BASIC ASSESSMENT REPORT (BAR) FOR THE PROPOSED CASTLE WEF TO HYDRA SUBSTATION GRID CONNECTION, IN THE NORTHERN CAPE PROVINCE

AQUATIC IMPACT ASSESSMENT

FOR

ACED (Pty) Ltd

BY

EnviroSci (Pty) Ltd

Dr Brian Colloty

1 Rossini Rd
Pari Park
Gqeberha
6070

DATE

12 May 2022

REVISION 1

Executive Summary

African Clean Energy Developments (Pty) Ltd (ACED) appointed EnviroSci (Pty) Ltd to conduct an aquatic assessment of the proposed Overhead transmission line (OHL) to connect to the authorised Castle Wind Energy Facility (WEF) to the existing Hydra Main Transmission Substation (MTS), on farms near De Aar in the Northern Cape. The wind energy facility itself has received approval, but this assessment focuses on the grid connection infrastructure 132kV to 400kV (single or double circuit) OHL. Associated infrastructure will include permanent access/service tracks (where no existing roads exist) as well as temporary laydown areas and site camps that will be rehabilitated after construction.

Therefore, this assessment includes delineating any natural waterbodies, as well as assessing the potential consequences of the proposed alignment (inclusive of a 300m wide corridor – The study area) on the surrounding watercourses. This was based on information collected during various site visits conducted within the region noting this same corridor has been assessed by the author for various other projects (i.e. adjoining farms and or projects directly adjacent to study area) in August 2014, May 2016, and a site-specific assessment in October 2019. The 2014 and 2019 surveys coincided higher than normal rainfall, and thus presented an opportunity to view the region with riverine flows.

These surveys adhered to the assessment criteria contained in the DWAF 2005 / 2008 delineation manuals and the National Wetland Classification System. This report will inform the Basic Assessment Report as well as the required Water Use license Application that will be initiated, once the final transmission line tower positions are available, i.e. once all the constraints, if any from this and other specialists have been considered in the design process.

The PROTOCOL FOR SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS FOR THE ENVIRONMENTAL IMPACTS ON AQUATIC BIODIVERSITY (Government Gazette 43110, 20 March 2020), superseding the Appendix 6 NEMA requirements, was also adhered to as results of the DFFE Screening tool indicated that portions of the study area are located within a VERY HIGH SENSITIVITY area, requiring this assessment. The proposed gird occurs within an area highlighted as a Strategic Water Resource Area (Ground Water), within a National Freshwater Ecosystem Priority area (NFEPA) and with wetlands in close proximity (wetland cluster).

The proposed connection corridor only occurs within the D62D quaternary catchment of the Brak River, in the Nama Karoo Ecoregion. Thus, permanent rivers and wetlands are limited mostly to mainstem rivers such as those observed within the study area, and typically only flow during extended periods of rainfall.

The study region is further characterised by Northern Upper Karoo (Nku3) vegetation and to a limited degree Besemkaree Koppies Shrubland (Gh4). This is due to the limited annual rainfall (ca. 190 – 400 mm/a), while the regional geomorphology is dominated by flat pediplain areas and hills with rocky outcrops.

The geology is mostly Dwyka / Ecca shales overlaid with shallow sandy soils that drain well. This typically allows for the development of broad alluvial floodplains, interspersed by the rocky inselbergs and small mountain ranges observed. These features thus concentrate flows into the lower portions of the catchment, and have allowed for the development of *Juncus rigidus* dominated wetlands in some areas. Both channelled and unchanneled valley bottom wetland types were observed (Plate 3) within the region, but only one such area is located within 500m of the proposed alignment.

The National Wetland Inventory v5.2 spatial data (NWI), also indicated a Pan / depression, located more than 2km from the edge of the study area. However, the large scale riverine floodplain was confirmed to be an alluvial system, and not a wetland as indicated in the NWI.

Overall, these catchment and subsequent rivers / watercourses and wetlands are largely in a natural state. Current impacts occur in localised areas and include the following:

- Erosion due small road crossings and tracks;
- Grazing; and
- Farm dams.

In terms of the National Freshwater Ecosystems Priority Areas (NFEPA) assessment, all the watercourses within the site have been assigned a condition score of B (Nel et al. 2011), indicating that they are largely intact and have biological significance.

The National Freshwater Ecosystems Priority Areas (NFEPA) (Nel *et al*., 2011), also earmarked sub-quaternaries, based either on the presence of important biota (e.g. rare or endemic fish species) or conversely the degree of riverine degradation, i.e. the greater the catchment degradation the lower the priority to conserve the catchment. The important catchments areas are then classified as Freshwater Ecosystems Priority Areas (FEPAs). The survey area falls within an Upstream FEPA, associated with the Brak River, although no permanent fish habitat occurs within the proposed site, this catchment is important for the provision and maintenance of flows within the lower catchments, that do contain important, fish, amphibian and invertebrate habitats with permanent water.

This report also indicates the significant watercourses and wetlands delineated within the study area, inclusive of the calculated 48m buffers. Any activities within these areas and or the 500m regulated zone will require a Water Use license under Section 21 c & i of the National Water Act (Act 36 of 1998). The respective Water Use Licenses must be finalised once the preferred alignment has been determined and the final tower / pylon positions are known and especially if any access tracks will need to cross these areas, but it is advised that the watercourse and wetlands areas are avoided.

The Present Ecological State scores (PES) for the main watercourses in the study area were rated as follows (DHSWS, 2014 – where B = Largely Natural and C = Moderately Modified):

Subquaternary Catchment Number	Present Ecological State	Ecological Importance	Ecological Sensitivity
5332	B	Low	Low
5391	C	Moderate	Low

These scores were substantiated by observations made in the field within the study area, and due to the overall lack of impacts or disturbance these scores for each of the watercourses within the site should be upheld. This was further substantiated by the inclusion of study area catchments into Critical Biodiversity Areas (CBA Type 1 and 2), i.e. the wetland areas near the alignment crossing the Brak River in particular and Ecological Support Area as shown in the Northern Cape CBA MAP spatial data.

The following direct impacts were assessed with regard the riparian areas and watercourses in this impact assessment phase based on the two routes provided:

- Impact 1: Loss of riparian systems and disturbance of the alluvial watercourses in the construction, operational and decommissioning phases
- Impact 2: Impact on riparian systems through the possible increase in surface water runoff on riparian form and function during the operational and decommissioning phases
- Impact 3: Increase in sedimentation and erosion in the construction, operational and decommissioning phases
- Impact 4: Potential impact on localised surface water quality during the construction and decommissioning phases
- Impact 5: The No-go Alternative
- Impact 6: Cumulative impacts for the overall project due to the high number of projects surrounding this application

The proposed alignment seems to have limited impact on the aquatic environment as for the most part the final placement of the towers could avoid the delineated wetlands and potentially span watercourses. It has however been assumed that due to the width of some of the broader alluvial systems, towers will need to be placed within these systems, but this would have little impact on these systems, especially if no new permanent access tracks are created within these areas.

Thus, based on the findings of this study there is no objection to the authorisation of any of the proposed activities.

Therefore, based on the site visit the significance of the impacts assessed for the aquatic systems after mitigation would be LOW. The ratings assume that the ECO/specialist that during the micro sitting process, that with the contractor the allowable work areas are pegged out, with the remaining areas be considered No-go. The contractor must provide a method statement to the ECO for each specific watercourse crossing once the allowable working areas are pegged. This method statement, coupled to a detailed pre-works photo record will form part of the ECO annexures and be audited.

Note the final number of actual water course crossings (i.e. towers within the alluvial water course and or within 500m of the wetland) can be determined when micro-siting occurs, as these would trigger the need for a Water Use License application (WULA). A potential General Application [GA] in terms of Section 21 (c) and (i) of the National Water Act (Act 36 of 1998) (NWA), should any construction take place within these areas will be required. Should any of the present road crossings need to be upgraded then the opportunity exists to improve the current state (lack of habitat continuity) for example by replacing pipe culverts with box culverts. **This opportunity to improve the hydrological conditions is a net benefit and has been assessed as part of the cumulative impact statement.**

As the proposed activities have the potential to create erosion the following recommendations are reiterated:

- Vegetation clearing should occur in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment, and suitable dust and erosion control mitigation measures should be included in the generic EMPr, if not included already to mitigate.

- All construction materials including fuels and oil should be stored in demarcated areas that are contained within berms / bunds to avoid spread of any contamination / leaks. Washing and cleaning of equipment should also be done in berms or bunds, to trap any cement / hazardous substances

and prevent excessive soil erosion. Mechanical plant and bowsers must not be refuelled or serviced within or directly adjacent to any channel. It is therefore suggested that all construction camps, lay down areas, batching plants or areas and any stores should be located more than 50 m from any demarcated watercourses.

- It is also advised that an Environmental Control Officer (ECO), with a good understanding of the local flora be appointed during the construction phase. The ECO should be able to make clear recommendations with regards to the re-vegetation of the newly completed / disturbed areas along aquatic features, using selected species detailed in this report.
- All alien plant re-growth must be monitored and should these alien plants reoccur these plants should be re-eradicated. The scale of the operation does however not warrant the use of a Landscape Architect and / or Landscape Contractor.
- It is further recommended from the project onset that all watercourse areas (inclusive of buffers) are included into the Final EMPr as reference, this to ensure a net benefit to the aquatic environment. This should form part of the civil contractor's pre-construction walkthrough with the ECO and aquatic specialist. All watercourse crossings must be pegged out using droppers painted blue (top) and wrapped with danger tape.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PHOTO PLATES

ACRONYMS

CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Area
CSIR	Council for Scientific and Industrial Research
DHSWS	Department of Human Settlement and Water and Sanitation formerly the Department of Water Affairs
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
ESA	Ecological Support Area
GIS	Geographic Information System
NFEPA	National Freshwater Ecosystem Priority Atlas (Nel, *et al*. 2011).
PES	Present Ecological State
SANBI	South African National Biodiversity Institute
SQ	Subquaternary catchment
WUL	Water Use License
WULA	Water Use License Application

COMPLIANCE WITH THE PROTOCOL FOR THE SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS FOR ENVIRONMENTAL IMPACTS ON AQUATIC BIODIVERSITY ISSUED 20 MARCH 2020, REPLACING REQUIREMENTS OF APPENDIX 6 – GN R326 EIA REGULATIONS OF 7 APRIL 2017

DFFE Screening Tool Summary			
Requirement	**Completed / Assessed**	**Date**	**Comments**
Desktop and satellite imagery analysis	Yes	12 April 2022	
Preliminary On-site inspection	No	October 2019	Several summer / winter, as well low and high rainfall periods have been observed within the region over the years
Additional information			**Results**
1:50 000 topocadastral maps	Yes	12 April 2022	Cadastre and indicated features unchanged
Google Earth	Yes	12 April 2022	Used as the basis of GIS mapping and corridor verification
National Wetland Inventory Spatial Data	Yes	12 April 2022	Natural and artificial systems present
National Vegetation Spatial Data	Yes	12 April 2022	Besemkaree Koppies Shrubland Gh4 & Northern Upper Karoo (Nku3)
Threatened Ecosystems Spatial Data	Yes	12 April 2022	None
Conservation Plans (WCBSP, ECBCP, NCBSP etc)	Yes	12 April 2022	Northern Cape Biodiversity Spatial Plan - ESA
National Freshwater Ecosystem Priority AREA (NFEPA)	Yes	12 April 2022	Upstream FEPAS
Strategic Water Resource Area	Yes	12 April 2022	Yes - Groundwater

DFFE Screening Tool Summary				
Requirement	**Completed / Assessed**	**Date**	**Comments**	
Free flowing Rivers	Yes	12 April 2022	None	
Wetland Clusters	Yes	12 April 2022	Yes	
Critical Biodiversity Area (CBA)	Yes	12 April 2022	YEs	
Ecological Support Area (ESA)	Yes	12 April 2022	Yes	
Ecological Importance and Sensitivity of Site (EIS)	Yes	12 April 2022	Moderate	
Description of ecosystem processes (movement of surface water, recharge/discharge & sediment transport etc)	Yes	12 April 2022	Ephemeral alluvial systems with little to no riparian zones	
Historic Reference Condition and Present Ecological State (PES) of rivers (instream, riparian, floodplain), wetlands or estuaries and possible changes to channel and flow regime (surface & groundwater)	Yes	12 April 2022	PES = B Reference Condition B	
Review of Screening Tool results	**Present**	**Confirmed / Disputed (if disputed photographic evidence must be included into assessment)**	**Aquatic Biodiversity Specialist Assessment Protocol Required (Y/N or N/A)**	**Aquatic Biodiversity Compliance Statement Protocol required (Y / N or N/A)**
Very High Aquatic Habitat	YES	Confirmed, but can be avoided	YES	N/A

DFFE Screening Tool Summary				
Requirement	**Completed / Assessed**	**Date**	**Comments**	
		by the proposed corridor		
Low Aquatic Habitat	No	Confirmed	N/A	N/A
Very High Terrestrial Habitat			NONE PROMULGATED AT THIS	
Low Terrestrial Habitat			POINT	

ASSESSMENT AND REPORTING OF IMPACTS ON AQUATIC BIODIVERSITY PROTOCOL REQUIREMENTS			
Aquatic Biodiversity Specialist Assessment Protocol	YES	**Aquatic Biodiversity Compliance Statement Protocol**	**NO**
Reason	VERY HIGH aquatic habitats	*Reason*	
Proposed Site (Site Sensitivity)	Moderate only within the footprint	Proposed Site (Site Sensitivity)	
Preferred Site (Site Sensitivity)	Not Assessed as site specific sensitive no-go areas were provided at the onset of the design process in order to avoid the systems that were rated a No-Go where feasible	Preferred Site (Site Sensitivity)	
ANTICIPATED IMPACT AND IF REQUIRING ASSESSMENT IN THE SPECIALIST ASSESSMENT	**(Y/N)**	**AQUATIC BIODIVERSITY COMPLIANCE STATEMENT REQUIREMENTS**	**(Y/N**
Aquatic features		**Aquatic features**	
Alteration in baseflow (increase or Reduction of overall flows)	No	Preferred site and proposed development footprint assessed	Yes

DFFE Screening Tool Summary			
Requirement	**Completed / Assessed**	**Date**	**Comments**
Hydrological regime or Hydroperiod changes (Quantity changes such as abstraction or diversion)	Yes	LOW site sensitivity confirmed	Yes with additional No-Go areas provided by the aquatic specialist including buffers
Change in hydrogeomorphic typing (Unchannelled valley bottom wetland to Channelled Valley Bottom Wetland)	No	Confirm whether or not the proposed development will have an impact on the aquatic features	Impacts will still occur
Water quality changes (increase in sediment, organic loads, chemicals or eutrophication	Yes		
Fragmentation (physical loss of ecological connectivity and or CBA corridors)	Yes		
Loss or degradation of unique characters or features (waterfalls, springs, oxbow lakes, meandering or braided channels, peat soils, pans/ depressions)	No		
Ecosystem regulating and supporting services			
Flood attenuation	No		
Streamflow regulation	Yes		
Sediment trapping	No		
Phosphate assimilation	No		
Nitrate assimilation	No		

DFFE Screening Tool Summary			
Requirement	**Completed / Assessed**	**Date**	**Comments**
Toxicant assimilation	No		
Erosion control	Yes		
Carbon storage	No		
Ecosystem Community Composition			
Changes in numbers and density of species	Yes		
Integrity (condition, viability, predator prey ratios, dispersal rates)	Yes		
Faunal and vegetation communities inhabiting the site	Yes		
Estuary function (where applicable)			
Size of estuary	N/A		
Availability of sediment	N/A		
Wave action in mouth	N/A		
Protection of mouth	N/A		
Beach slope	N/A		
volume of Mean Annual Runoff	N/A		
Extent of saline intrusion (especially where relevant to Permanently Open Systems	N/A		
REPORTING REQUIRMENTS ADDRESSED OR INCLUDED IN THE ASSESSMENT / COMPLIANCE STATEMENT (REPLACING SECTION 6 OF NEMA REGUALTIONS (REPORTING REQUIREMENTS			

DFFE Screening Tool Summary			
Requirement	**Completed / Assessed**	**Date**	**Comments**
Details of SACNASP author included (Registration number, field of expertise and CV	YES	Details of SACNASP author included (Registration number, field of expertise and CV attached in appendix 1.	
Signed statement of independence	YES	Signed statement of independence	
Statement of duration, date and season of site inspection, methods and models use, as well as equipment	YES	A baseline profile description of biodiversity and ecosystems of the site	
Description of assumptions and limitations (uncertainties & knowledge gaps)	YES	The methodology used to verify the sensitivities of the aquatic biodiversity features on the site including the equipment and modelling used where relevant.	
Local of No-Go areas for construction and operation	YES	In the vase of linear activity, confirmation from the aquatic biodiversity specialist that in their opinion, based on the mitigation and remedial measures proposed the land can be returned to the current state within two years of completion of the construction phase.	
Additional environmental impacts	YES	Proposed impact management actions and impact management outcomes or any monitoring requirements for inclusion in the EMPr.	
Direct, indirect and cumulative impacts assessed	YES	Description of assumptions and limitations (uncertainties & knowledge gaps).	
Degree to which impacts and risks can be mitigated	YES	Any conditions to which approval is subject	

DFFE Screening Tool Summary			
Requirement	**Completed / Assessed**	**Date**	**Comments**
Degree to which impact or risks can be reversed	YES	Signed copy of assessment must be appended to the BAR or EIA	
Degree to which impact or risks can cause the loss of irreplaceable resources	YES		
Inclusion of a suitable construction and operational buffer using accepted methodologies	YES		
Proposed impact management actions and impact management outcomes for inclusion in the EMPr	YES		
Motivation for using High Sensitive Areas versus available Low Biodiversity Sensitive Areas	YES		
Substantiated statement based on the findings of the specialist assessment, regarding the acceptability or no of the proposed development and if the proposed development should receive approval or not	YES		
Any conditions to which approval is subject	YES		
Signed copy of assessment must be appended to the BAR or EIA	YES		

SPECIALIST DECLARATION

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Castle WEF to Hydra Grid connection

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations

Private Bag X447

Pretoria

0001

Physical address:

Department of Environmental Affairs

Attention: Chief Director: Integrated Environmental Authorisations

Environment House

473 Steve Biko Road

Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:

Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

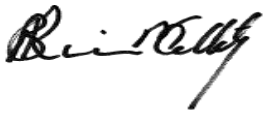
Specialist Company Name:	EnviroSci (Pty) Ltd			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	100
Specialist name:	Dr Brian Colloty			
Specialist Qualifications:	Ph.D.			
Professional affiliation/registration:	SACNASP Pr Sci Nat 400268/07 Ecological			
Physical address:	1 Rossini Rd Pari Park Gqeberha 6070			
Postal address:	1 Rossini Rd Pari Park Gqeberha 6070			
Postal code:	6070	Cell:	0834983299	
Telephone:	0413662077	Fax:	-	
E-mail:	brianc@envirosci.co.za			

2. DECLARATION BY THE SPECIALIST

I, _____Brian Colloty_____, 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 Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, 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; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.



Signature of the Specialist

EnviroSci (Pty) Ltd

Name of Company:

12 May 2022

Date

SPECIALIST REPORT DETAILS

Report prepared by: Dr. Brian Colloty Pr.Sci.Nat. (Ecology) / Member SAEIES.

Expertise / Field of Study: BSc (Hons) Zoology, MSc Botany (Rivers), Ph. D Botany Conservation Importance rating (Estuaries) and interior wetland / riverine assessment consultant from 1996 to present.

I, **Dr. Brian Michael Colloty** declare that this report has been prepared independently of any influence or prejudice as may be specified by the National Department of Environmental Affairs and or Department of Human Settlement, Water and Sanitation.

Signed: …… Date:12 May 2022……

Appendix 1 of this report contains a detailed CV

1. Introduction

African Clean Energy Developments (Pty) Ltd (ACED) appointed EnviroSci (Pty) Ltd to conduct an aquatic assessment of the proposed Overhead transmission line (OHL) to connect to the authorised Castle Wind Energy Facility (WEF) to the existing Hydra Main Transmission Substation (MTS), on farms near De Aar in the Northern Cape. The wind energy facility itself has received approval, but this assessment focuses on the grid connection infrastructure 132kV to 400kV (single or double circuit) OHL. Associated infrastructure will include permanent access/service tracks (where no existing roads exist) as well as temporary laydown areas and site camps that will be rehabilitated after construction.

Therefore, this assessment includes delineating any natural waterbodies, as well as assessing the potential consequences of the proposed alignment (inclusive of a 300m wide corridor – The study area) on the surrounding watercourses. This was based on information collected during various site visits conducted within the region noting this same corridor has been assessed by the author for various other projects (i.e. adjoining farms and or projects directly adjacent to study area) in August 2014, May 2016, and a site-specific assessment in October 2019. The 2014 and 2019 surveys coincided higher than normal rainfall, and thus presented an opportunity to view the region with riverine flows.

These surveys adhered to the assessment criteria contained in the DWAF 2005 / 2008 delineation manuals and the National Wetland Classification System. This report will inform the Basic Assessment Report as well as the required Water Use license Application that will be initiated, once the final transmission line tower positions are available, i.e. once all the constraints, if any from this and other specialists have been considered in the design process.

The PROTOCOL FOR SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS FOR THE ENVIRONMENTAL IMPACTS ON AQUATIC BIODIVERSITY (Government Gazette 43110, 20 March 2020), superseding the Appendix 6 NEMA requirements, was also adhered to as results of the DFFE Screening tool indicated that portions of the study area are located within a VERY HIGH SENSITIVITY area, requiring this assessment. The proposed gird occurs within an area highlighted as a Strategic Water Resource Area (Ground Water), within a National Freshwater Ecosystem Priority area (NFEPA) and with wetlands in close proximity (wetland cluster).

Several important national, provincial and municipal scale conservation plans were also reviewed, with the results of those studies being included in this report. Most conservation plans are produced at a high level, so it is therefore important to verify the actual status of the study area during this initial phase, prior to the final layout plan being produced.

1.1 Aims and objectives

The aim of this report is to provide the applicant with the requisite delineation of any natural waterbodies that would be impacted upon by the proposed structures and any sensitive areas should be avoided. This while providing the competent authorities with the relevant information to determine legislative requirements.

Certain aspects of the development will trigger the need for Section 21, Water Use License Applications (WULAs) (or general authorisation [GA] applications) such as river crossings. Any activities within these areas and or the 500m regulated zone will require a Water Use license under Section 21 c & i of the National Water Act (Act 36 of 1998). The respective Water Use Licenses must be finalised once the preferred alignment has been determined and the final tower / pylon positions are known and in particular if any road crossings over the watercourses are required.

Information with regard to the state and function of the observed water bodies, suitable no-go buffers and assessment of the potential impacts are also provided, but it is the intent that where possible sensitive areas such as the wetlands will be spanned.

1.2 Assumptions and Limitation

To obtain a comprehensive understanding of the dynamics of both the flora and fauna of the aquatic communities within a study site, as well as the status of endemic, rare or threatened species in any area, assessments should always consider investigations at different time scales (across seasons/years) and through replication. No baseline long-term monitoring was undertaken as part of this assessment. However, a concerted effort was made to assess as much of the potential site, as well as make use of any available literature, species distribution data and aerial photography. Furthermore, based on the previous assessments undertaken between 2014 - 2019 in the area and this was not foreseen as a huge limiting factor. The level of investigation undertaken is sufficient to inform this assessment.

It should be emphasised that information, as presented in this document, only has reference to the study area as indicated on the accompanying maps. Therefore, this information cannot be applied to any other area without detailed investigation.

For the purposes of this report, it is assumed that any existing roads and tracks will be used, while the tower structures will be placed outside the wetlands, while towers may need to be placed within the alluvial water courses due to the width of the watercourse. A further assumption is that water will be sourced from a licensed resource and not illegally abstracted from any surrounding watercourses, particularly if dust suppression is required for example at the laydown area or along main / district roads.

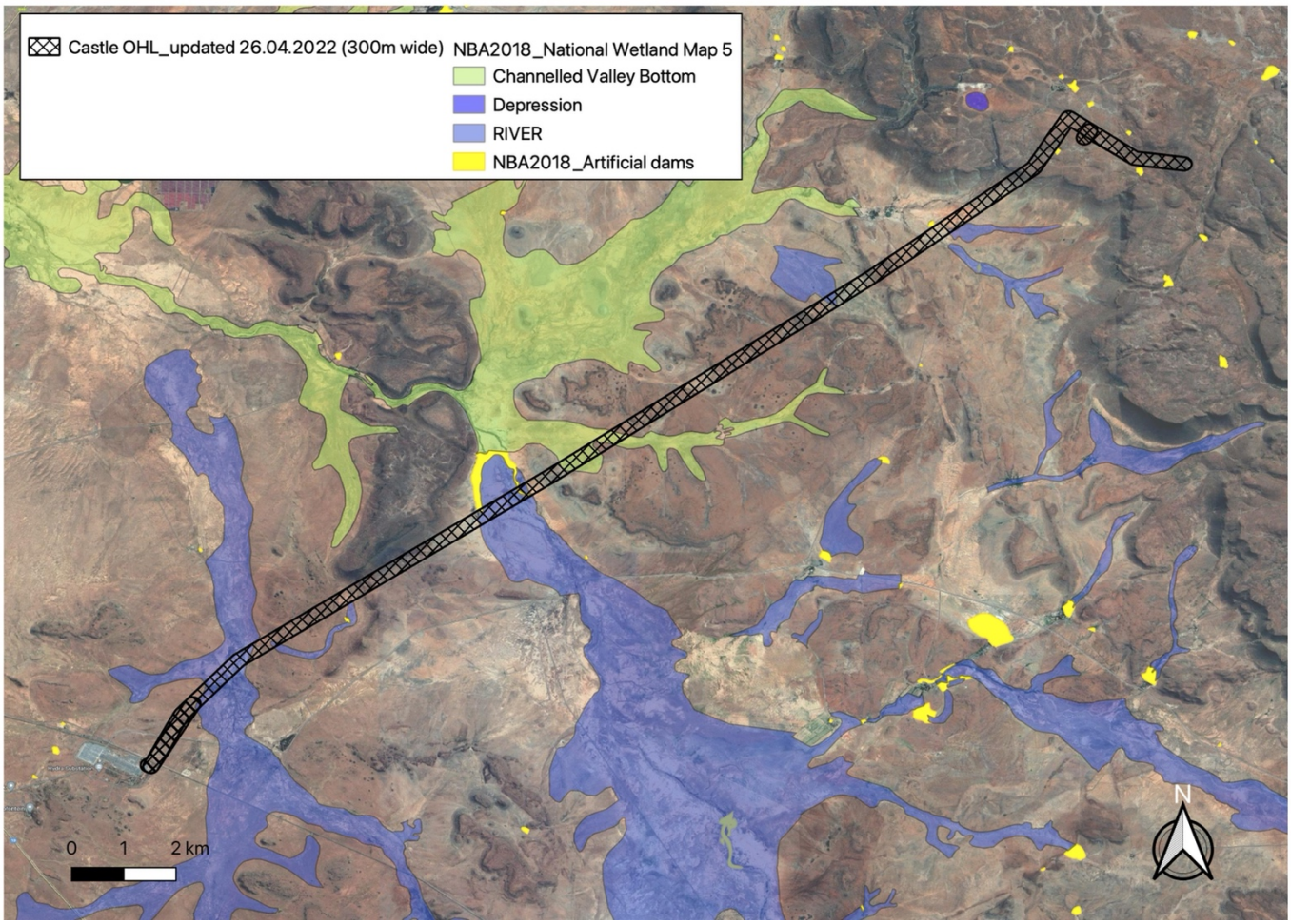


Figure 1: The proposed alignment in relation to major water courses in the region inclusive of 300m connection grid study area

2. Terms of Reference

The following scope of work was used as the basis of this study to fulfil the above requirements as provided by Arcus:

General Requirements:

- Adherence to the Protocol for Specialist Assessment and Minimum Report Content Requirements for the Environmental Impacts on Aquatic Biodiversity (Government Gazette 43110, 20 March 2020), superseding the Appendix 6 NEMA EIA Regulations 2014, as amended;
- Adherence to all appropriate best practice guidelines, relevant legislation and authority requirements;
- Provide a thorough overview of all applicable legislation, guidelines;
- Cumulative impact identification and assessment as a result of other developments in the area (including; a cumulative environmental impact table(s) and statement, review of the specialist reports undertaken for other Renewable Energy developments and an indication of how the recommendations, mitigation measures and conclusion of the studies have been considered);
- Identification sensitive areas to be avoided (including providing shapefiles/kmls);
- Assessment of the significance of the proposed development during the Pre-construction, Construction, Operation, Decommissioning Phases and Cumulative impacts. Potential impacts should be rated in terms of the direct, indirect and cumulative:
    - Direct impacts are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.
    - Indirect impacts of an activity are indirect or induced changes that may occur as a result of the activity. These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken, or which occur at a different place as a result of the activity.
    - Cumulative impacts are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.
- Comparative assessment of alternatives (infrastructure alternatives have been provided):
- Recommend mitigation measures in order to minimise the impact of the proposed development; and
- Implications of specialist findings for the proposed development (e.g. permits, licenses etc) and specialist comment if the proposed development should be authorised.

3. Project Description

The following information was provided by the client:

The proposed development entails the construction of an OHL required to connect the Castle WEF to the national Eskom electricity grid at the Hydra MTS (Figure 1). The Proponent (or their successor in title) proposes to develop the grid connection infrastructure under a Self- Build agreement with Eskom. It is anticipated that construction would commence within 5 years of the date of authorisation (if granted), and the construction phase would last approximately 6-18 months. Once construction of the grid connection infrastructure is complete, it is envisaged that the infrastructure (and the associated Environmental Authorisation, if granted) will be ceded to Eskom as per Eskom's requirements. Eskom is thus expected to be the eventual owner of the infrastructure and will be responsible for the long-term operation and maintenance of the grid connection infrastructure. Alternately, pending confirmation from Eskom, part or all of the grid connection infrastructure will be owned and maintained by the Proponent instead of Eskom (i.e. Own-Build agreement).

The proposed infrastructure is expected to be permanent and will remain in place for the duration of the lifespan of the associated Castle WEF (20 years or more). Note that the construction of the proposed grid connection infrastructure is dependent on the construction timelines of the associated Castle WEF, which are not yet known. If/when the WEF are decommissioned at some point in the future, the grid connection infrastructure may also be decommissioned. The owner of the grid connection infrastructure (Eskom, or their successor in title) would be responsible for the decommissioning phase.

4. Methodology

This study followed the approaches of several national guidelines with regards to wetland assessment. These have been modified by the author, to provide a relevant mechanism of assessing the present state of the study systems, applicable to the specific environment and in a clear and objective manner, assess the potential impacts associated with the proposed development site based on information collected within the relevant farm portions of a number of years for this and other proposed projects.

Current water resource classification systems make use of the Hydrogeomorphic (HGM) approach, and for this reason, the National Wetland Classification System (NWCS) approach will be used in this study. It is also important to understand wetland definition, means of assessing wetland conservation and importance as well as understanding the pertinent legislation with regards to protecting wetlands. These aspects will be discussed in greater depth in this section of the report, as they form the basis of the study approach to assessing wetland impacts.

4.1 Waterbody classification systems

Since the late 1960's, wetland classification systems have undergone a series of international and national revisions. These revisions allowed for the inclusion of additional wetland types, ecological and conservation rating metrics, together with a need for a system that would allude to the functional requirements of any given wetland (Ewart-Smith *et al*., 2006). Wetland function is a consequence of biotic and abiotic factors, and wetland classification should strive to capture these aspects. **Coupled to this was the inclusion of other criteria within the classification systems to differentiate between river, riparian and wetland systems, as well as natural versus artificial waterbodies.**

The South African National Biodiversity Institute (SANBI) in collaboration with several specialists and stakeholders developed the newly revised and now accepted National Wetland Classification Systems (NWCS) (Ollis *et al*., 2013). This system comprises a hierarchical classification process of defining a wetland based on the principles of the hydrogeomorphic (HGM) approach at higher levels, with including structural features at the finer or lower levels of classification (Ollis *et al*., 2013).

Wetlands develop in a response to elevated water tables, linked either to rivers, groundwater flows or seepage from aquifers (Parsons, 2004). These water levels or flows then interact with localised geology and soil forms, which then determines the form and function of the respective wetlands. Water is thus the common driving force, in the formation of wetlands (DWAF, 2005). It is significant that the HGM approach has now been included in the wetland classifications as the HGM approach has been adopted throughout the water resources management realm with regards to the determination of the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) and WET-Health assessments for aquatic environments. All these systems are then easily integrated using the HGM approach in line with the Eco-classification process of river and wetland reserve determinations used by the Department of Human Settlement, Water and Sanitation (DHSWS). The Ecological Reserve of a wetland or river is used by DHSWS to assess the water resource allocations when assessing WULAs

The National Wetland Classification System process is provided in more detail in the methods section of the report, but some of the terms and definitions used in this document are presented below:

Definition Box

Present Ecological State is a term for the current ecological condition of the resource. This is assessed relative to the deviation from the Reference State. Reference State/Condition is the natural or pre-impacted condition of the system. The reference state is not a static condition but refers to the natural dynamics (range and rates of change or flux) prior to development. The PES is determined per component - for rivers and wetlands this would be for the drivers: flow, water quality and geomorphology; and the biotic response indicators: fish, macroinvertebrates, riparian vegetation and diatoms. PES categories for every component would be integrated into an overall PES for the river reach or wetland being investigated. This integrated PES is called the EcoStatus of the reach or wetland.

EcoStatus is the overall PES or current state of the resource. It represents the totality of the features and characteristics of a river and its riparian areas or wetland that bear upon its ability to support an appropriate natural flora and fauna and its capacity to provide a variety of goods and services. The EcoStatus value is an integrated ecological state made up of a combination of various PES findings from component EcoStatus assessments (such as for invertebrates, fish, riparian vegetation, geomorphology, hydrology and water quality).

Reserve: The quantity and quality of water needed to sustain basic *human needs* and *ecosystems* (e.g. estuaries, rivers, lakes, groundwater and wetlands) to ensure ecologically sustainable development and utilisation of a water resource. The *Ecological Reserve* pertains specifically to aquatic ecosystems.

Reserve requirements: The quality, quantity and reliability of water needed to satisfy the requirements of basic human needs and the Ecological Reserve (inclusive of instream requirements).

Ecological Reserve determination study: The study undertaken to determine Ecological Reserve requirements.

Licensing applications: Water users are required (by legislation) to apply for licenses prior to extracting water resources from a water catchment.

Ecological Water Requirements: This is the quality and quantity of water flowing through a natural stream course that is needed to sustain instream functions and ecosystem integrity at an acceptable level as determined during an EWR study. These then form part of the conditions for managing achievable water quantity and quality conditions as stipulated in the **Reserve Template**

Water allocation process (compulsory licensing): This is a process where all existing and new water users are requested to reapply for their licenses, particularly in stressed catchments where there is an over-allocation of water or an inequitable distribution of entitlements.

Ecoregions are geographic regions that have been delineated in a top-down manner on the basis of physical/abiotic factors. • NOTE: For purposes of the classification system, the 'Level I Ecoregions' for South Africa, Lesotho and Swaziland (Kleynhans *et al.* 2005), which have been specifically developed by the Department of Water Affairs & Forestry (DWAF) for rivers but are used for the management of inland aquatic ecosystems more generally, are applied at Level 2A of the classification system. These Ecoregions are based on physiography, climate, geology, soils and potential natural vegetation.

4.2 Wetland definition

Although the National Wetland Classification System (NWCS) (Ollis *et al*., 2013) is used to classify wetland types it is still necessary to understand the definition of a wetland. Terminology currently strives to characterise a wetland not only on its structure (visible form), but also to relate this to the function and value of any given wetland.

The Ramsar Convention definition of a wetland is widely accepted as "areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres" (Davis 1994). South Africa is a signatory to the Ramsar Convention and therefore its extremely broad definition of wetlands has been adopted for the proposed NWCS, with a few modifications.

Whereas the Ramsar Convention included marine water to a depth of six metres, the definition used for the NWCS extends to a depth of ten metres at low tide, as this is recognised as the seaward boundary of the shallow photic zone (Lombard et al., 2005). An additional minor adaptation of the definition is the removal of the term 'fen' as fens are considered a type of peatland. The adapted definition for the NWCS is, therefore, as follows (Ollis *et al*., 2013):

WETLAND: an area of marsh, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed ten metres.

This definition encompasses all ecosystems characterised by the permanent or periodic presence of water other than marine waters deeper than ten metres. The only legislated definition of wetlands in South Africa, however, is contained within the National Water Act (Act No. 36 of 1998) (NWA), where wetlands are defined as "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 adapted to life in saturated soil." This definition is consistent with more precise working definitions of wetlands and therefore includes only a subset of ecosystems encapsulated in the Ramsar definition. It should be noted that the NWA definition is not concerned with marine systems and clearly distinguishes wetlands from estuaries, classifying the latter as a watercourse (Ollis *et al*., 2013). Table 1 below provides a comparison of the various wetlands included within the main sources of wetland definitions used in South Africa.

Although a subset of Ramsar-defined wetlands was used as a starting point for the compilation of the first version of the National Wetland Inventory (i.e. "wetlands", as defined by the NWA, together with open waterbodies), it is understood that subsequent versions of the Inventory include the full suite of Ramsar-defined wetlands in order to ensure that South Africa meets its wetland inventory obligations as a signatory to the Convention (Ollis *et al.*, 2013).

Wetlands must therefore have one or more of the following attributes to meet the above definition (DWAF, 2005):

- A high-water table that results in the saturation at or near the surface, leading to anaerobic conditions developing in the top 50 cm of the soil.
- Wetland or hydromorphic soils that display characteristics resulting from prolonged saturation, i.e. mottling or grey soils
- The presence of, at least occasionally, hydrophilic plants, i.e. hydrophytes (water loving plants).

It should be noted that riparian systems that are not permanently or periodically inundated are not considered true wetlands, i.e. those associated with the drainage lines and rivers.

Table 1: Comparison of ecosystems considered to be 'wetlands' as defined by the proposed NWCS, the NWA and ecosystems included in DWAF's (2005) delineation manual.

Ecosystem	NWCS "wetland"	National Water Act wetland	DWAF (2005) delineation manual
Marine	YES	NO	NO
Estuarine	YES	NO	NO
Waterbodies deeper than 2 m (i.e. limnetic habitats often described as lakes or dams)	YES	NO	NO
Rivers, channels and canals	YES	NO[1]	NO
Inland aquatic ecosystems that are not river channels and are less than 2 m deep	YES	YES	YES
Riparian[2] areas that are permanently / periodically inundated or saturated with water within 50 cm of the surface	YES	YES	YES[3]
Riparian [3] areas that are not permanently / periodically inundated or saturated with water within 50 cm of the surface	NO	NO	YES[3]

[1] Although river channels and canals would generally not be regarded as wetlands in terms of the National Water Act, they are included as a 'watercourse' in terms of the Act

[2] According to the National Water Act and Ramsar, riparian areas are those areas that are saturated or flooded for prolonged periods and would be considered riparian wetlands, as opposed to non –wetland riparian areas that are only periodically inundated and the riparian vegetation persists due to having deep root systems drawing on water many meters below the surface.

[3] The delineation of 'riparian areas' (including both wetland and non-wetland components) is treated separately to the delineation of wetlands in DWAF's (2005) delineation manual.

4.3 National Wetland Classification System method

During this study, due to the nature of the wetlands and watercourses observed, it was determined that the newly accepted NWCS be adopted. This classification approach has integrated aspects of the HGM approach used in the WET-Health system as well as the widely accepted eco-classification approach used for rivers.

The NWCS (Ollis *et al*., 2013) as stated previously, uses hydrological and geomorphological traits to distinguish the primary wetland units, i.e. direct factors that influence wetland function. Other wetland assessment techniques, such as the DWAF (2005) delineation method, only infer wetland function based on abiotic and biotic descriptors (size, soils & vegetation) stemming from the Cowardin approach (Ollis *et al.,* 2013).

The classification system used in this study is thus based on Ollis *et al*. (2013) and is summarised below:

The NWCS has a six-tiered hierarchical structure, with four spatially nested primary levels of classification (Figure 2). The hierarchical system firstly distinguishes between Marine, Estuarine and Inland ecosystems (**Level 1**), based on the degree of connectivity the particular system has with the open ocean (greater than 10 m in depth). Level 2 then categorises the regional wetland setting using a combination of biophysical attributes at the landscape level, which operate at a broad bioregional scale.

This is opposed to specific attributes such as soils and vegetation. **Level 2** has adopted the following systems:

- Inshore bioregions (marine)
- Biogeographic zones (estuaries)
- Ecoregions (Inland)

Level 3 of the NWCS assess the topographical position of inland wetlands as this factor broadly defines certain hydrological characteristics of the inland systems. Four landscape units based on topographical position are used in distinguishing between Inland systems at this level. No subsystems are recognised for Marine systems, but estuaries are grouped according to their periodicity of connection with the marine environment, as this would affect the biotic characteristics of the estuary.

Level 4 classifies the hydrogeomorphic (HGM) units discussed earlier. The HGM units are defined as follows:

- Landform – shape and localised setting of wetland
- Hydrological characteristics – nature of water movement into, through and out of the wetland
- Hydrodynamics – the direction and strength of flow through the wetland

These factors characterise the geomorphological processes within the wetland, such as erosion and deposition, as well as the biogeochemical processes.

Level 5 of the assessment pertains to the classification of the tidal regime within the marine and estuarine environments, while the hydrological and inundation depth classes are determined for inland wetlands. Classes are based on frequency and depth of inundation, which are used to determine the functional unit of the wetlands and are considered secondary discriminators within the NWCS.

Level 6 uses six descriptors to characterise the wetland types based on biophysical features. As with Level 5, these are non-hierarchal in relation to each other and are applied in any order, dependent on the availability of information. The descriptors include:

- Geology;
- Natural vs. Artificial;
- Vegetation cover type;
- Substratum;
- Salinity; and
- Acidity or Alkalinity.

It should be noted that where sub-categories exist within the above descriptors, hierarchical systems are employed, and these are thus nested in relation to each other.

The HGM unit (Level 4) is the **focal point of the NWCS**, with the upper levels (Figure 3 – Inland systems only) providing means to classify the broad bio-geographical context for grouping functional wetland units at the HGM level, while the lower levels provide more descriptive detail on the particular wetland type characteristics of a particular HGM unit. Therefore Level 1 – 5 deals with functional aspects, while Level 6 classifies wetlands on structural aspects.

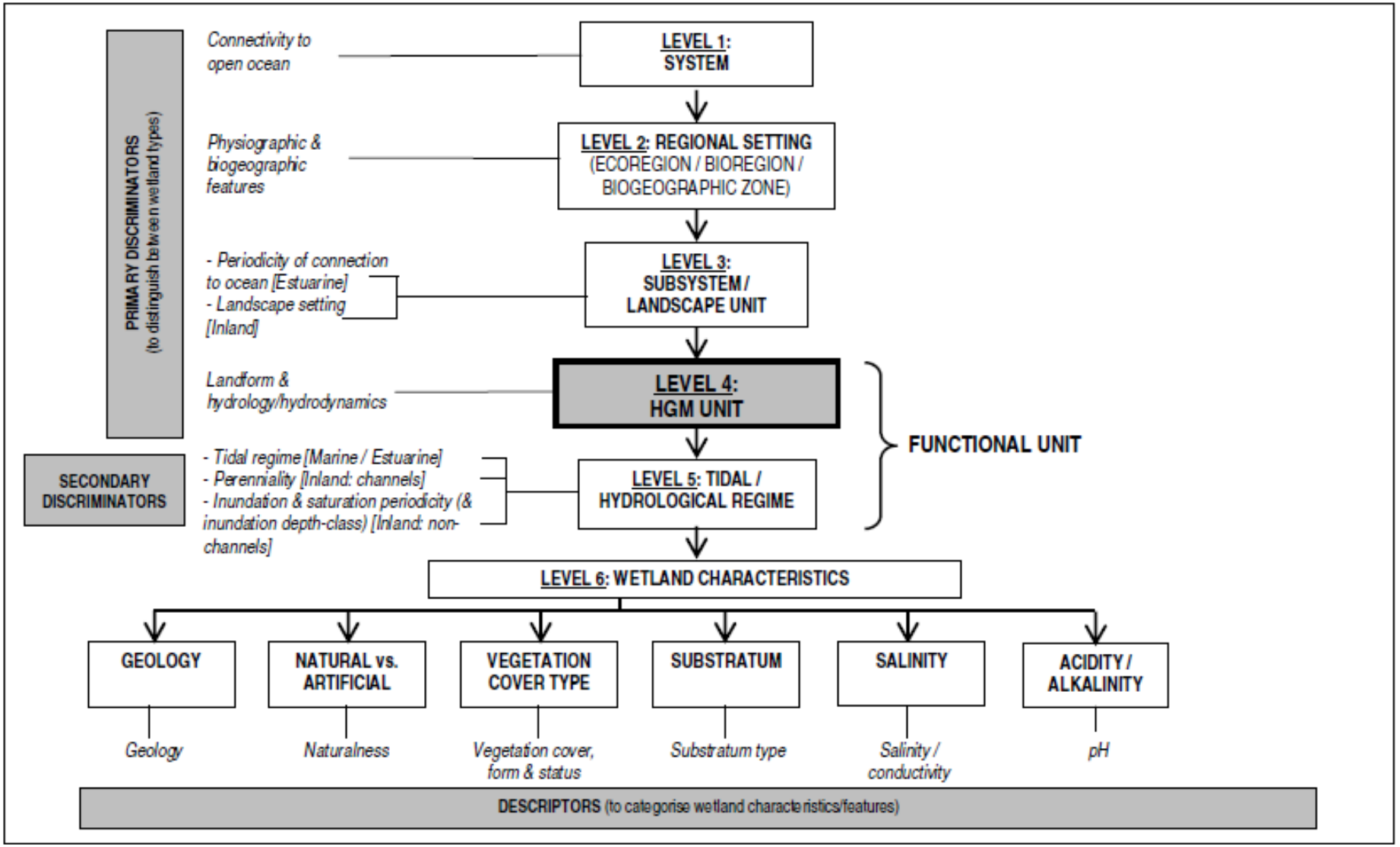


Figure 2: Basic structure of the NWCS, showing how 'primary discriminators' are applied up to Level 4 to classify Hydrogeomorphic (HGM) Units, with 'secondary discriminators' applied at Level 5 to classify the tidal/hydrological regime, and 'descriptors' applied at Level 6 to categorise the characteristics of wetlands classified up to Level 5 (From Ollis *et al*., 2013).

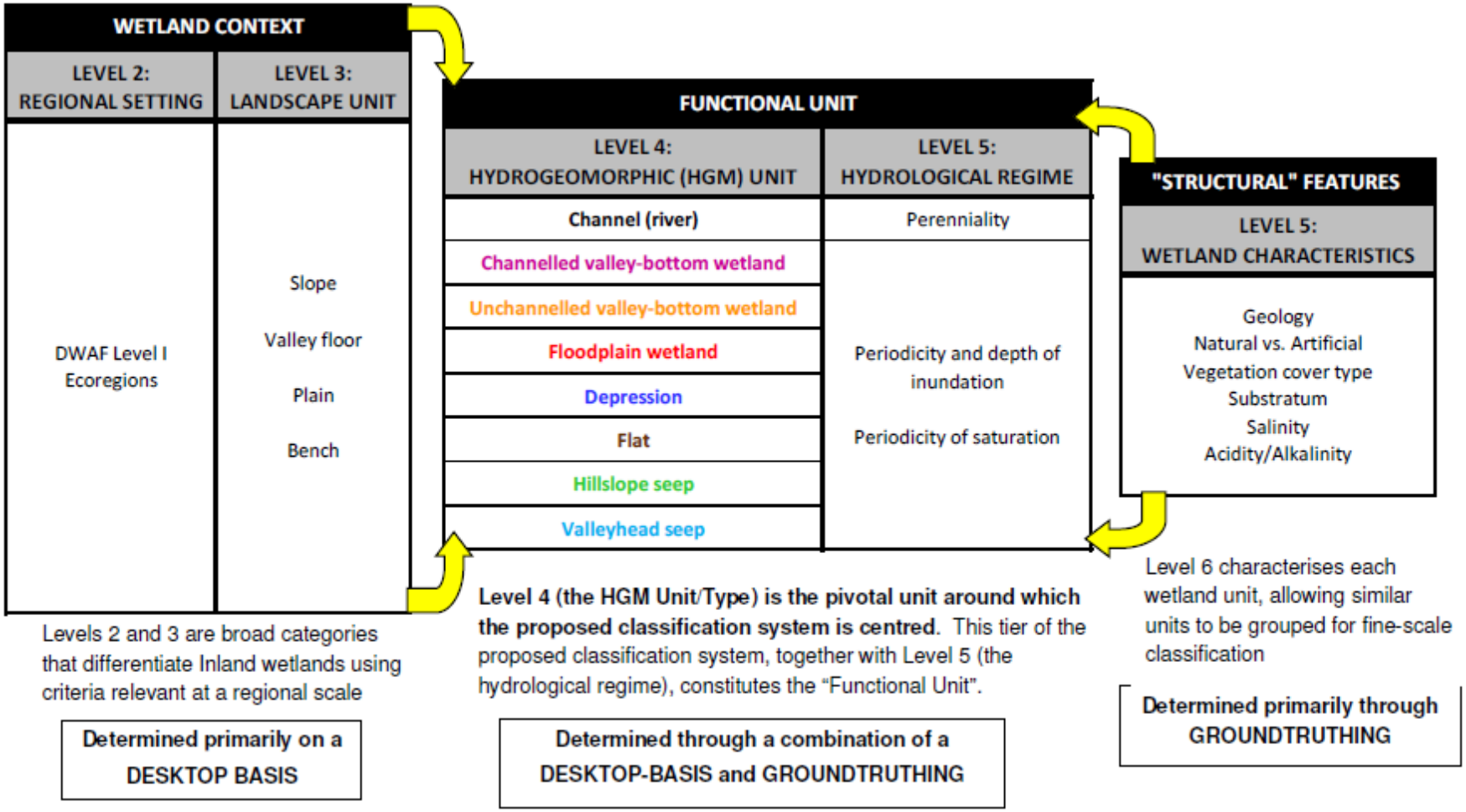


Figure 3: Illustration of the conceptual relationship of HGM Units (at Level 4) with higher and lower levels (relative sizes of the boxes show the increasing spatial resolution and level of detail from the higher to the lower levels) for Inland Systems (from Ollis *et al.*, 2013).

4.4 Waterbody condition

To assess the PES or condition of the observed wetlands, a modified Wetland Index of Habitat Integrity (DWAF, 2007) was used. The Wetland Index of Habitat Integrity (WETLAND-IHI) is a tool developed for use in the National Aquatic Ecosystem Health Monitoring Programme (NAEHMP), formerly known as the River Health Programme (RHP). The output scores from the WETLAND-IHI model are presented in the standard DWAF A-F ecological categories (Table 2) and provide a score of the PES of the habitat integrity of the wetland system being examined. The author has included additional criteria into the model-based system to include additional wetland types. This system is preferred when compared to systems such as WET-Health – wetland management series (WRC 2009), as WET-Health (Level 1) was developed with wetland rehabilitation in mind and is not always suitable for impact assessments. This coupled with the degraded state of the wetlands in the study area, indicated that a complex study approach was not warranted, i.e. conduct a Wet-Health Level 2 and WET-Ecosystems Services study required for an impact assessment.

Table 2: Description of A – F ecological categories based on Kleynhans *et al*., (2005)

ECOLOGICAL CATEGORY	ECOLOGICAL DESCRIPTION	MANAGEMENT PERSPECTIVE
A	Unmodified, natural.	Protected systems; relatively untouched by human hands; no discharges or impoundments allowed
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.	Some human-related disturbance, but mostly of low impact potential
C	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.	**Multiple disturbances associated with need for socio-economic development, e.g. impoundment, habitat modification and water quality degradation**
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	
E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.	**Often characterized by high human densities or extensive resource exploitation. Management intervention is needed to improve health, e.g. to restore flow patterns, river habitats or water quality**
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.	

The WETLAND-IHI model is composed of four modules. The “Hydrology”, “Geomorphology” and “Water Quality” modules all assess the contemporary driving processes behind wetland formation and maintenance. The last module, “Vegetation Alteration”, provides an indication of the intensity of human land use activities on the wetland surface itself and how these may have modified the condition of the wetland. The integration of the scores from these 4 modules provides an overall PES score for the wetland system being examined. The WETLAND-IHI model is an MS Excel-based model, and the data required for the assessment are generated during a site visit.

Additional data may be obtained from remotely sensed imagery (aerial photos; maps and/or satellite imagery) to assist with the assessment. The interface of the WETLAND-IHI has been developed in a format which is similar to DWA’s River EcoStatus models which are currently used for the assessment of PES in riverine environments.

4.5 Aquatic ecosystem importance and function

South Africa is a Contracting Party to the Ramsar Convention on Wetlands, signed in Ramsar, Iran, in 1971, and has thus committed itself to this intergovernmental treaty, which provides the framework for the national protection of wetlands and the resources they could provide. Wetland conservation is now driven by the South African National Biodiversity Institute, a requirement under the National Environmental Management: Biodiversity Act (No 10 of 2004).

Wetlands are among the most valuable and productive ecosystems on earth, providing important opportunities for sustainable development (Davies and Day, 1998). However, wetlands in South Africa are still rapidly being lost or degraded through direct human induced pressures (Nel *et al.,* 2004).

The most common attributes or goods and services provided by wetlands include:

- Improve water quality;
- Impede flow and reduce the occurrence of floods;
- Reeds and sedges used in construction and traditional crafts;
- Bulbs and tubers, a source of food and natural medicine;
- Store water and maintain base flow of rivers;
- Trap sediments; and
- Reduce the number of water-borne diseases.

In terms of this study, the wetlands provide ecological (environmental) value to the area acting as refugia for various wetland associated plants, butterflies and birds.

In the past wetland conservation has focused on biodiversity as a means of substantiating the protection of wetland habitat. However not all wetlands provide such motivation for their protection, thus wetland managers and conservationists began assessing the importance of wetland function within an ecosystem.

Table 3 below summarises the importance of wetland function when related to ecosystem services or ecoservices (Kotze *et al*., 2008). One such example is emergent reed bed wetlands that function as transformers converting inorganic nutrients into organic compounds (Mitsch and Gosselink, 2000).

Table 3: Summary of direct and indirect ecoservices provided by wetlands from Kotze *et al*., 2008

Ecosystem services supplied by wetlands	Indirect benefits	Hydro-geochemical benefits		Flood attenuation
				Stream flow regulation
			Water quality enhancement benefits	Sediment trapping
				Phosphate assimilation
				Nitrate assimilation
				Toxicant assimilation
				Erosion control
				Carbon storage
		Biodiversity maintenance		
	Direct benefits	*Provision of water for human use*		
		Provision of harvestable resources[2]		
		Provision of cultivated foods		
		Cultural significance		
		Tourism and recreation		
		Education and research		

Conservation importance of the individual wetlands was based on the following criteria:

- Habitat uniqueness;
- Species of conservation concern;
- Habitat fragmentation or rather, continuity or intactness with regards to ecological corridors; and
- Ecosystem service (social and ecological).

The presence of any or a combination of the above criteria would result in a HIGH conservation rating if the wetland was found in a near natural state (high PES). Should any of the habitats be found modified the conservation importance would rate as MEDIUM, unless a Species of Conservation Concern (SCC) was observed, in which case it would receive a HIGH rating. Any system that was highly modified (low PES) or had none of the above criteria, received a LOW conservation importance rating. Wetlands with HIGH and MEDIUM ratings should thus be excluded from development with incorporation into a suitable open space system, with the maximum possible buffer being applied. Natural wetlands or Wetlands that resemble some form of the past landscape but receive a LOW conservation importance rating could be included into stormwater management features and should not be developed to retain the function of any ecological corridors.

4.6 Relevant wetland legislation and policy

Locally the South African Constitution, seven (7) Acts and two (2) international treaties allow for the protection of wetlands and rivers. These systems are protected from destruction or pollution by the following:

- Section 24 of The Constitution of the Republic of South Africa, 1996;
- Agenda 21 – Action plan for sustainable development of the Department of Environmental Affairs and Tourism (DEAT) 1998;
- The Ramsar Convention, 1971 including the Wetland Conservation Programme (DEAT) and the National Wetland Rehabilitation Initiative (DEAT, 2000);
- National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998) inclusive of all amendments, as well as the NEM: Biodiversity Act;
- National Water Act, 1998 (Act No. 36 of 1998);
- Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983); and
- Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).
- Nature and Environmental Conservation Ordinance, 1974 (No. 19 of 1974)
- National Forest Act, 1998 (No. 84 of 1998)
- National Heritage Resources Act, 1999 (No. 25 of 1999)

NEMA and the Conservation of Agricultural Resources Act (CARA), 1983 (Act No. 43 of 1983) would also apply to this project. These Acts have categorised many invasive plants together with associated obligations on the landowner.

4.7 Provincial legislation and policy

Currently riverine and wetland buffers distances are calculated using the model described by Macfarlane *&* Bredin (2017). Site specific information was collected during the visit and is used to determine site and development specific range of buffers. In short, the buffer distances are based on the current condition of the waterbody, the state of the remainder of the site, the potential impacts posed by the type and scale of the of development, as wells as the proposed alteration of hydrological flows. The model also takes cognisance of the level of mitigation possible, coupled to the reversibility of the impacts. Based then on the information known for the site the buffer model provided the following:

Watercourses

1. Construction period: 45 m
2. Operation period: 27 m
3. Final: 45m

Wetlands:

1. Construction period: 48 m
2. Operation period: 35 m
3. Final: 48m

However, the study area has been highlighted as a Critical Biodiversity Areas (CBA1 & 2 and Ecological Support Area) per the Northern Biodiversity CBA map (Holness & Oosthuizen, 2016), the buffer of 48m for all aquatic systems is upheld, coupled to the fact that the wetlands are riverine in origin, thus water courses should also receive the maximum protection.

Other policies that are relevant include:

- Provincial Nature Conservation Ordinance (PNCO) – Protected Flora. Any plants found within the sites are described in the ecological assessment.
- National Freshwater Ecosystems Priority Areas (NFEPA) – (Nel *et al.,* 2011). This mapping product highlights potential rivers and wetlands that should be earmarked for conservation on a national basis.

5. Description of the affected environment

The proposed connection corridor only occurs within the D62D quaternary catchment of the Brak River, in the Nama Karoo Ecoregion (Figure 4). Thus, permanent rivers and wetlands are limited mostly to mainstem rivers such as those observed within the study area, typically only flow during extended periods of rainfall.

The study region is further characterised by Northern Upper Karoo (Nku3) vegetation and to a limited degree Besemkaree Koppies Shrubland (Gh4). This is due to the limited annual rainfall (ca. 190 – 400 mm/a), while the regional geomorphology is dominated by flat pediplain areas and hills with rocky outcrops.

The geology is mostly Dwyka / Ecca shales overlaid with shallow sandy soils that drain well. This typically allows for the development of broad alluvial floodplains, interspersed by the rocky inselbergs and small mountain ranges observed (Plate 1). These features thus concentrate flows into the lower portions of the catchment, and have allowed for the development of *Juncus rigidus* dominated wetlands in some areas. Both channelled (Plate 2) and unchanneled valley bottom wetland types were observed (Plate 3) within the region, but only one such area is located within 500m of the proposed alignment.

The National Wetland Inventory v5.2 spatial data (NWI), also indicated a Pan / depression, located more than 2km from the edge of the study area. However, the large scale riverine floodplain were confirmed to be alluvial systems, and not wetlands as indicated in the NWI, (Figure 5).

Overall, these catchment and subsequent rivers / watercourses and wetlands are largely in a natural state. Current impacts occur in localised areas and include the following:

- Erosion due small road crossings and tracks;
- Grazing; and
- Farm dams (Plate 4)

In terms of the National Freshwater Ecosystems Priority Areas (NFEPA) assessment (Figure 6), all the watercourses within the site have been assigned a condition score of B (Nel et al. 2011), indicating that they are largely intact and of biological significance.

The National Freshwater Ecosystems Priority Areas (NFEPA) (Nel *et al*., 2011), also earmarked sub-quaternaries, based either on the presence of important biota (e.g. rare or endemic fish species) or conversely the degree of riverine degradation, i.e. the greater the catchment degradation the lower the priority to conserve the catchment. The important catchments areas are then classified as Freshwater Ecosystems Priority Areas (FEPAs). The survey area falls within a Upstream FEPA, associated with the Brak River, although no permanent fish habitat occurs within the proposed site, this catchment is important for the provision and maintenance of flows within the lower catchments, that do contain important, fish, amphibian and invertebrate habitats with permanent water (Figure 6).

This report also indicates the significant watercourses and wetlands delineated within the study area (Figure 7) inclusive of the calculated 48m buffers. Any activities within these areas and or the 500m regulated zone will require a Water Use license (possible General Authorisation) under Section 21 c & i of the National Water Act (Act 36 of 1998). The respective Water Use Licenses must be finalised once the preferred alignment has been determined and the final tower / pylon positions are known and especially if any access tracks will need to cross these areas, but it is advised that the watercourse and wetlands areas are avoided.

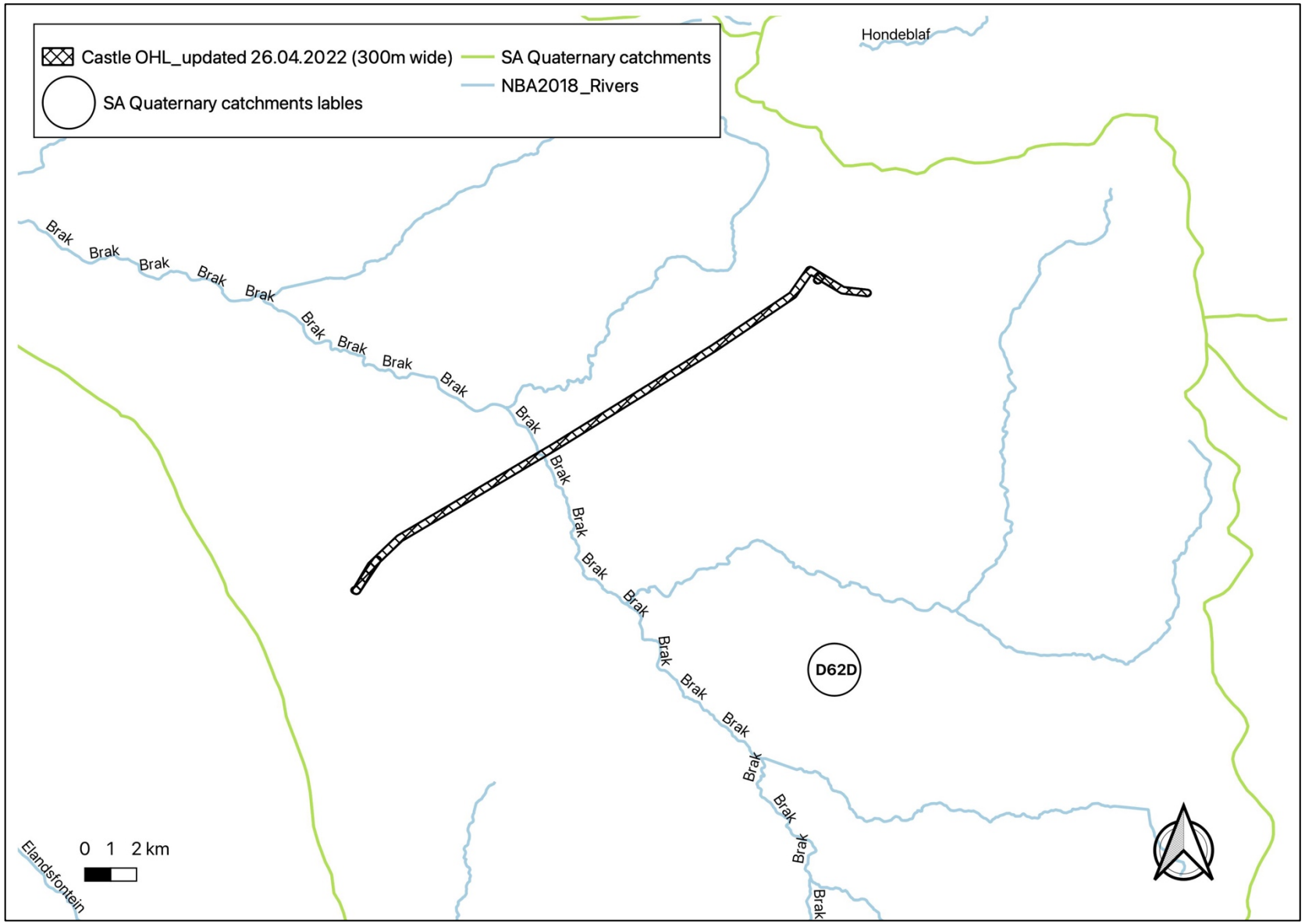


Figure 4: Project locality map indicating the various quaternary catchment boundaries (green line) in relation to the study area (Source DHSWS and NGI).

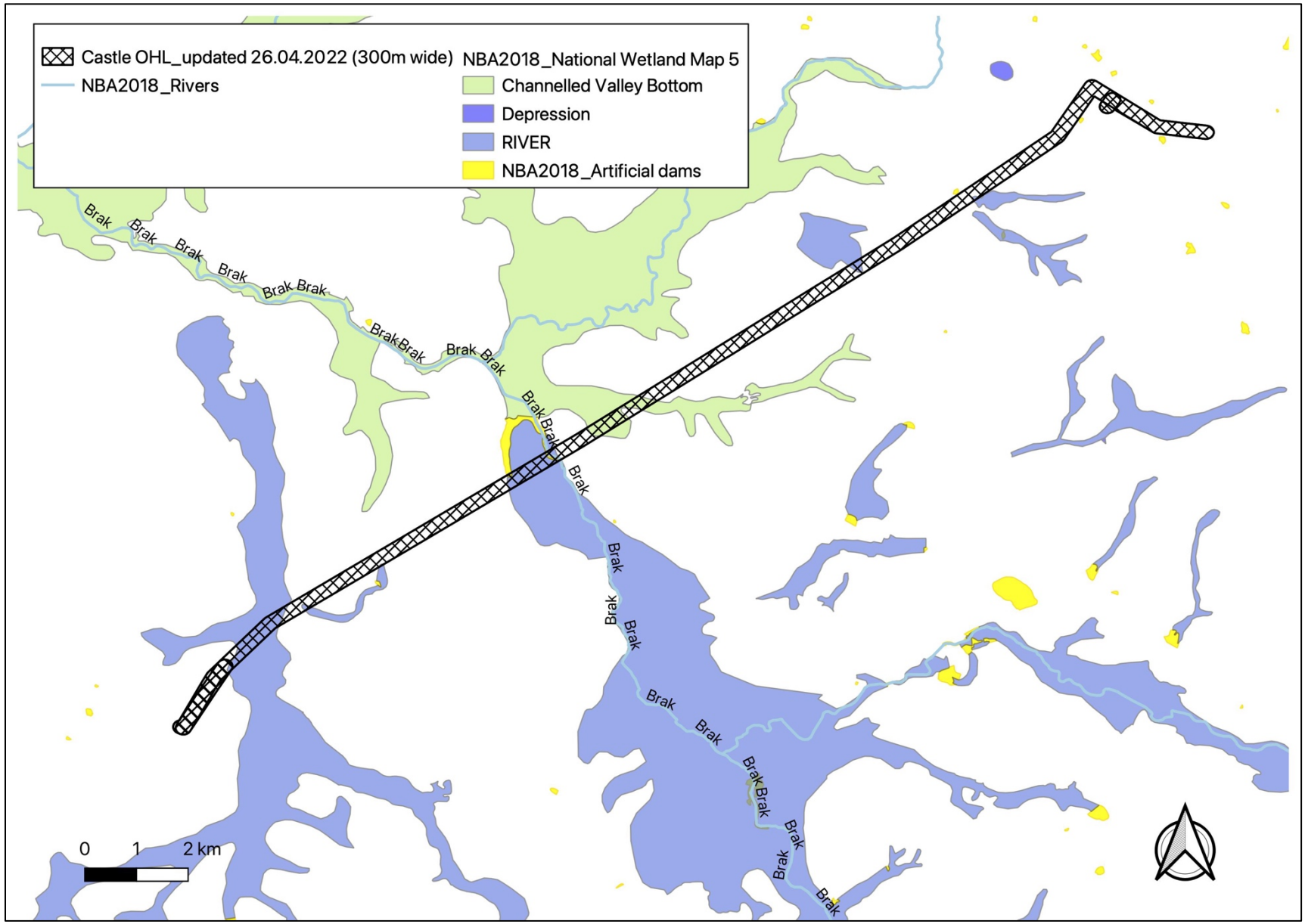


Figure 5: Various waterbodies identified in the National Wetland Inventory V5.2 (2020) based on 2007 land cover data

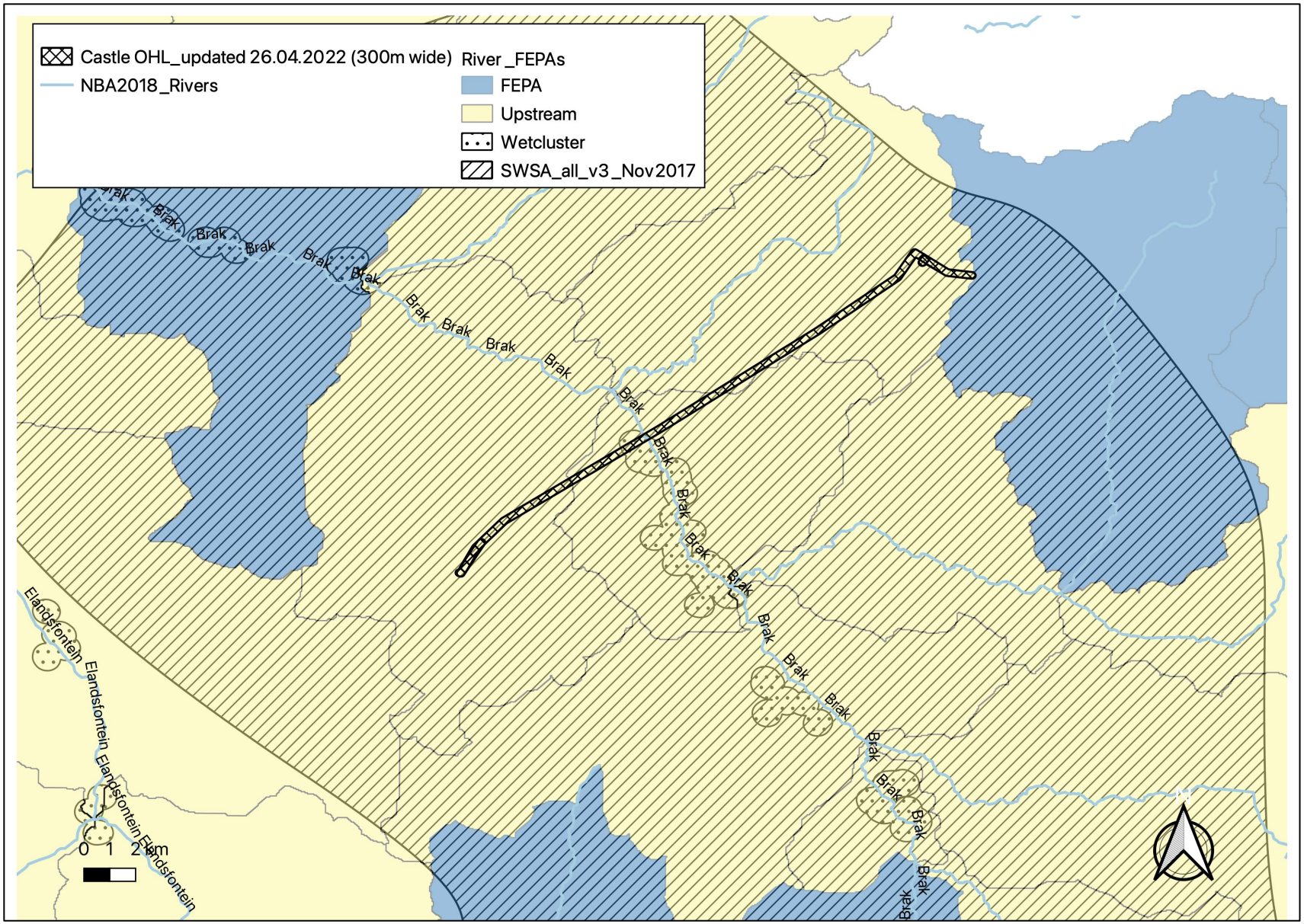


Figure 6: The respective Subquaternary catchments rated in terms of Freshwater Ecosystem Priority Areas (FEPAs) in relation to the study area

Figure 7: The confirmed watercourses and wetlands within the study area, inclusive of the respective buffers and the 500m Section 21c&i regulated water use zone

Plate 1: A view of a typical riverine floodplain, dominated by *Vachellia karroo*

Plate 2: A view of channelled valley bottom wetland colonised by *Juncus rigidus* more than 1 km from any of the proposed corridors

Plate 3: Unchanneled valley bottom wetland, dominated by *Juncus rigidus* sedge within 500m of the transmission line corridor

Plate 4: Several man made dams are located within the study area and are not considered wetland areas

6. Present Ecological State and conservation importance

The PES of a river represents the extent to which it has changed from the reference or near pristine condition (Category A) towards a highly impacted system where there has been an extensive loss of natural habit and biota, as well as ecosystem functioning (Category E).

The PES scores have been revised for the country and based on the current models, aspects of functional importance as well as direct and indirect impacts have been included (DWS, 2014). The current PES system also incorporates Ecological Importance (EI) and Ecological Sensitivity (ES) separately as opposed to Ecological Importance and Sensitivity (EIS) in the old model, although the new model is still heavily centred on rating rivers using broad fish, invertebrate, riparian vegetation and water quality indicators. The Recommended Ecological Category (REC) is still contained within the updated models, with the default REC being B, when little or no information is available to assess the system or when only one of the above-mentioned parameters are assessed or the overall PES is rated between a C or D.

The Present Ecological State scores (PES) for the main watercourses in the study area were rated as follows (DHSWS, 2014 – where B = Largely Natural and C = Moderately Modified):

Subquaternary Catchment Number	Present Ecological State	Ecological Importance	Ecological Sensitivity
5332	B	Low	Low
5391	C	Moderate	Low

These scores were substantiated by observations made in the field within the study area, and due to the overall lack of impacts or disturbance these scores for each of the watercourses within the site should be upheld. This was further substantiated by the inclusion of study area catchments into Critical Biodiversity Areas (Type 1 and 2), i.e. the wetland areas near the alignment crossing the Brak River in particular and Ecological Support Area as shown in the Northern Cape CBA MAP spatial data and Wetland Clusters (Figure 7 & 8).

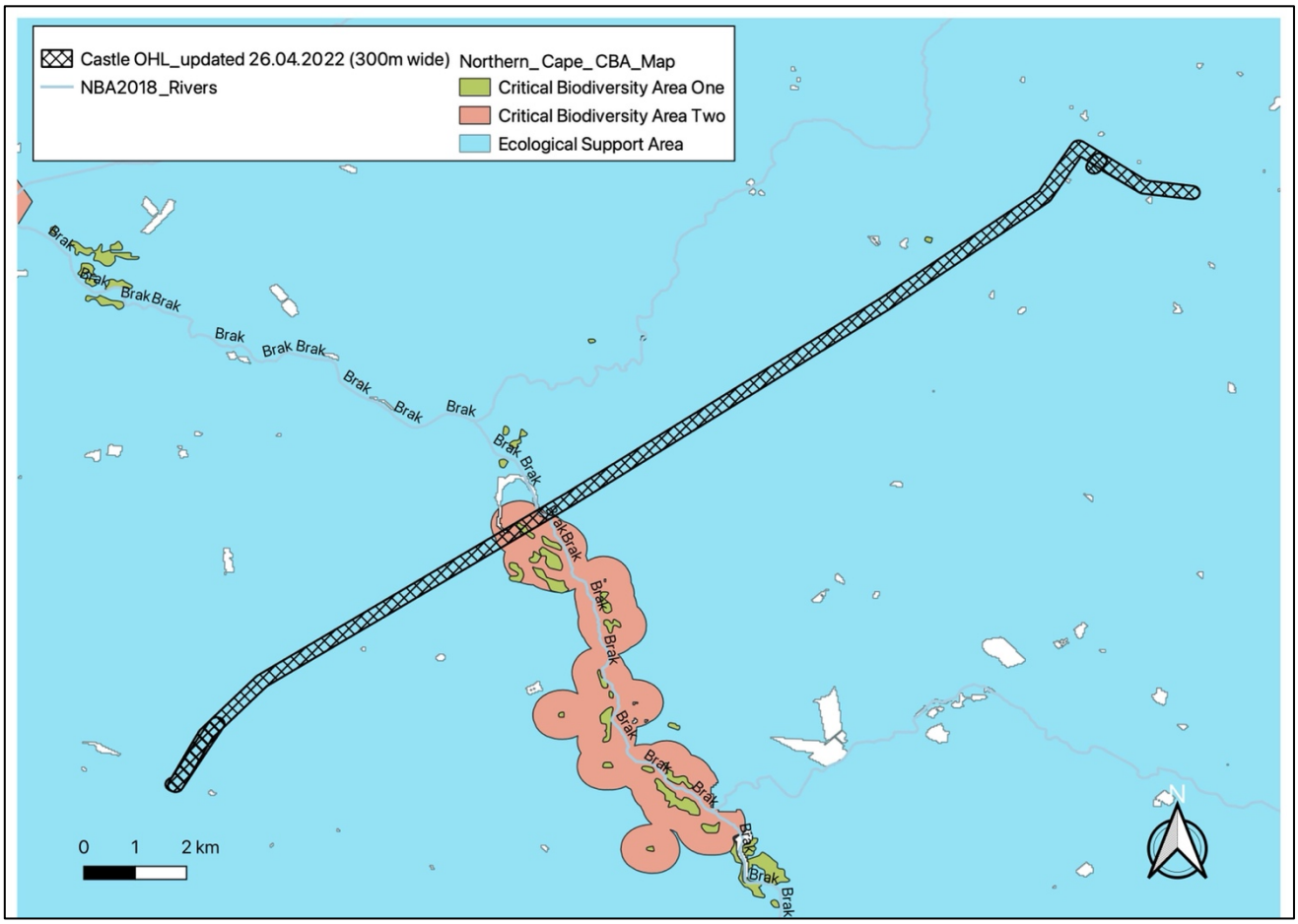


Figure 8: Critical Biodiversity Areas as per the Northern Cape Critical Biodiversity Map.

7. Permit requirements

Based on an assessment of the proposed activities and past engagement with DHSWS, the following WULs/ GA's could be required based on the following thresholds as listed in the following Government Notices, however ultimately the Department of Human Settlement, Water and Sanitation (DHSWS) will determine if a GA or full WULA will be required during the pre-application process (Phase 1):

- **DHSWS Notice 538 of 2016, 2 September in GG 40243**– Section 21 a & b, Abstraction and Storage of water.
- **Government Notice 509 in GG 40229 of 26 August 2016 –** Section 21 c & i, Impeding or diverting the flow of water in a watercourse and or altering the bed, banks, course or characteristics of a watercourse.

	Water Use Activity	**Applicable to this development proposal**
S21(a)	Taking water from a water resource	Only water if water is abstracted from a local river or borehole
S21(b)	Storing water	If the total volume stored is greater than 40 000 m^3 then a full Water Use License will be required. This is however unlikely due to the scale of the project and the need for such large volumes.
S21(c)	Impeding or diverting the flow of water in a watercourse	Yes – several new crossings of watercourses (i.e. activities within 500m of a wetland or towers may be placed within the alluvial areas if they cannot span these wide systems) will be required. A GA process can potentially be followed as the draft Risk Assessment Matrix indicates all impacts are LOW.
S21(d)	Engaging in a stream flow reduction activity	Not applicable
S21(e)	Engaging in a controlled activity	Not applicable
S21(f)	Discharging waste or water containing waste into a water resource through a pipe, canal, sewer or other conduit	Not applicable
S21(g)	Disposing of waste in a manner which may detrimentally impact on a water resource	Not applicable – Only portable toilets will be required
S21(h)	Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process	Not applicable

	Water Use Activity	Applicable to this development proposal
S21(i)	Altering the bed, banks, course or characteristics of a watercourse	Yes – several new crossings of watercourses (i.e. activities within 500m of a wetland or towers may be placed within the alluvial areas if they cannot span these wide systems) will be required. A GA process can potentially be followed as the draft Risk Assessment Matrix indicates all impacts are LOW.
S21(j)	Removing, discharging or disposing of water found underground for the continuation of an activity or for the safety of persons	Not applicable
S21(k)	Using water for recreational purposes	Not applicable

DHSWS WILL DETEMINE IF A GA OR WULA APPLICATION WILL BE REQUIRED DURING THE PREAPPLICATION PHASE AND TYPICALLY IF ONE OF THE ABOVE WATER USES REQUIRES A WULA THEN ALL APPLICATIONS WILL BE TREATED AS A WULA AND NOT GA. THE SUBMISSION PROCESS AND DETAIL REQUIREMENTS DOES HOWEVER NOT DIFFER ONLY THE PROCESSING TIMEFRAMES (60 vs 300 DAYS).

8. Impact assessment

During the impact assessment several potential key issues / impacts were identified and these were assessed based on the methodology supplied by Arcus.

The following impacts were not assessed as these were found not applicable:

- Loss of species of special concern – no listed or protected aquatic species were found during the assessment
- Loss of any wetlands – the only natural wetland observed could be avoided by the strategic placement of towers and no new road crossing must be allowed inclusive of the buffer – access can be gained from access roads to the upstream dam.

The following direct impacts were assessed with regard:

- Impact 1: Loss of riparian systems and the disturbance of the alluvial watercourses in the construction and decommissioning phases
- Impact 2: Impact on aquatic systems through the possible increase in surface water runoff on riparian/wetland form and function during the operational phase
- Impact 3: Increase in sedimentation and erosion in the construction, operational and decommissioning phases
- Impact 4: Potential impact on localised surface water quality during the construction and decommissioning phases
- Impact 5: The No-go Alternative
- Impact 6: Cumulative impacts for the overall project due to the high number of projects surrounding this application

No.	1	Alternative 1		
Project phase	**Construction, Operation & Decommissioning**			
Impact title	Loss of riparian system and disturbance of the alluvial watercourses in the construction, operational and decommissioning phases			
Impact description	Should any of the proposed structures associated with the transmission line be placed within the delineated watercourse, a physical loss of associated vegetation as well damage to the bed and banks of the observed systems could occur. Although true aquatic obligate vegetation was seldom seen, any disturbance of these areas could result in disturbance of the systems resulting in erosion / sedimentation, loss of habitat and corridor (Ecological Support Area) fragmentation. These disturbances will be the greatest during the construction and again in the decommissioning phases as the related disturbances could result in loss and/or damaged vegetation, while to a lesser degree in the operation phase (i.e. as and when maintenance occurs).			
Impact Assessment	**Impact not mitigated**		**Impact mitigated**	
Nature	**Negative**		**Negative**	
Extent	**Local**	Extending across the site and to nearby settlements.	**Limited**	Limited to the site and its immediate surroundings.
Duration	**Medium term**	Impact will last between 1 and 5 years.	**Short term**	Impact will last less than 1 year.
Intensity	**Medium**	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are moderately altered.	**Medium**	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are moderately altered.
Magnitude	**Moderate - negative**		**Low - negative**	
Probability	**Likely (>66%)**	The impact may occur, but not necessarily proof that it will.	**Unlikely (>33%)**	The impacts occurrence is rare but has happened before.
Significance	**Moderate - negative**		**Minimal - negative**	
Importance	**High**	High	**Low**	Low
Consequence	**Moderately-detrimental**		**Very slightly-detrimental**	
Confidence	**Well established**		**Well established**	
Reversibility	**Medium**	The affected environment may only recover from the impact with significant intervention or over long time period.		
Mitigatability	**High**	Mitigation exists and will considerably reduce the significance of impacts.		

Potential mitigation	*Mitigation measures to reduce residual risk or enhance opportunities:* *- A pre-construction walkthrough with an aquatic specialist is recommended and they can assist with the development of the stormwater management plan and Aquatic Rehabilitation and Monitoring plan, coupled to micro-siting of the final tower layout as required.* *- The layout planning has taken cognisance of the sensitivity layer as shown in Figure 7, to avoid these areas (towers) or where access is required, cross such areas using existing tracks / roads or where the impacts would be low or can easily be mitigated.* *- Due to the broad nature of the alluvial systems, towers would need to the placed in some of these areas, but it is recommended that no new permanent tracks to access these areas are created.* *- Vegetation clearing where required should occur in in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment.* *- It is also advised that an Environmental Control Officer (ECO), with a good understanding of the local flora be appointed during the construction phase. The ECO should be able to make clear recommendations with regards to the re-vegetation of the newly completed / disturbed areas within aquatic environment, using selected species detailed in this report.* *- All alien plant re-growth, which is currently low within the greater region must be monitored and should it occur, these plants must be eradicated within the project footprints and especially in areas near the proposed crossings. Prosopis (alien invasive riparian tree) is prevalent in areas to the north of the site, thus care in transporting any material, while ensuring that such materials is free of alien seed, coupled with pre and post alien clearing must be stipulated in the EMPr.*
Comment on ratings	The ratings assume that the ECO/specialist that during the micro sitting process, that with the contractor the allowable work areas are pegged out, with the remaining areas be considered No-go. The contractor must provide a method statement to the ECO for each specific watercourse crossing once the allowable working areas are pegged. This method statement, coupled to a detailed pre-works photo record will form part of the ECO annexures and be audited.

No.	2	Alternative 1		
Project phase	**Construction, Operation & Decommissioning**			
Impact title	Impact on riparian systems through the possible increase in surface water runoff on downstream riparian form and function, due to impacts to the hydrological regime such as alteration of surface run-off patterns			
Impact description	*This could occur within the operational and decommissioning phases. When any of the hard or compacted surfaces (roads or substation areas) increase the volume and velocity of the surface runoff increases. This could impact the hydrological regime through the increase in flows that are concentrated in area, and as most plants are drought tolerant an increase in water will allow for other species to develop and outcompete typical plant species found within the region. This then affects the structure (i.e. larger taller grasses / shrubs / trees) and function (greater attenuation of flows, restricting any runoff from reaching downstream areas). The opposite can also happen. If flows are too concentrated with high velocities, scour and erosion results, with a complete reduction or disturbance of riparian habitat.*			
Impact Assessment	**Impact not mitigated**		**Impact mitigated**	
Nature	**Negative**		**Negative**	
Extent	**Local**	Extending across the site and to nearby settlements.	**Limited**	Limited to the site and its immediate surroundings.
Duration	**Medium term**	Impact will last between 1 and 5 years.	**Short term**	Impact will last less than 1 year.
Intensity	**Medium**	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are moderately altered.	**Low**	Impacts affect the environmental in such a way that natural, cultural and/or social functions and processes are slightly affected.
Magnitude	**Moderate - negative**		**Low - negative**	
Probability	**Likely (>66%)**	The impact may occur, but not necessarily proof that it will.	**Unlikely (>33%)**	The impacts occurrence is rare but has happened before.
Significance	**Moderate - negative**		**Minimal - negative**	
Importance	**High**	High	**Low**	Low
Consequence	**Moderately-detrimental**		**Very slightly-detrimental**	
Confidence	**Well established**		**Well established**	
Reversibility	**Medium**	The affected environment may only recover from the impact with significant intervention or over long time period.		
Mitigatability	**High**	Mitigation exists and will considerably reduce the significance of impacts.		

Potential mitigation	Mitigation measures to reduce residual risk or enhance opportunities: - Vegetation clearing should occur in in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment. - Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities - No stormwater runoff must be allowed to discharge directly into any water course along roads, and flows should thus be allowed to dissipate over a broad area covered by natural vegetation. - Stormwater in the switching substation must be managed using appropriate channels and swales when located within steep areas or have steep embankments
Comment on ratings	The ratings assume that the ECO/specialist that during the micro sitting process, that with the contractor the allowable work areas are pegged out, with the remaining areas be considered No-go. The contractor must provide a method statement to the ECO for each specific watercourse crossing once the allowable working areas are pegged. This method statement, coupled to a detailed pre-works photo record will form part of the ECO annexures and be audited.

No.	**3**	**Alternative**		
Project phase	**Construction, Operation & Decommissioning**			
Impact title	Increase in sedimentation and erosion within the development footprint			
Impact description	Impacts include changes to the hydrological regime such as alteration of surface run-off patterns, runoff velocities and or volumes which could occur during the construction, operational and decommissioning phases			
Impact Assessment	**Impact not mitigated**		**Impact mitigated**	
Nature	**Negative**		**Negative**	
Extent	**Local**	Extending across the site and to nearby settlements.	**Limited**	Limited to the site and its immediate surroundings.
Duration	**Medium term**	Impact will last between 1 and 5 years.	**Short term**	Impact will last less than 1 year.
Intensity	**Medium**	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are moderately altered.	**Low**	Impacts affect the environmental in such a way that natural, cultural and/or social functions and processes are slightly affected.
Magnitude	**Moderate - negative**		**Low - negative**	
Probability	**Likely (>66%)**	The impact may occur, but not necessarily proof that it will.	**Unlikely (>33%)**	The impacts occurrence is rare but has happened before.

Significance	**Moderate - negative**		**Minimal - negative**	
Importance	**High**	High	**Low**	Low
Consequence	**Moderately-detrimental**		**Very slightly-detrimental**	
Confidence	**Well established**		**Well established**	
Reversibility	**Medium**	The affected environment may only recover from the impact with significant intervention or over long time period.		
Mitigatability	**High**	Mitigation exists and will considerably reduce the significance of impacts.		
Potential mitigation	Mitigation measures to reduce residual risk or enhance opportunities: - Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments and reduce flow velocities. Any management actions must be dealt with in the Stormwater Management Plan (SWMP), forming part of any WULA.			
Comment on ratings	The ratings assume that the ECO/specialist that during the micro sitting process, that with the contractor the allowable work areas are pegged out, with the remaining areas be considered No-go. The contractor must provide a method statement to the ECO for each specific watercourse crossing once the allowable working areas are pegged. This method statement, coupled to a detailed pre-works photo record will form part of the ECO annexures and be audited.			

No.	**4**	**Alternative**		
Project phase	**Construction, Operation & Decommissioning**			
Impact title	Impact on localized surface water quality			
Impact description	During construction / decommissioning and to a limited degree the operational activities, chemical pollutants (hydrocarbons from equipment and vehicles, cleaning fluids, cement powder, wet cement, shutter-oil, etc.) associated with site-clearing machinery and construction activities could be washed downslope via the ephemeral systems			
Impact Assessment	**Impact not mitigated**		**Impact mitigated**	
Nature	**Negative**		**Negative**	
Extent	**Local**	Extending across the site and to nearby settlements.	**Limited**	Limited to the site and its immediate surroundings.
Duration	**Medium term**	Impact will last between 1 and 5 years.	**Short term**	Impact will last less than 1 year.
Intensity	**Medium**	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are moderately altered.	**Low**	Impacts affect the environmental in such a way that natural, cultural and/or social functions and processes are slightly affected.

Magnitude	**Moderate - negative**		**Low - negative**	
Probability	**Likely (>66%)**	The impact may occur, but not necessarily proof that it will.	**Unlikely (>33%)**	The impacts occurrence is rare but has happened before.
Significance	**Moderate - negative**		**Minimal - negative**	
Importance	**High**	High	**Low**	Low
Consequence	**Moderately-detrimental**		**Very slightly-detrimental**	
Confidence	**Well established**		**Well established**	
Reversibility	**Medium**	The affected environment may only recover from the impact with significant intervention or over long time period.		
Mitigatability	**High**	Mitigation exists and will considerably reduce the significance of impacts.		
Potential mitigation	Mitigation measures to reduce residual risk or enhance opportunities: - Strict use and management of all hazardous materials used on site in line with the specific material safety data sheets, e.g. fuels must be stored within a contained / bunded site with the necessary and spill kits available. - Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.). - Containment of all contaminated water by means of careful run-off management on the development site. - Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility. - Strict control over the behaviour of construction workers, with regard littering, use and storage of chemicals. - Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the Environmental Management Programme (EMPr) for the project and strictly enforced.			
Comment on ratings	The ratings assume that the ECO/specialist that during the micro sitting process, that with the contractor the allowable work areas are pegged out, with the remaining areas be considered No-go. The contractor must provide a method statement to the ECO for each specific watercourse crossing once the allowable working areas are pegged. This method statement, coupled to a detailed pre-works photo record will form part of the ECO annexures and be audited.			

No.	5	Alternative		
Project phase	**Construction, Operation & Decommissioning**			
Impact title	No-go alternative			
Impact description	The no-go alternative assumes that no change in land use or additional activities will occur and that the status quo will persist. This includes agricultural activities along with the impact of existing roads and or existing renewable facilities on the project boundary			
Impact Assessment	**Impact not mitigated**		**Impact mitigated**	
Nature	**Negative**		**Negative**	
Extent	**Local**	Extending across the site and to nearby settlements.		
Duration	**Medium term**	Impact will last between 1 and 5 years.		
Intensity	**Medium**	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are moderately altered.		
Magnitude	**Moderate - negative**			
Probability	**Likely (>66%)**	The impact may occur, but not necessarily proof that it will.		
Significance	**Moderate - negative**			
Importance	**High**	High		
Consequence	**Moderately-detrimental**			
Confidence	**Well established**			
Reversibility	*Select*			
Mitigatability	*Select*			
Potential mitigation	No mitigation measures will be implemented with the no-go alternative			
Comment on ratings	The ratings assume that the ECO/specialist that during the micro sitting process, that with the contractor the allowable work areas are pegged out, with the remaining areas be considered No-go. The contractor must provide a method statement to the ECO for each specific watercourse crossing once the allowable working areas are pegged. This method statement, coupled to a detailed pre-works photo record will form part of the ECO annexures and be audited.			

No.	6	Alternative		
Project phase	**Construction, Operation & Decommissioning**			
Impact title	Overall cumulative impact			
Impact description	In the assessment of this project, several projects have been assessed by the report author within a 35km radius have been reviewed and or sites accessed during the course of travelling between the various projects Of these potential projects, this report author has been involved in the initial EIA aquatic assessments or has managed / assisted with the WUL process for several of the projects. All of the projects have indicated that this is also their intention with regard mitigation, i.e. selecting the best possible routes to minimise the local and regional impacts and improving the drainage or hydrological conditions with these rivers the cumulative impact could be seen as a net benefit. However, the worse-case scenario has been assessed below, i.e. only the minimum of mitigation be implemented by the other projects, and that flows within these systems are sporadic. This is also coupled to fact the several existing transmission lines already occur within the region			
Impact Assessment	**Impact not mitigated**		**Impact mitigated**	
Nature	**Negative**		**Negative**	
Extent	**Local**	Extending across the site and to nearby settlements.	**Limited**	Limited to the site and its immediate surroundings.
Duration	**Medium term**	Impact will last between 1 and 5 years.	**Short term**	Impact will last less than 1 year.
Intensity	**Medium**	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are moderately altered.	**Low**	Impacts affect the environmental in such a way that natural, cultural and/or social functions and processes are slightly affected.
Magnitude	**Moderate - negative**		**Low - negative**	
Probability	**Likely (>66%)**	The impact may occur, but not necessarily proof that it will.	**Unlikely (>33%)**	The impacts occurrence is rare but has happened before.
Significance	**Moderate - negative**		**Minimal - negative**	
Importance	**High**	High	**Low**	Low
Consequence	**Moderately-detrimental**		**Very slightly-detrimental**	
Confidence	**Well established**		**Well established**	

Reversibility	**Medium**	The affected environment may only recover from the impact with significant intervention or over long time period.
Mitigatability	**High**	Mitigation exists and will considerably reduce the significance of impacts.
Potential mitigation	Mitigation measures to reduce residual risk or enhance opportunities by local land owners and or Provincial / District Roads organizations within the study area: - Improve the current stormwater and energy dissipation features not currently found along the tracks and roads within the region - Install properly sized culverts with erosion protection measures at the present road / track crossings	
Comment on ratings	The ratings assume that the ECO/specialist that during the micro sitting process, that with the contractor the allowable work areas are pegged out, with the remaining areas be considered No-go. The contractor must provide a method statement to the ECO for each specific watercourse crossing once the allowable working areas are pegged. This method statement, coupled to a detailed pre-works photo record will form part of the ECO annexures and be audited.	

9. Conclusion and Recommendations

The proposed alignment seems to have limited impact on the aquatic environment as for the most part the final placement of the towers could avoid the delineated wetlands and potentially span watercourses. It has however been assumed that due to the width of some of the broader alluvial systems, towers will need to be placed within these systems, but this would have little impact on these systems, especially if no new permanent access tracks are created within these areas.

Thus, based on the findings of this study there is no objection to the authorisation of any of the proposed activities.

Therefore, based on the site visit the significance of the impacts assessed for the aquatic systems after mitigation would be LOW. The ratings assume that the ECO/specialist that during the micro sitting process, that with the contractor the allowable work areas are pegged out, with the remaining areas be considered No-go. The contractor must provide a method statement to the ECO for each specific watercourse crossing once the allowable working areas are pegged. This method statement, coupled to a detailed pre-works photo record will form part of the ECO annexures and be audited.

Note the final number of actual water course crossings (i.e. towers within the alluvial water course and or within 500m of the wetland) can be determined when micro-siting occurs, as these would trigger the need for a Water Use License application (WULA). A potential General Application [GA] in terms of Section 21 (c) and (i) of the National Water Act (Act 36 of 1998) (NWA), should any construction take place within these areas will be required. Should any of the present road crossings need to be upgraded then the opportunity exists to improve the current state (lack of habitat continuity) for example by replacing pipe culverts with box culverts. **This opportunity to improve the hydrological conditions is a net benefit and has been assessed as part of the cumulative impact statement.**

As the proposed activities have the potential to create erosion the following recommendations are reiterated:

- Vegetation clearing should occur in in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment, and suitable dust and erosion control mitigation measures should be included in the EMP to mitigate.
- All construction materials including fuels and oil should be stored in demarcated areas that are contained within berms / bunds to avoid spread of any contamination / leaks. Washing and cleaning of equipment should also be done in berms or bunds, to trap any cement / hazardous substances and prevent excessive soil erosion. Mechanical plant and bowsers must not be refuelled or serviced within or directly adjacent to any channel. It is therefore suggested that all construction camps, lay down areas, batching plants or areas and any stores should be located more than 50 m from any demarcated watercourses.
- It is also advised that an Environmental Control Officer (ECO), with a good understanding of the local flora be appointed during the construction phase. The ECO should be able to make clear recommendations with regards to the re-vegetation of the newly completed / disturbed areas along aquatic features, using selected species detailed in this report.
- All alien plant re-growth must be monitored and should these alien plants reoccur these plants should be re-eradicated. The scale of the operation does however not warrant the use of a Landscape Architect and / or Landscape Contractor.
- It is further recommended from the project onset that all watercourse areas (inclusive of buffers) are included into the Final EMPr as reference, this to ensure a net benefit to the aquatic environment. This should form part of the civil contractor's pre-construction walkthrough with the ECO and aquatic specialist.

All watercourse crossings must be pegged out using droppers painted blue (top) and wrapped with danger tape.

10. References

Agenda 21 – Action plan for sustainable development of the Department of Environmental Affairs and Tourism (DEAT) 1998.

Agricultural Resources Act, 1983 (Act No. 43 of 1983).

Berliner D. and Desmet P. 2007. Eastern Cape Biodiversity Conservation Plan: Technical Report. Department of Water Affairs and Forestry Project No 2005-012, Pretoria. 1 August 2007.

Department of Water Affairs and Forestry - DWAF (2005). A practical field procedure for identification and delineation of wetland and riparian areas Edition 1. Department of Water Affairs and Forestry, Pretoria. Updated with amendments in 2007.

Germishuizen, G. and Meyer, N.L. (eds) (2003). Plants of southern Africa: an annotated checklist. Strelitzia 14, South African National Biodiversity Institute, Pretoria.

Holness, S & Oosthuysen, E. 2016. Northern Cape Critical Biodiversity Area map, SANBI BGIS.

Kleynhans C.J., Thirion C. and Moolman J. (2005). A Level 1 Ecoregion Classification System for South Africa, Lesotho and Swaziland. Report No. N/0000/00/REQ0104. Resource Quality Services, Department of Water Affairs and Forestry, Pretoria.

Macfarlane, D.M. & Bredin, I.P. 2017. Buffer Zone Guidelines for Rivers, Wetlands and Estuaries Buffer Zone Guidelines for Rivers, Wetlands and Estuaries. WRC Report No TT 715/1/17 Water Research Commission, Pretoria.

Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), as amended.

National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended.

National Water Act, 1998 (Act No. 36 of 1998), as amended

Nel, J.L., Murray, K.M., Maherry, A.M., Petersen, C.P., Roux, D.J., Driver, A., Hill, L., Van Deventer, H., Funke, N., Swartz, E.R., Smith-Adao, L.B., Mbona, N., Downsborough, L. and Nienaber, S. (2011). Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. K5/1801.

Pool-Stanvliet, R., Duffell-Canham, A., Pence, G. & Smart, R. 2017. The Western Cape Biodiversity Spatial Plan Handbook. Stellenbosch: CapeNature.

12. Appendix 1 - Specialist CV

CURRICULUM VITAE
Dr Brian Michael Colloty
7212215031083

1 Rossini Rd
Pari Park
Port Elizabeth, 6070
b.colloty@gmail.com
083 498 3299

Profession: Ecologist & Environmental Assessment Practitioner (Pr. Sci. Nat. 400268/07)
Member of the South African Wetland Society
Specialisation: Ecology and conservation importance rating of terrestrial habitats, wetlands, rivers & estuaries
Years experience: 25 years

SKILLS BASE AND CORE COMPETENCIES

- 25 years experience in environmental sensitivity and conservation assessment of aquatic and terrestrial systems inclusive of Index of Habitat Integrity (IHI), WET Tools, Riparian Vegetation Response Assessment Index (VEGRAI) for Reserve Determinations, estuarine and wetland delineation throughout Africa. Experience also includes biodiversity and ecological assessments with regard sensitive fauna and flora, within the marine, coastal and inland environments. Countries include Mozambique, Kenya, Namibia, Central African Republic, Zambia, Eritrea, Mauritius, Madagascar, Angola, Ghana, Guinea-Bissau and Sierra Leone. Current projects also span all nine provinces in South Africa.
- 15 years experience in the coordination and management of multi-disciplinary teams, such as specialist teams for small to large scale EIAs and environmental monitoring programmes, throughout Africa and inclusive of marine, coastal and inland systems. This includes project and budget management, specialist team management, client and stakeholder engagement and project reporting.
- GIS mapping and sensitivity analysis

TERTIARY EDUCATION

- 1994: B Sc Degree (Botany & Zoology) - NMU
- 1995: B Sc Hon (Zoology) - NMU
- 1996: M Sc (Botany - Rivers) - NMU
- 2000: Ph D (Botany – Estuaries & Mangroves) – NMU

EMPLOYMENT HISTORY

- 1996 – 2000 Researcher at Nelson Mandela University – SAB institute for Coastal Research & Management. Funded by the WRC to develop estuarine importance rating methods for South African Estuaries
- 2001 – January 2003 Training development officer AVK SA (reason for leaving – sought work back in the environmental field rather than engineering sector)
- February 2003- June 2005 Project manager & Ecologist for Strategic Environmental Focus (Pretoria) – (reason for leaving – sought work related more to experience in the coastal environment)
- July 2005 – June 2009 Principal Environmental Consultant Coastal & Environmental Services (reason for leaving – company restructuring)
- June 2009 – August 2018 Owner / Ecologist of Scherman Colloty & Associates cc
- August 2018 Owner / Ecologist - EnviroSci (Pty) Ltd

SELECTED RELEVANT PROJECT EXPERIENCE

World Bank IFC Standards

- Kenmare Mining Pilivilli, Mozambique - wetland (mangroves, peatlands and estuarine) assessment and biodiversity offset analysis - current
- Botswana South Africa 400kv transmission line (400km) biodiversity assessment on behalf of Aurecon - current
- Farim phosphate mine and port development, Guinea Bissau – biodiversity and estuarine assessment on behalf of Knight Piesold Canada – 2016.
- Tema LNG offshore pipeline EIA – marine and estuarine assessment for Quantum Power (2015).
- Colluli Potash South Boulder, Eritrea, SEIA marine baseline and hydrodynamic surveys co-ordinator and coastal vegetation specialist (coastal lagoon and marine) (on-going).
- Wetland, estuarine and riverine assessment for Addax Biofeuls Sierra Leone, Makeni for Coastal & Environmental Services: 2009
- ESHIA Project manager and long-term marine monitoring phase coordinator with regards the dredge works required in Luanda bay, Angola. Monitoring included water quality and biological changes in the bay and at the offshore disposal outfall site, 2005-2011

South African

- Plant and animal search and rescue for the Karusa, Soetwater, Nxuba, Oyster Bay and Garob Wind Farms on behalf of Enel Green Power, 2018 - 2019
- Plant and Animal Search and Rescue for the Port of Ngqura, Transnet Landside infrastructure Project, with development and management of on site nursery (Current).
- Plant and Animal Search and Rescue for the Port of Ngqura, OTGC Tank Farm Project (2019)
- Plant search and rescue, for NMBM (Driftsands sewer, Glen Hurd Drive), Department of Social Development (Military veterans housing, Despatch) and Nxuba Wind Farm, - current
- Wetland specialist appointed to update the Eastern Cape Biodiversity Conservation Plan, for the Province on behalf of EOH CES appointment by SANBI – current. This includes updating the National Wetland Inventory for the province, submitting the new data to CSIR/SANBI.
- CDC IDZ Alien eradication plans for three renewable projects Coega Wind Farm, Sonop Wind Farm and Coega PV, on behalf of JG Afrika (2016 – 2017).
- Nelson Mandela Bay Municipality Baakens River Integrated Wetland Assessment (Inclusive of Rehabilitation and Monitoring Plans) for CEN IEM Unit - Current
- Rangers Biomass Gasification Project (Uitenhage), biodiversity and wetland assessment and wetland rehabilitation / monitoring plans for CEM IEM Unit – current.
- Gibson Bay Wind Farm implementation of the wetland management plan during the construction and operation of the wind farm (includes surface / groundwater as well wetland rehabilitation & monitoring plan) on behalf of Enel Green Power - current
- Gibson Bay Wind Farm 133kV Transmission Line wetland management plan during the construction of the transmission line (includes wetland rehabilitation & monitoring plan) on behalf of Eskom – 2016.
- Tsitsikamma Community Wind Farm implementation of the wetland management plan during the construction of the wind farm (includes surface / biomonitoring, as well wetland rehabilitation & monitoring plan) on behalf of Cennergi – completed May 2016.
- Alicedale bulk sewer pipeline for Cacadu District, wetland and water quality assessment, 2016
- Mogalakwena 33kv transmission line in the Limpopo Province, on behlaf of Aurecon, 2016
- Cape St Francis WWTW expansion wetland and passive treatment system for the Kouga Municipality, 2015
- Macindane bulk water and sewer pipelines wetland and wetland rehabilitation plan 2015
- Eskom Prieska to Copperton 132kV transmission line aquatic assessment, Northern Cape on behalf of Savannah Environmental 2015.
- Joe Slovo sewer pipeline upgrade wetland assessment for Nelson Mandela Bay Municipality 2014
- Cape Recife Waste Water Treatment Works expansion and pipeline aquatic assessment for Nelson Mandela Bay Municipality 2013
- Pola park bulk sewer line upgrade aquatic assessment for Nelson Mandela Bay Municipality 2013
- Transnet Freight Rail – Swazi Rail Link (Current) wetland and ecological assessment on behalf of Aurecon for the proposed rail upgrade from Ermelo to Richards Bay
- Eskom Transmission wetland and ecological assessment for the proposed transmission line between Pietermaritzburg and Richards Bay on behalf of Aurecon (2012).
- Port Durnford Exarro Sands biodiversity assessment for the proposed mineral sands mine on behalf of Exxaro (2009)
- Fairbreeze Mine Exxaro (Mtunzini) wetland assessment on behalf of Strategic Environmental Services (2007).
- Wetland assessment for Richards Bay Minerals (2013) – Zulti North haul road on behalf of RBM.
- Biodiversity and aquatic assessments for 101 renewable projects in the past 8 years in the Western, Eastern, Northern Cape, KwaZulu-Natal and Free State provinces. Clients included RES-SA, Red Cap, ACED Renewables, Mainstream Renewable, GDF Suez, Globeleq, ENEL, Abengoa amongst others. Particular aquatic sensitivity assessment and Water Use License Applications on behalf of Mainstream Renewable Energy (8 wind farms and 3 PV facilities.), Cennergi / Exxaro (2 Wind farms), WKN Wind current (2 wind farms & 2 PV facilities), ACED (6 wind farms) and Windlab (3 Wind farms) were also conducted. Several of these projects also required the assessment of the proposed transmission lines and switching stations, which were conducted on behalf of Eskom.
- Vegetation assessments on the Great Brak rivers for Department of Water and Sanitation, 2006 and the Gouritz Water Management Area (2014)
- Proposed FibreCo fibre optic cable vegetation assessment along the PE to George, George to Graaf Reinet, PE to Colesburg, and East London to Bloemfontein on behalf of SRK (2013-2015).

Appendix 2 - Site Sensitivity Verification Report

Site verification report – Aquatic Ecology

Government Notice No. 645, dated 10 May 2019, includes the requirement that an Initial Site Sensitivity Verification Report must be produced for a development footprint. As per Part 1, Section 2.3, the outcome of the Initial Site Verification must be recorded in the form of a report that-

(a) Confirms or disputes the current use of the land and environmental sensitivity as identified by the national web based environmental screening tool;
(b) Contains a motivation and evidence of either the verified or different use of the land and environmental sensitivity;
(c) Is submitted together with the relevant reports prepared in accordance with the requirements of the Environmental Impact Assessment Regulations.

This report has been produced specifically to consider the aquatic ecology theme and addresses the content requirements of (a) and (b) above. The report will be appended to the respective specialist study included in the Basic Assessment Report produced for the project.

Site sensitivity based on the aquatic biodiversity theme included in the Screening Tool and specialist assessment

Based on the DFFE Screening Tool, the Grid Connection falls within an area of very high sensitivity (Figure 1).

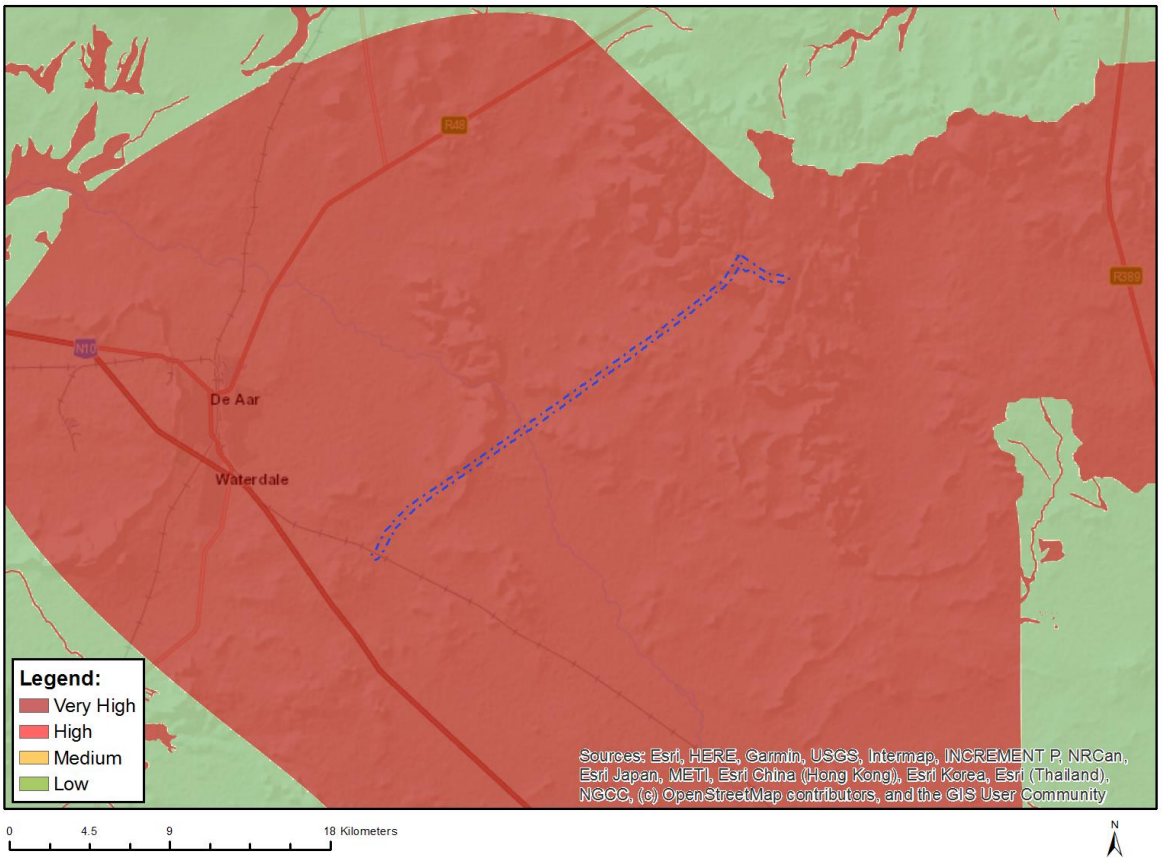


Figure 1. DFFE Screening Tool outcome for the aquatic biodiversity theme for the Grid Connection

Based on the above outcomes, the specialist **agrees** the environmental sensitivities identified on site. However, disputes the exact extent of the systems, as the Screening Tool shows a catchment wide representation of the aquatic waterbodies that were rated as sensitive.

The specialist findings were informed by a site visits undertaken by Dr Brian Colloty over the course of several years. The photo plates below shows the various aquatic features present on site. This information was then compared to current wetland inventories, 1: 50 000 topocadastral surveys mapping and the site. A baseline map was then developed which was refined, noting that due to the complex of the topography and geology, some of the river lines were digitised at a scale of 1:2000.

Plate 1: A view of a typical riverine floodplain, dominated by *Vachellia karroo*

Plate 2: A view of channelled valley bottom wetland colonised by *Juncus rigidus* more than 1 km from any of the proposed corridors

Plate 3: Unchanneled valley bottom wetland, dominated by *Juncus rigidus* sedge within 500m of the transmission line corridor

Plate 4: Several man made dams are located within the study area and are not considered wetland areas

Figure 3 below shows the sensitivity map produced following the desktop assessment as well as a groundtruthing exercises. The PES of a river, watercourse or wetland represents the extent to which it has changed from the reference or near pristine condition (Category A) towards a highly impacted system where there has been an extensive loss of natural habit and biota, as well as ecosystem functioning (Category E).

The Present Ecological State scores (PES) for the main watercourses in the study area were rated as follows (DHSWS, 2014 – where B = Largely Natural and C = Moderately Modified):

Subquaternary Catchment Number	Present Ecological State	Ecological Importance	Ecological Sensitivity
5332	B	Low	Low
5391	C	Moderate	Low

These scores were substantiated by observations made in the field within the study area, and due to the overall lack of impacts or disturbance these scores for each of the watercourses within the site should be upheld. This was further substantiated by the inclusion of study area catchments into Critical Biodiversity Areas (Type 1 and 2), i.e. the wetland areas near the alignment crossing the Brak River in particular and Ecological Support Area as shown in the Northern Cape CBA MAP spatial data and Wetland Clusters (Figure 7 & 8).

Figure 2. Environmental sensitivity map produced by the aquatic specialist

Motivation of the outcomes of the sensitivity map and key conclusions

In conclusion, the DFFE Screening Tool identified one sensitivity rating within the development footprint, namely, very high.

Although there is some overlap with the findings on site and the Screening Tool's outcome, the development footprint contains various sensitivities (very high and low) that were identified following the undertaking of several site visits and spatial input considerations.

The environmental sensitivity input received from the aquatic ecology specialist has been taken forward and considered within the formal EA process and the impact to these areas assessed. Appropriate layout and development restrictions will be implemented within the development footprint to ensure that the impact to aquatic ecology is deemed acceptable by the aquatic ecologist.