Appendix G.2

AQUATIC SCOPING REPORT

SCIENTIFIC AQUATIC SERVICES

SCOPING-PHASE FRESHWATER ECOLOGICAL ASSESSMENT

AS PART OF THE ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED GRID CONNECTION ASSOCIATED WITH THE PHEFUMULA EMOYENI ONE WIND ENERGY FACILITY NEAR ERMELO, MPUMALANGA PROVINCE.

Prepared for:	Phefumula Emoyeni One (Pty) Ltd
Report author:	P. da Cruz (Cert. Sci. Nat.)
Report reviewer:	S. van Staden (Pri. Sci. Nat.)
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Part of the SAS Environmental Group of Companies

Website: http://www.sasenvironmental.co.za

EXECUTIVE SUMMARY

Scientific Aquatic Services (SAS) (Pty) Ltd was appointed to conduct a freshwater ecological assessment as part of the Environmental Impact Assessment (EIA) process for the proposed grid connection associated with the Phefumula Emoyeni One Wind Energy Facility (WEF) in the Ermelo area of the Mpumalanga Province. The project comprises a short 400kV loop in loop out with 3 x 132kV OHPLs and 3 x 33/132kV substations (collectively known as the 'study area'), along with a 500 m "zone of investigation" (the investigation area), in accordance with Government Notice (GN) 4167 of December 2023 as it relates to the National Water Act, 1998 (Act No. 36 of 1998) as amended (NWA).

Delineation of freshwater ecosystems was undertaken using desk-based methods to identify all freshwater ecosystems in the study and investigation areas. A field verification site assessment was undertaken in October 2023 to verify the presence of freshwater ecosystems in the wider WEF development area.

The desk-based and field verification assessment has verified that the freshwater ecosystems in the study and investigation areas are all wetlands, with two hydrogeomorphic (HGM) types present in the study and investigation areas being seeps and channelled valley bottom wetlands. This is due to the nature of various physical characteristics of the study area, including the nature of the terrain which is partly undulating with moderate slopes of wide valleys characterising much of the study area and due to the nature of the underlying soils, with much of the area being underlain by sandstone which is associated with strong surface-groundwater linkages and groundwater seepage. Soils in the bottomlands are typically highly clayey in nature with the presence of vertic soils in many areas. Wetlands in this context are typically channelled features.

In the context of the designation of the DFFE's National Web-based Environmental Screening Tool (2020), all freshwater ecosystems were verified to be associated with a very high freshwater-related sensitivity. This sensitivity has been used as the basis on which to identify development opportunity and constraints areas on the development site from a freshwater perspective. All freshwater ecosystems and an associated non-development buffer have been designated as development high restriction areas, with the remainder of the 500m Zone of Regulation (ZoR) being designated as developable areas, but with mitigation measures implemented, and the remaining area of the study area being designated as developable with no restrictions.

The proposed development could result in direct impacts if grid infrastructure were to be placed within freshwater ecosystems and if the access road / track used for construction encroaches on watercourses as well as a suite of indirect impacts. The potential for impacts to occur will be significantly reduced if no infrastructure with a physical footprint is placed within a freshwater ecosystem or associated buffer zone. A recommendation has been made that the development area of the DX1 substation which encroaches on to the delineated extent of a seep wetland and which occupies a significant portion of the uppermost part of the wetland's uppermost catchment be relocated to avoid these aspects from having the potential to materialise. The nature and intensity of impacts, and associated mitigation measures will be assessed in the EIA phase of the project.

DOCUMENT GUIDE

The table below provides the specialist report requirements for the assessment and reporting of impacts on aquatic biodiversity in terms of Government Notice 320 as promulgated in Government Gazette 43110 of 20 March 2020 in line with the Department of Environment, Forestry, and Fisheries screening tool requirements, as it relates to the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) as well as for the Environmental Impact Assessment (EIA) Regulations 2014 (as amended) requirements for Specialist Reports (Appendix 6).

No.	Requirements	Section in report
2.1	Assessment must be undertaken by a suitably qualified SACNASP registered specialist	Front Page and Appendix I
2.2	Description of the preferred development site, including the following aspects-	
2.2.1	a. Aquatic ecosystem type b. Presence of aquatic species and composition of aquatic species communities, their habitat, distribution, and movement patterns	Section 3 and 4
2.2.2	Threat status, according to the national web-based environmental screening tool of the species and ecosystems, including listed ecosystems as well as locally important habitat types identified	Sections 3 and 4
2.2.3	National and Provincial priority status of the aquatic ecosystem (i.e. is this a wetland or river Freshwater ecosystem Priority Area (FEPA), a FEPA sub- catchment, a Strategic Water Source Area (SWSA), a priority estuary, whether or not they are free-flowing rivers, wetland clusters, etc., a CBA or an ESA; including for all a description of the criteria for their given status	Section 3
2.2.4	A description of the Ecological Importance and Sensitivity of the aquatic ecosystem including: a. The description (spatially, if possible) of the ecosystem processes that operate in relation to the aquatic ecosystems on and immediately adjacent to the site (e.g. movement of surface and subsurface water, recharge, discharge, sediment transport, etc.); b. The historic ecological condition (reference) as well as Present Ecological State (PES) of rivers (in-stream, riparian, and floodplain habitat), wetlands, and/or estuaries in terms of possible changes to the channel, flow regime (surface and groundwater)	Section 3
2.3	Identify any alternative development footprints within the preferred development site which would be of a "low" sensitivity as identified by the national web based environmental screening tool and verified through the Initial Site Sensitivity Verification	Section 6,7
2.4	Assessment of impacts - a detailed assessment of the potential impact(s) of the proposed development on the following very high sensitivity areas/ features:	Section 8
2.4.1	Is the development consistent with maintaining the priority aquatic ecosystem in its current state and according to the stated goal?	Section 3
2.4.2	Is the development consistent with maintaining the Resource Quality Objectives for the aquatic ecosystems present?	Section 3
2.4.3	How will the development impact on fixed and dynamic ecological processes that operate within or across the site, including: a. Impacts on hydrological functioning at a landscape level and across the site which can arise from changes to flood regimes (e.g. suppression of floods, loss of flood attenuation capacity, unseasonal flooding, or destruction of floodplain processes); b. Change in the sediment regime (e.g. sand movement, meandering river mouth/estuary, changing flooding or sedimentation patterns) of the aquatic ecosystem and its sub-catchment; c. The extent of the modification in relation to the overall aquatic ecosystem (i.e. at the source, upstream or downstream portion, in the temporary / seasonal / permanent zone of a wetland, in the riparian zone, or within the channel of a watercourse, etc.). d. Assessment of the risks associated with water use/s and related activities.	Section8
2.4.4	How will the development impact on the functionality of the aquatic feature including: a. Base flows (e.g. too little/too much water in terms of characteristics and requirements of system); b. Quantity of water including change in the hydrological regime or hydroperiod of the aquatic ecosystem (e.g. seasonal to temporary or permanent; impact of over-abstraction or instream or off-stream impoundment of a wetland or river); c. Change in the hydrogeomorphic typing of the aquatic ecosystem (e.g. change from an unchannelled valley-bottom wetland to a channelled valley-bottom wetland); d. Quality of water (e.g. due to increased sediment load, contamination by chemical and/or organic effluent, and/or eutrophication); and	Section 8

	e. Fragmentation (e.g. road or pipeline crossing a wetland) and loss of ecological connectivity (lateral and longitudinal).	
2.4.5	How will the development impact on key ecosystem regulating and supporting services, especially Flood attenuation; Streamflow regulation; Sediment trapping; Phosphate assimilation; Nitrate assimilation; Toxicant assimilation; Erosion control; and Carbon storage?	Section 8
2.4.6	How will the development impact community composition (numbers and density of species) and integrity (condition, viability, predator-prey ratios, dispersal rates, etc.) of the faunal and vegetation communities inhabiting the site?	Section 8
2.4.7	In addition to the above, where applicable, impacts to the frequency of estuary mouth closure should be considered, in relation to: size of the estuary; availability of sediment; wave action in the mouth; protection of the mouth; beach slope; volume of mean annual runoff; and extent of saline intrusion (especially relevant to permanently open systems).	NA – project not in proximity to estuaries.
3.	**The report must contain as a minimum the following information:**	
3.1	Contact details and curriculum vitae of the specialist including SACNASP registration number and field of expertise and their curriculum vitae;	Appendix I
3.2	A signed statement of independence by the specialist;	Appendix I
3.3	The duration, date, and season of the site inspection and the relevance of the season to the outcome of the assessment;	Section 2
3.4	The methodology used to undertake the impact assessment and site inspection, including equipment and modelling used, where relevant;	Section 1, 2, Appendix C
3.5	A description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations;	Section 1.4
3.6	Areas not suitable for development, to be avoided during construction and operation (where relevant);	Section 7
3.7	Additional environmental impacts expected from the proposed development based on those already evident on the site and a discussion on the cumulative impacts;	Section 8
3.8	A suitable construction and operational buffer for the aquatic ecosystem, using the accepted protocol;	Sections 6 and 7
3.9	Impact management actions and impact management outcomes proposed by the specialist for inclusion in the EMPr;	N/A – this will be assessed in the EIA-phase freshwater assessment
3.10	A motivation where the development footprint identified as per 2.3 were not considered stating reasons why these were not being considered; and	N/A – this will be assessed in the EIA-phase freshwater report
3.11	A reasoned opinion, based on the finding of the specialist assessment, regarding the acceptability or not, of the development and if the development should receive approval, and any conditions to which the statement is subjected.	N/A – this will be assessed in the EIA-phase freshwater report
3.12	A suitable construction and operational buffer for the aquatic ecosystem, using the accepted methodologies.	Section 7
3.13	Proposed impact management actions and impact management outcomes for inclusion in the Environmental Management Programme (EMPr).	N/A – this will be assessed in the EIA-phase freshwater report
3.14	A motivation must be provided if there were development footprints identified as per paragraph 2.3 for reporting in terms of Section 24(5)(a) and (h) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) that were identified as having a “low” aquatic biodiversity and sensitivity and that were not considered appropriate.	Sections 6 and 7
3.15	A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability or not of the proposed development and if the proposed development should receive approval or not.	N/A – this will be assessed in the EIA-phase freshwater report
3.16	Any conditions to which this statement is subjected.	N/A – this will be assessed in the EIA-phase freshwater report

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GLOSSARY OF TERMS

Alien vegetation:	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.
Alluvial Material / Deposits	Sedimentary deposits resulting from the action of rivers, including those deposited within river channels, floodplains, etc
Apedal	A term indicating the degree of aggregation of soil particles within a soil horizon, where the material is well aggregated, but without well-formed peds (individual soil aggregates); in the context of the South African Soil Classification System, apedal soils also include structureless soils (e.g. sands) and somewhat more structured soils than the above description.
Biodiversity:	The number and variety of living organisms on earth, the millions of plants, animals, and micro-organisms, the genes they contain, the evolutionary history and potential they encompass, and the ecosystems, ecological processes, and landscape of which they are integral parts.
Buffer:	A strip of land surrounding a wetland or riparian area in which activities are controlled or restricted, in order to reduce the impact of adjacent land uses on the wetland or riparian area.
Catchment:	The area where water is collected by the natural landscape, where all rain and run-off water ultimately flows into a river, wetland, lake, and ocean or contributes to the groundwater system.
Catena	A repeated sequence of soil profiles that is related to relief features, indicating the same sequence when traced from the crest (interfluve) to the valley floor. Profiles change in character as one moves downslope (change in slope angle and drainage conditions), so that different degrees of leaching / translocation are encountered
Cumulative Impact	The impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area
Delineation (of a wetland):	To determine the boundary of a wetland based on soil, vegetation, and/or hydrological indicators.
Drainage Density	A measure of the texture of a drainage system, expressed as the ratio of the total length of all stream channels within a catchment to the area of that catchment
Duplex Soils	Soils with a duplex morphology are characterised by the presence of a topsoil (A) horizon that differs markedly from the underlying subsoil in terms of texture, structure and composition, with an abrupt transition between the two soil horizons
Ecoregion:	An ecoregion is a "recurring pattern of ecosystems associated with characteristic combinations of soil and landform that characterise that region".
Endorheic	A term given to an inward oriented pattern of drainage that is not connected to a wider drainage system
Facultative species:	Species usually found in wetlands (76%-99% of occurrences) but occasionally found in non-wetland areas.
Fluvial:	The physical interaction of flowing water and the natural channels of rivers and streams.
Graminoid	Grasses, sedges and rushes.
Groundwater:	Subsurface water in the saturated zone below the water table.
Herb	A small non woody plant in which the aerial parts die back at the end of every growing season
Hydromorphic soil:	A soil that in its undrained condition is saturated or flooded long enough to develop anaerobic conditions favouring the growth and regeneration of hydrophytic vegetation (vegetation adapted to living in anaerobic soils).
Hydrology:	The study of the occurrence, distribution, and movement of water over, on, and under the land surface.
Hydroperiod	The term hydroperiod describes the different variations in water input and output that form a freshwater ecosystem characterising its ecology – i.e. the water balance of the wetland
Land Type	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
Macro channel (bank)	The (overall) compound channel of a watercourse that is situated between the two outermost and highest-lying banks
Melanic	A type of topsoil horizon that is dark-coloured and usually well-structured
Perennial:	Flows all year round.
RDL (Red Data listed) species:	Organisms that fall into the Extinct in the Wild (EW), critically endangered (CR), Endangered (EN), Vulnerable (VU) categories of ecological status
Reach	A longitudinal stretch of a river
Redoximorphic	Features within soil that are a result of the reduction, translocation and oxidation (precipitation) of Fe (iron) and Mn (manganese) oxides that occur when soils are saturated for sufficiently long periods of time to become anaerobic.
Riparian Area / Corridor	The physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised 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 land areas
Vertic	Soils characterised by the presence of swelling and shrinking clays, typically formed where there is a distinct wet and dry period that affects the soils. These soils swell when they become saturated, and shrink again when they dry out, leading to characteristic 'cracking' on the surface of the ground
Watercourse:	In terms of the definition contained within the National Water Act, a watercourse means: • A river or spring; • A natural channel which water flows regularly or intermittently; • A wetland, dam, or lake into which, or from which, water flows; and • Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse; • and a reference to a watercourse includes, where relevant, its bed and banks
Wetland Vegetation (WetVeg) type:	Broad groupings of wetland vegetation, reflecting differences in regional context, such as geology, climate, and soils, which may, in turn, have an influence on the ecological characteristics and functioning of wetlands.

ACRONYMS

°C	Degrees Celsius.
BAS	Best Attainable State
BGIS	Biodiversity Geographic Information Systems
BESS	Battery Energy Storage System
CBA	Critical Biodiversity Area
CSIR	Council of Scientific and Industrial Research
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
Dx	Distribution
EA	Environmental Authorisation
EC	Ecological Class
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMC	Ecological Management Class
EMPr	Environmental Management Program
ESA	Ecological Support Area
EWR	Ecological Water Requirements
FEPA	Freshwater Ecosystem Priority Areas
GIS	Geographic Information System
GN	Government Notice
GPS	Global Positioning System
ha	Hectares
HGM	Hydrogeomorphic
IPP	Independent Power Producer
m	Meter
MAP	Mean Annual Precipitation
MTS	Main Transmission Station
MW	Megawatt
NEMA	National Environmental Management Act
NFEPA	National Freshwater Ecosystems Priority Areas
NBA	National Biodiversity Assessment
NWA	National Water Act
OHL	Overhead (power) line
PES	Present Ecological State
REC	Recommended Ecological Category
RMO	Resource Management Objective
RQIS	Research Quality Information Services
SACNASP	South African Council for Natural Scientific Professions
SANBI	South African National Biodiversity Institute
SAS	Scientific Aquatic Services
SQR	Sub quaternary catchment reach
subWMA	Sub-Water Management Area
WetVeg Groups	Wetland Vegetation Groups
WEF	Wind Energy Facility
WMA	Water Management Areas
WMS	Water Management System

WRC	Water Research Commission
WUA	Water Use Authorisation
ZoR	Zone of Regulation

1 INTRODUCTION

1.1 Background

Scientific Aquatic Services (SAS) (Pty) Ltd was appointed to conduct a freshwater ecological assessment as part of the Environmental Impact Assessment (EIA) process for the proposed Grid Connection associated with the Phefumula Emoyeni One Wind Energy Facility (WEF) in the Ermelo area of the Mpumalanga Province. The area of assessment consists of short 400kV loop in loop out with 3 x 132kV OHPLs and 3 x 33/132kV substations (collectively known as the 'study area').

In order to identify all freshwater ecosystems that may potentially be impacted by the development of the proposed Phefumula Emoyeni One Grid Connection infrastructure, a 500 m "zone of investigation" was implemented around the proposed study area, in accordance with Government Notice (GN) 4167 of December 2023 as it relates to the National Water Act, 1998 (Act No. 36 of 1998) as amended (NWA), in order to assess possible sensitivities of the receiving freshwater environment. This area – i.e., the 500 m zone of investigation around the proposed Phefumula Emoyeni One Grid Connection - will henceforth be referred to as the 'investigation area'.

The purpose of this scoping phase freshwater report is to provide a description of the ecology of the freshwater ecosystems associated with the proposed Phefumula Emoyeni One Grid Connection study and investigation area, including mapping of the natural freshwater ecosystems, a brief description of their characteristics, verification of freshwater sensitivity in the context of the aquatic biodiversity sensitivity that has been assigned through the DFFE Web-based Screening Tool, an assessment of areas of freshwater sensitivity and according development constraints and opportunities, and a high-level investigation of potential impacts on freshwater ecosystems that would potentially result from the development of the Phefumula Emoyeni One Grid Connection. A plan of study for the EIA-phase report is also provided.

1.2 Project description[1]

Phefumula Emoyeni One Pty Ltd is proposing to develop the Phefumula Emoyeni One WEF to be integrated to the national grid with a short 400kV loop in loop out with 3 x 132kV OHPLs and 3 x 33/132kV substations in order to support the Phefumula Emoyeni One WEF. The project will be located approximately 16km north of Ermelo in the Msukaligwa Local Municipality and Gert Sibande District Municipality, in the Mpumalanga Province of South Africa. The grid will be located over 10 farm portions and will be approximately 18.5km.

The project is comprised of the following infrastructure:

- 2 x 1 km (estimated) 400 kV loop-in-loop-out of the existing Camden – Duvha 400 kV line 1 to the new proposed MTS;
- A new 400/132kV MTS, with 2 x 400 kV feeder bays (17.4 ha footprint);
- The MTS is proposed to be equipped with 132 kV double busbars, 1 x 132 kV Bus coupler bay, 1 x 400/132 kV transformer bay, 1 x 500 MVA 400/132 kV transformer, and 3x132 kV feeder bays (for Independent Power Producer (IPP) integration);
- 3 x Distribution (DX) substations (one per each phase). The IPP substation will be constructed adjacent to the Dx substations:
    - Dx1-approx.6.62Ha footprint;
    - Dx2- approx.5.23Ha footprint;
    - Dx3- approx.6.13Ha footprint;
- 3 x 132kV overhead lines (OHL) from each Dx sub to the MTS (total length approx.18.2km):
    - Dx1-approx.9.58km;
    - Dx2- approx.1.44km;
    - Dx3- approx.7.18km;
- A 300m assessment corridor (150m either side of centre line) for each OHL.

[1] Note: the information in this section was provided by the proponent.

For the proposed 400kV line the following technical details are pertinent to the freshwater study:

- Span length between pylon structures is typically up to 100 – 250 m apart, depending on complexity and slope of terrain;
- For up to 400kV structures footprint sizes may vary depending on design type up to 110m^2 (10.5m by 10.5m), with concrete foundations of up to 80m^2 and depths reaching up to 3.5 m typically depending on the number and design of the foundations (to be determined during the detailed design engineering phase). The actual number of structures required will vary according to the final route alignment determined;
- Pylon (tower) structures will be either monopole or lattice structures depending on what is identified as appropriate during final design.

For the proposed up to 132kV lines the following technical details are pertinent to the freshwater study:

- Pylon structures will be either monopole or lattice structures depending on what is identified as appropriate during final design;
- Pylon structures may require anchors with guy-wires or be anchorless;
- For up to 132kV structures, concrete foundation sizes may vary depending on design type up to 80 m^2 (10 m by 8 m), with depths reaching up to 3.5 m typically in a rectangular ‘pad’ shape;
- A working area of approximately 100 m x 100 m is needed for each of the proposed structures to be constructed.

Components of the proposed MTS:

- A high voltage substation yard to allow for multiple 132kV and 400kV feeder bays and transformers, with infrastructure to allow for step-up to 400kV as required;
- Standard substation electrical equipment, including but not limited to transformers, busbars, office area, operation and control room, workshop, and storage area, feeder bays, transformers, busbars, stringer strain beams, insulators, isolators, conductors, circuit breakers, lightning arrestors, relays, capacitor banks, batteries, wave trappers, switchyard, metering and indication instruments, equipment for carrier current, surge protection and outgoing feeders, as may be needed;
- A control building, telecommunication infrastructure, oil dam(s) etc.;
- Workshop and office area including conservancy tank within the collector substation footprint;
- Fencing around the Substation;

- All the access road infrastructure to and within the substation.

Temporary/ construction phase infrastructure:

- Construction compound at the MTS (3ha) (site offices including conservancy tank for ablutions, stores, material laydown area, generator, fuel storage, etc.);
- 3 x construction compound / laydown areas, including site office of 3ha each at each of the Dx locations (150m x 200m each) (including conservancy tank for ablutions);
- Batching plant of 4-7 ha (unless a commercial source is used and concrete is trucked to site);
- Portable ablution facilities will be used along the power line routes.

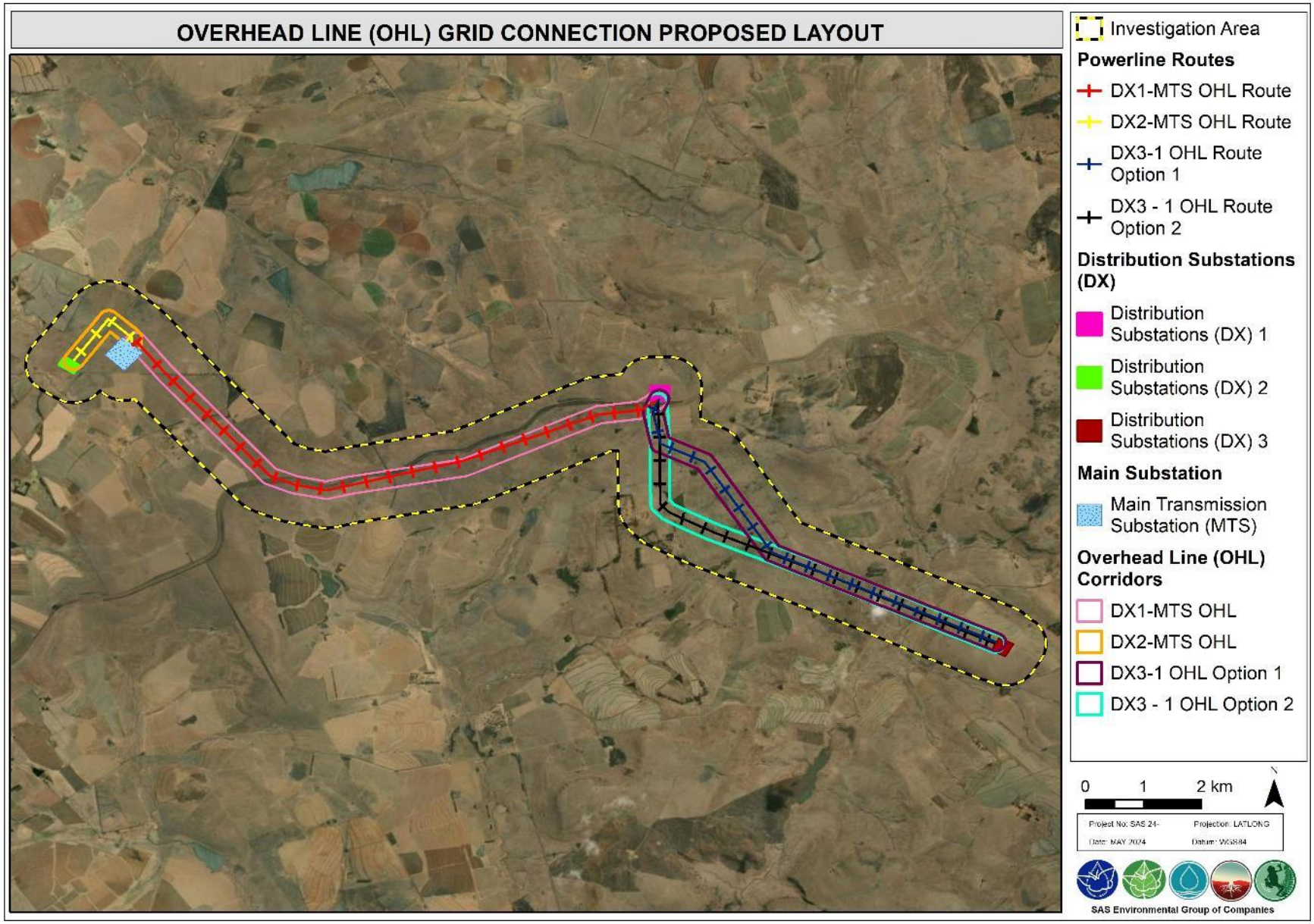

Figure 1: Digital satellite image depicting the location of the proposed Phefumula Emoyeni One Grid Connection study area and associated investigation area in relation to the surrounding area.

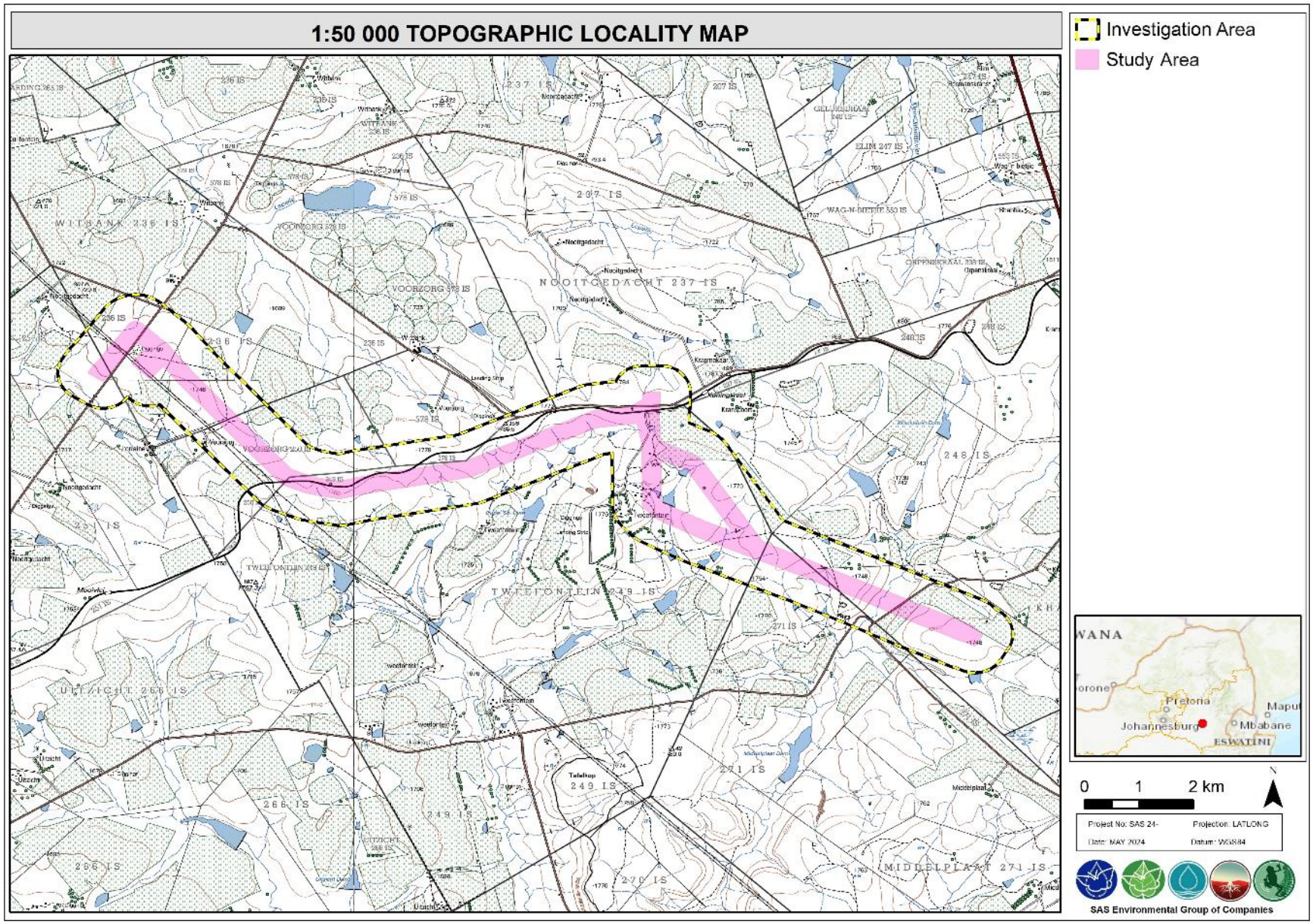

Figure 2: The proposed Phefumula Emoyeni One Grid Connection study area and associated investigation area depicted on a 1:50 000 topographical map in relation to the surrounding area.

1.3 Scope of Work

Specific outcomes in terms of this scoping-phase freshwater assessment report are outlined below:

- A background study of relevant national, provincial, and municipal datasets (such as National Freshwater Ecosystem Priority Areas [NFEPA] (2011), and the National Biodiversity Assessment 2018: South African Inventory of Inland Aquatic Ecosystems (SAIIAE) databases were undertaken to aid in defining the Ecological Importance and Sensitivity (EIS) of the freshwater ecosystems;
- All freshwater ecosystems within the investigation area were delineated using desktop methods in accordance with GN4167 of December 2023 as it relates to activities as stipulated in the NWA and verified where possible according to the "Department of Water Affairs and Forestry (DWAF)[2] (2005)[3]: A practical field procedure for identification of wetlands and riparian areas". Aspects such as terrain setting, hydrological characteristics, vegetation indicators (e.g. vegetation species composition and structure), and soil wetness were used to verify the freshwater ecosystems;
- The freshwater ecosystem classification assessment was undertaken according to the Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland systems (Ollis *et al*., 2013);
- A high-level description of the findings of the field verification relating to the characteristics of the freshwater ecosystems in the study and investigation areas has been provided;
- Opportunities and constraints for development of the proposed Phefumula Emoyeni One Grid Connection from a freshwater perspective were highlighted and spatially depicted;
- High-level issues and potential impacts on freshwater ecosystems were identified and discussed; and
- A Plan of Study for the EIA-phase freshwater assessment was compiled.

[2] The Department of Water Affairs and Forestry (DWAF) was formerly known as the Department of Water Affairs (DWA) and subsequently as the Department of Water and Sanitation (DWS). For the purposes of referencing in this report, the name under which the Department was known during the time of publication of reference material, will be used.
[3] Even though an updated manual is available since 2008 (Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas), this is still considered a draft document currently under review.

1.4 Assumptions and Limitations

The following assumptions and limitations are applicable to this report:

- All freshwater ecosystems associated with the proposed Phefumula Emoyeni One Grid Connection study area and within 500 m in fulfilment of GN4167, were delineated using various desktop methods including the use of topographic maps, digital satellite imagery, and aerial photographs. Desk-based delineations were subject to limited ground-truthing where feasible which allowed for refinement of the delineations of the freshwater ecosystems upon completion of the freshwater assessment;
- No tower / pylon positions have been provided for assessment. These will be assessed in the EIA phase, if available;
- A separate scoping-phase report for the WEF components has been produced (SAS, 2024). This report only covers the Grid Connection-related aspects of the proposed project;
- Global Positioning System (GPS) technology is inherently inaccurate and some inaccuracies due to the use of handheld GPS instrumentation may occur. If more accurate assessments are required, the freshwater ecosystems will need to be surveyed and pegged according to surveying principles and with survey equipment;
- The delineations as presented in this report are regarded as the best estimate of the boundaries based on desk-based delineation with limited ground truthing based on the site conditions present during the scoping-phase site assessment;
- The grid connection layout was not available to specialists when the scoping-phase site assessment was undertaken in October 2023. This entails that limited parts of the Grid Connection study area were assessed in the field, but verification of other freshwater ecosystems in the study area was extrapolated to assist the delineation and characterisation of freshwater ecosystems in the Grid Connection study and investigation areas;
- Wetland, riparian, and terrestrial ecosystem zones create transitional areas where an ecotone is formed as vegetation species change from terrestrial to obligate/facultative species. Within this transition zone, some variation of opinion on the freshwater ecosystem boundary may occur. However, if the DWAF (2008) method is followed, all assessors should get largely similar results;
- With regards to data sources used to provide background information on the sensitivity of the assessed areas, it is important to note that although all data sources provide useful and often verifiable, high-quality data, the various databases used do not always provide an entirely accurate indication of the proposed Phefumula Emoyeni One grid

connection's actual site characteristics at the scale required to inform the environmental authorisation and water use authorisation processes;

- With ecology being dynamic and complex, certain aspects (some of which may be important) may have been overlooked. However, it is expected that the existing activities have been accurately assessed and considered, based on the field observations and the consideration of existing studies and monitoring data in terms of aquatic, riparian, and wetland ecology; and
- The only activities which were assessed were the Phefumula Emoyeni One Grid Connection and identified freshwater ecosystems within 500 m thereof that may be impacted by the development footprint. All other activities located outside these boundaries that may intercept/create other potential impacts were not considered.

1.5 Legislative Requirements and Provincial Guidelines

The following legislative requirements and relevant provincial guidelines were taken into consideration during the assessment. A detailed description of these legislative requirements is presented in Appendix B:

- The Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996);
- The National Environmental Management Act, 1998 (Act No. 107 of 1998) as amended (NEMA);
- The NEMA EIA Regulations of 2014, as amended (GN 982 of 04 December 2014);
- National Water Act, 1998 (Act No. 36 of 1998) as amended; and
- Government Notice (GN) 4167 as published in the Government Gazette 49833 of December 2023 as it relates to the NWA.

2 ASSESSMENT APPROACH

2.1 Freshwater Ecosystem 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;

For the purposes of this investigation, the definition of a freshwater ecosystem is considered to be synonymous with the definition of a watercourse as per the NWA and carries the same meaning as "watercourse" as defined by the Act.

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."

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 composition and physical structure distinct from those of adjacent areas.

2.2 Freshwater Ecosystem Field Verification

Use was made of historical and current digital satellite imagery, topographic maps, and available provincial and national databases to aid in the delineation of the freshwater ecosystems at a desktop level prior to the undertaking of a site assessment. The following were taken into consideration when utilising the above desktop methods:

- Linear features: since water flows/moves through the landscape, freshwater ecosystems often have a distinct linear element to their signature which makes them discernible on aerial photography or satellite imagery;
- Vegetation associated with freshwater ecosystems: a distinct increase in density as well as shrub size near flow paths;

- Hue: with water flow paths often showing as white/grey or black and outcrops or bare soils displaying varying chroma created by varying vegetation cover, geology, and soil conditions. Changes in the hue of vegetation, with freshwater ecosystem vegetation often indicated on black and white images as areas of darker hue (dark grey and black). In colour imagery, these areas mostly show up as darker green and olive colours or brighter green colours in relation to adjacent areas, where there is less soil moisture or surface water present; and
- Texture: with areas displaying various textures which are distinct from the adjacent terrestrial areas, created by varying vegetation cover and soil conditions within the freshwater ecosystems.

A scoping phase freshwater ecosystem site verification and assessment was undertaken from the 3rd to the 5th of October 2023 (spring season), the aim of which was to verify the desktop delineation undertaken. As part of the verification the presence of any freshwater ecosystem characteristics as defined by the Department of Water Affairs and Forestry (2008) and the NWA were noted and delineated (please refer to Section 4 of this report). A detailed explanation of the methods of assessment undertaken is provided in Appendix C of this report.

The freshwater ecosystem delineation took place, as far as possible, 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 ecosystems have several distinguishing factors including the following:

- Landscape position;
- The presence of water at or near the ground surface;
- Distinctive hydromorphic soils;
- Vegetation that is adapted to saturated soils; and
- The presence of alluvial soil in stream systems.

3 RESULTS OF THE DESKTOP ANALYSIS

3.1 Analyses of Relevant Databases

The following section contains data accessed as part of the desktop assessment and is presented as a “dashboard” report below (Table 1). The dashboard report aims to present concise summaries of the data on as few pages as possible to allow for the integration of results by the reader to take place. Where required, further discussion and interpretation are provided, and information that was considered of importance was emboldened.

It is important to note that although all data sources are used to provide useful and often verifiable, high-quality data, the various databases used do not always provide an entirely accurate indication of the proposed Phefumula Emoyeni One Grid Connection’s actual site characteristics at the scale required to inform the EA processes. Nevertheless, this information is considered useful as background information to the study, is important in legislative contextualisation of risk and impact, and was used as a guideline to inform the assessment and to focus on areas and aspects of increased conservation importance. It must, however, be noted that site assessment of key areas may potentially contradict the information contained in the relevant databases, in which case the site-verified information must carry more weight in the decision-making process. The information contained in the dashboard report below is intended to provide background to the landscape of the proposed Phefumula Emoyeni One Grid Connection and the associated investigation area. Actual site conditions at the time of the assessment may differ from the background information provided by various datasets. Please refer to Section 4 for details pertaining to the site investigation results.

Table 1: Desktop data relating to the characteristics of the freshwater ecosystems associated with the Overhead Line (OHL) grid connection study area and associated investigation area [Quarter Degree Square (QDS) 2629BC and 2629BD].

Aquatic ecoregion and sub-regions in which study area is located		
Ecoregion	Highveld	
Catchments	Olifants North and Vaal Catchments	
Quaternary Catchment	B11A and C11F	
WMAs	Olifants and Upper Vaal	
subWMAs	Upper Olifants and Upstream Vaal	
Dominant characteristics of the Highveld Ecoregion (Kleynhans *et al.*, 2007)		
Ecoregion Level II	11.05	11.02
Dominant primary terrain morphology	Slightly undulating plains, slightly irregular undulating plains, few hills;	Moderately undulating plains and pans;
Dominant primary vegetation types	Moist Clay Highveld Grassland.	Moist Sandy Highveld Grassland;
Altitude (m a.m.s.l)	1300 to 1900	
MAP (mm)	500 to 800	
Coefficient of Variation	20 to 29 (% of MAP)	
Rainfall concentration index	55 to 64	
Rainfall seasonality	Early summer	Early to mid-Summer
Mean annual temp. (°C)	14 to 16	12 to 8
Winter temperature (July)	0 to 18	0 to 20
Summer temperature (Feb)	12 to 26	10 to 26
Median annual runoff (mm)	20 to 150	20 to 80
Mpumalanga Highveld Wetlands (MPHW), (2014)		
The Mpumalanga Highveld Wetlands Database indicates the presence of several wetland types within the study and investigation area. The wetlands are indicated to be in a natural to near-natural (A/B) ecological condition seep and channelled valley bottom wetlands. One floodplain wetland and several artificial impoundments (dams) overlaying the seep wetlands largely are also indicated by the database.		
Renewable Energy Development Zones (REDZs) within 30 km of the study area		
A very small section of the Study area and associated investigation area are located within 30 km of the Emalahleni REDZ.		
Power Corridors within 30 km of the study area and associated study Area		
The study area is not located within 30 km of a power corridor.		
Details according to the Strategic Water Source Areas (2021) Database.		
Surface water SWSAs are defined as areas of land that supply a disproportionate (i.e., relatively large) quantity of mean annual surface water runoff in relation to their size.		

Details of the study area in terms of the National Freshwater Ecosystem Priority Area (NFEPA) (2011) database	
FEPA CODE	The study area and investigation area in the south and east fall within **CODE 1 FEPA catchment**, while the remainder is not indicated to be within a FEPA catchment. **Code1 (FEPAs)** achieve biodiversity targets for river ecosystems and threatened fish species and were identified in rivers that are currently in a good condition. Although the FEPA status applies to the actual river reach within the sub-quaternary catchment the surrounding land and smaller stream network needs to be managed in a way that maintain the good condition of the river reach
Wetland Vegetation Type	The study area and investigation areas fall within the Mesic Highveld Grassland Group 3 and Group 4. These vegetation groups are considered to be Least Threatened (LT) according to Mbona *et al.* (2015).
NFEPA Wetlands	The NFEPA database indicates numerous wetlands within the study area and the associated investigation area, the majority of which are seeps and flat wetlands. The large seep and flat wetlands in the western section are indicated by the database to be in a largely Natural/Near-Natural (Class AB) and Moderately Modified (Class C) ecological condition. The majority of the smaller seep wetlands are indicated by the database to be in a Heavily to Critically Modified (Class Z) ecological condition. No other HGM except the flat and seep wetlands are indicated by the database.
NFEPA Rivers	According to the NFEPA (2011) database, the unnamed tributary of the Xspruit River is indicated by the database to traverse the study area and its associated investigation area in the west. The Unnamed tributary of Xspruit River is indicated to be in a Natural to Near-Natural (RIVERCON A/B) ecological condition by the NFEPA Rivers Database.
National Biodiversity Assessment (2018): South African Inventory of Inland Aquatic Ecosystems – National Wetland Map 5 is included	
The NBA (2018) database like the NFEPA database, also indicates the presence of numerous channelled valley bottom (CVB) and seep wetlands, and one depression wetland. The CVB wetlands are largely in the western and eastern sections and are mostly indicated to be in a Largely to Critically Modified (Class D/E/F) ecological condition. The seep wetlands are indicated to largely be in a Moderately Modified (Class C) ecological condition and in a Largely to Critically Modified (Class D/E/F) ecological condition. The seep wetlands are indicated by the database to be Critically Endangered (ETS) and Poorly Protected (EPL). The one depression wetland is indicated to be of Least Concern (ETS), Natural/Near-Natural (PES Class AB), and Poorly Protected (EPL). The NBA Rivers database further indicates the unnamed tributary of Xspruit River traversing the study area in the east and is indicated to be in a near natural to natural (RIVERCON A/B) ecological condition, in a critically endangered (ETS), and poorly protected (EPL). The NBA Artificial Wetlands Database furthermore indicates numerous dams within the study and associated investigation area.	
Detail of the study area in terms of the Land Type Data (Job et al., 2019)	
The potential presence of wetlands in the study and investigation areas can be examined in the context of the land type for the area. The study and investigation areas fall within the Ea23 land type grouping. EA land types accommodate high base status, dark coloured and/or red structured soils, usually of clay texture, associated with basis igneous rocks. More than half of the land surface is covered by vertic, melanic or red structured diagnostic horizons. Duplex soils or exposed rock may cover significant portions of the land surface, but vertic, melanic or red structured horizons are dominant.	
Renewable Energy EIA Applications and associated grid connections within 30 km of the study area (REEIA, Q4_2023)	
The study area and associated investigation area are located within 30 km of six (6) approved wind energy projects.	
National Web-Based Environmental Screening Tool (2020) (Accessed 2024)	
The Screening Tool is intended to allow for the pre-screening of sensitivities in the landscape to be assessed within the EA process. This assists with implementing the mitigation hierarchy by allowing developers to adjust their proposed development footprint to avoid sensitive areas.	

They include transboundary areas that extend into Lesotho and Swaziland. The sub-national Water Source Areas (WSAs) are not nationally strategic as defined in the report but were included to provide complete coverage	The majority of the study and investigation area especially in the south and east are indicated to be of **very high aquatic biodiversity sensitivity**, with the exception of a sections in the north and west of the study area not associated with rivers or wetlands. The triggering features for the very high aquatic biodiversity are: the presence of aquatic Critical Biodiversity Area (CBA) rivers associated with the unnamed tributary of the Xspruit River; CBA and Ecological Support Area (ESA) wetlands associated with the study area; being within an ESA sub catchment; location within a Freshwater Ecosystem Priority Area (FEPA) sub-catchment in the east and south which is consistent with the FEPA CODE 1 designation by NFEPA (2011); and proximity to natural/near natural (AB) rivers and Wetlands (depressions, seeps, and valley bottoms).
The study area and associated investigation area are not associated with a surface water Strategic Water Source Areas (SWSA).	
Mpumalanga Biodiversity Sector Plan (MBSP, 2022)	
Aquatic Critical Biodiversity Area (CBA)	The areas adjacent to the unnamed tributary of the Xspruit River are indicated as Aquatic CBA River areas. Several sections of the channelled valley bottom wetlands (per the NBA: 2018 and MPHW: 2014 Databases) in the western sections of the investigation area as indicated as CBA Wetlands. CBA Areas that are required to meet biodiversity targets for species, ecosystems, or ecological processes. These include all areas required to meet biodiversity pattern targets and to ensure the continued existence and functioning of species and ecosystems, special habitats, and species of conservation concern; Critically Endangered ecosystems; and critical linkages (corridor 'pinch-points') to maintain connectivity. CBAs are areas of high biodiversity value and need to be kept in a natural state, with no further loss of habitat or species.
Aquatic Ecological Support Area (ESA)	The unnamed tributary of the Xspruit River, the seep wetlands, and the remaining CVB wetlands are indicated as ESA Wetlands. The study area and investigation area in the south and east as indicated by FEPA:2011 database as a Code 1 FEPA catchment is indicated by the Mpumalanga Biodiversity Sector Plan database as an ESA Important sub-Catchment. ESAs. ESAs are areas that are not essential for meeting targets, but that play an important role in supporting the functioning of CBAs and that deliver important ecosystem services. ESAs need to be maintained in at least a functional and often natural state, supporting the purpose for which they were identified. They include features such as riparian habitat surrounding rivers or wetlands.
Other Natural Areas (ONA)	Patches of the study and investigation area in the central and western sections are indicated as ONAs. ONAs are areas that have been identified as a priority in the current systematic biodiversity plan but retain most of their natural character and perform a range of biodiversity and ecological infrastructural functions.
Moderately or Heavily Modified Areas (Transformed)	Patches of the study and investigation area associated with agricultural areas are indicated as heavily modified areas. Heavily modified areas are those that have been heavily modified by human activity so that they are by-and-large no longer natural, and do not contribute to biodiversity targets. Some of these areas may still provide limited biodiversity and ecological infrastructural functions but, their biodiversity value has been significantly and, in many cases, irreversibly compromised.

Ecological Status of the most proximal sub-quaternary reach (DWS, 2014)	
Sub-quaternary reach	C11F-01491 (Unnamed Tributary of the Xspruit River)
Point Proximity	±3.6 km south of the investigation area
Assessed by an expert?	Yes
PES Category Median	Moderately Modified (C)
Mean EI Class	Moderate
Mean ES Class	Moderate
Stream Order	1
Default Ecological Class	C (Moderate)

CBA = Critical Biodiversity Area; DWS = Department of Water and Sanitation; EI = Ecological Importance; EPL = Ecosystem Protection Level; ES = Ecological Sensitivity; ESA = Ecological Support Area; ETS = Ecosystem Threat Status; LT = Least Threatened; m.a.m.s.l = Meters Above Mean Sea Level; MAP = Mean Annual Precipitation; NBA= National Biodiversity Assessment; NFEPA = National Freshwater Ecosystem Priority Areas; NP = Not Protected; ONA = Other Natural Areas; PES = Present Ecological State; SAIIAE = South African Inventory of Inland Aquatic Ecosystems; WMA = Water Management Area; STUDY AREA = Overhead Powerline.

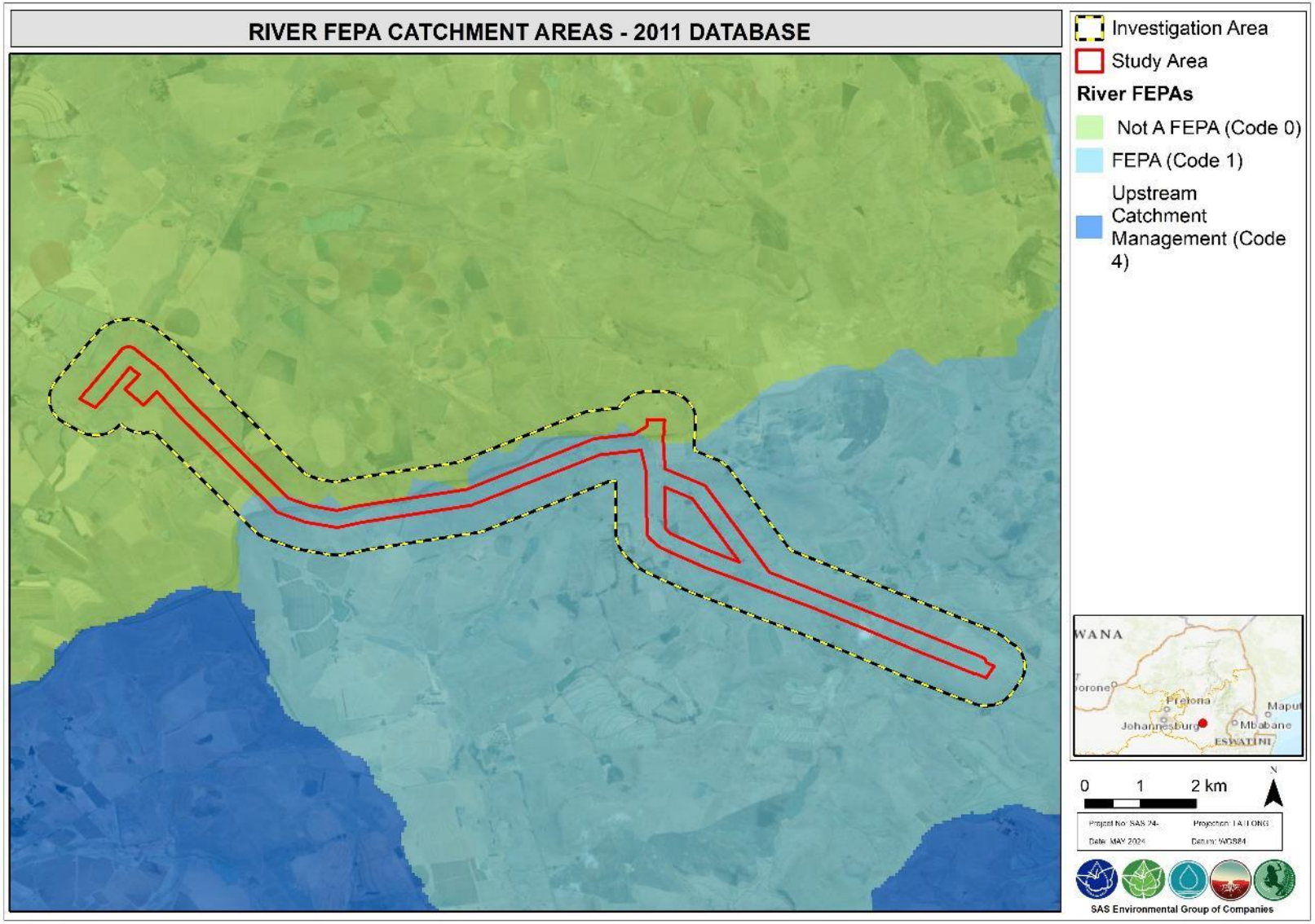

Figure 3: FEPA Sub WMAs associated with the proposed Phefumula Emoyeni One Grid Connection study area and associated investigation area.

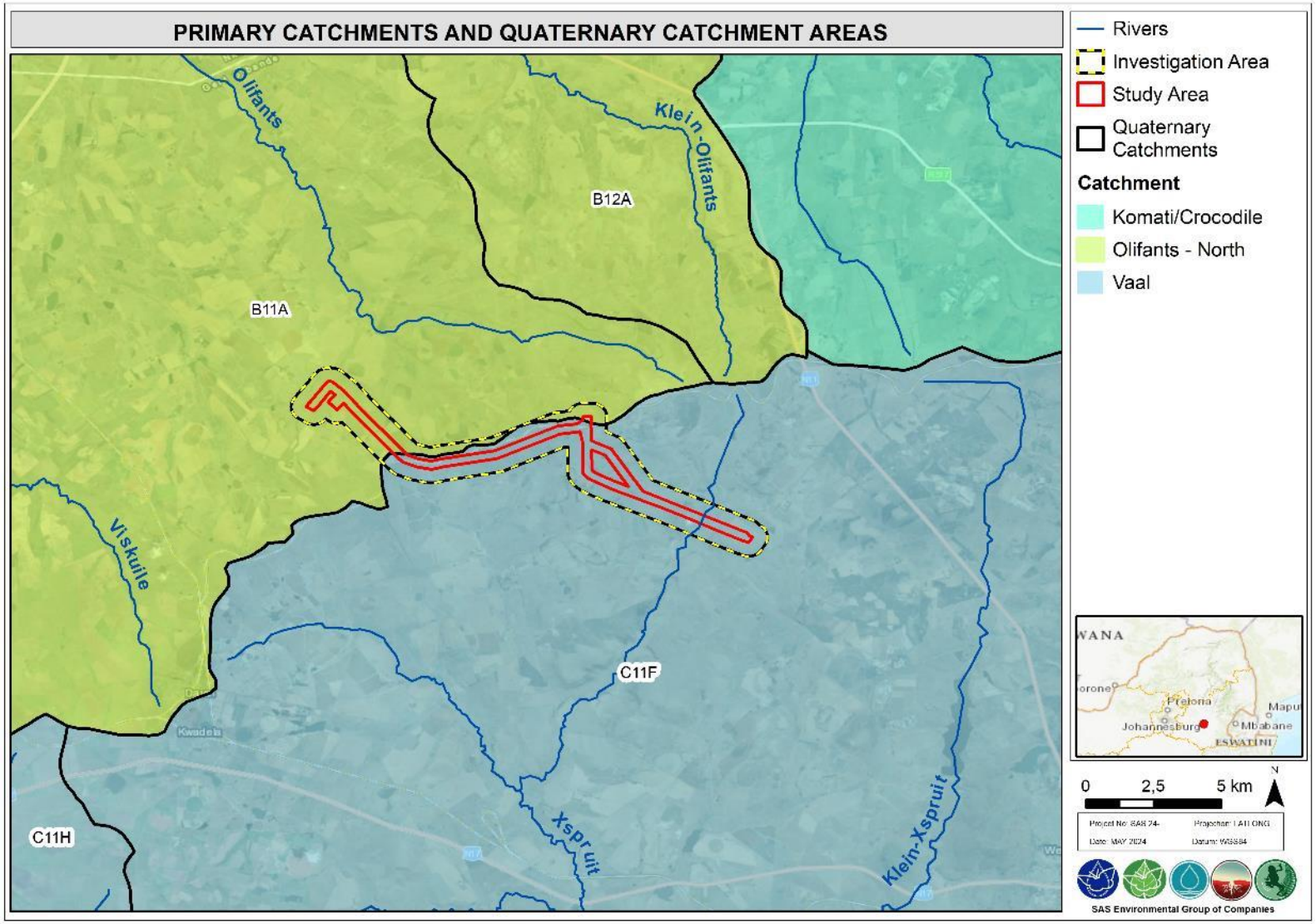

Figure 4: Quaternary catchments and overall surface water drainage associated with the proposed Phefumula Emoyeni One Grid Connection study area and associated investigation area.

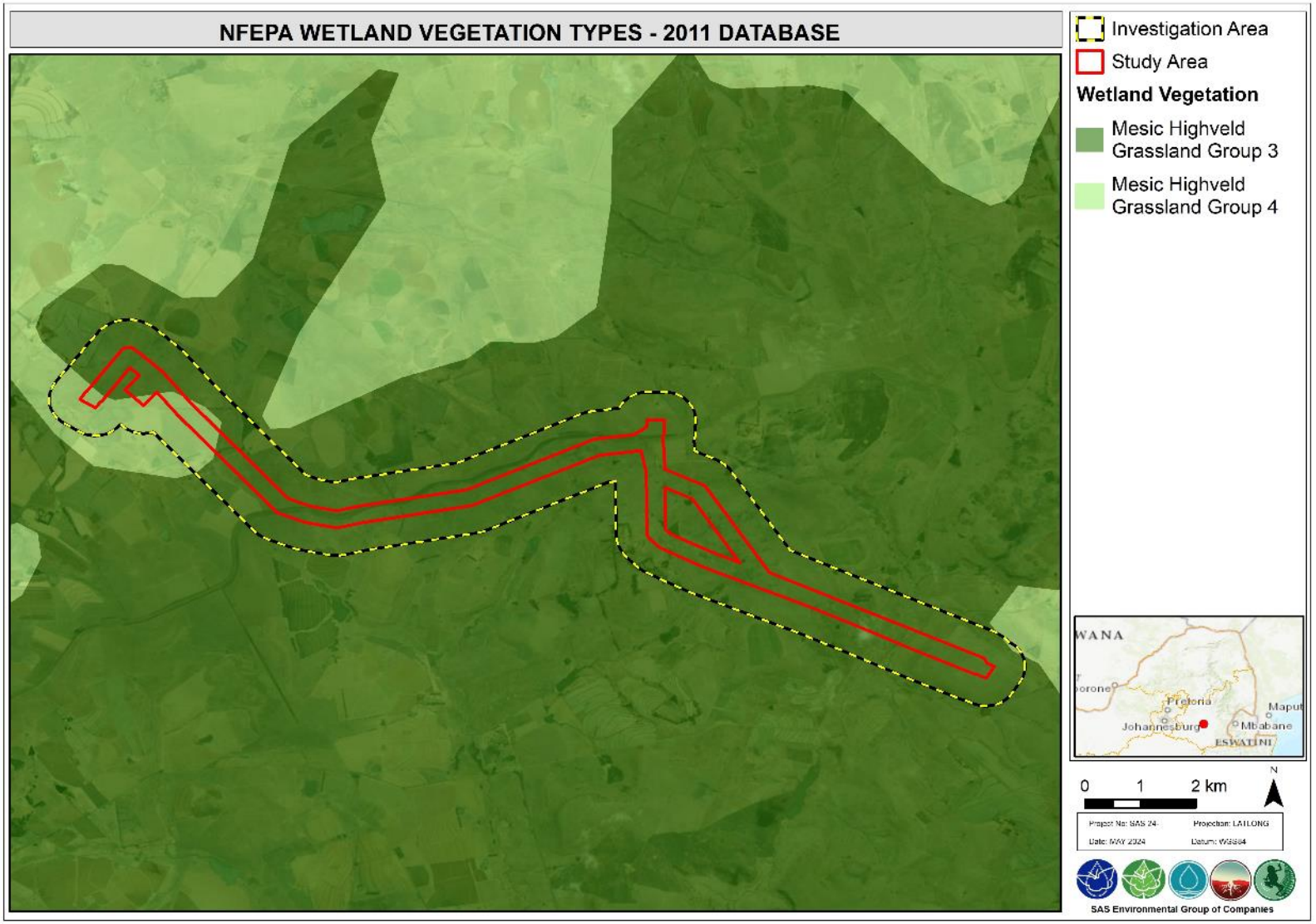

Figure 5: Freshwater ecosystems associated with the proposed Phefumula Emoyeni One Grid Connection study area and associated investigation area according to the NFEPA (2011) database.

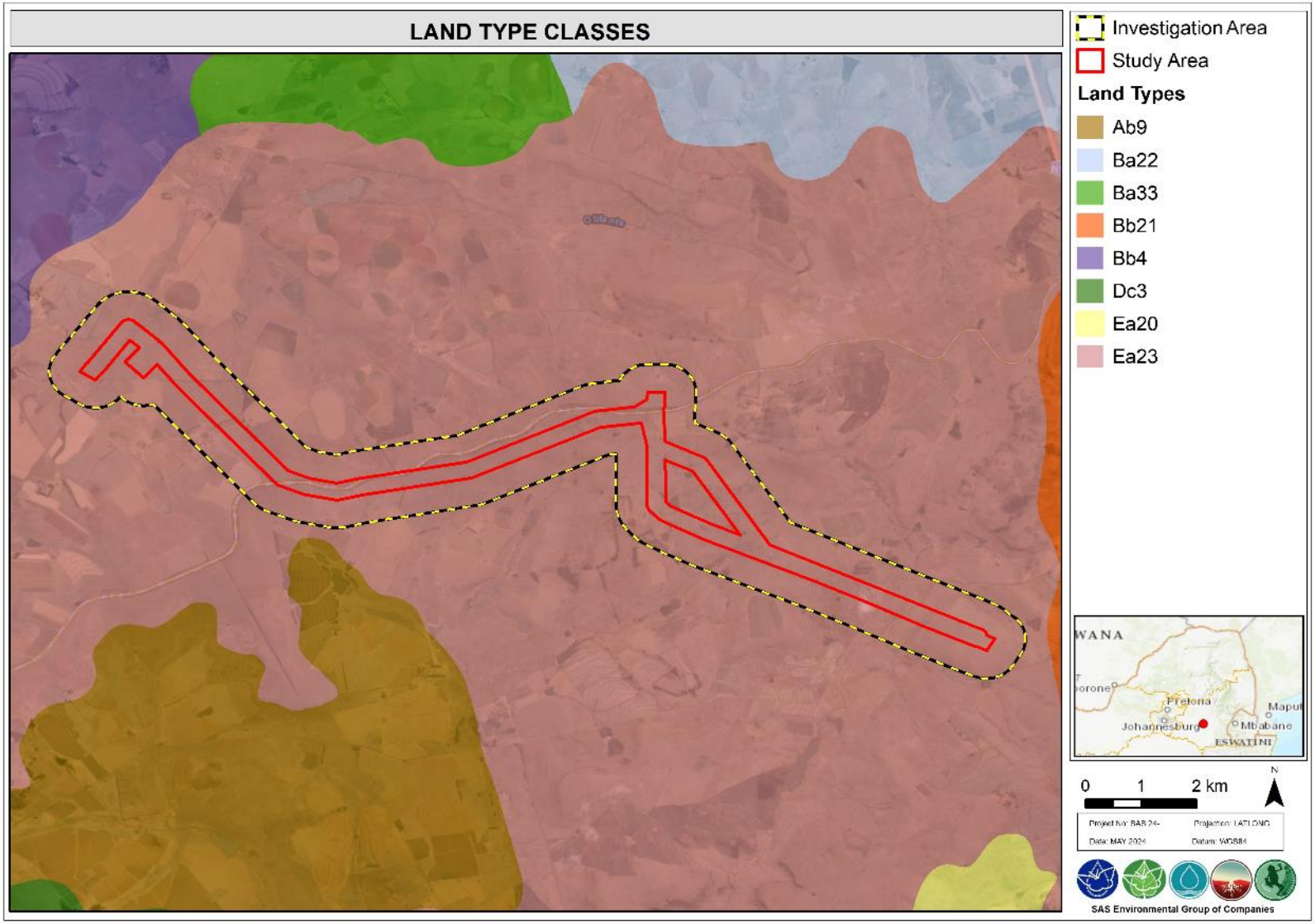

Figure 6: Land types located withing the proposed Phefumula Emoyeni One Grid Connection study area and associated investigation area.

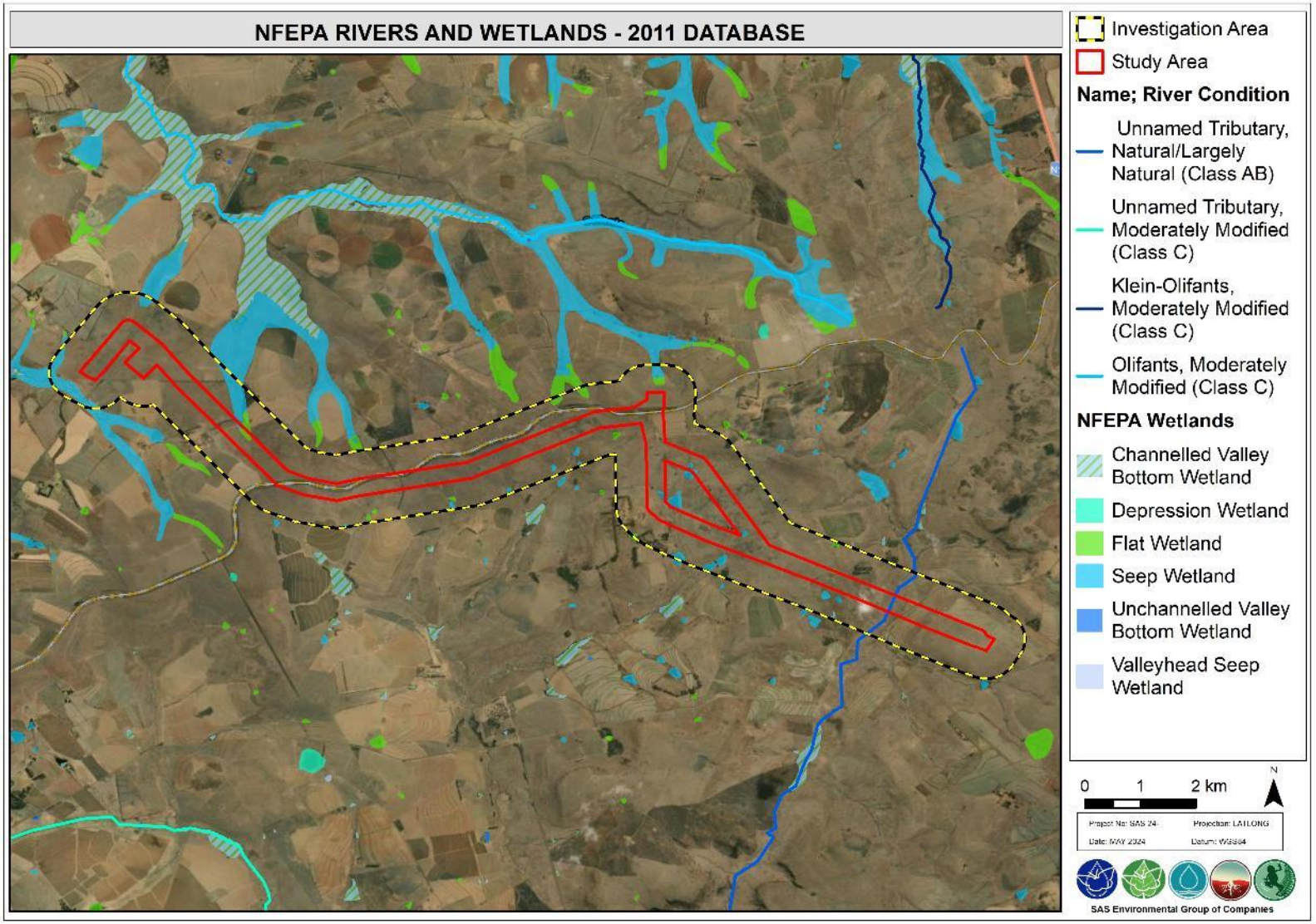

Figure 7: Freshwater ecosystems associated with the proposed Phefumula Emoyeni One Grid Connection study area and associated investigation area according to the NFEPA (2011) database.

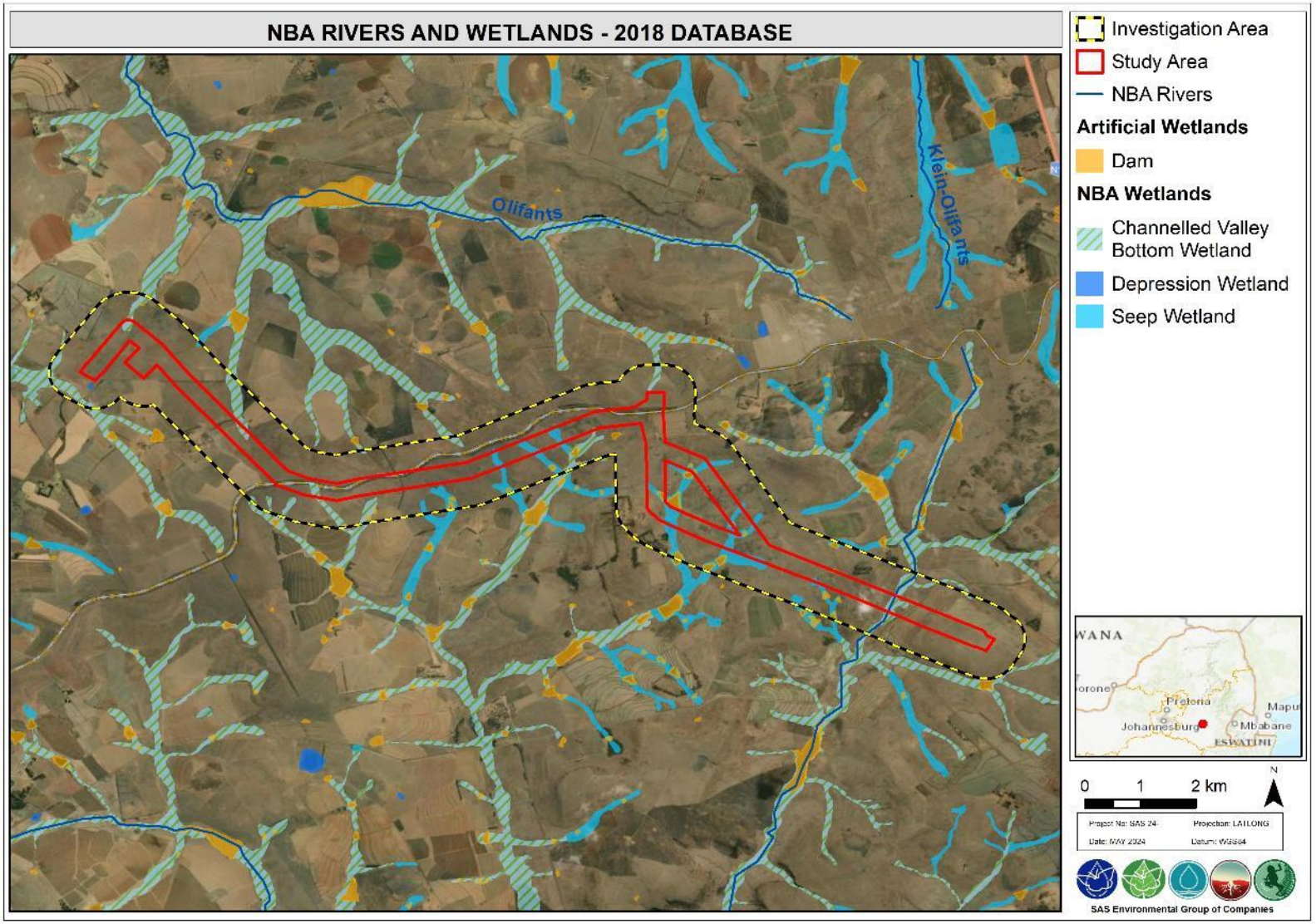

Figure 8: Freshwater ecosystems associated with the proposed Phefumula Emoyeni One WEF and associated investigation area according to the NBA (2018) database.

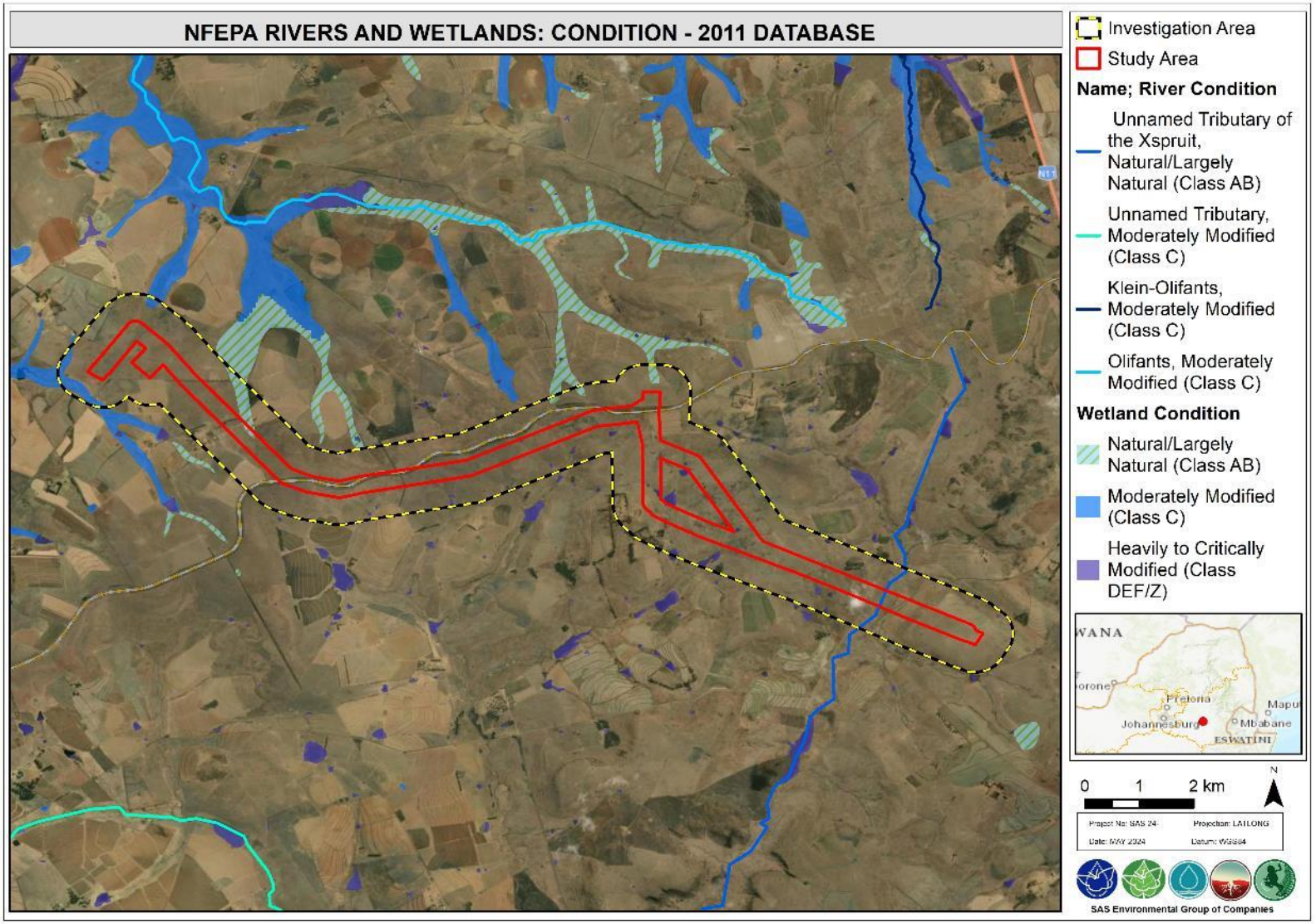

Figure 9: Wetland ecological condition associated with the proposed Phefumula Emoyeni One Grid Connection study area and associated investigation area according to the NFEPA database.

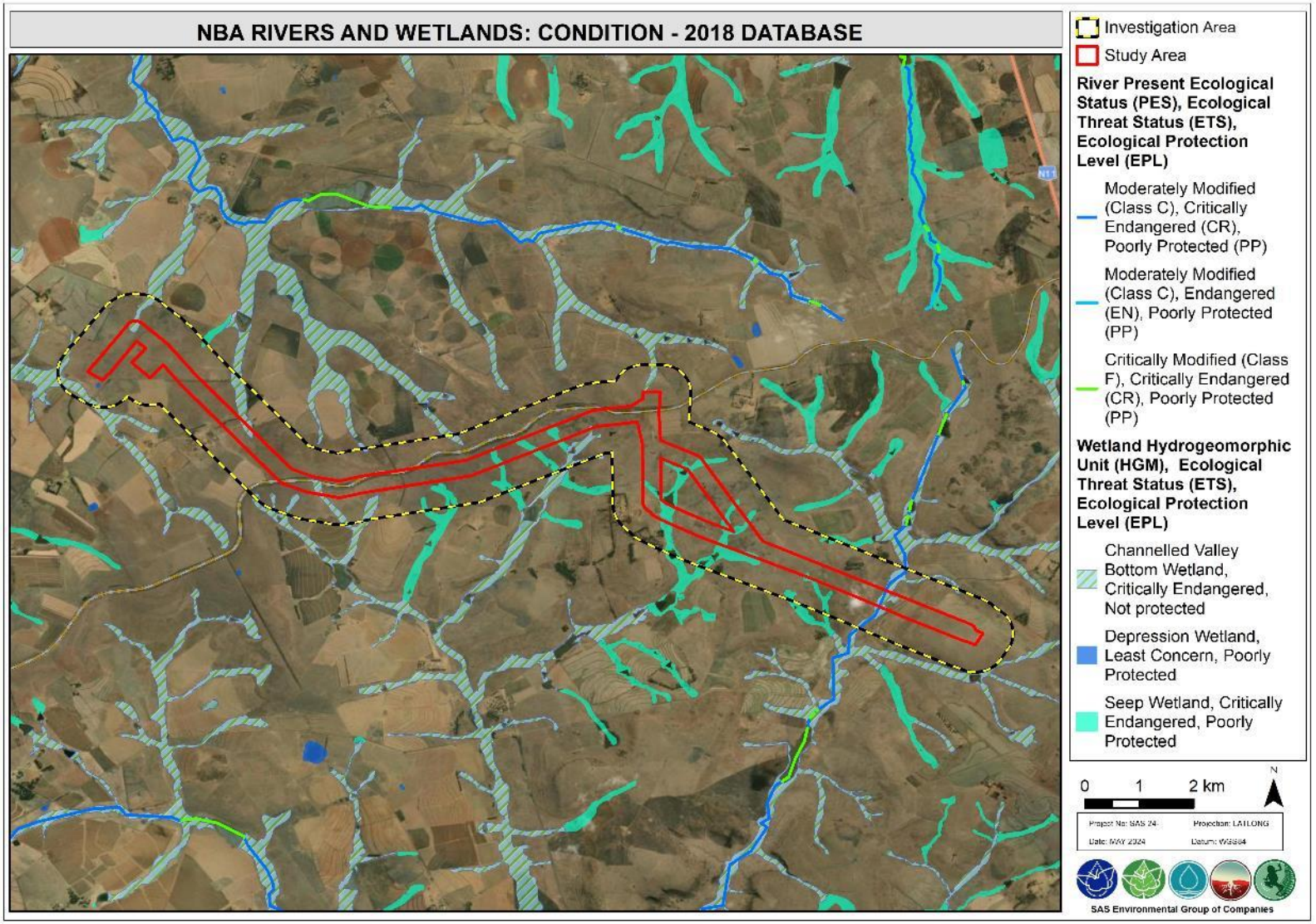

Figure 10: River ecological condition associated with the proposed Phefumula Emoyeni One Grid Connection study area and associated investigation area according to the NBA (2018) database.

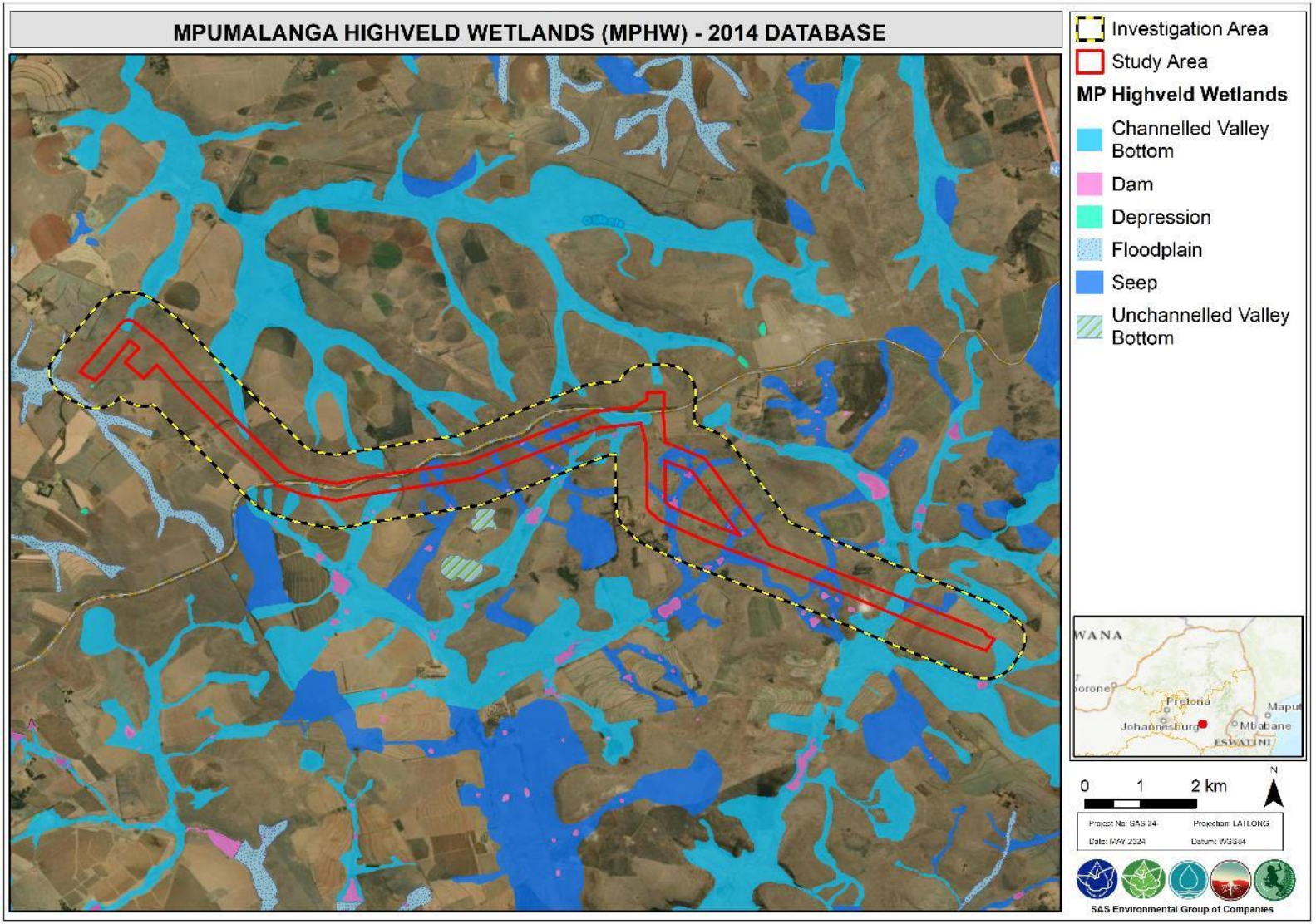

Figure 11: Freshwater ecosystems associated with the proposed Phefumula Emoyeni One Grid Connection study area and associated investigation area according to the Mpumalanga Highveld Wetlands database.

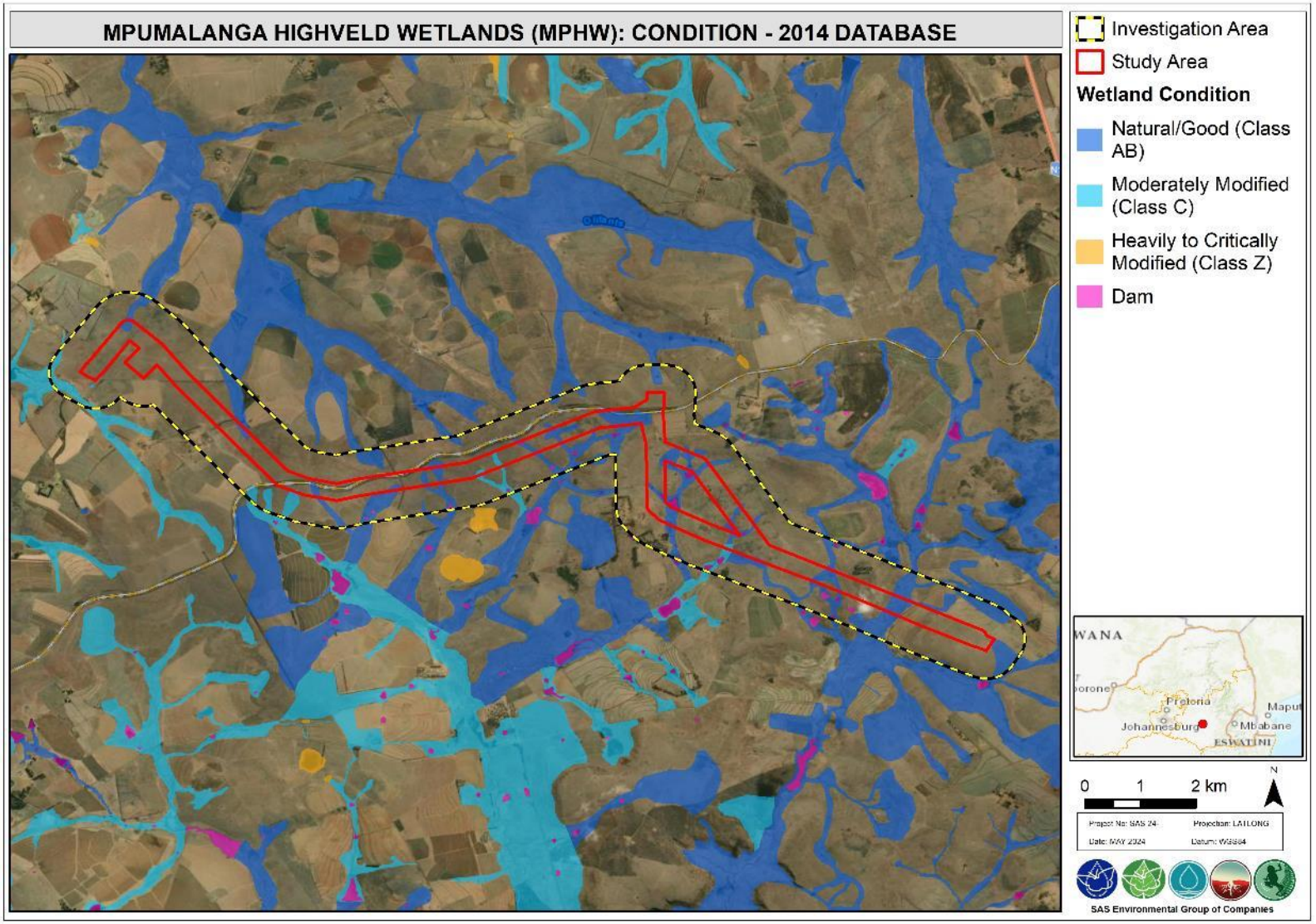

Figure 12: Freshwater ecosystem condition associated with the proposed Phefumula Emoyeni One Grid Connection study area and associated investigation area according to the Mpumalanga Highveld Wetlands database.

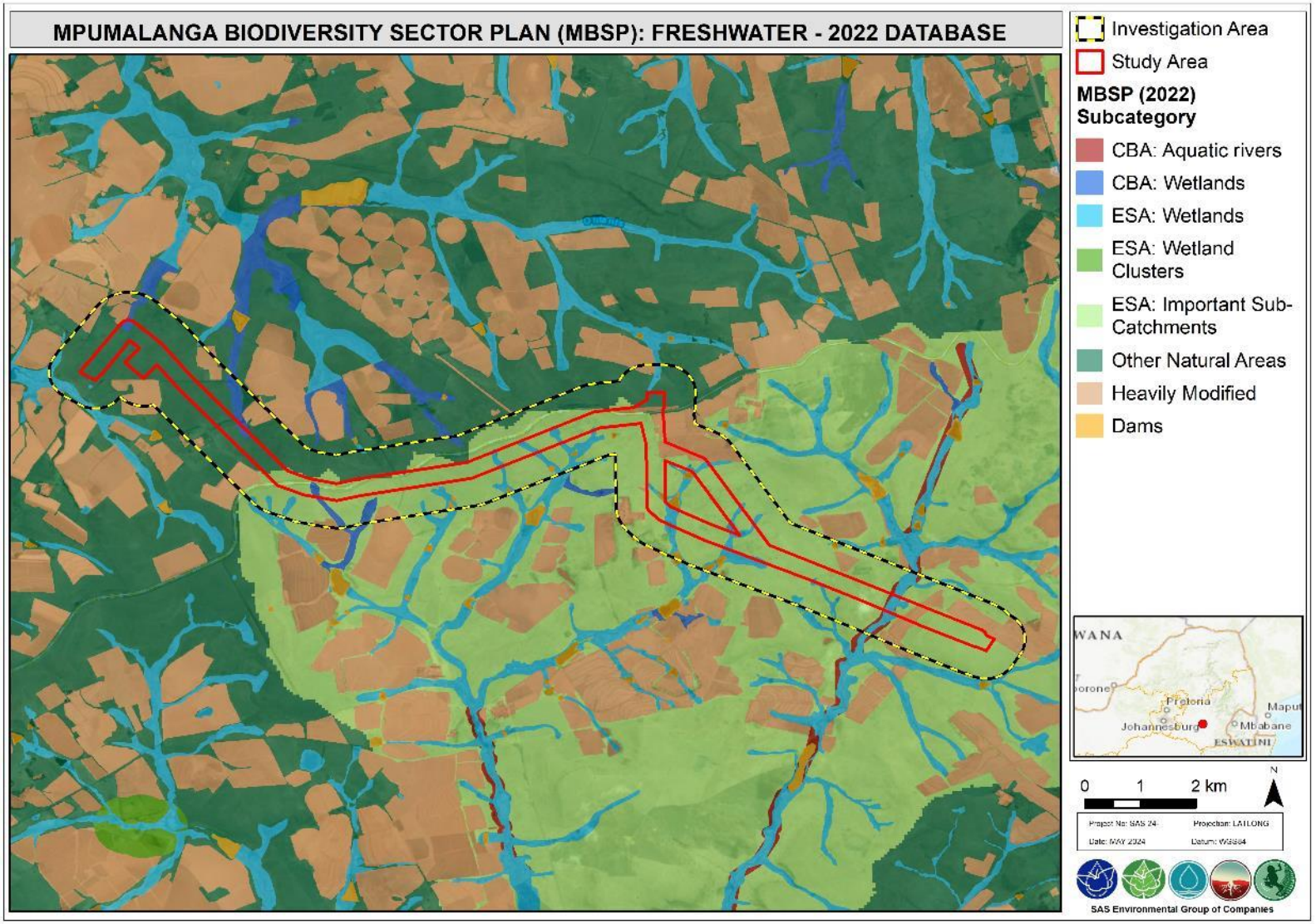

Figure 13: Areas of freshwater ecological importance associated with the proposed Phefumula Emoyeni One Grid Connection's study area and investigation area and associated investigation area is indicated by the Mpumalanga Biodiversity Sector Plan (2019).

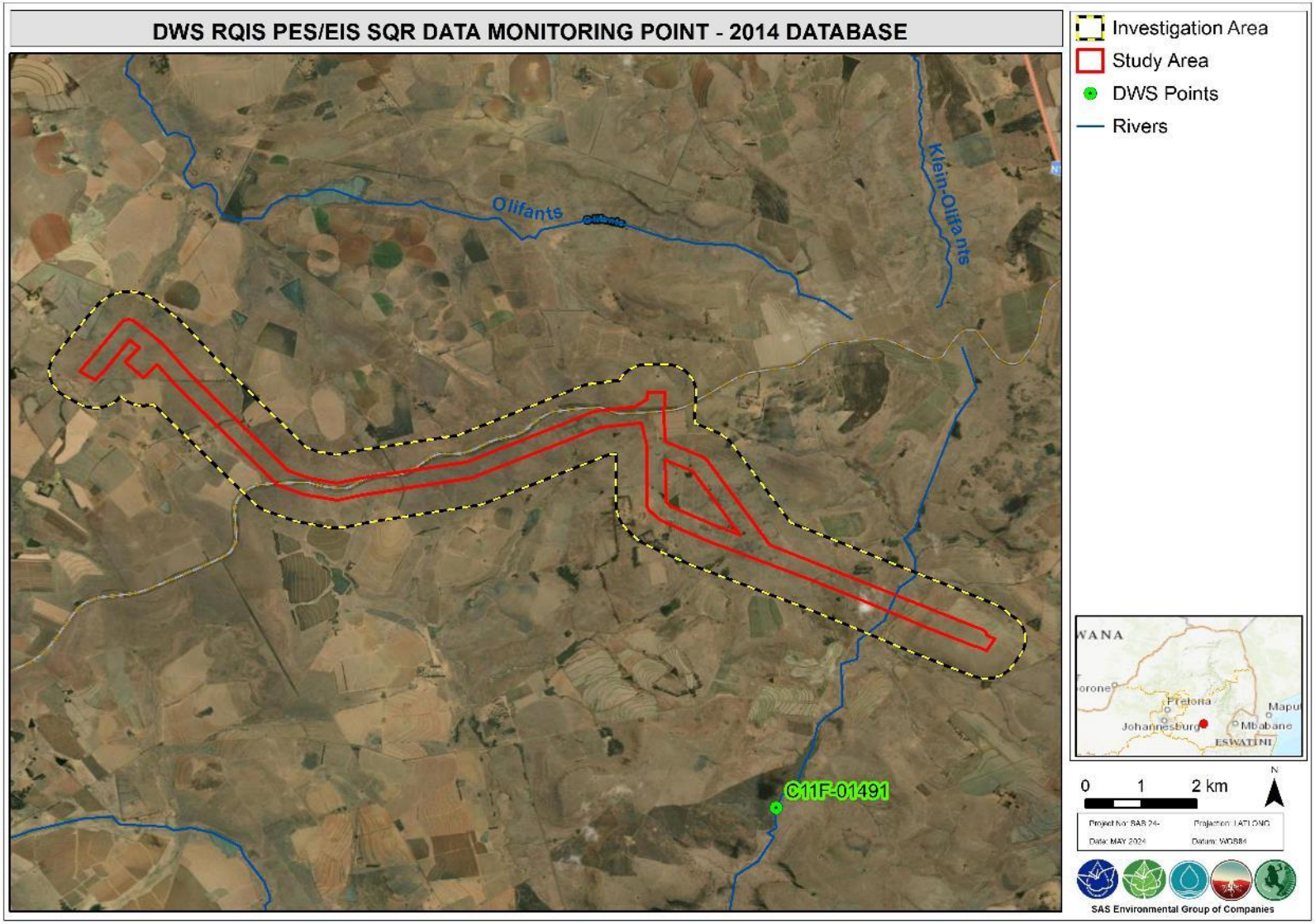

Figure 14: The relevant Sub-Quaternary Catchment Reach (SQR) associated with the proposed Phefumula Emoyeni One Grid Connection and associated investigation area according to the DWS (2014).

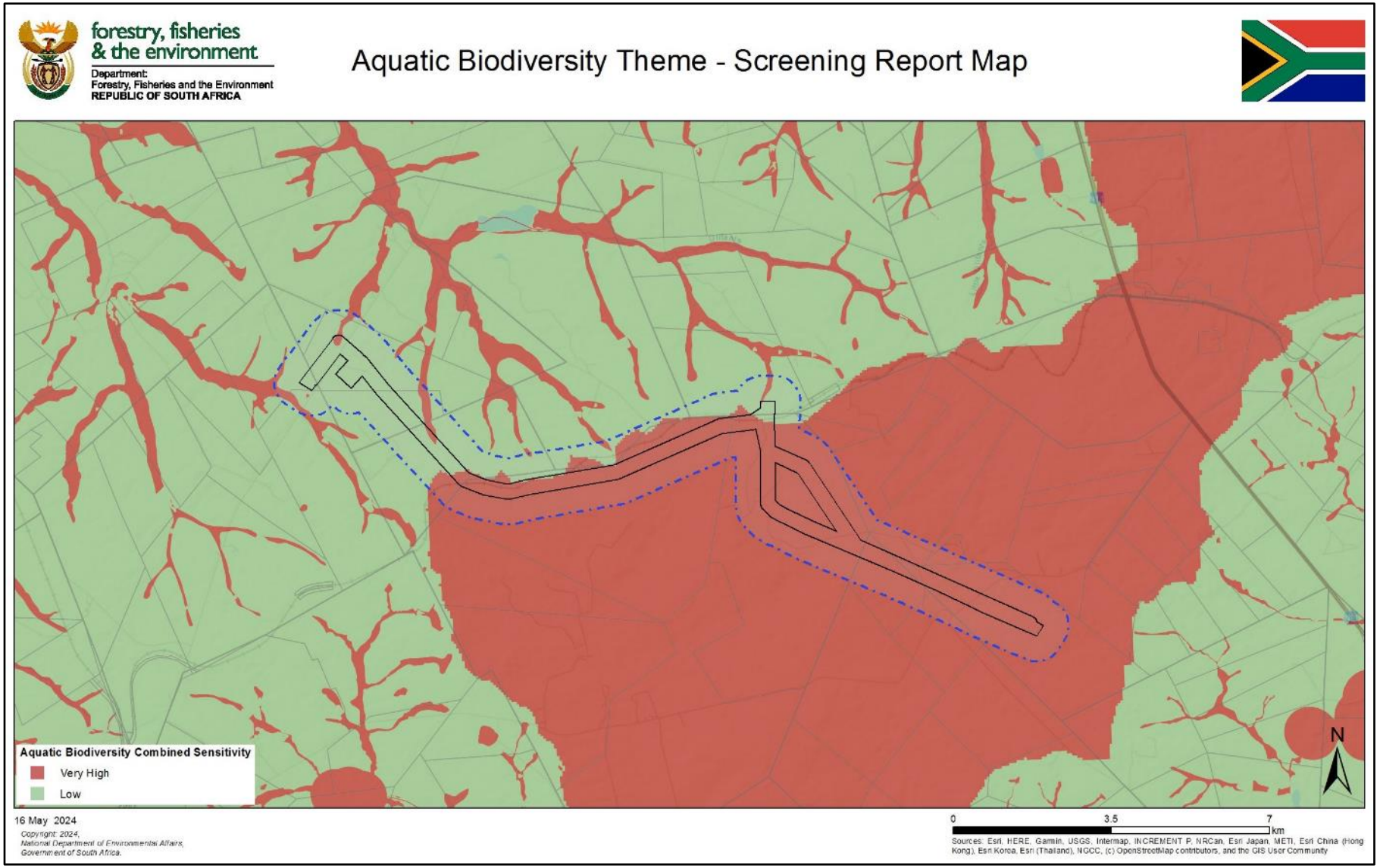

Figure 15: Map of relative aquatic biodiversity theme sensitivity for the proposed Phefumula Emoyeni One Grid Connection's study area and investigation area according to the National Web-Based Environmental Screening Tool (Accessed 2024).

3.2 Ecological Status of Sub-Quaternary Catchments [Department of Water and Sanitation (DWS) Resource Quality Services (RQS) PES/EIS Database]

The PES/EIS database, as developed by the DWS RQIS department, was utilised to obtain additional background information on the project area. The PES/EIS database has been made available to consultants since mid-August 2014. The information from this database is based on information at a sub-quaternary catchment reach (SQR) level. Descriptions of the aquatic ecology is based on information collated by the DWS RQIS department from available sources of reliable information, such as SA RHP sites, Ecological Water Requirements (EWR) sites and Hydro Water Management system (WMS) sites.

In this regard, information for the SQR of the rivers within the study and investigation areas was obtained. (Figure 14 above). Key information on fish species, invertebrates, and background conditions, associated with the rivers detailed in the Tables below, as contained in this database and pertaining to the Present Ecological State (PES), ecological importance and ecological sensitivity for the river, are tabulated below.

Table 2 - Fish species previously collected from or expected in the SQR associated with C11F-01491 (Unnamed Tributary of the Xspruit River):

Enteromius anoplus	*Enteromius paludinosus*	*Pseudocrenilabrus philander*	*Tilapia sparrmanii*

Table 3: Freshwater macro-invertebrate species observed, or expected to occur at the sites:

Aeshnidae	Corixidae	Hydropsychidae 1 Sp	Physidae
Ancylidae	Culicidae	Hydroptilidae	Planorbinae
Atyidae	Dytiscidae	Leptoceridae	Pleidae
Baetidae > 2 Sp	Gerridae	Leptophlebiidae	Potamonautidae
Belostomatidae	Gomphidae	Libellulidae	Simuliidae
Caenidae	Gyrinidae	Muscidae	Sphaeriidae
Ceratopogonidae	Hirudinea	Naucoridae	Tabanidae
Chironomidae	Hydracarina	Nepidae	Turbellaria
Coenagrionidae	Hydrometridae	Notonectidae	Veliidae/Mesoveliidae
Corbiculidae	Hydrophilidae	Oligochaeta	

Table 4: Summary of the ecological status of the sub-quaternary (SQ) catchment reach associated with the freshwater ecosystems in proximity of the study area based on the DWS RQS PES/EIS dataset.

Ecological status	C11F-01491 (Unnamed tributary of Xspruit River)
Synopsis	
PES Category Median	C (Moderately Modified)
Mean EI class	Moderate
Mean ES class	Moderate
Length	18,95
Stream order	1
Default EC[4]	C (Moderate)
PES Details	
Instream habitat continuity MOD	Moderate
RIP/wetland zone continuity MOD	Moderate
Potential instream habitat MOD activities	Moderate
Riparian/wetland zone MOD	Moderate
Potential flow MOD activities	Moderate
Potential physico-chemical MOD activities	Small
EI Details	

Ecological status	C11F-01491 (Unnamed tributary of Xspruit River)
Fish spp/SQ	4,00
Fish average confidence	1,00
Fish representivity per secondary class	Low
Fish rarity per secondary class	Low
Invertebrate taxa/SQ	39,00
Invertebrate average confidence	1,00
Invertebrate representivity per secondary class	High
Invertebrate rarity per secondary class	Low
EI importance: riparian-wetland-instream vertebrates (excluding fish) rating	Low
Habitat diversity class	Moderate
Habitat size (length) class	Low
Instream migration link class	High
Riparian-wetland zone migration link	High
Riparian-wetland zone habitat integrity class	High
Instream habitat integrity class	High
Riparian-wetland natural vegetation rating based on percentage natural vegetation in 500m	Very high
Riparian-wetland natural vegetation rating based on expert rating	Low
Fish physical-chemical sensitivity description	Moderate
Fish no-flow sensitivity description	Moderate
Invertebrates physical-chemical sensitivity description	Very high
Invertebrates velocity sensitivity	Very high
Riparian-wetland-instream vertebrates (excluding fish) intolerance water level/flow changes description	Low
Stream size sensitivity to modified flow/water level changes description	Low
Riparian-wetland vegetation intolerance to water level changes description	Low

4 RESULTS: FRESHWATER ECOSYSTEM ASSESSMENT

4.1 Freshwater Ecosystem Characterisation and Delineation

The desk-based delineation and ground truthing confirmed the presence of numerous freshwater ecosystems that are distributed in most parts of the study area and within the associated investigation area. These freshwater ecosystems were confirmed to all be wetlands. The two confirmed wetland hydrogeomorphic (HGM) forms are:

- Seep wetlands; and
- Channelled Valley Bottom wetlands.

The freshwater ecosystems identified were classified according to the Classification System (Ollis *et al.*, 2013) as Inland Systems. The freshwater ecosystems fall within the Highveld Aquatic Ecoregion and the Mesic Highveld Grassland Groups 3 and 4 WetVeg (wetland vegetation) groups, classified by Mbona *et al.* (2015) as "Least Concern". At Levels 3 (Landscape Unit) and 4 (HGM Type) of the Classification System, the systems were classified as per the summary in Table 5, below. The freshwater ecosystems are depicted in the map in Figure 16 below.

Table 5: Characterisation at Levels 3 and 4 of the Classification System (Ollis *et al*., 2013) of the freshwater ecosystems associated with the Phefumula Emoyeni One Grid Connection study and investigation areas.

Freshwater Ecosystem HGM Type	Level 3: Landscape unit	Level 4: Hydrogeomorphic (HGM) Type
Channelled Valley Bottom Wetland	Valley floor—the base of a valley, situated between two distinct valley side-slopes, where alluvial or fluvial processes typically dominate.	A mostly flat wetland area located along a valley floor, characterised by the presence of an active channel running through it.
Seep Wetland	Slope-an inclined stretch of ground typically located on the side of a mountain, hill or valley, not forming part of a valley floor. Includes scarp slopes, mid-slopes and foot-slopes.	A wetland area located on gently to steeply sloping land and dominated by colluvial (i.e. gravity-driven), unidirectional movement of water and material down-slope.

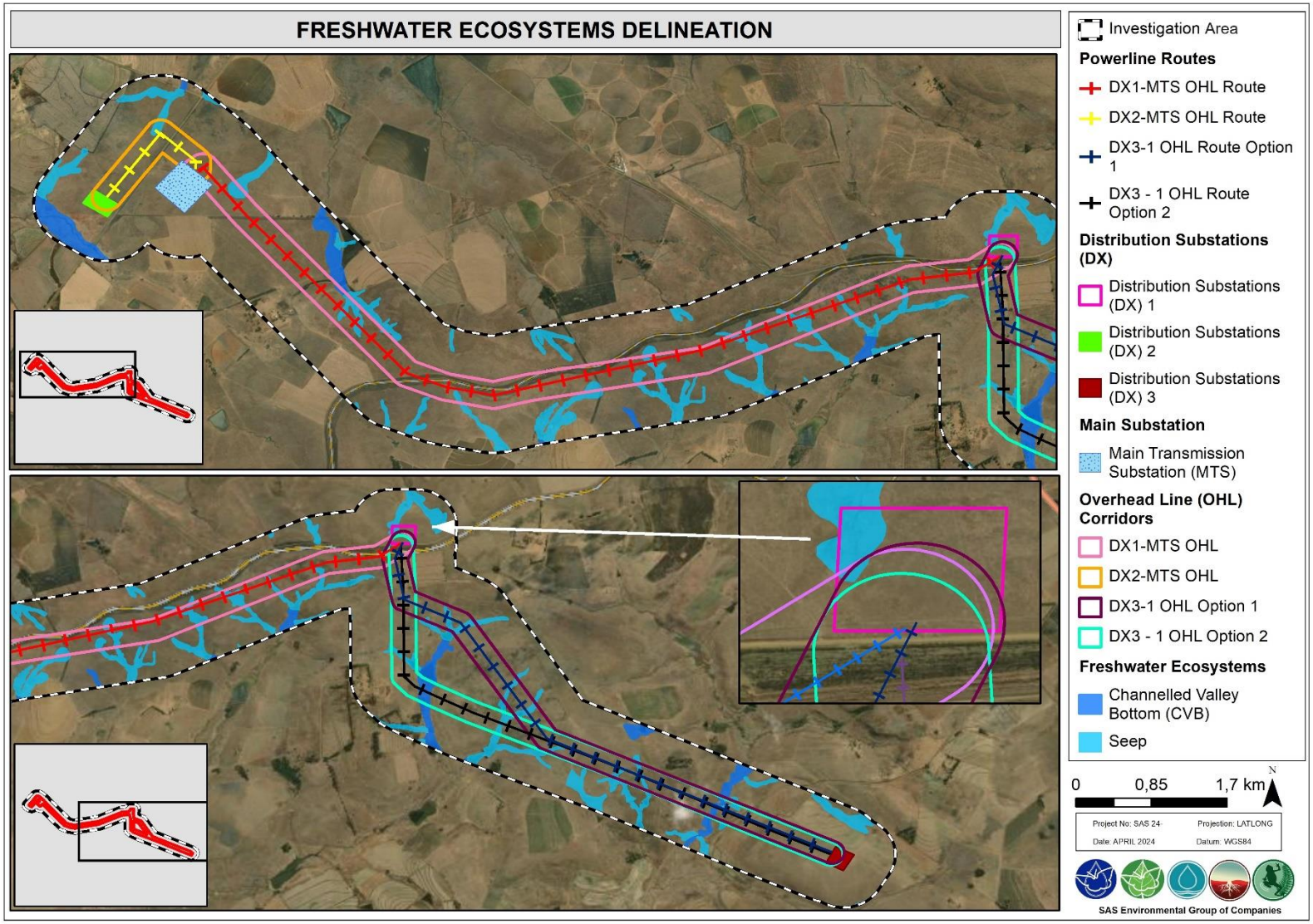

Figure 16: Delineated freshwater ecosystems associated with the proposed Phefumula Emoyeni One Grid Connection study area and associated investigation area.

4.2 Freshwater ecosystem: Site Verification Results

The study area is located within the context of the north-eastern highveld and is thus relatively high-lying with altitudes ranging from around 1650m to just over 1800m asl. From a wider drainage and surface water occurrence perspective the study area is of significance as it is located in a wider area in which two large regional rivers rise. This wider area contains parts of the headwaters of the Olifants (Lepelle) and Vaal Rivers. The study area straddles the catchment divide between the Olifants (drainage to the north) and Vaal Rivers (drainage to the south), and the study area thus straddles the continental divide, with drainage to the north flowing into the Indian Ocean via the Olifants River and Limpopo Rivers and drainage to the south flowing into the Atlantic Ocean via the Vaal and Orange Rivers. The study area accordingly falls over two quaternary catchments, with most the study area being located in the C11F catchment which comprises of parts of one of the uppermost catchments of the Vaal River and the remainder in the north-west part of the study area being located in the B11A catchment which is one of the uppermost catchments of the Olifants River, as drained by the headwaters of the Olifants River.

The nature of the terrain and soil and geological characteristics are the main drivers of freshwater occurrence and typology in the study area. The predominant geology of the wider area is characterised by sandstone and shales of the Vryheid Formation of the Ecca Group - sedimentary geology belonging to the Karoo Supergroup which characterises much of the interior of South Africa and the Mpumalanga Highveld. Such geology is typically associated with gently to moderately undulating terrain which is largely characteristic of the wider area. However large parts of the Grid Connection study area are typified by significant intrusions of Karoo dolerite, an igneous rock of much greater resistance to weathering than the dominant sedimentary rocks of the Ecca Group. The Karoo dolerites consist of a network of dolerite sills, sheets and dykes, which have intruded into the sedimentary geology.

The presence of igneous geology such as dolerite often leads to the formation of vertic and melanic soils – soils of highly clayey character that are typified by their distinctive swelling and shrinking characteristics in response to wetting and drying. Accordingly the entire study area, is characterised by the Ea23 land type. Ea land types are characterised by high base status, dark coloured and/or red structured soils, usually of clay texture, associated with basis igneous rocks (Job *et al*, 2019). In Ea land types more than half of the land surface is covered by vertic, melanic or red structured diagnostic horizons. Duplex soils or exposed rock may cover significant portions of the land surface, but vertic, melanic or red structured horizons are dominant (Job *et al,* 2019).

The Ea23 land type is strongly typified by the presence of vertic clay soils, especially in lower-lying parts of the landscape. As such the vast majority of the valley bottom terrain unit within this land type consists of vertic soil forms, particularly the Rensburg Soil Form, which can be a wetland-related soil form. Vertic soils are still predominant on the hillslopes within this land type, but other poorly draining clayey soil forms (e.g. Valsrivier and Bonheim) are present. From a wetland / hydromorphic soils perspective the occurrence of the Kroonstad Soil Form in approximately 20% of the hillslope terrain form is strongly indicative of the presence of wetlands as the Kroonstad soil form is a distinctive wetland soil form. Clay soils continue to dominate on the midslopes with the increasing presence of weathered or hard rock, and with an absence of soils displaying signs of wetness. Accordingly from an analysis of the Ea23 land type, wetlands are mostly like to occur in bottomlands and to a lesser extent on footslopes, which was borne out by observations during the site visit where the Rensburg soil form was noted to be dominant in many valley bottom wetlands.

Observations from the scoping phase field assessment indicated that melanic and primarily vertic soils are dominant in the valley bottoms across most of the wider WEF study area. This means that the dominant soil form in most of the valley bottom wetlands in the study area is the Rensburg Soil form, as evident in many exposed soil profiles along wetland channel banks in the wider area (Figure 17). Wetlands in vertic soil settings show certain distinctive characteristics – valley bottom wetlands and seeps are predominantly channelled, with the wetland often being narrow in lateral extent and with the wetland habitat with the entire later extent of the wetland often being limited to the confines of a single thread channel. This characteristic is often exacerbated by erosion with the vertic soils being highly erosive.

Figure 17: An example of an exposed Rensburg soil form profile (top left), the upper part of a seep wetland located very close to the development footprint of substation DX1 (top right); a channelled valley bottom wetland downstream of the DX3 line corridor (bottom left) and a view into the same valley bottom (looking down the Dx3 corridor) (bottom right).

The moderately undulating terrain setting, with the presence of an east-west aligned high line (catchment divide) away from which surface flows drain southwards and northwards within shallow valley heads has resulted in a relatively high drainage density in the study area. Accordingly seeps are very common on the sloping ground in the upper slopes and valley heads within the higher lying, sloping ground that is located on either side of the Olifants-Vaal catchment divide in the study area. Such seeps are typically relatively narrow, often channelled features (as described above), with most seeps having experienced a degree of erosion.

Valley bottom wetlands in the wider area are generally narrow features with the absence of extensive lateral wetland habitat beyond the relatively incised wetland channel. However wider areas of lateral wetland habitat do exist in some reaches, with these being located in wide, gently sloping valleys with the wetland being characterised by a meandering shallow channel which will regularly overtop its banks, thereby inundating the lateral wetland habitat. The

valley bottom wetland crossed by the DX3 corridor is characterised by a relatively incised natural channel with the channel having eroded down to the sandstone bedrock in places, forming areas of sandstone sheet rock within the wetland (Figure 17).

Vegetatively, the study area is located within the grassland biome and accordingly wetlands are largely graminoid-dominated, with the occurrence of forbs and herbs, many of which are annual in nature. *Phragmites australis* reedbeds and *Typha capensis* dominate the channels of the valley bottom wetlands. Wetland vegetation was noted to be moribund in many valley bottom wetland settings, with sedge species *Eleocharis dregeana* forming extensive stands. Many seeps were noted to be dominated by stands of *Imperata cylindrica.*

Freshwater ecosystems in the wider area are subject to a number of impacts, the most prominent of which is the transformation of wetland habitat and the hydrological and geomorphological alteration caused by the impounding (damming) of seeps and valley bottoms. Most of the larger valley bottoms in the wider area have been dammed, with large area of wetland habitat having been cumulatively transformed to open water habitats. In the context of the grid connection study area, many of the seeps draining the southern side of the Olifants-Vaal catchment divide in the uppermost parts of the C11F quaternary catchment have been dammed. The effects of such impounding features are pronounced in many wetlands where there is a clear vegetative response to increased wetness upstream of the impounding structure and much drier conditions downstream of it as insufficient water is allowed to bypass under the impounding structure. In the wider WEF area excessive erosion was noted in many places downstream of roads and dams, a likely geomorphological response to the depriving of sediment to the downstream reach by the impounding structure.

The catchments of certain wetlands in the study area are cultivated for crops and accordingly the timing and patterns of inflows from the catchments to the wetlands have been altered. Geomorphological balances have also been affected due to increased availability of sediments as a result of tillage. Ecological processes have accordingly also been disrupted with wetlands in such landuse settings being increasingly fragmented. Certain seep wetlands have been vegetatively transformed by cultivation, with the resultant loss of wetland habitat in such wetland units. In certain wetlands gulley erosion is prominent, with the water table having been lowered and loss of wetland habitat having resulted. Although not widespread, reaches of certain wetlands have been infested with alien invasive vegetation such as poplars (*Populus sp*.)

Despite these varying impacting factors, wetlands in the study area perform several critically important ecosystem services, most notably of which is streamflow regulation, flood control, biodiversity maintenance and provision of critical resources to sustain parts of the rural economy in terms of livestock grazing and provision of water for irrigation. In a fragmented context of landuse related natural habitat transformation, wetlands provide highly important ecological corridors and linkages between residual areas of natural habitat.

5 LEGISLATIVE REQUIREMENTS

The following legislative requirements and relevant provincial guidelines were taken into consideration during the assessment. A detailed description of these legislative requirements is presented in Appendix B:

- Constitution of the Republic of South Africa, 1996[4];
- The National Environmental Management Act, 1998 (Act No. 107 of 1998) as amended (NEMA);
- The NEMA EIA Regulations of 2014, as amended (GN 982 of 04 December 2014);
- The National Water Act, 1998 (Act No. 36 of 1998) as amended (NWA); and
- Government Notice 4167 (GN4167) as published in the Government Gazette 49833 of December 2023 as it relates to the National Water Act, 1998 (Act No. 36 of 1998).

Certain articles of legislation related to the above Acts and legislation impose potential zones of regulation on freshwater ecosystems in both a national and provincial context. The Zones of Regulation (ZoR) are not necessarily development exclusion zones, rather areas in which EIA and Water Use Authorisation legislative tools have been introduced for the protection and sustainable use of freshwater resources by requiring that certain types of activities within a freshwater ecosystem, or within a certain distance of a freshwater ecosystem require authorisation. The definition and motivation for a regulated zone of activity for the protection of freshwater ecosystems can be summarised as follows:

[4] Since 1996, the Constitution has been amended by seventeen amendments acts. The Constitution is formally entitled the 'Constitution of the Republic of South Africa, 19996". 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 6: Articles of Legislation and the relevant zones of regulation applicable to each article.

Regulatory authorisation required	Zone of applicability
Water Use Authorisation Application in terms of the National Water Act, 1998 (Act No. 36 of 1998) as amended. **Department of Water and Sanitation (DWS).**	Government Notice 4167 as published in the Government Gazette 49833 of December 2023 as it relates to the National Water Act, 1998 (Act No.36 of 1998) as amended. In accordance with GN4167 of December 2023 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: • 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; • 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 • **a 500 m radius from the delineated boundary (extent) of any wetland or pan in terms of this regulation.**
Listed activities in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) EIA Regulations (2014), as amended in 2017[5]. **Department of Forestry, Fisheries and the Environment (DFFE).**	**Activities of Listing Notice 1 (GN 327) of the National Environmental Management Act, 1998 (Act No.107 of 1998) EIA regulations, 2014 (as amended):** **Activity 12** *The development of—* *(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or* *(ii) infrastructure or structures with a physical footprint of 100 square metres or more;* *where such development occurs—;* ***a) within a watercourse;*** *b) in front of a development setback;* *c) if no development setback exists, within **32 metres of a watercourse**, measured from the edge of a watercourse.* ***Activity 48:*** *The expansion of—* *(i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more; or* *(ii) dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 100 square metres or more;* *where such expansion occurs—* *(a) **within a watercourse;*** *(b) in front of a development setback; or* *(c) if no development setback exists, within **32 metres of a watercourse,** measured from the edge of a watercourse;* **Activities of Listing Notice 3 (GN 324) of the National Environmental Management Act, 1998 (Act No.107 of 1998) EIA regulations, 2014 (as amended) applicable to Mpumalanga, outside of urban areas.** ***Activity 10**:* *The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage*

[5] Note – only listing notice activities that are associated with a zone of regulation are detailed in this table. This does not exclude the applicability of other potentially applicable activities that relate to the freshwater environment (e.g., Listing Notice 1 Activity 19) or any other applicable listing notice activity to the proposed development.

Regulatory authorisation required	Zone of applicability
	occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres. *(f)Mpumalanga:* *(i) Outside urban areas:* *(hh). **Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland.*** ***Activity 14**:* *The development of—* *(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 10 square metres; or* *(ii) infrastructure or structures with a physical footprint of 10 square metres or more;* *where such development occurs—;* ***a) within a watercourse;*** *b) in front of a development setback;* *if no development setback exists, within **32 metres of a watercourse**, measured from the edge of a watercourse* *(f) Mpumalanga -i. Outside urban areas:* *(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.* ***Activity 23:*** *The expansion of—* *(i) infrastructure or structures where the physical footprint is expanded by 10 square metres or more; or* *(ii) dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 10 square metres or more;* *where such expansion occurs—* *(a) **within a watercourse;*** *(b) in front of a development setback; or* *(c) if no development setback exists, within **32 metres of a watercourse,** measured from the edge of a watercourse;* *(f) Mpumalanga -i. Outside urban areas:* *(ee) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.*

Due to the sole occurrence of wetlands in the study area, a 500m GN4167-related Zone of Regulation will apply to all freshwater ecosystems on the site.

In terms of the NEMA EIA Regulations, two different ZoR's could apply. Due to the potential development of pylons / towers within 32 of a watercourse and potential development of new access roads, as well as the potential expansion of existing access roads, both Listing Notice 1 Activities 12 and 48 which are associated with a 32m Zone of Regulation would potentially apply to the proposed development (should the activity trigger the 100m^2 threshold). Within

areas designated by the 2014 Mpumalanga Biodiversity Sector Plan as ESAs or CBAs (most freshwater drainage in the study area has been designated at ESAs), activities 14 and 23 of Listing Notice 3 would also apply to such new power line tower development or potential new and expanded road crossings of freshwater ecosystems, as well as to any other infrastructure of >10m^2 in physical extent that is located in, or within 32m of a watercourse. These two LN3 activities are also associated with a 32m Zone of Regulation.

Lastly Activity 10 of Listing Notice 1, relating to the storage of dangerous goods with a combined capacity of >30 to <80 m^3 would be triggered within 100m of a freshwater ecosystem. Accordingly should the proponent wish to store dangerous goods (e.g. fuel) on the development site, a 100m ZoR related to the NEMA EIA Regulations (in addition to the 32m ZoR) would apply to the development should the 30m3 threshold be exceeded.

The applicable zones of regulation for the proposed Phefumula Emoyeni One Grid Connection can be summarised as follows:

- 32 m Zone of Regulation (NEMA EIA Regulations);
- (Potential) 100 m Zone of Regulation (NEMA EIA Regulations); and
- 500m Zone of Regulation (GN4167).

The respective zones of regulation as stipulated above are depicted in Figure 18 below.

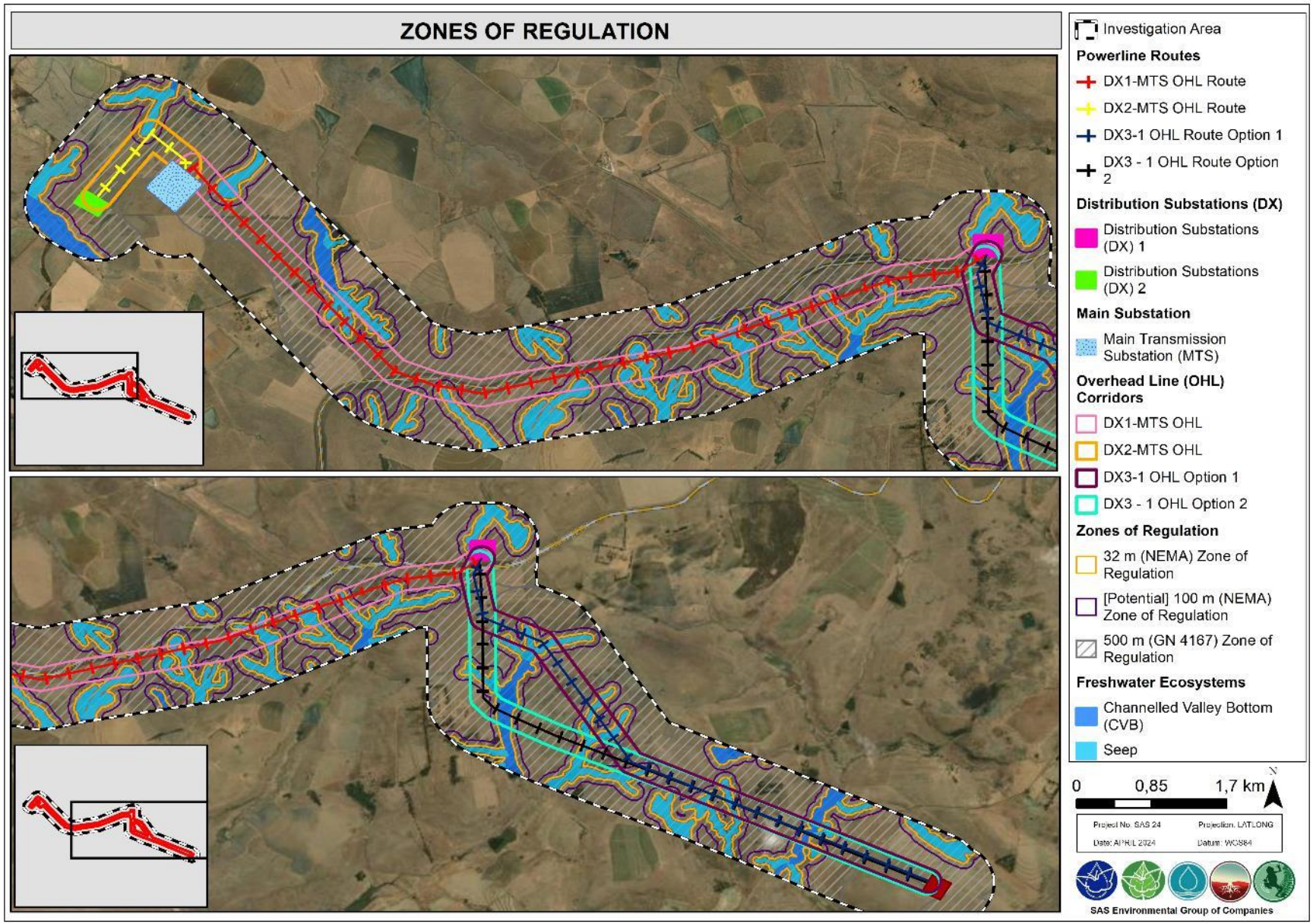

Figure 18: Conceptual presentation of the zones of regulation in the Phefumula Emoyeni One Grid Connection study and investigation areas in relation to the delineated freshwater ecosystems.

6 FRESHWATER SENSITIVITY VERIFICATION

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 / freshwater biodiversity 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.

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 during a site survey undertaken by a suitably qualified freshwater ecologist should the sensitivity be determined 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 screening tool allocation.

As part of the process of the background information gathering, the screening tool was applied to the study and investigation areas. According to the screening tool, certain parts of the study area and investigation area of the Phefumula Emoyeni One Grid Connection are within areas of very high aquatic/ freshwater biodiversity significance, (Figure 15) including most of the south-eastern and central parts of the study and investigation areas. The accords with the parts of the study area that are located in the C11F quaternary catchment and the very high sensitivity designation is due the catchment’s designation as a Phase 1 FEPA catchment. Within the north-western parts of the study and investigation areas, these areas have been largely designated as being of low sensitivity with the exception of certain larger wetland systems.

Based on the site verification undertaken by Scientific Aquatic Services and the findings thereof presented in this report, the designation of very high sensitivity to ***all*** freshwater features in the wider area by the DFFE Screening Tool has been supported through the findings of the freshwater assessment that has confirmed the very high sensitivity of all freshwater ecosystems (wetlands) that are present within the study and investigation areas. The ecological and hydrological functionality of the freshwater ecosystems in a study area context in the context of their designation of many of these as both FEPAs and CBAs renders them as ecologically very sensitive. Thus for areas in which freshwater ecosystems fall into an area of very high freshwater designation, the designation is supported. Conversely, the designation of catchments of wetlands in the central and south-eastern parts of the study area as very high is disputed. Although certain catchment areas of wetlands in this part of the study and investigation area consist of residual natural grassland, many areas are transformed primarily by crop cultivation and the sensitive of these catchment areas is a lower 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 very high aquatic biodiversity sensitivity an Aquatic Biodiversity Assessment must be produced. Such a reporting approach (scoping and EIA-phase freshwater reports) have accordingly been compiled.

Please refer to the site sensitivity verification report contained in Appendix E.

7 OPPORTUNITIES AND CONSTRAINTS

The spatial occurrence of freshwater ecosystems and associated buffers are the primary determinant in a spatial depiction of development opportunities and constraints on the development site in a freshwater context.

The Mpumalanga Biodiversity Spatial Plan Handbook (2014) has been utilised to provide guidelines on freshwater buffers. In a freshwater context the handbook stipulates the following:

- For Freshwater CBAs – a buffer of 100 m should be used to buffer rivers and wetlands, unless DWS's river / wetland buffer tool has been applied;
- For ESA Important Sub-catchments and Fish Support Areas – generic buffers of 100 m should be established around streams and wetlands within these catchments; and
- For ESA Wetlands: Any further loss of area or ecological condition must be avoided, including if needed, a 100 m generic buffer around the wetland.

As detailed in section 3.1 most wetlands in the study area have been designated as CBA or ESA wetlands. Furthermore the central and south-eastern parts of the study area fall within an ESA Important Sub-catchment. As all of these areas are associated with a 100m buffer, and this 100m MTPA buffer has been applied as part of the designation of freshwater-related opportunities and constraints.

The opportunities and constraints can be detailed as follows:

- The delineated extent of the freshwater ecosystems and the associated MTPA 100m buffer are considered "**Development High Restriction" areas** for the Phefumula Emoyeni One Grid Connection development. This accords with the verification of all freshwater ecosystems as having a very high aquatic biodiversity sensitivity (see Section 6); All non-linear infrastructure including construction camps and laydown areas and substations ***must be kept outside of this zone.*** Linear infrastructure with a physical footprint – i.e. access roads must be kept out of these areas as far as possible, and existing infrastructure footprints used where possible along with the clustering of new infrastructure along with existing infrastructure. Power lines can span these areas but the towers ***must be planned to be located outside of the delineated boundaries of the wetlands and where technically possible out of the 100m buffer portion of this area***.
- The remainder (i.e. 101m-500m of all freshwater ecosystems) of the 500m ZoR of the freshwater ecosystems in accordance with Government Notice 4167 as published in the Government Gazette 49833 of December 2023 as it relates to the NWA is

considered an area where all development components can occur with implementation of mitigation measures and subject to a Water Use Authorisation (WUA) as stipulated in terms of Section 21(c) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) as amended from the DWS. Linear infrastructure must be designed to not exert indirect impacts on adjacent / downgradient development high restriction zones and non-linear infrastructure should avoid this zone where possible; and

- The areas outside of the G509 500 ZoR and within the remainder of the study area are considered developable without any water resource management constraints as the areas fall outside any regulated zones, with the >500m buffer providing an adequate level of protection to all freshwater ecosystems in the context of potential indirect impacts (e.g. stormwater).

It should be noted that should development be kept out of the Development High Restriction" areas, no biodiversity / freshwater offsetting would be required. For linear infrastructure developed in this zone, the nature of the impact and respective development footprint would determine the need for an offset as part of the application of the mitigation hierarchy, through which avoidance, mitigation and rehabilitation are prioritised above offsetting.

The development opportunities and constraints zones are visually depicted in Figure 19 below.

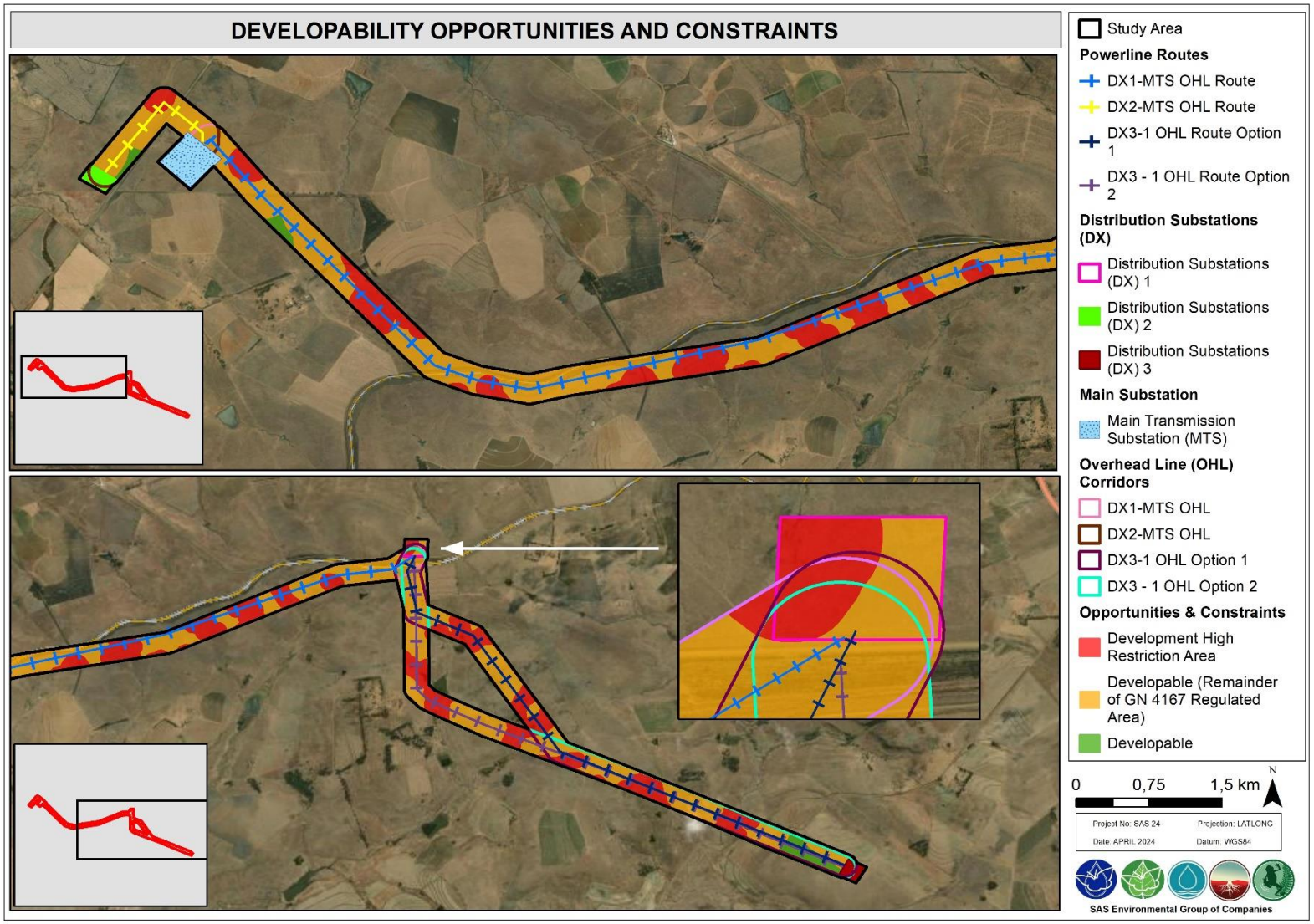

Figure 19: Opportunities and constraints analysis for the Phefumula Emoyeni One Grid Connection study area from a freshwater ecological perspective.

8 POTENTIAL IMPACTS ASSOCIATED WITH THE PROPOSED GRID CONNECTION INFRASTRUCTURE

This section of the scoping-phase freshwater report aims to provide a brief summary of the anticipated impacts that the proposed project components within the development may exert on the surrounding freshwater ecosystems. There are five key ecological impacts on freshwater ecosystems that may potentially occur in relation to the proposed project components, specifically:

- Altered freshwater ecosystem habitat and ecological structure;
- Changes to sociocultural and service provision;
- Altered biotic integrity and disturbance to ecosystem function;
- Impacts on the hydrology and sediment balance of the freshwater ecosystems; and
- Altered water quality.

Direct impacts on a freshwater ecosystem will materialise if infrastructure were to be developed within a freshwater ecosystem. This encompasses various types of infrastructure associated with the proposed development including:

- Power line pylons / towers;
- Internal access roads;
- Onsite substations; and
- Temporary construction-related infrastructure including contractor camps and laydown areas.

Such infrastructure, if developed within freshwater ecosystems could exert various impacts on the affected freshwater ecosystem, including destruction of wetland habitat, which would have knock-on effects on wetland biota and vegetation. Other impacts such as alteration of wetland hydrology and geomorphology could occur if infrastructure was developed within freshwater ecosystems. Direct impacts are particularly pertinent to towers, that if placed within the delineated extent of wetlands would result in the disturbance of, and transformation of a certain area of wetland habitat. Access tracks, if newly developed, could also exert a transformative impact on wetlands.

Greater detail on the potential risks related to indirect impacts and direct impacts associated with project components and their required mitigation measures are presented in Table 7 below.

Table 7: Potential Freshwater-related Impacts and Preliminary Mitigation measures for the Phefumula Emoyeni One Grid Connection development.

Activity / Component	Potential Impact	Required Mitigation
Site clearing associated with development of infrastructure	•Site clearing (vegetation removal) and preparation prior to commencement of any construction related activities for the proposed project may result in the potential for an increased degree of runoff and erosion, thus leading to increased sedimentation of adjacent / downgradient freshwater ecosystems, with the degree risk of impacts directly proportional to the proximity of the area being cleared to the freshwater ecosystem. This may further contribute to smothering of freshwater biota due to increased sedimentation and decreased ecological service provisioning. •The potential exists for construction activities associated with the proposed project, especially site clearing and subsequent exposure of soils to generate dust through the removal of vegetation and topsoil, especially if indiscriminate, large scale clearing of vegetation associated with the development of infrastructure with larger footprints (e.g. construction camps, substations) were to occur. This could result in large volumes of dust being transported into nearby freshwater systems, thereby smothering vegetation and other biota.	•As detailed the risk of such impacts are related to the proximity of the clearing to freshwater ecosystems. The locating of larger infrastructure footprints to be cleared of vegetation is thus highly important in avoiding this risk; **Infrastructure Relocation Recommendation:** **•In the context of the above mitigation measure, the proposed footprint / development area for the DX1 substation encroaches on the upper part of a seep wetland. It is strongly recommended that the development area for the proposed substation be relocated to ensure that the development area / footprint is located outside of the development high restriction area associated with the seep. It is suggested that the substation development area be relocated to the south of the district road currently located along the southern boundary of the substation development area;** •Furthermore the implementation of sediment and stormwater controls over the entire duration of the construction phase, to prevent the transport of silt-laden runoff from being transported into downgradient freshwater ecosystems is highly important. •The implementation of dust control measures in the construction phase, related to cleared areas and areas in which vehicles move regularly, including unsurfaced construction access routes.
General Construction activities (note: these apply to decommissioning activities as well).	General construction activities could result in a variety of impacts in addition to the aspect specific impacts below. These could include: •Unplanned incursion of construction machinery / personnel into freshwater ecosystems that could damage freshwater ecosystem habitat (in particular soils and vegetation) and adversely affect freshwater biota; •Dumping of construction material into freshwater ecosystems that could physically alter freshwater habitat and lead to habitat degradation; •Poor management of hazardous materials (e.g. fuel, paint, chemicals, etc.) and inadequate remediation of spills of such materials which could lead to leakage and such pollutants that could enter freshwater ecosystems via stormwater runoff or groundwater pollution; •Poor vehicle and equipment maintenance and associated inadequate spill management which could lead to leakages of fuel and oil, which could directly enter and thereby pollute freshwater ecosystems;	•The clear marking and physical demarcation of freshwater ecosystems and associated buffers in areas of active construction to prevent accidental / uncontrolled ingress into freshwater ecosystems; •The creation and clear demarcation of a construction right of way where construction activities occur within, or in close proximity to freshwater ecosystems; •The implementation of a clear construction waste control protocol in all areas of the construction area that is strictly enforced; •Storing of all hazardous materials used for construction in areas away from freshwater ecosystems and associated buffers and the storage of such materials in contained or bunded spaces; •The implementation and strict enforcement of spill protocol to ensure thar spills of hazardous and potentially polluting materials are properly remediated and correctly disposed of; •The regular maintenance and control of machinery and vehicles and the immediate removal and repair of leaking machinery / vehicles from the construction site; •All mobile machinery operated near or within freshwater ecosystems that could leak fuel or oils (e.g. mobile generators) must be operated on drip trays;

Activity / Component	Potential Impact	Required Mitigation
	•Uncontrolled fires which could lead to burning of freshwater ecosystem habitat which could adversely affect wetland biota and which could adversely affect freshwater habitat quality due to too frequent burning; •Poor control of construction waste which could lead to waste being washed / blown into adjacent freshwater ecosystems.	•The prevention of any fires / open flames on the construction site and the education of construction personnel regarding the risk of fires.
All infrastructure where cement mixing / batching is required.	•Cement mixing (batching) during construction could adversely affect downgradient freshwater ecosystems if polluted stormwater from the batching / mixing areas is transported into freshwater ecosystems. Such polluted stormwater could alter the pH of surface water, thereby posing a risk to freshwater biota.	•Control and undertaking of cement mixing in a way that does not result in an impact on freshwater ecosystems, in particular ensuring that batching areas are placed as far away from freshwater ecosystems as possible. the implementation of containment in cement mixing / batching areas and the implementation of adequate stormwater control and containment, especially in batching areas.
Internal access roads.	•The development of new proposed access roads could result in both direct and indirect impacts. Development of new roads in the catchment of wetlands could lead to the alteration of patterns and timing of water inputs from the catchment into downgradient wetlands. It is not known if the grid connection would be associated with development of any access roads across wetlands. Should this transpire, the development of new roads across freshwater ecosystems would result in a direct impact on the affected reach of the wetland. New roads would lead to the direct transformation of a certain area of freshwater habitat and could result in alterations to the hydrology and geomorphology of the affected reach by potentially impounding surface flows upstream of the crossing and preventing sediment from being transported into the downstream reach of the freshwater ecosystem. Crossing structures may also cause the channelisation of flows downstream of the structure and lead to scouring, if not properly designed.	•It is strongly recommended that no new roads be developed along the proposed power line alignments and that existing farm roads must be utilised as far as possible to gain access to pylon / tower positions and to substation locations. •The potential impact associated with access roads will be strongly mitigated if existing farm access roads were to be utilised and upgraded, if necessary, thus ensuring that the proposed road crossings are located within already impacted parts of the freshwater ecosystem reaches; •New access roads must be aligned to avoid as far as possible any freshwater ecosystem and the associated 100m buffer. According to the MBSP Handbook (2014) no roads should be constructed through or around more than 20% of the edge of CBA wetlands or their buffers; •If new crossings are required to be developed, or if existing crossing structures are expanded / upgraded, crossing structures must be designed to minimise the downstream and upstream impacts on the freshwater ecosystem through the installation of sufficient culverts to ensure flows are not impounded and to allow the movement of biota along reach; •If drift-type structures are designed, the level of the drift must be the same as the bed of the freshwater ecosystem to facilitate the movement of biota and to prevent a change in levels which could lead to scour and the development of erosion; •In steep terrain access roads must not be designed to run directly down the slope, rather perpendicular to the slope, and adequate stormwater controls must be installed as part of the road design.
Development of new power lines.	•Direct impacts could result if power line pylons / towers associated with the power lines are located within freshwater ecosystems, including in the case of freshwater ecosystems being too wide to be singly spanned. This could lead to a localised loss of / transformation of freshwater	•In the case of power line development the alignment must be designed /aligned to ensure that no pylons are placed within the delineated extent of a freshwater ecosystem, including in the case of freshwater ecosystems being too wide to be singly spanned.

Activity / Component	Potential Impact	Required Mitigation
	habitat in the pylon footprint(s)and impacts on freshwater habitat due to the movement of construction equipment. This could lead to a localised loss of / transformation of freshwater habitat in the pylon footprint(s)and impacts on freshwater habitat due to the movement of construction equipment.	•Furthermore, pylon / tower placement must be kept out of the stipulated 100m buffer that forms part of the development high restriction zone where technically possible to further minimise the potential for indirect impacts associated with tower development to affect wetlands that are spanned; •In the case of line stringing, machinery must not be permitted to enter any freshwater ecosystem for the purpose of stringing.
Substations	•The substation transformers contain oils, which could pollute soils and groundwater and freshwater resources through polluted groundwater inputs or though stormwater in the event of fire or leakage that could expel the oil.	**Infrastructure Relocation Recommendation:** **•See above for the recommended relocation of the DX1 Substation footprint** •Substation transformers must be stored in bunded areas, with the bunds able to hold >100% volume of the oil stored in the transformers.

The potential risk to the receiving freshwater environment will be appropriately assessed as part of the EIA-phase freshwater report using a pre-defined impact assessment method and a quantum of significance defined.

8.1 Implications of the Development Layout

The proposed layout of the three proposed substations has largely considered the spatial occurrence of freshwater ecosystems as delineated for the study area, with the exception of the proposed substation DX1. The DX1 substation development area / site has been placed to the north of a district road, on steeply sloping ground that slopes down northwards from the local watershed along which the road is located. The north-western corner of the DX1 site development area encroaches on the upper parts of a delineated seep wetland, and large parts of the 100m buffer of this seep wetland (i.e. being located within the development high restriction zone) are occupied by the substation development area. With a large component of the seep wetland's catchment that currently consists of residual grassland and a portion of the wetland itself potentially being completely transformed by the proposed substation, the impact of the substation development on this wetland would potentially be of high significance. Accordingly a relocation of the substation development area is proposed. The relocation of the substation to the south of the district road is supported, as the substation could then be located in areas of planted pasture and crop cultivation that are located outside of the delineated extents of seep wetlands.

In the context of the proposed power lines, the power line corridors would cross numerous wetlands. Due to the linear nature of a power line, it is impossible to avoid the crossing of wetlands in a drainage setting such as is present in the study area that is characterised by a high drainage density, and mitigation as a control measure is thus important. Much of the corridor is located at the uppermost part of the local catchment and thus there is not a high density of wetlands of extensive width as would be more likely to occur in a valley bottom setting. Seep wetlands at the head of the catchment are typically narrow features that are easily able to be spanned. The potential impacts of the proposed power lines and recommendations for alignment within the corridors will need to be more fully assessed in the EIA phase freshwater assessment, once a field verified delineation has been completed.

8.2 Scoping Phase (Screening) Impact Assessment

Specialists on the Phefumula Emoyeni One Grid Connection project have been requested to undertake a screening (scoping-phase assessment) of impacts. The methodology is presented in Appendix F.

Table 8 below presents the results of the impact screening. Please note that all impacts are negative and that the rating has been assessed assuming that mitigation measures have not been applied (Table 8) and have been applied (Table 9).

Table 8: Significance of Potential Impacts associated with the Phefumula-Emoyeni Grid Connection as based on the screening (scoping phase impact assessment) methodology (assuming mitigation measures have not been applied).

Potential Impact	Probability	Consequence	Impact Significance
Site clearing and associated impacts (i.e. sedimentation, dust generation).	Highly Probable (3)	Moderately Severe (2)	Medium
Taking of water from a watercourse for construction purposes	Probable (2)	Moderately Severe (2)	Low
General Construction activities	Probable (2)	Moderately Severe (2)	Low
Cement mixing / batching (construction).	Probable (2)	Moderately Severe (2)	Low
Development of new Internal access roads.	Probable (2)	Severe (3)	Medium
Development of power lines.	Probable (2)	Moderately Severe (2)	Low
Development and Operation of Substations	Highly Probable (3)	Severe (3)	Medium

Table 9: Significance of Potential Impacts associated with the Phefumula-Emoyeni Grid Connection as based on the screening (scoping phase impact assessment) methodology (assuming mitigation measures have been applied).

Potential Impact	Probability	Consequence	Impact Significance
Site clearing and associated impacts (i.e. sedimentation, dust generation).	Probable (2)	Moderately Severe (2)	Low
Taking of water from a watercourse for construction purposes	Probable (2)	Moderately Severe (2)	Low
General Construction activities	Improbable (1)	Negligible (1)	Very Low
Cement mixing / batching (construction).	Probable (2)	Negligible (1)	Very Low
Development of Internal access roads.	Probable (2)	Moderately Severe (2)	Low
Development of power lines	Improbable (1)	Moderately Severe (2)	Very Low
Development and Operation of Substations	Improbable (1)	Moderately Severe (2)	Very Low

8.3 Cumulative Impacts

Freshwater ecosystems within the wider area of the eastern Mpumalanga Highveld are under continued threat due a variety of factors primarily related to landuse which, in the long term, may prove to be unsustainable. The expansion of agricultural landuses, in particular cultivation and mining (especially coal mining), as well as urban expansion typically result in transformative impacts on freshwater ecosystems. Development of renewable energy infrastructure, including wind and solar energy facilities can also form part of the cumulative impact on freshwater ecosystems. Other factors such as existing linear infrastructure (roads and railways) as well as climate change also exert impacts on the freshwater ecosystems in the wider region.

The following renewable energy projects are located within a 55km radius of the site, and have been considered in the cumulative impact assessment:

- The Halfgewonnen solar photovoltaic (PV) facilities on portions 7,8,9 and 16 of the farm Halfgewonnen 190 IS (DFFE Ref: 14/12/16/3/3/2/2068) located 19km northeast of the site;
- The authorised Forzando North Coal Mine Solar PV Facility, 9.5MW, (DFFE Ref: 14/12/16/3/3/1/452) is located 13km northwest of the site;
- Eskom Arnot PV Facility at the Arnot Power Station on Remainder of Portion 24 of Reitkuil 491 JS near Middleburg in Mpumalanga (DFFE Ref: 14/12/16/3/3/2/760) is located 35km north of the site;
- Proposed establishment of the Haverfontein wind energy facility near Carolina, Mpumalanga Province (DFFE Ref: 12/12/20/2018/AM2) is located 42km Northwest of the site;
- Camden I Wind Energy Facility (WEF) (up to 200MW) (subject to a Scoping and Environmental Impact Reporting (S&EIR) process) (DFFE Ref: 14/12/16/3/3/2/2137) located approximately 28km southeast of the site;
- Camden I WEF Grid Connection (up to 132kV) (DFFE Ref: 14/12/16/3/3/1/2769) located approximately 28km southeast of the site;
- Camden Grid Connection and Collector substation (up to 400kV) (DFFE Ref: 14/12/16/3/3/2/2134) located approximately 28km southeast of the site;
- Camden I Solar (up to 100MW) (DFFE Ref: 14/12/16/3/3/2/2136) located approximately 28km southeast of the site;
- Camden I Solar Grid Connection (up to 132kV) (DFFE Ref: 14/12/16/3/3/1/2768) located approximately 28km southeast of the site;

- Camden II Wind Energy Facility (up to 200MW) (DFFE Ref: 14/12/16/3/3/2/2135) located approximately 35km southeast of the site;
- Camden II Wind Energy Facility up to 132kV Grid Connection located approximately 35km southeast of the site;
- Hendrina North WEF (up to 200MW) (DFFE Ref: 14/12/16/3/3/2/2130) located approximately 16km northwest of the site;
- Hendrina North Grid Infrastructure (up to 275kV) (DFFE Ref: 14/12/16/3/3/2/2128) located approximately 16km northwest of the site;
- Hendrina South WEF (up to 200MW) (DFFE Ref: 14/12/16/3/3/2/2131) located approximately 16km northwest of the site;
- Hendrina South Grid Infrastructure (up to 275kV) (DFFE Ref: 14/12/16/3/3/2/2129) located approximately 16km northwest of the site;
- Ummbila Emoyeni WEF (up to 900MW) (DFFE Ref: 14/12/16/3/3/2/2160) located approximately 10km southwest of the site;
- Ummbila Emoyeni Grid Connection (up to 400kV) (DFFE Ref: 14/12/16/3/3/2/2162) located approximately 10km southwest of the site; and
- Ummbila Emoyeni Solar Facility (up to 150MW) (DFFE Ref: 14/12/16/3/3/2/2161) located approximately 17km southwest of the site.

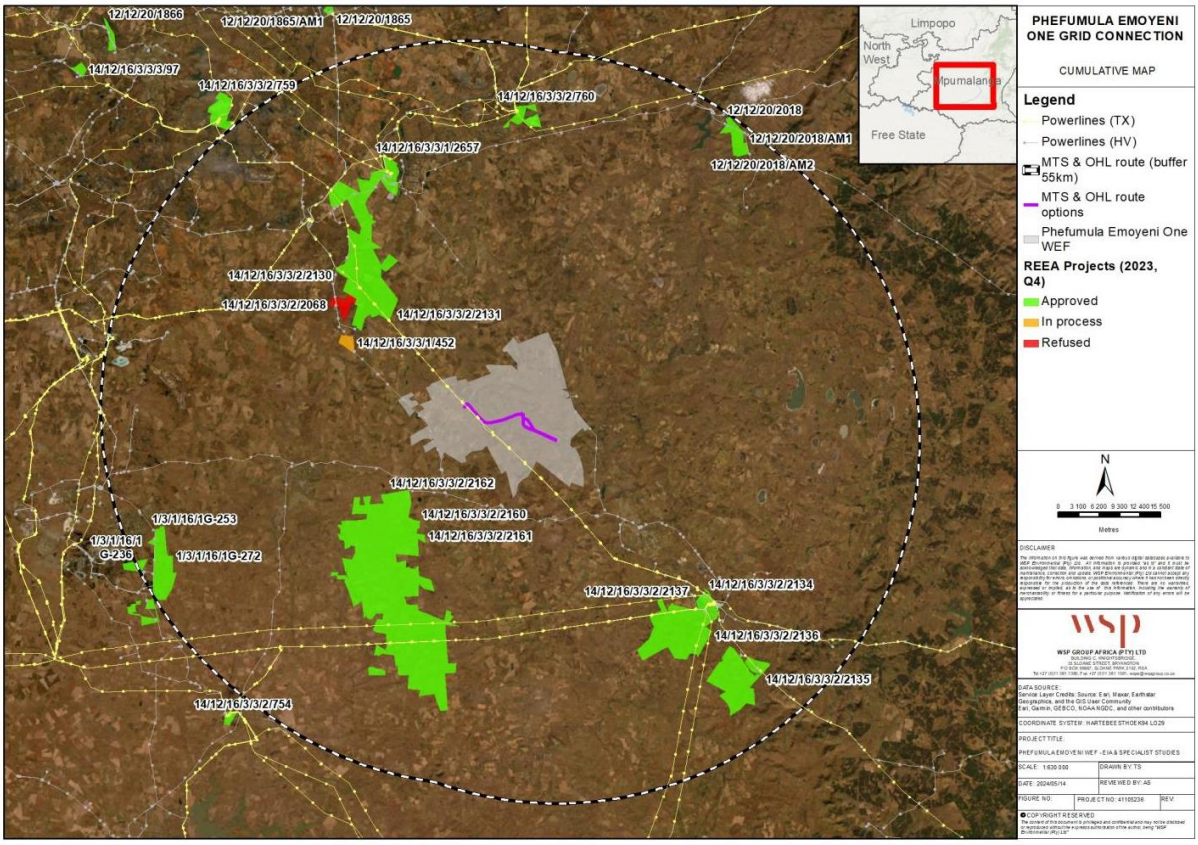

Figure 20 – Map showing Renewable Energy Developments within 55km of the proposed project.

Should the development of the Phefumula Emoyeni One Grid Connection impact freshwater resources, this will result in a cumulative impact on the freshwater ecosystems in a wider area, especially at a quaternary catchment or smaller catchment area level. The implementation of mitigation measures to avoid impacts (that will be detailed in the EIA-phase freshwater report) will either reduce the scale and intensity of such a cumulative impact, or under a best-case scenario will negate the creation of a cumulative impact.

9 PLAN OF STUDY FOR THE EIA (IMPACT) PHASE

The following points highlight the envisaged components of the EIA-phase freshwater report:

- An in-field assessment of freshwater ecosystems in the study area will be undertaken to gather data for the detailed assessment of potentially affected freshwater ecosystems and to further refine the desktop-based delineation of freshwater ecosystems in the study area;
- As part of the detailed assessment of wetlands proposed to be crossed by the proposed power lines and potentially affected by the proposed substations, the

Ecological Importance and Sensitivity of these freshwater ecosystems will be determined according to the method described by Rountree and Kotze, (2013);

- As part of the detailed assessment of wetlands proposed to be crossed by the proposed power lines and potentially affected by the proposed substations, the ecological goods and services provided by these freshwater ecosystems will be assessed according to the method of Kotze *et al* (2009) in which services to the ecology of the study area as well as services to the people of the area are defined;
- As part of the detailed assessment of wetlands proposed to be crossed by the proposed power lines and potentially affected by the proposed substations, the Present Ecological State of these freshwater ecosystems will be assessed according to the resource directed measures guideline as advocated by Macfarlane *et al*., (2008) or DWAF (2007) as applicable;
- As part of the detailed assessment of wetlands proposed to be crossed by the proposed power lines and potentially affected by the proposed substations the Recommended Ecological Category (REC), Recommended Management Objective (RMO) and Best Attainable State (BAS) for these freshwater ecosystems will be assessed;
- All potential impacts identified in the scoping phase of the project will be assessed in detail according to the DWS Risk Assessment Matrix (2016) methodology and the impact assessment methodology provided by the EAP. The impact assessment will also consider cumulative and residual impacts;
- All alternatives as presented by the EAP for assessment (including the No Go alternative) will be comparatively assessed;
- All relevant and applicable mitigation measures will be refined;
- A statement regarding the acceptability of the proposed development from a freshwater context will be provided; and
- recommendations for the EMPr or conditions to be included in the Environmental Authorisation will be made.

The details of the various methodologies that should be employed in the EIA phase are provided in **Appendix C, D & F** of this report.

10 CONCLUSION

Scientific Aquatic Services (SAS) (Pty) Ltd was appointed to conduct a freshwater ecological assessment as part of the Environmental Impact Assessment for the proposed Phefumula Emoyeni One Grid Connection. The proposed development consists of various components including power lines and substations. The results of the desk based delineation and field verification indicated that there is a high density of drainage (natural freshwater ecosystems) in the study area. These freshwater ecosystems are wetlands, comprising of hillslope seeps and channelled valley bottom wetlands. The presence of such freshwater ecosystems is important in a development context; all such features have been confirmed to be associated with very high aquatic biodiversity sensitivity and accordingly all freshwater ecosystems and the associated MTPA 100m buffer around the freshwater ecosystems have been designated as a high development restriction area.

The proposed development could have the potential to directly impact freshwater features, especially in the context of power lines that will need to cross freshwater ecosystems, and the potential development of roads. Indirect impacts could result from transformation of parts of the catchments of wetlands by infrastructure. A potentially significant impact has been identified to be associated with the development of the proposed DX1 substation, of which a component of the development footprint would directly affect a seep wetland in addition to transforming a significant portion of the wetland's upper catchment. A relocation of the substation development area is accordingly strongly recommended. The EIA-phase report will focus on the detailed assessment of likely impacts and the mitigation thereof based on the conceptual development layout provided for that phase.

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APPENDIX A – Terms of Use and Indemnity

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.

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APPENDIX B – Legislation

LEGISLATIVE REQUIREMENTS

The Constitution of the Republic of South Africa, 1996	The environment and the health and well-being of people are safeguarded under the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) by way of section 24. Section 24(a) guarantees a right to an environment that is not harmful to human health or well-being and to environmental protection for the benefit of present and future generations. Section 24(b) directs the state to take reasonable legislative and other measures to prevent pollution, promote conservation, and secure the ecologically sustainable development and use of natural resources (including water and mineral resources) while promoting justifiable economic and social development. Section 27 guarantees every person the right of access to sufficient water, and the state is obliged to take reasonable legislative and other measures within its available resources to achieve the progressive realisation of this right. Section 27 is defined as a socio-economic right and not an environmental right. However, read with section 24 it requires of the state to ensure that water is conserved and protected and that sufficient access to the resource is provided. Water regulation in South Africa places a great emphasis on protecting the resource and on providing access to water for everyone.
National Environmental Management Act (NEMA) (Act No. 107 of 1998)	The National Environmental Management Act (NEMA) (Act 107 of 1998) and the associated Regulations as amended in 2017, states that prior to any development taking place within a wetland or riparian area, an environmental authorisation process needs to be followed. This could follow either the Basic Assessment Report (BAR) process or the Environmental Impact Assessment (EIA) process depending on the scale of the impact. Provincial regulations must also be considered.
The National Water Act (NWA) (Act No. 36 of 1998)	The National Water Act (NWA) (Act 36 of 1998) recognises that the entire ecosystem and not just the water itself in any given water resource constitutes the resource and as such needs to be conserved. No activity may therefore take place within a watercourse unless it is authorised by the Department of Water and Sanitation (DWS). Any area within a wetland or riparian zone is therefore excluded from development unless authorisation is obtained from the DWS in terms of Section 21 (c) & (i).
National Environmental Management: Biodiversity Act (2004) (Act 10 of 2004) (NEMBA)	**Ecosystems that are threatened or in need of protection.** (1) (a) The Minister may, by notice in the Gazette, publish a national list of ecosystems that are threatened and in need of protection. *(b)* An MEC for environmental affairs in a province may, by notice in *the Gazette,* publish a provincial list of ecosystems in the province that are threatened and in need of protection. (2) The following categories of ecosystems may be listed in terms of subsection (1): *(a)* critically endangered ecosystems, being ecosystems that have undergone severe degradation of ecological structure, function or composition as a result of human intervention and are subject to an extremely high risk of irreversible transformation; *(b)* endangered ecosystems, being ecosystems that have undergone degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems; (c) vulnerable ecosystems, being ecosystems that have a high risk of undergoing significant degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems or endangered ecosystems; and *(d)* protected ecosystems, being ecosystems that are of high conservation value or of high national or provincial importance, although they are not listed in terms of paragraphs *(a), (b)* or (c).
Government Notice 598 Alien and Invasive Species Regulations (2014), including the Government Notice 864 Alien Invasive Species List as published in the Government Gazette 40166 of 2016, as it relates	NEMBA is administered by the Department of Environmental Affairs and aims to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA. This act in terms of alien and invasive species aims to: ➢ Prevent the unauthorized introduction and spread of alien and invasive species to ecosystems and habitats where they do not naturally occur, ➢ Manage and control alien and invasive species, to prevent or minimize harm to the environment and biodiversity; and ➢ Eradicate alien species and invasive species from ecosystems and habitats where they may harm such ecosystems or habitats.

to the National Environmental Management Biodiversity Act, 2004 (Act No 10 of 2004)	Alien species are defined, in terms of the NEMBA as: (a) A species that is not an indigenous species; or (b) An indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by natural means of migration or dispersal without human intervention. Categories according to NEMBA (Alien and Invasive Species Regulations, 2017): ➢ **Category 1a:** Invasive species that require compulsory control; ➢ **Category 1b:** Invasive species that require control by means of an invasive species management programme; ➢ **Category 2:** Commercially used plants that may be grown in demarcated areas, provided that there is a permit and that steps are taken to prevent their spread; and ➢ **Category 3:** Ornamentally used plants that may no longer be planted.
Government Notice 4167 as published in the Government Gazette 49833 of 08 December 2023 as it relates to the NWA (Act 36 of 1998) as amended	GN 4167 outlines the parameters and process of a General Authorisation (GA), which replaces the need to apply for a licence in terms of Section 40 of the NWA, provided that the water use is within the limits and conditions of the GA. The notice replaces GN 509 of 2016. The GA sets out the need to determine the regulated area of a watercourse, as well as the degree of risk posed by an activity/ies related to a particular water use. In accordance with GN 4167 of December 2023, the regulated area of a watercourse for section 21c and 21i of the NWA, 1998 is defined as: a) the outer edge of the 1 in 100-year flood line 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; b) in the absence of a determined 1 in 100-year flood line or riparian area the area within 100 m distance from the edge of a watercourse where the edge of the watercourse (excluding flood plains) is the first identifiable annual bank fill flood bench; or c) In respect of a wetland, a 500 m radius around the delineated boundary (extent) of any wetland, including pans. The GA only applies to the use of water in terms of Section 21(c) and (i) of the NWA where the risk class is LOW as determined through the application of the Risk Matrix as prescribed in the Notice. The GA also does not apply where other Section 21 water uses are triggered, does not apply for most sewage infrastructure and pipelines carrying hazardous materials, water uses associated with hazardous materials, water uses associated with water and wastewater treatment works, and for most mining-related water uses. The GA may be exercised as follows: i) Section 21(c) or (i) water use activities that are determined to pose a LOW Risk as determined through the application of the Risk Matrix as prescribed in the Notice can be undertaken subject to the general conditions of the GA; ii) Section 21(c) or (i) water use activities set out in Appendix D1 of the Notice can be undertaken without being subject to the requirement of a risk assessment and subject to the general conditions of the GA. Such water use activities in Appendix D1 include inter alia emergency river crossings, fence erection, solar renewable infrastructure that has no direct impact on watercourses and mini-scale hydropower developments; iii) Prescribed water use activities undertaken by certain State Owned Entities as detailed in Appendix D2 of the Notice can be undertaken without being subject to the requirement of a risk assessment and subject to the general conditions of the GA; iv) Maintenance work associated an existing lawful water use in terms of section 21(c) or (i) of the Act that has a LOW risk class as determined through the Risk Matrix can be undertaken ; v) River and stormwater management activities including maintenance of infrastructure as contained in a river management plan or similar management plan, may be

	conducted subject to the approval of such a plan by the relevant DWS regional office or catchment management agency; vi) Rehabilitation of wetlands or rivers where such rehabilitation activities has a LOW risk class as determined through the Risk Matrix can be conducted; and vii) Emergency work arising from an emergency situation and or incident associated with the persons' existing lawful water use entitlement can be undertaken, provided that all work is executed and reported in the manner prescribed in the Emergency protocol contained in Appendix C of the GA. A General Authorisation (GA) issued as per this notice will require the proponent to adhere with specific conditions, rehabilitation criteria and monitoring and reporting programme. Furthermore, the water user must ensure that there is a sufficient budget to complete, rehabilitate and maintain the water use as set out in this GA. Upon completion of the registration, the responsible authority will provide a certificate of registration to the water user within 30 working days of the submission. On written receipt of a registration certificate from the Department, the person will be regarded as a registered water user and can commence within the water use as contemplated in the GA.
National Environmental Management: Waste Act, No 59 of 2008 (NEMWA)	NEMWA, which reforms the law regulating waste management in order to protect the health and the environment by providing reasonable measures for the prevention of pollution; provides for national norms and standards for regulating the management of waste by all spheres of government and provides for the licensing and control of waste management activities.

APPENDIX C – Method of Assessment

1. Desktop Study

Prior to the commencement of the field assessment, a background study, including a literature review, was conducted in order to determine the ecoregion and Ecostatus of the larger aquatic system within which the freshwater ecosystems present or in close proximity of the study area are located. Aspects considered as part of the literature review are discussed in the sections that follow.

1.1 National Freshwater ecosystem Priority Areas (NFEPA, 2011)

The NFEPA project is a multi-partner project between the Council of Scientific and Industrial Research (CSIR), Water Research Commission (WRC), South African National Biodiversity Institute (SANBI), DWA, South African Institute of Aquatic Biodiversity (SAIAB) and South African National Parks (SANParks). The project responds to the reported degradation of freshwater ecosystem condition and associated biodiversity, both globally and in South Africa. It uses systematic conservation planning to provide strategic spatial priorities of conserving South Africa's freshwater biodiversity, within the context of equitable social and economic development.

The NFEPA project aims to identify a national network of freshwater conservation areas and to explore institutional mechanisms for their implementation. Freshwater ecosystems provide a valuable, natural resource with economic, aesthetic, spiritual, cultural and recreational value. However, the integrity of freshwater ecosystems in South Africa is declining at an alarming rate, largely as a consequence of a variety of challenges that are practical (managing vast areas of land to maintain connectivity between freshwater ecosystems), socio-economic (competition between stakeholders for utilisation) and institutional (building appropriate governance and co-management mechanisms).

The NFEPA database was searched for information in terms of conservation status of rivers, wetland habitat and wetland features present in the vicinity of or within the study area.

2. Classification System for Wetlands and other Aquatic Ecosystems in South Africa

The freshwater ecosystems encountered within the study area were assessed using the Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland Systems (Ollis *et al*., 2013), hereafter referred to as the "Classification System". A summary of Levels 1 to 4 of the classification system are presented in Table C1 and C2, below.

Table C1: Proposed classification structure for Inland Systems, up to Level 3.

WETLAND / AQUATIC ECOSYSTEM CONTEXT		
LEVEL 1: SYSTEM	LEVEL 2: REGIONAL SETTING	LEVEL 3: LANDSCAPE UNIT
Inland Systems	DWA Level 1 Ecoregions OR NFEPA WetVeg Groups OR Other special framework	Valley Floor
		Slope
		Plain
		Bench (Hilltop / Saddle / Shelf)

Table C2: Hydrogeomorphic (HGM) Unit for the Inland System, showing the primary HGM Types at Level 4A and the subcategories at Level 4B to 4C.

FUNCTIONAL UNIT		
LEVEL 4: HYDROGEOMORPHIC (HGM) UNIT		
HGM type	Longitudinal zonation/ Landform / Outflow drainage	Landform / Inflow drainage
A	**B**	**C**
River	Mountain headwater stream	Active channel
		Riparian zone
	Mountain stream	Active channel
		Riparian zone
	Transitional	Active channel
		Riparian zone
	Upper foothills	Active channel
		Riparian zone
	Lower foothills	Active channel
		Riparian zone
	Lowland river	Active channel
		Riparian zone
	Rejuvenated bedrock fall	Active channel
		Riparian zone
	Rejuvenated foothills	Active channel
		Riparian zone
	Upland floodplain	Active channel
		Riparian zone
Channelled valley-bottom wetland	(not applicable)	(not applicable)
Unchannelled valley-bottom wetland	(not applicable)	(not applicable)
Floodplain wetland	Floodplain depression	(not applicable)
	Floodplain flat	(not applicable)
Depression	Exorheic	With channelled inflow
		Without channelled inflow
	Endorheic	With channelled inflow
		Without channelled inflow
	Dammed	With channelled inflow
		Without channelled inflow
Seep	With channelled outflow	(not applicable)
	Without channelled outflow	(not applicable)
Wetland flat	(not applicable)	(not applicable)

Level 1: Inland systems

From the Classification System, Inland Systems are defined as aquatic ecosystems that have no existing connection to the ocean[6] (i.e. characterised by the complete absence of marine exchange and/or tidal influence) but which are inundated or saturated with water, either permanently or periodically. It is important to bear in mind, however, that certain Inland Systems may have had a historical connection to the ocean, which in some cases may have been relatively recent.

[6] Most rivers are indirectly connected to the ocean via an estuary at the downstream end, but where marine exchange (i.e., the presence of seawater) or tidal fluctuations are detectable in a river channel that is permanently or periodically connected to the ocean, it is defined as part of the estuary.

Level 2: Ecoregions & NFEPA Wetland Vegetation Groups

For Inland Systems, the regional spatial framework that has been included at Level 2 of the classification system is that of DWA's Level 1 Ecoregions for aquatic ecosystems (Kleynhans *et al.,* 2005). There is a total of 31 Ecoregions across South Africa, including Lesotho and Swaziland. DWA Ecoregions have most commonly been used to categorise the regional setting for national and regional water resource management applications, especially in relation to rivers.

The Vegetation Map of South Africa, Swaziland and Lesotho (Mucina & Rutherford, 2006) group's vegetation types across the country according to Biomes, which are then divided into Bioregions. To categorise the regional setting for the wetland component of the National Freshwater ecosystem Priority Areas (NFEPA) project, wetland vegetation groups (referred to as WetVeg Groups) were derived by further splitting bioregions into smaller groups through expert input (Nel *et al*., 2011). There are currently 133 NFEPA WetVeg Groups. It is envisaged that these groups could be used as a special framework for the classification of wetlands in national- and regional-scale conservation planning and wetland management initiatives.

Level 3: Landscape Setting

At Level 3 of the Classification System, for Inland Systems, a distinction is made between four Landscape Units (Table C1) on the basis of the landscape setting (i.e. topographical position) within which an HGM Unit is situated, as follows (Ollis *et al.,* 2013):

- **Slope:** an included stretch of ground that is not part of a valley floor, which is typically located on the side of a mountain, hill or valley;
- **Valley floor:** The base of a valley, situated between two distinct valley side-slopes;
- **Plain:** an extensive area of low relief characterised by relatively level, gently undulating or uniformly sloping land; and
- **Bench (hilltop/saddle/shelf):** an area of mostly level or nearly level high ground (relative to the broad surroundings), including hilltops/crests (areas at the top of a mountain or hill flanked by down-slopes in all directions), saddles (relatively high-lying areas flanked by down-slopes on two sides in one direction and up-slopes on two sides in an approximately perpendicular direction), and shelves/terraces/ledges (relatively high-lying, localised flat areas along a slope, representing a break in slope with an up-slope one side and a down-slope on the other side in the same direction).

Level 4: Hydrogeomorphic Units

Seven primary HGM Types are recognised for Inland Systems at Level 4A of the Classification System (Table C2), on the basis of hydrology and geomorphology (Ollis *et al*., 2013), namely:

- **River:** a linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water;
- **Channelled valley-bottom wetland:** a valley-bottom wetland with a river channel running through it;
- **Unchannelled valley-bottom wetland:** a valley-bottom wetland without a river channel running through it;
- **Floodplain wetland:** the mostly flat or gently sloping land adjacent to and formed by an alluvial river channel, under its present climate and sediment load, which is subject to periodic inundation by over-topping of the channel bank;
- **Depression:** a landform with closed elevation contours that increases in depth from the perimeter to a central area of greatest depth, and within which water typically accumulates.
- **Wetland Flat:** a level or near-level wetland area that is not fed by water from a river channel, and which is typically situated on a plain or a bench. Closed elevation contours are not evident around the edge of a wetland flat; and
- **Seep:** a wetland area located on (gently to steeply) sloping land, which is dominated by the colluvial (i.e. gravity-driven), unidirectional movement of material down-slope. Seeps are often located on the side-slopes of a valley but they do not, typically, extend into a valley floor.

The above terms have been used for the primary HGM Units in the classification system to try and ensure consistency with the wetland classification terms currently in common usage in South Africa. Similar terminology (but excluding categories for “channel”, “flat” and “valleyhead seep”) is used, for example, in the recently developed tools produced as part of the Wetland Management Series including WET-Health (Macfarlane *et al*., 2008), WET-IHI (DWAF, 2007) and WET-EcoServices (Kotze *et al*., 2009).

3. WET-Health

Healthy wetlands are known to provide important habitats for wildlife and to deliver a range of important goods and services to society. Management of these systems is therefore essential if these attributes are to be retained within an ever-changing landscape. The primary purpose of this assessment is to evaluate the eco-physical health of wetlands, and in so doing to promote their conservation and wise management.

Level of Evaluation
Two levels of assessment are provided by WET-Health:

- Level 1: Desktop evaluation, with limited field verification. This is generally applicable to situations where a large number of wetlands need to be assessed at a very low resolution; or
- Level 2: On-site evaluation. This involves structured sampling and data collection in a single wetland and its surrounding catchment.

Framework for the Assessment
A set of three modules has been synthesised from the set of processes, interactions and interventions that take place in wetland systems and their catchments: hydrology (water inputs, distribution and retention, and outputs), geomorphology (sediment inputs, retention and outputs) and vegetation (transformation and presence of introduced alien species).

Units of Assessment
Central to WET-Health is the characterisation of HGM Units, which have been defined based on geomorphic setting (e.g. hillslope or valley-bottom; whether drainage is open or closed), water source (surface water dominated or sub-surface water dominated) and pattern of water flow through the wetland unit (diffusely or channelled) as described under the Classification System for Wetlands and other Aquatic Ecosystems above.

Quantification of Present State of a wetland
The overall approach is to quantify the impacts of human activity or clearly visible impacts on wetland health, and then to convert the impact scores to a Present State score. This takes the form of assessing the spatial *extent* of the impact of individual activities and then separately assessing the *intensity* of the impact of each activity in the affected area. The extent and intensity are then combined to determine an overall *magnitude* of impact. The impact scores, and Present State categories are provided in the table below.

Table C3: Impact scores and categories of Present State used by WET-Health for describing the integrity of wetlands.

Impact category	Description	Impact score range	Present State category
None	Unmodified, natural	0-0.9	A
Small	Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1-1.9	B
Moderate	Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact.	2-3.9	C
Large	Largely modified. A large change in ecosystem processes and loss of natural habitat and biota and has occurred.	4-5.9	D

Impact category	Description	Impact score range	Present State category
Serious	The change in ecosystem processes and loss of natural habitat and biota is great, but some remaining natural habitat features are still recognisable.	6-7.9	E
Critical	Modifications have reached a critical level and the ecosystem processes have been completely modified with an almost complete loss of natural habitat and biota.	8-10	F

Assessing the Anticipated Trajectory of Change

As is the case with the Present State, future threats to the state of the wetland may arise from activities in the catchment upstream of the unit or within the wetland itself or from processes downstream of the wetland. In each of the individual sections for hydrology, geomorphology and vegetation, five potential situations exist depending upon the direction and likely extent of change (table below).

Table C4: Trajectory of Change classes and scores used to evaluate likely future changes to the present state of the wetland.

Change Class	Description	HGM change score	Symbol
Substantial improvement	State is likely to improve substantially over the next 5 years	2	↑↑
Slight improvement	State is likely to improve slightly over the next 5 years	1	↑
Remain stable	State is likely to remain stable over the next 5 years	0	→
Slight deterioration	State is likely to deteriorate slightly over the next 5 years	-1	↓
Substantial deterioration	State is expected to deteriorate substantially over the next 5 years	-2	↓↓

Overall health of the wetland

Once all HGM Units have been assessed, a summary of health for the wetland as a whole needs to be calculated. This is achieved by calculating a combined score for each component by area-weighting the scores calculated for each HGM Unit. Recording the health assessments for the hydrology, geomorphology and vegetation components provide a summary of impacts, Present State, Trajectory of Change and Health for individual HGM Units and for the entire wetland.

4. Freshwater ecosystem Function Assessment

"The importance of a water resource, in ecological social or economic terms, acts as a modifying or motivating determinant in the selection of the management class".[7] The assessment of the ecosystem services supplied by the identified freshwater ecosystems was conducted according to the guidelines as described by Kotze *et al.* (2009). An assessment was undertaken that examines and rates the following services according to their degree of importance and the degree to which the service is provided:

- Flood attenuation;
- Stream flow regulation;
- Sediment trapping;
- Phosphate trapping;
- Nitrate removal;
- Toxicant removal;
- Erosion control;
- Carbon storage;

[7] Department of Water Affairs and Forestry, South Africa Version 1.0 of Resource Directed Measures for Protection of Water Resources, 1999

- Maintenance of biodiversity;
- Water supply for human use;
- Natural resources;
- Cultivated foods;
- Cultural significance;
- Tourism and recreation; and
- Education and research.

The characteristics were used to quantitatively determine the value, and by extension sensitivity, of the freshwater ecosystems. Each characteristic was scored to give the likelihood that the service is being provided. The scores for each service were then averaged to give an overall score to the freshwater ecosystems.

Table C5: Classes for determining the likely extent to which a benefit is being supplied.

Score	Rating of the likely extent to which the benefit is being supplied
<0.5	Low
0.6-1.2	Moderately low
1.3-2	Intermediate
2.1-3	Moderately high
>3	High

5. Ecological Importance and Sensitivity (EIS) (Rountree & Kotze, 2013)

The purposed of assessing importance and sensitivity of water resources is to be able to identify those systems that provide higher than average ecosystem services, biodiversity support functions or are especially sensitive to impacts. Water resources with higher ecological importance may require managing such water resources in a better condition than the present to ensure the continued provision of ecosystem benefits in the long term (Rountree & Kotze, 2013).

In order to align the outputs of the Ecoservices assessment (i.e. ecological and socio-cultural service provision) with methods used by the DWA (now the DWS) used to assess the EIS of other freshwater ecosystem types, a tool was developed using criteria from both WET-Ecoservices (Kotze, *et, al,* 2009) and earlier DWA EIA assessment tools. Thus, three proposed suites of important criteria for assessing the Importance and Sensitivity for wetlands were proposed, namely:

- Ecological Importance and Sensitivity, incorporating the traditionally examined criteria used in EIS assessments of other water resources by DWA and thus enabling consistent assessment approaches across water resource types;
- Hydro-functional importance, taking into consideration water quality, flood attenuation and sediment trapping ecosystem services that the wetland may provide; and
- Importance in terms of socio-cultural benefits, including the subsistence and cultural benefits provided by the wetland system.

The highest of these three suites of scores is then used to determine the overall Importance and Sensitivity category (Table C6) of the wetland system being assessed.

Table C6: Ecological Importance and Sensitivity Categories and the interpretation of median scores for biota and habitat determinants (adapted from Kleynhans, 1999).

EIS Category	Range of Mean	Recommended Ecological Management Class
Very high Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these wetlands is usually very sensitive to flow and habitat modifications.	>3 and <=4	A
High Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these wetlands may be sensitive to flow and habitat modifications.	>2 and <=3	B
Moderate Wetlands that 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 modifications.	>1 and <=2	C
Low/marginal Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these wetlands is ubiquitous and not sensitive to flow and habitat modifications.	>0 and <=1	D

6. Recommended Management Objective (RMO) and Recommended Ecological Category (REC) Determination

"A high management class relates to the flow that will ensure a high degree of sustainability and a low risk of ecosystem failure. A low management class will ensure marginal maintenance of sustainability but carries a higher risk of ecosystem failure" (DWA, 1999).

The RMO (table below) was determined based on the results obtained from the PES, reference conditions and EIS of the freshwater ecosystem (sections above), with the objective of either maintaining, or improving the ecological integrity of the freshwater ecosystem in order to ensure continued ecological functionality.

Table C7: Recommended management objectives (RMO) for water resources based on PES & EIS scores.

PES			Ecological and Importance Sensitivity (EIS)			
			Very High	High	Moderate	Low
	A	Pristine	A Maintain	A Maintain	A Maintain	A Maintain
	B	Natural	A Improve	A/B Improve	B Maintain	B Maintain
	C	Good	A Improve	B/C Improve	C Maintain	C Maintain
	D	Fair	C Improve	C/D Improve	D Maintain	D Maintain
	E/F	Poor	D* Improve	E/F* Improve	E/F* Maintain	E/F* Maintain

***PES Categories E and F are considered ecologically unacceptable (Malan and Day, 2012) and therefore, should a freshwater ecosystem fall into one of these PES categories, an REC class D is allocated by default, as the minimum acceptable PES category.**

A freshwater ecosystem may receive the same class for the REC as the PES if the freshwater ecosystem is deemed in good condition, and therefore must stay in good condition. Otherwise, an appropriate REC should be assigned in order to prevent any further degradation as well as enhance the PES of the freshwater ecosystem.

Table C8: Description of Recommended Ecological Category (REC) classes.

Class	Description
A	Unmodified, natural
B	Largely natural with few modifications
C	Moderately modified
D	Largely modified

7. General Habitat Integrity

The general habitat integrity of each site was discussed based on the application of the Index of Habitat Integrity (Kleynhans *et al.* 2008). It is important to assess the habitat at each site in order to aid in the interpretation of the results of the community integrity assessments, by taking habitat conditions and impacts into consideration. This method describes the Present Ecological State (PES) of both the in-stream and riparian habitat at each site. The method classifies habitat integrity into one of six classes, ranging from unmodified/natural (Class A) to critically modified (Class F), as indicated in Table C8 below.

Table C9: Classification of Present State Classes in terms of Habitat Integrity [Kleynhans *et al.* 2008]

Class	Description	Score (% of total)
A	Unmodified, natural.	90 - 100
B	Largely natural with few modifications. The flow regime has been only slightly modified and pollution is limited to sediment. A small change in natural habitats may have taken place. However, the ecosystem functions are essentially unchanged.	80 - 89
C	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.	60 - 79
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	40 – 59
E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.	20 – 39
F	Critically / Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances, the basic ecosystem functions have been destroyed and the changes are irreversible.	0 - 19

4. Index of Habitat Integrity

The general habitat integrity of each site was discussed based on the application of the Index of Habitat Integrity (Kleynhans et al. 2008). It is important to assess the habitat at each site in order to aid in the interpretation of the results of the community integrity assessments, by taking habitat conditions and impacts into consideration. This method describes the Present Ecological State (PES) of both the in-stream and riparian habitat at each site. The method classifies habitat integrity into one of six classes, ranging from unmodified/natural (Class A) to critically modified (Class F), as indicated in Table C3 below.

Table C10: Classification of Present State Classes in terms of Habitat Integrity [Kleynhans et al. 2008]

Class	Description	Score (% of total)
A	Unmodified, natural.	90 - 100
B	Largely natural with few modifications. The flow regime has been only slightly modified and pollution is limited to sediment. A small change in natural habitats may have taken place. However, the ecosystem functions are essentially unchanged.	80 - 89
C	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.	60 - 79
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	40 – 59
E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.	20 – 39
F	Critically / Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.	0 - 19

8. Freshwater ecosystem delineation

The freshwater ecosystem delineation took place according to the method presented in the “Updated manual for the identification and delineation of wetland and riparian resources” published by DWAF in 2008. The foundation of the method is based on the fact that wetlands and riparian zones have several distinguishing factors including the following:

- 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.

According to the DWA (2005) like wetlands, riparian areas have their own unique set of indicators. It is possible to delineate riparian areas by checking for the presence of these indicators. Some areas may display both wetland and riparian indicators and can accordingly be classified as both. If you are adjacent to a freshwater ecosystem, it is important to check for the presence of the riparian indicators described below, in addition to checking for wetland indicators, to detect riparian areas that do not qualify as wetlands. The delineation process requires that the following be taken into account:

- topography associated with the freshwater ecosystem;
- vegetation; and
- alluvial soils and deposited material.

By observing the evidence of these features in the form of indicators, wetlands and riparian zones can be delineated and identified. If the use of these indicators and the interpretation of the findings are applied correctly, then the resulting delineation can be considered accurate (DWA, 2005).

APPENDIX D – Risk Assessment Methodology

In order for the EAP to allow for sufficient consideration of all environmental impacts, impacts were assessed using a common, defensible method of assessing significance that will enable comparisons to be made between risks/impacts and will enable authorities, stakeholders and the client to understand the process and rationale upon which risks/impacts have been assessed. The method to be used for assessing risks/impacts is outlined in the sections below.

The first stage of the risk/impact assessment is the identification of environmental activities, aspects and impacts. This is supported by the identification of receptors and resources, which allows for an understanding of the impact pathway and an assessment of the sensitivity to change. The definitions used in the impact assessment are presented below.

- An **activity** is a distinct process or task undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or infrastructure that is possessed by an organisation.
- An **environmental aspect** is an 'element of an organizations activities, products and services which can interact with the environment'[8]. The interaction of an aspect with the environment may result in an impact.
- **Environmental risks/impacts** are the consequences of these aspects on environmental resources or receptors of particular value or sensitivity, for example, disturbance due to noise and health effects due to poorer air quality. In the case where the impact is on human health or wellbeing, this should be stated. Similarly, where the receptor is not anthropogenic, then it should, where possible, be stipulated what the receptor is.
- **Receptors** can comprise, but are not limited to, people or human-made systems, such as local residents, communities and social infrastructure, as well as components of the biophysical environment such as freshwater features, flora and riverine systems.
- **Resources** include components of the biophysical environment.
- **Frequency of activity** refers to how often the proposed activity will take place.
- **Frequency of impact** refers to the frequency with which a stressor (aspect) will impact on the receptor.
- **Severity** refers to the degree of change to the receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards.
- **Spatial extent** refers to the geographical scale of the impact.
- **Duration** refers to the length of time over which the stressor will cause a change in the resource or receptor.

The significance of the impact is then assessed by rating each variable numerically according to the defined criteria (refer to the table below). The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The severity, spatial scope and duration of the impact together comprise the consequence of the impact and when summed can obtain a maximum value of 15. The frequency of the activity, impact, legal issues and the detection of the impact together comprise the likelihood of the impact occurring and can obtain a maximum value of 20. The values for likelihood and consequence of the impact are then read off a significance rating matrix and are used to determine whether mitigation is necessary[9].

[8] The definition has been aligned with that used in the ISO 14001 Standard.
[9] Some risks/impacts that have low significance will however still require mitigation.

The model outcome of the impacts was then assessed in terms of impact certainty and consideration of available information. The Precautionary Principle is applied in line with South Africa's National Environmental Management Act (Act No. 107 of 1998) in instances of uncertainty or lack of information, by increasing assigned ratings or adjusting final model outcomes. In certain instances, where a variable or outcome requires rational adjustment due to model limitations, the model outcomes have been adjusted.

"RISK ASSESSMENT KEY" (Based on DWS 2015 publication: Section 21 c and i water use Risk Assessment Protocol)

Table D1: Severity (How severe does the aspects impact on the resource quality (flow regime, water quality, geomorphology, biota, habitat)

Insignificant / non-harmful	1
Small / potentially harmful	2
Significant / slightly harmful	3
Great / harmful	4
Disastrous / extremely harmful and/or wetland(s) involved	5
Where "or wetland(s) are involved" it means that the activity is located within the delineated boundary of any wetland. The score of 5 is only compulsory for the significance rating.	

Table D2: Spatial Scale (How big is the area that the aspect is impacting on)

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

Table D3: Duration (How long does the aspect impact on the resource quality)

One day to one month, PES, EIS and/or REC not impacted	1
One month to one year, PES, EIS and/or REC impacted but no change in status	2
One year to 10 years, PES, EIS and/or REC impacted to a lower status but can be improved over this period through mitigation	3
Life of the activity, PES, EIS and/or REC permanently lowered	4
More than life of the organisation/facility, PES and EIS scores, a E or F	5
PES and EIS (sensitivity) must be considered.	

Table D4: Frequency of the activity (How often do you do the specific activity)

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

Table D5: The frequency of the incident or impact (How often does the activity impact on the resource quality)

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

Table D6: Legal issues (How is the activity governed by legislation)

No legislation	1
Fully covered by legislation (wetlands are legally governed)	5
Located within the regulated areas	

Table D7: Detection (How quickly or easily can the impacts/risks of the activity be observed on the resource quality, people and resource)

Immediately	1
Without much effort	2
Need some effort	3
Remote and difficult to observe	4
Covered	5

Table D8: Rating Classes

RATING	CLASS	MANAGEMENT DESCRIPTION
1 – 55	(L) Low Risk	Acceptable as is or consider requirement for mitigation. Impact to freshwater ecosystems and resource quality small and easily mitigated.
56 – 169	M) Moderate Risk	Risk and impact on freshwater ecosystems are notably and require mitigation measures on a higher level, which costs more and require specialist input. License required.
170 – 300	(H) High Risk	Freshwater ecosystem(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve License required.

A low risk class must be obtained for all activities to be considered for a GA

Table D9: Calculations

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

The following points were considered when undertaking the assessment:

- Risks and impacts were analysed in the context of the *project's area of influence* encompassing:
  - Primary project site and related facilities that the client and its contractors develops or controls;
  - Areas potentially impacted by cumulative impacts for further planned development of the project, any existing project or condition and other project-related developments; and
  - Areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location.
- Risks/Impacts were assessed for construction phase and operational phase; and
- Individuals or groups who may be differentially or disproportionately affected by the project because of their disadvantaged or vulnerable status were assessed.

Control Measure Development

The following points presents the key concepts considered in the development of mitigation measures for the proposed construction:

- Mitigation and performance improvement measures and actions that address the risks and impacts[10] are identified and described in as much detail as possible. Mitigating measures are investigated according to the impact minimisation hierarchy as follows:
  - Avoidance or prevention of impact;
  - Minimisation of impact;
  - Rehabilitation; and
  - Offsetting.
- Measures and actions to address negative impacts will favour avoidance and prevention over minimisation, mitigation or compensation; and

[10] Mitigation measures should address both positive and negative impacts.

- Desired outcomes are defined and have been developed in such a way as to be measurable events with performance indicators, targets and acceptable criteria that can be tracked over defined periods, wherever possible.

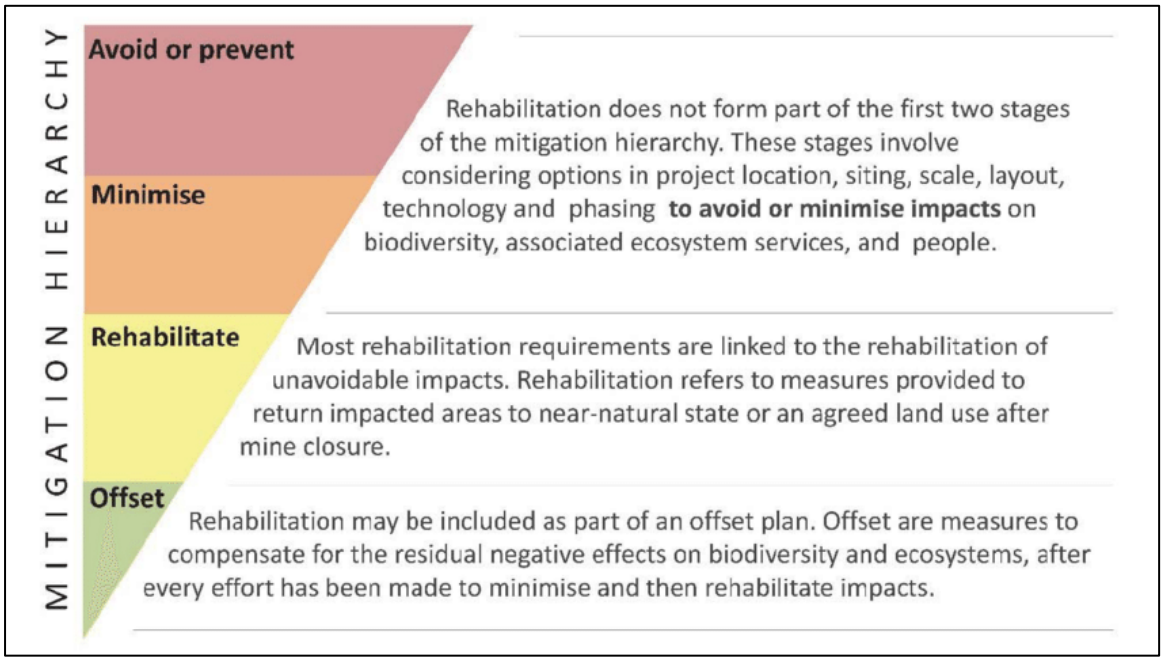

Figure D1: Impact Minimisation hierarchy as advocated by the DEA *et al.*, (2013)

Recommendations

Recommendations were developed to address and mitigate potential impacts on the freshwater ecology of the resources traversed by or in close proximity of the proposed project.

Table D10: Reversibility of impacts on the freshwater ecosystems

Reversibility Rating:	**Irreversible** (the activity will lead to an impact that is permanent)
	Partially reversible (The impact is reversible to a degree e.g. acceptable revegetation measures can be implemented but the pre-impact species composition and/or diversity may never be attained. Impacts may be partially reversible within a short (during construction), medium (during operation) or long term (following decommissioning) timeframe
	Fully reversible (The impact is fully reversible, within a short, medium or long-term timeframe)

APPENDIX E – Site Sensitivity Verification Report

AQUATIC BIODIVERSITY SITE SENSITIVITY VERIFICATION REPORT

Scientific Aquatic Services (SAS) was appointed to conduct an aquatic biodiversity (freshwater) assessment as part of the Scoping and Environmental Impact Assessment (EIA) (S&EIA) process for the proposed Phefumula Emoyeni One Wind Energy Facility (WEF) Grid Connection near Ermelo in the Mpumalanga Province. The Phefumula Emoyeni One WEF will have generation capacity of up to 550MW. The Phefumula Emoyeni One WEF will also require a grid connection.

This report serves as the aquatic biodiversity Site Sensitivity Verification Report for the proposed Grid Connection component of the project.

This aquatic biodiversity site sensitivity verification report relates to the Screening Tool Report completed for the site in May 2024. A site visit was conducted by the specialist on 03-05 October 2023 to inform the specialist reports required for the proposed project and confirm the site sensitivity.

The table below provides information regarding the outcome of the Screening tool in terms of the aquatic biodiversity theme sensitivities associated with the proposed project and the specialist sensitivity verification.

Table 10: Aquatic biodiversity theme sensitivity for the Phefumula Emoyeni One WEF

ENVIRONMENTAL THEME	DFFE SCREENING TOOL SENSITIVITY	APPLICABLE PROTOCOL	SPECIALIST SENSITIVITY VERIFICATION
Aquatic Biodiversity	Certain parts of the study area and investigation area of the Phefumula Emoyeni One WEF have been designated as areas of very high aquatic/ freshwater biodiversity significance. The Screening Tool has designated these areas as being of very high freshwater sensitivity due to numerous factors: • A sub-catchment (quinary catchment) of the C11F catchment in the south-eastern part of the study area is delineated as a Phase 1 FEPA catchment and has accordingly been designated as very high freshwater sensitivity. In addition various other designations have triggered areas of very high sensitivity: • CBA: Aquatic rivers • CBA: Wetlands • ESA: Important sub-catchments • ESA: Wetlands • Rivers: PES AB - D • Wetlands in the Mesic Highveld Grassland Bioregion The remainder of the study area has been designated as low aquatic biodiversity sensitivity.	Protocol for the Specialist Assessment and Minimum Report Contents for Environmental Impacts on Aquatic Biodiversity (GN 320 of March 2020)	Based on the site verification undertaken by Scientific Aquatic Services and the findings thereof presented in this report, the designation of very high sensitivity to ***all*** freshwater features in the wider area by the DFFE Screening Tool has been supported through the findings of the freshwater assessment that has confirmed the very high sensitivity of all freshwater ecosystems (primarily wetlands) that are present within the study and investigation areas. The ecological and hydrological functionality of the freshwater ecosystems in a study area context in the context of their designation of certain of these in the wider WEF area as both FEPAs and CBAs renders them as ecologically very sensitive. Thus for areas in which freshwater ecosystems fall into an area of very high freshwater designation, the designation is supported. Conversely, the designation of catchments of wetlands in the central and south-eastern parts of the study area as very high is disputed. Although certain catchment areas of wetlands in this part of the study and investigation area consist of residual natural grassland, many areas are transformed primarily by crop cultivation and the sensitivity of these catchment areas is a lower sensitivity

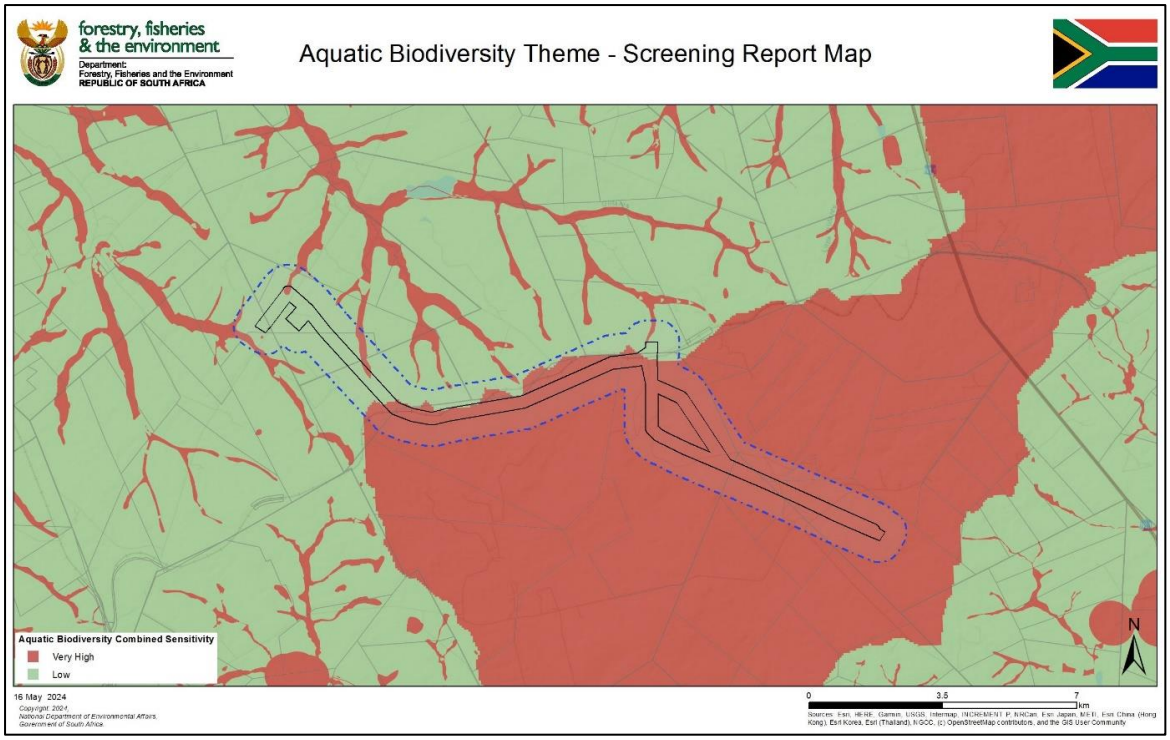

Figure E1: Aquatic Biodiversity sensitivity as assigned through the web-based Screening Tool

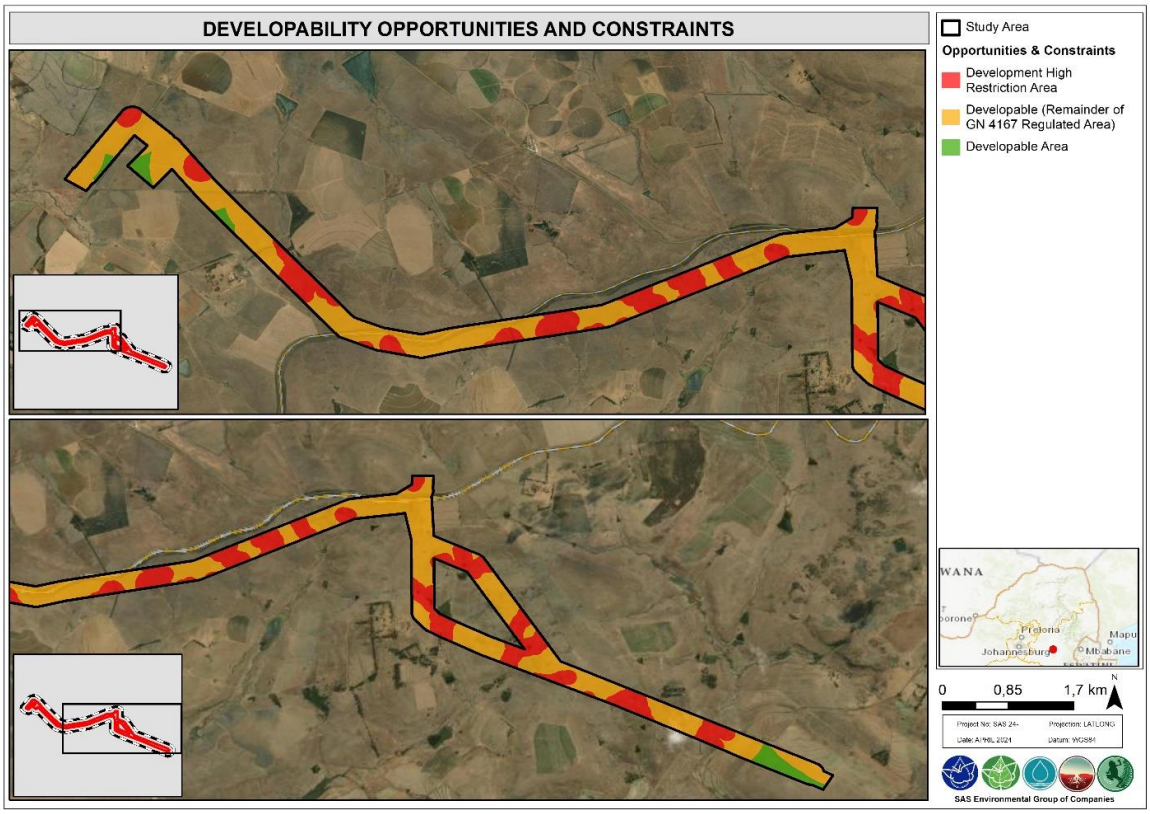

Figure E 2: Opportunities and Constraints map for the south-western part of the study area showing sensitive areas in red

This site sensitivity verification was undertaken by Paul da Cruz from Scientific Aquatic Services.

Paul da Cruz

APPENDIX F – Impact Assessment Methodology utilised in the scoping-phase Freshwater Report

HIGH-LEVEL SCREENING OF IMPACTS AND MITIGATION

Appendix 2 of GNR 982, as amended, requires the identification of the significance of potential impacts during scoping. To this end, an impact screening tool has been used in the scoping phase. The screening tool is based on two criteria, namely probability; and, consequence (Table F1), where the latter is based on general consideration to the intensity, extent, and duration.

The scales and descriptors used for scoring probability and consequence are detailed in Table F1 and Table F2 respectively.

Table F1 – Probability Scores and Descriptions

Score	Descriptor
4	**Definite**: The impact will occur regardless of any prevention measures
3	**Highly Probable**: It is most likely that the impact will occur
2	**Probable**: There is a good possibility that the impact will occur
1	**Improbable:** The possibility of the impact occurring is very low

Table F2 – Consequence and Score Descriptions

Score	Negative	Positive
4	Very severe: An irreversible and permanent change to the affected system(s) or party(ies) which cannot be mitigated.	Very beneficial: A permanent and very substantial benefit to the affected system(s) or party(ies), with no real alternative to achieving this benefit.
3	Severe: A long term impacts on the affected system(s) or party(ies) that could be mitigated. However, this mitigation would be difficult, expensive or time consuming or some combination of these.	Beneficial: A long term impact and substantial benefit to the affected system(s) or party(ies). Alternative ways of achieving this benefit would be difficult, expensive or time consuming, or some combination of these.
2	Moderately severe: A medium to long term impacts on the affected system(s) or party (ies) that could be mitigated.	Moderately beneficial: A medium to long term impact of real benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are equally difficult,

Score	Negative	Positive
		expensive and time consuming (or some combination of these), as achieving them in this way.
1	Negligible: A short to medium term impacts on the affected system(s) or party(ies). Mitigation is very easy, cheap, less time consuming or not necessary.	Negligible: A short to medium term impact and negligible benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are easier, cheaper and quicker, or some combination of these.

Table F3 – Significance Screening Score

	Consequence Scale				
Probability Scale		**1**	**2**	**3**	**4**
	1	**Very Low**	**Very Low**	**Low**	**Medium**
	2	**Very Low**	**Low**	**Medium**	**Medium**
	3	**Low**	**Medium**	**Medium**	**High**
	4	**Medium**	**Medium**	**High**	**Very High**

The nature of the impact must be characterised as to whether the impact is deemed to be positive (+ve) (i.e. beneficial) or negative (-ve) (i.e. harmful) to the receiving environment/receptor. For ease of reference, a colour reference system (Table F4) has been applied according to the nature and significance of the identified impacts.

Table F4 – Impact Significance Colour Reference System to Indicate the Nature of the Impact

Negative Impacts (-ve)	Positive Impacts (+ve)
Negligible	Negligible
Very Low	Very Low
Low	Low
Medium	Medium
High	High
Very High	Very High

APPENDIX G – Impact Assessment Methodology to be utilised in the EIA-phase Freshwater Report

ASSESSMENT OF IMPACTS AND MITIGATION

The assessment of impacts and mitigation evaluates the likely extent and significance of the potential impacts on identified receptors and resources against defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise or compensate for any adverse environmental impacts, to enhance positive impacts, and to report the significance of residual impacts that occur following mitigation.

The key objectives of the risk assessment methodology are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed project, and to propose a significance ranking. Issues / aspects will be reviewed and ranked against a series of significance criteria to identify and record interactions between activities and aspects, and resources and receptors to provide a detailed discussion of impacts. The assessment considers direct , indirect , secondary as well as cumulative impacts.

A standard risk assessment methodology is used for the ranking of the identified environmental impacts pre-and post-mitigation (i.e. residual impact). The significance of environmental aspects is determined and ranked by considering the criteria presented in Table G1.

Table G1 - Impact Assessment Criteria and Scoring System

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite
Significance (S) is determined by combining the above criteria in the following formula:	$[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$				
IMPACT SIGNIFICANCE RATING					
Total Score	**4 to 15**	**16 to 30**	**31 to 60**	**61 to 80**	**81 to 100**
Environmental Significance Rating (Negative (-))	**Very low**	**Low**	**Moderate**	**High**	**Very High**
Environmental Significance Rating (Positive (+))	**Very low**	**Low**	**Moderate**	**High**	**Very High**

IMPACT MITIGATION

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the proposed development's actual extent of impact and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures and is thus the final level of impact associated with the development. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this report.

The mitigation measures chosen are based on the mitigation sequence/hierarchy which allows for consideration of five (5) different levels, which include avoid/prevent, minimise, rehabilitate/restore, offset and no-go in that order. The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can

be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

he mitigation sequence/hierarchy is shown in Figure G2 below.

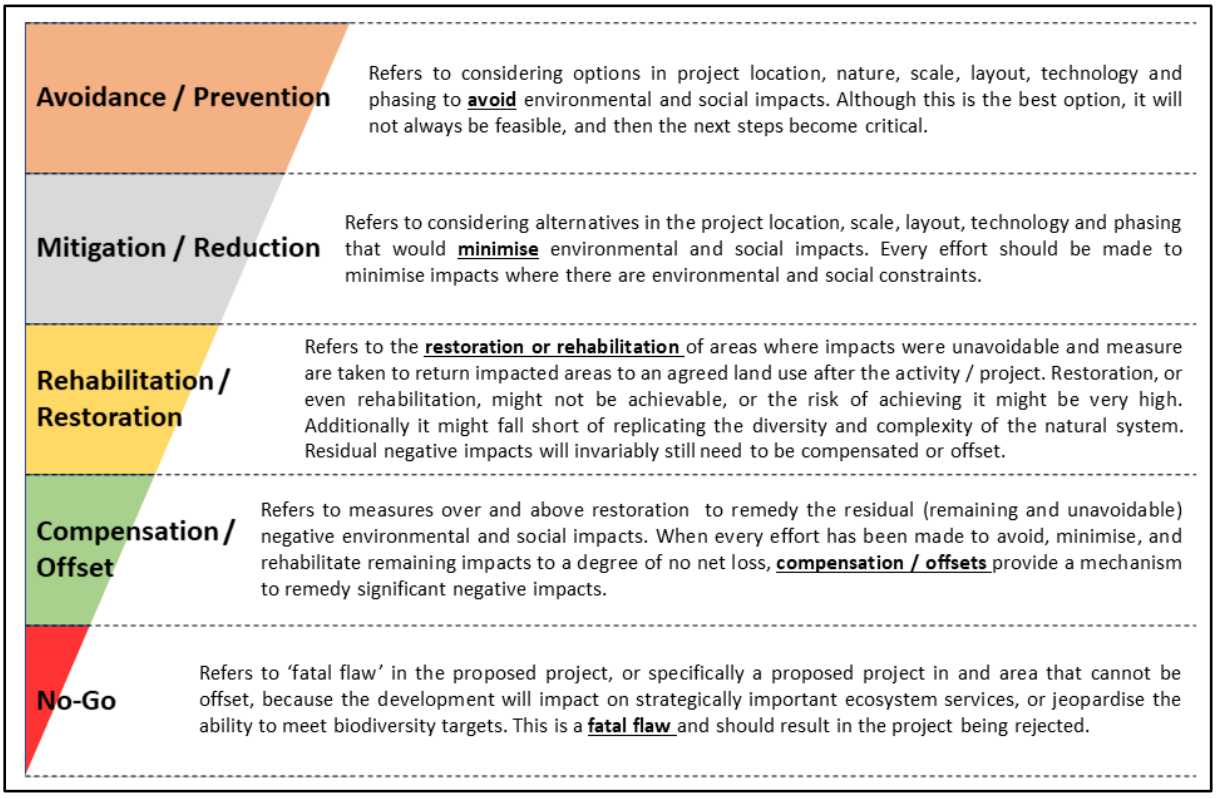

Figure G2 – The mitigation hierarchy

APPENDIX H – General "Good Housekeeping" Mitigation Measures

General construction management and good housekeeping practices

Latent and general impacts which may affect the freshwater ecosystem ecology and biodiversity will include any activities which take place in close proximity to the proposed servitude that may impact on the receiving environment. Mitigation measures for these impacts are highlighted below and are relevant to the freshwater ecosystem identified in this report:

Development footprint

- All development footprint areas should remain as small as possible and should only encroach into the freshwater ecosystem if considered absolutely essential;
- The boundaries of footprint areas, including contractor laydown areas, are to be clearly defined and it should be ensured that all activities remain within defined footprint areas. Edge effects will need to be extremely carefully controlled;
- Planning of temporary roads and access routes should avoid freshwater ecosystem areas and be restricted to existing or pre-approved access roads and should not traverse the freshwater ecosystem;
- Appropriate sanitary facilities must be provided for the life of the repair and maintenance phase and all waste removed to an appropriate waste facility;
- All hazardous chemicals as well as stockpiles should be stored on bunded surfaces and have facilities constructed to control runoff from these areas;
- It must be ensured that all hazardous storage containers and storage areas comply with the relevant SABS standards to prevent leakage;
- No fires should be permitted in or near the construction area; and
- Ensuring that an adequate number of waste and "spill" bins are provided will also prevent litter and ensure the proper disposal of waste and spills.

Vehicle access

- All vehicles must be regularly inspected for leaks. Re-fuelling must take place on a sealed surface area to prevent ingress of hydrocarbons into the topsoil;
- In the event of a vehicle breakdown, maintenance of vehicles must take place with care and the recollection of spillage should be practised near the surface area to prevent ingress of hydrocarbons into topsoil and subsequent habitat loss; and
- All spills should they occur, should be immediately cleaned up and treated accordingly.

Vegetation

- Proliferation of alien and invasive species is expected within any disturbed areas. Whilst not considered severe at this time, the vegetation component within the freshwater ecosystem environment is already transformed. However, alien invasive species are opportunistic, and where disturbances do occur, they will promulgate; therefore, these species should be eradicated and controlled to prevent their spread beyond the project footprint. Alien plant seed dispersal within the top layers of the soil within footprint areas, that will have an impact on future rehabilitation, has to be controlled;
- Removal of the alien and weed species encountered within the freshwater ecosystem must take place in order to comply with existing legislation (amendments to the regulations under the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) and Section 28 of the National Environmental Management Act, 1998 (Act No. 107 of 1998); and
- Species-specific and area-specific eradication recommendations:
    - Footprint areas should be kept as small as possible when removing alien plant species; and

- No vehicles should be allowed to drive through designated sensitive freshwater ecosystems areas during the eradication of alien and weed species.

Soils

- Sheet runoff from compacted areas should be slowed down by the strategic placement of berms;
- It is considered ideal that activities occur within the current season (low rainfall) to minimise impacts of sedimentation;
- As much vegetation growth as possible (of indigenous floral species) should be encouraged to protect soils;
- Temporary stockpiling of excavated material from trenches can be retained alongside trenches, as required for backfilling. Any soil to be stockpiled for longer than a month should be moved to a designated stockpile area, as approved by the Environmental Control Officer (ECO);
- All soils compacted during the repair and maintenance phase should be ripped and profiled; and
- A monitoring plan for the development and the immediate zone of influence should be implemented to prevent erosion and incision.

Rehabilitation

- Construction rubble must be collected and disposed of at a suitable landfill site; and
- All alien vegetation in the footprint area, as well as the immediate vicinity of the proposed work area, should be removed.

APPENDIX I – Specialist information

DETAILS, EXPERTISE AND CURRICULUM VITAE OF SPECIALISTS

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

Stephen van Staden: MSc (Environmental Management) (University of Johannesburg)

Paul da Cruz BA (Hons) (Geography and Environmental Studies) (University of the Witwatersrand)

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

Company of Specialist:	Scientific Aquatic Services		
Name / Contact person:	Stephen van Staden		
Postal address:	29 Arterial Road West, Oriel, Bedfordview		
Postal code:	1401	Cell:	083 415 2356
Telephone:	011 616 7893	Fax:	011 615 6240/ 086 724 3132
E-mail:	stephen@sasenvgroup.co.za		
Qualifications	MSc Environmental Management (University of Johannesburg) BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg) BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)		
Registration / Associations	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)		

1. (b) 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.

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.

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

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
International – United Kingdom (England and Scotland); USA

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.