FINAL BASIC ASSESSMENT REPORT

Basic Assessment for the proposed development of the up to 100 MW Padloper Solar PV Facility 6 (i.e., Padloper PV 6), the proposed development of 132 kV Electrical Grid Infrastructure between the proposed Padloper PV 4 and the proposed Padloper PV 6 (i.e., Padloper EGI 6), and their associated infrastructure, near Murraysburg in the Western Cape Province

APPENDIX D.5:
Aquatic Biodiversity and Species



AQUATIC BIODIVERSITY IMPACT ASSESSMENT:

Basic Assessment for the Proposed Development of the Four 150 MW to 250 MW Padloper PV Facilities 1 – 4, and their Associated Infrastructure, near Murraysburg in the Western Cape and Northern Cape provinces

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Executive Summary

African Clean Energy Developments (Pty) Ltd (Pty) Ltd (ACED) appointed EnviroSci (Pty) Ltd (EnviroSci) to conduct an aquatic assessment for the proposed Padloper Solar Photovoltaic (PV) Cluster, near Murraysburg located in the Northern and Western Cape provinces.

The Project Applicant, Padloper PV (Pty) Ltd (hereinafter referred to as "Padloper PV" or "the Applicant")[1], is proposing the development of 7 x solar PV facilities with a capacity of between 100 and 250 MW each, and the associated 7 x 132 kV overhead power lines, and their associated infrastructure. Each solar PV facility will have a range of associated infrastructure, including, but not limited to, an on-site substation and Battery Energy Storage System (BESS) complex and will connect to the authorised Ishwati Emoyeni Collector Substation via associated 132 kV overhead power lines. This study assesses the Padloper PV 1, PV 2, PV 3 and PV 4 facility projects sites, while the respective grid connections from the relevant switching-stations to the Ishwati Emoyeni Collector Substation are assessed in a separate report.

The findings of this report are based on the Aquatic Ecological Screening Assessment, supported by baseline data collected during detailed site visits in February and March 2022 (summer). Additional information collected by EnviroSci in 2022/2023 for other renewable energy projects surrounding Murraysburg, which included several detailed walkdowns for adjacent facilities and/ or grid connections that will use the same corridor to the Ishwati Emoyeni Collector Substation, supplemented the information collected for this report. Thus, this assessment is based both winter and summer seasonal data for the area.

The regulatory requirements are also discussed with regards to the National Water Act (NWA, Act No. 36 of 1998) and National Environmental Management Act (NEMA, Act No. 107 of 1998) in Section 4 of this report, as well as the *Protocol for the specialist assessment and minimum report content requirements for environmental impacts on aquatic biodiversity*. Although these protocols supersede the Appendix 6 NEMA requirements, they are also taken into account. This report thus meets the criteria to fulfil a Specialist Verification Assessment Report as the proposed development sites do intersect areas rated as Very High aquatic sensitivity by the Department of Forestry, Fisheries and Environment (DFFE) Screening Tool (see Screening Verification Statement – Appendix 2), and is related to a variety of habitats observed during onsite field investigations, associated with rivers and National Ecosystem Priority Areas (NFEPA).

The study area (i.e., the area in which the 4 PV study sites are located) is situated predominantly within the Eastern Upper Karoo (NKu 4) and Southern Karoo Riviere vegetation units, associated with the mainstem systems of the Synderskraal / Bakensklip / Buffels rivers. The study area forms part of the upper catchment of the Groot / Gamtoos river systems near Jefferey's Bay.

Current waterbody inventories (van Deventer *et al*., 2020), 1: 50 000 topocadastral surveys mapping indicated the potential for several wetlands within the greater study region. These inventories include wetland spatial data based on landcover 2007 data, previous assessments and wetland information retained by the Provincial authorities, combined into one database that formed part of the updated National Spatial Biodiversity Assessment, 2018.

A baseline map was then developed and refined using the 2022 survey data, noting that due to the complex nature of the topography and geology, the features were digitised at a scale of 1:5 000, which included several more wetland areas associated with riverine floodplains previously indicated in the national assessments.

This, coupled to the aquatic delineations, preliminary information was collected on potential species that could occur within the watercourses, especially any conservation worthy species (Listed or Protected).

[1]Padloper Solar (Pty) Ltd is the Project Applicant, whereas African Clean Energy Developments (Pty) Ltd (ACED) is the Project Developer.

Using the baseline description and field data, while considering the current disturbances and site characteristics, several ecological features were identified, then categorised into one of a number pre-determined sensitivity categories to provide protection and/ or guide the layout planning and design processes.

The sensitivity ratings of High (No-Go) to Low were determined through an assessment of the habitat sensitivity and related constraints. However, these No-Go areas (with buffers) relate in general terms to the project and there are areas where encroachment on these areas could occur (i.e., existing road crossings within systems) and is considered acceptable since these areas have already been impacted.

These proposed constraints / buffers do not include bird and or bat specialist buffers / constraints as theirs buffers along aquatic features are at times far larger around aquatic features, than those required for the known aquatic species within this region and are summarised below:

Development Component	Habitat Type	Sensitivity Rating of the Respective Habitat Type	Development Acceptability	Sensitivity Rating Override [2]
PV Panel Areas	Alluvial rivers / washes with or without riparian vegetation	High	No	A single-axis pole array could pose a limited physical impact to the open alluvial areas (sandy) with no riparian vegetation in the operational phase, coupled to the final design of any of the associated access routes to these areas needs will need to be assessed in the post authorisation walkdown phase.
	Minor watercourses/drainage lines	Moderate - Low	No	Yes
	Remainder of site	Low	Yes	N/A
Buildings / Substations and BESS	Alluvial rivers / washes with or without riparian vegetation	High	No	None
	Minor watercourses / drainage lines	Moderate - Low	No	None
	Remainder of site	Low	Yes	N/A
Roads	Alluvial rivers / washes with or without riparian vegetation	High	Yes with override	Yes if existing track or road is used.
	Minor watercourses / drainage lines	Moderate - Low	Yes	N/A
	Remainder of site	Low	Yes	N/A

In summary, structures such as buildings, substations and Battery Energy Storage Systems (BESS), should be placed outside of the High Sensitivity habitats, while remaining structures (PV panels and roads) could cross or span the Moderate / Low Sensitivity areas. Noting that Low Sensitivity can also = Moderate Sensitivity areas but with existing impacts e.g., current roads and farm tracks within previously disturbed areas.

[2] **Should an impact such as a road or disturbance already occur within the proposed footprint and confirmed during a site walkdown process and / or a technical solution can be provided that would not impact on the form or function of the habitat in question, then sensitivity rating for that habitat against the activity can be overridden.**

Several potential issues, risks and related impacts are summarised below and then discussed in more detail in Section 7 of this report. However all the impacts assessed were found to be similar for all the projects and are relevant to the proposed Padloper PV Facilities 1 - 4 as listed below. This is largely since the proposed layouts have avoided Very High Sensitivity / No go areas identified in this assessment as a means of impact avoidance rather than rely of the implementation of impact mitigation measures and management actions to ameliorate negative impacts.

Construction Phase

- Potential impact 1: Loss of species of special concern (SSC).
- Potential impact 2: Damage or loss of riparian and wetlands systems and disturbance of the waterbodies.
- Potential impact 3: Spills and leaks from construction vehicles / machinery when working in or near the delineated systems, impacting localised surface water quality.

Operational and Maintenance Phase

- Potential impact 4: Creation of hard surfaces, resulting in runoff, erosion and sedimentation.

Decommissioning Phase

- Potential impact 5: Damage or loss of riparian and wetlands systems and disturbance of the waterbodies.
- Potential impact 6: Spills and leaks from construction vehicles / machinery when working in or near the delineated systems, impacting localised surface water quality.

Cumulative Impacts

- Cumulative impact 7: The cumulative assessment considers the various proposed renewable projects that occur within a 30 km radius of this site and their associated grid connections as well as the remainder of the Padloper cluster projects.

The nature of projects is such that they carry a low intensity impact on aquatic resources. The developer of the Padloper PV 1 - 4 targeted the higher lying areas where solar resources are best (which is typical in this environment), thus keeping the PV panel areas and associated infrastructure away from freshwater resources for the most part. However, the associated main access roads must cross the site, and these come into more frequent contact with the drainage lines and associated features.

The PV facility projects also have small footprint when compared to the remaining farm portions, thus allowing for retention of much of the natural area, so the ecosystems should remain largely unaffected. This is largely based on the assumption that all sensitivity aquatic habitats will be avoided, using the existing tracks and roads, as shown in this assessment report.

In conclusion, the anticipated impacts within the aquatic systems include disturbance during the construction phase, while changes to form and function of the site due to increased runoff even from rainfall would occur in the operational and maintenance (O&M) phase, however these would be **Very Low** post mitigation. This is because although some of the roads will need to cross several drainage lines / watercourses, the areas selected already contain impacts such as existing tracks / roads with crossings that may be upgraded, while the PV panel areas have avoided these systems. This in turn has also allowed for the avoidance of any Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) linked to the aquatic ecosystems.

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List of Abbreviations

BA	Basic Assessment
BESS	Battery Energy Storage System
BI	Biodiversity Importance
BID	Background Information Document
CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Area
CI	Conservation Importance
CSIR	Council for Scientific and Industrial Research
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and Environment
DWAF	Department of Water Affairs and Forestry, now DWS
DWS	Department of Water and Sanitation, formerly the Department of Water Affairs (DWA)
EA	Environmental Authorisation
ECO	Environmental Control Officer
EGI	Electrical Grid Infrastructure
EI	Ecological Importance
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Plan/Programme Report
EO	Environmental Officer (Site)
ES	Ecological Sensitivity
ESA	Ecological Support Area
EWR	Ecological Water Requirements
FBIS	Freshwater Biodiversity Information System
FEPA	Freshwater Ecosystem Priority Area
FI	Functional Integrity
GA	General Authorisation (Water Use Authorisation [WUA] type)
GIS	Geographic Information System
HGM	Hydrogeomorphic
IBA	International Bird Area
IHI	Integrated Habitat Index
IUCN	International Union of Conservation of Nature
NAEHMM	National Aquatic Ecosystem Health Monitoring Programme
NAEMP	National Aquatic Ecological Monitoring Program
NBA	National Biodiversity Assessment, 2018 also referred to as the National Biodiversity Assessment, 2018
NCBSBP	Northern Cape Biodiversity Spatial Plan
NCNCA	Northern Cape Nature Conservation Act No. 9 of 2009, amended 2012
NEM:BA	National Environmental Management: Biodiversity Act No. 10 of 2004
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NFEPA	National Freshwater Ecosystem Priority Atlas (Nel *et al*., 2011)
NWCS	National Wetland Classification System
O&M	Operations and Maintenance
OHL	Overhead Line – transmission line cable that is not buried
PA	Protected Area
PES	Present Ecological State
PPE	Personal Protective Equipment
PV	Photovoltaic
REC	Recommended Ecological Category
RHP	River Health Programme
RR	Receptor Resilience
RTU	Recognisable Taxonomic Unit
SAIIAE	South African Inventory of Inland Aquatic Ecosystems
SANBI	South African National Biodiversity Institute
SAPAD	South African Protected Areas Database
SCC	Species of Special Concern
SEI	Sensitivity and Ecological Importance
SQ	Subquaternary Catchment
SWMP	Stormwater Management Plan
ToR	Terms of Reference
VEGMAP	National Biodiversity Assessment 2018 Vegetation
WCBSP	Western Cape Biodiversity Spatial Plan
WRC	Water Research Commission
WUA	Water Use Authorisation
WUL	Water Use License
WULA	Water Use License Application

Glossary

For reference the following definitions apply:

- **Drainage line**: Lower category or order of watercourse that does not have a clearly defined bed or bank. It carries water only during or immediately after periods of heavy rainfall i.e. non-perennial, and riparian vegetation may not be present.

- **Perennial and non-perennial:** Perennial systems contain flow or standing water for all or a large proportion of any given year, while non-perennial systems are episodic or ephemeral and thus contain flows for short periods, such as a few hours or days in the case of drainage lines.

- **Riparian**: The area of land adjacent to a stream or river that is influenced by stream-induced or related processes. Riparian areas which are saturated or flooded for prolonged periods would be considered wetlands and could be described as riparian wetlands. However, some riparian areas are not wetlands, for example an area where alluvium is periodically deposited by a stream during floods but which is well drained.

- **Wetland**: 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 under normal circumstances supports or would support vegetation typically adapted to life in saturated soil (NWA, Act No. 36 of 1998); land where an excess of water is the dominant factor determining the nature of the soil development and the types of plants and animals living at the soil surface (Cowardin *et al*., 1979).

- **Water course**: As per the NWA means -

  (a) a river or spring;

  (b) a natural channel in which water flows regularly or intermittently;

  (c) a wetland, lake or dam into which, or from which, water flows; and

  (d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

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Figure 1: The study area in relation to the general environment.

[3] Padloper PV (Pty) Ltd is the Project Applicant, whereas African Clean Energy Developments (Pty) Ltd (ACED) is the Project Developer.

1. Introduction

1.1. Scope, Purpose and Objectives of this Specialist Report

The aim of this report is to provide a summary of the aquatic baseline and identify, discuss and assess the potential impacts that may arise should the projects (i.e. the proposed Padloper PV Facilities 1 – 4) be authorised. The report also makes recommendations with regards to management and mitigation, to further reduce, avoid or mitigate the potential impacts, and ultimately ensure the responsible and sustainable use of South Africa's aquatic resources. This report, in part, aims to provide the Competent Authority (Department of Forestry, Fisheries and Environment - DFFE) with sufficient information regarding the project's impacts on aquatic resources to inform responsible decision-making.

Certain aspects of the development, such as river crossings or any activities within 500 m of a wetland, will trigger the need for Section 21 Water Use License Applications (WULAs) or General Authorisation (GA) applications in terms of the National Water Act (Act No. 36 of 1998) (NWA).

Information regarding the state and function of the observed water bodies, including suitable no-go buffers areas and assessment of the potential direct and cumulative impact, where relevant, are also provided.

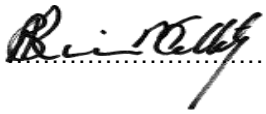
1.2. Details of Specialist

This report has been prepared as per the requirements of the Environmental Impact Assessment Regulations and the National Environmental Management Act (NEMA; Act No. 107 of 1998), any subsequent amendments and any relevant National and / or Provincial Policies related to biodiversity assessments. This also includes the minimum requirements as stipulated in the National Water Act (Act No. 36 of 1998), as amended in Water Use Licence Application and Appeals Regulations, 2017 Government Notice R267 in Government Gazette 40713 dated 24 March 2017, which includes the minimum requirements for a Wetland Delineation/ Aquatic Report.

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Expertise / Field of Study: BSc (Hons) Zoology, MSc Botany (Rivers), PhD Botany Conservation Importance rating, and has worked as an independent consulting specialist 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 Department of Forestry, Fisheries and Environment (DFFE) and or the Department of Water and Sanitation (DWS).

Signed:…  Date:…3 September 2023……

1.3. Terms of Reference

The methodology used in this assessment was developed with the renewable industry in mind, coupled with the minimum requirements stipulated by DFFE (in terms of the *Protocol for the specialist assessment and minimum report content requirements for environmental impacts on aquatic biodiversity*) and the DWS (in terms of the National Water Act No. 36 of 1998, as amended). The methodology has been successful in assessing the direct, indirect and cumulative impacts of 185 proposed renewable energy projects between 2010 and 2023, of which 20 projects have been constructed:

The ToR prescribed that the surface water and aquatic biodiversity study included the following:

- Desktop analysis
- Site investigation
- Compilation of one draft and one final report for the proposed project which adheres to, but is not limited to, the following:
    - Initial Site Sensitivity Verification reporting requirements for environmental themes set out in Government Gazette No. 43110 which was promulgated on 20 March 2020 in terms of section 24(5)(a) and (h) of the NEMA, Act No. 107 of 1998.
    - Identification and mapping of any discrepancies with the environmental sensitivity as identified on the national web based environmental screening tool.
    - Identification of sensitive areas to be avoided (including corresponding spatial data) and the determination of the respective buffers (if applicable) for each of the proposed development sites.
    - Recommendations for the layout and allowable development footprint from a surface water and aquatic biodiversity perspective (including corresponding spatial data).
    - Provision of a list of potentially significant environmental impacts that may arise in the construction, operation and decommissioning phases of the project, including cumulative impacts.
    - A detailed impact assessment of each impact including:
        - A pre-mitigation and post-mitigation impact assessment
        - A list of essential mitigation measures and management interventions
    - A summary table of all the impacts to show the post-mitigation significance ratings.
    - Recommendations regarding the areas to be utilised for solar technologies within the proposed project development sites from a biodiversity perspective (including corresponding spatial data).

2. Approach and Methodology

This aquatic assessment 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 area's aquatic systems, applicable to the specific environment. They were used in a clear and objective manner, to identify and assess the potential impacts associated with the proposed development sites based on information collected within the relevant farm portions.

Current water resource classification systems make use of the Hydrogeomorphic (HGM) approach, and for this reason, the National Wetland Classification System (NWCS) approach was used in this study. It is important to understand the legal definition of a wetland, the means of assessing wetland conservation and importance and the relevant legislation aimed at 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.

For reference the following definitions apply:

- **Drainage line**: Lower category or order of watercourse that does not have a clearly defined bed or bank. It carries water only during or immediately after periods of heavy rainfall i.e. non-perennial, and riparian vegetation may not be present.

- **Perennial and non-perennial:** Perennial systems contain flow or standing water for all or a large proportion of any given year, while non-perennial systems are episodic or ephemeral and thus contain flows for short periods, such as a few hours or days in the case of drainage lines.

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- **Wetland**: 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 under normal circumstances supports or would support vegetation typically adapted to life in saturated soil (NWA, Act No. 36 of 1998); land where an excess of water is the dominant factor determining the nature of the soil development and the types of plants and animals living at the soil surface (Cowardin *et al*., 1979).

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    - a river or spring;
    - a natural channel in which water flows regularly or intermittently;
    - a wetland, lake or dam into which, or from which, water flows; and
    - any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

Waterbody classification systems

Since the late 1960s, wetland classification systems have undergone a series of international and national revisions. 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 NWCS (Ollis *et al*., 2013). This system comprises a hierarchical classification process of defining a wetland based on the principles of the 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 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 this 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. 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 DWS. The Ecological Reserve of a wetland or river is used by DWS to assess the water resource allocations when assessing WULAs.

The NWCS 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 present 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 or any other activity that qualifies as a water use.

Ecological Water Requirement: 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 Ecological Water Requirement (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: Geographic regions that have been delineated in a top-down manner on the basis of physical/abiotic factors. 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 and Forestry (DWAF, now DWS) 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.

Wetland definition

Although NWCS (Ollis *et al*., 2013) was used to classify aquatic habitat types, but 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 they 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 NWA (Act No. 36 of 1998), 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 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 NWCS, the NWA and ecosystems included in DWAF's delineation manual (2005).

Ecosystem	National Wetland Classification System (NWCS)	National Water Act (NWA)	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 NWA, they are included as a 'watercourse' in terms of the Act.

[2] According to the NWA 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 delineation manual (2005).

National Wetland Classification System method

Due to the nature of the wetlands and watercourses observed, it was determined that the newly accepted NWCS should 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 and 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); and
- 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 HGM units discussed earlier. These 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; and
- 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 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 Levels 1 – 5 deal with functional aspects, while Level 6 classifies wetlands on structural aspects.

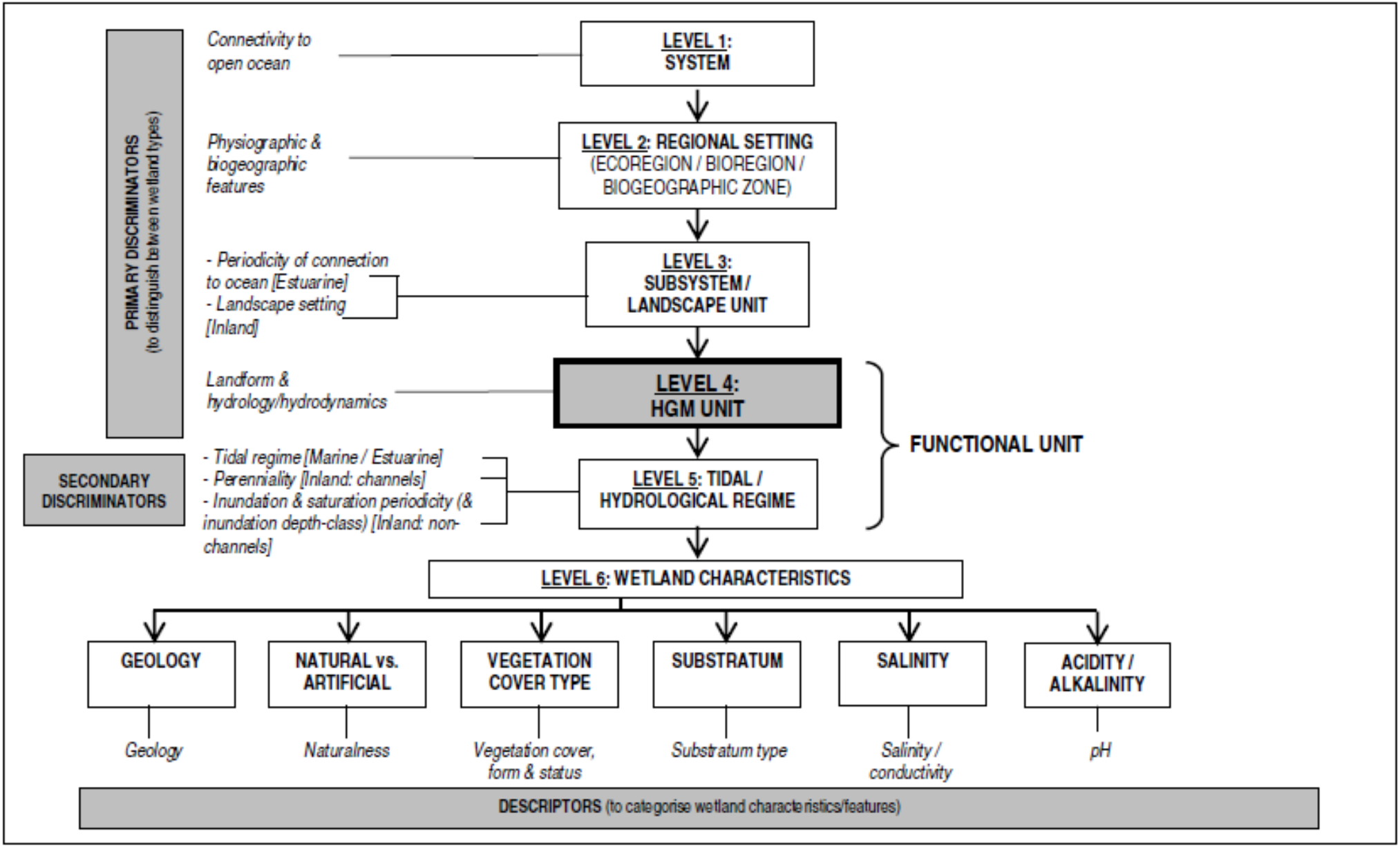


Figure 2: Basic structure of the National Wetland Classification System (NWCS), showing how 'primary discriminators' are applied up to Level 4 to classify Hydrogeomorphic (HGM) Units, with 'secondary discriminators' applied at Level 5 to classify the tidal/hydrological regime, and 'descriptors' applied.

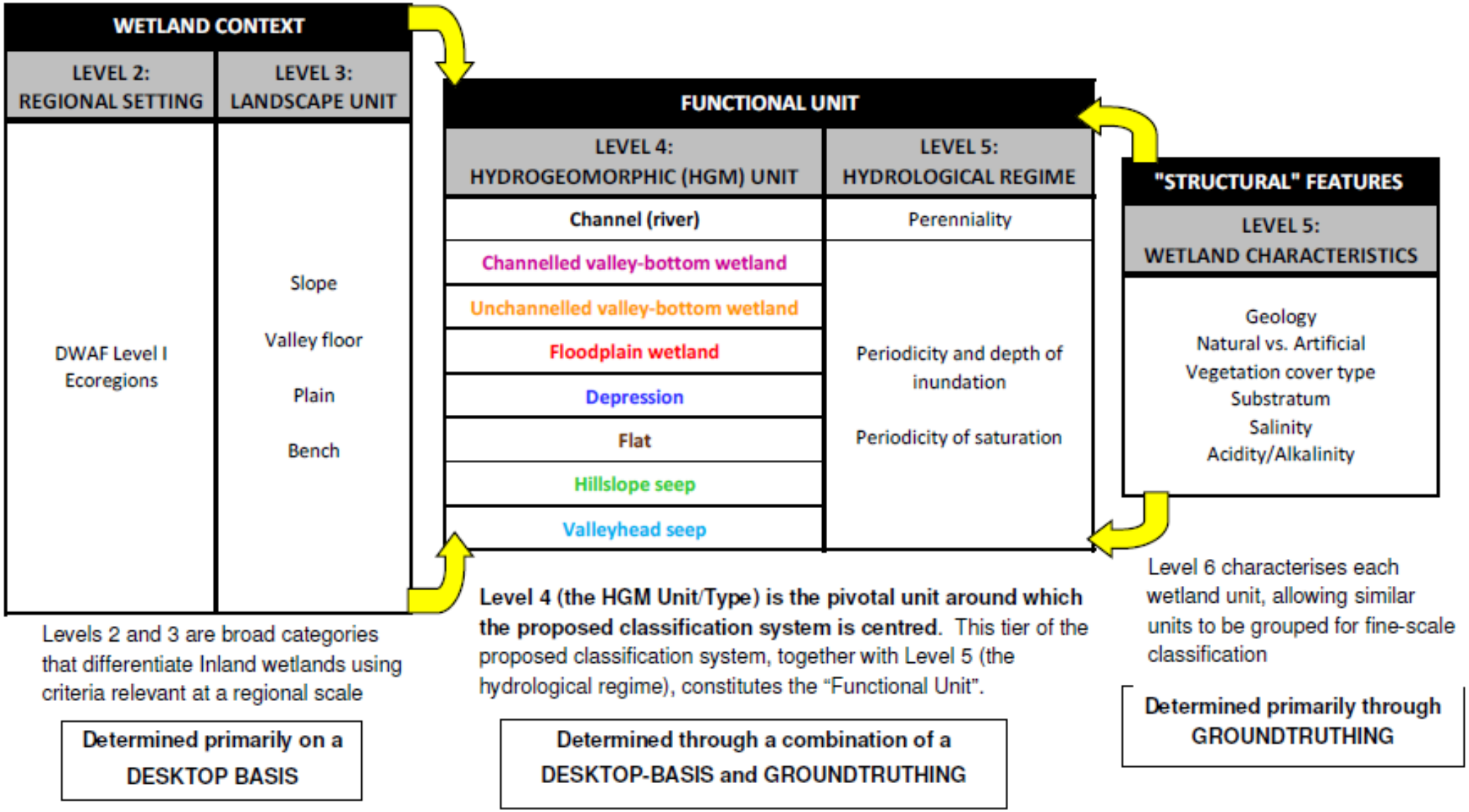


Figure 3: Illustration of the conceptual relationship of Hydrogeomorphic (HGM Units) (at Level 4) with higher and lower levels (relative sizes of the boxes show the increasing spatial resolution and level of detail from the higher to the lower levels) for Inland Systems (Ollis *et al*., 2013).

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 3) 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 (Water Research Commission (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.

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 (SANBI), a requirement under the National Environmental Management: Biodiversity Act (NEM:BA, 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.

2.1. Information Sources

Table 4: Key information sources used to conduct this assessment.

Data / Information	Source	Date	Type	Description
South African National Protected Areas Database (SAPAD)	Department of Environmental Affairs	2020, Q2	Spatial data	Spatial delineation of protected areas in South Africa. Updated quarterly
Western Cape Biodiversity Spatial Plan (WCBSP)	Pool-Stanvliet, R., Duffell-Canham, A., Pence, G. and Smart, R. CapeNature / SANBI	2017	Report and Spatial data	Spatial conservation planning units and associated management recommendations for the best land use options
National Biodiversity Assessment (NBA)	South African National Biodiversity Institute (SANBI)	2018	Report and Spatial data	Latest assessment of South African biodiversity and ecosystems, including, vegetation types, wetlands and rivers
Review of available data for a South African Inventory of Inland Aquatic Ecosystems (SAIIAE). Water SA 44 (2) 184-199	van Deventer H., Smith-Adao, L. Petersen C., Mbona N., Skowno A. and Nel, J.L.	2018	Report	Assessment of available spatial data regards aquatic ecosystems
Technical Report for the National Freshwater Ecosystem Priority Areas (NFEPA) project. WRC Report No. K5/1801.	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	Report	NFEPA
FrogMAP. 2019.	Animal Demography Unit. Accessed from http://frogmap.adu.org.za/?sp=400; on 2020-10-09	2020	Spatial data	Frog distribution map
Freshwater Biodiversity Information System (FBIS)	Freshwater Biodiversity Information System (FBIS). 2022. Downloaded from https://freshwaterbiodiversity.org accessed on 15 June 2023	2022	Species distribution data	Freshwater species distribution data
Northern Cape Biodiversity Plan	Holness & Oosthuizen	2017	Spatial data	Spatial conservation planning units and associated management recommendations for the best land use options

The reference list at the end of this report (Section 12) also includes various sources of literature with regards to the assessment of birds and amphibia associated with aquatic systems.

2.2. Assumptions, Knowledge Gaps and Limitations

To obtain a comprehensive understanding of the dynamics of both the flora and fauna of 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. However, due to time constraints these long-term studies are not feasible, and the assessment is thus mostly based on instantaneous sampling. This limitation is common to many impact assessment type studies, but the findings are deemed adequate for the purposes of decision-making support regarding the projects acceptability. Unless otherwise stated, the confidence in the level of assessment remains high.

Therefore, due to the scope of the work presented in this report, a long-term investigation of the proposed sites was not possible and as such not perceived as part of the Terms of Reference (ToR). However, a concerted effort was made to sample and assess as much of the potential sites, as well as make use of any supporting literature, species distribution data and aerial photography.

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.

2.3. Consultation Processes Undertaken

Comment was received during the pre-application phase (i.e., following the release of the Background Information Document - BID) with regards to the aquatic environments and has been integrated into this assessment with reference to the Provincial Biodiversity Spatial Plans.

3. Description of Project Aspects relevant to Aquatic Biodiversity

The clearing of natural vegetation, and the creation of hard surfaces associated, with required roads, PV panel areas, substations, operations buildings and temporary laydown areas and camps in the construction phase, typically results in this highest number of impacts. Therefore, from an aquatic standpoint, the impacts will firstly result in the disturbance of the natural vegetation, which then impacts on the available animal habitat and any corridors. However, these impacts are related to the creation of the needed cleared areas, while the remaining landscape, which includes the aquatic environment then remains unchanged.

4. Baseline Environmental Description

4.1. General Description

The National Wetland Inventory (van Deventer *et al*., 2018), National Freshwater Ecosystems Priority Atlas (Nel *et al*. 2011), which is included into the National Biodiversity Assessment (SANBI, 2018), have indicated that several important riverine systems could occur within the greater region, i.e., riverine reaches associated with the Synderskraal, Bakensklip and Buffels river catchments.

Furthermore, these spatial databases indicated that some of these systems are perennial but having assessed and or travelled through the region for several years, all of the system would be considered non-perennial or ephemeral (Plates 1-3).



Plate 1: A watercourse with narrow riparian zone within a broad alluvial zone, with channel areas down to exposed bedrock on the eastern boundary of PV 4.



Plate 2: The upper reaches of the Bakensklip river system.



Plate 3: A minor watercourse observed within the study area associated with PV 1 site.

4.1.1. Aquatic Biodiversity and Ecosystems

4.1.1.1. Aquatic Ecosystems

Current waterbody inventories (van Deventer et al., 2020), 1: 50 000 topocadastral surveys mapping indicated the potential for several wetlands within the greater study region. These inventories include wetland spatial data based on landcover 2007 data, previous assessments and wetland information retained by the Provincial authorities, combined into one database that formed part of the updated National Spatial Biodiversity Assessment, 2018.

The proposed projects are located in the L21C (Synderskraal / Bakensklip) and L21E (Buffels River) Quinary Catchments of the Drought Corridor Ecoregion in the Mzimvubu-Tsitsikamma Proto Catchment Management Agency (Gqeberha Regional Office) (Figure 4).

The Department of Environment Fisheries and Forestry (DFFE) identified the aquatic environment for the study area as having a Very High Sensitivity, but this was based on the only the presence of these rivers, are included into as important rivers and also contain a National Freshwater Priority Ecosystem Areas (NFEPAs) (Figure 7). The presence of these Very High Sensitivity features was confirmed during this assessment (Appendix 2 for Verification Statement).

No wetlands were found within the study areas, only riverine features such as alluvial floodplains and riparian thickets dominated by *Vachellia karroo, Searsia lancea* and *Euclea undulata*. Additional species surveyed within selected reaches are listed below.

The study areas are not located within an International Bird Area (IBA) or a Strategic Water Resource Area and did not contain any Wetland Clusters, Protected Areas Expansion Strategy Areas or Listed Threatened Ecosystems.

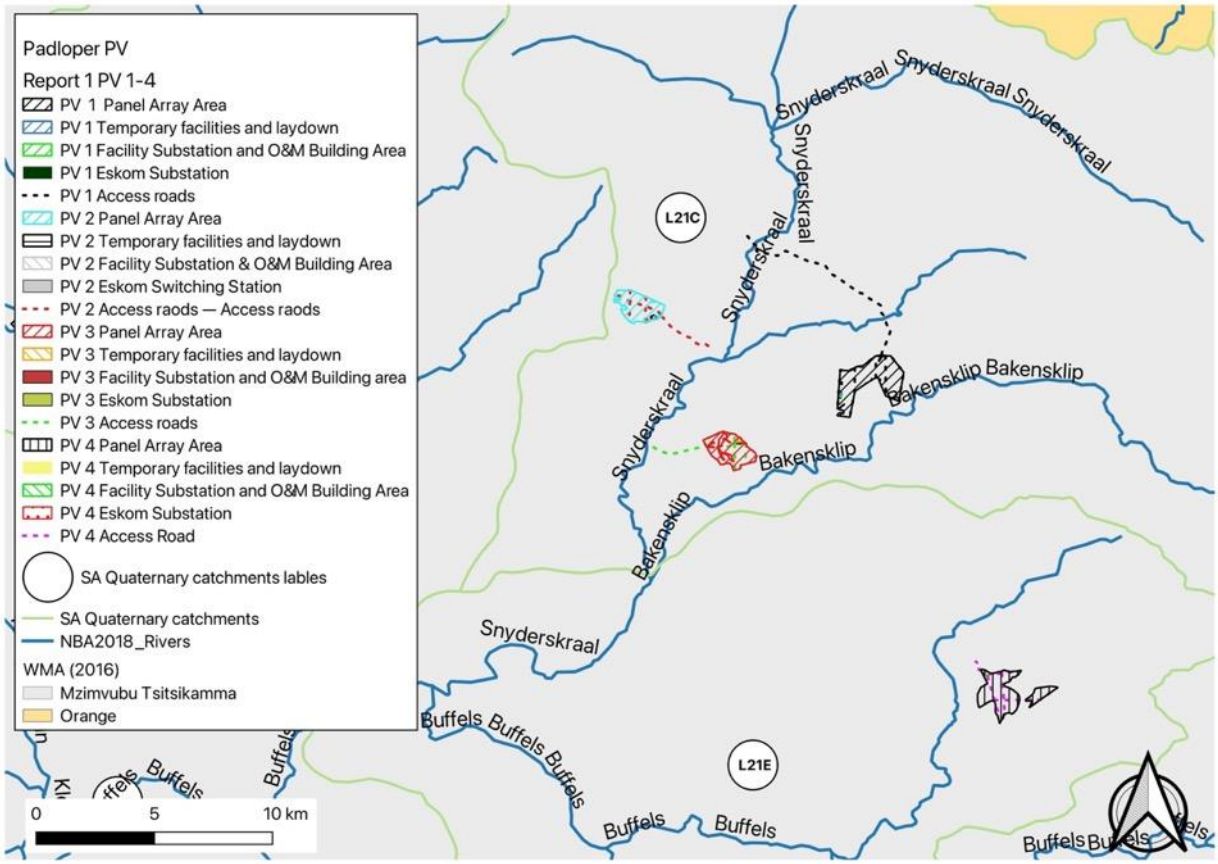


Figure 4 Mainstem rivers, quinary catchments and Water Management Areas in relation to the various project components.

4.1.1.2. Aquatic Species

Coupled to the aquatic delineations, information was collected on potential species that could occur within the wetlands and water courses, especially any areas that would contain open water for long periods and or conservation worthy species (Listed or Protected).

None of the dominant riparian / wetland associated plant species observed are listed or protected under any form of legislation. Plant species included the following:

- *Seersia lanceolata*
- *Vachellia karroo*
- *Ficinia nodusa*
- *Juncus effusus*
- *Carex* spp
- *Centella asiatica*
- *Erianthus capensis*
- *Sporobolus fimbriatus*
- *Cynodon incompletus*
- *Prosopis* spp (Exotic)
- *Eragrostis curvula*
- *Erharta calcynia*
- *Merxmuellera disticha*
- *Phragmites australis*
- *Cynodon dactylon*

Additional species known to occur in the aquatic systems within the study area also include the following species (FBIS, 2023):

- *Carex glomerabilis*
- *Cyperus marginatus*
- *Denekia capensis*
- *Eleocharis dregeana*
- *Fingerhuthia sesleriiformis*
- *Geranium multisectum*
- *Helictotrichon turgidulum*
- *Jamesbrittenia aurantiaca*
- *Juncus inflexus*
- *Lobelia laxa*
- *Merxmuellera macowanii*
- *Pterygodium nigrescens*
- *Ranunculus trichophyllus*
- *Trifolium burchellianum* subsp*. burchellianun*

Similarly, amphibian species are known to occur within the region based on collection data for the region, but little is known of the actual distribution of frogs within the study area. Therefore, based on mapping data contained in Minter *et al*. (2004) and the FrogMAP spatial database, Table 5 indicates the potential frogs known to occur in the area and their preferred habitat, with three frog species being observed during this assessment.

Table 5: Potential and observed amphibians within the study area.

FrogMAP. 2019. Animal Demography Unit. Accessed from http://frogmap.adu.org.za/?sp=400; on 2022.10.015.

Amphibian Taxa	Common Name	Conservation Status (IUCN)	Likelihood of Occurring Based on Previous Records and or Availability of Habitat
Vandijkophrynus gariepensis gariepensis	Karoo toad	Least Concern	Likely
Cacosternum boettgeri	Common caco	Least Concern	Likely
Cacosternum karooicum	Karoo dainty frog	Least Concern	Unlikely
Strongylopus grayii	Clicking stream frog	Least Concern	Unlikely
Amietia fuscigula	Cape river frog	Least Concern	Observed
Xenopus laevis	African clawed toad	Least Concern	Observed
Tomopterna delanandii	Cape sand frog	Least Concern	Unlikely

4.2. Identification of Environmental Sensitivities

The PES scores have been revised for the country and based on the new models, aspects of functional importance as well as direct and indirect impacts have been included (DWS, 2014). The new PES system 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 new 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.

All the systems assessed by DWS (2014) on a Subquaternary level within the study area were rated as PES B = Largely Natural to C = Moderately Modified. While these were also rated as High in terms of Ecological Sensitivity and Low in terms of Ecological Importance respectively.

Based on the information collected during the field investigations, these ratings are verified and upheld for the riverine systems. The High Ecological Sensitivity rating for the natural water sources, is further substantiated by the fact that some of the affected catchments are included in both the National Freshwater Priority Atlas and the respective provincial Biodiversity Spatial Plan Critical Biodiversity Areas (CBA) spatial layers (Figures 5 and 6).

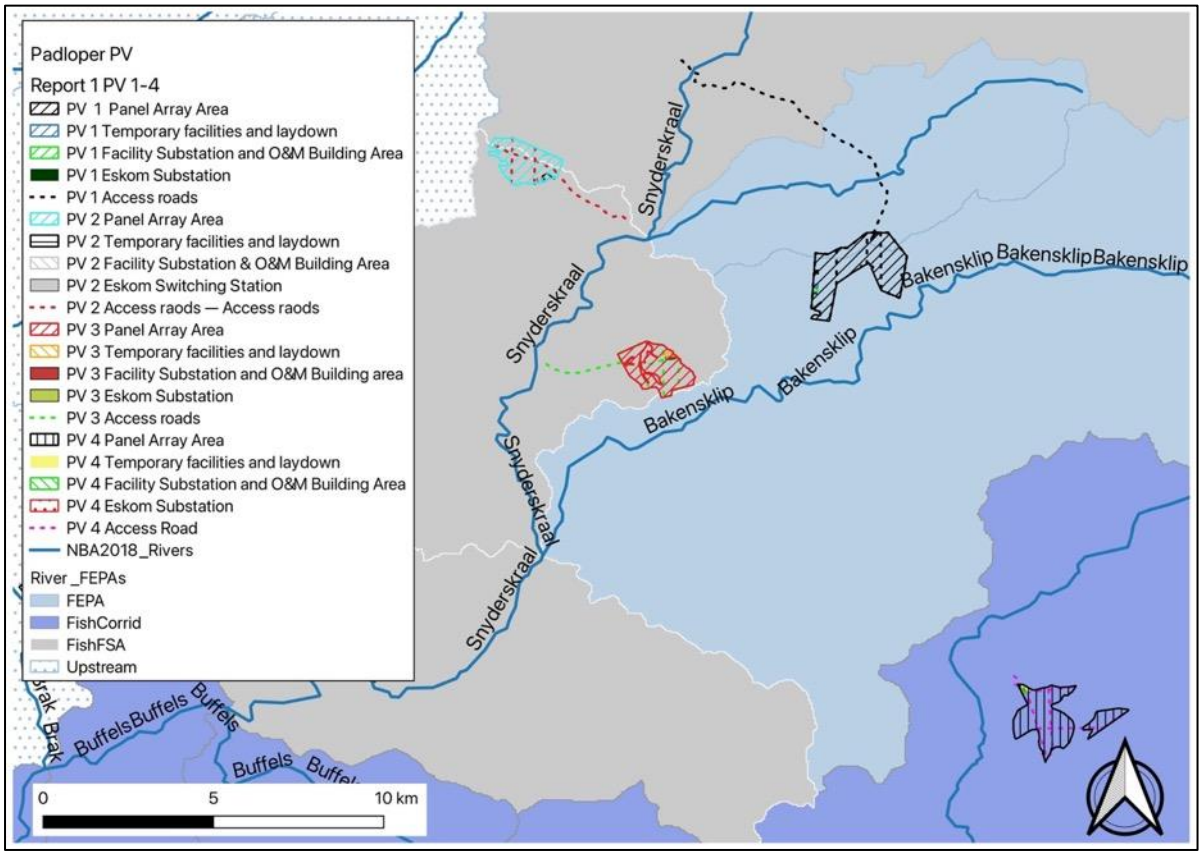


Figure 5: The Freshwater Ecosystem Priority Areas for the study sites (Nel *et al.*, 2011).

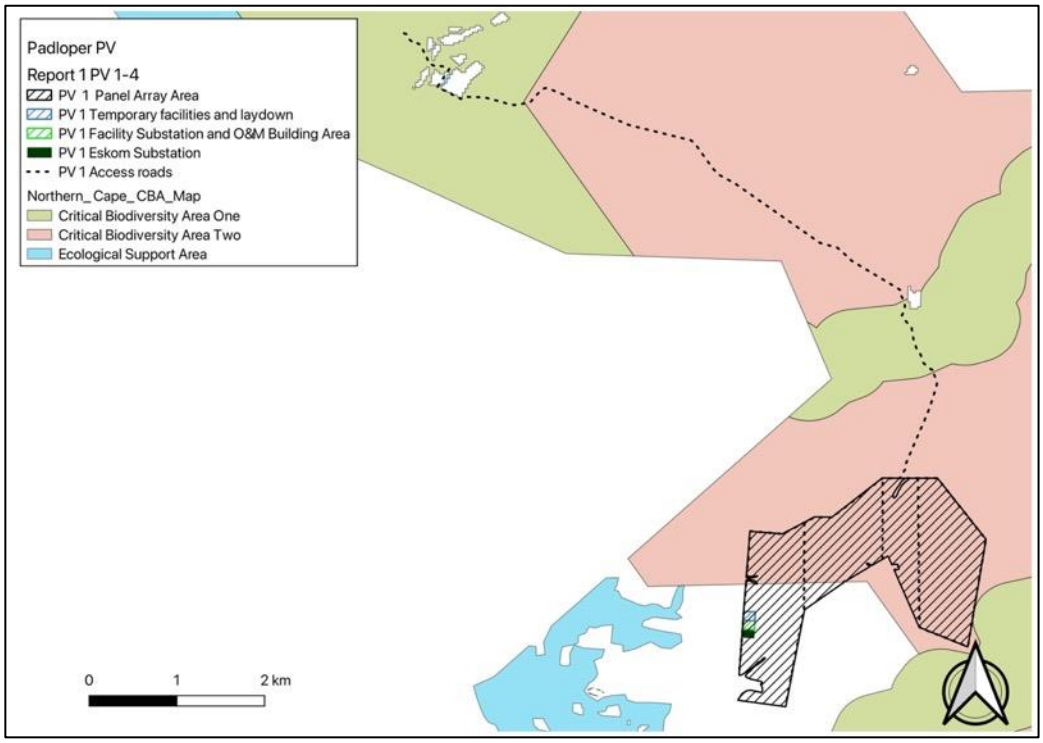


Figure 5a: The Critical Biodiversity Areas (CBAs) as per the NCBSP for PV 1.

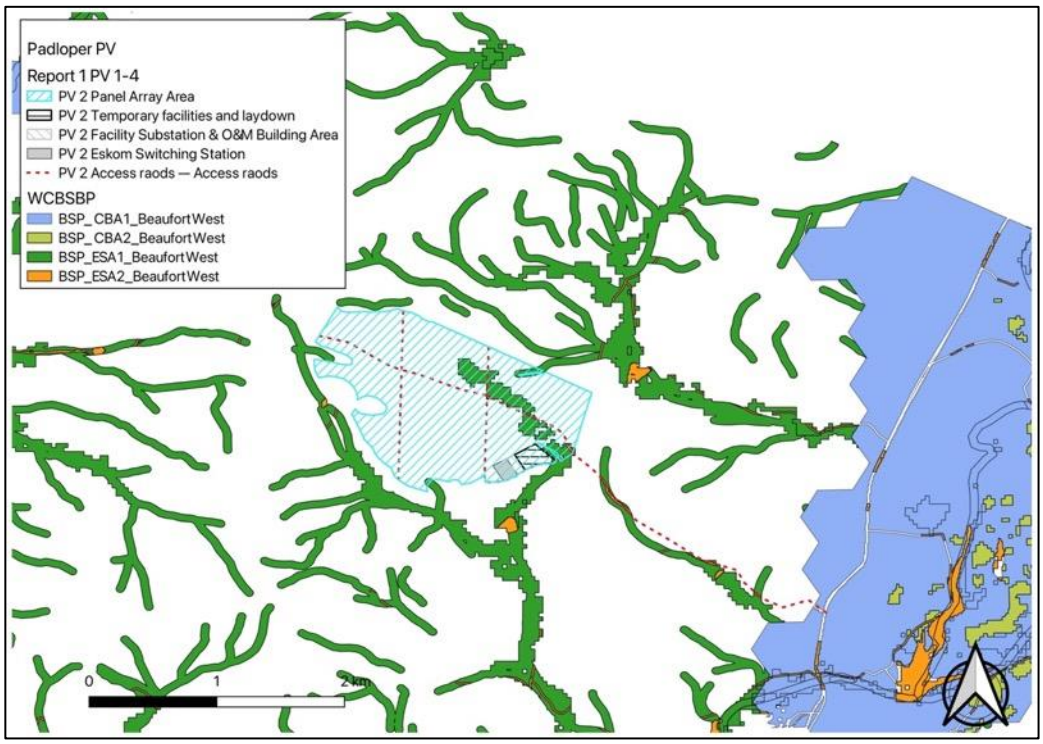


Figure 5b: The Critical Biodiversity Areas (CBAs) as per the Western Cape Biodiversity Spatial Plan (WCBSP) (Beaufort West) for PV 2.

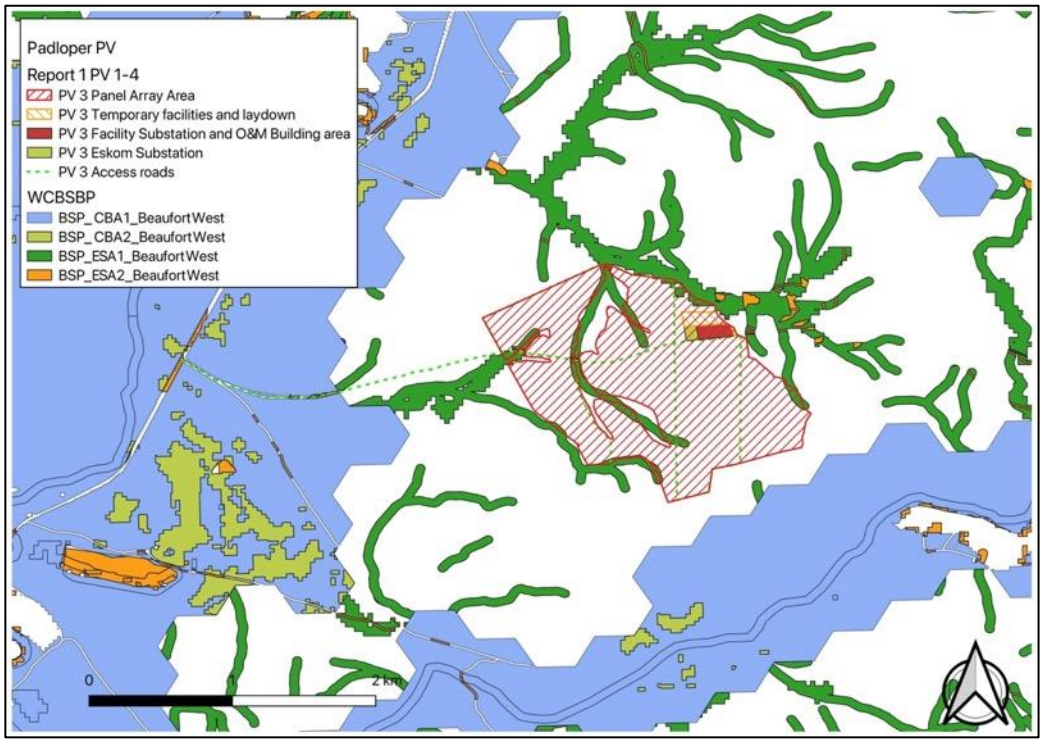


Figure 5c: The Critical Biodiversity Areas (CBAs) as per the Western Cape Biodiversity Spatial Plan (WCBSP) (Beaufort West) for PV 3.

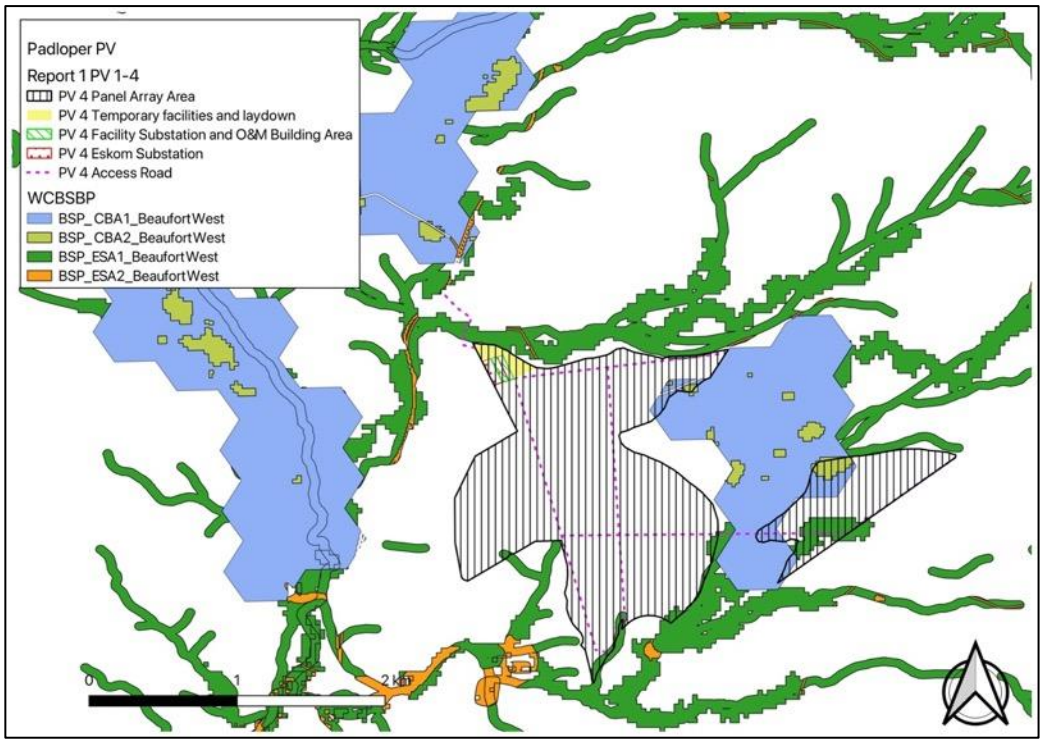


Figure 5d The Critical Biodiversity Areas (CBAs) as per the Western Cape Biodiversity Spatial Plan (WCBSP) (Beaufort West) for PV 4.

4.2.1. Sensitivities identified by the National Web-Based Environmental Screening Tool

Figure 6 below extracted from the DFFE Screening Tool indicates that Very High sensitivity areas summarised as follows, where if none are indicated then LOW:

PV 1	PV 2	PV 3	PV 4
FEPA Sub-catchment	ESA 1 Aquatic	ESA 1 Aquatic	ESA 1 Aquatic
		FEPA Sub-catchment	

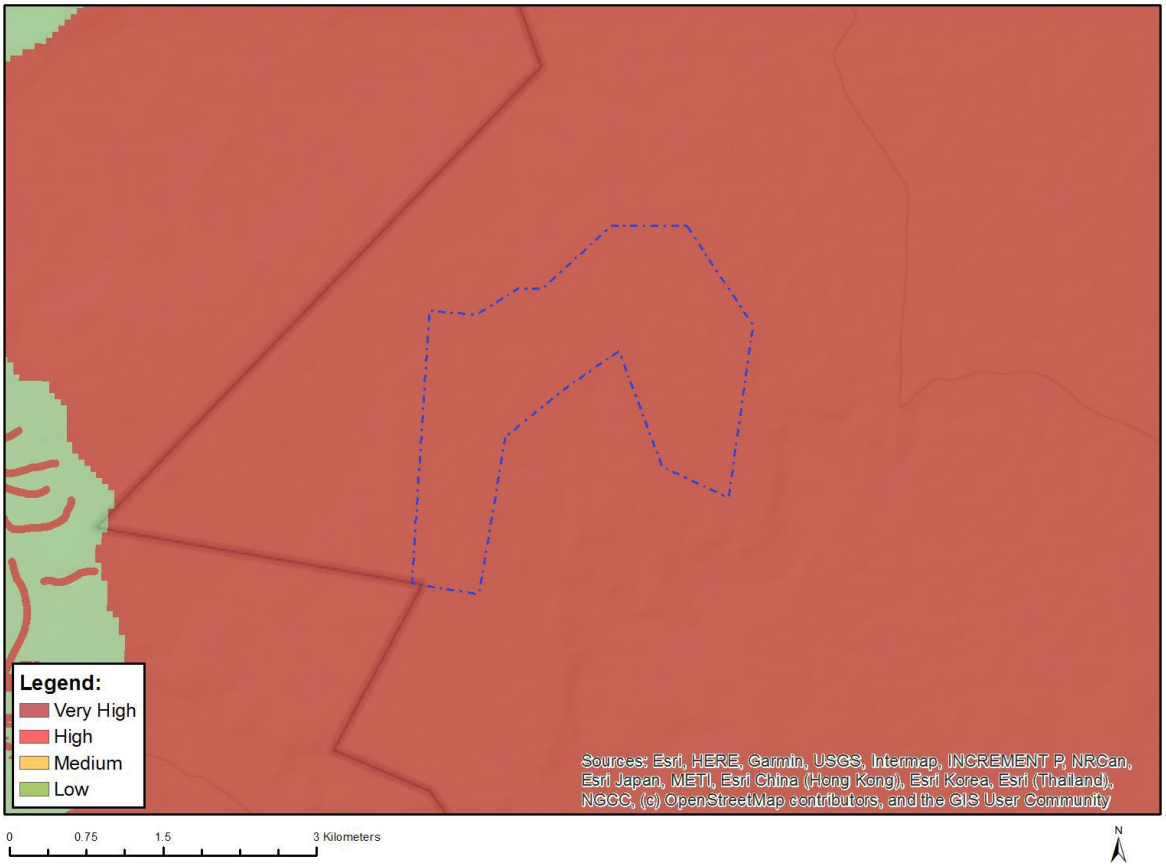


Figure 6a: The map presented in the National Screening Tool results for PV 1 site area (top) where Dark Red = Very High and Green = Low.

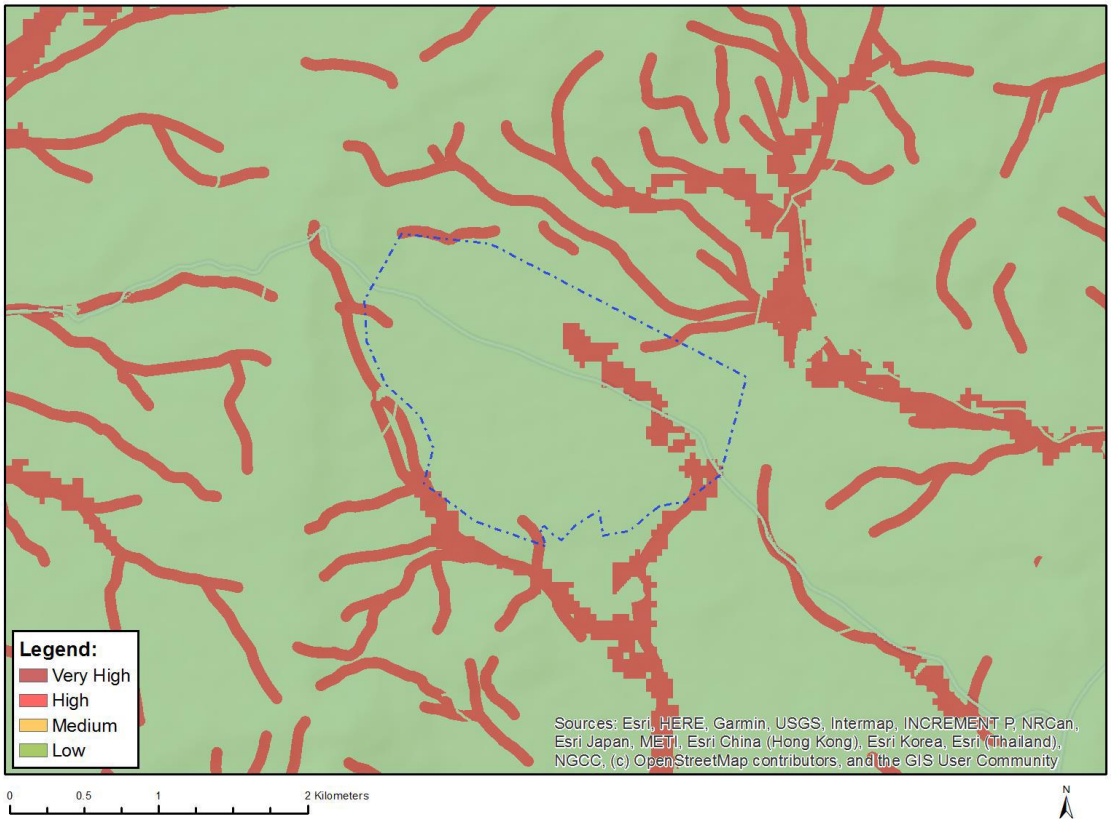


Figure 6b: The map presented in the National Screening Tool results for PV 2 site area, where Dark Red = Very High and Green = Low.

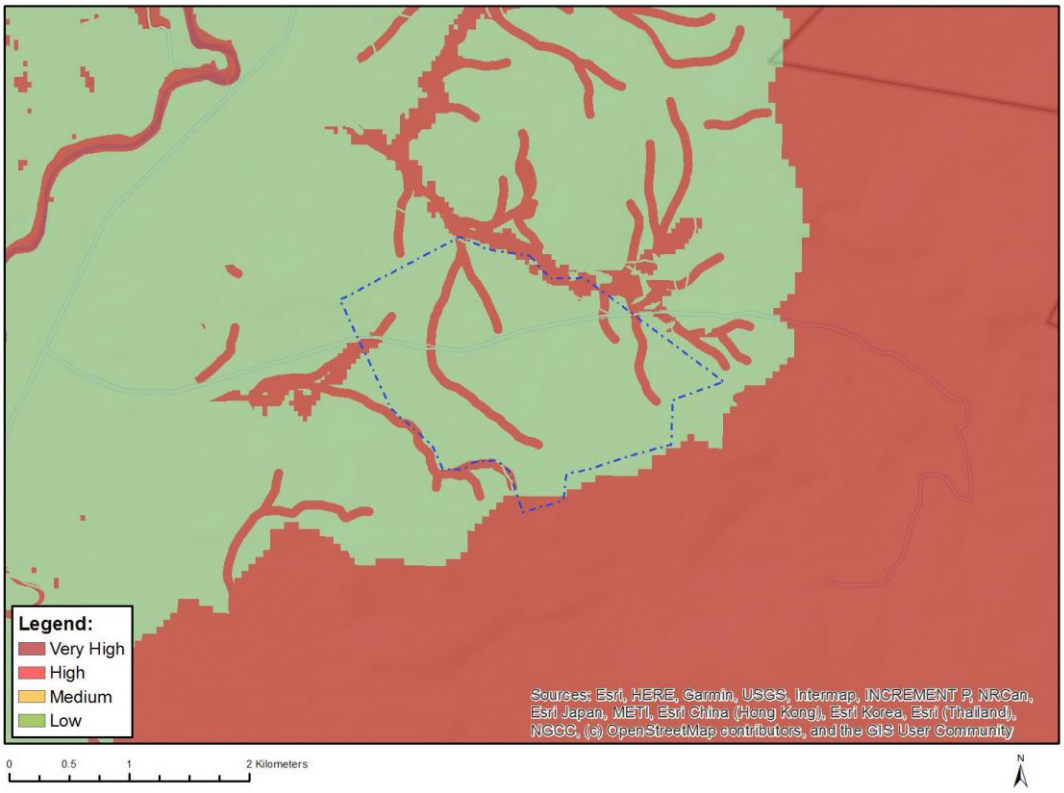


Figure 6c: The map presented in the National Screening Tool results for PV 3 site, where Dark Red = Very High and Green = Low.



Figure 6d: The map presented in the National Screening Tool results for PV 4 site, where Dark Red = Very High and Green = Low.

4.2.2. Specialist Sensitivity Analysis and Verification

Using the baseline description and preliminary field data while considering the current disturbances and site characteristics, the following features were identified, then categorised into one of number pre-determined sensitivity categories to provide protect and/or guide the layout planning and possibly the design processes:

High = No Go	"No go" areas or setbacks and areas or features that are considered of such significance that impacting them may be regarded as fatal flaw or strongly influence the project impact significance profile Therefore areas or features that are considered to have a high sensitivity or where project infrastructure would be highly constrained and should be avoided as far as possible. Infrastructure located in these areas are likely to drive up impact significance ratings and mitigations.
Moderate	Areas that are deemed to be of medium sensitivity but should still be avoided as this would minimise impacts and or the need for additional Water Use Authorisation in the case of any aquatic features.
Low	Areas of low sensitivity or constraints, such as artificial systems with little to no biological value or would not result in any future licensing requirements e.g. dry earth wall farm dams. While from a terrestrial perspective the vegetation or habitat is ubiquitous within the greater region or has seem some form of disturbance.

Table 6 below provides an overview of the sensitivity of features (with buffers distances included) as it relates to the main project component types for the project. The features are shown spatially in Figure 7. The sensitivity ratings of High No-Go to Low were determined through an assessment of the habitat sensitivity and related constraints. However, these No-Go areas (with buffers) relate in general terms to the project and there are areas where encroachment on these areas would occur (i.e., existing road crossings within systems and considered acceptable since these areas have already been impacted).

Table 6: Results of the sensitivity rating / constraints assessment

Development Component	Habitat Type	Sensitivity Rating of the Respective Habitat Type	Development Acceptability	Sensitivity Rating Override [4]
PV Panel areas	Alluvial rivers / washes with or without riparian vegetation	High	No	A single-axis pole array could pose a limited physical impact to the open alluvial areas (sandy) with no riparian vegetation in the operational phase, coupled to the final design of any of the associated access routes to these areas needs will need to be assessed in the post authorisation walkdown phase
	Minor watercourses / drainage lines	Moderate - Low	No	Yes
	Remainder of site	Low	Yes	N/A
Buildings / Substations & BESS	Alluvial rivers / washes with or without riparian vegetation	High	No	None
	Minor watercourses / drainage lines	Moderate - Low	No	None
	Remainder of site	Low	Yes	N/A
Roads	Alluvial rivers / washes with or without riparian vegetation	High	Yes with override	Yes if existing track or road is used.
	Minor watercourses / drainage lines	Moderate - Low	Yes	N/A
	Remainder of site	Low	Yes	N/A

[4] **Should an impact such as a road or disturbance already occur within the proposed footprint and confirmed during a site walkdown process and / or a technical solution can be provided that would not impact on the form or function of the habitat in question, then sensitivity rating for that habitat against the activity can be overridden.**

In summary, structures such as buildings, substations and Battery Energy Storage Systems (BESSs), have been placed outside of the High Sensitivity habitats, while remaining structures (PV panels, roads and power lines) could cross or span the Moderate / Low Sensitivity areas. Noting that Low Sensitivity can also = Moderate areas but with existing impacts e.g., current roads and farm tracks within previously disturbed areas.

Figure 7 below indicates the proposed activities in relation to the delineated systems and the respective sensitivity ratings.

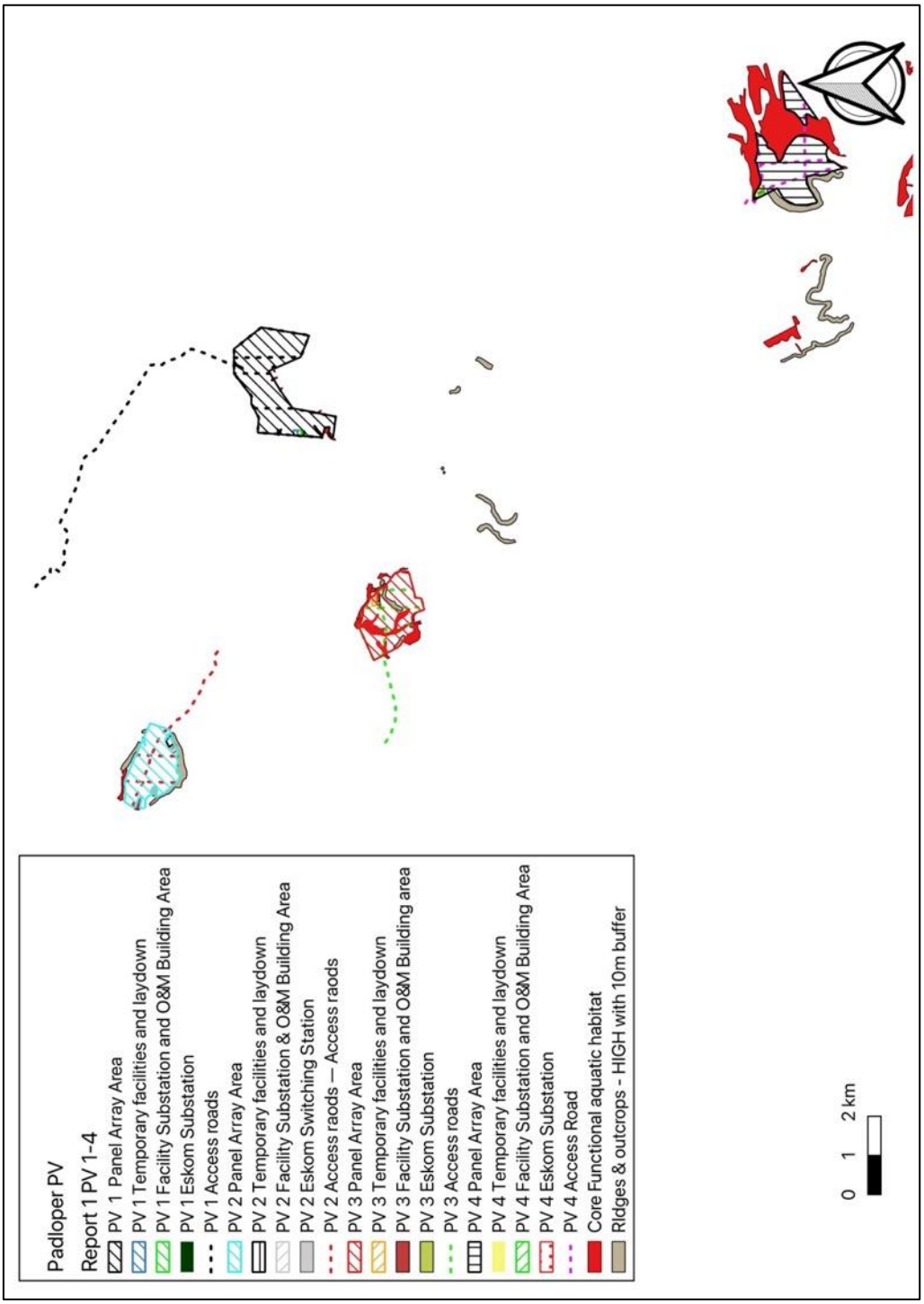


Figure 7: The delineated waterbodies and their respective sensitivity ratings in relation to the proposed layouts, where the Core Functional Aquatic Habitats = Very High / No-Go Sensitivity

4.2.3. Sensitivity Analysis Summary Statement

When compared to the results of the National Screening Tool results in relation to the receiving environment, the proposed layout has avoided any areas that would be considered, as Very High sensitivity, with the only exception being a number of the proposed roads that cross some of these areas. However, all proposed road crossings are located within or near existing impacted areas such as farm track crossings or existing roads / disturbance (Figure 7).

5. Alternative Development Footprints

The 2014 EIA Regulations require that any feasible and reasonable activity, location or technology alternatives considered must be described and comparatively assessed. However as most of the infrastructure has, through a process of design iteration, avoided important aquatic habitats, no alternative layout assessment is deemed necessary.

6. Issues, Risks, and Impacts

Several potential issues, risks and related impacts are summarised below and then discussed in more detail in Section 7 of the impact assessment below, however all the impacts assessed were found to be similar for all the projects where relevant as listed below. This is largely due to the fact that the proposed layouts have avoided Very High sensitivity / No go areas identified in this assessment as a means to impact avoidance rather the impact mitigation.

6.1. Identification of Potential Impacts/Risks for the proposed Padloper PV 1 – 4

Construction and Decommissioning Phases

- Impact 1: Loss of aquatic species of special concern (SSC).
- Impact 2: Damage or loss of riparian and wetlands systems and disturbance of the waterbodies in the construction phase.
- Impact 3: Potential impact on localised surface water quality.

Operational Phase

- Impact 4: Impact on aquatic systems through the possible increase in surface water runoff on form and function - Increase in sedimentation and erosion.

Construction and Operational Phases

- Impact 5: No-go option.
- Impact 6: Cumulative impacts or powerline infrastructure on the aquatic resources or the area.

6.2. Summary of Issues identified during the Public Consultation Phase [if relevant]

A Background Information Document (BID) was released to I&APs for a 30 day public consultation period. During this public consultation period the Northern Cape Authorities indicated that they would like to see separated maps for the various CBA areas as shown in Figure 6 a – d.

7. Impact Assessment

Due to the nature of the project layouts, the overall impacts are typically related to the construction and decommissioning phases of the project, i.e., when the soils are disturbed when hard surface areas for the PV panel areas and associated buildings / infrastructure.

The potential impacts identified during the assessment are:

Construction Phase

- Potential impact 1: Loss of aquatic species of special concern (SSC).
- Potential impact 2: Damage or loss of riparian and watercourse systems and disturbance of the waterbodies in the construction phase.
- Potential impact 3: Spills and leaks from construction vehicles / machinery when working in or near the delineated systems, impacting localised surface water quality.

Operational Phase

- Potential impact 4: Creation of hard surfaces, resulting in runoff, erosion and sedimentation.

Decommissioning Phase

- Potential impact 5: Damage or loss of riparian and watercourse systems and disturbance of the waterbodies in the construction phase.
- Potential impact 6: Spills and leaks from construction vehicles / machinery when working in or near the delineated systems, impacting localised surface water quality.

Cumulative Impacts

- Cumulative impact 7: The cumulative assessment considers the various proposed renewable projects that occur within a 30 km radius of this site and their associated grid connections as well as the remainder of the Padloper cluster projects.

7.1 Potential Impacts during the Construction Phase

IMPACT 1: Loss of aquatic species of special concern – Direct Impact

Several plant Species of Special Concern (SCC) within the region have conservation value or are protected by the Provincial bodies of legislation, but no listed species were observed within any of the aquatic systems on the site.

IMPACT 2: Damage or loss of riparian and riverine systems and disturbance of the waterbodies in the construction phase when road crossings are created – Direct Impact

The PV panel areas have for the most part avoided any aquatic ecosystems. However access roads will need to cross someaquatic systems, within the intention of using existing tracks, thus only requiring road upgrades. This will however still lead to some form of disturbance in these areas.

IMPACT 3: Spills and leaks from construction vehicles / machinery when working in or near the delineated systems, impacting localised surface water quality – Direct Impact

Leaks from machinery, vehicles, or certain construction materials such as cement / concrete used during the construction phase have the potential to result in very localised pollution, should any spill / leaks occur within the watercourse / wetlands observed. These are likely to occur, but on a small scale, with quick remediation.

IMPACT 4: Creation of hard surfaces, resulting in runoff, erosion and sedimentation – Direct Impact

Impact on localised surface water quality and habitat degradation, should the unstable soils erode resulting in downstream sedimentation. This impact would have a limited effects on the natural watercourse, as these already carry natural sediment loads when flowing. Any disturbances within these areas, could impact on the flow and dynamics within the riverine areas, although on a limited scale.

Impact Summary: Construction Phase (for all substation hub location/ BESS technology alternatives)

Impact 1	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential Mitigation Measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
CONSTRUCTION PHASE						
Loss of aquatic species of special concern (SSC)	*Status*	*Negative*	*Low*	*A preconstruction walkdown must be conducted to identify any areas that may contain any aquatic SSC so that these can be demarcated and avoided in the final design process.* *Any remaining species that could not be avoided must then be relocated in a Search and Rescue programme that should be initiated prior to construction. (Note this has not been included to reduce the impact rating).* *Develop Construction EMP, Monitoring and Rehabilitation Plan.*	***Very Low***	*High*
	Spatial Extent	*Regional*				
	Duration	*Long term*				
	Consequence	*Moderate*				
	Probability	*Unlikely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Low*				

Impact 2	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential Mitigation Measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
CONSTRUCTION PHASE						
Damage or loss of riparian and riverine systems and disturbance of the waterbodies in the	*Status*	*Negative*	*Low*	*A pre-construction walkthrough by an aquatic specialist is recommended so they can assist with the development of the Stormwater Management Plan (SWMP) and Aquatic Construction Rehabilitation and Monitoring Plan, coupled*	***Very Low***	*High*
	Spatial Extent	*Site specific*				
	Duration	*Short term*				
	Consequence	*Moderate*				
	Probability	*Likely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Low*				
	Spatial Extent	*Site specific*				
	Duration	*Short term*				

construction phase	*Consequence*	*Moderate*		*to micro-siting of the final layout.* *Suitable stormwater management systems must be installed along roads and other areas and monitored during the first few months of use. Any erosion / sedimentation must be resolved through whatever additional interventions maybe necessary (i.e., extension, energy dissipaters, spreaders, etc).* *Furthermore, the following applies to watercourse crossing upgrades associated with the proposed development:* • *All pipe culverts must be removed and replaced with suitable sized box culverts, where road levels are raised.* • *River levels, regardless of the current state of the river / water course will be reinstated thus preventing any impoundments from being formed. The related designs must be assessed by an aquatic specialist during a pre-construction walkdown.* • *Where large cut and fill areas are required, these must be stabilised and rehabilitated during the construction process, to minimise erosion and sedimentation.* *Monitoring* *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.*		
	Probability	*Likely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Low*				

Impact 3	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential Mitigation Measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
CONSTRUCTION PHASE						
Impact on localised surface water quality ***(Spills and leaks from construction vehicles / machinery when working in or near the delineated systems)***	*Status*	*Negative*	*Low*	*• All liquid chemicals including fuels and oil, including for the BESS, must be stored in with secondary containment (bunds or containers or berms) that can contain a leak or spill. Such facilities must be inspected routinely and must have the suitable Personal Protective Equipment (PPE) and spill kits needed to contain likely worst-case scenario leak or spill in that facility, safely.* *• Washing and cleaning of equipment must be done in designated wash bays, where rinse water is contained. in evaporation/sedimentation ponds (to capture oils, grease cement and sediment).* *• Mechanical plant and bowsers must not be refuelled or serviced within 100m of a river channel.* *• All construction camps, laydown areas, wash bays, batching plants or areas and any stores should be more than 50m from any demarcated water courses.* *• Littering and contamination associated with construction activity must be avoided through effective construction camp management.* *• No stockpiling should take place within or near a water course.* *• All stockpiles must be protected and located in flat areas where run-off will be minimised and sediment recoverable.*	***Very Low***	*High*
	Spatial Extent	*Site specific*				
	Duration	*Short term*				
	Consequence	*Moderate*				
	Probability	*Likely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Low*				

7.2 Potential Impacts during the Operational Phase

IMPACT 4: Creation of hard surfaces, resulting in runoff, erosion and sedimentation – Indirect Impact

This impact would be limited to any additional hard surface areas, although limited to PV panel areas and any supporting infrastructure. Any such structures have then ability to generate surface water runoff, which then has the potential to create erosion with downstream sedimentation. Noting the alluvial nature of the receiving environment and the size and position of the structures, this impact is unlikely to occur.

Impact 4	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential Mitigation Measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
OPERATIONAL PHASE						
Creation of hard surfaces resulting in runoff, erosion and sedimentation	*Status*	*Negative*	*Low*	*A Stormwater Management Plan (SWMP) must be developed in the preconstruction phase, detailing the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems. Effective stormwater management must include effective stabilisation (gabions and Reno mattresses) of exposed soil.* *Monitoring should occur on a monthly basis for 6 months post construction and where any unstable soils occur, these must be protected with temporary stabilisation dependent on the scale of the impact i.e. sand bags - hay bales) until areas become revegetated. If any areas require permanent erosion protection (e.g., gabions or stone pitching) then this must be included in the WULA / GA application.*	***Very Low***	*High*
	Spatial Extent	*Site specific*				
	Duration	*Short term*				
	Consequence	*Moderate*				
	Probability	*Unlikely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Low*				

7.3 Potential Impacts during the Decommissioning Phase

IMPACT 5: Damage or loss of riparian and riverine systems and disturbance of the waterbodies in the decommissioning phase when roads crossings are created – Direct Impact

IMPACT 6 Spills and leaks from construction vehicles / machinery when working in or near the delineated systems, impacting localised surface water quality – Direct Impact

Leaks from machinery, vehicles, or certain construction materials such as cement / concrete used during the decommissioning phase have the potential to result in very localised pollution, should any spill / leaks occur within the watercourse / riverine areas observed. These are likely to occur, but on a small scale, with quick remediation.

Impact Summary: Decommissioning Phase

Impact 5	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential Mitigation Measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
DECOMMISSIONING PHASE						
Damage or loss of riparian and riverine systems and disturbance of the waterbodies in the construction phase.	*Status*	*Negative*	*Low*	*Development of the SWMP and Aquatic Rehabilitation and Monitoring Plan, is recommended.* *Suitable stormwater management systems must be installed along roads and other areas and monitored during the first few months of use. Any erosion / sedimentation must be resolved through whatever additional interventions maybe necessary (i.e., extension, energy dissipaters, spreaders, etc).* *Furthermore, the following applies to watercourse crossing upgrades:* *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 decommissioned crossings.*	***Very Low***	*High*
	Spatial Extent	*Site specific*				
	Duration	*Short term*				
	Consequence	*Moderate*				
	Probability	*Likely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Low*				
	Spatial Extent	*Site specific*				
	Duration	*Short term*				
	Consequence	*Moderate*				
	Probability	*Likely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Low*				

Impact 6	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential Mitigation Measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
DECOMMISIONING PHASE						
Impact on localised surface water quality ***(Spills and leaks from construction vehicles / machinery when working in or near the delineated systems)***	*Status*	*Negative*	*Low*	*• All liquid chemicals including fuels and oil, including for the BESS, must be stored in with secondary containment (bunds or containers or berms) that can contain a leak or spill. Such facilities must be inspected routinely and must have the suitable PPE and spill kits needed to contain likely worst-case scenario leak or spill in that facility, safely.* *• Washing and cleaning of equipment must be done in designated wash bays, where rinse water is contained in evaporation/sedimentation*	***Very Low***	*High*
	Spatial Extent	*Site specific*				
	Duration	*Short term*				
	Consequence	*Moderate*				
	Probability	*Likely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Low*				

				ponds (to capture oils, grease cement and sediment). *• Mechanical plant and bowsers must not be refuelled or serviced within 100m of a river channel.* *• All construction camps, lay down areas, wash bays, batching plants or areas and any stores should be more than 50m from any demarcated water courses.* *• Littering and contamination associated with construction activity must be avoided through effective construction camp management.* *• No stockpiling should take place within or near a water course.* *• All stockpiles must be protected and located in flat areas where run-off will be minimised and sediment recoverable.*		

7.4 Cumulative Impacts

When assessing the impacts, it is unlikely that additional large-scale impacts on the aquatic environment would occur, this being based on the fact that once stable / vegetated, the works areas would not create any additional disturbances to the flow regime and or aquatic habitats observed. This is assuming that the mitigation in the construction, operational and decommissioning phases are adhered to.

Therefore, the cumulative assessment considers the various proposed renewable projects that occur within a 30 km radius of this site and their associated infrastructure/ grid connections, as well as the remainder of the Padloper cluster projects.

Potential impacts in this instance are related to the poor placement of project sites, within or close to any aquatic features (loss of habitat and fragmentation), or where activities result in poor stormwater management that could lead to sedimentation or erosion or introduce pollutants that result from any spills (Habitat transformation through changes to flow or water quality).

EnviroSci has assisted with assessing and micrositing several of these projects, thus understands these developments and the potential impacts and proposed mitigations.

Impact 7: All proposed activities within delineated areas, when combined with present day activities.

The cumulative impact of the present-day projects combined with the proposed project activities that may impact on the respective systems were considered for this project proposal.

Impact Summary: Cumulative Impacts for this proposed project

Impact 8	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential Mitigation Measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
CONSTRUCTION PHASE						
Additional activities within delineated Very High Sensitivity areas	*Status*	*Negative*	*Low*	*It is assumed that all projects will adhere to the site-specific recommendations in their respective EMPrs to ensure that impacts are mitigated where possible – including avoidance of identified sensitive systems and usage of existing disturbance areas.*	***Very low***	*High*
	Spatial Extent	*Site specific*				
	Duration	*Long term*				
	Consequence	*Moderate*				
	Probability	*Unlikely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Low*				
OPERATIONAL PHASE						
Displacement of fauna	*Status*	*Negative*	*Very Low*	*It is assumed that all projects will adhere to the site-specific recommendations in their respective EMPrs to ensure that impacts are mitigated where possible - including usage of existing disturbance area and stabilisation of erosion points (sand bags in the short term) using gabions and reno mattress as required.*	***Very Low***	*High*
	Spatial Extent	*Site specific*				
	Duration	*Short term*				
	Consequence	*Low*				
	Probability	*Unlikely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Low*				
DECOMISSIONING PHASE						
Displacement of fauna	*Status*	*Negative*	*Very Low*	*It is assumed that all projects will adhere to the site-specific recommendations in their respective EMPrs to ensure that impacts are mitigated where possible - including usage of existing disturbance area and stabilisation of erosion points (sand bags in the short term) using gabions and reno mattress as required.*	***Very Low***	*High*
	Spatial Extent	*Site specific*				
	Duration	*Short term*				
	Consequence	*Low*				
	Probability	*Unlikely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Low*				

The cumulative impact of the present-day projects combined with the proposed project cluster activities that may impact on the respective systems were considered for all projects combined.

Impact Summary: Cumulative Impacts for the combined projects (Cluster) should all the proposed PV projects be approved.

Impact 8	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential Mitigation Measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
CONSTRUCTION PHASE						
Additional activities within delineated Very High Sensitivity Areas	*Status*	*Negative*	*Low*	*It is assumed that all projects will adhere to the site-specific recommendations in their respective EMPrs to ensure that impacts are mitigated where possible – including avoidance of identified sensitive systems and usage of existing disturbance areas.*	***Very low***	*High*
	Spatial Extent	*Site specific*				
	Duration	*Long term*				
	Consequence	*Moderate*				
	Probability	*Unlikely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Low*				
OPERATIONAL PHASE						
Displacement of fauna	*Status*	*Negative*	*Very Low*	*It is assumed that all projects will adhere to the site-specific recommendations in their respective EMPrs to ensure that impacts are mitigated where possible - including usage of existing disturbance area and stabilisation of erosion points (sand bags in the short term) using gabions and reno mattress as required.*	***Very Low***	*High*
	Spatial Extent	*Site specific*				
	Duration	*Short term*				
	Consequence	*Low*				
	Probability	*Unlikely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Low*				
DECOMISSIONING PHASE						
Displacement of fauna	*Status*	*Negative*	*Very Low*	*It is assumed that all projects will adhere to the site-specific recommendations in their respective EMPrs to ensure that impacts are mitigated where possible - including usage of existing disturbance area and stabilisation of erosion points (sand bags in the short term) using gabions and reno mattress as required.*	***Very Low***	*High*
	Spatial Extent	*Site specific*				
	Duration	*Short term*				
	Consequence	*Low*				
	Probability	*Unlikely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Low*				

7.5 No-Go Option

With regard the No-Go option it is assumed that the site would continue to function even with the prevalence of agricultural land use. This would continue into the long-term with a Low intensity that would impact on the regional scale due to loss of important habitat. Little in the way of mitigation could be proposed due to the social needs of the surrounding residents, grazing areas, coupled to the need access will continue.

Impact 9N	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential Mitigation Measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
No-Go						
Should the project not proceed	*Status*	*Negative*	*Low*	*As the present land use will continue, which has led to little in the way of overall degradation of the site, no mitigation measures are proposed.*	***Very Low***	*High*
	Spatial Extent	*Site specific*				
	Duration	*Short term*				
	Consequence	*Moderate*				
	Probability	*Unlikely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Low*				

8. Legislative and Permit Requirements

The following is pertinent to this study:

- 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);
- National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998) inclusive of all amendments, as well as the NEM:: BA);
- National Water Act, 1998 (NWA, Act No. 36 of 1998);
- Conservation of Agricultural Resources Act, 1983 (CARA, Act No. 43 of 1983);
- Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002);
- National Forest Act (Act No. 84 of 1998);
- National Heritage Resources Act (Act No. 25 of 1999) – could apply if cultural use or heritage is linked to any aquatic resources; and
- Protocol for Specialist assessment and Minimum Report content Requirements for the Environmental Impacts on Aquatic Biodiversity (Government Gazette 43110, 20 March 2020).

Based on an assessment of the proposed activities typical of the renewable industry requirements (Table 6) and past engagement with DWS, the following Water Use Authorisations may be required based on the thresholds as listed in the following Government Notices. However ultimately the Department must determine if a GA or full Water Use License Application (WULA) will be required during the pre-application process as it relates to the following, bearing in mind that this will only be conducted once a final project scope is known:

- DWS Notice 538 of 2016, 2 September in GG 40243– Section 21a water uses relating to the abstraction of water.
- Government Notice 509 in GG 40229 of 26 August 2016 – Section 21c and 21i water uses relating to the impediment or diversion of the flow of water in a watercourse and or altering the bed, banks, course or characteristics of a watercourse. This applies to any activities within the regulated zones, namely 100m from a watercourse or 500m from a wetland boundary.

- Government Notice 665, 6 September 2013 in GG 36820 - Section 21g relating to the disposal of waste in a manner that may detrimentally impact on a water source which includes temporary storage of domestic wastewater i.e. conservancy tanks under Section 37 of the notice.

Table 6: Water Use Activities

	Water Use Activity	Applicable to this Development Proposal
S21(a)	Taking water from a water resource	Yes, if water is abstracted from new and/ or existing boreholes which will also require a change of use from agricultural to industrial. The use of surface water in this region due to the ephemeral nature of the rivers / watercourses is not recommended. The available volumes for use can only be determined once the available allocations are known, but typically for a GA these cannot exceed 40 000m^3 per farm portion per annum.
S21(b)	Storing water	Only if water is stored within an instream dam. The use of tanks and or reservoirs is thus advised as these **do not require** a license.
S21(c)	Impeding or diverting the flow of water in a watercourse	If any works (permanent or temporary) are located within a regulated zone, then a GA process can potentially be followed if the DWS Risk Assessment Matrix indicates that all impacts with mitigation 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	Typically, the conservancy tanks at construction camps and the Operations and Maintenance (O&M) buildings require a license (GA if volumes are less than 10 000 m^3).
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
S21(i)	Altering the bed, banks, course or characteristics of a watercourse	If any works (permanent or temporary) are located within a regulated zone, then a GA process can potentially be followed if the DWS Risk Assessment Matrix indicates that all impacts with mitigation 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

9. Environmental Management Programme Inputs

The following are key recommendations, which are also critical to the proposed mitigations:

- Any of the activities, should also be monitored by the appointed Environmental Officer /Environmental Control Officer (EO/ECO) on a daily basis, especially during periods of river flow during construction.
- Any points of erosion should be stabilised immediately (sand bags in the short term) using gabions and reno mattress as required. No activities should take place outside of the demarcated servitude, to prevent additional cumulative impacts on these systems.
- Search and Rescue should be initiated prior to construction for any protected or listed plant species.
- The EMPr, must include a Construction Specific Monitoring and Rehabilitation Plan related to the water course and wetland crossings, and specifically to the prevention of erosion and sedimentation as these systems are prone to scour, with rehabilitation options being limited due to the sparse nature of the vegetation.
- Monitoring should occur on a monthly basis for 6 months post construction and where any unstable soils occur, these must be protected with temporary stabilisation dependent on the scale of the impact i.e. sand bags - hay bales) until areas become revegetated. If any areas require permanent erosion protection (e.g. gabions or stone pitching) then the GA must be amended to include these areas.

10. Final Specialist Statement and Authorisation Recommendation

A variety of aquatic features, mostly ephemeral in nature were identified within the study areas and, where required, the layout has taken some cognisance of these features by selecting areas that have already been impacted. On these grounds the current overall impact on the aquatic environment is **Very Low (with mitigation).**

11.1. Statement and Reasoned Opinion

Based on the findings of this study, the specialist finds no reason to withhold an authorisation of any of the proposed activities, assuming that the key recommended mitigations measures are implemented.

11.2. Environmental Authorisation (EA) Condition Recommendations

- During the construction mobilisation process, the temporary construction camps, stockpiles and laydown areas are located outside of any delineated aquatic systems and within any existing disturbed areas.
- A final walkdown by an aquatic specialist must be conducted to ensure that any of the proposed structures are placed within disturbed areas and sensitive systems are avoided and appropriate construction methods are employed as necessary.

11. 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).

Cowardin L.M., Carter V, Golet F.C. and Laroe E.T. (1979) Classification of wetlands and deepwater habitats of the United States. FWS-OBS-79-31. US Fish and Wildlife Service, Washington, DC. Davies, B. and Day J., (1998). Vanishing Waters. University of Cape Town Press.

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Appendix A - Specialist Expertise

CURRICULUM VITAE

Dr Brian Michael Colloty
7212215031083
1 Rossini Rd
Pari Park
Port Elizabeth, 6070
brianc@envirosci.co.za
083 498 3299

Profession: Ecologist (Pr. Sci. Nat. 400268/07) Member of the South African Wetland Society
Specialisation: Ecology and conservation importance rating of inland 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

- 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

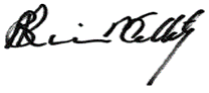
- Nuweveld Wind Farms aquatic assessment for RedCap renewables, (3 wind farms and 130km transmission line) - current
- Plant and animal search and rescue for the Karusa and Soetwater Wind Farms on behalf of Enel Green Power, Current
- Plant and animal search and rescue for the Nxuba, Oyster Bay and Garob 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
- 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 - 2018
- 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
- 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
- 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 125 renewable projects in the past 9 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. . 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 B - Specialist Statement of Independence

Note from the CSIR: Specialists to please complete this section. We will add the actual specialist declaration (on the DFFEF prescribed form) as an appendix to the BA Report.

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: _____ _____

Name of Company: _____EnviroSci (Pty) Ltd_____

Date: _____3 / 09/ 2023_____

Appendix C: Site Sensitivity Verification

Prior to commencing with the Aquatic Biodiversity Specialist Assessment in accordance with the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity (Government Notice 320, dated 20 March 2020), a site sensitivity verification was undertaken in order to confirm the current land use and environmental sensitivity of the proposed project area as identified by the National Web-Based Environmental Screening Tool (Screening Tool).

The details of the site sensitivity verification are noted below:

Date of Site Visit	February (4 – 8) and March (22 – 24) 2022
Specialist Name	Dr Brian Colloty
Professional Registration Number	400268/07
Specialist Affiliation / Company	EnviroSci (Pty) Ltd

Government Notice No. 320, dated 20 March 2020, 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 biodiversity theme and addresses the content requirements of (a) and (b) above. The report will be appended to the respective specialist study included in the EA Reports produced for the projects.

<u>Site sensitivity based on the aquatic biodiversity theme included in the Screening Tool and specialist assessment</u>

Based on the DFFE Screening Tool, the sites i.e., Padloper PV 1 - 4 contain areas of very high sensitivity areas summarised as follows below. The remaining area within the development footprint is deemed to be of low sensitivity (See Figure 1 - 4).

PV 1	**PV 2**	**PV 3**	**PV 4**
FEPA Sub-catchment	ESA 1 Aquatic	ESA 1 Aquatic	ESA 1 Aquatic
		FEPA Sub-catchment	

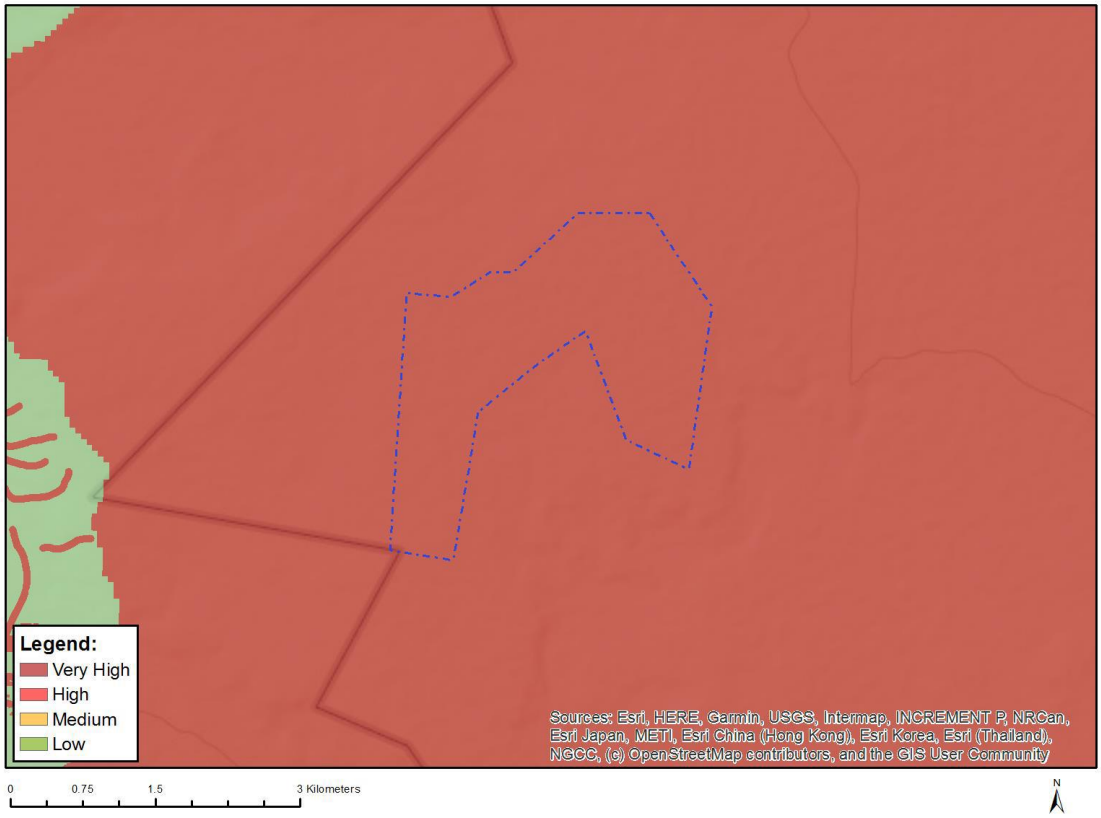


Figure 1: The map presented in the National Screening Tool results for PV 1 site area, where Dark Red = Very High and Green = Low

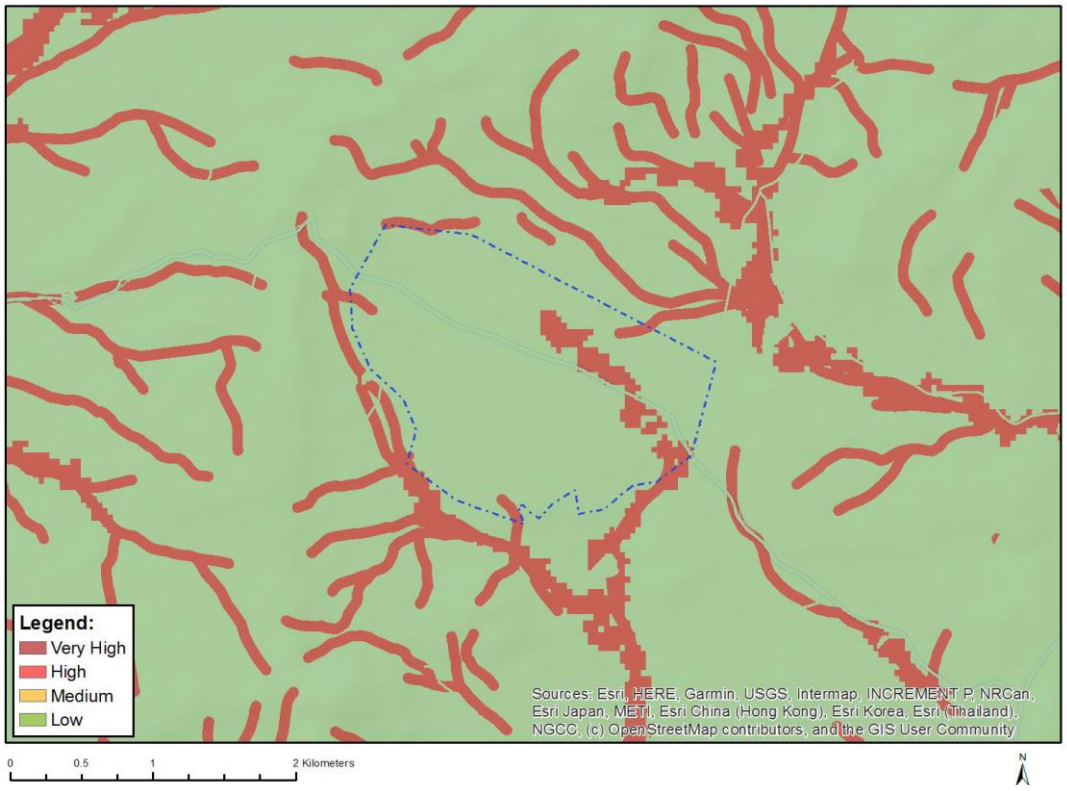


Figure 2: The map presented in the National Screening Tool results for PV 2 site area, where Dark Red = Very High and Green = Low

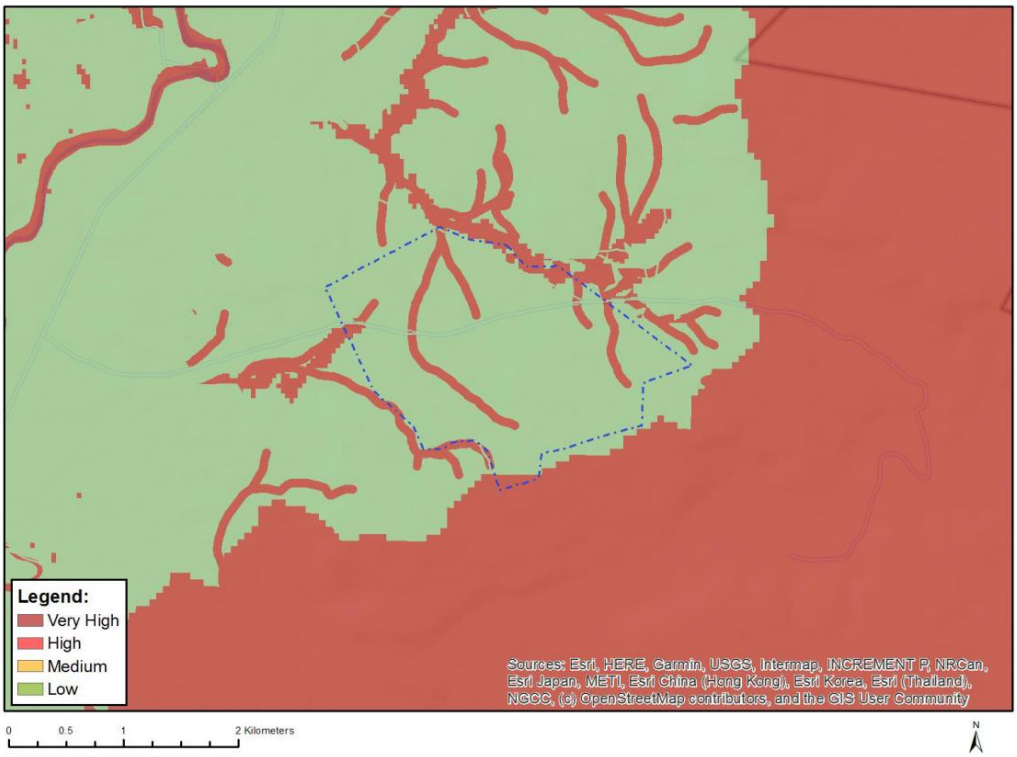


Figure 3: The map presented in the National Screening Tool results for PV 3 site, where Dark Red = Very High and Green = Low



Figure 4: The map presented in the National Screening Tool results for PV 4 site, where Dark Red = Very High and Green = Low

Based on the above outcomes, the specialist **confirms** the environmental sensitivities identified on site, informed by a site visit undertaken by Dr Brian Colloty in February (4 – 8) and March (22 – 24) 2022. 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, the river lines were digitised at a scale of 1:5000.

Figure 7 of the specialist report above indicates the fine scale delineation and resultant sensitivity maps produced following the desktop assessment as well as a groundtruthing exercises.

Therefore, in summary, several Very High Sensitivity habitats were confirmed and then delineated for each of the project areas and summarised as follows:

PV 1 Site

The site was earmarked as having potential ESA 1 Aquatic and FEPA sub-catchments associated with the main stem rivers within the region. These were rated as Very High sensitivity in the screening tool results. Based on the site observation, the habitat associated with these areas, or habitat functions (important catchments and or water courses were then mapped to a fine scale level as thus indicated as No-go (Very High) for the site. The proposed layout has thus avoided these areas. So, in short, Very High Sensitivity habitats / areas were confirmed for this project, with the project footprint being located within the remaining Low sensitivity areas (See Figure 7 of the specialist assessment).

PV 2 Site

The site was earmarked as having potential ESA 1 Aquatic with the main stem rivers within the region. These were rated as Very High sensitivity in the screening tool results. Based on the site observation, the habitat associated with these areas, or habitat functions (important catchments and or water courses were then mapped to a fine scale level as thus indicated as No-go (Very High) for the site. Therefore, Very High Sensitivity habitats / areas were confirmed for this project, with the project footprint being located within the remaining Low sensitivity areas (See Figure 7 of the specialist assessment).

PV 3 Site

The site was earmarked as having potential ESA 1 Aquatic and FEPA sub-catchments associated with the main stem rivers within the region. These were rated as Very High sensitivity in the screening tool results. Based on the site observation, the habitat associated with these areas, or habitat functions (important catchments and or water courses were then mapped to a fine scale level as thus indicated as No-go (Very High) for the site. The proposed layout has thus avoided these areas. So, in short, Very High Sensitivity habitats / areas were confirmed for this project, with the project footprint being located within the remaining Low sensitivity areas (See Figure 7 of the specialist assessment).

PV 4 Site

The site was earmarked as having potential ESA 1 Aquatic with the main stem rivers within the region. These were rated as Very High sensitivity in the screening tool results. Based on the site observation, the habitat associated with these areas, or habitat functions (important catchments and or water courses were then mapped to a fine scale level as thus indicated as No-go (Very High) for the site. Therefore, Very High Sensitivity habitats / areas were confirmed for this project, with the project footprint being located within the remaining Low sensitivity areas (See Figure 7 of the specialist assessment).

Motivation of the outcomes of the sensitivity map and key conclusions

In conclusion, the DFFE Screening Tool identified two sensitivity ratings within the development footprints namely, very high and low. 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 site visits and spatial input considerations were then used in the finalisation of the designs.

Appendix D: Impact Assessment Methodology

The impact assessment includes:

- *the nature, significance and consequences of the impact and risk;*
- *the extent and duration of the impact and risk;*
- *the probability of the impact and risk occurring;*
- *the degree to which impacts, and risks can be mitigated;*
- *the degree to which the impacts and risks can be reversed; and*
- *the degree to which the impacts and risks can cause loss of irreplaceable resources.*

As per the DEFFE Guideline 5: Assessment of Alternatives and Impacts, the following methodology is applied to the prediction and assessment of impacts and risks. Potential impacts and risks have been 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.*

The impact assessment methodology includes the following aspects:

- *Nature of impact/risk - The type of effect that a proposed activity will have on the environment.*

- *Status - Whether the impact/risk on the overall environment will be:*
    - *Positive - environment overall will benefit from the impact/risk;*
    - *Negative - environment overall will be adversely affected by the impact/risk; or*
    - *Neutral - environment overall not be affected.*

- *Spatial extent – The size of the area that will be affected by the impact/risk:*
    - *Site specific;*
    - *Local (<10 km from site);*
    - *Regional (<100 km of site);*
    - *National; or*
    - *International (e.g., Greenhouse Gas emissions or migrant birds).*

- *Duration – The timeframe during which the impact/risk will be experienced:*
    - *Very short term (instantaneous);*
    - *Short term (less than 1 year);*
    - *Medium term (1 to 10 years);*
    - *Long term (the impact will cease after the operational life of the activity (i.e., the impact or risk will occur for the project duration)); or*
    - *Permanent (mitigation will not occur in such a way or in such a time span that the impact can be considered transient (i.e., the impact will occur beyond the project decommissioning)).*

- *Consequence – The anticipated consequence of the risk/impact:*

- *Extreme (extreme alteration of natural systems, patterns or processes, i.e., where environmental functions and processes are altered such that, they permanently cease);*
- *Severe (severe alteration of natural systems, patterns or processes, i.e., where environmental functions and processes are altered such that they temporarily or permanently cease);*
- *Substantial (substantial alteration of natural systems, patterns or processes, i.e., where environmental functions and processes are altered such that they temporarily or permanently cease);*
- *Moderate (notable alteration of natural systems, patterns, or processes, i.e., where the environment continues to function but in a modified manner); or*
- *Slight (negligible alteration of natural systems, patterns, or processes, i.e., where no natural systems/environmental functions, patterns, or processes are affected).*

- *Reversibility of the Impacts - the extent to which the impacts/risks are reversible assuming that the project has reached the end of its life cycle (decommissioning phase):*
  - *High reversibility of impacts (impact is highly reversible at end of project life i.e., this is the most favourable assessment for the environment);*
  - *Moderate reversibility of impacts;*
  - *Low reversibility of impacts; or*
  - *Impacts are non-reversible (impact is permanent, i.e., this is the least favourable assessment for the environment).*

- *Irreplaceability of Receiving Environment/Resource Loss caused by impacts/risks – the degree to which the impact causes irreplaceable loss of resources assuming that the project has reached the end of its life cycle (decommissioning phase):*
  - *High irreplaceability of resources (project will destroy unique resources that cannot be replaced, i.e., this is the least favourable assessment for the environment);*
  - *Moderate irreplaceability of resources;*
  - *Low irreplaceability of resources; or*
  - *Resources are replaceable (the affected resource is easy to replace/rehabilitate, i.e., this is the most favourable assessment for the environment).*

Using the criteria above, the impacts have been further assessed in terms of the following:

- *Probability – The probability of the impact/risk occurring:*
  - *Extremely unlikely (little to no chance of occurring);*
  - *Very unlikely (<30% chance of occurring);*
  - *Unlikely (30-50% chance of occurring)*
  - *Likely (51 – 90% chance of occurring); or*
  - *Very Likely (>90% chance of occurring regardless of prevention measures).*

To determine the significance of the identified impact/risk, the consequence is multiplied by probability (qualitatively as shown in Figure 1).

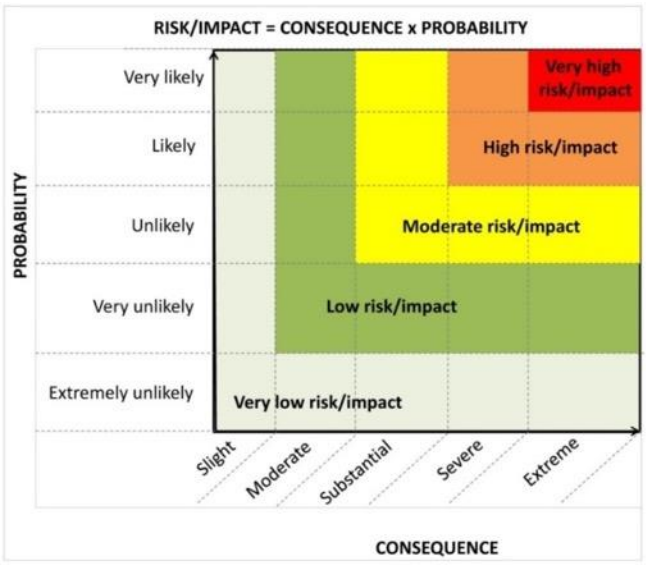


Figure 1. Guide to assessing risk/impact significance as a result of consequence and probability.

- *Significance – Will the impact cause a notable alteration of the environment?*
    - *Very low (the risk/impact may result in very minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making);*
    - *Low (the risk/impact may result in minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making);*
    - *Moderate (the risk/impact will result in moderate alteration of the environment and can be reduced or avoided by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated);*
    - *High (the risk/impact will result in major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making); and*
    - *Very high (the risk/impact will result in very major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making (i.e., the project cannot be authorised unless major changes to the engineering design are carried out to reduce the significance rating)).*

With the implementation of mitigation measures, the residual impacts/risks are ranked as follows in terms of significance:

- *Very low = 5;*
- *Low = 4;*
- *Moderate = 3;*
- *High = 2; and*
- *Very high = 1.*

Confidence – The degree of confidence in predictions based on available information and specialist knowledge:

- *Low;*
- *Medium; or*
- *High.*

Appendix E: Compliance with the Aquatic Biodiversity Protocol (GN 320, 20 March 2020)

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity	***Section where this has been addressed in the Specialist Report***
2.3. The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects: *2.3.1. a description of the aquatic biodiversity and ecosystems on the site, including;* *a) aquatic ecosystem types; and* *b) presence of aquatic species, and composition of aquatic species communities, their habitat, distribution, and movement patterns;*	*Section 4 Pg 20*
2.3.2. the threat status of the ecosystem and species as identified by the screening tool;	*Section 4 Pg 20*
2.3.3. an indication of the national and provincial priority status of the aquatic ecosystem, including a description of the criteria for the given status (i.e., if the site includes a wetland or a river freshwater ecosystem priority area or sub catchment, a strategic water source area, a priority estuary, whether or not they are free -flowing rivers, wetland clusters, a critical biodiversity or ecologically sensitivity area); and	*Section 4 Pg 20*
2.3.4. a description of the ecological importance and sensitivity of the aquatic ecosystem including: *a) the description (spatially, if possible) of the ecosystem processes that operate in relation to the aquatic ecosystems on and immediately adjacent to the site (e.g., movement of surface and subsurface water, recharge, discharge, sediment transport, etc.); and* *b) the historic ecological condition (reference) as well as present ecological state of rivers (in- stream, riparian, and floodplain habitat), wetlands and/or estuaries in terms of possible changes to the channel and flow regime (surface and groundwater).*	*Section 4 Pg 20*
2.4. The assessment must identify alternative development footprints within the preferred site which would be of a "low" sensitivity as identified by the screening tool and verified through the site sensitivity verification and which were not considered appropriate.	*Section 5 Page 30*
2.5. Related to impacts, a detailed assessment of the potential impacts of the proposed development on the following aspects must be undertaken to answer the following questions: *2.5.1. Is the proposed development consistent with maintaining the priority aquatic ecosystem in its current state and according to the stated goal?* *2.5.2. Is the proposed development consistent with maintaining the resource quality objectives for the aquatic ecosystems present?* *2.5.3. How will the proposed development impact on fixed and dynamic ecological processes that operate within or across the site? This must include:*	*Section 6 and 7*

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity	***Section where this has been addressed in the Specialist Report***
a) impacts on hydrological functioning at a landscape level and across the site which can arise from changes to flood regimes (e.g., suppression of floods, loss of flood attenuation capacity, unseasonal flooding or destruction of floodplain processes); *b) will the proposed development change the sediment regime of the aquatic ecosystem and its sub -catchment (e.g. sand movement, meandering river mouth or estuary, flooding or sedimentation patterns);* *c) what will the extent of the modification in relation to the overall aquatic ecosystem be (e.g., at the source, upstream or downstream portion, in the temporary I seasonal I permanent zone of a wetland, in the riparian zone or within the channel of a watercourse, etc.); and* *d) to what extent will the risks associated with water uses and related activities change;*	
2.5.4. how will the proposed development impact on the functioning of the aquatic feature? This must include: *a) base flows (e.g., too little or too much water in terms of characteristics and requirements of the system);* *b) quantity of water including change in the hydrological regime or hydroperiod of the aquatic ecosystem (e.g., seasonal to temporary or permanent; impact of over -abstraction or instream or off stream impoundment of a wetland or river);* *c) change in the hydrogeomorphic typing of the aquatic ecosystem (e.g., change from an unchannelled valley-bottom wetland to a channelled valley -bottom wetland);* *d) quality of water (e.g., due to increased sediment load, contamination by chemical and/or organic effluent, and/or eutrophication);* *e) fragmentation (e.g., road or pipeline crossing a wetland) and loss of ecological connectivity (lateral and longitudinal); and* *f) the loss or degradation of all or part of any unique or important features associated with or within the aquatic ecosystem (e.g., waterfalls, springs, oxbow lakes, meandering or braided channels, peat soils, etc.);*	*Section 6 and 7.*
2.5.5. how will the proposed development impact on key ecosystems regulating and supporting services especially: *a) flood attenuation;* *b) streamflow regulation;* *c) sediment trapping;* *d) phosphate assimilation;* *e) nitrate assimilation;* *f) toxicant assimilation;* *g) erosion control; and* *h) carbon storage?*	*Section 6 and 7.*

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity	***Section where this has been addressed in the Specialist Report***
2.5.6. how will the proposed development impact community composition (numbers and density of species) and integrity (condition, viability, predator - prey ratios, dispersal rates, etc.) of the faunal and vegetation communities inhabiting the site?	*Section 6 and 7*
2.6. In addition to the above, where applicable, impacts to the frequency of estuary mouth closure should be considered, in relation to: *a) size of the estuary;* *b) availability of sediment;* *c) wave action in the mouth;* *d) protection of the mouth;* *e) beach slope;* *f) volume of mean annual runoff; and* *g) extent of saline intrusion (especially relevant to permanently open systems).*	*N/A*
2.7. The findings of the specialist assessment must be written up in an Aquatic Biodiversity Specialist Assessment Report that contains, as a minimum, the following information:	*This report*
2.7.1. contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	*Appendix A and B*
2.7.2. a signed statement of independence by the specialist;	*Appendix B*
2.7.3. a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	*Section 5*
2.7.4. the methodology used to undertake the site inspection and the specialist assessment, including equipment and modelling used, where relevant;	*Section 2*
2.7.5. a description of the assumptions made any uncertainties or gaps in knowledge or data;	*Section 2*
2.7.6. the location of areas not suitable for development, which are to be avoided during construction and operation, where relevant;	*Section 5*
2.7.7. additional environmental impacts expected from the proposed development;	*Section 6 and &*
2.7.8. any direct, indirect, and cumulative impacts of the proposed development on site;	*Section 6 and 7*
2.7.9. the degree to which impacts, and risks can be mitigated;	*Section 6 and 7*
2.7.10. the degree to which the impacts and risks can be reversed;	*Section 6 and 7*
2.7.11. the degree to which the impacts and risks can cause loss of irreplaceable resources;	*Section 6 and 7*
2.7.12. a suitable construction and operational buffer for the aquatic ecosystem, using the accepted methodologies;	*Section 6 and 7*
2.7.13. proposed impact management actions and impact management outcomes for inclusion in the Environmental Management Programme (EMPr);	*Section 6 and 7*
2.7.14. a motivation must be provided if there were development footprints identified as per paragraph 2.4 above that were	*Section 6 and 7*

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity	***Section where this has been addressed in the Specialist Report***
identified as having a "low" aquatic biodiversity sensitivity and that were not considered appropriate;	
2.7.15. a substantiated statement, based on the findings of the specialist assessment, regarding the acceptability or not of the proposed development and if the proposed development should receive approval or not; and	*Section 10*
2.7.16. any conditions to which this statement is subjected.	*Section 10*
2.8. The findings of the Aquatic Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report including the mitigation and monitoring measures as identified, that are to be included in the EMPr.	*Yes*
2.9. A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	*Yes*

AQUATIC BIODIVERSITY IMPACT ASSESSMENT:

Basic Assessment for the Proposed Development of four 132 kV Overhead Power Lines and Associated Infrastructure in Support of the Proposed Padloper PV 1, PV 2, PV 3 and PV 4 Facilities and their Associated Infrastructure, near Murraysburg in the Western Cape and Northern Cape Provinces

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Report prepared for:	*Report prepared by:*
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September 2023

Executive Summary

African Clean Energy Developments (Pty) Ltd (Pty) Ltd (ACED) appointed EnviroSci (Pty) Ltd (EnviroSci) to conduct an aquatic assessment for the proposed Padloper Solar Photovoltaic (PV) Cluster, near Murraysburg located in the Northern and Western Cape provinces.

The Project Applicant, Padloper PV (Pty) Ltd (hereinafter referred to as "Padloper PV" or "the Applicant")[1], is proposing the development of 7 x Solar PV facilities with a capacity of between 100 and 250 MW each, and the associated 7 x 132 kV overhead power lines, and their associated infrastructure. Each solar PV facility will have a range of associated infrastructure, including, but not limited to, an on-site substation / switching station and Battery Energy Storage System (BESS) complex and will connect from the switching stations to the proposed Ishwati Emoyeni Collector Substation via associated 132 kV overhead power lines. This assessment investigates the respective grid connections to the to the proposed Ishwati Emoyeni Collector that will connect the PV 1, PV 2, PV 3 and PV 4 projects to the national grid.

The findings of this report are based on the Aquatic Ecological Screening Assessment, supported by baseline data collected during detailed site visits in February and March 2022 (summer). Additional information collected by EnviroSci for other renewable energy projects surrounding Murraysburg, which included several detailed walkdowns undertaken in 2022/2023 for adjacent projects and or grid connections that will use the same corridor to the Ishwati Emoyeni Collector Substation, were used to supplement the information contained in this report. Thus, this assessment is based both winter and summer seasonal data for the area.

The regulatory requirements are also discussed with regard the National Water Act (NWA, Act No. 36 of 1998) and National Environmental Management Act (NEMA, Act No. 107 of 1998) in Section 4 of this report, as well as the *Protocol for the specialist assessment and minimum report content requirements for environmental impacts on aquatic biodiversity*. This protocol supersede the Appendix 6 NEMA requirements. This report thus meets the criteria to fulfil a Specialist Verification Assessment Report, as the proposed development sites do intersect areas rated as Very High aquatic sensitivity Aquatic by the Department of Forestry, Fisheries and Environment (DFFE) Screening Tool (see Screening Verification Statement – Appendix 2), related to a variety of habitats observed during field investigations on site, associated with rivers and National Ecosystem Priority Areas (NFEPA).

The study area (i.e. where the power lines corridors - 400 m wide corridors, 200m each side of the proposed centreline) is situated predominantly within the Eastern Upper Karoo (NKu 4), Upper Karoo Hardeveld (NKu 2) and Southern Karoo Riviere vegetation units, associated with the mainstem systems of the Synderskraal / Bakensklip / Buffels rivers. The study area forms part of the upper catchment of the Groot / Gamtoos river systems near Jefferey's Bay.

Current waterbody inventories (van Deventer *et al*., 2020), 1: 50 000 topocadastral surveys mapping indicated the potential for several wetlands within the greater study region. These inventories include wetland spatial data based on landcover 2007 data, previous assessments and wetland information retained by the Provincial authorities, combined into one database that formed part of the updated National Spatial Biodiversity Assessment, 2018.

A baseline map was then developed and refined using the 2022 survey data, noting that due to the complex nature of the topography and geology, the features were digitised at a scale of 1:5 000, which included several more wetland areas associated with riverine floodplains previously indicated in the national assessments.

This, coupled to the aquatic delineations, preliminary information was collected on potential species that could occur within the watercourses, especially any conservation worthy species (Listed or Protected).

[1]Padloper Solar (Pty) Ltd is the Project Applicant, whereas African Clean Energy Developments (Pty) Ltd (ACED) is the Project Developer.

Using the baseline description and field data, while considering the current disturbances and site characteristics, several ecological features were identified, then categorised into one of number pre-determined sensitivity categories to provide protect and/or guide the layout planning and design processes.

The sensitivity ratings of High (No-Go) to Low were determined through an assessment of the habitat sensitivity and related constraints. However, these No-Go areas (with buffers) relate in general terms to the project and as some areas will need to be spanned by the overhead lines, with the assumption that as far as possible no towers / pylons and access tracks will be placed in these areas. The only override being if these areas are already disturbed or have and existing road/track crossing.

These proposed constraints / buffers do not include bird and or bat specialist buffers / constraints as theirs buffers along aquatic features are at times far larger around aquatic features, than those required for the known aquatic species within this region and are summarised below;

Development Component	Habitat Type	Sensitivity Rating of the Respective Habitat Type	Development Acceptability	Sensitivity Rating Override [2]
Switching Stations	Alluvial rivers / washes with or without riparian vegetation	High	No	None
	Minor watercourses / drainage lines	Moderate - Low	No	None
	Remainder of site	Low	Yes	N/A
OHLs	Alluvial rivers / washes with or without riparian vegetation	High	Yes but no new permanent tracks	Yes if access already occurs or no clearing of vegetation or creation of permanent tracks occurs.
	Minor watercourses / drainage lines	Moderate - Low	No	Access must be along existing tracks.
	Remainder of site	Low	Yes	N/A

In summary, structures such as switching stations and OHL pylons/towers, should be placed outside of the High Sensitivity habitats, while remaining structures (roads and transmission lines) could cross or span the Moderate / Low Sensitivity areas. Noting that Low Sensitivity can also = Moderate areas but with existing impacts e.g., current roads, farm tracks of previously disturbed areas.

[2] **Should an impact such as a road or disturbance already occur within the proposed footprint and confirmed during a site walkdown process and / or a technical solution can be provided that would not impact on the form or function of the habitat in question, then sensitivity rating for that habitat against the activity can be overridden.**

Several potential issues, risks and related impacts are summarised below and then discussed in more detail in Section 7 of this report, however all the impacts assessed were found to be similar for all the project corridors and were relevant as listed below. This is largely since the proposed layouts have avoid Very High sensitivity / No go areas identified in this assessment to impact avoidance rather the impact mitigation.

Construction Phase

- Potential impact 1: Loss of species of special concern.
- Potential impact 2: Damage or loss of riparian and wetlands systems and disturbance of the waterbodies.
- Potential impact 3: Spills and leaks from construction vehicles / machinery when working in or near the delineated systems, impacting localised surface water quality.

Operational and Maintenance Phase

- Potential impact 4: Creation of hard surfaces, resulting in runoff, erosion and sedimentation by the switching stations.

Decommissioning Phase

- Potential impact 5: Damage or loss of riparian and wetlands systems and disturbance of the waterbodies.
- Potential impact 6: Spills and leaks from construction vehicles / machinery when working in or near the delineated systems, impacting localised surface water quality.

Cumulative Impacts

- Cumulative impact 7: The cumulative assessment considers the various proposed renewable projects that occur within a 30 km radius of this site and their associated grid connections as well as the remainder of the Padloper cluster projects.

The nature of grid connection projects is such that they carry a low intensity impact on aquatic resources. The developer of the Padloper PV 1 - 4 targeted the higher lying areas where solar resources are best (which is typical in this environment), thus keeping the PV panel areas away from freshwater resources for the most part. However, the associated roads, OHL and other infrastructures must cross the site, and these come in more frequent contact with the drainage lines and associated features.

The projects also have small footprint when compared to the remaining farm portions, thus allowing for retention of much of the natural area, so the ecosystems should remain largely unaffected. This is largely based on the assumption that all sensitivity aquatic habitats will be avoided, using the existing tracks and roads shown in this assessment.

In conclusion, the anticipated impacts within the aquatic systems include disturbance during the construction phase, while changes to form and function of the site due to increased runoff even from rainfall would occur in the operational and maintenance (O&M) phase, however these would be **Very Low** post mitigation. This is because although some of the grind connection roads will need to cross several drainage lines / watercourses, the areas selected already contain impacts such as existing tracks / roads with crossings that may be upgraded, while it has been assumed that the OHL towers/pylons/pylons can avoid these systems. This in turn has also allowed for the avoidance of any Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) linked to the aquatic ecosystems.

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List of Abbreviations

BA	Basic Assessment
BESS	Battery Energy Storage System
BI	Biodiversity Importance
BID	Background Information Document
CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Area
CI	Conservation Importance
CSIR	Council for Scientific and Industrial Research
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and Environment
DWAF	Department of Water Affairs and Forestry, now DWS
DWS	Department of Water and Sanitation, formerly the Department of Water Affairs (DWA)
EA	Environmental Authorisation
ECO	Environmental Control Officer
EGI	Electrical Grid Infrastructure
EI	Ecological Importance
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Plan/Programme Report
EO	Environmental Officer (Site)
ES	Ecological Sensitivity
ESA	Ecological Support Area
EWR	Ecological Water Requirements
FBIS	Freshwater Biodiversity Information System
FEPA	Freshwater Ecosystem Priority Area
FI	Functional Integrity
GA	General Authorisation (Water Use Authorisation [WUA] type)
GIS	Geographic Information System
HGM	Hydrogeomorphic
IBA	International Bird Area
IHI	Integrated Habitat Index
IUCN	International Union of Conservation of Nature
NAEHMM	National Aquatic Ecosystem Health Monitoring Programme
NAEMP	National Aquatic Ecological Monitoring Program
NBA	National Biodiversity Assessment, 2018 also referred to as the National Biodiversity Assessment, 2018
NCBSBP	Northern Cape Biodiversity Spatial Plan
NCNCA	Northern Cape Nature Conservation Act No. 9 of 2009, amended 2012
NEM:BA	National Environmental Management: Biodiversity Act No. 10 of 2004
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NFEPA	National Freshwater Ecosystem Priority Atlas (Nel *et al*., 2011)
NWCS	National Wetland Classification System
O&M	Operations and Maintenance
OHL	Overhead Line – transmission line cable that is not buried
PA	Protected Area
PES	Present Ecological State
PPE	Personal Protective Equipment
PV	Photovoltaic
REC	Recommended Ecological Category
RHP	River Health Programme
RR	Receptor Resilience
RTU	Recognisable Taxonomic Unit
SAIIAE	South African Inventory of Inland Aquatic Ecosystems
SANBI	South African National Biodiversity Institute
SAPAD	South African Protected Areas Database
SCC	Species of Special Concern
SEI	Sensitivity and Ecological Importance
SQ	Subquaternary Catchment
SWMP	Stormwater Management Plan
ToR	Terms of Reference
VEGMAP	National Biodiversity Assessment 2018 Vegetation
WCBSP	Western Cape Biodiversity Spatial Plan
WRC	Water Research Commission
WUA	Water Use Authorisation
WUL	Water Use License
WULA	Water Use License Application

Glossary

For reference the following definitions apply:

- **Drainage line**: Lower category or order of watercourse that does not have a clearly defined bed or bank. It carries water only during or immediately after periods of heavy rainfall i.e. non-perennial, and riparian vegetation may not be present.

- **Perennial and non-perennial:** Perennial systems contain flow or standing water for all or a large proportion of any given year, while non-perennial systems are episodic or ephemeral and thus contain flows for short periods, such as a few hours or days in the case of drainage lines.

- **Riparian**: The area of land adjacent to a stream or river that is influenced by stream-induced or related processes. Riparian areas which are saturated or flooded for prolonged periods would be considered wetlands and could be described as riparian wetlands. However, some riparian areas are not wetlands, for example an area where alluvium is periodically deposited by a stream during floods but which is well drained.

- **Wetland**: 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 under normal circumstances supports or would support vegetation typically adapted to life in saturated soil (NWA, Act No. 36 of 1998); land where an excess of water is the dominant factor determining the nature of the soil development and the types of plants and animals living at the soil surface (Cowardin *et al*., 1979).

- **Water course**: As per the NWA means -

  (a) a river or spring;

  (b) a natural channel in which water flows regularly or intermittently;

  (c) a wetland, lake or dam into which, or from which, water flows; and

  (d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

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The Project Applicant, Padloper PV (Pty) Ltd (hereinafter referred to as "Padloper PV" or "the Applicant")[3], is proposing to develop 7 x solar PV facilities with a capacity of between 100 and 250 MW each and the associated 7 x 132 kV overhead power lines, and their associated infrastructure, near Murraysburg in the Western Cape and Northern Cape provinces. Each solar PV facility will have a range of associated infrastructure, including, but not limited to, an on-site substation and Battery Energy Storage System (BESS) complex and will connect from the switching station to the existing Gamma Main Transmission Substation (MTS) via dedicated 132 kV Overhead Power Lines (OHLs or Electrical Grid Infrastructure [EGI]). This assessment investigates the respective grid connections to the Ishwati Emoyeni Collector Substation and then Gamma MTS that will connect the PV 1, PV 2, PV 3 and PV 4 projects to the national grid (Figure 1).



Figure 1: The study area in relation to the general environment with the respective grid connections and PV sites shown for reference as these are assessed in a separate report.

[3] Padloper PV (Pty) Ltd is the Project Applicant, whereas African Clean Energy Developments (Pty) Ltd (ACED) is the Project Developer.

1. Introduction

1.1. Scope, Purpose, and Objectives of this Specialist Report

The aim of this report is to provide a summary of the aquatic baseline and identify, discuss and assess the potential impacts that may arise should the project be authorised. The report also makes recommendations with regards to management and mitigation, to further reduce, avoid or mitigate the potential impacts, and ultimately ensure the responsible and sustainable use of South Africa's aquatic resources. This report, in part, aims to provide the Competent Authority (Department of Forestry, Fisheries and Environment - DFFE) with sufficient information regarding the project's impacts on aquatic resources to inform responsible decision-making.

Certain aspects of the development, such as river crossings or any activities within 500 m of a wetland, will trigger the need for Section 21 Water Use License Applications (WULAs) or General Authorisation (GA) applications in terms of the National Water Act (Act No. 36 of 1998) (NWA).

Information regarding the state and function of the observed water bodies, including suitable no-go buffers areas and assessment of the potential direct and cumulative impact, where relevant, are also provided.

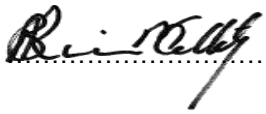
1.2. Details of Specialist

This report has been prepared as per the requirements of the Environmental Impact Assessment Regulations and the National Environmental Management Act (NEMA; Act No. 107 of 1998), any subsequent amendments and any relevant National and / or Provincial Policies related to biodiversity assessments. This also includes the minimum requirements as stipulated in the National Water Act (Act No. 36 of 1998), as amended in Water Use Licence Application and Appeals Regulations, 2017 Government Notice R267 in Government Gazette 40713 dated 24 March 2017, which includes the minimum requirements for a Wetland Delineation/ Aquatic Report.

Report prepared by: Dr. Brian Colloty Pr.Sci.Nat. 400268/07 (Ecology) / Member SAEIES and Wetland Society of South Africa.

Expertise / Field of Study: BSc (Hons) Zoology, MSc Botany (Rivers), PhD Botany Conservation Importance rating, and has worked as an independent consulting specialist 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 Department of Forestry, Fisheries and Environment (DFFE) and or the Department of Water and Sanitation (DWS).

Signed:…  Date:…3 September 2023……

1.3. Terms of Reference

The methodology used in this assessment was developed with the renewable industry in mind, coupled with the minimum requirements stipulated by DFFE (in terms of the *Protocol for the specialist assessment and minimum report content requirements for environmental impacts on aquatic biodiversity*) and the DWS (in terms of the National Water Act No. 36 of 1998, as amended). The methodology has been successful in assessing the direct, indirect and cumulative impacts of 185 proposed renewable energy projects between 2010 and 2023, of which 20 projects have been constructed:

The ToR prescribed that the surface water and aquatic biodiversity study included the following:

- Desktop analysis
- Site investigation
- Compilation of one draft and one final report for the proposed project which adheres to, but is not limited to, the following:
    - Initial Site Sensitivity Verification reporting requirements for environmental themes set out in Government Gazette No. 43110 which was promulgated on 20 March 2020 in terms of section 24(5)(a) and (h) of the NEMA, Act No. 107 of 1998.
    - Identification and mapping of any discrepancies with the environmental sensitivity as identified on the national web based environmental screening tool (hereafter referred to as the Screening Tool).
    - Identification of sensitive areas to be avoided (including corresponding spatial data) and the determination of the respective buffers (if applicable) for each of the proposed development sites.
    - Recommendations for the layout and allowable development footprint from a surface water and aquatic biodiversity perspective (including corresponding spatial data).
    - Provision of a list of potentially significant environmental impacts that may arise in the construction, operation and decommissioning phases of the project, including cumulative impacts.
    - A detailed impact assessment of each impact including:
        - A pre-mitigation and post-mitigation impact assessment
        - A list of essential mitigation measures and management interventions
    - A summary table of all the impacts to show the post-mitigation significance ratings.
    - Recommendations regarding the areas to be utilised for solar technologies within the proposed project development sites from a biodiversity perspective (including corresponding spatial data).

2. Approach and Methodology

This aquatic assessment 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 area's aquatic systems, applicable to the specific environment. They were used in a clear and objective manner, to identify and assess the potential impacts associated with the proposed development sites based on information collected within the relevant farm portions.

Current water resource classification systems make use of the Hydrogeomorphic (HGM) approach, and for this reason, the National Wetland Classification System (NWCS) approach was used in this study. It is important to understand the legal definition of a wetland, the means of assessing wetland conservation and importance and the relevant legislation aimed at 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.

For reference the following definitions apply:

- **Drainage line**: Lower category or order of watercourse that does not have a clearly defined bed or bank. It carries water only during or immediately after periods of heavy rainfall i.e. non-perennial, and riparian vegetation may not be present.

- **Perennial and non-perennial:** Perennial systems contain flow or standing water for all or a large proportion of any given year, while non-perennial systems are episodic or ephemeral and thus contain flows for short periods, such as a few hours or days in the case of drainage lines.

- **Riparian**: The area of land adjacent to a stream or river that is influenced by stream-induced or related processes. Riparian areas which are saturated or flooded for prolonged periods would be considered wetlands and could be described as riparian wetlands. However, some riparian areas are not wetlands, for example an area where alluvium is periodically deposited by a stream during floods but which is well drained.

- **Wetland**: 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 under normal circumstances supports or would support vegetation typically adapted to life in saturated soil (NWA, Act No. 36 of 1998); land where an excess of water is the dominant factor determining the nature of the soil development and the types of plants and animals living at the soil surface (Cowardin *et al*., 1979).

- **Water course**: As per the NWA means -

    - a river or spring;
    - a natural channel in which water flows regularly or intermittently;
    - a wetland, lake or dam into which, or from which, water flows; and
    - any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

<u>Waterbody classification systems</u>

Since the late 1960s, wetland classification systems have undergone a series of international and national revisions. 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 NWCS (Ollis *et al*., 2013). This system comprises a hierarchical classification process of defining a wetland based on the principles of the 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 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 this 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. 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 DWS. The Ecological Reserve of a wetland or river is used by DWS to assess the water resource allocations when assessing WULAs.

The NWCS 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 present 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 or any other activity that qualifies as a water use.

Ecological Water Requirement: 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 Ecological Water Requirement (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: Geographic regions that have been delineated in a top-down manner on the basis of physical/abiotic factors. 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 and Forestry (DWAF, now DWS) 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.

Wetland definition

Although NWCS (Ollis *et al*., 2013) was used to classify aquatic habitat types, but 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 they 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 NWA (Act No. 36 of 1998), 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 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 NWCS, the NWA and ecosystems included in DWAF's delineation manual (2005).

Ecosystem	National Wetland Classification System (NWCS)	National Water Act (NWA)	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 NWA, they are included as a 'watercourse' in terms of the Act.

[2] According to the NWA 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 delineation manual (2005).

National Wetland Classification System method

Due to the nature of the wetlands and watercourses observed, it was determined that the newly accepted NWCS should 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 and 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); and
- 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 HGM units discussed earlier. These 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; and
- 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 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 levels 1 – 5 deal with functional aspects, while Level 6 classifies wetlands on structural aspects.

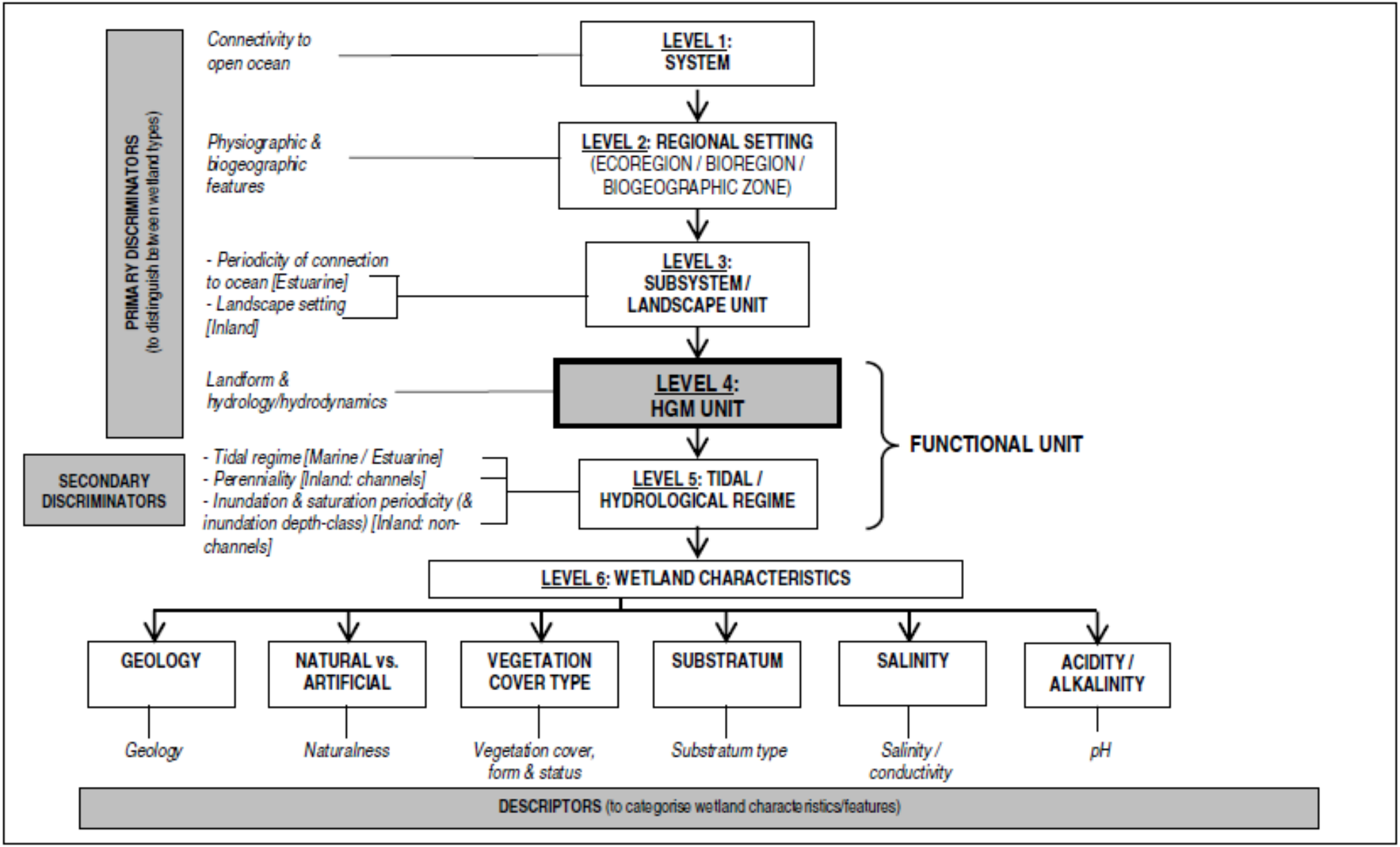


Figure 2: Basic structure of the NWCS, showing how 'primary discriminators' are applied up to Level 4 to classify Hydrogeomorphic (HGM) Units, with 'secondary discriminators' applied at Level 5 to classify the tidal/hydrological regime, and 'descriptors' applied.

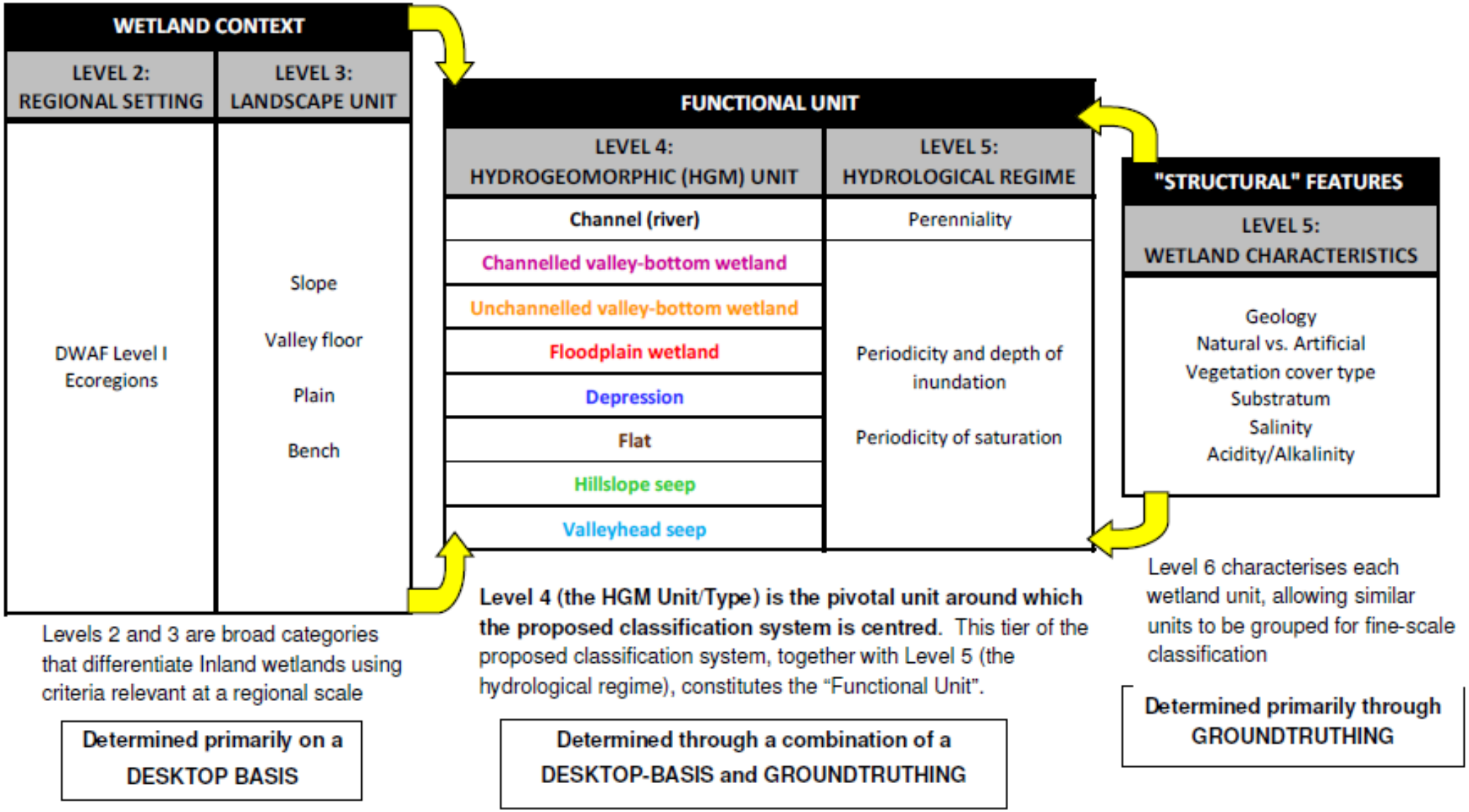


Figure 3: Illustration of the conceptual relationship of HGM Units (at Level 4) with higher and lower levels (relative sizes of the boxes show the increasing spatial resolution and level of detail from the higher to the lower levels) for Inland Systems (Ollis *et al*., 2013).

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 3) 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 (Water Research Commission (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.

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 (SANBI), a requirement under the National Environmental Management: Biodiversity Act (NEM:BA, 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.

2.1. Information Sources

Table 4: Key information sources used to conduct this assessment.

Data / Information	Source	Date	Type	Description
South African National Protected Areas Database (SAPAD)	Department of Environmental Affairs	2020, Q2	Spatial	Spatial delineation of protected areas in South Africa. Updated quarterly
Western Cape Biodiversity Spatial Plan (WCBSP)	Pool-Stanvliet, R., Duffell-Canham, A., Pence, G. and Smart, R. CapeNature / SANBI	2017	Report and Spatial	Spatial conservation planning units and associated management recommendations for the best land use options
National Biodiversity Assessment	South African National Biodiversity Institute	2018	Report and Spatial	Latest assessment of South African biodiversity and ecosystems, including, vegetation types, wetlands and rivers
Review of available data for a South African Inventory of Inland Aquatic Ecosystems (SAIIAE). Water SA 44 (2) 184-199	van Deventer H., Smith-Adao, L. Petersen C., Mbona N., Skowno A. and Nel, J.L.	2018	Report	Assessment of available spatial data regards aquatic ecosystems
Technical Report for the National Freshwater Ecosystem Priority Areas project. Water Research Commission (WRC) Report No. K5/1801.	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	Report	NFEPA
FrogMAP. 20202.	Animal Demography Unit. Accessed from http://frogmap.adu.org.za/?sp=400; on 2020-10-09	2020	Spatial databases	Frog distribution map
Freshwater Biodiversity Information System (FBIS)	Freshwater Biodiversity Information System (FBIS). 2022. Downloaded from https://freshwaterbiodiversity.org accessed on 15 June 2023	2022	Species distribution database	Freshwater species distribution data
Northern Cape Biodiversity Plan	Holness & Oosthuizen	2017	Spatial database	Spatial conservation planning units and associated management recommendations for the best land use options

The reference list at the end of this report (Section 12) also includes various sources of literature with regard the assessment of birds and, amphibia associated with aquatic systems.

2.2. Assumptions, Knowledge Gaps and Limitations

To obtain a comprehensive understanding of the dynamics of both the flora and fauna of 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. However, due to time constraints these long-term studies are not feasible, and the assessment is thus mostly based on instantaneous sampling. This limitation is common to many impact assessment type studies, but the findings are deemed adequate for the purposes of decision-making support regarding project acceptability, unless otherwise state, the confidence in the level of assessment remains high.

Therefore, due to the scope of the work presented in this report, a long-term investigation of the proposed site was not possible and as such not perceived as part of the Terms of Reference. However, a concerted effort was made to sample and assess as much of the potential site, as well as make use of any supporting literature, species distribution data and aerial photography.

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.

2.3. Consultation Processes Undertaken

Comment was received during the pre-application phase (i.e., following the release of the Background Information Document - BID) with regard the aquatic environments and has been integrated into this assessment with reference to the Provincial Biodiversity Spatial Plans.

3. Description of Project Aspects relevant to Aquatic Biodiversity

The clearing of natural vegetation, placement of OHL towers/pylons and the creation of hard surfaces associated with substations, temporary laydowns and camps in the construction phase, typically results in this highest number of impacts. Therefore, from an aquatic environment standpoint, the impacts will firstly result in the disturbance of the natural vegetation, which then impacts on the available animal habitat and any corridors. However, these impacts are related to the creation of the needed cleared areas, while the remaining landscape then remains unchanged.

4. Baseline Environmental Description

4.1. General Description

The National Wetland Inventory (van Deventer *et al*., 2018), National Freshwater Ecosystems Priority Atlas (Nel *et al*. 2011), which is included into the National Biodiversity Assessment (SANBI, 2018), have indicated that several important riverine systems could occur within the greater region, i.e. riverine reaches associated with the Synderskraal, Bakensklip and Buffels river catchments.

Furthermore, these spatial databases indicated that some of these systems are perennial but having assessed and or travelled through the region for several years, all of the system would be considered non-perennial or ephemeral (Plates 1-3).



Plate 1: A watercourse with narrow riparian zone within a broad alluvial zone, with channel areas down to exposed bedrock on the eastern boundary of PV 4.



Plate 2: The upper reaches of the Bakensklip river system that will be spanned by the EGI 3 connection.



Plate 3: A minor watercourse observed within the study area associated with PV 1 site, near the proposed switching station

4.1.1. Aquatic Biodiversity and Ecosystems

4.1.1.1. Aquatic Ecosystems

Current waterbody inventories (van Deventer *et al.,* 2020), 1: 50 000 topocadastral surveys mapping indicated the potential for several wetlands within the greater study region (Figure 4). These inventories include wetland spatial data based on landcover 2007 data, previous assessments and wetland information retained by the Provincial authorities, combined into one database that formed part of the updated National Spatial Biodiversity Assessment, 2018.

The proposed PV projects are in the L21C (Synderskraal / Bakensklip) and L21E (Buffels River) Quinary Catchments of the Drought Corridor Ecoregion in the Mzimvubu-Tsitsikamma Proto Catchment Management Agency (Gqeberha Regional Office) (Figure 4). While the proposed grid connections to the Ishwati Emoyeni Collector Substation will traverse across quinary catchments L21B, L21C and L21E of the rivers mentioned above, also located in the Mzimvubu-Tsitsikamma Proto Catchment Management Agency.

The DFFE Screening Tool identified the aquatic environment for the study area as having a Very High Sensitivity, but this was based on the only the presence of these rivers, are included into as important rivers and also contain a National Freshwater Priority Ecosystem Areas (NFEPAs) (Figure 7). The presence of these Very High Sensitivity features was confirmed during this assessment (Appendix 2 for Verification Statement).

No wetlands were found within the study areas, only riverine features such as alluvial floodplains and riparian thickets dominated by *Vachellia karroo, Searsia lancea* and *Euclea undulata*. Additional species surveyed within selected reaches are listed below.

The study areas are not located within an International Bird Area (IBA) or a Strategic Water Resource Area and did not contain any Wetland Clusters, Protected Areas Expansion Strategy Areas or listed Threatened Ecosystems.

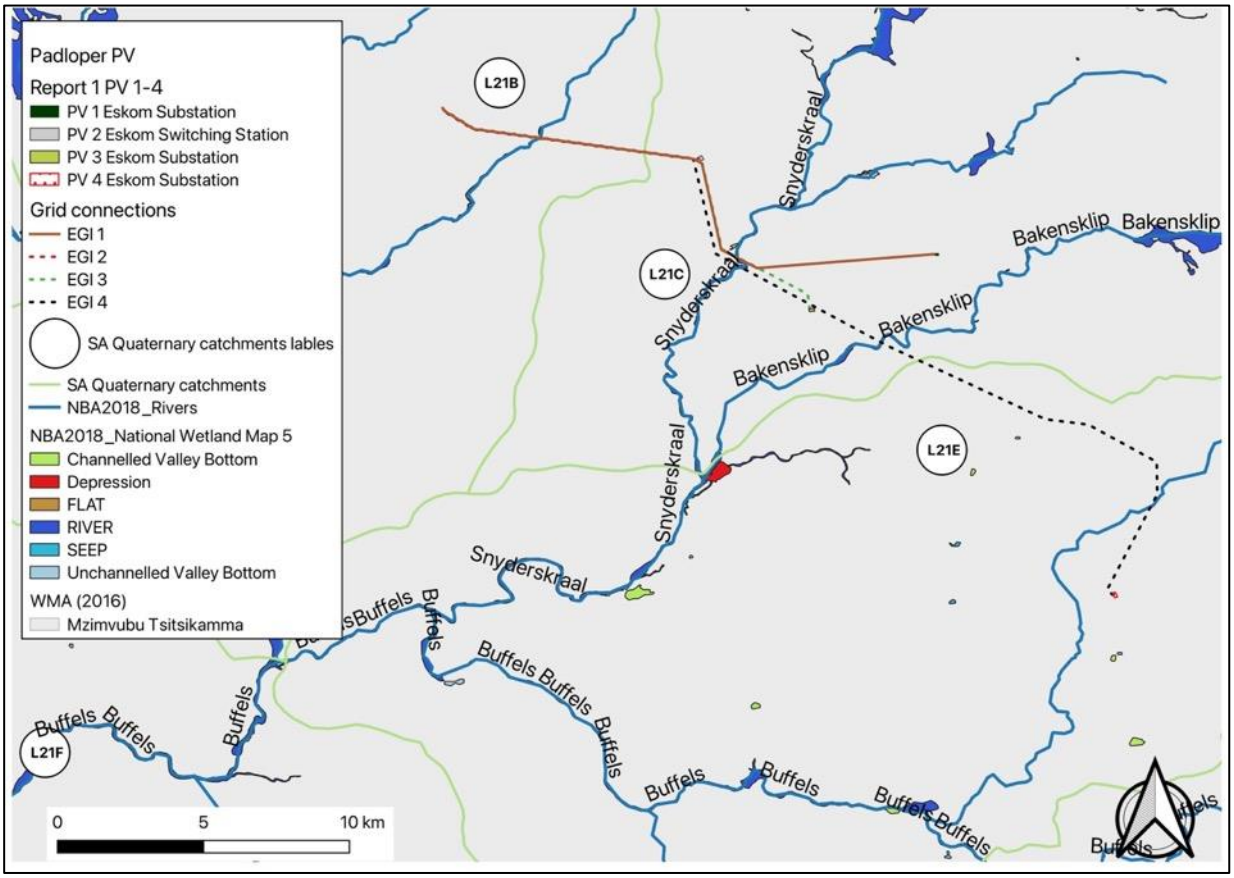


Figure 4 Mainstem rivers, quinary catchments and Water Management Areas in relation to the various project components and potential waterbody / wetland areas.

4.1.1.2. Aquatic Species

Coupled to the aquatic delineations, information was collected on potential species that could occur within the wetlands and water courses, especially any areas that would contain open water for long periods and or conservation worthy species (Listed or Protected).

None of the dominant riparian / wetland associated plant species observed are listed or protected under any form of legislation. Plant species included the following;

- *Seersia lanceolata*
- *Vachellia karroo*
- *Ficinia nodusa*
- *Juncus effusus*
- *Carex* spp
- *Centella asiatica*
- *Erianthus capensis*
- *Sporobolus fimbriatus*
- *Cynodon incompletus*
- *Prosopis* spp (Exotic)
- *Eragrostis curvula*
- *Erharta calcynia*
- *Merxmuellera disticha*
- *Phragmites australis*
- *Cynodon dactylon*

Additional species known to occur in the aquatic systems within the study area also include the following species (FBIS, 2023):

- *Carex glomerabilis*
- *Cyperus marginatus*
- *Denekia capensis*
- *Eleocharis dregeana*
- *Fingerhuthia sesleriiformis*
- *Geranium multisectum*
- *Helictotrichon turgidulum*
- *Jamesbrittenia aurantiaca*
- *Juncus inflexus*
- *Lobelia laxa*
- *Merxmuellera macowanii*
- *Pterygodium nigrescens*
- *Ranunculus trichophyllus*
- *Trifolium burchellianum* subsp. *burchellianun*

Similarly, amphibian species are known to occur within the region based on collection data for the region, but little is known of the actual distribution of frogs within the study area. Therefore, based on mapping data contained in Minter *et al*. (2004) and the FrogMAP spatial database, Table 5 indicates the potential frogs known to occur in the area and their preferred habitat, with three frog species being observed during this assessment.

Table 5: Potential and observed amphibians within the study area.

FrogMAP. 2019. Animal Demography Unit. Accessed from http://frogmap.adu.org.za/?sp=400; on 2022.10.015.

Amphibian Taxa	Common Name	Conservation Status (IUCN)	Likelihood of Occurring Based on Previous Records and or Availability of Habitat
Vandijkophrynus gariepensis gariepensis	Karoo toad	Least Concern	Likely
Cacosternum boettgeri	Common caco	Least Concern	Likely
Cacosternum karooicum	Karoo dainty frog	Least Concern	Unlikely
Strongylopus grayii	Clicking stream frog	Least Concern	Unlikely
Amietia fuscigula	Cape river frog	Least Concern	Observed
Xenopus laevis	African clawed toad	Least Concern	Observed
Tomopterna delanandii	Cape sand frog	Least Concern	Unlikely

4.2. Identification of Environmental Sensitivities

The PES scores have been revised for the country and based on the new models, aspects of functional importance as well as direct and indirect impacts have been included (DWS, 2014). The new PES system 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 new 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.

All the systems assessed by DWS (2014) on a Subquaternary level within the study area were rated as PES B = Largely Natural to C = Moderately Modified. While these were also rated as High in terms of Ecological Sensitivity and Low in terms of Ecological Importance respectively.

Based on the information collected during the field investigations, these ratings are verified and upheld for the riverine systems. The High Ecological Sensitivity rating for the natural water sources, is further substantiated by the fact that some of the affected catchments are included in both the National Freshwater Priority Atlas and the respective provincial Biodiversity Spatial Plan Critical Biodiversity Areas (CBA) spatial layers (Figures 5 and 6).

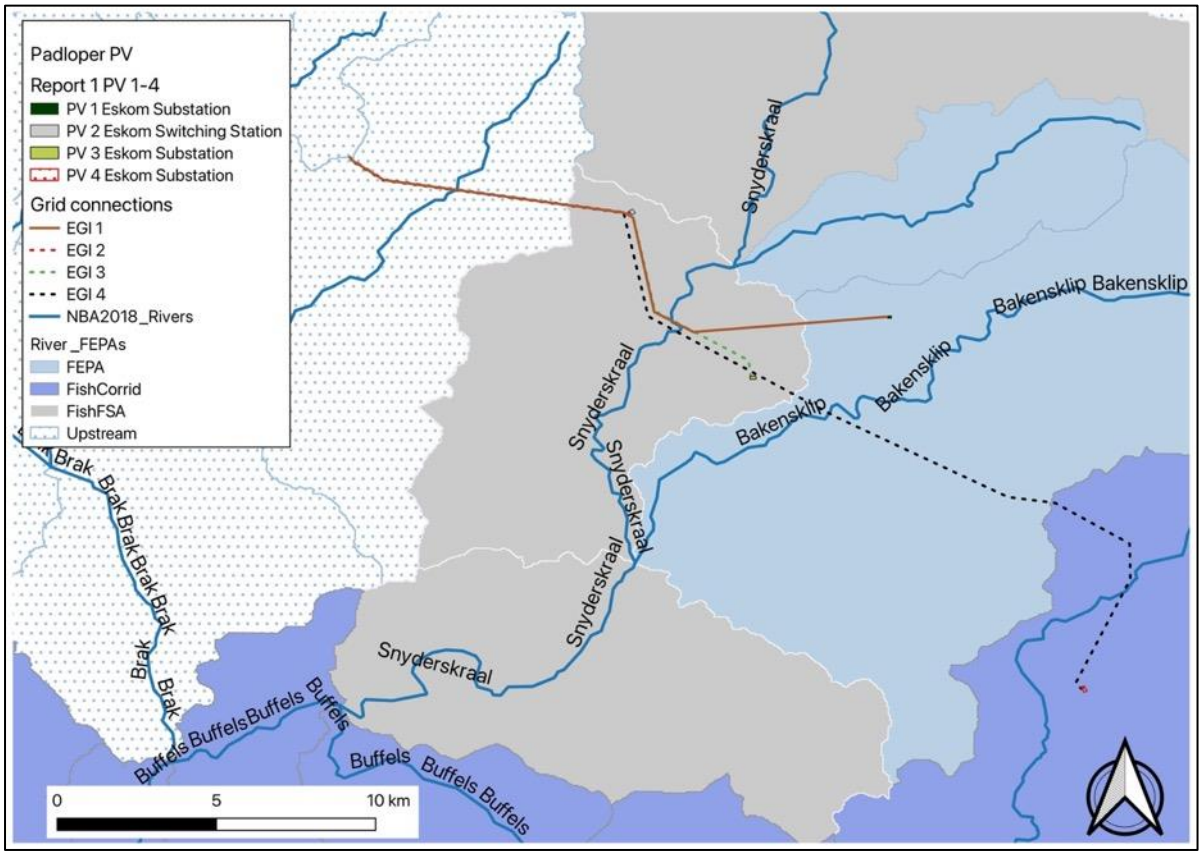


Figure 5: The Freshwater Ecosystem Priority Areas for the study sites (Nel *et al.*, 2011).

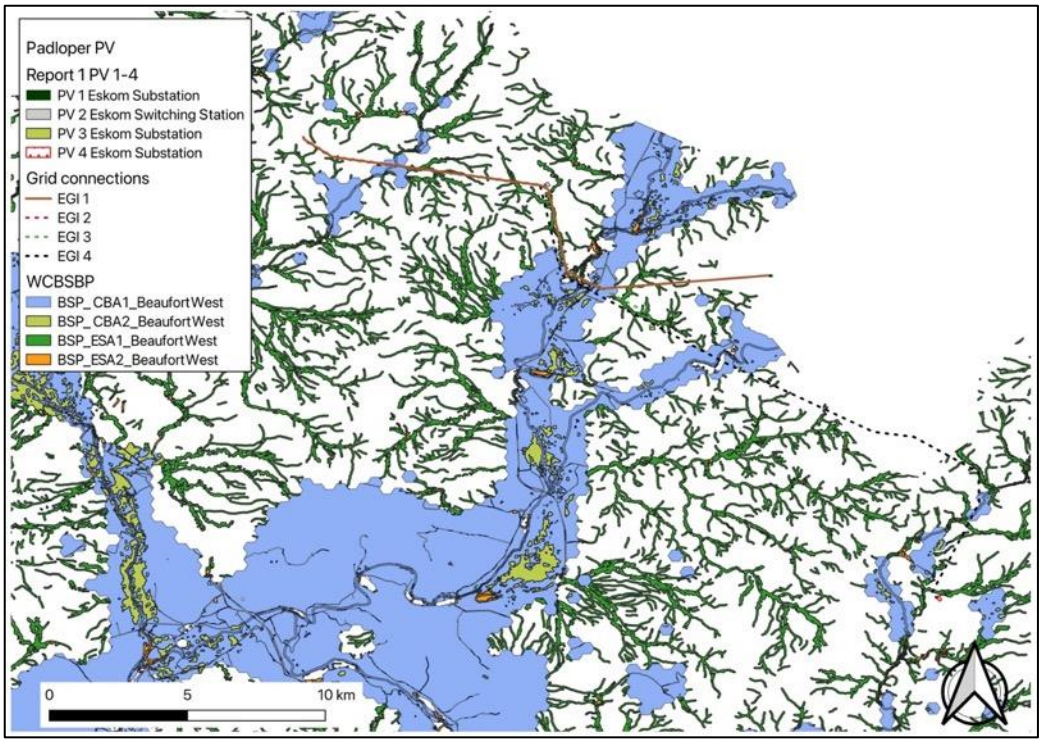


Figure 5a: The Critical Biodiversity Areas (CBAs) as per the WCBSP (Beaufort West).

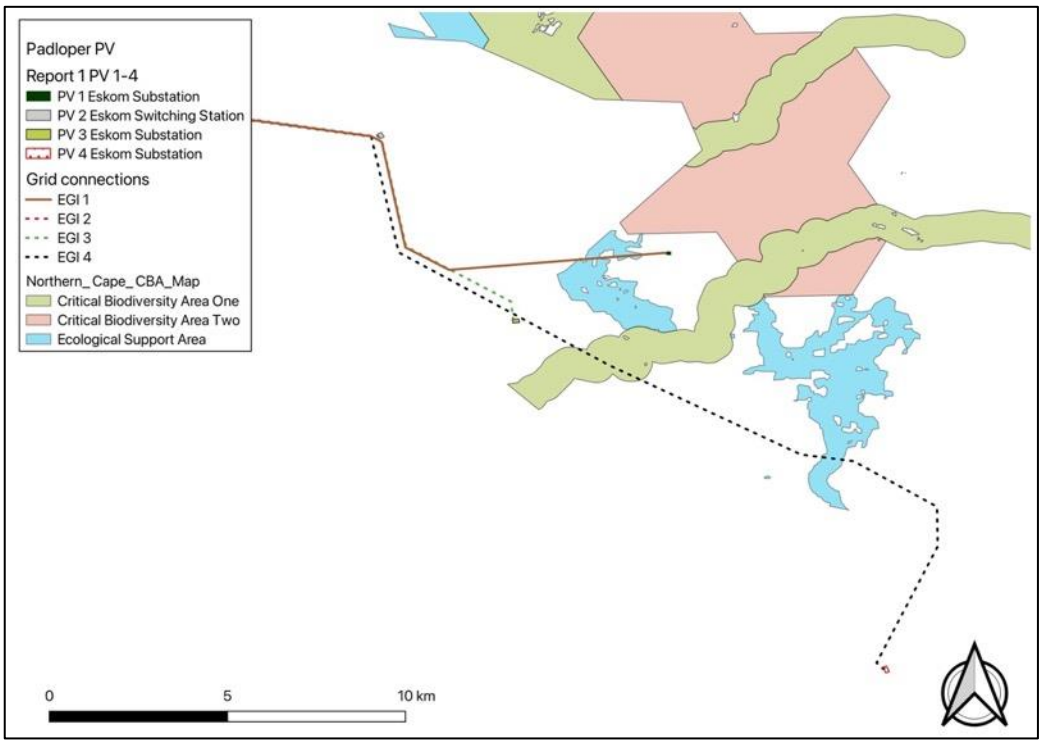


Figure 5b: The Critical Biodiversity Areas (CBAs) as per the NCBSP.

4.2.1. Sensitivities identified by the National Web-Based Environmental Screening Tool

Figure 6 below extracted from the DFFE Screening Tool indicates that Very High sensitivity areas summarised as follows, where if none are indicated then LOW:

PV 1 Grid	PV 2 Grid	PV 3 Grid	PV 4 Grid
CBA 1 Aquatic	CBA 1 Aquatic	CBA 1 Aquatic	CBA 1 Aquatic
ESA 1 Aquatic	ESA 1 Aquatic		
ESA 1	Rivers Condition Score AB		
FEPA Catchment	Wetlands / Rivers		
Rivers Condition Score AB		ESA 1 Aquatic	ESA 1 Aquatic
Rivers Condition Score C		Rivers Condition Score AB	FEPA Catchment
Wetlands / Rivers		Wetlands / Rivers	Rivers Condition Score AB
		Wetlands – Upper Karoo Bioregion Valley Bottom	Rivers Condition Score C
			Wetlands / Rivers

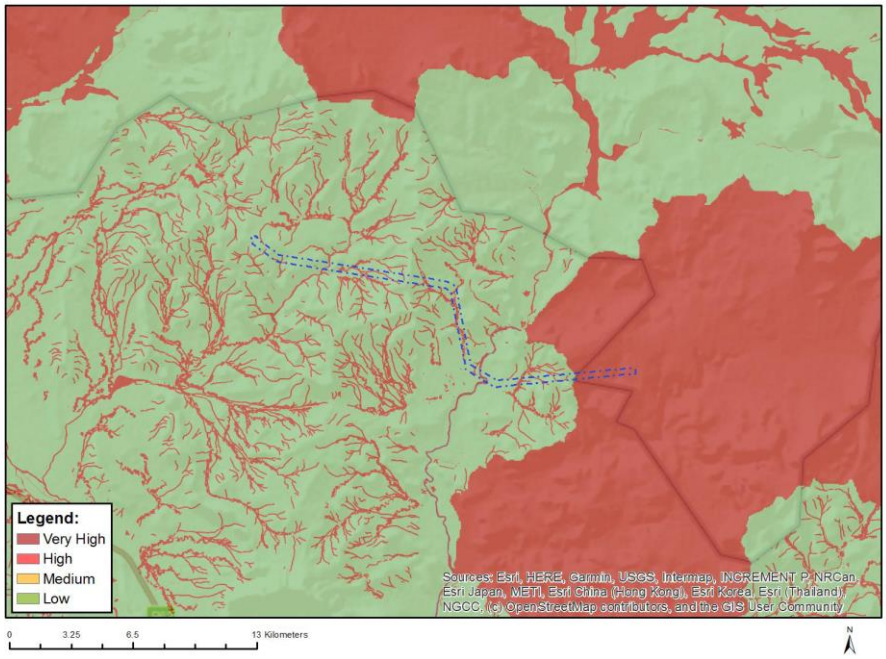


Figure 6a: The map presented in the National Screening Tool results for the PV 1 grid corridor, where Dark Red = Very High and Green = Low.



Figure 6b: The map presented in the National Screening Tool results for PV 2 grid corridor, where Dark Red = Very High and Green = Low.

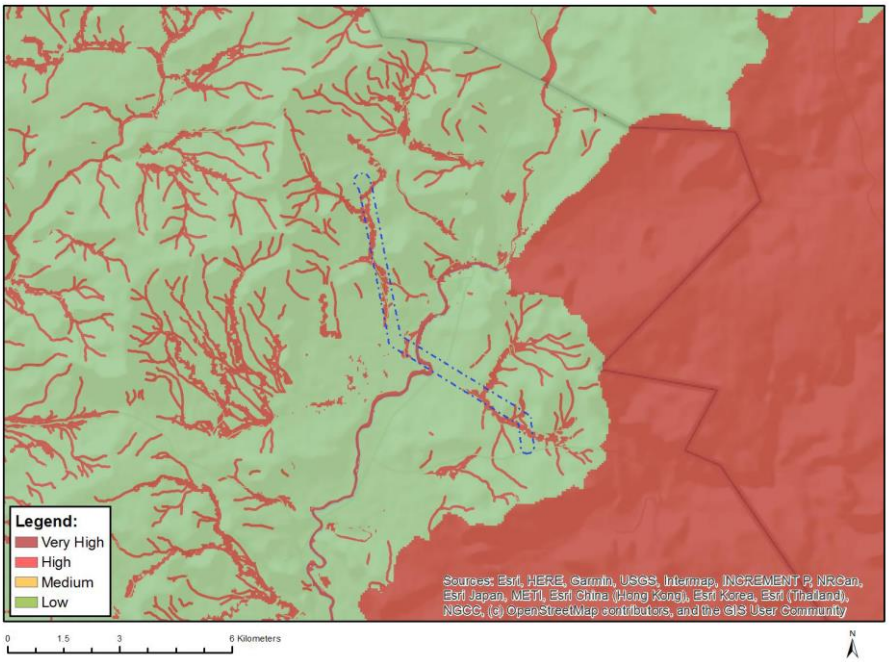


Figure 6c: The map presented in the National Screening Tool results for PV 3 grid corridor, where Dark Red = Very High and Green = Low.

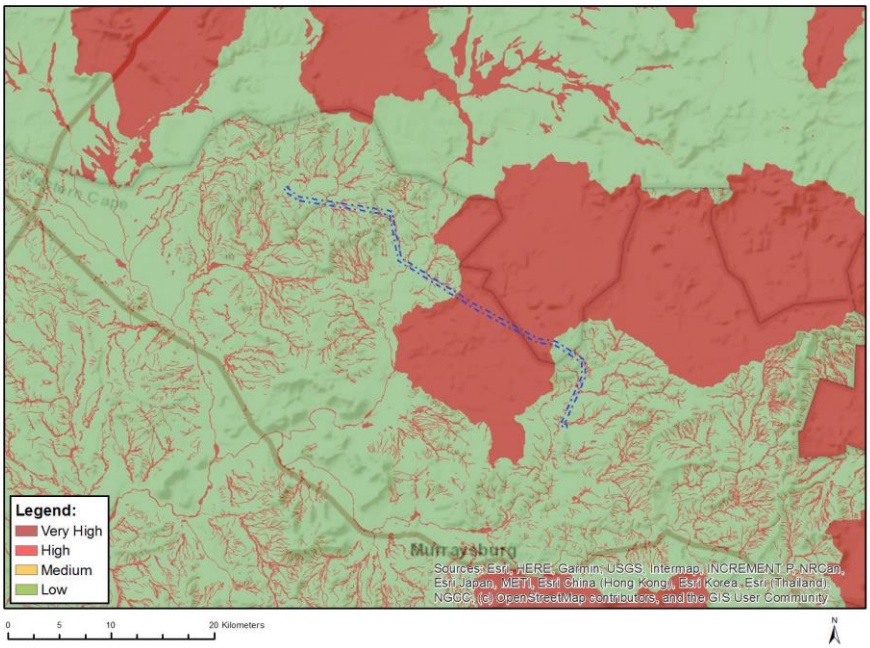


Figure 6d: The map presented in the National Screening Tool results for PV 4 grid corridor, where Dark Red = Very High and Green = Low.

4.2.2. Specialist Sensitivity Analysis and Verification

Using the baseline description and preliminary field data while considering the current disturbances and site characteristics, the following features were identified, then categorised into one of a number pre-determined sensitivity categories to provide protect and/or guide the layout planning and possibly the design processes:

High = No Go	"No go" areas or setbacks and areas or features that are considered of such significance that impacting them may be regarded as fatal flaw or strongly influence the project impact significance profile Therefore areas or features that are considered to have a high sensitivity or where project infrastructure would be highly constrained and should be avoided as far as possible. Infrastructure located in these areas are likely to drive up impact significance ratings and mitigations.
Moderate	Areas that are deemed to be of medium sensitivity but should still be avoided as this would minimise impacts and or the need for additional Water Use Authorisation in the case of any aquatic features.
Low	Areas of low sensitivity or constraints, such as artificial systems with little to no biological value or would not result in any future licensing requirements e.g. dry earth wall farm dams. While from a terrestrial perspective the vegetation or habitat is ubiquitous within the greater region or has seem some form of disturbance.

Table 6 below provides an overview of the sensitivity of features (with buffers distances included) as it relates to the main project component types for the project. The features are shown spatially in Figure 7.

The sensitivity ratings of High No-Go to Low were determined through an assessment of the habitat sensitivity and related constraints. However, these No-Go areas (with buffers) relate in general terms to the project and there are areas where encroachment on these areas would occur (i.e. existing road crossings within systems and considered acceptable since these areas have already been impacted).

Table 6: Results of the sensitivity rating / constraints assessment

Development Component	Habitat Type	Sensitivity Rating of the Respective Habitat Type	Development Acceptability	Sensitivity Rating Override [4]
Switching Stations	Alluvial rivers / washes with or without riparian vegetation	High	No	None
	Minor watercourses / drainage lines	Moderate - Low	No	None
	Remainder of site	Low	Yes	N/A
OHLs	Alluvial rivers / washes with or without riparian vegetation	High	Yes but no new permanent tracks	Yes if access already occurs or no clearing of vegetation or creation of permanent tracks occurs.
	Minor watercourses / drainage lines	Moderate - Low	No	Access must be along existing tracks.
	Remainder of site	Low	Yes	N/A

[4] **Should an impact such as a road or disturbance already occur within the proposed footprint and confirmed during a site walkdown process and / or a technical solution can be provided that would not impact on the form or function of the habitat in question, then sensitivity rating for that habitat against the activity can be overridden.**

In summary, structures such as substations and OHL pylons/towers, should be placed outside of the High Sensitivity habitats, while remaining structures (roads and transmission lines) could cross or span the Moderate / Low Sensitivity areas. Noting that Low Sensitivity can also = Moderate areas but with existing impacts e.g., current roads, farm tracks of previously disturbed areas.

Figure 7 below indicates the proposed activities in relation to the delineated systems and the respective sensitivity ratings.

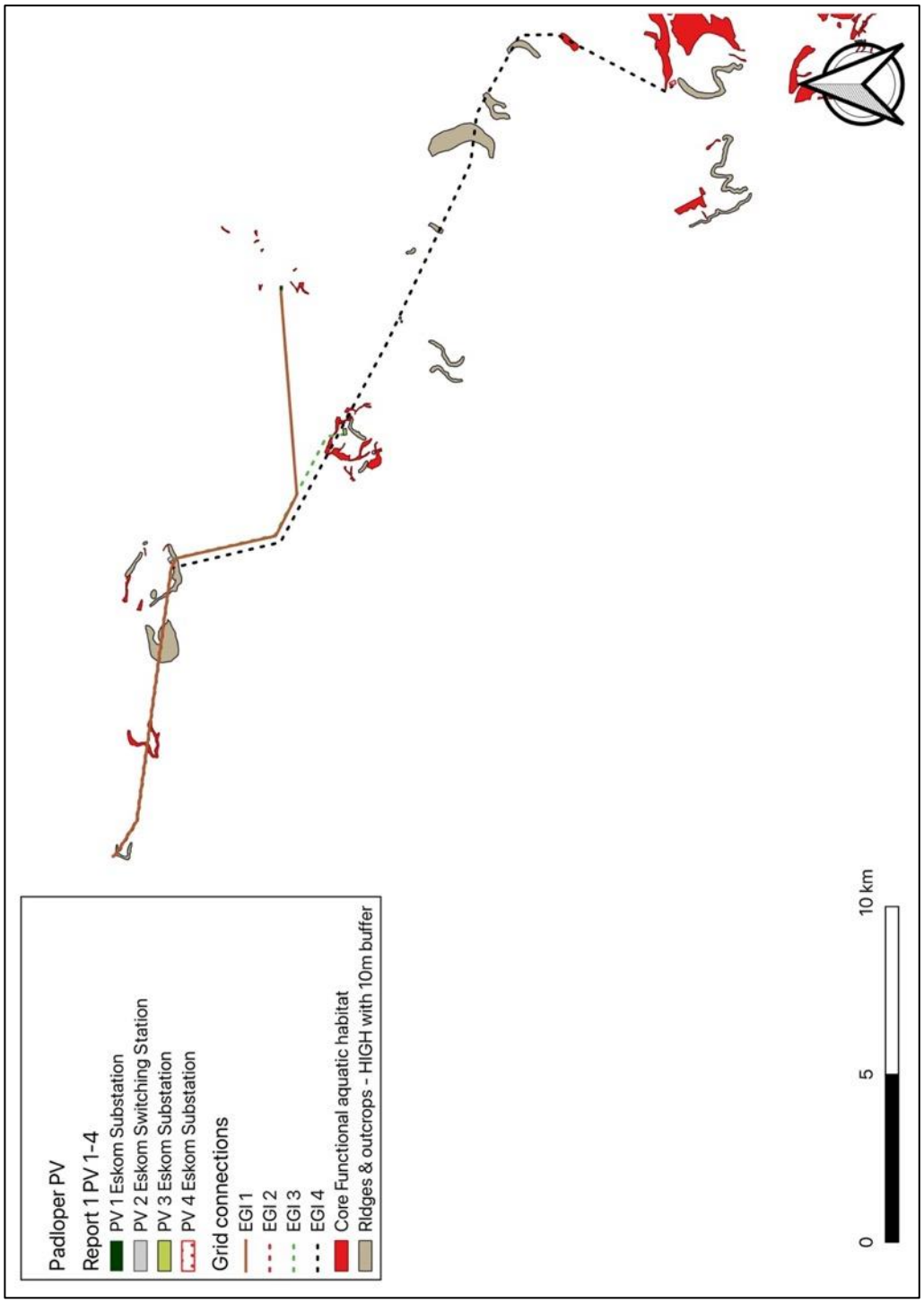


Figure 7: The delineated waterbodies and their respective sensitivity ratings in relation to the proposed layouts, where the Core Functional Aquatic Habitats = Very High / No-Go Sensitivity

4.2.3. Sensitivity Analysis Summary Statement

When compared to the results of the National Screening Tool results in relation to the receiving environment, the proposed layout has avoided any areas that would be considered, as Very High sensitivity, with the only exception being a number of the proposed grid connections that cross some of these areas (Figure 7).

5. Alternative Development Footprints

The 2014 EIA Regulations require that any feasible and reasonable activity, location or technology alternatives considered must be described and comparatively assessed. However as most of the infrastructure has, through a process of design iteration, avoided important aquatic habitats, no alternative layout assessment is deemed necessary.

6. Issues, Risks, and Impacts

Several potential issues, risks and related impacts are summarised below and then discussed in more detail in Section 7 of the impact assessment below, however all the impacts assessed were found to be similar for all the projects where relevant as listed below. This is largely due to the fact that the proposed layouts have avoid Very High sensitivity / No go areas identified in this assessment as a means to impact avoidance rather the impact mitigation.

6.1. Identification of Potential Impacts/Risks for the proposed Padloper EGI 1 – 4

Construction and Decommissioning Phases

- Impact 1: Loss of aquatic species of special concern
- Impact 2: Damage or loss of riparian and wetlands systems and disturbance of the waterbodies in the construction phase.
- Impact 3: Potential impact on localised surface water quality

Operational Phase

- Impact 4: Impact on aquatic systems through the possible increase in surface water runoff on form and function - Increase in sedimentation and erosion.

Construction and Operational Phases

- Impact 5: No-go option
- Impact 6: Cumulative impacts or powerline infrastructure on the aquatic resources or the area.

6.2. Summary of Issues identified during the Public Consultation Phase [if relevant]

A BID was released to I&AP for a 30 day public consultation period. During this public consultation period the Northern Cape Authorities indicated that they would like to see separated maps for the various CBA areas as shown in Figures 6 a – d.

7. Impact Assessment

Due to the nature of the project layouts, the overall impacts are typically related to the construction and decommissioning phases of the project, i.e. when the soils are disturbed when the substation hard surface areas and or tower /pylons foundations are installed. It has been assumed that the overhead cable sections will have the pylons placed outside of the demarcated water course areas and would thus have less of an impact or if they have to span waterbodies such as floodplain areas, no access tracks will be created in these areas and only the pylons will be installed.

The potential impacts identified during the assessment are:

Construction Phase

- Potential impact 1: Loss of aquatic Species of Special Concern (SSC).
- Potential impact 2: Damage or loss of riparian and watercourse systems and disturbance of the waterbodies in the construction phase.
- Potential impact 3: Spills and leaks from construction vehicles / machinery when working in or near the delineated systems, impacting localised surface water quality.

Operational Phase

- Potential impact 4: Creation of hard surfaces, resulting in runoff, erosion and sedimentation.

Decommissioning Phase

- Potential impact 5: Damage or loss of riparian and watercourse systems and disturbance of the waterbodies in the construction phase.
- Potential impact 6: Spills and leaks from construction vehicles / machinery when working in or near the delineated systems, impacting localised surface water quality.

Cumulative Impacts

- Cumulative impact 7: The cumulative assessment considers the various proposed renewable projects that occur within a 30 km radius of this site and their associated grid connections as well as the remainder of the Padloper cluster projects.

7.1 Potential Impacts during the Construction Phase

IMPACT 1: Loss of aquatic species of special concern – Direct Impact

Several plant SCC within the region have conservation value or are protected by the Provincial bodies of legislation, but no listed species were observed within any of the aquatic systems on the site.

IMPACT 2: Damage or loss of riparian and riverine systems and disturbance of the waterbodies in the construction phase when road crossings are created – Direct Impact

The OHL have for the most part avoided any aquatic ecosystems; however some will need to spanned, but it is assumed that if no existing track occurs, then these will be avoided or no formal crossings will be created.

IMPACT 3: Spills and leaks from construction vehicles / machinery when working in or near the delineated systems, impacting localised surface water quality – Direct Impact

Leaks from machinery, vehicles, or certain construction materials such as cement / concrete used during the construction phase have the potential to result in very localised pollution, should any spill / leaks occur within the watercourse / wetlands observed. These are likely to occur, but on a small scale, with remediation being easy and quick to implement.

IMPACT 4: Creation of hard surfaces, resulting in runoff, erosion and sedimentation – Direct Impact

Impact on localised surface water quality and habitat degradation, should the unstable soils erode resulting in downstream sedimentation. This impact would have a limited effects on the natural watercourse, as these already carry natural sediment loads when flowing. Any disturbances within these areas, could impact on the flow and dynamics within the riverine areas, although on a limited scale.

Impact Summary: Construction Phase (for all substation hub location/ BESS technology alternatives)

Impact 1	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential Mitigation Measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
CONSTRUCTION PHASE						
Loss of aquatic species of special concern (SSC)	*Status*	*Negative*	*Low*	*A preconstruction walkdown must be conducted to identify any areas that may contain any aquatic SSC so that these can be demarcated and avoided in the final design process.* *Any remaining species that could not be avoided must then be relocated in a Search and Rescue programme that should be initiated prior to construction. (Note this has not been included to reduce the impact rating)* *Develop Construction EMPr, Monitoring and Rehabilitation Plan*	***Very Low***	*High*
	Spatial Extent	*Regional*				
	Duration	*Long term*				
	Consequence	*Moderate*				
	Probability	*Unlikely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Low*				

Impact 2	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential Mitigation Measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
CONSTRUCTION PHASE						
Damage or loss of riparian and riverine systems and disturbance of the waterbodies in the	*Status*	*Negative*	*Low*	*A pre-construction walkthrough by an aquatic specialist is recommended so they can assist with the development of the Stormwater Management Plan (SWMP) and Aquatic Construction Rehabilitation and Monitoring Plan, coupled*	***Very Low***	*High*
	Spatial Extent	*Site specific*				
	Duration	*Short term*				
	Consequence	*Moderate*				
	Probability	*Likely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Low*				
	Spatial Extent	*Site specific*				
	Duration	*Short term*				
	Consequence	*Moderate*				

construction phase	*Probability*	*Likely*		*to micro-siting of the final layout.* *Suitable stormwater management systems must be installed along roads to or along the OHL and other areas and monitored during the first few months of use. Any erosion / sedimentation must be resolved through whatever additional interventions maybe necessary (i.e., extension, energy dissipaters, spreaders, etc).* *Furthermore, the following applies to watercourse crossing upgrades associated with the proposed development:* • *All pipe culverts must be removed and replaced with suitable sized box culverts, where road levels are raised.* • *River levels, regardless of the current state of the river / water course will be reinstated thus preventing any impoundments from being formed. The related designs must be assessed by an aquatic specialist during a pre-construction walkdown.* • *Where large cut and fill areas are required, these must be stabilised and rehabilitated during the construction process, to minimise erosion and sedimentation.* *Monitoring* *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 river crossings.*		
	Reversibility	*Moderate*				
	Irreplaceability	*Low*				

Impact 3	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential Mitigation Measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
CONSTRUCTION PHASE						
Impact on localised surface water quality ***(Spills and leaks from construction vehicles / machinery when working in or near the delineated systems)***	*Status* *Spatial Extent* *Duration* *Consequence* *Probability* *Reversibility* *Irreplaceability*	*Negative* *Site specific* *Short term* *Moderate* *Likely* *Moderate* *Low*	*Low*	• *All liquid chemicals including fuels and oil, must be stored in with secondary containment (bunds or containers or berms) that can contain a leak or spill. Such facilities must be inspected routinely and must have the suitable Personal Protective Equipment (PPE) and spill kits needed to contain likely worst-case scenario leak or spill in that facility, safely.* • *Washing and cleaning of equipment must be done in designated wash bays, where rinse water is contained in evaporation/sedimentation ponds (to capture oils, grease cement and sediment).* • *Mechanical plant and bowsers must not be refuelled or serviced within 100m of a river channel.* • *All construction camps, laydown areas, wash bays, batching plants or areas and any stores should be more than 50m from any demarcated water courses.* • *Littering and contamination associated with construction activity must be avoided through effective construction camp management.* • *No stockpiling should take place within or near a water course.* • *All stockpiles must be protected and located in flat areas where run-off will be minimised and sediment recoverable.*	***Very Low***	*High*

7.2 Potential Impacts during the Operational Phase

IMPACT 4: Creation of hard surfaces, resulting in runoff, erosion and sedimentation – Indirect Impact

This impact would be limited to any additional hard surface areas, and too a limited degree to the OHL structures unless tracks are created. Any such structures have then ability to generate surface water runoff,

which then has the potential to create erosion with downstream sedimentation. Noting the alluvial nature of the receiving environment and the size and position of the structures, this impact is unlikely to occur.

Impact 4	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential Mitigation Measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
OPERATIONAL PHASE						
Creation of hard surfaces resulting in runoff, erosion and sedimentation	*Status*	*Negative*	*Low*	*A SWMP must be developed in the preconstruction phase, detailing the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems. Effective stormwater management must include effective stabilisation (gabions and Reno mattresses) of exposed soil.* *Monitoring should occur on a monthly basis for 6 months post construction and where any unstable soils occur, these must be protected with temporary stabilisation dependent on the scale of the impact i.e. sand bags - hay bales) until areas become revegetated. If any areas require permanent erosion protection (e.g., gabions or stone pitching) then this must be included in the WULA / GA application.*	***Very Low***	*High*
	Spatial Extent	*Site specific*				
	Duration	*Short term*				
	Consequence	*Moderate*				
	Probability	*Unlikely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Low*				

7.3 Potential Impacts during the Decommissioning Phase

IMPACT 5: Damage or loss of riparian and riverine systems and disturbance of the waterbodies in the decommissioning phase when roads crossings are created – Direct Impact

IMPACT 6 Spills and leaks from construction vehicles / machinery when working in or near the delineated systems, impacting localised surface water quality – Direct Impact

Leaks from machinery, vehicles, or certain construction materials such as cement / concrete used during the decommissioning phase have the potential to result in very localised pollution, should any spill / leaks occur within the watercourse / riverine areas observed. These are likely to occur, but on a small scale, with quick remediation.

Impact Summary: Decommissioning Phase

Impact 5	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential Mitigation Measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
DECOMMISSIONING PHASE						
	Status	*Negative*	*Low*		***Very Low***	*High*

Damage or loss of riparian and riverine systems and disturbance of the waterbodies in the construction phase.	*Spatial Extent* *Duration* *Consequence* *Probability* *Reversibility* *Irreplaceability* *Spatial Extent* *Duration* *Consequence* *Probability* *Reversibility* *Irreplaceability*	*Site specific* *Short term* *Moderate* *Likely* *Moderate* *Low* *Site specific* *Short term* *Moderate* *Likely* *Moderate* *Low*		*Development of the SWMP and Aquatic Rehabilitation and Monitoring Plan, is recommended.* *Suitable stormwater management systems must be installed along roads and other areas and monitored during the first few months of use. Any erosion / sedimentation must be resolved through whatever additional interventions maybe necessary (i.e., extension, energy dissipaters, spreaders, etc).* *Furthermore, the following applies to watercourse crossing upgrades:* *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 decommissioned river crossings.*		

Impact 6	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential Mitigation Measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
DECOMMISIONING PHASE						
Impact on localised surface water quality ***(Spills and leaks from construction vehicles / machinery when working in or near the delineated systems)***	*Status* *Spatial Extent* *Duration* *Consequence* *Probability* *Reversibility* *Irreplaceability*	*Negative* *Site specific* *Short term* *Moderate* *Likely* *Moderate* *Low*	*Low*	*• All liquid chemicals including fuels and oil, including for the BESS, must be stored in with secondary containment (bunds or containers or berms) that can contain a leak or spill. Such facilities must be inspected routinely and must have the suitable PPE and spill kits needed to contain likely worst-case scenario leak or spill in that facility, safely.* *• Washing and cleaning of equipment must be done in designated wash bays, where rinse water is contained in evaporation/sedimentation ponds (to capture oils, grease cement and sediment).* *• Mechanical plant and bowsers must not be refuelled or serviced within 100m of a river channel.* *• All construction camps, lay down areas, wash bays, batching plants or areas and*	***Very Low***	*High*

				any stores should be more than 50m from any demarcated water courses. *• Littering and contamination associated with construction activity must be avoided through effective construction camp management.* *• No stockpiling should take place within or near a water course.* *• All stockpiles must be protected and located in flat areas where run-off will be minimised and sediment recoverable.*		

7.4 Cumulative Impacts

When assessing the impacts, it is unlikely that additional large-scale impacts on the aquatic environment would occur, this being based on the fact that once stable / vegetated, the works areas would not create any additional disturbances to the flow regime and or aquatic habitats observed. This is assuming that the mitigation in the construction, operational and decommissioning phases are adhered to.

Therefore, the cumulative assessment considers the various proposed renewable projects that occur within a 30 km radius of this site and their associated infrastructure/ grid connections, as well as the remainder of the Padloper cluster projects.

Potential impacts in this instance are related to the poor placement of grid corridors, within or close to any aquatic features (loss of habitat and fragmentation), or where activities result in poor stormwater management that could lead to sedimentation or erosion or introduce pollutants that result from any spills (Habitat transformation through changes to flow or water quality) that result for switching stations or access tracks.

EnviroSci has assisted with assessing and micrositing several of these projects, thus understands these developments and the potential impacts and proposed mitigations.

Impact 7: All activities within delineated areas, when combined with present day activities

The cumulative impact of the present-day projects combined with the proposed project activities that may impact on the respective systems were considered for this project proposal.

Impact Summary: Cumulative Impacts for this proposed project

Impact 8	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential Mitigation Measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
CONSTRUCTION PHASE						
Additional activities within delineated Very High Sensitivity Areas	*Status*	*Negative*	*Low*	*It is assumed that all projects will adhere to the site-specific recommendations in their respective EMPrs to ensure that impacts are mitigated where possible – including avoidance of identified sensitive systems and usage of existing disturbance areas.*	***Very Low***	*High*
	Spatial Extent	*Site specific*				
	Duration	*Long term*				
	Consequence	*Moderate*				
	Probability	*Unlikely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Low*				
OPERATIONAL PHASE						
Displacement of fauna	*Status*	*Negative*	*Very Low*	*It is assumed that all projects will adhere to the site-specific recommendations in their respective EMPrs to ensure that impacts are mitigated where possible - including usage of existing disturbance area and stabilisation of erosion points (sand bags in the short term) using gabions and reno mattress as required.*	***Very Low***	*High*
	Spatial Extent	*Site specific*				
	Duration	*Short term*				
	Consequence	*Low*				
	Probability	*Unlikely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Low*				
DECOMISSIONING PHASE						
Displacement of fauna	*Status*	*Negative*	*Very Low*	*It is assumed that all projects will adhere to the site-specific recommendations in their respective EMPrs to ensure that impacts are mitigated where possible - including usage of existing disturbance area and stabilisation of erosion points (sand bags in the short term) using gabions and reno mattress as required.*	***Very Low***	*High*
	Spatial Extent	*Site specific*				
	Duration	*Short term*				
	Consequence	*Low*				
	Probability	*Unlikely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Low*				

The cumulative impact of the present-day projects combined with the proposed project cluster activities that may impact on the respective systems were considered for all projects combined.

Impact Summary: Cumulative Impacts for the combined projects (Cluster) should all the proposed PV projects be approved.

Impact 8	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential Mitigation Measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
CONSTRUCTION PHASE						
Additional activities within delineated Very High Sensitivity Areas	*Status*	*Negative*	*Low*	*It is assumed that all projects will adhere to the site-specific recommendations in their respective EMPrs to ensure that impacts are mitigated where possible – including avoidance of identified sensitive systems and usage of existing disturbance areas.*	***Very low***	*High*
	Spatial Extent	*Site specific*				
	Duration	*Long term*				
	Consequence	*Moderate*				
	Probability	*Unlikely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Low*				
OPERATIONAL PHASE						
Displacement of fauna	*Status*	*Negative*	*Very Low*	*It is assumed that all projects will adhere to the site-specific recommendations in their respective EMPrs to ensure that impacts are mitigated where possible - including usage of existing disturbance area and stabilisation of erosion points (sand bags in the short term) using gabions and reno mattress as required.*	***Very Low***	*High*
	Spatial Extent	*Site specific*				
	Duration	*Short term*				
	Consequence	*Low*				
	Probability	*Unlikely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Low*				
DECOMISSIONING PHASE						
Displacement of fauna	*Status*	*Negative*	*Very Low*	*It is assumed that all projects will adhere to the site-specific recommendations in their respective EMPrs to ensure that impacts are mitigated where possible - including usage of existing disturbance area and stabilisation of erosion points (sand bags in the short term) using gabions and reno mattress as required.*	***Very Low***	*High*
	Spatial Extent	*Site specific*				
	Duration	*Short term*				
	Consequence	*Low*				
	Probability	*Unlikely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Low*				

7.5 No-Go Option

With regard the No-Go option it is assumed that the site would continue to function even with the prevalence of agricultural land use. This would continue into the long-term with a Low intensity that would impact on the regional scale due to loss of important habitat. Little in the way of mitigation could be proposed due to the social needs of the surrounding residents, grazing areas, coupled to the need access will continue.

Impact 9N	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential Mitigation Measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
No-Go						
Should the project not proceed	*Status*	*Negative*	*Low*	*As present land use will continue, which has led to little in the way of overall degradation of the site, no mitigation is proposed.*	***Very Low***	*High*
	Spatial Extent	*Site specific*				
	Duration	*Short term*				
	Consequence	*Moderate*				
	Probability	*Unlikely*				
	Reversibility	*Moderate*				
	Irreplaceability	*Low*				

8. Legislative and Permit Requirements

The following is pertinent to this study:

- 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);
- National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998) inclusive of all amendments, as well as the National Environmental Management: Biodiversity Act (NEM:BA, Act No. 10 of 2004);
- National Water Act, 1998 (NWA, Act No. 36 of 1998);
- Conservation of Agricultural Resources Act, 1983 (CARA, Act No. 43 of 1983);
- Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002);
- National Forest Act (Act No. 84 of 1998);
- National Heritage Resources Act (Act No. 25 of 1999) – could apply if cultural use or heritage is linked to any aquatic resources; and
- Protocol for Specialist assessment and Minimum Report content Requirements for the Environmental Impacts on Aquatic Biodiversity (Government Gazette 43110, 20 March 2020).

Based on an assessment of the proposed activities typical of the renewable industry requirements (Table 6) and past engagement with DWS, the following Water Use Authorisations may be required based on the thresholds as listed in the following Government Notices. However ultimately the Department must determine if a GA or full Water Use License Application (WULA) will be required during the pre-application process as it relates to the following, bearing in mind that this will only be conducted once a final project scope is known:

- DWS Notice 538 of 2016, 2 September in GG 40243– Section 21a water uses relating to the abstraction of water.
- Government Notice 509 in GG 40229 of 26 August 2016 – Section 21c and 21i water uses relating to the impediment or diversion of the flow of water in a watercourse and or altering the bed, banks, course or characteristics of a watercourse. This applies to any activities within the regulated zones, namely 100m from a watercourse or 500m from a wetland boundary.

- Government Notice 665, 6 September 2013 in GG 36820 - Section 21g relating to the disposal of waste in a manner that may detrimentally impact on a water source which includes temporary storage of domestic wastewater i.e. conservancy tanks under Section 37 of the notice.

Table 6: Water Use Activities

	Water Use Activity	Applicable to this Development Proposal
S21(a)	Taking water from a water resource	Yes, if water is abstracted from new and/ or existing boreholes which will also require a change of use from agricultural to industrial. The use of surface water in this region due to the ephemeral nature of the rivers / watercourses is not recommended. The available volumes for use can only be determined once the available allocations are known, but typically for a GA these cannot exceed 40 000m^3 per farm portion per annum.
S21(b)	Storing water	Only if water is stored within an instream dam. The use of tanks and or reservoirs is thus advised as these **do not require** a license.
S21(c)	Impeding or diverting the flow of water in a watercourse	If any works (permanent or temporary) are located within a regulated zone, then a GA process can potentially be followed if the DWS Risk Assessment Matrix indicates that all impacts with mitigation 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	Typically, the conservancy tanks at construction camps and the Operations and Maintenance (O&M) buildings require a license (GA if volumes are less than 10 000 m^3).
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
S21(i)	Altering the bed, banks, course or characteristics of a watercourse	If any works (permanent or temporary) are located within a regulated zone, then a GA process can potentially be followed if the DWS Risk Assessment Matrix indicates that all impacts with mitigation 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

9. Environmental Management Programme Inputs

The following are key recommendations, which are also critical to the proposed mitigations for inclusion in the Environmental Management Programme (EMPr):

- All of the activities should be monitored by the appointed Environmental Officer /Environmental Control Officer (EO/ECO) on a daily basis, especially during periods of river flow during construction.
- Any points of erosion should be stabilised immediately (sand bags in the short term) using gabions and reno mattress as required. No activities should take place outside of the demarcated servitude, to prevent additional cumulative impacts on these systems.
- Search and Rescue should be initiated prior to construction for any protected or listed plant species.
- The EMPr must include a Construction Specific Monitoring and Rehabilitation Plan related to the water course and wetland crossings, and specifically to the prevention of erosion and sedimentation as these systems are prone to scour, with rehabilitation options being limited due to the sparse nature of the vegetation.
- Monitoring should occur on a monthly basis for 6 months post construction and where any unstable soils occur, these must be protected with temporary stabilisation dependent on the scale of the impact i.e. sand bags - hay bales) until areas become revegetated. If any areas require permanent erosion protection (e.g. gabions or stone pitching) then the GA must be amended to include these areas.

10. Final Specialist Statement and Authorisation Recommendation

A variety of aquatic features, mostly ephemeral in nature were identified within the study areas and, where required, the layout has taken some cognisance of these features by selecting areas that have already been impacted. On these grounds the current overall impact on the aquatic environment is **Very Low (with mitigation).**

11.1. Statement and Reasoned Opinion

Based on the findings of this study, the specialist finds no reason to withhold an authorisation of any of the proposed activities, assuming that the key recommended mitigations measures are implemented.

11.2. Environmental Authorisation (EA) Condition Recommendations

- During the construction mobilisation process, the temporary construction camps, stockpiles and laydown areas are located outside of any delineated aquatic systems and within any existing disturbed areas.
- A final walkdown by an aquatic specialist must be conducted to ensure that any of the proposed structures are placed within disturbed areas and sensitive systems are avoided and appropriate construction methods are employed as necessary.

11. References

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Appendix A - Specialist Expertise

CURRICULUM VITAE

Dr Brian Michael Colloty
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Pari Park
Port Elizabeth, 6070
brianc@envirosci.co.za
083 498 3299

Profession: Ecologist (Pr. Sci. Nat. 400268/07) Member of the South African Wetland Society
Specialisation: Ecology and conservation importance rating of inland 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

- 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

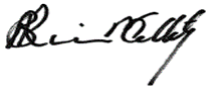
- Nuweveld Wind Farms aquatic assessment for RedCap renewables, (3 wind farms and 130km transmission line) - current
- Plant and animal search and rescue for the Karusa and Soetwater Wind Farms on behalf of Enel Green Power, Current
- Plant and animal search and rescue for the Nxuba, Oyster Bay and Garob 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
- 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 - 2018
- 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
- 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
- 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 125 renewable projects in the past 9 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. . 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 B - Specialist Statement of Independence

Note from the CSIR: Specialists to please complete this section. We will add the actual specialist declaration (on the DFFEF prescribed form) as an appendix to the BA Report.

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: _____ _____

Name of Company: _____EnviroSci (Pty) Ltd_____

Date: _____24 / 06/ 2023_____

Appendix C: Site Sensitivity Verification

Prior to commencing with the Aquatic Biodiversity Specialist Assessment in accordance with the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity (Government Notice 320, dated 20 March 2020), a site sensitivity verification was undertaken in order to confirm the current land use and environmental sensitivity of the proposed project area as identified by the National Web-Based Environmental Screening Tool (Screening Tool).

The details of the site sensitivity verification are noted below:

Date of Site Visit	February (4 – 8) and March (22 – 24) 2022
Specialist Name	Dr Brian Colloty
Professional Registration Number	400268/07
Specialist Affiliation / Company	EnviroSci (Pty) Ltd

Government Notice No. 320, dated 20 March 2020, 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 biodiversity theme and addresses the content requirements of (a) and (b) above. The report will be appended to the respective specialist study included in the EA Reports produced for the projects.

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

Based on the DFFE Screening Tool, the sites (i.e., Padloper EGI 1 - 4) contain areas of very high sensitivity areas summarised as follows below. The remaining area within the development footprint is deemed to be of low sensitivity (See Figure 1 - 3).

PV 1 Grid	PV 2 Grid	PV 3 Grid	PV 4 Grid
CBA 1 Aquatic	CBA 1 Aquatic	CBA 1 Aquatic	CBA 1 Aquatic
ESA 1 Aquatic	ESA 1 Aquatic		
ESA 1	Rivers Condition Score AB		
FEPA Catchment	Wetlands / Rivers		
Rivers Condition Score AB		ESA 1 Aquatic	ESA 1 Aquatic
Rivers Condition Score C		Rivers Condition Score AB	FEPA Catchment
Wetlands / Rivers		Wetlands / Rivers	Rivers Condition Score AB
		Wetlands – Upper Karoo Bioregion Valley Bottom	Rivers Condition Score C
			Wetlands / Rivers

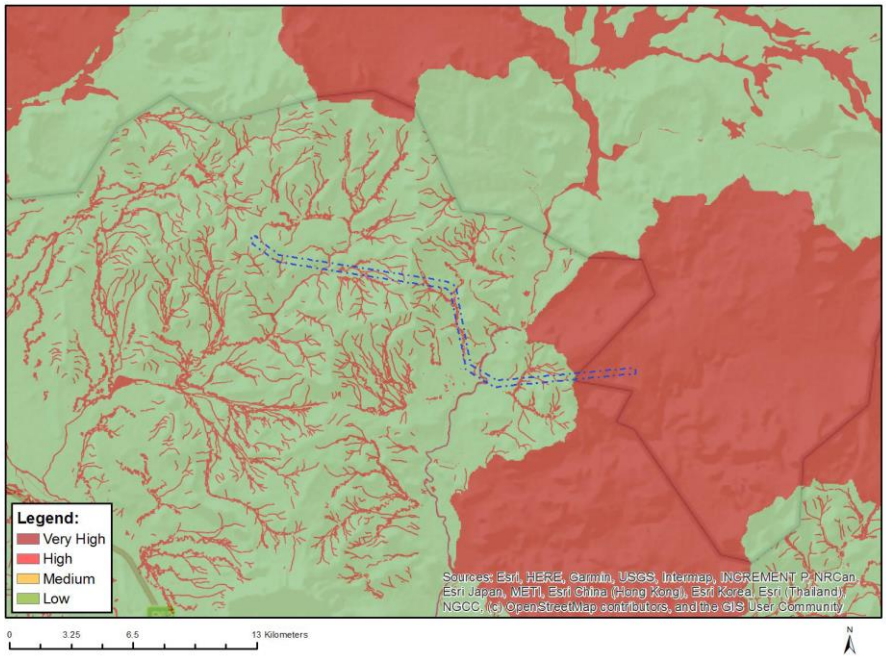


Figure 1: The map presented in the National Screening Tool results for EGI 1 grid corridor, where Dark Red = Very High and Green = Low



Figure 2: The map presented in the National Screening Tool results for EGI 2 grid corridor, where Dark Red = Very High and Green = Low

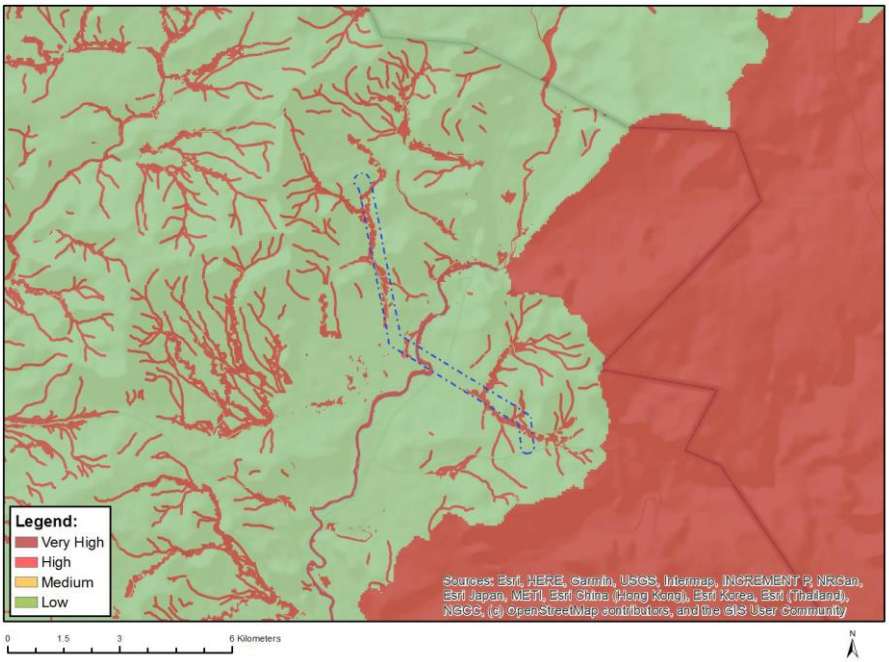


Figure 3: The map presented in the National Screening Tool results for EGI 3 grid corridor, where Dark Red = Very High and Green = Low

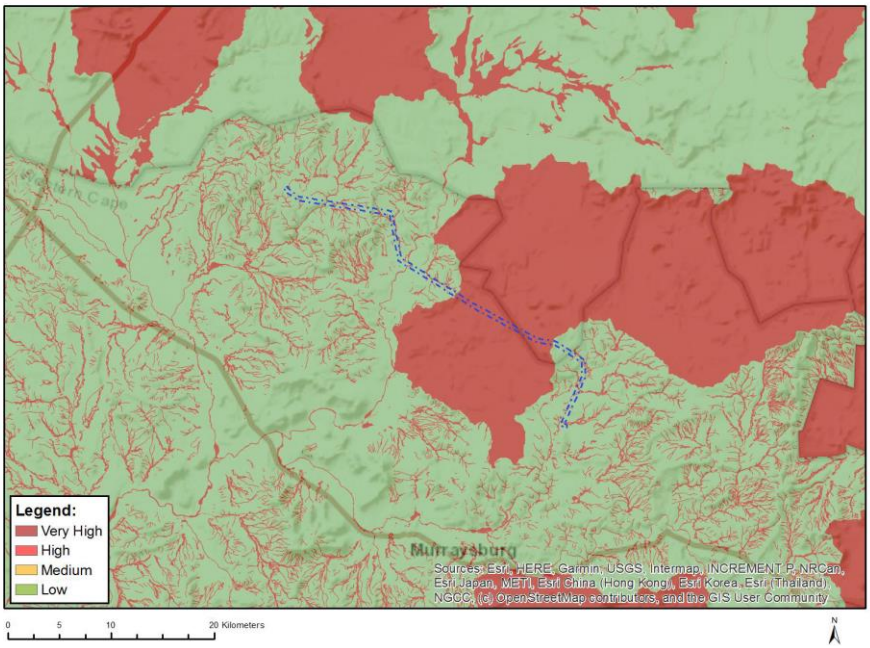


Figure 4: The map presented in the National Screening Tool results for EGI 4 grid corridor, where Dark Red = Very High and Green = Low

Based on the above outcomes, the specialist **confirms** the environmental sensitivities identified on site, informed by a site visit undertaken by Dr Brian Colloty in February (4 – 8) and March (22 – 24) 2022. 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, the river lines were digitised at a scale of 1:5000.

Figure 7 of the specialist report above indicates the fine scale delineation and resultant sensitivity maps produced following the desktop assessment as well as a ground truthing exercises.

Therefore, in summary, several Very High Sensitivity habitats were confirmed and then delineated for each of the project areas and summarised as follows:

EGI 1

The grid connection corridor was earmarked as having potential CBA 1 aquatic, ESA 1 aquatic, FEPA catchments, Rivers with Conditions Score AB, C and Wetlands/Rivers associated with the main stem rivers within the region. These were rated as Very High sensitivity in the screening tool results. Based on the site observation, the habitat associated with these areas, or habitat functions (important catchments and or water courses were then mapped to a fine scale level as thus indicated as No-go (Very High) for the site. The proposed layout can avoid or span these areas. So, in short, Very High Sensitivity habitats / areas were confirmed for this project, however the project footprint could be located within the remaining Low sensitivity areas (See Figure 7 of the specialist assessment).

EGI 2

The grid connection corridor was earmarked as having potential CBA 1 aquatic, ESA 1 aquatic, Rivers with Conditions Score AB and Wetlands/Rivers associated with the main stem rivers within the region. These were rated as Very High sensitivity in the screening tool results. Based on the site observation, the habitat associated with these areas, or habitat functions (important catchments and or water courses were then mapped to a fine scale level as thus indicated as No-go (Very High) for the site. The proposed layout can avoid or span these areas. So, in short, Very High Sensitivity habitats / areas were confirmed

for this project, however the project footprint could be located within the remaining Low sensitivity areas (See Figure 7 of the specialist assessment).

EGI 3

The site and grid connection corridor were earmarked as having potential CBA 1 aquatic, ESA 1 aquatic, Rivers with Conditions Score AB and Wetlands Upper Karoo Bioregion Valley Bottom, associated with the main stem rivers within the region. These were rated as Very High sensitivity in the screening tool results. Based on the site observation, the habitat associated were it existed, with or habitat functions with important catchments and or water courses were then mapped to a fine scale level as thus indicated as No-go (Very High) for the site. The proposed layout can avoid or span these areas. So, in short, Very High Sensitivity habitats / areas were confirmed for this project, however the project footprint could be located within the remaining Low sensitivity areas (See Figure 7 of the specialist assessment).

EGI 4

The site and grid connection corridor were earmarked as having potential CBA 1 aquatic, ESA 1 aquatic, FEPA Catchments, Rivers with Conditions Score AB & C and Wetlands / Rivers, associated with the main stem rivers within the region. These were rated as Very High sensitivity in the screening tool results. Based on the site observation, the habitat associated were it existed, with or habitat functions with important catchments and or water courses were then mapped to a fine scale level as thus indicated as No-go (Very High) for the site. The proposed layout can avoid or span these areas. So, in short, Very High Sensitivity habitats / areas were confirmed for this project, however the project footprint could be located within the remaining Low sensitivity areas (See Figure 7 of the specialist assessment).

Motivation of the outcomes of the sensitivity map and key conclusions

In conclusion, the DFFE Screening Tool identified two sensitivity ratings within the development footprints namely, very high and low. 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 site visits and spatial input considerations were then used in the finalisation of the designs.

Appendix D: Impact Assessment Methodology

The impact assessment includes:

- *the nature, significance and consequences of the impact and risk;*
- *the extent and duration of the impact and risk;*
- *the probability of the impact and risk occurring;*
- *the degree to which impacts, and risks can be mitigated;*
- *the degree to which the impacts and risks can be reversed; and*
- *the degree to which the impacts and risks can cause loss of irreplaceable resources.*

As per the DEFFE Guideline 5: Assessment of Alternatives and Impacts, the following methodology is applied to the prediction and assessment of impacts and risks. Potential impacts and risks have been 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.*

The impact assessment methodology includes the following aspects:

- *Nature of impact/risk - The type of effect that a proposed activity will have on the environment.*

- *Status - Whether the impact/risk on the overall environment will be:*
    - *Positive - environment overall will benefit from the impact/risk;*
    - *Negative - environment overall will be adversely affected by the impact/risk; or*
    - *Neutral - environment overall not be affected.*

- *Spatial extent – The size of the area that will be affected by the impact/risk:*
    - *Site specific;*
    - *Local (<10 km from site);*
    - *Regional (<100 km of site);*
    - *National; or*
    - *International (e.g., Greenhouse Gas emissions or migrant birds).*

- *Duration – The timeframe during which the impact/risk will be experienced:*
    - *Very short term (instantaneous);*
    - *Short term (less than 1 year);*
    - *Medium term (1 to 10 years);*
    - *Long term (the impact will cease after the operational life of the activity (i.e., the impact or risk will occur for the project duration)); or*
    - *Permanent (mitigation will not occur in such a way or in such a time span that the impact can be considered transient (i.e., the impact will occur beyond the project decommissioning)).*

- *Consequence – The anticipated consequence of the risk/impact:*

- *Extreme (extreme alteration of natural systems, patterns or processes, i.e., where environmental functions and processes are altered such that, they permanently cease);*
- *Severe (severe alteration of natural systems, patterns or processes, i.e., where environmental functions and processes are altered such that they temporarily or permanently cease);*
- *Substantial (substantial alteration of natural systems, patterns or processes, i.e., where environmental functions and processes are altered such that they temporarily or permanently cease);*
- *Moderate (notable alteration of natural systems, patterns, or processes, i.e., where the environment continues to function but in a modified manner); or*
- *Slight (negligible alteration of natural systems, patterns, or processes, i.e., where no natural systems/environmental functions, patterns, or processes are affected).*

- *Reversibility of the Impacts - the extent to which the impacts/risks are reversible assuming that the project has reached the end of its life cycle (decommissioning phase):*
  - *High reversibility of impacts (impact is highly reversible at end of project life i.e., this is the most favourable assessment for the environment);*
  - *Moderate reversibility of impacts;*
  - *Low reversibility of impacts; or*
  - *Impacts are non-reversible (impact is permanent, i.e., this is the least favourable assessment for the environment).*

- *Irreplaceability of Receiving Environment/Resource Loss caused by impacts/risks – the degree to which the impact causes irreplaceable loss of resources assuming that the project has reached the end of its life cycle (decommissioning phase):*
  - *High irreplaceability of resources (project will destroy unique resources that cannot be replaced, i.e., this is the least favourable assessment for the environment);*
  - *Moderate irreplaceability of resources;*
  - *Low irreplaceability of resources; or*
  - *Resources are replaceable (the affected resource is easy to replace/rehabilitate, i.e., this is the most favourable assessment for the environment).*

Using the criteria above, the impacts have been further assessed in terms of the following:

- *Probability – The probability of the impact/risk occurring:*
  - *Extremely unlikely (little to no chance of occurring);*
  - *Very unlikely (<30% chance of occurring);*
  - *Unlikely (30-50% chance of occurring)*
  - *Likely (51 – 90% chance of occurring); or*
  - *Very Likely (>90% chance of occurring regardless of prevention measures).*

To determine the significance of the identified impact/risk, the consequence is multiplied by probability (qualitatively as shown in Figure 1).

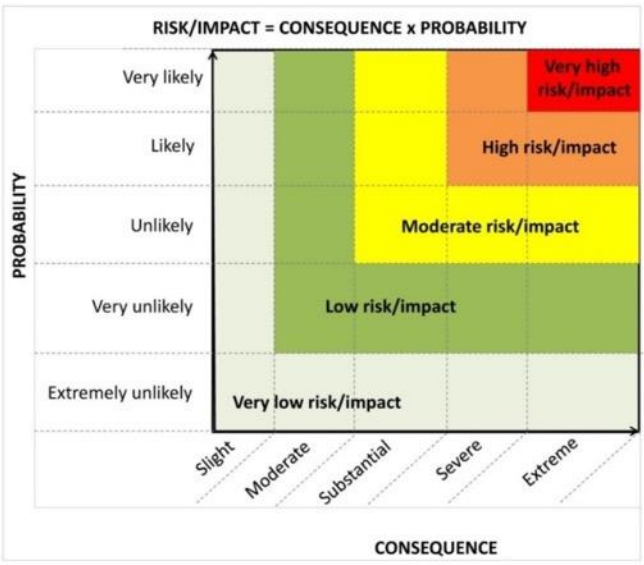


Figure 1. Guide to assessing risk/impact significance as a result of consequence and probability.

- *Significance – Will the impact cause a notable alteration of the environment?*
    - *Very low (the risk/impact may result in very minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making);*
    - *Low (the risk/impact may result in minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making);*
    - *Moderate (the risk/impact will result in moderate alteration of the environment and can be reduced or avoided by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated);*
    - *High (the risk/impact will result in major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making); and*
    - *Very high (the risk/impact will result in very major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making (i.e., the project cannot be authorised unless major changes to the engineering design are carried out to reduce the significance rating)).*

With the implementation of mitigation measures, the residual impacts/risks are ranked as follows in terms of significance:

- *Very low = 5;*
- *Low = 4;*
- *Moderate = 3;*
- *High = 2; and*
- *Very high = 1.*

Confidence – The degree of confidence in predictions based on available information and specialist knowledge:

- *Low;*
- *Medium; or*
- *High.*

Appendix E: Compliance with the Aquatic Biodiversity Protocol (GN 320, 20 March 2020)

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity	***Section where this has been addressed in the Specialist Report***
2.3. The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects: *2.3.1. a description of the aquatic biodiversity and ecosystems on the site, including;* *a) aquatic ecosystem types; and* *b) presence of aquatic species, and composition of aquatic species communities, their habitat, distribution, and movement patterns;*	*Section 4 Pg 20*
2.3.2. the threat status of the ecosystem and species as identified by the screening tool;	*Section 4 Pg 20*
2.3.3. an indication of the national and provincial priority status of the aquatic ecosystem, including a description of the criteria for the given status (i.e., if the site includes a wetland or a river freshwater ecosystem priority area or sub catchment, a strategic water source area, a priority estuary, whether or not they are free -flowing rivers, wetland clusters, a critical biodiversity or ecologically sensitivity area); and	*Section 4 Pg 20*
2.3.4. a description of the ecological importance and sensitivity of the aquatic ecosystem including: *a) the description (spatially, if possible) of the ecosystem processes that operate in relation to the aquatic ecosystems on and immediately adjacent to the site (e.g., movement of surface and subsurface water, recharge, discharge, sediment transport, etc.); and* *b) the historic ecological condition (reference) as well as present ecological state of rivers (in- stream, riparian, and floodplain habitat), wetlands and/or estuaries in terms of possible changes to the channel and flow regime (surface and groundwater).*	*Section 4 Pg 20*
2.4. The assessment must identify alternative development footprints within the preferred site which would be of a "low" sensitivity as identified by the screening tool and verified through the site sensitivity verification and which were not considered appropriate.	*Section 5 Page 30*
2.5. Related to impacts, a detailed assessment of the potential impacts of the proposed development on the following aspects must be undertaken to answer the following questions: *2.5.1. Is the proposed development consistent with maintaining the priority aquatic ecosystem in its current state and according to the stated goal?* *2.5.2. Is the proposed development consistent with maintaining the resource quality objectives for the aquatic ecosystems present?* *2.5.3. How will the proposed development impact on fixed and dynamic ecological processes that operate within or across the site? This must include:*	*Section 6 and 7*

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity	***Section where this has been addressed in the Specialist Report***
a) impacts on hydrological functioning at a landscape level and across the site which can arise from changes to flood regimes (e.g., suppression of floods, loss of flood attenuation capacity, unseasonal flooding or destruction of floodplain processes); *b) will the proposed development change the sediment regime of the aquatic ecosystem and its sub -catchment (e.g. sand movement, meandering river mouth or estuary, flooding or sedimentation patterns);* *c) what will the extent of the modification in relation to the overall aquatic ecosystem be (e.g., at the source, upstream or downstream portion, in the temporary I seasonal I permanent zone of a wetland, in the riparian zone or within the channel of a watercourse, etc.); and* *d) to what extent will the risks associated with water uses and related activities change;*	
2.5.4. how will the proposed development impact on the functioning of the aquatic feature? This must include: *a) base flows (e.g., too little or too much water in terms of characteristics and requirements of the system);* *b) quantity of water including change in the hydrological regime or hydroperiod of the aquatic ecosystem (e.g., seasonal to temporary or permanent; impact of over -abstraction or instream or off stream impoundment of a wetland or river);* *c) change in the hydrogeomorphic typing of the aquatic ecosystem (e.g., change from an unchannelled valley-bottom wetland to a channelled valley -bottom wetland);* *d) quality of water (e.g., due to increased sediment load, contamination by chemical and/or organic effluent, and/or eutrophication);* *e) fragmentation (e.g., road or pipeline crossing a wetland) and loss of ecological connectivity (lateral and longitudinal); and* *f) the loss or degradation of all or part of any unique or important features associated with or within the aquatic ecosystem (e.g., waterfalls, springs, oxbow lakes, meandering or braided channels, peat soils, etc.);*	*Section 6 and 7.*
2.5.5. how will the proposed development impact on key ecosystems regulating and supporting services especially: *a) flood attenuation;* *b) streamflow regulation;* *c) sediment trapping;* *d) phosphate assimilation;* *e) nitrate assimilation;* *f) toxicant assimilation;* *g) erosion control; and* *h) carbon storage?*	*Section 6 and 7.*

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity	***Section where this has been addressed in the Specialist Report***
2.5.6. how will the proposed development impact community composition (numbers and density of species) and integrity (condition, viability, predator - prey ratios, dispersal rates, etc.) of the faunal and vegetation communities inhabiting the site?	*Section 6 and 7*
2.6. In addition to the above, where applicable, impacts to the frequency of estuary mouth closure should be considered, in relation to: *a) size of the estuary;* *b) availability of sediment;* *c) wave action in the mouth;* *d) protection of the mouth;* *e) beach slope;* *f) volume of mean annual runoff; and* *g) extent of saline intrusion (especially relevant to permanently open systems).*	*N/A*
2.7. The findings of the specialist assessment must be written up in an Aquatic Biodiversity Specialist Assessment Report that contains, as a minimum, the following information:	*This report*
2.7.1. contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	*Appendix A and B*
2.7.2. a signed statement of independence by the specialist;	*Appendix B*
2.7.3. a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	*Section 5*
2.7.4. the methodology used to undertake the site inspection and the specialist assessment, including equipment and modelling used, where relevant;	*Section 2*
2.7.5. a description of the assumptions made any uncertainties or gaps in knowledge or data;	*Section 2*
2.7.6. the location of areas not suitable for development, which are to be avoided during construction and operation, where relevant;	*Section 5*
2.7.7. additional environmental impacts expected from the proposed development;	*Section 6 and &*
2.7.8. any direct, indirect, and cumulative impacts of the proposed development on site;	*Section 6 and 7*
2.7.9. the degree to which impacts, and risks can be mitigated;	*Section 6 and 7*
2.7.10. the degree to which the impacts and risks can be reversed;	*Section 6 and 7*
2.7.11. the degree to which the impacts and risks can cause loss of irreplaceable resources;	*Section 6 and 7*
2.7.12. a suitable construction and operational buffer for the aquatic ecosystem, using the accepted methodologies;	*Section 6 and 7*
2.7.13. proposed impact management actions and impact management outcomes for inclusion in the Environmental Management Programme (EMPr);	*Section 6 and 7*
2.7.14. a motivation must be provided if there were development footprints identified as per paragraph 2.4 above that were	*Section 6 and 7*

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity	***Section where this has been addressed in the Specialist Report***
identified as having a "low" aquatic biodiversity sensitivity and that were not considered appropriate;	
2.7.15. a substantiated statement, based on the findings of the specialist assessment, regarding the acceptability or not of the proposed development and if the proposed development should receive approval or not; and	*Section 10*
2.7.16. any conditions to which this statement is subjected.	*Section 10*
2.8. The findings of the Aquatic Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report including the mitigation and monitoring measures as identified, that are to be included in the EMPr.	*Yes*
2.9. A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	*Yes*

forestry, fisheries
& the environment

Department:
Forestry, Fisheries and the Environment
REPUBLIC OF SOUTH AFRICA

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SPECIALIST DECLARATION FORM – AUGUST 2023

Specialist Declaration form for assessments undertaken for 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)

REPORT TITLE

Basic Assessment for the proposed development of the Padloper Solar PV Facility 6 (i.e., Padloper PV 6), the proposed development of 132 kV Electrical Grid Infrastructure between the proposed Padloper PV 4 and the proposed Padloper PV 6 (i.e., Padloper EGI 6), and their associated infrastructure, near Murraysburg in the Western Cape Province

Kindly note the following:

1. This form must always be used for assessment that are in support of 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 August 2023. 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.dffe.gov.za/documents/forms.
3. An electronic copy of the signed declaration form must be appended to all Draft and Final Reports submitted to the department for consideration.
4. The specialist must be aware of and comply with *'the Procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the act, when applying for environmental authorisation - GN 320/2020)'*, where applicable.

1. SPECIALIST INFORMATION

Title of Specialist Assessment	Padloper Aquatic Assessment PV 6
Specialist Company Name	EnviroSci (Pty) Ltd
Specialist Name	Dr Brian Colloty
Specialist Identity Number	[redacted]
Specialist Qualifications:	PhD Botany BSc Hons Zoology
Professional affiliation/registration:	SACNASP 400268/07 Ecological
Physical address:	[redacted]
Postal address:	
Postal address	
Telephone	
Cell phone	
E-mail	

SPECIALIST DECLARATION FORM – AUGUST 2023

2. DECLARATION BY THE SPECIALIST

I, Brian Colloty declare that –

- I act as the independent specialist in this application;
- I am aware of the procedures and requirements for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the National Environmental Management Act (NEMA), 1998, as amended, when applying for environmental authorisation which were promulgated in Government Notice No. 320 of 20 March 2020 (i.e. "the Protocols") and in Government Notice No. 1150 of 30 October 2020.
- 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 NEMA Act.



Signature of the Specialist

EnviroSci (Pty) Ltd

Name of Company:

07 Aug 2023

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, _ Brian Colloty_____, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist

EnviroSci (Pty) Ltd

Name of Company

7 August 2023

Date

Click or tap here to enter text.

Signature of the Commissioner of Oaths

10 August 2023

Date

KERRY AUGUST
Commissioner of Oaths
Master HR Professional (MHRP)
Member Number: 53544596
25 Bordeaux Close
Stellenbosch
7600

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