<u>Aquatic Impact Assessment Report</u>:

Highlands Wind Farm,

Eastern Cape Province

Prepared for:

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Prepared by:

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August 2018

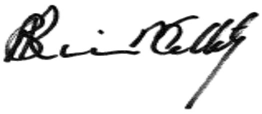
SPECIALIST STATEMENT DETAIL

This aquatic assessment has been prepared with the requirements of the Environmental Impact Assessment Regulations and the National Environmental Management Act (Act 107 of 1998), any subsequent amendments and any relevant other National and / or Provincial Policies related to biodiversity assessments in mind.

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

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

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

Signed:…  ……………… Date:…15 August 2018…………

EXECUTIVE SUMMARY

Scherman Colloty & Associates (SC&A) were appointed by Arcus Consultancy Services (Pty) Ltd (Arcus) to conduct an aquatic feasibility assessment, followed by an aquatic impact assessment report for the proposed Highlands Wind Energy Facilities near Somerset East in the Eastern Cape.

The Wind Farm consists of three potential phases described later in this report and this assessment thus includes the delineation of any natural waterbodies remaining on the properties in question. This was based on information collected during site visits in September 2017 and May 2018 while adhering to the assessment criteria contained in the DWAF 2005 / 2007 delineation manuals and the Wetland Classification System found in the Appendix 1.

Several national spatial databases and project specific wetland / waterbody spatial database layers were also used in this phase of the assessment.

The proposed development/s occur within the following catchments within the Great Karoo and Drought Corridor Ecoregions both located within the Mzimvubu-Tsitsikamma Water Management Area.

- Q80D – Klein Vis catchment
- Q80F – Brak River catchment
- N30B – Slotspruit, Klipplaat and Voël Rivers catchments

These catchments are characterised by perennial water courses and drainage lines associated with these mainstem systems listed above, and most flow only after high rainfall events. The Klein Vis (Little Fish) does however form part of the Fish-Sundays River Canal scheme that receives a constant supply of water from the Gariep Dam.

In terms of the National Freshwater Ecosystems Priority Areas (NFEPA) assessment, all of the watercourses within the site have been assigned a condition score of AB, indicating that they largely intact with some biological significance. This is largely due to these catchments falling within the headwaters of their respective catchments and forming part of a Freshwater Ecosystem Priority Area (Fish FEPA) such as the Brak River. This score would have been A (Natural) if none of the dams, erosion and Vachellia karroo encroachment was not evident. The Eastern Cape Biodiversity Conservation Plan (Berliner and Desmet, 2007) have identified the subquaternary catchments associated with the Voel River (Plate 2) as Aquatic Critical Biodiversity Areas Type CBA 2. This would however only be affected by 2 turbines and a small portion of a new road.

According to the National Freshwater Ecosystems Priority Area (NFEPA) wetland data, no natural wetland could occur within the study area. The remaining waterbodies are artificial or man-made systems. This was confirmed during the site visits and analysis of the various aerial images as well as supported by the updated National Wetland Inventory Data supplied by CSIR/ SANBI (currently ver 5.2).

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

The following impacts were not assessed as the factors were not present within the study area aquatic ecosystems:

- Loss of aquatic species of special concern, and
- Wetland loss as no natural wetlands were observed in close proximity to any of the proposed infrastructure (i.e. within 500m of the roads layout).

The following direct and indirect impacts were assessed with regard the riparian areas and water courses:

- Impact 1: Loss of riparian systems and water courses
- Impact 2: Impact on riparian systems through the possible increase in surface water runoff on riparian form and function
- Impact 3: Increase in sedimentation and erosion
- Impact 4: Potential impact on localised surface water quality

The proposed facilities and transmission line corridors would have a limited impact on the aquatic environment as all large structures will avoid the delineated natural systems, with a limited number of new water course crossings, i.e. the layout makes use of many of the existing roads, as far as practicable. Thus, presently no objection to the development taking place is made. Further no preference is given to any of the transmission line corridors assuming that all towers will be placed outside of the watercourse inclusive of the 32m buffer, and that no large-scale access tracks will be created across these systems within the grid corridor.

Simply stated there would be no additional impact as the development would make use of existing major access routes, while other impacts such as erosion or sedimentation would be small scale and localised. This coupled to limited connectivity due to the high number of dams have further reduced the potential for additional cumulative impacts.

Current as well as cumulative impacts would be reduced, should any of the existing water course crossing be upgraded with properly sized culverts coupled to suitable erosion protection.

This report further indicates the affected water courses and those that would trigger the need for a Water Use License application (a potential GA) in terms of Section 21 c and i of the National Water Act, should any construction take place within these areas. Should any of the present road crossings need to be upgraded then the opportunity exists to improve the current state (lack of habitat continuity) for example by replacing pipe culverts with box culverts, while also reducing the height of the bridge footings (culvert bases) to reinstate natural water course levels. This was mostly observed along the district roads within the area, but in line with other projects within the region.

TABLE OF CONTENTS

1 - Introduction

Scherman Colloty & Associates (SC&A) were appointed by Arcus Consultancy Services (Pty) Ltd to conduct an aquatic feasibility assessment, followed by an aquatic impact assessment report for the proposed Highlands Wind Energy Facilities near Somerset East in the Eastern Cape.

The Wind Farm consists of three phases described later in this report and this assessment thus includes the delineation of any natural waterbodies remaining on the properties in question. This was based on information collected during site visits in September 2017 and May 2018 while adhering to the assessment criteria contained in the DWAF 2005 / 2007 delineation manuals and the Wetland Classification System found in the Appendix 1.

This report thus provides the delineations of the observed waterbodies that have assisted in finalising the placement of the wind turbines and then secondly develop the associated internal roads, underground transmission line cable routes and the final positioning of the required substation/switching stations. This was carried out firstly to minimise the number of potential impacts through impact avoidance, but secondly to reduce the number of potential Section 21 c & i Water Use License Applications that will be required.

2 – Approach to Study

2.1 Scope

It is our understanding that the proposed Highlands Wind Farm project, has triggered the undertaking of an environmental impact assessment in terms of the National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998) and potential applications under the National Water Act (Act 36 of 1998), where required. The potential impacts on the surrounding water bodies therefore need evaluation, with specific attention drawn to the likelihood of any changes to the regional hydrology and how this could impact on these systems and recommend suitable mitigation measures to reduce any potential impacts. SC&A understands the study area well and has worked on several projects, which includes all of the constructed Wind Farms (namely, Cookhouse, Nojoli, Amakhala Emoyeni Wind Farms), the R335 upgrade (Zuurberg to Somerset East) and portions of the R63, and therefore possesses a high level of information.

The following potential issues were thus assessed, and then used as criteria when ranking the specific sensitivity of any of the delineated waterbodies:

- Potential loss of riverine and wetland habitat (road and services crossings)
- Increase in stormwater runoff and the potential to increase the amount of erosion in the catchments
- Supplying the water requirements for construction and operation phases of the development, should a natural resource be considered as the supply source
- Cumulative impact of additional turbines, roads or associated infrastructure within the region.

2.2 Terms of reference

The following TOR was adhered to, while a detailed description of the methods and any equipment used is contained in Appendix 1.
SC&A has endeavoured to provide the following reports which would include the following aspects related to potential wetlands and rivers for the site:

Phase 1 - Preliminary Assessment or Feasibility Study [Completed]

- A desktop and literature review of the area (WEF and transmission line alternatives) under investigation was conducted to collate as much information as possible prior to any detailed fieldwork. The purpose of the desktop assessment is to rank relevant sites according to their ecological sensitivity and to identify an area of HIGH aquatic ecological risk (to be assessed in the Environmental Risk Assessment).
- Relevant literature (e.g. SABIF, PRECIS database, Red Data books, provincial ordinances and conservation plans, etc.) were also consulted.
- This information was then used to produce a feasibility report document (x1) that also highlighted any potential issues for the projects, while providing relevant spatial information for the required map production.

- A site visit was then conducted to determine the location and extent of any sensitive areas earmarked for each of the project components. This allowed for the finalization of any layouts or alignments as well as assist with the determining the expected requirements / way forward with regard to the WULA process.

Phase 2 - Impact assessment phase (BA reports) [This report]

Based on the information collected in phased one and the subsequent site visits, habitat areas have been delineated and ranked into High, Medium or Low classes in terms of their significance based on their Ecological Sensitivity and Conservation Importance, functionality. The sensitivity and ecological risk mapping data (including buffer zones if applicable) from the desktop phase has been updated and used in this impact assessment report.

Recommendations and potential mitigation measures, where required, are also included in the report, particularly where abstraction sites for large volumes of water will be required.

<u>General scope of this report:</u>

- An assessment of the study area, that covers a 500m development buffer in relation to available information on the aquatic systems within the study area. This includes the WEF site boundary and the associated transmission lines (max of three alternative lines per phase)
- A map, demarcating the relevant local drainage areas and catchments of the respective streams and wetlands and other wetland areas within a 500m radius of the study area. This will demonstrate, from a holistic point of view the connectivity between the site and the surrounding regions, i.e. the zone of influence.
- Mapping data that demarcates aquatic and wetland vegetation units delineated to a scale of 1:10 000, following the methodology described by the DWS, together with a classification of delineated wetland areas, according to the methods contained in the Level 1 WET-Health methodology and the latest Wetland Classification System (Ollis et al., 2013) after a site visit has been conducted.
- The site visit information presented in the determination of the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) of any waterbodies, estimating their biodiversity, conservation and ecosystem function importance with regard ecosystem services.
- Recommend buffer zones and No-go areas around any delineated aquatic vegetation areas based on the buffer model as described in Macfarlane et al., 2017 for rivers and wetlands respectively.
- Provide mitigations regarding project related impacts, including engineering services that could negatively affect demarcated aquatic vegetation units.
- Recommend specific actions that could enhance the aquatic functioning in the areas, allowing the potential for a positive contribution by the project.

- Supply the client with geo-referenced GIS shape files of the waterbodies as per the required specifications supplied.

Where relevant, recommendations and instructions regarding any additional authorisation, permitting or licensing procedures, or any other requirements pertaining to legislation and policies relevant to the Specialist's field of interest have been included.

An outline of recommended measures to manage residual impacts (i.e. impacts that remain after optimisation of design and planning) for the construction, operational and decommissioning phases with an indication of the following has also been provided:

- Who should be responsible for implementation of mitigation;
- Details of frequency of implementation of each measure; and
- Envisaged outcome of each action.

Furthermore, the following checklist as per the NEMA specialist assessment requirements was also adhered to:

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	**Section of Aquatic Report**
(a) details of the specialist who prepared the report; and the expertise of that specialist to compile a specialist report including a *curriculum vitae*;	**Page 3 and Appendix 2 & 3 of this report**
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	**Appendix 3 of this report**
(c) an indication of the scope of, and the purpose for which, the report was prepared;	**Section 2 of this report**
(A) an indication of the quality and age of base data used for the specialist report;	**Yes – data included ranged from 2017/2018 to present which has also been incorporated into the National SANBI database as part of the revised National Wetland Inventory that will form part of the 2018 National Biodiversity Assessment**
(B) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	**Yes Section 5 -11**
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	**Yes Section 4**
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	**Yes – See Appendix 1**
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternative;	**Yes – See Section 9**
(g) an identification of any areas to be avoided, including buffers;	**Yes – See Section 8 and 9**
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	**Yes – See Section 9**
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	**Yes – Section 2.3 of this report**
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment, or activities;	**Yes – Section 5, 6, 7 and 8 of this report**
(k) any mitigation measures for inclusion in the EMPr;	**Yes – Section 12**

(l) any conditions for inclusion in the environmental authorisation;	**Yes – Section 9 and 12**
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	**Yes – Section 9 and 12**
(n) a reasoned opinion— i. as to whether the proposed activity, activities or portions thereof should be authorised; ii. Regarding the acceptability of the proposed activity or activities; and iii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr or Environmental Authorization, and where applicable, the closure plan;	**Yes – Section 13 of this report**
(o) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	**N/A**
(p) any other information requested by the competent authority	**N/A**
Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	**Yes – This report also meets the DWS requirements in terms of GN 267 (40713) of March 2017**

2.3 Assumptions and limitations

In order to obtain a comprehensive understanding of the dynamics of both the flora and fauna of both the aquatic communities within a study site, as well as the status of endemic, rare or threatened species in any area, assessments should always consider investigations at different time scales (across seasons/years) and through replication. However, due to time constraints these long-term studies are not feasible and are mostly based on instantaneous sampling. This site was assessed after a period of spring and early winter rainfall, although the study area has been visited during other years and seasons by the author. This provides the author of this report with an understanding of the region and the aquatic environment.

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.

A last assumption is that water required for the various phases of the project will be sourced from a licensed resource and not illegally abstracted from any surrounding water courses, particularly if dust suppression is required.

With regard to the potential water course crossings (new and or upgraded crossings) the following assumptions have been made, which for the purposes of this report have also been included in the mitigations to assist for any future design criteria:

- The crossings, where required could be upgraded to allow for heavy vehicles to pass will be raised using correctly sized culverts, and all pipe culverts will be removed.
- 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 post authorisation walkdown, prior to commencement of the construction phase.

- Approach road embankments especially where large cut and fill areas will be required must be rehabilitated during the construction process, to minimise erosion.
- Suitable stormwater management systems must be installed and monitored during the first few months of use. Any erosion / sedimentation must be prevented.

2.4 Relevant legislation and policy

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

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

The following possible Section 21 Water Uses are anticipated, and would thus require a License or General Authorisation as deemed by the Department of Water and Sanitation:

- Section 21 a – Abstraction of water from boreholes and rivers or dams
- Section 21 b – Storage of water (dams or reservoirs)
- Section 21 c – Impeding or diverting flows when construction occurs within a water course or within 500 m of a wetland (whichever is relevant)
- Section 21 g – Storage of domestic waste in conservancy tanks
- Section 21 i – Alteration of the bed or banks of water course of any activities within 500m of a wetland (if relevant).

3 – Project description

The following has been provided by Arcus:

WKN Windcurrent South Africa (Ltd) Pty ('WKN-WC') are proposing the Highlands Wind Energy Facilities (WEF), and associated infrastructure including grid connection infrastructure (the Proposed Development), located near the town of Somerset East in the Eastern Cape Province. The Proposed Development Site (Figure 1) is situated within the Cookhouse REDZ and the affected land parcels cover an area of approximately 11 180 hectares. The area of interest for development within these land parcels is approximately 9000 hectares.

There are two existing Eskom Transmission lines located within the Proposed Development Site boundary, one a 66 kV and the other a 132 kV. Both have a limited available capacity, and both will be required to connect the Highlands WEF to the national grid. In order to comply with the Department of Energy's Renewable Energy Independent Power Producers Programme (REIPPP), a Project can only submit a bid with one grid connection (in this case either the 66kV or 132kV Transmission lines). Therefore, should the Highlands project be bid in the REIPPP, it will be split into two bid submissions, each requiring its own Environmental Authorisation. Based on uncertainty surrounding the available capacities on each line and the downstream constraints (for example the Eskom main transmission system (MTS) substations), it is unknown at this stage how many turbines can connect to which line. The technical and financial feasibility for the optimum Project split can only be determined on finalising the ongoing analysis of meteorological data – this will ultimately determine whether the larger of the two projects connecting to the 132 kV line will be located to the north or the south of the smaller project connecting to the 66 kV line.

Therefore, for the purpose of obtaining Environmental Authorisation, the project has been split into three phases: North, Central and South. If the projects are successful in obtaining Environmental Authorisation the Highlands Central WEF (Phase 2) will be combined with either Highlands North (Phase 1) or Highlands South (Phase 3), depending on meteorological data, for bidding in the REIPPP.

There are six components to the Proposed Development, representing three development phases:

- Highlands North WEF: Phase 1;
- Electrical Grid Connection and Associated Infrastructure for Highlands North WEF Phase 1;
- Highlands Central WEF: Phase 2;
- Electrical Grid Connection and Associated Infrastructure for Highlands Central WEF Phase 2;
- Highlands South WEF: Phase 3; and
- Electrical Grid Connection and Associated Infrastructure for Highlands South WEF Phase 3.

The location of the six components within the Proposed Development Site are presented in Figure 2. It should be noted that this site boundary includes the total area within which all components of the Proposed Development may be developed. The footprint of the combined six development components will only occupy a small portion (approximately 2%) of the land within this boundary, and fall entirely within the REDZ.

Each WEF development phase will comprise of the following:

Highlands North WEF: Phase 1

The proposed Highlands North WEF will comprise of 17 turbines with a maximum generation capacity of 5 MW per turbine. Internal roads will connect the turbines. On-site cabling will largely follow the road infrastructure where possible, and will be either overhead, or underground. One on-site substation location (Substation A) will form part of this application.

Highlands Central WEF: Phase 2

The proposed Highlands Central WEF will comprise of 14 wind turbines, with each turbine having an installed maximum generation capacity of 5 MW per turbine. Internal roads will connect the turbines. On-site cabling will largely follow the road infrastructure where possible, and will be either overhead, or underground. One on-site substation location (Substation B) will form part of this application. An existing access road may require upgrading as part of this application.

Highlands South WEF: Phase 3

The proposed Highlands South WEF will comprise of 18 wind turbines, with each turbine having an installed maximum generation capacity of 5 MW per turbine. Internal roads will connect the turbines. On-site cabling will largely follow the road infrastructure where possible, and will be either overhead, or underground. Two on-site substation locations (Substation C1 and C2) will form part of this application. An existing access road may require upgrading as part of this application.

It is important to note that while Environmental Authorisation will be sought for four substation locations, only a maximum of two substation locations will be used for the actual construction, to connect the two windfarms to the two Eskom transmission line tie-ins.

For all three phases turbines with a maximum height to blade tip of 200 m will be considered (a hub height of up to 135 m, and a rotor diameter of up to 150 m).

In addition to the Highlands WEF, WKN-WC also proposes obtaining Environmental Authorisation from the Department of Environmental Affairs (DEA) for Eskom Transmission and Eskom Distribution Grid Connection to connect the WEFs to the national grid. If Environmental Authorisation is granted, and the project receives preferred bidder status this will be entirely or partially transferred from the Project(s) to Eskom Holdings SOC Limited (Eskom) as applicable in advance of construction. The grid connection infrastructure will be routed from a start location within the WEF Site Boundary to the existing National Grid, which is also within the WEF site boundary (Figure 2).

Electrical Grid Connection and Associated Infrastructure for Highlands North WEF Phase 1:

The proposed Grid Connection will connect Substation A to the Eskom transmission line. Two route alternatives are proposed. The maximum length will be 5 km with a 31 m wide servitude. A 300 m corridor surrounding the proposed line alternatives is to be assessed (150 m each side). The line will either be a 66 kV line, or a 132 kV line.

Electrical Grid Connection and Associated Infrastructure for Highlands Central WEF Phase 2:

The proposed Grid Connection will be a 132 kV line. It will connect Substation B to the Eskom transmission line. Two route alternatives are proposed. The maximum length will be 8 km with a 31 m wide servitude. A 300 m corridor surrounding the proposed line alternatives is to be assessed (150 m each side).

Electrical Grid Connection and Associated Infrastructure for Highlands South WEF Phase 3:

The proposed Grid Connection will connect Substation C1 and C2 to the Eskom transmission line. Two route alternatives are proposed. It will be either a 66 kV line, and /or a 132 kV line. The maximum length of the line will be 20 km with a 31 m wide servitude. A 300 m corridor surrounding the proposed line alternatives is to be assessed (150 m each side).

4 - Methods

A detailed specialist assessment method is included in the Appendices of this report, which is based on best practice methods developed in conjunction with other wetland and aquatic specialists and the Department of Water and Sanitation. This methodology has been used in the assessment of approximately 120 renewable energy projects alone by the author in the past 5 years. This includes the assessment of several projects within the region.

5 - Study area description

The proposed development/s occur within the following catchments within the Great Karoo and Drought Corridor Ecoregions both located within the Mzimvubu-Tsitsikamma Water Management Area (Figure 1)

- Q80D – Klein Vis catchment
- Q80F – Brak River catchment
- N30B – Slotspruit, Klipplaat and Voël Rivers catchments

These catchments are characterised by perennial water courses and drainage lines associated with these mainstem systems listed above, and most flow only after high rainfall events (Plate 1). The Klein Vis (Little Fish) does however form part of the Fish-Sundays River Canal scheme that receives a constant supply of water from the Gariep Dam.

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According to the National Freshwater Ecosystems Priority Area (NFEPA) wetland data, no natural wetland could occur within the study area. The remaining waterbodies are artificial or man-made systems as shown in Figure 3, Plate 3 & 4. This was confirmed during the site visits and analysis of the various aerial images as well as supported by the updated National Wetland Inventory Data supplied by CSIR/ SANBI (currently ver 5.2).

Figure 3 indicates the watercourses observed within the site. Any activities within these areas or the 32m buffer (or the 1:100 floodline, whichever is the greatest) will require a Water Use license (mostly likely a General Authorisation if all other Section 21 uses are below the GA thresholds).

Simply stated there would be no additional impact as the development would make use of existing major access routes, while other impacts such as erosion or sedimentation would be small scale and localised. This coupled to limited connectivity due to the high number of dams have further reduced the potential for additional cumulative impacts.

Current as well as cumulative impacts would be reduced, should any of the existing water course crossing be upgraded with properly sized culverts coupled to suitable erosion protection (Plate 5) See Section 9 for further details.

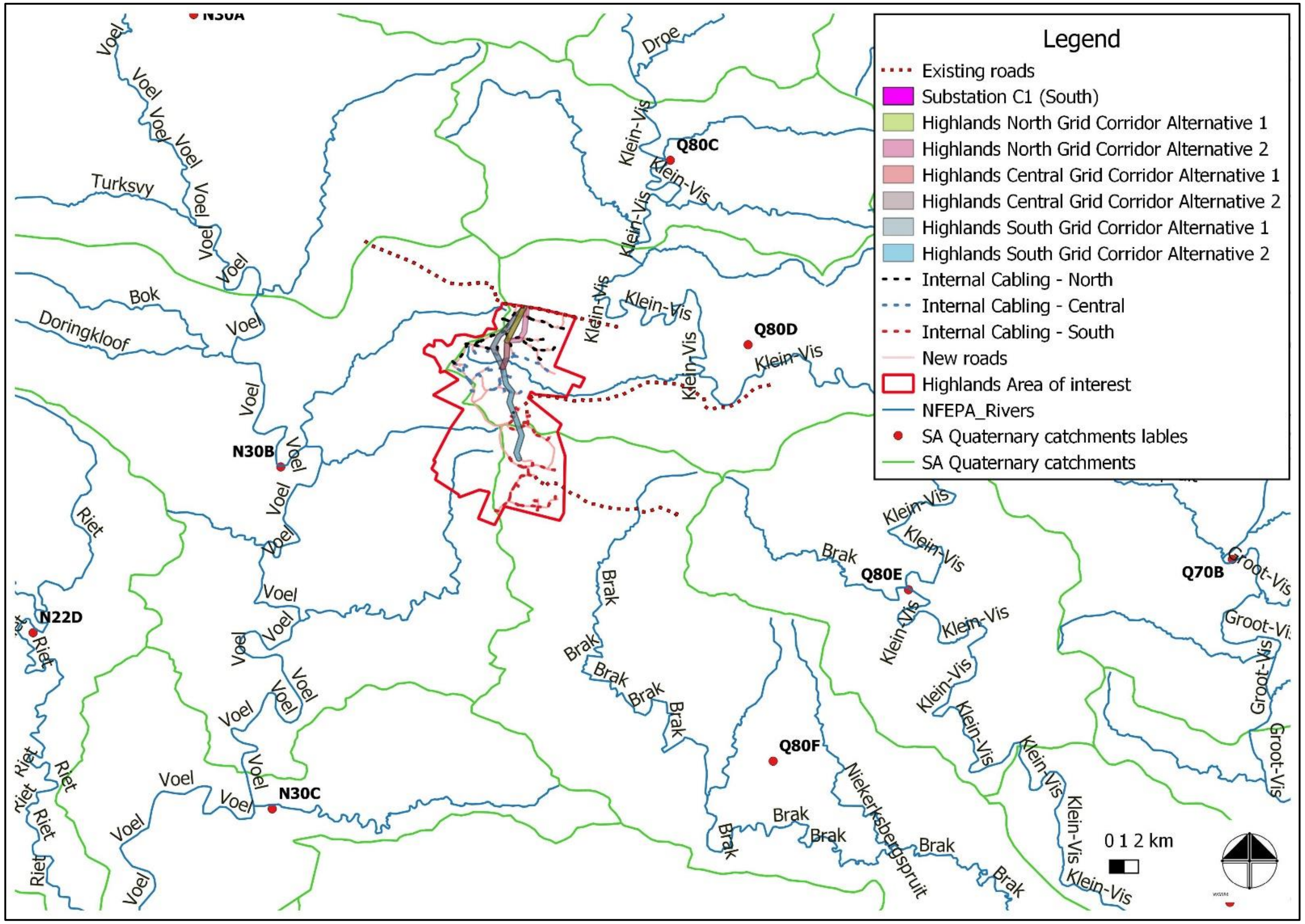

Figure 1: Project locality map indicating various quaternary catchments and mainstem rivers within the region (NFEPA & DWS)

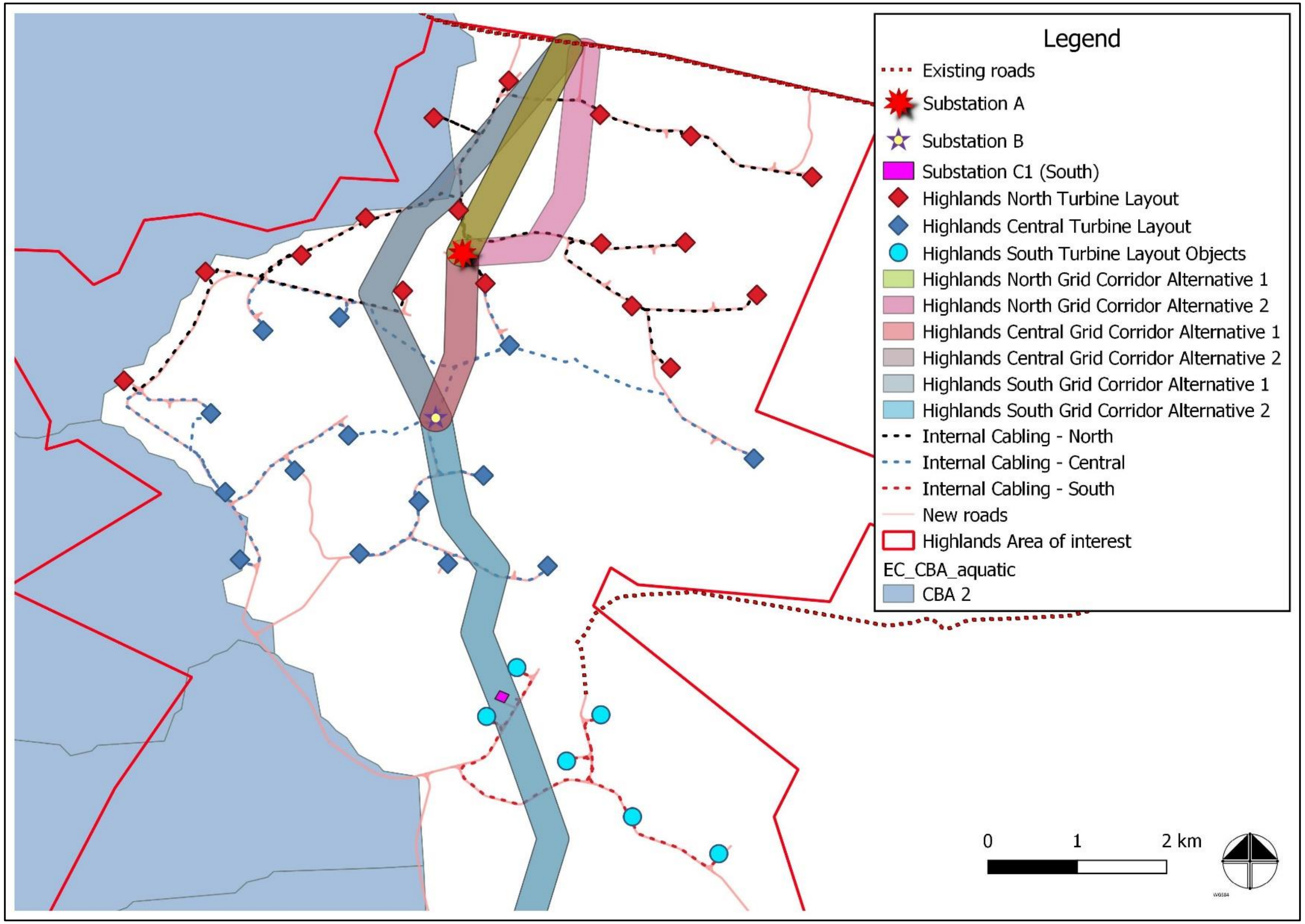

Figure 2: Aquatic Critical Biodiversity Areas according to the Eastern Cape Biodiversity Conservation Plan (Berliner & Desmet, 2007)

Plate 1: A typical water course within the central eastern portion of the site, with a degree of bank erosion evident

Plate 2: A view of lower Voël River, near the confluence with the unknown tributary that flows from the study area

Plate 3: A view of one of the larger farm dams near the Central WEF, located within the Little Fish catchment.

Plate 4: One of several smaller farm dams located in the North WEF site

Plate 4: One of the main access roads with two small pipe culverts

6 – Waterbody delineation & classification

The water body delineation and classification was conducted using the standards and guidelines produced by the DWA (DWAF, 2005 & 2007) and the South African National Biodiversity Institute (SANBI, 2009, Ollis *et al.*, 2013). These methods are contained in the attached Appendix 1, which also includes wetland definitions, wetland conservation importance and Present Ecological State (PES) assessment methods that will be used in this report. Reference is also included with regard to relevant legislation related to the protection of waterbodies and the minimum requirements in terms of prescribed buffers that were supplied to the developer in the screening phase that have been incorporated into the layout option to date.

For reference the following definitions are as follows:

- **Drainage line**: A drainage line is a 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 contains 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 (e.g. 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 (Water Act 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 National Water Act 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

According to the National Freshwater Ecosystems Priority Area (NFEPA) wetland data, and the National Wetland Inventory Data being updated by CSIR/ SANBI (currently version 5.2) indicated waterbodies could occur within the study area. These were classified as follows as shown in Figure 3:

- Artificial dams (Plate 3 & 4) within the site
- River areas associated with the Brak, Voel and Little Fish rivers, connected to the site via various unknown tributaries

The lack of any natural wetlands was confirmed during this assessment.

Figure 4 indicates the watercourses observed within the site. Any activities within these areas or the 32 m buffer (or the 1:100 floodline, whichever is the greatest) will require a Section 21 c and i Water Use License (mostly likely a General Authorisation (GA) if all other Section 21 uses are below the GA thresholds). In this regard as shown in Figure 3 and 4 the development layout has made use of as many existing farm tracks and as far as possible to minimise any new impacts on these or the wetland systems. Further, crossings were selected and verified by this report's author, to ascertain if any of the crossings and/or road upgrades required would impact on any sensitive aquatic environments. This also included verifying that environments such as steep valleys that would pose a threat to the aquatic environment (i.e. a poorly placed road would create a high risk of sedimentation or erosion) would be avoided or designs would have taken cognisance of this. However, all of these sensitive areas or new crossings within important water resources have been avoided with the exception of 15 new crossings, 5 of which are underground cable crossings only (Figure 4.) These are located within high ephemeral areas of the water courses and any impacts are easily mitigated through responsible design and construction.

7 - Present Ecological State and conservation importance

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

The national Present Ecological Score or 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 also incorporates EI (Ecological Importance) and ES (Ecological Sensitivity) separately as opposed to EIS (Ecological Importance and Sensitivity) 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 Present Ecological State scores (PES) for the drainage lines and the rivers in the study area were rated as follows (DWS, 2014 – where B = Moderately Modified & D = Largely Modified):

Subquaternary Catchment Number	Present Ecological State	Ecological Importance	Ecological Sensitivity
7728	C	Moderate	Moderate
7787	C	Moderate	Moderate
7725	B	High	Moderate
7850	B	High	Moderate
7884	B	High	Moderate
7867	B	High	Moderate

It is thus evident that the study area systems are largely functional and or have limited impacts as a result of current land use practices. This was confirmed for several of the affected reaches located within the development footprint and in particular the areas that would be crossed by future access roads (Figure 4). In other words the systems observed are largely natural, with small or narrow riparian zones, dominated by *Searsia lancea* and *Vachellia karroo.* The only obligate species observed include small areas of *Juncus rigidus* and *Phragmites australis* associated with small pools created by road culverts found throughout the study area. With the exception of current roads (Plate 6) and tracks current land use practices have had a Low - Moderate impact on the state and function of the majority of the catchments under assessment. Impacts are as follows:

- Bush encroachment due to changes in fire regime and grazing patterns
- Over grazing
- Erosion and sedimentation at water course crossings (Plate 6) and or over grazed areas

Plate 6: A water course crossing with no downstream erosion protection that has lead to river bank scour and channel incision

Typical aquatic species included:
PNCO = Provincial Nature Conservation Ordinance

Species	**Protection Status**
Miscanthus capensis	
Disa chrysostachya	Protected PNCO - Orchid
Phragmites australis	
Cyperus textilis	
Isolepis spp	
Eleocharis limosa	
Ficinia nodose	
Juncus lomatophyllus	
Leersia hexandra.	
Paspallum distichum,	
Pycreus polystachyos	
Typha capensis	
Setaria spacellata	
Stenotaphrum secundatum	
Cynodon dactylon	
Centella asiatica	
Conyza scabrida	
Elegia tectorum	

Alien invasive species in the riparian / instream areas included:

- *Lantana camara*
- *Populus X canescens*
- *Cortaderia selloana*
- *Pennisetum clandestinum*

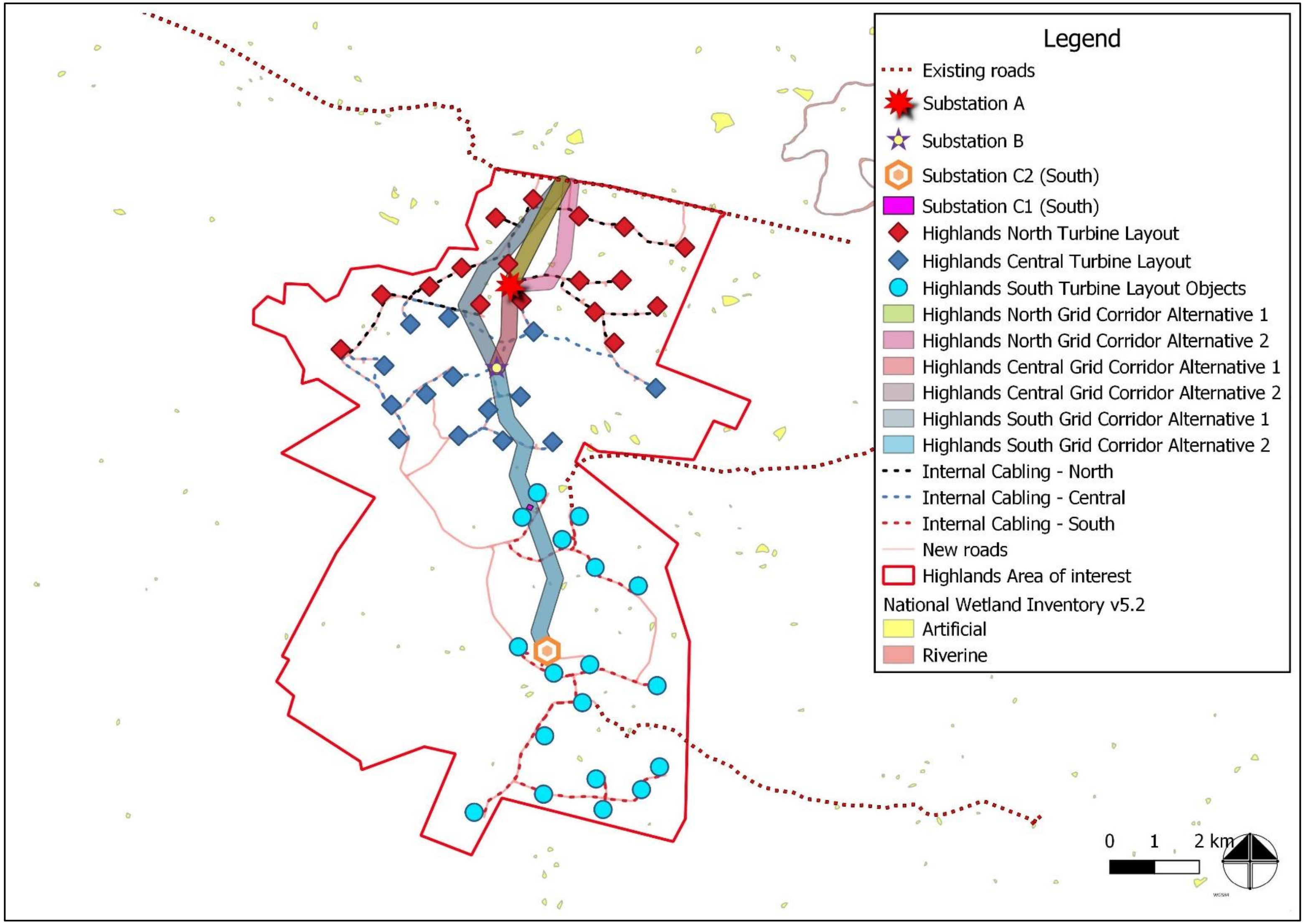

Figure 3: Confirmed waterbodies according to the National Wetland Inventory (SANBI, Ver 5.2) in relation to the proposed layout which were all artificial

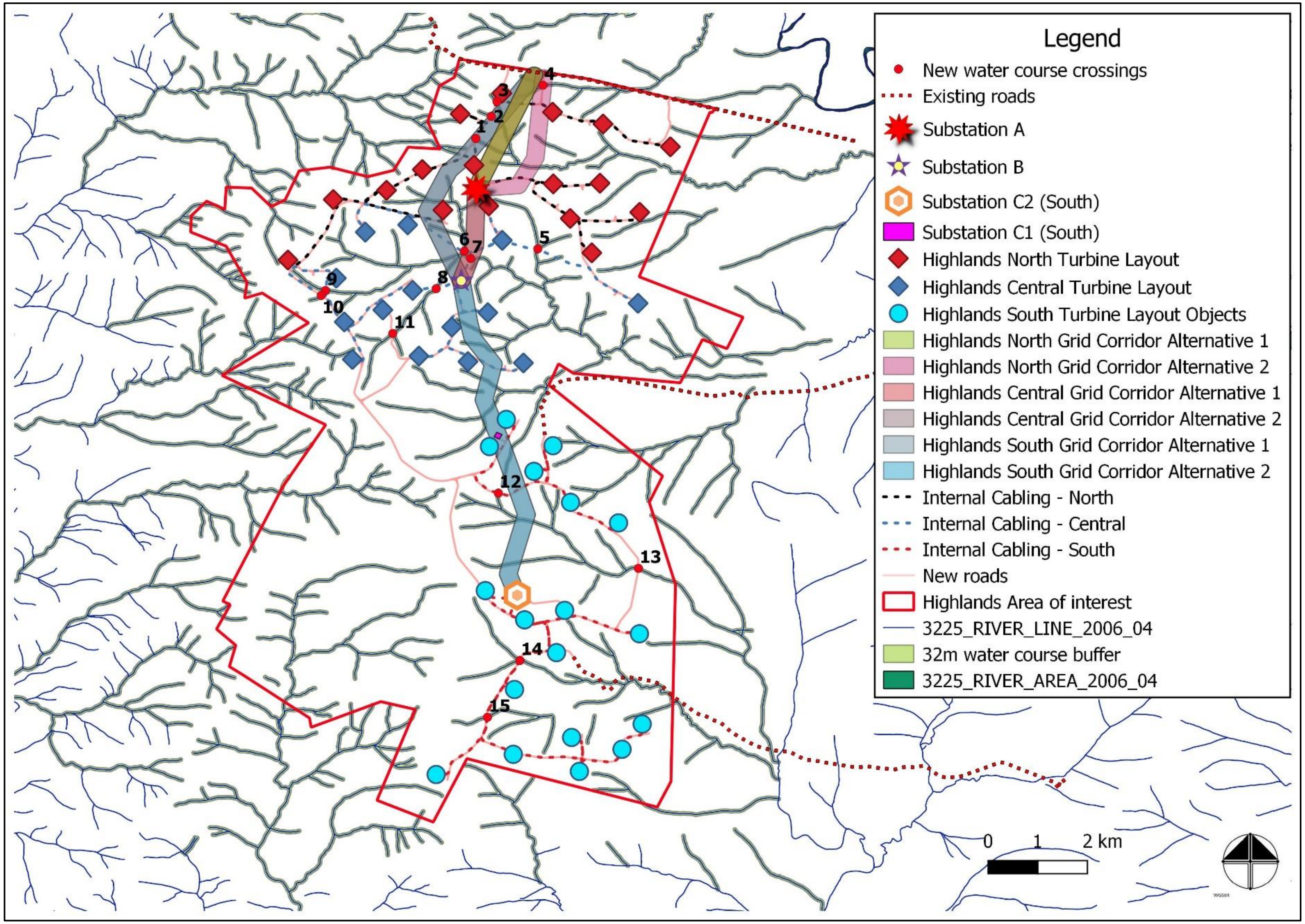

Figure 4: Watercourses and rivers within and adjacent to the study area

8 - Recommended buffers

Presently there are no prescribed riverine buffers other than those proposed in the recommendations by Desmet and Berliner (2007). These were applied (Table 1) by the design engineers, i.e. 32 m for this development, during the planning and conceptual design of the layout, while using as many existing roads and crossings as possible.

This was verified using the buffer model as described by Macfarlane *et al.*, 2017 for rivers, based on the condition of the water courses, the state of the study area, coupled to the type of development, as wells as the proposed mitigations, the buffer model provided the following:

1. Construction period buffer: 30m
2. Operation period: 15m

However, in line with best practice for other wind energy facilities and environmental guidelines a 32m buffer is recommended (Figure 4), with the exception of the 15 new crossings, all three phases have mostly avoided the aquatic environment within the study area.

Table 1: Recommended buffers for rivers, with those applicable to the project highlighted in blue

River criterion used	Buffer width (m)	Rationale
Mountain streams and upper foothills of all 1:500 000 rivers, i.e. rivers mapped at this scale by DWS	50	▪ These longitudinal zones generally have more confined riparian zones than lower foothills and lowland rivers and are generally less threatened by agricultural practices.
Lower foothills and lowland rivers of all 1:500 000 rivers i.e. rivers mapped at this scale by DWS	100	▪ These longitudinal zones generally have less confined riparian zones than mountain streams and upper foothills and are generally more threatened by development practices.
All remaining 1:50 000 scale streams, i.e. all systems that appear on the topo-cadastral maps	32	▪ Generally smaller upland streams corresponding to mountain streams and upper foothills, smaller than those designated in the 1:500 000 rivers layer. They are assigned the riparian buffer required under South African legislation.

9 – Potential impact assessment

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

The following impacts were not assessed as the factors were not present within the study area aquatic ecosystems:

- Loss of aquatic species of special concern, and
- Wetland loss as no natural wetlands were observed in close proximity to any of the proposed infrastructure (i.e. within 500m of the roads layout).

The following direct and indirect impacts were assessed with regard the riparian areas and water courses:

- Impact 1: Loss of riparian systems and water courses
- Impact 2: Impact on riparian systems through the possible increase in surface water runoff on riparian form and function
- Impact 3: Increase in sedimentation and erosion
- Impact 4: Potential impact on localised surface water quality

With this in mind the impacts were assessed as follows:

9.1 Highlands North WEF – Phase 1

Nature: Impact 1 - Loss of riparian systems and water courses during the construction phase The physical removal of the narrow strips of riparian zones and disturbance of any watercourses by the road crossings only, being replaced by hard engineered surfaces. This biological impact would however be localised, as a large portion of the remaining catchment would remain intact, while the significant structures (e.g. turbines and hard standing areas) have been placed well outside of these areas.		
▪ **Reversibility**	▪ High	▪ High
▪ **Irreplaceable loss of resources**	▪ No	▪ No
▪ **Can impacts be mitigated**	▪ Yes	
▪ **Mitigation:** • Where water course crossings are required, the engineering team must provide an effective means to minimise the potential upstream and downstream effects of sedimentation and erosion (erosion protection) as well minimise the loss of riparian vegetation (crossing should have a small footprint). • No vehicles to refuel or be maintained within drainage lines/ riparian vegetation. • Where possible culvert bases must be placed as close as possible with natural levels in mind so that these don't form additional steps / barriers.		
▪ **Cumulative impacts:** The increase in surface run-off velocities and the reduction in the potential for groundwater infiltration is likely to occur, considering that the site is near the main drainage channels. However, the annual rainfall figures are low and this impact is not anticipated and only a small percentage of the proposed projects reach the construction phase and or cover large portions of the site.		
▪ **Residual impacts:** Possible impact on the remaining catchment due to changes in run-off characteristics in the development site.		

	Extent	Duration	Severity	Status	Significance	Probability	Confidence
Without Mitigation	Local (L)	Medium Term (M)	L-	Negative	Medium (-)	High	High
With Mitigation	Local (L)	Short term (L)	L-	Negative	Low (-)	Low	High

Nature: Impact 2 - Impact on riparian systems through the possible increase in surface water runoff from hard surfaces and or new road crossings on riparian form and function during the operational phase		
	▪ **Without mitigation**	**With mitigation**
▪ **Reversibility**	▪ High	▪ High
▪ **Irreplaceable loss of resources**	▪ No	▪ No
▪ **Can impacts be mitigated**	▪ Yes	
▪ **Mitigation:** Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities. This is particularly important due to the levels of erosion already observed within the affected catchments.		
▪ **Cumulative impacts:** Downstream alteration of hydrological regimes due to the increased run-off from the area. However coupled to the fact that surrounding developments would impact on a different catchments these impacts would be low.		
▪ **Residual impacts:** Possible impact on the remaining catchment due to changes in run-off characteristics in the development site. However due to low mean annual runoff within the region this is not anticipated due to the nature of the development together with the proposed layout.		

	Extent	Duration	Severity	Status	Significance	Probability	Confidence
Without	Local (L)	Short Term	L-	Negative	Medium (-)	High	High

Mitigation		(L)					
With Mitigation	Local (L)	Short term (L)	L-	Negative	Low (-)	Low	High

Nature: Impact 3 - Increase in sedimentation and erosion within the development footprint during the construction phase and to a lesser degree the operational phase		
	▪ **Without mitigation**	**With mitigation**
▪ **Reversibility**	▪ High	▪ High
▪ **Irreplaceable loss of resources**	▪ No	▪ No
▪ **Can impacts be mitigated**	▪ Yes	
▪ **Mitigation:** Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments and reduce flow velocities.		
▪ **Cumulative impacts:** Downstream erosion and sedimentation of the downstream systems and farming operations. However, coupled to the fact that surrounding developments would impact on a different catchments these impacts would be low.		
▪ **Residual impacts:** During flood events, any unstable banks (eroded areas) and sediment bars (sedimentation downstream) already deposited downstream.		

	Extent	**Duration**	**Severity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	Local (L)	Medium-term (M)	L-	Negative	Medium (-)	High	High
With Mitigation	Local (L)	Short term (L)	L-	Negative	Low (-)	Low	High

Nature: Impact 4 – Impact on localized surface water quality mainly during the construction phase.

During construction and to a limited degree the operational activities, chemical pollutants (hydrocarbons from equipment and vehicles, cleaning fluids, cement powder, wet cement, shutter-oil, etc.) associated with site-clearing machinery and construction activities could be washed downslope via the ephemeral systems.

	Without mitigation	**With mitigation**
Reversibility	Yes (high)	Yes (high)
Irreplaceable loss of resources	Yes (medium)	Yes (low)
Can impacts be mitigated	Yes (high)	

Mitigation:

- » Strict use and management of all hazardous materials used on site.
- » Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.).
- » Containment of all contaminated water by means of careful run-off management on the development site.
- » Strict control over the behaviour of construction workers.
- » Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the Construction Environmental Management Plan (CEMP) for the project and strictly enforced.
- » Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility.

Cumulative impacts:
Unlikely due to the scale of the development and the lack of aquatic connectivity between the sites and the respective catchments.

Residual impacts:
Residual impacts will be negligible after appropriate mitigation.

	Extent	**Duration**	**Severity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	Local (L)	Medium term (M)	L-	Negative	Medium (-)	High	High
With Mitigation	Local (L)	Short term (L)	L-	Negative	Low (-)	Low	High

9.2 Electrical Grid Connect and Associated Infrastructure for Highlands North WEF Phase 1

If no towers are located within the waterbodies and watercourses shown (Figure 4) it is anticipated that the overall impacts with mitigation would be low to none, based on the assumption that existing tracks, cattle pathways and roads are used as construction access routes as far as possible and where new access roads are required they must avoid sensitive aquatic areas. Further all erosion mitigation measures recommended in this report must be effectively implemented for runoff generated by these tracks as well as the substations. This must be confirmed during a post approval walk down or inspection of the final tower positions and access routes by the aquatic specialist.

Based on these criteria only the following impacts are anticipated for the electrical systems:

Nature: Impact 1 - Increase in sedimentation and erosion within the development footprint during the construction phase and to a lesser degree the operational phase

	Without mitigation	With mitigation
Reversibility	High	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	

Mitigation:

Any stormwater within the site / structures must be handled in a suitable manner, i.e. trap sediments and reduce flow velocities.

Cumulative impacts:

Downstream erosion and sedimentation of the downstream systems and farming operations. However, coupled to the fact that surrounding developments would impact on a different catchments these impacts would be low.

Residual impacts:

During flood events, any unstable banks (eroded areas) and sediment bars (sedimentation downstream) already deposited downstream. However due to low mean annual runoff within the region this is not anticipated due to the nature of the development together with the proposed layout.

	Extent	Duration	Severity	Status	Significance	Probability	Confidence
Without Mitigation	Local (L)	Medium-term (M)	L-	Negative	Medium (-)	High	High
With Mitigation	Local (L)	Short term (L)	L-	Negative	Low (-)	Low	High

Nature: Impact 2 – Impact on localized surface water quality mainly during the construction phase.

During construction and to a limited degree the operational activities, chemical pollutants (hydrocarbons from equipment and vehicles, cleaning fluids, cement powder, wet cement, shutter-oil, etc.) associated with site-clearing machinery and construction activities could be washed downslope via the ephemeral systems.

	Without mitigation	With mitigation
Reversibility	Yes (high)	Yes (high)
Irreplaceable loss of resources	Yes (medium)	Yes (low)
Can impacts be mitigated	Yes (high)	

Mitigation:

» Strict use and management of all hazardous materials used on site.

» Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.).

» Containment of all contaminated water by means of careful run-off management on the development site.

» Strict control over the behaviour of construction workers. » Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the Construction Environmental Management Plan (CEMP) for the project and strictly enforced. » Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility.
Cumulative impacts: Possible impact on the remaining catchment due to changes in run-off characteristics in the development site. However due to low mean annual runoff within the region this is not anticipated due to the nature of the development together with the proposed layout.
Residual impacts: Residual impacts will be negligible after appropriate mitigation.

	Extent	Duration	Severity	Status	Significance	Probability	Confidence
Without Mitigation	Local (L)	Medium term (M)	L-	Negative	Medium (-)	High	High
With Mitigation	Local (L)	Short term (L)	L-	Negative	Low (-)	Low	High

9.3 Highlands Central WEF – Phase 2

Nature: Impact 1 - Loss of riparian systems and water courses during the construction phase The physical removal of the narrow strips of riparian zones and disturbance of any watercourses by the road crossings only, being replaced by hard engineered surfaces. This biological impact would however be localised, as a large portion of the remaining catchment would remain intact, while the significant structures (e.g. turbines and hard standing areas) have been placed well outside of these areas.		
▪ **Reversibility**	▪ High	▪ High
▪ **Irreplaceable loss of resources**	▪ No	▪ No
▪ **Can impacts be mitigated**	▪ Yes	
▪ **Mitigation:** • Where water course crossings are required, the engineering team must provide an effective means to minimise the potential upstream and downstream effects of sedimentation and erosion (erosion protection) as well minimise the loss of riparian vegetation (crossing should have a small footprint). • No vehicles to refuel or be maintained within drainage lines/ riparian vegetation. • Where possible culvert bases must be placed as close as possible with natural levels in mind so that these don't form additional steps / barriers.		
▪ **Cumulative impacts:** The increase in surface run-off velocities and the reduction in the potential for groundwater infiltration is likely to occur, considering that the site is near the main drainage channels. However, the annual rainfall figures are low and this impact is not anticipated and only a small percentage of the proposed projects reach the construction phase and or cover large portions of the site.		
▪ **Residual impacts:** Possible impact on the remaining catchment due to changes in run-off characteristics in the development site.		

	Extent	Duration	Severity	Status	Significance	Probability	Confidence
Without Mitigation	Local (L)	Medium Term (M)	L-	Negative	Medium (-)	High	High
With Mitigation	Local (L)	Short term (L)	L-	Negative	Low (-)	Low	High

Nature: Impact 2 - Impact on riparian systems through the possible increase in surface water runoff from hard surfaces and or new road crossings on riparian form and function during the operational phase		
	▪ **Without mitigation**	**With mitigation**
▪ **Reversibility**	▪ High	▪ High
▪ **Irreplaceable loss of resources**	▪ No	▪ No

▪ **Can impacts be mitigated**	▪ Yes	
▪ **Mitigation:** Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities. This is particularly important due to the levels of erosion already observed within the affected catchments.		
▪ **Cumulative impacts:** Downstream alteration of hydrological regimes due to the increased run-off from the area. However coupled to the fact that surrounding developments would impact on a different catchments these impacts would be low.		
▪ **Residual impacts:** Possible impact on the remaining catchment due to changes in run-off characteristics in the development site. However due to low mean annual runoff within the region this is not anticipated due to the nature of the development together with the proposed layout.		

	Extent	Duration	Severity	Status	Significance	Probability	Confidence
Without Mitigation	Local (L)	Short Term (L)	L-	Negative	Medium (-)	High	High
With Mitigation	Local (L)	Short term (L)	L-	Negative	Low (-)	Low	High

Nature: Impact 3 - Increase in sedimentation and erosion within the development footprint during the construction phase and to a lesser degree the operational phase		
	▪ **Without mitigation**	**With mitigation**
▪ **Reversibility**	▪ High	▪ High
▪ **Irreplaceable loss of resources**	▪ No	▪ No
▪ **Can impacts be mitigated**	▪ Yes	
▪ **Mitigation:** Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments and reduce flow velocities.		
▪ **Cumulative impacts:** Downstream erosion and sedimentation of the downstream systems and farming operations. However, coupled to the fact that surrounding developments would impact on a different catchments these impacts would be low.		
▪ **Residual impacts:** During flood events, any unstable banks (eroded areas) and sediment bars (sedimentation downstream) already deposited downstream.		

	Extent	Duration	Severity	Status	Significance	Probability	Confidence
Without Mitigation	Local (L)	Medium-term (M)	L-	Negative	Medium (-)	High	High
With Mitigation	Local (L)	Short term (L)	L-	Negative	Low (-)	Low	High

Nature: Impact 4 – Impact on localized surface water quality mainly during the construction phase.

During construction and to a limited degree the operational activities, chemical pollutants (hydrocarbons from equipment and vehicles, cleaning fluids, cement powder, wet cement, shutter-oil, etc.) associated with site-clearing machinery and construction activities could be washed downslope via the ephemeral systems.

	Without mitigation	With mitigation
Reversibility	Yes (high)	Yes (high)
Irreplaceable loss of resources	Yes (medium)	Yes (low)
Can impacts be mitigated	Yes (high)	

Mitigation:

» Strict use and management of all hazardous materials used on site.

» Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.).

» Containment of all contaminated water by means of careful run-off management on the development site.

» Strict control over the behaviour of construction workers.

» Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the Construction Environmental Management Plan (CEMP) for the project and strictly enforced.

» Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility.							
Cumulative impacts: Unlikely due to the scale of the development and the lack of aquatic connectivity between the sites and the respective catchments.							
Residual impacts: Residual impacts will be negligible after appropriate mitigation.							
	Extent	**Duration**	**Severity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	Local (L)	Medium term (M)	L-	Negative	Medium (-)	High	High
With Mitigation	Local (L)	Short term (L)	L-	Negative	Low (-)	Low	High

9.4 Electrical Grid Connect and Associated Infrastructure for Highlands Central WEF Phase 2

If no towers are located within the waterbodies and watercourses shown (Figure 4) it is anticipated that the overall impacts with mitigation would be low to none, based on the assumption that existing tracks, cattle pathways and roads are used as construction access routes as far as possible and where new access roads are required they must avoid sensitive aquatic areas. Further all erosion mitigation measures recommended in this report must be effectively implemented for runoff generated by these tracks as well as the substations. This must be confirmed during a post approval walk down or inspection of the final tower positions and access routes by the aquatic specialist.

Based on these criteria only the following impacts are anticipated for the electrical systems:

Nature: Impact 1 - Increase in sedimentation and erosion within the development footprint during the construction phase and to a lesser degree the operational phase		
	▪ **Without mitigation**	**With mitigation**
▪ **Reversibility**	▪ High	▪ High
▪ **Irreplaceable loss of resources**	▪ No	▪ No
▪ **Can impacts be mitigated**	▪ Yes	
▪ **Mitigation:** Any stormwater within the site / structures must be handled in a suitable manner, i.e. trap sediments and reduce flow velocities.		
▪ **Cumulative impacts:** Downstream erosion and sedimentation of the downstream systems and farming operations. However, coupled to the fact that surrounding developments would impact on a different catchments these impacts would be low.		
▪ **Residual impacts:** During flood events, any unstable banks (eroded areas) and sediment bars (sedimentation downstream) already deposited downstream. However due to low mean annual runoff within the region this is not anticipated due to the nature of the development together with the proposed layout.		

	Extent	**Duration**	**Severity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	Local (L)	Medium-term (M)	L-	Negative	Medium (-)	High	High
With Mitigation	Local (L)	Short term (L)	L-	Negative	Low (-)	Low	High

Nature: Impact 2 – Impact on localized surface water quality mainly during the construction phase.

During construction and to a limited degree the operational activities, chemical pollutants (hydrocarbons from equipment and vehicles, cleaning fluids, cement powder, wet cement, shutter-oil, etc.) associated with site-clearing machinery and construction activities could be washed downslope via the ephemeral systems.		
	Without mitigation	**With mitigation**
Reversibility	Yes (high)	Yes (high)
Irreplaceable loss of resources	Yes (medium)	Yes (low)
Can impacts be mitigated	Yes (high)	

Mitigation:

- » Strict use and management of all hazardous materials used on site.
- » Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.).
- » Containment of all contaminated water by means of careful run-off management on the development site.
- » Strict control over the behaviour of construction workers.
- » Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the Construction Environmental Management Plan (CEMP) for the project and strictly enforced.
- » Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility.

Cumulative impacts:
Possible impact on the remaining catchment due to changes in run-off characteristics in the development site. However due to low mean annual runoff within the region this is not anticipated due to the nature of the development together with the proposed layout.

Residual impacts:
Residual impacts will be negligible after appropriate mitigation.

	Extent	Duration	Severity	Status	Significance	Probability	Confidence
Without Mitigation	Local (L)	Medium term (M)	L-	Negative	Medium (-)	High	High
With Mitigation	Local (L)	Short term (L)	L-	Negative	Low (-)	Low	High

9.5 Highlands South WEF – Phase 3

Nature: Impact 1 - Loss of riparian systems and water courses during the construction phase

The physical removal of the narrow strips of riparian zones and disturbance of any watercourses by the road crossings only, being replaced by hard engineered surfaces. This biological impact would however be localised, as a large portion of the remaining catchment would remain intact, while the significant structures (e.g. turbines and hard standing areas) have been placed well outside of these areas.

▪ **Reversibility**	▪ High	▪ High
▪ **Irreplaceable loss of resources**	▪ No	▪ No
▪ **Can impacts be mitigated**	▪ Yes	

▪ **Mitigation:**

- Where water course crossings are required, the engineering team must provide an effective means to minimise the potential upstream and downstream effects of sedimentation and erosion (erosion protection) as well minimise the loss of riparian vegetation (crossing should have a small footprint).
- No vehicles to refuel or be maintained within drainage lines/ riparian vegetation.
- Where possible culvert bases must be placed as close as possible with natural levels in mind so that these don't form additional steps / barriers.

▪ **Cumulative impacts:**

The increase in surface run-off velocities and the reduction in the potential for groundwater infiltration is likely to occur, considering that the site is near the main drainage channels. However, the annual rainfall figures are low and this impact is not anticipated and only a small percentage of the proposed projects reach the construction phase and or cover large portions of the site.

▪ **Residual impacts:**

Possible impact on the remaining catchment due to changes in run-off characteristics in the development site.

	Extent	Duration	Severity	Status	Significance	Probability	Confidence

Without Mitigation	Local (L)	Medium Term (M)	L-	Negative	Medium (-)	High	High
With Mitigation	Local (L)	Short term (L)	L-	Negative	Low (-)	Low	High

Nature: Impact 2 - Impact on riparian systems through the possible increase in surface water runoff from hard surfaces and or new road crossings on riparian form and function during the operational phase

	▪ **Without mitigation**	**With mitigation**
▪ **Reversibility**	▪ High	▪ High
▪ **Irreplaceable loss of resources**	▪ No	▪ No
▪ **Can impacts be mitigated**	▪ Yes	

▪ **Mitigation:**

Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities. This is particularly important due to the levels of erosion already observed within the affected catchments.

▪ **Cumulative impacts:**

Downstream alteration of hydrological regimes due to the increased run-off from the area. However coupled to the fact that surrounding developments would impact on a different catchments these impacts would be low.

▪ **Residual impacts:**

Possible impact on the remaining catchment due to changes in run-off characteristics in the development site. However due to low mean annual runoff within the region this is not anticipated due to the nature of the development together with the proposed layout.

	Extent	Duration	Severity	Status	Significance	Probability	Confidence
Without Mitigation	Local (L)	Short Term (L)	L-	Negative	Medium (-)	High	High
With Mitigation	Local (L)	Short term (L)	L-	Negative	Low (-)	Low	High

Nature: Impact 3 - Increase in sedimentation and erosion within the development footprint during the construction phase and to a lesser degree the operational phase

	▪ **Without mitigation**	**With mitigation**
▪ **Reversibility**	▪ High	▪ High
▪ **Irreplaceable loss of resources**	▪ No	▪ No
▪ **Can impacts be mitigated**	▪ Yes	

▪ **Mitigation:**

Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments and reduce flow velocities.

▪ **Cumulative impacts:**

Downstream erosion and sedimentation of the downstream systems and farming operations. However, coupled to the fact that surrounding developments would impact on a different catchments these impacts would be low.

▪ **Residual impacts:**

During flood events, any unstable banks (eroded areas) and sediment bars (sedimentation downstream) already deposited downstream.

	Extent	Duration	Severity	Status	Significance	Probability	Confidence
Without Mitigation	Local (L)	Medium-term (M)	L-	Negative	Medium (-)	High	High
With Mitigation	Local (L)	Short term (L)	L-	Negative	Low (-)	Low	High

Nature: Impact 4 – Impact on localized surface water quality mainly during the construction phase.

During construction and to a limited degree the operational activities, chemical pollutants (hydrocarbons from equipment and vehicles, cleaning fluids, cement powder, wet cement, shutter-oil, etc.) associated with site-clearing machinery and construction activities could be washed downslope via the ephemeral systems.

	Without mitigation	With mitigation
Reversibility	Yes (high)	Yes (high)
Irreplaceable loss of resources	Yes (medium)	Yes (low)
Can impacts be mitigated	Yes (high)	

Mitigation:

- Strict use and management of all hazardous materials used on site.
- Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.).
- Containment of all contaminated water by means of careful run-off management on the development site.
- Strict control over the behaviour of construction workers.
- Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the Construction Environmental Management Plan (CEMP) for the project and strictly enforced.
- Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility.

Cumulative impacts:
Unlikely due to the scale of the development and the lack of aquatic connectivity between the sites and the respective catchments.

Residual impacts:
Residual impacts will be negligible after appropriate mitigation.

	Extent	Duration	Severity	Status	Significance	Probability	Confidence
Without Mitigation	Local (L)	Medium term (M)	L-	Negative	Medium (-)	High	High
With Mitigation	Local (L)	Short term (L)	L-	Negative	Low (-)	Low	High

9.6 Electrical Grid Connect and Associated Infrastructure for Highlands South WEF Phase 3

If no towers are located within the waterbodies and watercourses shown (Figure 4) it is anticipated that the overall impacts with mitigation would be low to none, based on the assumption that existing tracks, cattle pathways and roads are used as construction access routes as far as possible and where new access roads are required they must avoid sensitive aquatic areas. Further all erosion mitigation measures recommended in this report must be effectively implemented for runoff generated by these tracks as well as the substations. This must be confirmed during a post approval walk down or inspection of the final tower positions and access routes by the aquatic specialist.

Based on these criteria only the following impacts are anticipated for the electrical systems:

Nature: Impact 1 - Increase in sedimentation and erosion within the development footprint during the construction phase and to a lesser degree the operational phase

	Without mitigation	With mitigation
Reversibility	High	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	

- **Mitigation:**

Any stormwater within the site / structures must be handled in a suitable manner, i.e. trap sediments and reduce flow velocities.

- **Cumulative impacts:**

Downstream erosion and sedimentation of the downstream systems and farming operations. However, coupled to the fact that

surrounding developments would impact on a different catchments these impacts would be low.
▪ **Residual impacts:** During flood events, any unstable banks (eroded areas) and sediment bars (sedimentation downstream) already deposited downstream. However due to low mean annual runoff within the region this is not anticipated due to the nature of the development together with the proposed layout.

	Extent	Duration	Severity	Status	Significance	Probability	Confidence
Without Mitigation	Local (L)	Medium-term (M)	L-	Negative	Medium (-)	High	High
With Mitigation	Local (L)	Short term (L)	L-	Negative	Low (-)	Low	High

Nature: Impact 2 – Impact on localized surface water quality mainly during the construction phase.

During construction and to a limited degree the operational activities, chemical pollutants (hydrocarbons from equipment and vehicles, cleaning fluids, cement powder, wet cement, shutter-oil, etc.) associated with site-clearing machinery and construction activities could be washed downslope via the ephemeral systems.

	Without mitigation	With mitigation
Reversibility	Yes (high)	Yes (high)
Irreplaceable loss of resources	Yes (medium)	Yes (low)
Can impacts be mitigated	Yes (high)	

Mitigation:

» Strict use and management of all hazardous materials used on site.

» Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.).

» Containment of all contaminated water by means of careful run-off management on the development site.

» Strict control over the behaviour of construction workers.

» Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the Construction Environmental Management Plan (CEMP) for the project and strictly enforced.

» Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility.

Cumulative impacts:
Possible impact on the remaining catchment due to changes in run-off characteristics in the development site. However due to low mean annual runoff within the region this is not anticipated due to the nature of the development together with the proposed layout.

Residual impacts:
Residual impacts will be negligible after appropriate mitigation.

	Extent	Duration	Severity	Status	Significance	Probability	Confidence
Without Mitigation	Local (L)	Medium term (M)	L-	Negative	Medium (-)	High	High
With Mitigation	Local (L)	Short term (L)	L-	Negative	Low (-)	Low	High

10 – Cumulative Impacts

In the assessment of this project, the surrounding projects within a 35km radius of the site were assessed. From an aquatic environment standpoint, these projects don't share any of the same direct subquaternary catchment and thus the other projects are too far removed. These would also not share any of the new roads, as it has been shown in the past that the access roads have always had some form of impact on aquatic systems, while internal structures (hard stands and turbines) to a lesser degree.

Presently, no significant cumulative impacts with regard to the proposed turbine placement, hardstands and associated underground cabling were identified as these are also located outside of the delineated aquatic systems and their buffers for the proposed site.

<table>
<tr><td colspan="8">Nature: Impact 5 – Overall cumulative impact during the construction and operational phases.

In the assessment of this project, the surrounding projects within a 35km radius of the site were assessed, including a number of Solar projects

The author has also reviewed the outcomes of the remaining projects as part of this EIA or other EIA / WUL applications in the region.

All of the projects have indicated that aquatic impact avoidance as part of their layouts design process coupled mitigation, i.e. selecting the best possible routes to minimise the local and regional impacts while improving the drainage or hydrological conditions within these rivers has been included to result in a cumulative impact that would be negligible. However, the worse-case scenario has been assessed below, i.e. only the minimum of mitigation is implemented by the other projects, noting only a small number of projects ever reach the construction phase and that flows within these systems are sporadic.</td></tr>
<tr><td colspan="3"></td><td colspan="2">Without mitigation</td><td colspan="3">With mitigation</td></tr>
<tr><td colspan="3">Reversibility</td><td colspan="2">Yes (high)</td><td colspan="3">Yes (high)</td></tr>
<tr><td colspan="3">Irreplaceable loss of resources</td><td colspan="2">Yes (medium)</td><td colspan="3">Yes (low)</td></tr>
<tr><td colspan="3">Can impacts be mitigated</td><td colspan="2">Yes (high)</td><td colspan="3"></td></tr>
<tr><td colspan="8">Mitigation:
» Improve the current stormwater and energy dissipation features not currently found along the tracks and roads within the region
» Install properly sized culverts with erosion protection measures at the present road / track crossings</td></tr>
<tr><td colspan="8">Residual impacts:
Residual impacts will be negligible after appropriate mitigation.</td></tr>
<tr><td></td><td>Extent</td><td>Duration</td><td>Severity</td><td>Status</td><td>Significance</td><td>Probability</td><td>Confidence</td></tr>
<tr><td>Without Mitigation</td><td>Local (L)</td><td>Medium term (M)</td><td>L-</td><td>Negative</td><td>Medium (-)</td><td>High</td><td>High</td></tr>
<tr><td>With Mitigation</td><td>Local (L)</td><td>Short term (L)</td><td>L-</td><td>Negative</td><td>Low (-)</td><td>Low</td><td>High</td></tr>
</table>

11 – Environmental Management Plan – Construction and Operational Phase

Objective	Potential Impact	Mitigation Measures	Indicator	Responsibility	Timeframes
Loss of aquatic species of concern	» Loss of rare, endemic or protected species	» A final pre-construction walkdown should be conducted, as part of a Plant Search and Rescue plan, with the appropriate permits in place. » All alien plant re-growth, which is currently high within the greater region must be monitored and should it occur, these plants should be eradicated within the project footprints and especially in areas near the proposed crossings. » Where any roads and crossings will be upgraded, the following applies: 1. All pipe culverts must be removed and replaced with suitably sized box culverts, where road levels are raised. 2. 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 post authorisation walkdown, prior to commencement of the construction phase. 3. Approach road embankments especially where large cut and fill areas will be required must be rehabilitated during the construction process, to minimise erosion. 4. Suitable stormwater management systems must be installed and monitored during the first few months of use. Any erosion / sedimentation must be prevented.	» No activity in identified no-go areas » Acceptable level of activity within disturbance areas, as determined by ECO » Where required all applicable permits should be in place	ECO Contractor	Preconstruction and during site establishment
Loss of any functional riverine habitat	» Loss of functional habitat within the site and near any of the required crossing upgrades	» The layout planning has taken cognisance of the areas Figure 4, however a final walkdown should also be conducted post authorisation to assist with the development of the stormwater management plan and Riverine Rehabilitation and Monitoring plan. » All alien plant re-growth must be monitored and should it occur, these plants should be eradicated within the project footprints and especially in areas near the proposed crossings » Where any roads and crossings will be upgraded, the following applies:	» No activity in identified no-go areas » Acceptable level of activity within disturbance areas, as determined by ECO » Where required all applicable permits and or water use licenses should be in place	ECO Contractor	Preconstruction and during site establishment

Objective	Potential Impact	Mitigation Measures	Indicator	Responsibility	Timeframes
		» All pipe culverts must be removed and replaced with suitably 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 post authorisation walkdown, prior to commencement of the construction phase. » Approach road embankments especially where large cut and fill areas will be required must be rehabilitated during the construction process, to minimise erosion. » Suitable stormwater management systems must be installed and monitored during the first few months of use. Any erosion / sedimentation must be prevented.			
Soil erosion control, water quality management at potential road crossings	» Erosion and soil loss within **watercourses** » Disturbance to or loss of **watercourses** » Sedimentation of **watercourse areas** » Loss of indigenous vegetation cover, particularly in **watercourse areas** » Increased runoff into rivers potentially associated with accelerated erosion in **watercourses**	» Identify and demarcate construction areas for general construction work and restrict construction activity to these areas. Prevent unnecessary destructive activity within construction areas (prevent over-excavations and double handling) » Stockpile topsoil for re-use in rehabilitation phase. Maintain stockpile shape and protect from erosion. All stockpiles must be positioned at least 30 m away from water courses, unless agreed otherwise with the ECO. Limit the height of stockpiles as far as possible in order to reduce compaction. » Any excavation, including those for cables, must be supervised by the ECO. Disturbance of vegetation and topsoil must be kept to a practical minimum. » Rehabilitate disturbance areas as soon as construction in an area is completed.	» No activity in identified no-go areas » Acceptable level of activity within disturbance areas, as determined by ECO » Acceptable level of soil erosion around site, as determined by ECO » Acceptable level of increased siltation in water courses, as determined by ECO » Acceptable level of soil degradation, as determined by ECO » Acceptable state of excavations, as determined by Resident Engineer & ECO	ECO Contractor	During site establishment, construction and operational phase
Objective	**Potential Impact**	**Mitigation Measures**	**Indicator**	**Responsibility**	**Timeframes**
Successful waste and pollutant management	» The watercourse areas could be impacted via: 1. Release of contaminated water from contact with spilled chemicals 2. Generation of contaminated wastes	» Identify and demarcate construction areas for general construction work and restrict construction activity to these areas. Prevent unnecessary destructive activity within construction areas (prevent over-excavations and double handling). » Any excavation, including those for cables, must be supervised by the ECO. Disturbance of vegetation and topsoil must be kept to a practical minimum.	» No chemical spills outside of designated storage areas » No water or soil contamination by chemical spills » No complaints received regarding waste on site or indiscriminate dumping	ECO Contractor	During site establishment, construction and operational phase

Objective	Potential Impact	Mitigation Measures	Indicator	Responsibility	Timeframes
	from used chemical containers 3. Inefficient use of resources resulting in excessive waste generation 4. Litter or contamination of the site or water through poor waste management practices	» Stockpile topsoil for re-use in rehabilitation phase. Maintain stockpile shape and protect from erosion. All stockpiles must be positioned at least 32 m away from water courses. Limit the height of stockpiles as far as possible in order to reduce compaction. » Storage areas must be located more than 50 m away from the watercourse, unless agreed otherwise with the ECO. » The storage of flammable and combustible liquids such as oils must be in designated areas which are appropriately bunded, and stored in compliance with material safety datasheet (MSDS) files, as defined by the safety, health and environment (SHE) Representative / ECO. » Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals must be complied with. » Routine servicing and maintenance of vehicles is not to take place on-site (except for emergency situations or large cranes which cannot be moved off-site). If repairs of vehicles must take place on site, an appropriate drip tray must be used to contain any fuel or oils. » Transport of all hazardous substances must be in accordance with the relevant legislation and regulations. » Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors. » Waste disposal records must be available for review at any time. Documentation (waste manifest) must be maintained detailing the quantity, nature and fate of any hazardous waste. » Construction contractors must provide specific detailed waste management plans to deal with all waste streams. » Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap) and contaminated waste. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage and vermin control.	» Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately » Provision of all appropriate waste manifests for all waste streams » Firefighting equipment and training provided before the construction phase commences » No activity in identified no-go areas » Acceptable level of activity within disturbance areas, as determined by ECO » Acceptable level of soil erosion around site, as determined by ECO » Acceptable level of increased siltation in water courses, as determined by ECO » Acceptable level of soil degradation, as determined by ECO » Acceptable state of excavations, as determined by Resident Engineer & ECO		

Objective	Potential Impact	Mitigation Measures	Indicator	Responsibility	Timeframes
		» Where possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation and storage of waste streams (such as wood, metals, general refuse etc.). Supply waste collection bins at construction equipment and construction crew camps. » Under no circumstances may solid waste be burnt or buried on site. » Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area. » Waste and surplus dangerous goods must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal. » Hazardous and non-hazardous waste must be separated at source. Separate waste collection bins must be provided for this purpose. These bins must be clearly marked and appropriately covered. » Construction equipment must be refuelled within designated refuelling locations, or where remote refuelling is required, appropriate drip trays must be utilised. » All stored fuels to be maintained within a bund and on a sealed surface. Fuel storage areas must be inspected regularly to ensure bund stability, integrity and function. » Construction machinery must be stored in an appropriately sealed area. » An incident/complaints register must be established and maintained on-site. » Corrective action must be undertaken immediately if a complaint is received, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures. » Appropriate emergency training (e.g. firefighting) must be given to team prior to the construction period. » Any spills must receive the necessary clean-up action. If required, bioremediation kits are to be kept on-site and used to remediate any spills that			

Objective	Potential Impact	Mitigation Measures	Indicator	Responsibility	Timeframes
		may occur. Appropriate arrangements to be made for appropriate collection and disposal of all cleaning materials, absorbents and contaminated soils (in accordance with a waste management plan). » Oily water from bunds at the substation must be removed from site by licensed contractors. » Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility. » Spilled cement or concrete must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site. » In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents. » Upon the completion of construction, the area will be cleared of potentially polluting materials. » Rehabilitate disturbance areas as soon as construction in an area is completed.			

12 - Conclusion and recommendations

The proposed facilities and transmission line corridors would have a limited impact on the aquatic environment as all large structures will avoid the delineated natural systems, with a limited number of new water course crossings, i.e. the Final Mitigated Layout makes use of any of the existing roads (Figures 4), as far as practicable. Thus, presently no objection to the development taking place is made. Further no preference is given to any of the transmission line corridors assuming that all towers will be placed outside of the watercourse inclusive of the 32m buffer, and no large scale access tracks will be created across these systems within the grid corridor.

Figure 4 further indicates the 15 affected water courses and those that would trigger the need for a Water Use License application (a potential GA) in terms of Section 21 c and i of the National Water Act, should any construction take place within these areas. Should any of the present road crossings need to be upgraded then the opportunity exists to improve the current state (lack of habitat continuity) for example by replacing pipe culverts with box culverts, while also reducing the height of the bridge footings (culvert bases) to reinstate natural water course levels. This was mostly observed along the district roads within the area, but in line with other projects within the region.

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

- Vegetation clearing should occur in in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment.
- All construction materials including fuels and oil should be stored in demarcated areas that are contained within berms / bunds to avoid spread of any contamination. Washing and cleaning of equipment should also be done in berms or bunds, in order to trap any cement and prevent excessive soil erosion. Mechanical plant and bowsers must not be refuelled or serviced within or directly adjacent to any channel. It is therefore suggested that all construction camps, lay down areas, batching plants or areas and any stores should be more than 32 m from any demarcated water courses, unless agreed otherwise with the Environmental Control Officer (ECO).
- It is also advised that an ECO, with a good understanding of the local flora be appointed during the construction phase. The ECO should be able to make clear recommendations with regards to the re-vegetation of the newly completed / disturbed areas, using selected species detailed in this report.
- All alien plant re-growth must be monitored, and should it occur these plants should be eradicated. The scale of the operation does however not warrant the use of a Landscape Architect and / or Landscape Contractor.

It is further recommended that a comprehensive rehabilitation plan be implemented from the project onset within areas of disturbance (inclusion of buffers) to ensure a net benefit to the aquatic environment. This should from part of the suggested walk down as part of the final EMPr preparation. The walkdown is required as the final cut/fill and embankments for roads and other structures could not be provided at this point, thus it would be important to evaluate in terms of the aquatic environment and evaluate the need for a Water Use License / GA for these areas.

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14 – Appendix 1: Wetland assessment methods

The assessment was initiated with a survey of the pertinent literature, past reports and the various conservation plans that exist for the study region. Maps and Geographical Information Systems (GIS) were then employed to ascertain, which portions of the proposed development, could have the greatest impact on the wetlands and associated habitats.

Site visits were conducted to ground-truth the above findings, thus allowing critical comment of the development when assessing the possible impacts and delineating the wetland areas.

Sampling equipment used included:

- Camera
- GPS
- Soil auger
- Sample bags
- Munsell colour chart
- Field data capture sheets (PES/EIS/IHI)
- Electronic maps on Ipad

Wetland and riparian areas were then assessed on the following basis:

- Vegetation type – verification of type and its state or condition based, supported by species identification using Germishuizen and Meyer (2003), Vegmap (Mucina and Rutherford, 2006 as amended) and the South African Biodiversity Information Facility (SABIF) database.
- Plant species were further categorised as follows:
    - Terrestrial: species are not directly related to any surface or groundwater base-flows and persist solely on rainfall
    - Facultative: species usually found in wetlands (inclusive of riparian systems) (67 – 99% of occurrences), but occasionally found in terrestrial systems (non-wetland) (DWAF, 2005/2007)
    - Obligate: species that are only found within wetlands (>99% of occurrences) (DWAF, 2005/2007)
- Assessment of the wetland type based on the National Wetland Classification System (NWCS) method discussed below and the required buffers
- Mitigation or recommendations required

National Wetland Classification System (Ollis *et al.*, 2013)

Since the late 1960s, wetland classification systems have undergone a series of international and national revisions. These revisions allowed for the inclusion of additional wetland types, ecological and conservation rating metrics, together with a need for a system that would allude to the functional requirements of any given wetland (Ewart-Smith *et al*., 2006). Wetland function is a consequence of biotic and abiotic factors, and wetland classification should strive to capture these aspects.

The South African National Biodiversity Institute (SANBI) in collaboration with a number of specialists and stakeholders developed the newly revised and now accepted National

Wetland Classification Systems (NWCS, 2014). This system comprises a hierarchical classification process of defining a wetland based on the principles of the Hydrogeomorphic (HGM) approach at higher levels, including structural features at the finer or lower levels of classification.

Wetlands developed in a response to elevated water tables, linked either to rivers, groundwater flows or seepage from aquifers (Parsons, 2004). These water levels or flows then interact with localised geology and soil forms, which then determines the form and function of the respective wetlands. Water is thus the common driving force, in the formation of wetlands (DWAF, 2005/2007). It is significant that the HGM approach has now been included in wetland classification as the HGM approach has been adopted throughout the water resources management realm with regard the determination of the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) and WET-Health assessments for aquatic environments. All of these systems are then easily integrated using the HGM approach in line with the Eco-classification process of river and wetland reserve determinations used by the Department of Water and Sanitation (DWS). The Ecological Reserve of a wetland or river is used by DWS to assess the water resource allocations when assessing water use license applications (WULA).

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).

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

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

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

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

Wetland definition

Although the National Wetland Classification System (2014) is used to classify wetland types it is still necessary to understand the definition of a wetland. Wetland definitions as with classification systems have changed over the years. 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 seaward boundary of the shallow photic zone (Lombard *et al*., 2005). An additional minor adaptation of the definition is the removal of the term 'fen' as fens are considered a type of peatland. The adapted definition for the NWCS is, therefore, as follows:

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

This definition encompasses all ecosystems characterised by the permanent or periodic presence of water other than marine waters deeper than ten metres. The only legislated definition of wetlands in South Africa, however, is contained within the National Water Act (Act No. 36 of 1998) (NWA), where wetlands are defined as "land which is transitional between terrestrial and aquatic systems, where the water table is usually at, or near the surface, or the land is periodically covered with shallow water and which land in normal circumstances supports, or would support, vegetation adapted to life in saturated soil." This definition is consistent with more precise working definitions of wetlands and therefore includes only a subset of ecosystems encapsulated in the Ramsar definition. It should be noted that the NWA definition is not concerned with marine systems and clearly distinguishes wetlands from estuaries, classifying the latter as a water course (NWCS, 2014). The DWS is however reconsidering this position with regard the management of estuaries due to the ecological needs of these systems with regard to water allocation. Table 1 provides a comparison of the various wetlands included within the main sources of wetland definition 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 (NWCS, 2014).

Wetlands must therefore have one or more of the following attributes to meet the above definition (DWAF, 2005/2007):

- A high water table that results in the saturation at or near the surface, leading to anaerobic conditions developing in the top 50cm 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.

Table 1: Comparison of ecosystems considered to be 'wetlands' as defined by the proposed NWCS, the National Water Act (Act No. 36 of 1998), and ecosystems are included in DWAF's (2005) delineation manual.

Ecosystem	NWCS "wetland"	National Water Act wetland	DWAF (2005) delineation manual
Marine	▪ YES	▪ NO	▪ NO

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

Wetland importance and function

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

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

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

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

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

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

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

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 2 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 2: Summary of direct and indirect ecoservices provided by wetlands from Kotze *et al.*, 2008.

<table>
<tr><td rowspan="15">Ecosystem services supplied by wetlands</td><td rowspan="9">Indirect benefits</td><td rowspan="8">Hydro-geochemical benefits</td><td colspan="2">Flood attenuation</td></tr>
<tr><td colspan="2">▪ Stream flow regulation</td></tr>
<tr><td rowspan="5">Water quality enhancement benefits</td><td>▪ Sediment trapping</td></tr>
<tr><td>▪ Phosphate assimilation</td></tr>
<tr><td>▪ Nitrate assimilation</td></tr>
<tr><td>▪ Toxicant assimilation</td></tr>
<tr><td>▪ Erosion control</td></tr>
<tr><td colspan="2">▪ Carbon storage</td></tr>
<tr><td colspan="3">▪ Biodiversity maintenance</td></tr>
<tr><td rowspan="6">Direct benefits</td><td colspan="3">▪ Provision of water for human use</td></tr>
<tr><td colspan="3">▪ Provision of harvestable resources[2]</td></tr>
<tr><td colspan="3">▪ Provision of cultivated foods</td></tr>
<tr><td colspan="3">▪ Cultural significance</td></tr>
<tr><td colspan="3">▪ Tourism and recreation</td></tr>
<tr><td colspan="3">▪ Education and research</td></tr>
</table>

National Wetland Classification System method

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

The NWCS (SANBI, 2009) as stated previously, uses hydrological and geomorphological traits to distinguish the primary wetland units, i.e. direct factors that influence wetland function. Other wetland assessment techniques, such as the DWAF (2005) delineation method, only infer wetland function based on abiotic and biotic descriptors (size, soils & vegetation) stemming from the Cowardin approach (SANBI, 2009).

The classification system used in this study is thus based on SANBI (2009) and is summarised below:

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

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

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

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

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

(i) Landform – shape and localised setting of wetland
(ii) Hydrological characteristics – nature of water movement into, through and out of the wetland
(iii) 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 the 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 of six descriptors to characterise the wetland types on the basis of 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:

(i) Geology;
(ii) Natural vs. Artificial;
(iii) Vegetation cover type;
(iv) Substratum;
(v) Salinity; and
(vi) Acidity or Alkalinity.

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

The HGM unit (Level 4) is the **focal point of the NWCS**, with the upper levels (Figure 2 – Inland systems only) providing means to classify the broad bio-geographical context for grouping functional wetland units at the HGM level, while the lower levels provide more descriptive detail on the particular wetland type characteristics of a particular HGM unit. Therefore Level 1 – 5 deals with functional aspects, while Level 6 classifies wetlands on structural aspects.

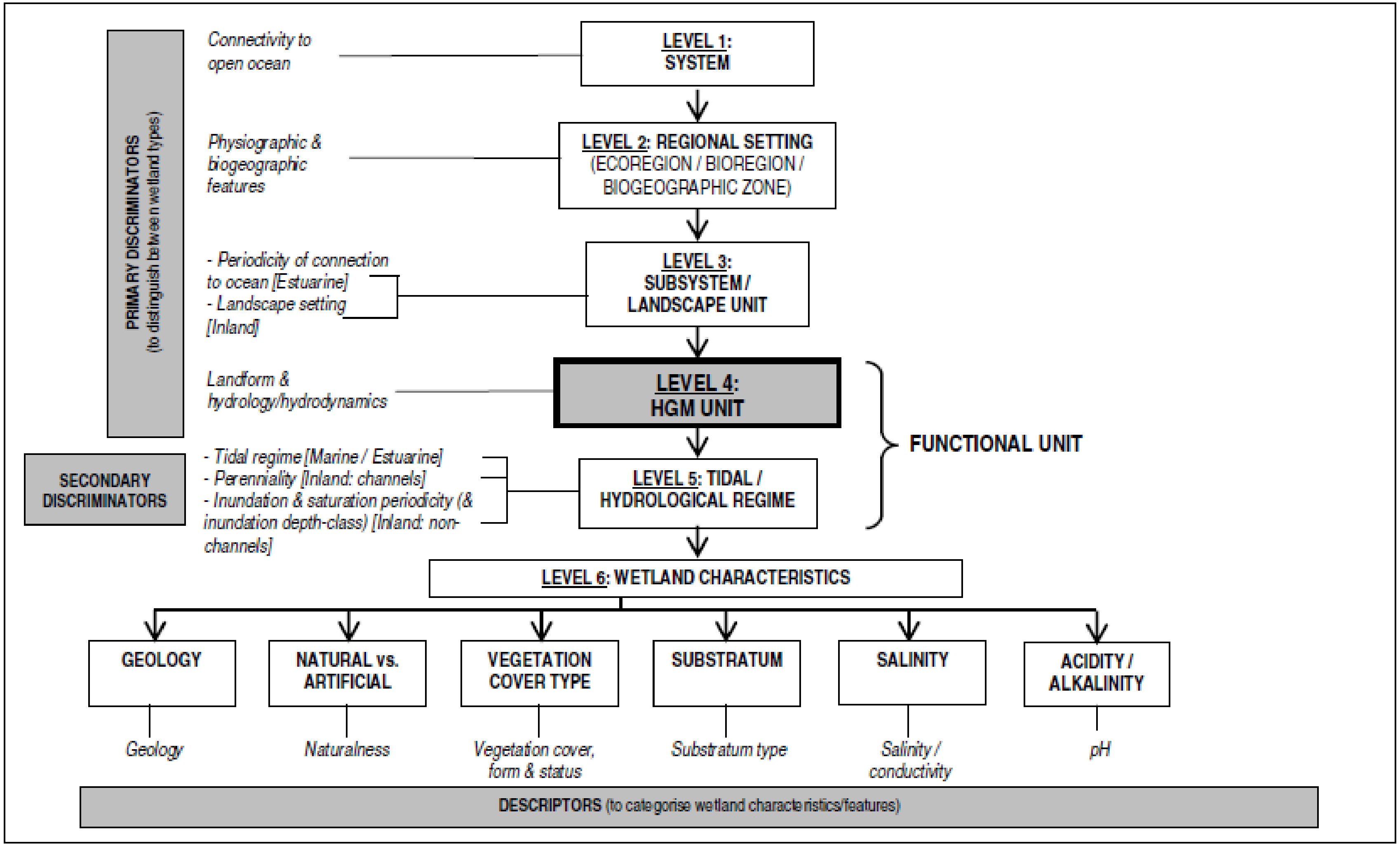

Figure 1: Basic structure of the National Wetland Classification System, showing how 'primary discriminators' are applied up to Level 4 to classify Hydrogeomorphic (HGM) Units, with 'secondary discriminators' applied at Level 5 to classify the tidal/hydrological regime, and 'descriptors' applied at Level 6 to categorise the characteristics of wetlands classified up to Level 5 (From SANBI, 2009).

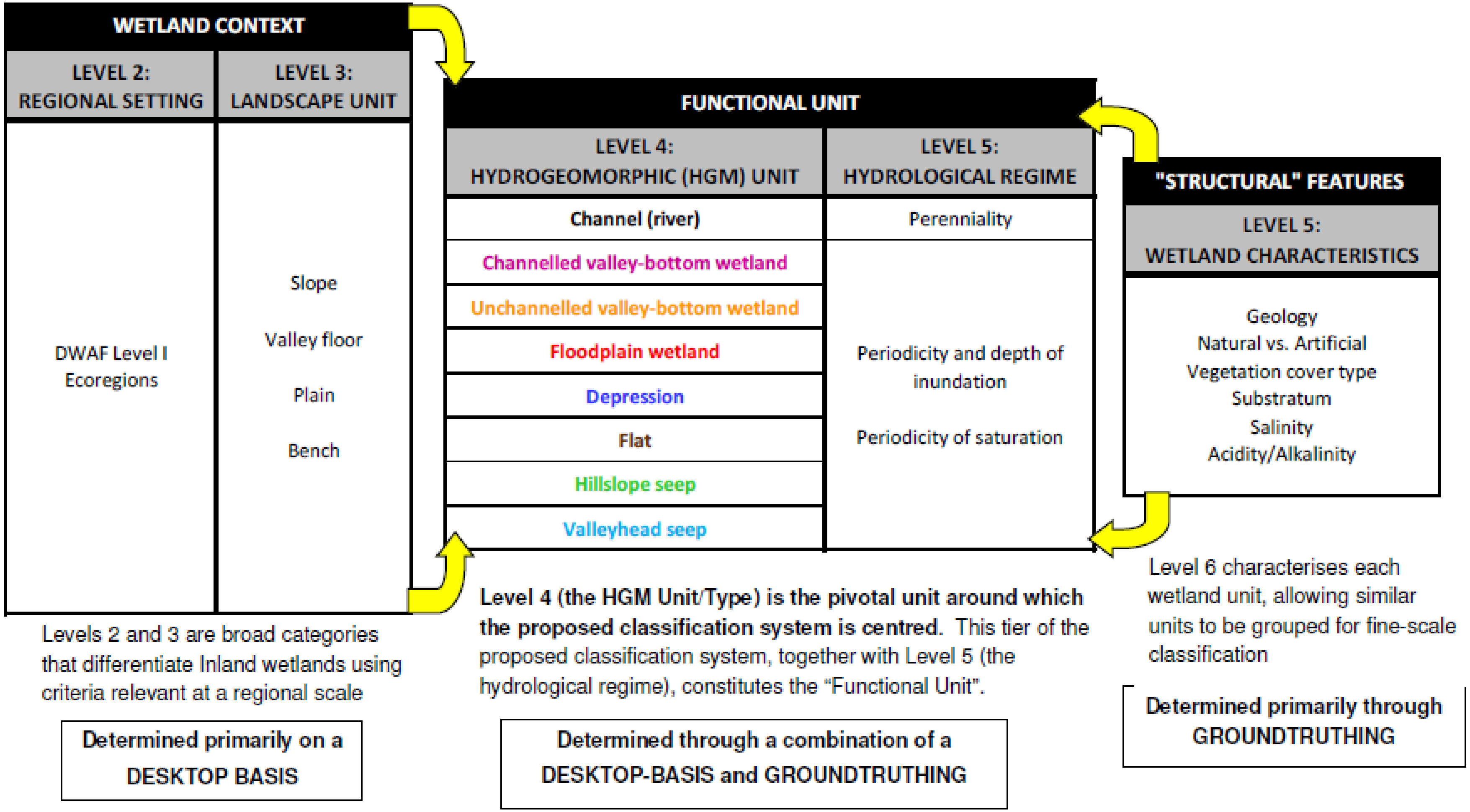

Figure 2 Illustration of the conceptual relationship of HGM Units (at Level 4) with higher and lower levels (relative sizes of the boxes show the increasing spatial resolution and level of detail from the higher to the lower levels) for Inland Systems (from SANBI, 2009).

Wetland condition and conservation importance assessment

To assess the Present Ecological State (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 4), and provide a score of the PES of the habitat integrity of the wetland system being examined. The author has included additional criteria into the model based system to include additional wetland types. This system is preferred when compared to systems such as WET-Health – wetland management series (WRC 2009), as WET-Health (Level 1) was developed with wetland rehabilitation in mind, and is not always suitable for impact assessments. This coupled to degraded state of the wetlands in the study area, 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 4: 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 landuse 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 rapid 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 DWAF's River EcoStatus models which are currently used for the assessment of PES in riverine environments.

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

- Habitat uniqueness
- Species of conservation concern
- Habitat fragmentation with regard ecological corridors
- 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 was observed (HIGH). Any systems 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. Wetlands which receive a LOW conservation importance rating could be included into stormwater management features, but should not be developed so as to retain the function of any ecological corridors.

14 - Appendix 2: Specialist CV

CURRICULUM VITAE
Dr Brian Michael Colloty
7212215031083

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Pari Park
Port Elizabeth, 6070
brian@itsnet.co.za
083 498 3299

Profession: Ecologist & Environmental Assessment Practitioner (Pr. Sci. Nat. 400268/07 & EAPSA certified). Member of the South African Wetland Society
Specialisation: Ecology and conservation importance rating of inland habitats, wetlands, rivers & estuaries
Years experience: 21 years

SKILLS BASE AND CORE COMPETENCIES

- 21 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.
- 12 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) - NMMU
- 1995: B Sc Hon (Zoology) - NMMU
- 1996: M Sc (Botany - Rivers) - NMMU
- 2000: Ph D (Botany – Estuaries & Mangroves) – NMMU

EMPLOYMENT HISTORY

- 1996 – 2000 Researcher at Nelson Mandela Metropolitan University – SAB institute for Coastal Research & Management. Funded by the WRC.
- 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 – present Owner / Ecologist of Scherman Colloty & Associates cc

SELECTED RELEVANT PROJECT EXPERIENCE

World Bank IFC Standards

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

South African

- 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.

Dr Brian Colloty 1

- Nelson Mandela Bay Municipality Baakens River Integrated Wetland Assessment (Inclusive of Rehabilitation and Monitoring Plans) for CEN IEM Unit - Current
- Rangers Biomass Gasification Project (Uitenhage), wetland assessment and wetland rehabilitation / monitoring plans for CEM IEM Unit – current.
- Gibson Bay Wind Farm implementation of the wetland management plan during the construction and operation of the wind farm (includes surface / groundwater as well wetland rehabilitation & monitoring plan) on behalf of Enel Green Power - current
- Gibson Bay Wind Farm 133kV Transmission Line wetland management plan during the construction of the transmission line (includes wetland rehabilitation & monitoring plan) on behalf of Eskom – 2016.
- Tsitsikamma Community Wind Farm implementation of the wetland management plan during the construction of the wind farm (includes surface / biomonitoring, as well wetland rehabilitation & monitoring plan) on behalf of Cennergi – completed May 2016.
- Alicedale bulk sewer pipeline for Cacadu District, wetland and water quality assessment, 2016
- Mogalakwena 33kv transmission line in the Limpopo Province, on behlaf of Aurecon, 2016
- Cape St Francis WWTW expansion wetland and passive treatment system for the Kouga Municipality, 2015
- Macindane bulk water and sewer pipelines wetland and wetland rehabilitation plan for the Indwe 2015
- Eskom Prieska to Copperton 132kV transmission line aquatic assessment, Northern Cape on behalf of Savannah Environmental 2015.
- Joe Slovo sewer pipeline upgrade wetland assessment for Nelson Mandela Bay Municipality 2014
- Cape Recife Waste Water Treatment Works expansion and pipeline aquatic assessment for Nelson Mandela Bay Municipality 2013
- Pola park bulk sewer line upgrade aquatic assessment for Nelson Mandela Bay Municipality 2013
- Transnet Freight Rail – Swazi Rail Link (Current) wetland and ecological assessment on behalf of Aurecon for the proposed rail upgrade from Ermelo to Richards Bay
- Eskom Transmission wetland and ecological assessment for the proposed transmission line between Pietermaritzburg and Richards Bay on behalf of Aurecon (2012).
- Port Durnford Exarro Sands biodiversity assessment for the proposed mineral sands mine on behalf of Exxaro (2009)
- Fairbreeze Mine Exxaro (Mtunzini) wetland assessment on behalf of Strategic Environmental Services (2007).
- Wetland assessment for Richards Bay Minerals (2013) – Zulti North haul road on behalf of RBM.
- Biodiversity and aquatic assessments for 85 renewable projects in the past four years in the Western, Eastern, Northern Cape, KwaZulu-Natal and Free State provinces. Clients included RES-SA, RedCap, ACED Renewables, Mainstream Renewable, GDF Suez, Globeleq, ENEL, Abengoa amongst others. Particular aquatic sensitivity assessment and Water Use License Applications on behalf of Mainstream Renewable Energy (8 wind farms and 3 PV facilities.), Cennergi / Exxaro (2 Wind farm), WKN Wind current (2 wind farms & 2 PV facilities), ACED (6 wind farms) and Windlab (3 Wind farms) were also conducted. Several of these projects also required the assessment of the proposed transmission lines and switching stations, which were conducted on behalf of Eskom.
- Vegetation assessments on the Great Brak rivers for Department of Water and Sanitation, 2006 and the Gouritz Water Management Area (2014)
- Proposed FibreCo fibre optic cable vegetation assessment along the N2, PE to Cape Town, 2012 on behalf of SRK (2013).

15 - Appendix 3: Signed declaration

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/ or 12/9/11/L
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

HIGHLANDS WEF AND TRANSMISSION LINES

Specialist:	Scherman Colloty and Associates		
Contact person:	Dr Brian Colloty		
Postal address:	1 Rossini Rd Pari Park Port Elizabeth		
Postal code:	6070	Cell:	0834983299
Telephone:	0413662077	Fax:	-
E-mail:	brian@itsnet.co.za		
Professional affiliation(s) (if any)	Pr Sci Nat Ecologist 40068/07 Wetland Soc of SA, SASAqs		

Project Consultant:	Arcus Consulting		
Contact person:	Anja Albertyn		
Postal address:	Office 220 Cube Workspace Cnr Long Street and Hans Strijdom Cape Town		
Postal code:	8001	Cell:	076 265 8933
Telephone:	021 412 1533	Fax:	-
E-mail:	anjaa@arcusconsulting.co.za		

4.2 The specialist appointed in terms of the Regulations_

I, Brian Colloty, declare that --

General declaration:

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]

Signature of the specialist:

Scherman Colloty and Associates

Name of company (if applicable):

27/06/2018

Date: