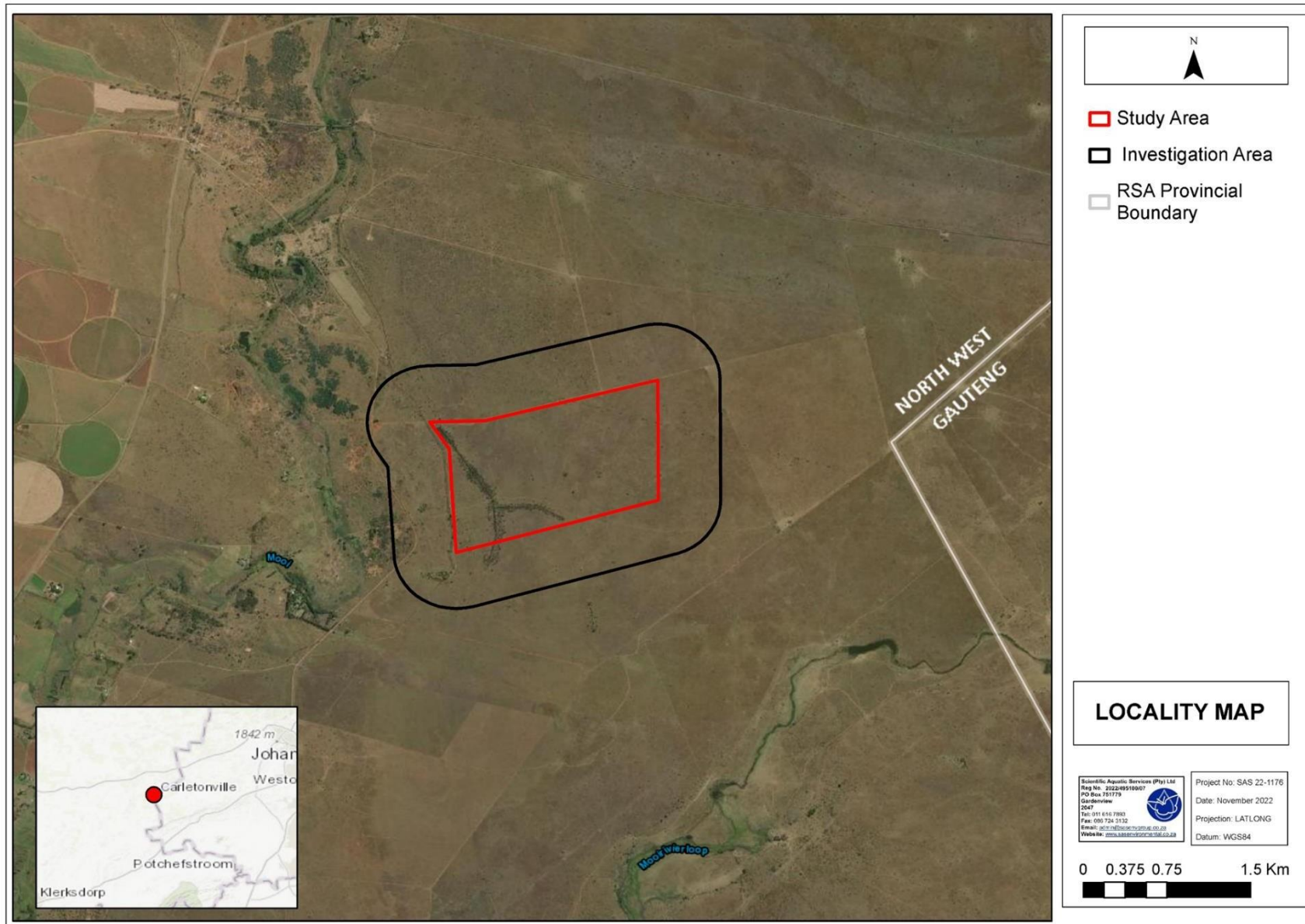


Figure 1: Digital satellite image depicting the study and investigation areas in relation to the surrounding area.



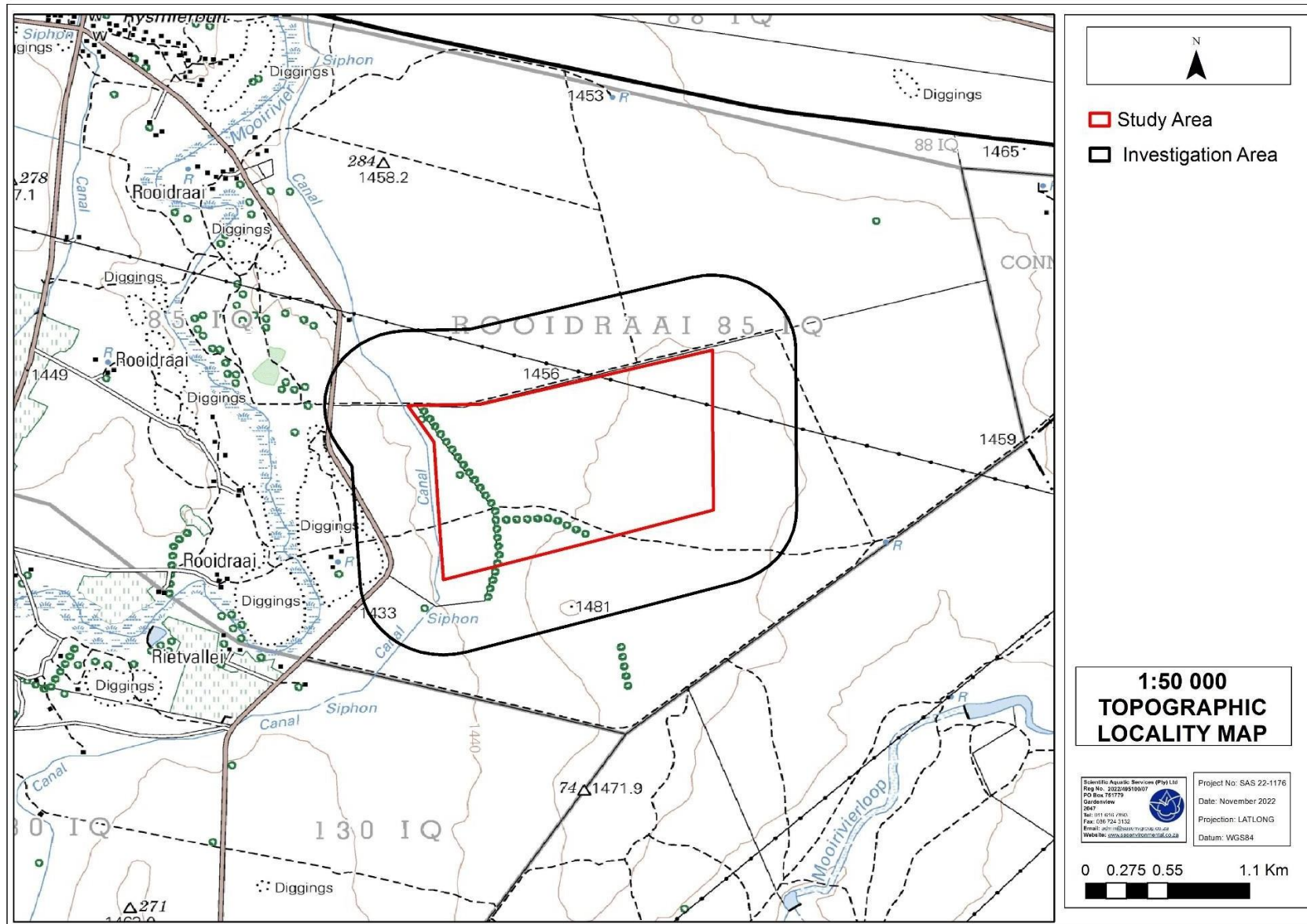


Figure 2: Location of the study and investigation areas depicted on a 1:50 000 topographical map, in relation to surrounding area.



#### **4. APPLICATION OF THE DEPARTMENT OF FORESTRY, FISHERIES AND ENVIRONMENT (DFFE) WEB-BASED ENVIRONMENTAL SCREENING TOOL**

The protocol for the assessment of freshwater and aquatic biodiversity prepared in support of the Department of Forestry, Fisheries and Environment (DFFE) (previously the Department of Environmental Affairs (DEA)) National Web-based Environmental Screening Tool (2020), provides the criteria for the assessment and reporting of impacts on aquatic/freshwater biodiversity for activities requiring Environmental Authorisation (EA). For the aquatic biodiversity (freshwater) theme, the requirements are for sites which support various levels of biodiversity. The relevant aquatic / freshwater biodiversity theme in the National Web-based Environmental Screening Tool (2020) has been provided by the South African National Biodiversity Institute (SANBI). Based on the sensitivity rating, a suitably qualified specialist must prepare the relevant report or opinion memorandum which is to be submitted as part of the EA application.

As part of the process of the background information gathering, the DFFE Screening Tool was applied to the study and investigation areas. According to the guidelines, an applicant intending to undertake an activity on a site identified as being of “very high sensitivity” for an aquatic biodiversity theme must submit an Aquatic Biodiversity Impact Assessment, or if the area is identified as being of “low sensitivity” then an Aquatic Biodiversity Compliance Statement must be compiled and submitted to the competent authority. It is noted, however, that if during a site survey undertaken by a suitably qualified freshwater ecologist, the sensitivity is determined to be different from that assigned by the screening tool (i.e. that a high risk to the regional aquatic biodiversity or freshwater ecosystems in the area is likely even though it is assigned as a “low” sensitivity, or if it is assigned a high sensitivity, however, the proposed development risks are deemed low) then the relevant assessment approach must be followed based on the site survey results and not the DFFE Screening Tool allocation.

The DFFE Web-based Environmental Screening Tool indicates that the study area is classified as an area of very high aquatic biodiversity sensitivity (Figure 3). However, this is only due to the area being classified as a strategic water source area for groundwater, which motivates the consideration of classifying the area as being of a “low” sensitivity within the context of this development.





**Figure 3: The Screening Tool image snip depicting the sensitivity associated with the investigation area in relation to the surrounding area.**

## 5. DESKTOP INVESTIGATION FINDINGS

A background study of relevant national, provincial and municipal datasets (such as the National Freshwater Ecosystem Priority Areas [NFEPA] 2011 database; The National Wetland Map 5 (2018) and the North-West Biodiversity Spatial Plan (2015) was undertaken to aid in defining presence of any freshwater ecosystems prior to the site survey of the study area (see Table 1) as well as the associated 500 m investigation area. The results are summarised in the dashboard and relevant maps below.

- According to the NFEPA (2011) and National Wetland Map (NBA 2018) freshwater databases, no wetlands are indicated within the study or investigation area.
- Although not located within the investigation area, the closest river (as indicated in the NBA (2018) and NFEPA (2011) databases) is the Mooi River, which is located west of the investigation area.
- According to the NWBSP 2015, the majority of the study area is classified as an Ecological Support Area 1 (ESA 1) of aquatic importance. A small aquatic ESA2 is



indicated within a southwestern portion of the investigation area. Critical Biodiversity Areas (CBA1 and CBA2) of aquatic importance (associated with the Mooi River) are also present west of the investigation area.

- The topo-cadastral drainage map layer (CDNGI, 2006) (Figure 4) indicates no watercourses within the study or investigation areas, except an artificial canal on the western border of the study area. The most proximal natural drainage lines are associated with the Mooi River.
- The DFFE Web-based Environmental Screening Tool has designated the study area as being of very high aquatic biodiversity sensitivity due to the area being classified as a strategic water source area for groundwater.

The results are summarised in the dashboard below.

**Table 1: Desktop data relating to the characteristics of the freshwater ecosystems / features associated with the study and investigation area.**

Aquatic ecoregion and sub-regions in which the study and investigation areas are located.		Details of the study and investigation areas in terms of the National Freshwater Ecosystem Priority Area (NFEP) (2011) database.	
Ecoregion	Highveld	FEPACODE (Figure 6)	The majority of the study and investigation area is classified as a Fish Support Area (FSA). Fish Support Areas include sub-quaternary catchments that are important for migration of threatened fish species. A south-eastern section of the investigation area, and to a lesser extent the study area, falls within an Upstream Management Area (FEPACODE = 4). These are sub-quaternary catchments in which human activities need to be managed to prevent degradation of downstream river FEPA's and Fish Support Areas.
Catchment	Vaal		
Quaternary Catchment	C23G		
WMA	Upper Vaal		
subWMA	Downstream Vaal Dam		
<b>Dominant characteristics of the Highveld (11.01) Ecoregion Level 2 (Kleynhans <i>et al.</i>, 2007).</b>		NFEP Wetlands (Figure 7)	According to the NFEP (2011) database, no wetlands are present inside the study or investigation area. A channelled valley-bottom wetland (associated with the Mooi River) is located approximately 1 km west of the study area. The ecological condition of this wetland is considered to be natural or good (WETCON AB).
Dominant primary terrain morphology	Plains: low relief		
Dominant primary vegetation types	Rocky Highveld Grassland; Mixed Bushveld	Wetland Vegetation Type	The study and investigation area fall within the Dry Highveld Grassland Group 5, which is considered least threatened according to Mbona <i>et al.</i> (2015).
Altitude (m a.m.s.l)	1300 to 1900		
MAP (mm)	500 to 700	NFEP Rivers (Figure 7)	According to the NFEP (2011) database, no rivers are present within the study or investigation area. The closest river feature (the Mooi River) is indicated approximately 1 km west of the study area. The Mooi River is indicated to be in a moderately modified (Class C) ecological condition (PES 1999).
Coefficient of Variation (% of MAP)	20 to 34		
Rainfall concentration index	55 to 64		
Mean annual temp. (°C)	14 to 18		
Winter temperature (July)	0 to 20		
Summer temperature (Feb)	12 to 30	<b>Landtypes</b>	
Median annual simulated runoff (mm)	20 to 60	The study and investigation area are situated entirely within the Fa14 Landtype. Fa landtypes are characterised by generally shallow soils consisting of a topsoil directly underlain by weathered rock (the Glenrosa Soil Form) or hard rock (the Mispah form), sometimes with surface rock and steep slopes. Within the Fa14 landtype the only occurrence of hydromorphism as indicated by soil forms associated with wetlands occurs in the valley bottoms. The Willowbrook (a melanic A topsoil horizon underlain by a G (gley) subsoil horizon and Avalon (an orthic A topsoil underlain by a yellow-brown apedal B underlain by a soft plinthic B horizon) soil forms occur within valley bottoms in this landtype, but neither of these soil forms occupy a very large portion of the valley bottom terrain unit. The absence of wetland-related soil forms in other terrain units is strongly suggestive that no wetland habitat occurs in these settings.	
<b>Ecological Status of the most proximal sub-quaternary reach (DWS, 2014).</b>		<b>Detail of the study area in terms of the North-West Biodiversity Spatial Plan (2015) (Figure 8).</b>	
Sub-quaternary reach	C23G-01250 (Mooi River)	According to the <b>NWBSP 2015</b> , the majority of the study area is classified as an Ecological Support Area 1 (ESA 1) of aquatic importance. A small aquatic ESA2 is indicated within a southwestern portion of the investigation area. Critical Biodiversity Areas (CBA1 and CBA2) of aquatic importance (associated with the Mooi River) are also present west of the investigation area.  CBA1s are areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure. CBA2s are areas in a degraded or secondary condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure. ESAs are areas that are not essential for	
Proximity of data point to study area	±12 km		
Assessed by expert?	Yes		
PES Category Median	(D) Largely Modified		
Mean Ecological Importance (EI) Class	High		
Mean Ecological Sensitivity (ES) Class	Moderate		



Stream Order	2	meeting biodiversity targets, but that play an important role in supporting the functioning of PAs or CBAs and are often vital for delivering ecosystem services.
Default Ecological Class (based on median PES and highest EI or ES mean)	B (High)	<b>Strategic Water Source Areas (2017)</b>
<b>National Biodiversity Assessment (2018): South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (Figure 5).</b>		According to the Strategic Water Source Area Database (2017), the study and investigation area falls within the Far West Karst Region Water Source area for groundwater. The Strategic Water Source Areas for groundwater (SWSA-gw) reflect areas that have high groundwater recharge and where the groundwater forms a nationally important resource. The areas are delineated for the purposes of research, and the outcomes are useful to national level planners and decision makers as an indication of the location of strategic groundwater sources and resources.
According to the NBA database (2018), no rivers or wetlands are present within the study or investigation area. The closest river feature (the Mooi River) is indicated approximately 1.km west of the study area. The Ecological Protection Level (EPL) of the Mooi River is considered to be 'poorly protected' and the Ecosystem Threat Status (ETS) 'critically endangered'. A channelled valley-bottom wetland, which is associated with the Mooi River, is indicated west of the study area. The EPL status of this wetland is reported as 'not protected' and the ETS 'critically endangered'.		
<b>National Web Based Environmental Screening Tool (Accessed 2022) (Figure 3).</b>		
The study and investigation area have a very high aquatic sensitivity due to the area being classified as a strategic water source area for groundwater.		

CBA = Critical Biodiversity Area; DWS = Department of Water and Sanitation; EI = Ecological Importance; ES = Ecological Sensitivity; EPL = Ecosystem Protection Level; ESA = Ecological Support Area; ETS = Ecosystem Threat Status; m.a.m.s.l = Metres Above Mean Sea Level; MAP = Mean Annual Precipitation; NBA = National Biodiversity Assessment; NFEPA = National Freshwater Ecosystem Priority Areas; PES = Present Ecological State; SAIIAE = South African Inventory of Inland Aquatic Ecosystems; WMA = Water Management Area



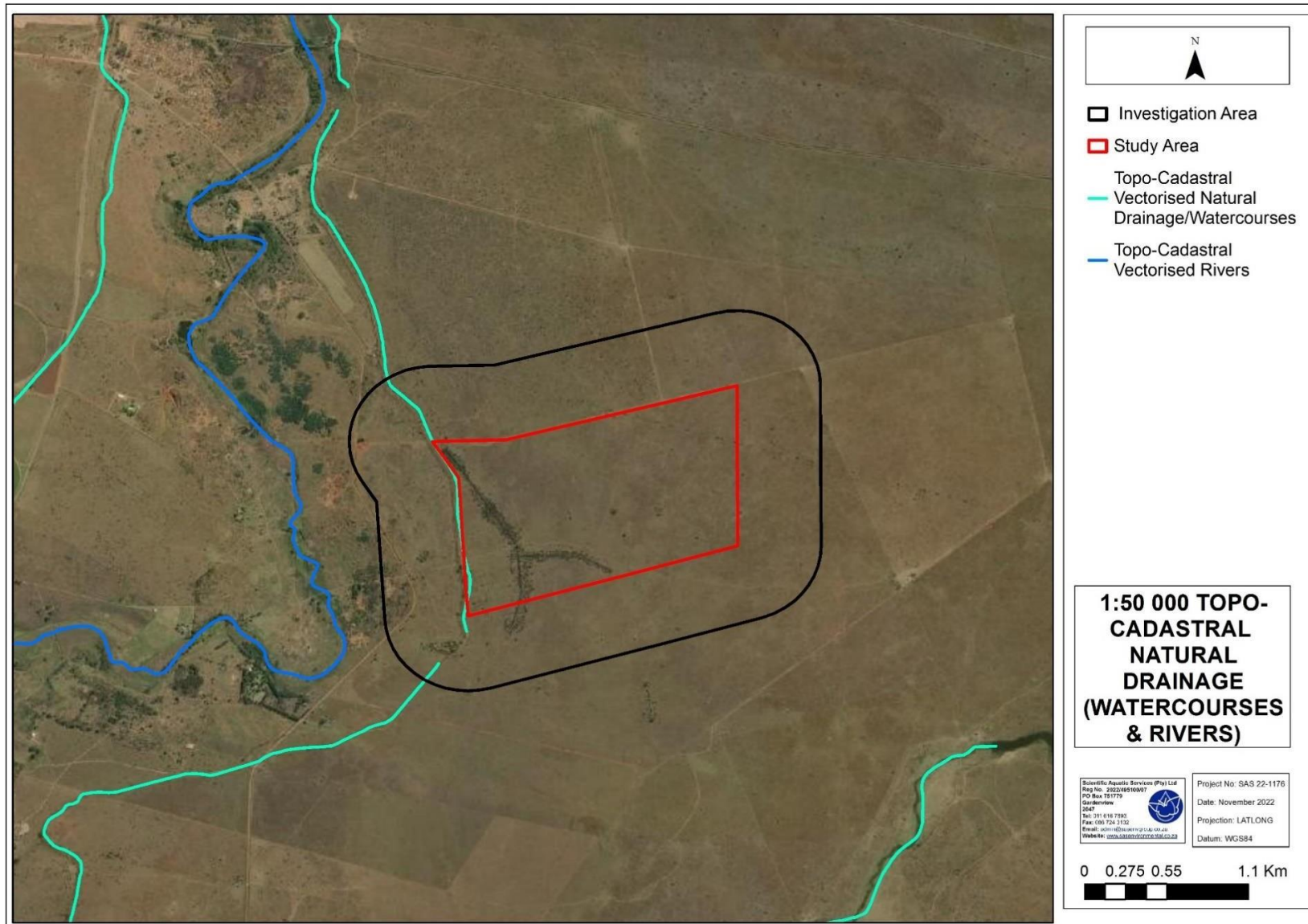


Figure 4: Map of natural surface water drainage in the study and investigation areas, as presented on the 1:50 000-scale topo-cadastral map for the area.



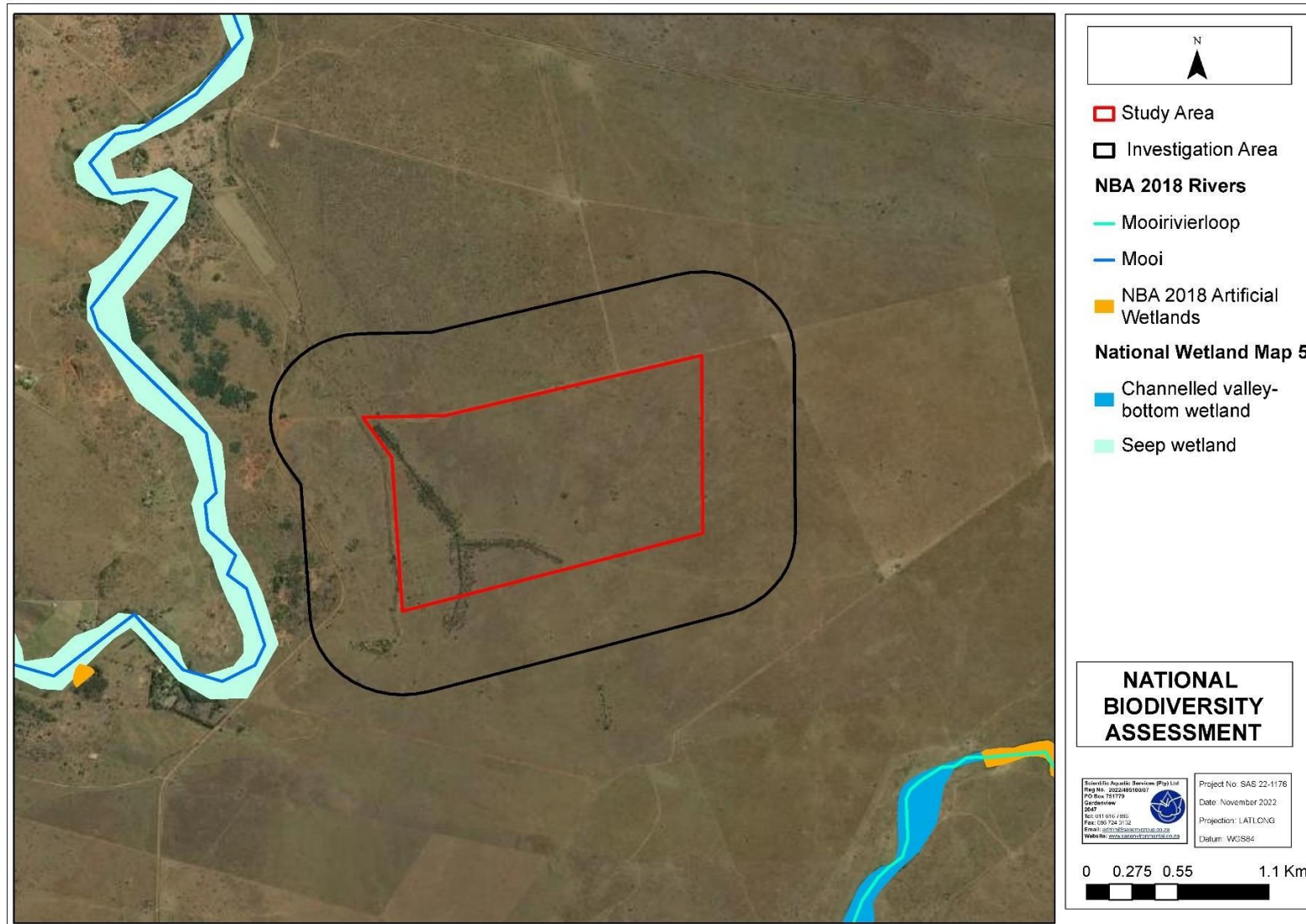


Figure 5: Wetlands and rivers associated with the study and investigation areas according to the National Biodiversity Assessment database (2018).



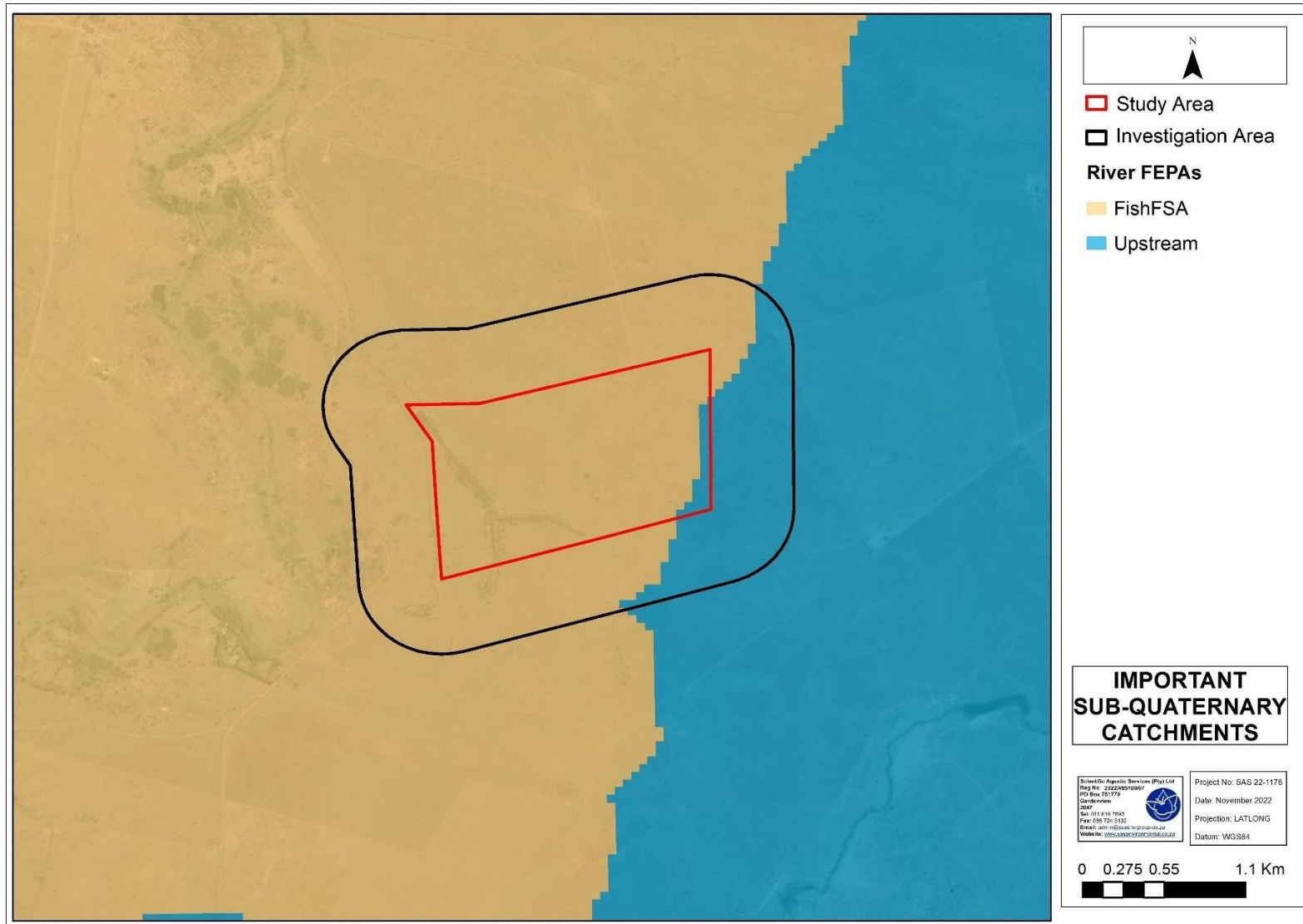


Figure 6: Important sub-quaternary catchment areas associated with the study and investigation area according to the NFEPA database (2011)



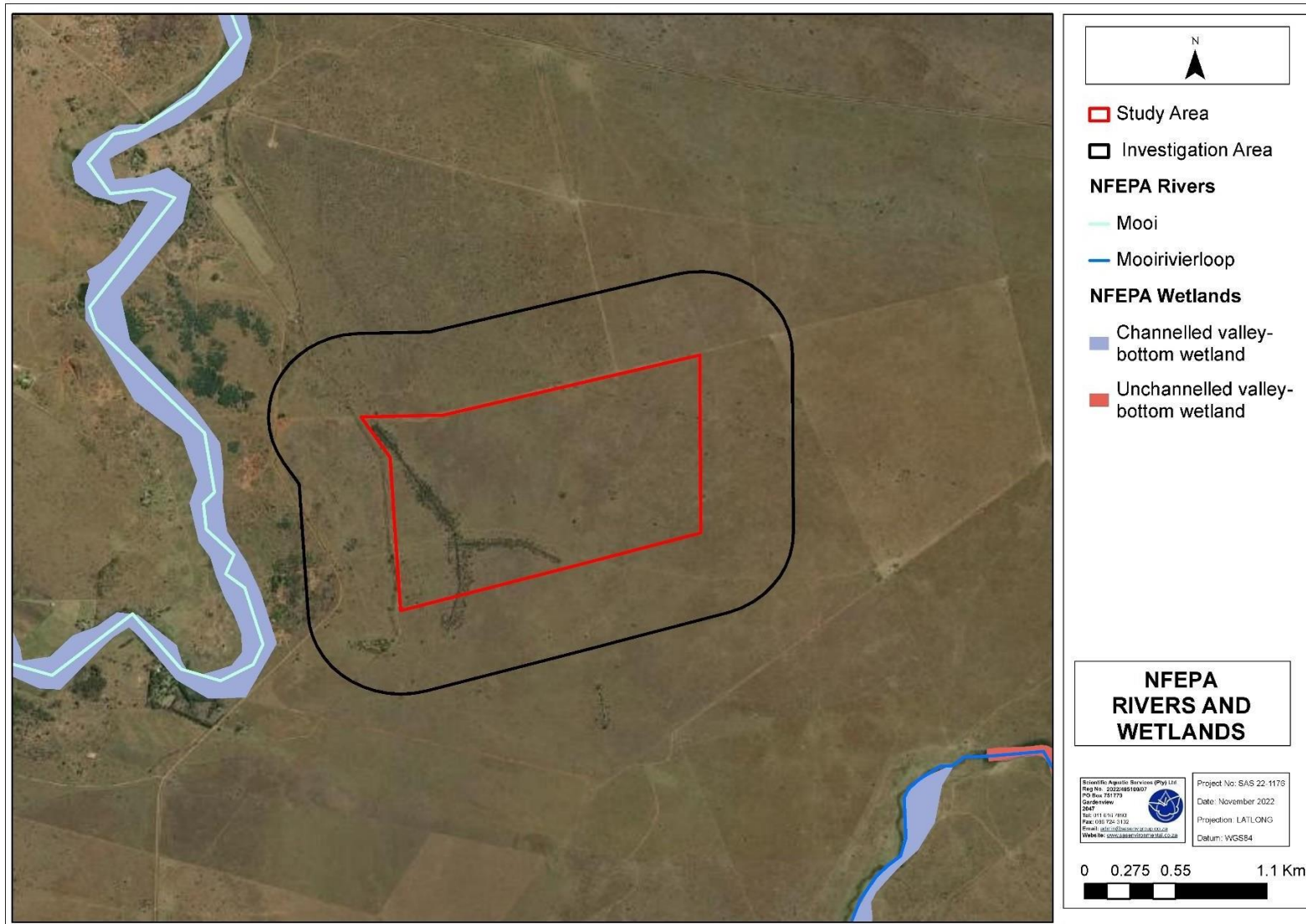


Figure 7: Wetlands and river HGM classifications associated with the study and investigation areas according to the NFEPA database (2011).



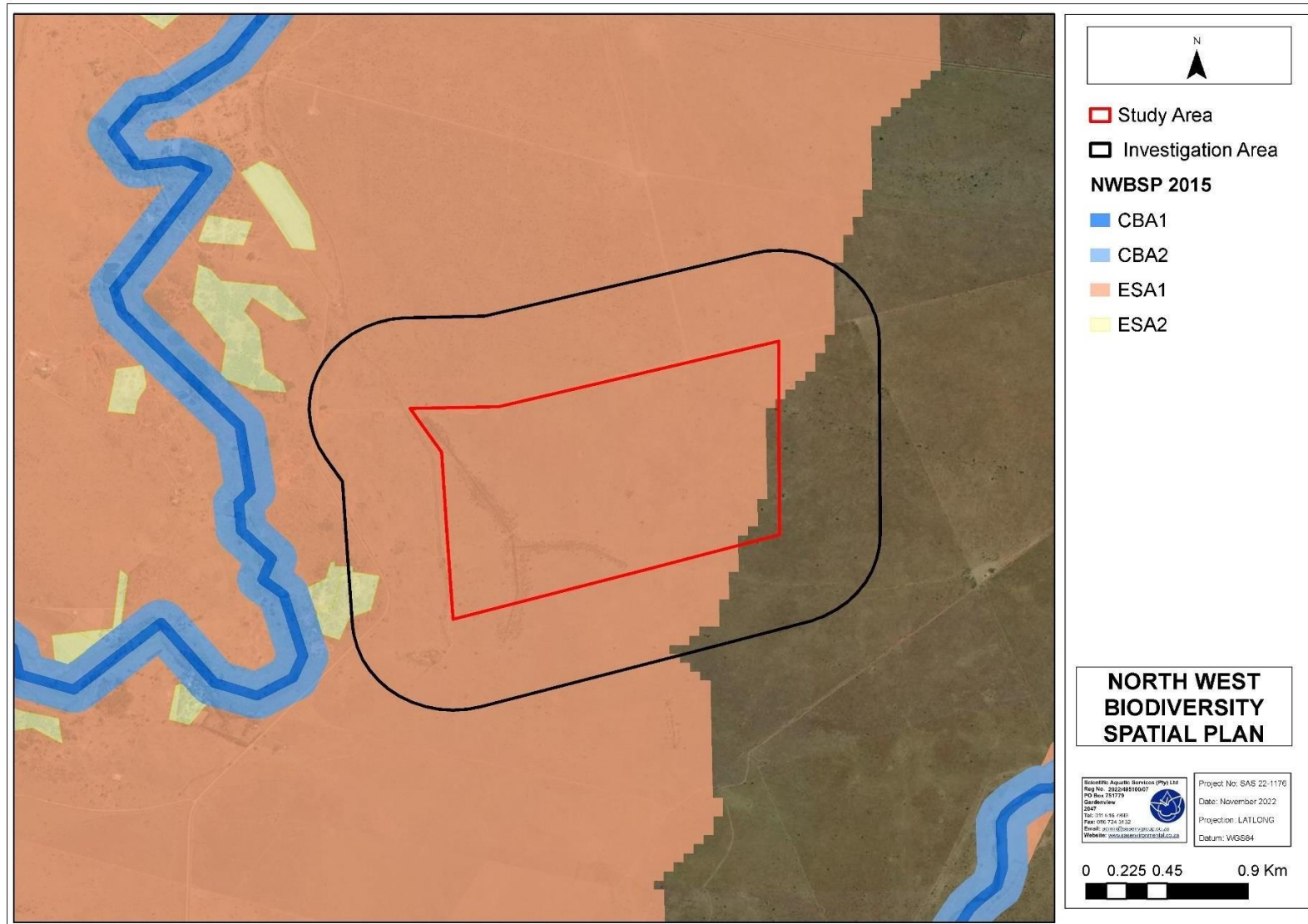


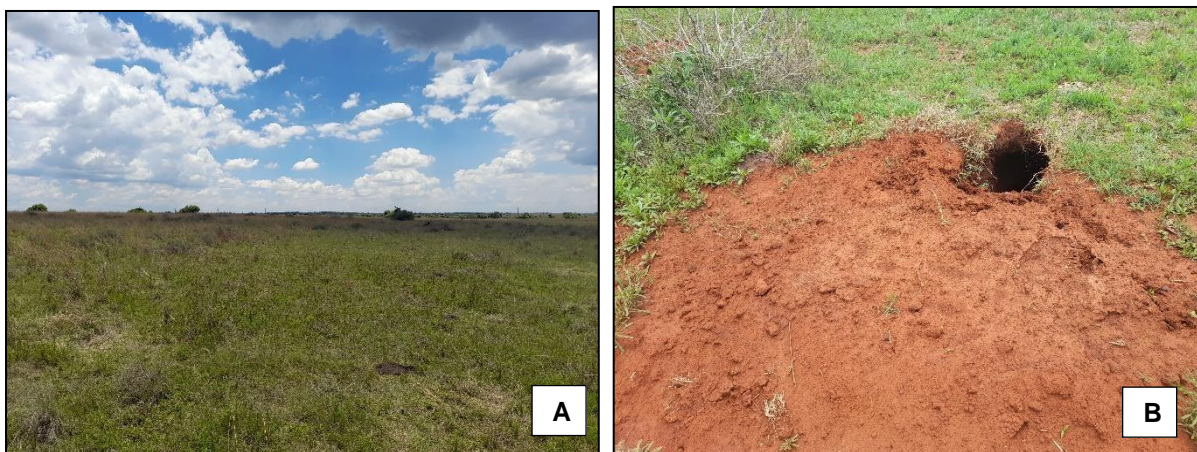
Figure 8: Ecologically important areas associated with the study and investigation areas according to the North-West Biodiversity Spatial Plan (2011).





## 6. SITE SURVEY RESULTS

Aerial photographs, digital satellite imagery, and provincial and national wetland databases (as outlined in Section 5) were used to identify areas of interest at a desktop level. All possible measures were undertaken to ensure all freshwater ecosystems within the study and investigation areas were assessed. Site investigation of the study area was undertaken in November 2022, using visual assessment methods as well as digital satellite imagery. In addition, a bucket soil auger was used to verify soil characteristics that may indicate the presence or lack thereof of any potential wetland/riparian features in the study area and associated investigation area.



**Figure 9: Representative photograph of the study area (A). The soils (B) are red, unconsolidated, apedal soils with no indication of hydromorphism (wetland characteristics).**

The vegetation within the study area is largely natural rangeland (grazed by cattle) dominated by graminoids from the genus *Hyparrhenia*, *Cymbopogon* and *Harporchloa* among isolated patches of woody species such as *Celtis africana*, *Searsia lancea* and *Vachellia karroo*. No plant species (hydrophytes) typically associated with permanent or temporary wet conditions were observed.

The landtype data for the study area indicates that hydromorphism in these areas are located exclusively in valley bottom areas. The study area is situated on the crest and mid-slope terrain units of which the predominant soil forms are unconsolidated apedal soil forms, Glenrosa and Mispah (rock dominated) which are not associated with hydromorphism. Upon investigation of the soil on site, it was confirmed that the soil in the study area did not display any characteristics of redoximorphism such as mottling (indicators of a fluctuating water table associated with wetland conditions) (Figure 9).

No natural freshwater ecosystems were found either in the study area or the investigation area. It is noted that although there were depressional areas in the topography of the landscape, none of these areas were found to possess vegetative wet responses.

## **6.1 Freshwater Wetland Sensitivity**

Under the Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity, (GN320 of March 2020), for areas of low aquatic biodiversity sensitivity an Aquatic Biodiversity Compliance Statement must be produced. As described in Section 5, the DFFE Web-based Environmental Screening Tool has designated the study area as being of very high aquatic biodiversity sensitivity due to the area being located within a strategic water source area. However, since the site survey confirmed that no natural freshwater ecosystems are located within the study or investigation area, and the proposed PV plant poses no quantum of risk to any watercourses outside this area, the study area has been assessed to have a low aquatic biodiversity sensitivity. This supports the approach of undertaking an Aquatic Biodiversity Compliance Statement.

## **7. LEGISLATIVE REQUIREMENTS**

The following legislative requirements and provincial guidelines were considered during the assessment.

- The Constitution of the Republic of South Africa, 1996<sup>1</sup>;
- The National Environmental Management Act, 1998 (Act No. 107 of 1998) as amended (NEMA);
- The National Water Act, 1998 (Act No. 36 of 1998) as amended (NWA);
- Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998); and
- GDARD Requirements for Biodiversity Assessments, Version 3 (2014).

The legislative context of a regulated zone(s) of activity for the protection of freshwater ecosystems as based on the above legislation can be summarised as follows:

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<sup>1</sup> Since 1996, the Constitution has been amended by seventeen amendments acts. The Constitution is formally entitled the 'Constitution of the Republic of South Africa, 1996'. It was previously also numbered as if it were an Act of Parliament – Act No. 108 of 1996 – but since the passage of the Citation of Constitutional Laws Act, neither it nor the acts amending it are allocated act numbers.



**Table 2: Articles of Legislation and the relevant zones of regulation applicable to each article.**

Legislation / Guideline	Zone of applicability
<p>Water Use Authorisation. Application for water uses as stipulated in Section 21(c) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) as amended.</p> <p><b>Department of Water and Sanitation (DWS)</b></p>	<p><b>Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998)</b></p> <p>In accordance with GN509 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998), a regulated area of a watercourse in terms of water uses as listed in Section 21 (c) and 21(i) is defined as:</p> <ul style="list-style-type: none"> <li>• the outer edge of the 1 in 100 year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam;</li> <li>• <b>in the absence of a determined 1 in 100 year flood line or riparian area the area within 100 m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench; or</b></li> <li>• <b>a 500 m radius from the delineated boundary (extent) of any wetland or pan in terms of this regulation.</b></li> </ul>
<p>Listed activities in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) EIA Regulations (2014), as amended in 2017.</p>	<p><b>Activity 12 of Listing Notice 1 (GN 327) of the National Environmental Management Act, 1998 (Act No.107 of 1998) EIA regulations, 2014 (as amended in 2017)</b></p> <p>The development of—</p> <p>(ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs—;</p> <p>a) within a watercourse;</p> <p>b) in front of a development setback; or</p> <p>c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.</p> <p>excluding—</p> <p>(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies;</p> <p>(ee) where such development occurs within existing roads, road reserves or railway line reserves; or</p> <p>(ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared.</p>
<p>GDARD Requirements for Biodiversity Assessments, Version 3 (2014).*</p>	<p>The GDARD Requirements for Biodiversity Assessments, Version 3 (2014) specifies buffer widths for sensitive features. For rivers (non-perennial / perennial) riparian zones and wetlands, buffer zones must be designated as sensitive according to the following mapping rules.</p> <ul style="list-style-type: none"> <li>• The riparian zone/wetland must be delineated according to “DWAF, 2003: A Practical Guideline Procedure for the Identification and Delineation of Wetlands and Riparian Zones”.</li> <li>• A 100m buffer zone from the edge of the riparian zone for rivers/streams outside urban areas must apply.</li> <li>• A 50 m buffer for wetlands occurring outside urban areas must apply.</li> </ul> <p>The Guidelines highlight that these buffer zones are essential to ensure healthy functioning and maintenance of aquatic ecosystems and function as wildlife corridors and refugia.</p>

\*Note that although the GDARD Requirements do not legally apply to areas outside Gauteng, it was still considered for the purpose of this report given that a portion of the investigation area falls within Gauteng.

Due to the closest freshwater ecosystem being greater than 500 m distant from the study area, no Zones of Regulation, or the required GDARD 100 m riparian/50m wetland buffer will apply to the study area or the activities therein.



## **8. CONCLUSION**

### ***8.1 Summary of Desktop Verification Outcome/Findings***

Based on the site verification undertaken by Scientific Aquatic Services and the findings thereof presented in this report, it was confirmed that no natural freshwater ecosystems occur within the study or investigation area. Due to the closest freshwater ecosystem being greater than 500 m distant from the study area, no Zones of Regulation, or the required GDARD 100 m riparian/50m wetland buffer will apply to the study area and proposed development, nor would the development be subject to a Water Use Authorisation in terms of Section 21 c and i of the National Water Act (Act No 36 of 1998). The proposed PV Power Plant poses no significant quantum of risk to existing freshwater ecosystems in the area and therefore no risk assessment is required in accordance with GN509 of 2016.

### ***8.2 Compliance Statement/Impact Statement***

No impacts to the freshwater environment or freshwater features in the area surrounding the study area are envisioned and the risk profile to the freshwater environment is considered low to negligible. Should the PV power plant, as proposed, remain within the demarcated footprint (study area) as provided by the proponent, the PV power plant construction and operation will not result in an impact (new or cumulative) on any freshwater features in the vicinity of the study area. The proposed PV plant in its current form is associated with a low risk to the freshwater environment.

### ***8.3 Reasoned Opinion for issuing of EA***

Due to the fact that all identified freshwater ecosystems are located at a distance greater than 500m from the proposed PV power plant site, no impact on the freshwater environment is anticipated. As such it is the professional opinion of the freshwater specialist that the proposed PV power plant be granted Environmental Authorisation.

## 9. REFERENCES

- Department of Water Affairs and Forestry (DWAF). 2005. Final draft: A practical field procedure for identification and delineation of wetlands and Riparian areas.
- Department of Water Affairs and Forestry (DWAF). 2008. *Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas*, prepared by M. Rountree, A. L. Batchelor, J. MacKenzie and D. Hoare. Report no. X. Stream Flow Reduction Activities, Department of Water Affairs and Forestry, Pretoria, South Africa.
- Department of Water and Sanitation (DWS). 2014. A Desktop Assessment of the Present Ecological State, Ecological Importance and Ecological Sensitivity per Sub Quaternary Reaches for Secondary Catchments in South Africa. Secondary: C2 Compiled by RQIS-RDM: Online available: <https://www.dwa.gov.za/iwqs/rhp/eco/peseismodel.aspx>.
- Nel, J.L., Driver, A., Strydom W.F., Maherry, A., Petersen, C., Hill, L., Roux, D.J., Nienaber, S., Van Deventer, H., Swartz, E. & Smith-Adao, L.B. 2011. *Atlas of Freshwater Ecosystem Priority Areas in South Africa: Maps to support sustainable development of water resources*. Water Research Commission Report No. TT 500/11, Water Research Commission, Pretoria.
- NFEPA: Driver, A., Nel, J.L., Snaddon, K., Murrui, K., Roux, D.J., Hill, L., Swartz, E.R., Manuel, J. and Funke, N. 2011. Implementation Manual for Freshwater Ecosystem Priority Areas. Water Research Commission. Report No. 1801/1/11. Online available: <http://bgis.sanbi.org/nfepa/project.asp>
- Van Deventer, H., Smith-Adao, L., Collins, N.B., Grenfell, M., Grundling, A., Grundling, P-L., Impson, D., Job, N., Lötter, M., Ollis, D., Petersen, C., Scherman, P., Sieben, E., Snaddon, K., Tererai, F. & Van der Colff, D. 2019. *South African National Biodiversity Assessment 2018: Technical Report. Volume 2b: Inland Aquatic (Freshwater) Realm*. CSIR report number CSIR/NRE/ECOS/IR/2019/0004/A. South African National Biodiversity Institute, Pretoria. <http://hdl.handle.net/20.500.12143/6230>.
- Van Deventer, H.; Smith-Adao, L.; Mbona, N.; Petersen, C.; Skowno, A.; Collins, N.B.; Grenfell, M.; Job, N.; Lötter, M.; Ollis, D.; Scherman, P.; Sieben, E.; Snaddon, K. 2018. *South African Inventory of Inland Aquatic Ecosystems*. South African National Biodiversity Institute, Pretoria. Report Number: CSIR report number CSIR/NRE/ECOS/IR/2018/0001/A; SANBI report number <http://hdl.handle.net/20.500.12143/5847>.



## APPENDIX A - INDEMNITY AND DECLARATION OF INDEPENDENCE

### INDEMNITY AND TERMS OF USE OF THIS REPORT

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and SAS and its staff reserve the right to, at their sole discretion, modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

Although SAS CC exercises due care and diligence in rendering services and preparing documents, SAS CC accepts no liability and the client, by receiving this document, indemnifies SAS CC and its directors, managers, agents and employees against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, directly or indirectly by SAS CC and by the use of the information contained in this document.

This report must not be altered or added to or used for any other purpose other than that for which it was produced without the prior written consent of the author(s). This also refers to electronic copies of this report which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.

### DETAILS, EXPERTISE AND CURRICULUM VITAE OF SPECIALISTS

#### 1. (a) (i) Details of the specialist who prepared the report

Stephen van Staden	MSc. Environmental Management (UJ)
Paul Da Cruz	BA (Hons) (Geography and Environmental Studies) (WITS)
Monique Botha	PhD Env. Sci (NWU)

#### 1. (a). (ii) The expertise of that specialist to compile a specialist report including a curriculum vitae


Company of Specialist:	Scientific Aquatic Services (Pty) Ltd		
Name / Contact person:	Monique Botha		
Postal address:	29 Arterial Road West, Oriel, Bedfordview		
Postal code:	1401	Cell:	0727670435
Telephone:	011 616 7893	Fax:	011 615 6240/ 086 724 3132
E-mail:	monique@sasenvgroup.co.za		
Qualifications	Ph. D Environmental Science		
Registration / Associations	Registered Candidate Member of the South African Council for Natural Scientific Professions (SACNASP)		



**1. (a) a declaration that the specialist is independent in a form as may be specified by the competent authority.**

I, Stephen van Staden, declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct.




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Signature of the Specialist

**1. (b) a declaration that the specialist is independent in a form as may be specified by the competent authority.**

I, Paul da Cruz, declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct.



-----  
Signature of the Specialist

**1. (c) a declaration that the specialist is independent in a form as may be specified by the competent authority.**

I, Monique Botha, declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct.



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Signature of the Specialist



## APPENDIX B - CV OF SPECIALISTS



### SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

#### CURRICULUM VITAE OF **STEPHEN VAN STADEN**

##### PERSONAL DETAILS

Position in Company	Group CEO, Water Resource Discipline Lead, Managing Member, Ecologist, Aquatic Ecologist
Joined SAS Environmental Group of Companies	2003 (year of establishment)

##### MEMBERSHIP IN PROFESSIONAL SOCIETIES

Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP)  
Accredited River Health Practitioner by the South African River Health Program (RHP)  
Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum  
Member of the Gauteng Wetland Forum  
Member of International Association of Impact Assessors (IAIA) South Africa;  
Member of the Land Rehabilitation Society of South Africa (LaRSSA)

##### EDUCATION

###### Qualifications

MSc Environmental Management (University of Johannesburg)	2003
BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg)	2001
BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)	2000

###### Short Courses

Integrated Water Resource Management, the National Water Act, and Water Use Authorisations, focusing on WULAs and IWWMPs	2017
Tools for Wetland Assessment (Rhodes University)	2017
Legal liability training course (Legricon Pty Ltd)	2018
Hazard identification and risk assessment training course (Legricon Pty Ltd)	2018
Wetland Management: Introduction and Delineation (WLID1502S) (University of the Free State)	2018
Hydropedology and Wetland Functioning (TerraSoil Science and Water Business Academy)	2018

##### AREAS OF WORK EXPERIENCE

South Africa – All Provinces  
Southern Africa – Lesotho, Botswana, Mozambique, Zimbabwe Zambia  
Eastern Africa – Tanzania Mauritius



West Africa – Ghana, Liberia, Angola, Guinea Bissau, Nigeria, Sierra Leona  
 Central Africa – Democratic Republic of the Congo

### **DEVELOPMENT SECTORS OF EXPERIENCE**

1. Mining: Coal, chrome, Platinum Group Metals (PGMs), mineral sands, gold, phosphate, river sand, clay, fluorspar
2. Linear developments (energy transmission, telecommunication, pipelines, roads)
3. Minerals beneficiation
4. Renewable energy (Hydro, wind and solar)
5. Commercial development
6. Residential development
7. Agriculture
8. Industrial/chemical

### **KEY SPECIALIST DISCIPLINES**

#### **Legislative Requirements, Processes and Assessments**

- Water Use Applications (Water Use Licence Applications / General Authorisations)
- Environmental and Water Use Audits
- Freshwater Resource Management and Monitoring as part of EMPR and WUL conditions

#### **Freshwater Assessments**

- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Maintenance and Management Plans
- Plant Species and Landscape Plans
- Freshwater Offset Plans
- Hydropedological Assessment
- Pit Closure Analysis

#### **Aquatic Ecological Assessment and Water Quality Studies**

- Habitat Assessment Indices (IHAS, HRC, IHIA & RHAM)
- Aquatic Macro-Invertebrates (SASS5 & MIRAI)
- Fish Assemblage Integrity Index (FRAI)
- Fish Health Assessments
- Riparian Vegetation Integrity (VEGRAI)
- Toxicological Analysis
- Water quality Monitoring
- Screening Test
- Riverine Rehabilitation Plans

#### **Biodiversity Assessments**

- Floral Assessments
- Biodiversity Actions Plan (BAP)
- Biodiversity Management Plan (BMP)
- Alien and Invasive Control Plan (AICP)
- Ecological Scan
- Terrestrial Monitoring
- Biodiversity Offset Plan

#### **Soil and Land Capability Assessment**

- Soil and Land Capability Assessment
- Hydropedological Assessment

#### **Visual Impact Assessment**

- Visual Baseline and Impact Assessments

Visual Impact Peer Review Assessments





**SAS ENVIRONMENTAL GROUP OF COMPANIES –  
SPECIALIST CONSULTANT INFORMATION**

**CURRICULUM VITAE OF PAUL DA CRUZ**

**PERSONAL DETAILS**

Position in Company	Senior Ecologist
Joined SAS Environmental Group of Companies	2022

**MEMBERSHIP IN PROFESSIONAL SOCIETIES**

Registered Certificated Scientist at South African Council for Natural Scientific Professions (SACNASP)  
Registered Environmental Assessment Practitioner (EAP) with the Environmental Assessment Practitioners Association of South Africa (EAPASA)  
Member of the South African Wetland Society (SAWS)

**EDUCATION**

**Qualifications**

BA (Hons) (Geography and Environmental Studies) (University of the Witwatersrand)	1998
BA (Geography) (University of the Witwatersrand)	1997

**Short Courses**

Taxonomy of Wetland Plants (Water Research Commission)	2017
Advanced Grass Identification (Frits van Outshoorn)	2010
Grass Identification (Frits van Outshoorn),	2009
Soil Form Classification and Wetland Delineation; (TerraSoil Science)	2008

**AREAS OF WORK EXPERIENCE**

South Africa – All Provinces  
Southern Africa – Lesotho, Botswana

**DEVELOPMENT SECTORS OF EXPERIENCE**

1. Renewable energy (Wind and solar)
2. Linear developments (energy transmission, telecommunication, pipelines, roads, border infrastructure)
3. Nature Conservation and Ecotourism Development
4. Commercial development
5. Residential development
6. Environmental and Development Planning and Strategic Assessment
7. Industrial/chemical; Non-renewable power Generation



**KEY SPECIALIST DISCIPLINES****Legislative Requirements, Processes and Assessments**

- EIA / BA Applications
- Environmental Authorisation Amendments
- EMPr Compilation
- Environmental Compliance Monitoring (Environmental Auditing)
- Environmental Screening Assessments and Listing Notice 3 Trigger Identification / Mapping
- Strategic Environmental Assessments and Environmental Management Frameworks
- EIA / Specialist Study Peer Review

**Freshwater Assessments**

- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Maintenance and Management Plans
- Plant Species and Landscape Plans
- Freshwater Assessments in support of Environmental Screening Assessments, Precinct Planning & SEA
- Wetland Construction (Compliance) Monitoring

**Biodiversity Assessments**

- Avifaunal Assessments
- Strategic Biodiversity Assessment

**Visual Impact Assessment**

- Visual Impact Assessments

**GIS / Spatial Analysis**

- GIS Spatial Analysis and Listing Notice 3 mapping



**SAS ENVIRONMENTAL GROUP OF COMPANIES –  
SPECIALIST CONSULTANT INFORMATION  
CURRICULUM VITAE OF **MONIQUE BOTHA****

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**PERSONAL DETAILS**

Position in Company	Junior field ecologist
Joined SAS Environmental Group of Companies	2022

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**MEMBERSHIP IN PROFESSIONAL SOCIETIES**

SACNASP Candidate Natural Scientist (Environmental Sciences) **#126160**

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**EDUCATION**

**Qualifications**

B.Sc. Environmental and Biological Sciences (North-West University)	2010
Hons. B.Sc. Environmental Sciences (North-West University)	2011
M.Sc. Environmental Sciences (North-West University)	2014
Ph.D. Environmental Sciences (North-West University)	2016

**Short Courses**

Freshwater bio-assessment techniques (North-West University)	2010
River profile analysis (North-West University)	2010
Spatial analysis and Geoprocessing (ESRI Online)	2022

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**KEY SPECIALIST DISCIPLINES**

- Desktop Freshwater Ecosystem (wetland / riparian) Delineation
- Wetland Delineation and Assessment
- Mapping (GIS, Global Mapper)

