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Baseline Aquatic Assessment for Proposed Gas to Power Powership Project at the Port of Richards Bay, KZN

Final

31 October 2022

Triplo4 Sustainable Solutions (Pty) Ltd

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DISCLAIMER

The opinions expressed in this Report have been based on the information supplied to GCS Water and Environment (Pty) Ltd (GCS) by Triplo4 (Pty) Ltd, historical specialist studies undertaken by GCS, and data extracted from previous Reports.

GCS has exercised all due care in reviewing the supplied information. Whilst GCS has compared key supplied data with expected values, the accuracy of the results and conclusions are entirely reliant on the accuracy and completeness of the supplied data. GCS does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them.

Opinions presented in this report, apply to the site conditions and features as they existed at the time of GCS's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this report, about which GCS had no prior knowledge nor had the opportunity to evaluate.

DECLARATION

I Jaco du Plessis, declare that:

- I act as an independent specialist;
- Results will be interpreted in an objective manner, even if the viewpoints are not favourable to the applicant;
- I have the relevant expertise to conduct a report of this nature, including knowledge of the National Environmental Management Act (Act No. 107 of 1998) and the National Water Act (Act No. 36 of 1998);
- I will comply with the act(s) and other relevant legislation;
- As a registered member of the South African Council for Natural Scientific Professions, will undertake my profession in accordance with the Code of Conduct of the Council, as well as any other societies to which I am a member;
- Based on the information provided to me by the project proponent and in addition to information obtained during the course of this study, have presented the results and conclusion within the associated document to the best of my professional ability;
- I reserve the right to modify aspects pertaining to the present investigation should additional information become available through ongoing research and/or further work in this field;
- I understand that any false information published in this document is an offence in terms of regulation 71 and is punishable in terms of section 24F of the Act; and
- I undertake to have my work peer reviewed on a regular basis by a competent specialist in the field of study for which I am registered.

Jaco du Plessis

Ecologist

Pr. Sci. Nat. 118234

[GCS (Pty) Ltd]

EXECUTIVE SUMMARY

GCS Water and Environmental Consultants (Pty) Ltd (GCS) was appointed by Triplo4 (Pty) Ltd (Triplo4) to undertake a Baseline Aquatic Assessment for the proposed development of a transmission line, associated with the Proposed Gas to Power Powership Project at the Port of Richards Bay, Kwa-Zulu Natal (KZN).

The aquatic assessment was undertaken to fulfil the requirements of an Environmental Authorisation and a Water Use License Application (WULA) for the proposed establishment of 132kV transmission lines. The aquatic study focussed on the freshwater environment and therefore only the transmission lines forming a part of the whole project were assessed. The Powership will be constructed offsite and therefore will not have any impact on the surrounding freshwater features of the study area and thus was not included in this assessment.

The aim of the aquatic assessment was to ascertain, by means of rapid biomonitoring methods, the ecological state of the surrounding surface water (river) resources associated with the proposed development. A site visit was undertaken on the 22nd to the 23rd of September 2020.

This document constitutes a baseline aquatic assessment of selected riverine sites in proximity to, or potentially affected by, the proposed 132 kilovolt (kV) transmission line. The survey included in situ assessments of water quality, invertebrate habitat availability, aquatic invertebrate communities, and anthropogenic impacts on the instream and riparian environments. Analysis of the river ecosystems was undertaken according to nationally developed methodologies as defined by the Department of Water Affairs River Health Program. The results of the assessment have been summarised in Table 0-1.

Table 0-1: Summary of baseline aquatic assessment results for the study site

Site	**RB4**
SASS / ASPT	**16 / 5.3**
MIRAI Ecological Category	**D**
Water quality	No exceedance during the 2022 assessment
IHAS	Inadequate
IHI Instream Habitat	D
IHI Riparian Habitat	D/E

Six assessment sites were investigated, to assess the possible impacts associated with the proposed project. Only one site on an unnamed non-perennial drainage line (RB4) presented flowing water in which SASS5 sampling could be undertaken. A downstream assessment site could not be assessed as it falls within the estuarine functional zone.

The aquatic macroinvertebrate community assessment of the unnamed drainage line could not be classed using the Dallas (2007) biological bands due to insufficient information for the Natal Coastal Plan Ecoregion. However, a variance calculation based on the expected number of taxa for the SQR was revealed to be high. The absence of taxa is considered to be impacted primarily by inadequate habitat availability. The MIRAI assessment indicated that the macro-invertebrate assemblage was in a largely modified state with an ecological category of D.

The impact of the proposed project range from medium to low pre mitigation and impacts can be further reduced with appropriate mitigation. The proposed project is located within a Sub-Quaternary Reach (SQR) that is already within a modified state. Thus, considering the project type which is linear and that impacts are of low significance with mitigation measures applied, the project can be considered for approval.

The purpose of a monitoring program is to directly measure, assess, and report on the status and trends of the applicable environment. The objective of such a program will be to identify potential impacts emanating from the operational activities on the receiving aquatic ecosystems from the proposed transmission lines. However, the construction and associated impacts of the transmission lines will be once off, and the operational phase will have no further inputs or impacts on the receiving environment. It is therefore not believed necessary to implement a biomonitoring plan regarding the proposed project.

It is recommended that:

- An estuarine impact assessment is undertaken;
- It is recommended that mitigation measures, as described in Section 5.6.1 be implemented during the construction and operational phase of this project; and
- The Department of Environmental Affairs (DEA) published a generic Environmental Management Plan (EMPr) for substations and powerlines (22 March 2019). It is proposed that the mitigation and monitoring plan presented in this report be further supplemented by the generic EMP document.

APPENDIX 6 OF THE EIA REGULATION – CHECKLIST AND REFERENCE FOR THIS REPORT

Table 1 - Requirements from Appendix 6 of GN 326 EIA Regulation 2017

Requirements from Appendix 6 of GN 326 EIA Regulation 2017	Chapter
(a) Details of: (i) The specialist who prepare the reports; and (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae	Page ii
(b) Declaration that the specialist is independent in a form as may be specialities by the competent authority	Appendix 3.
(c) Indication of the scope of, and purpose for which, the report was prepared	Section 1.
(cA) Indication of the quality and age of base data used for the specialist report	Section 3.
(cB) A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 1 and Section 3.5.
(d) Duration, Date and seasons of the site investigation and the relevance of the season to the outcome of the assessment	Sections 2, 3.3.
(e) Description of the methodology adopted in preparing the report or carrying out the specialised process include of equipment and modelling used	Section 3.
(f) Details of an assessment of the specifically identified sensitivity of the site related to the proposed activity or activities and its associate's structures and infrastructure, inclusive of a site plan identifying alternative	Section 1 and Section 4.
(g) Identification of any areas to be avoided, including buffers	Section 6.
(h) Map superimposing the activity and associated structures and infrastructure on environmental sensitivities of the site including areas to be avoided, including buffers	Sections 1, 2, 3, and 4
(i) Description of any assumptions made and uncertainties or gaps in knowledge	Section 2.1.
(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	Sections 5.
(k) Mitigation measures for inclusion in the EMPr	Sections 5 and 6.
(l) Conditions for inclusion in the environmental authorisation	Executive summary, Section 6.
(m) Monitoring requirements for inclusion in the EMPr or environmental authorisation	Sections 5 and 6.
(n) Reasoned opinion – (i) as to whether the proposed activity, activities or portions thereof should be authorised. (iA) regarding the acceptability of the proposed activity or activities; and (ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, and avoidance, management, and mitigation measures should be included in the EMPr, and where applicable, the closure plan	Sections 5 and 6.
(o) Description of any consultation process that was undertaken during preparing the specialist report	Sections 5 and 6.
(p) A summary and copies of any comments received during any consultation process and where applicable all responses thereto	Sections 5 and 6.
(q) Any other information requested by the competent authority	None required.

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GLOSSARY OF TERMS

Biodiversity	The wide variety of plant and animal species occurring in their natural environment (habitats). The term encompasses different ecosystems, landscapes, communities, populations, and genes as well as the ecological and evolutionary processes that allow these elements of biodiversity to persist over time.
Biotope	An area of uniform environmental conditions and biota.
Catchment	The area where water from atmospheric precipitation becomes concentrated and drains downslope into a river, lake, or wetland. The term includes all land surface, streams, rivers, and lakes between the source and where the water enters the ocean.
Channel	The part of a river-bed containing its main current, naturally shaped by the force of water flowing through it.
Ecoregion	Geographic regions that have been delineated in a top-down manner on the basis of physical/abiotic factors including physiography, climate, geology, soils and potential natural vegetation.
Ecosystem	An ecosystem is essentially a working natural system, maintained by internal ecological processes, relationships, and interactions between the biotic (plants & animals) and the non-living or abiotic environment (e.g. soil and atmosphere). Ecosystems can operate at different scales, from very small (e.g. a small wetland pan) to large landscapes (e.g. an entire water catchment area).
Ecological Water Reserve	It is the quality and quantity of water required to ensure appropriate protection of water resources, to secure ecologically sustainable development and use.
Erosion	Erosion is the process by which soil and rock are removed from the Earth's surface by natural processes such as wind or water flow, and then transported and deposited in other locations. While erosion is a natural process, human activities have dramatically increased the rate at which erosion is occurring globally. Erosion gullies are erosive channels formed by the action of concentrated surface runoff.
Environmental Impact	A change to the state, character, or nature of the environment usually a result of some form of human action or activity. Impacts can be positive or negative (detrimental to the receiving environment).
Function/functioning/ Functional	Used here to describe natural systems working or operating in a healthy way, opposed to dysfunctional, which means working poorly or in an unhealthy way.
Habitat	The general features of an area inhabited by animal or plant which are essential to its survival (i.e. the natural "home" of a plant or animal species).
Invasive alien species	Any non-indigenous plant or animal species whose establishment and spread outside of its natural range threatens natural ecosystems, habitats, or other species or has the potential to threaten ecosystems, habitats, or other species.
Mitigate/Mitigation	Impact mitigation refers to reactive practical actions that minimize or reduce impacts. Mitigation actions can take place anywhere, as long as their effect is to reduce the effect on the site where a change in ecological character is likely, or the values of the site are affected by those changes (Ramsar Convention, 2012).
Non-perennial Stream	These streams are generally storm-event driven and flow occurs less than 20% of the time; these streams have a limited (if any) baseflow component with no groundwater discharge.
Pollution	Pollution is the introduction of contaminants into the natural environment that cause adverse change.
Riparian (area/zone)	Includes the physical structure and associated vegetation within a zone or area adjacent to and affected by surface and subsurface hydrologic features such as rivers, streams, lakes, or drainage ways and are commonly associated with alluvial soils.
Transformation (habitat loss)	This refers to the destruction and clearing of an area of its indigenous vegetation, resulting in loss of natural habitat. In many instances, this can and has led to the partial or complete breakdown of natural ecological processes.
Watercourse	A river or spring; a natural channel in which water flows regularly or intermittently: a wetland, lake or dam into which, or from which, water flows: and any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks (National Water Act, 1998).

1 INTRODUCTION

GCS Water and Environmental Consultants (Pty) Ltd (GCS) was appointed by Triplo4 (Pty) Ltd (Triplo4) to undertake a Baseline Aquatic Assessment for the proposed development of a transmission line, associated with the Proposed Gas to Power Powership Project at the Port of Richards Bay, KZN (Figure 1-1). The site visit was undertaken from the 22nd to the 23rd of September 2020. A follow-up assessment was conducted on the 13th and 14th of September 2022.

The Project Concept comprises gas engine power ships or barges provided by Karpower moored on a spread mooring close to the shore or in the protection of a harbour to export power via transmission cables to an Eskom transmission switching station on the shore (refer to Figure 1-1 and Figure 1-2).

The Project entails the generation of electricity by two Powerships moored in the Port of Richards Bay, fed with natural gas from a third ship, a Floating Storage & Regasification Unit (FSRU). The three ships will be moored in the port for the Project's anticipated 20-year lifespan. A Liquefied Natural Gas Carrier (LNGC) will bring in liquified natural gas (LNG) and offload it to the FSRU approximately once every 20 to 30 days, dependent on power demand which is determined by the buyer, ESKOM. The FSRU stores the LNG onboard and turns the liquid form into gaseous form (Natural Gas) upon demand from the Powership (Regassification). Natural gas will be transferred from the FSRU to the Powerships via a subsea gas pipeline. The Project's design capacity is 540MW. Electricity will be generated on Powerships by 27 reciprocating engines, each having a heat input in excess of 10MW (design capacity of 18.32MW each at full capacity). Heat generated by operation of the reciprocating engines is captured, and that energy is used to create steam to drive three steam turbines that each have a heat input of circa 15.45MW. The contracted capacity of 450MW, which cannot be exceeded under the terms of the RMIPPPP, will be evacuated via a 132kV transmission line over a distance of approximately 3km, from the Richards Bay Port tie-in point to the Eskom line, at a connection point (necessitating a new switching station) in proximity to the existing Bayside Substation, which feeds electricity into the national grid.

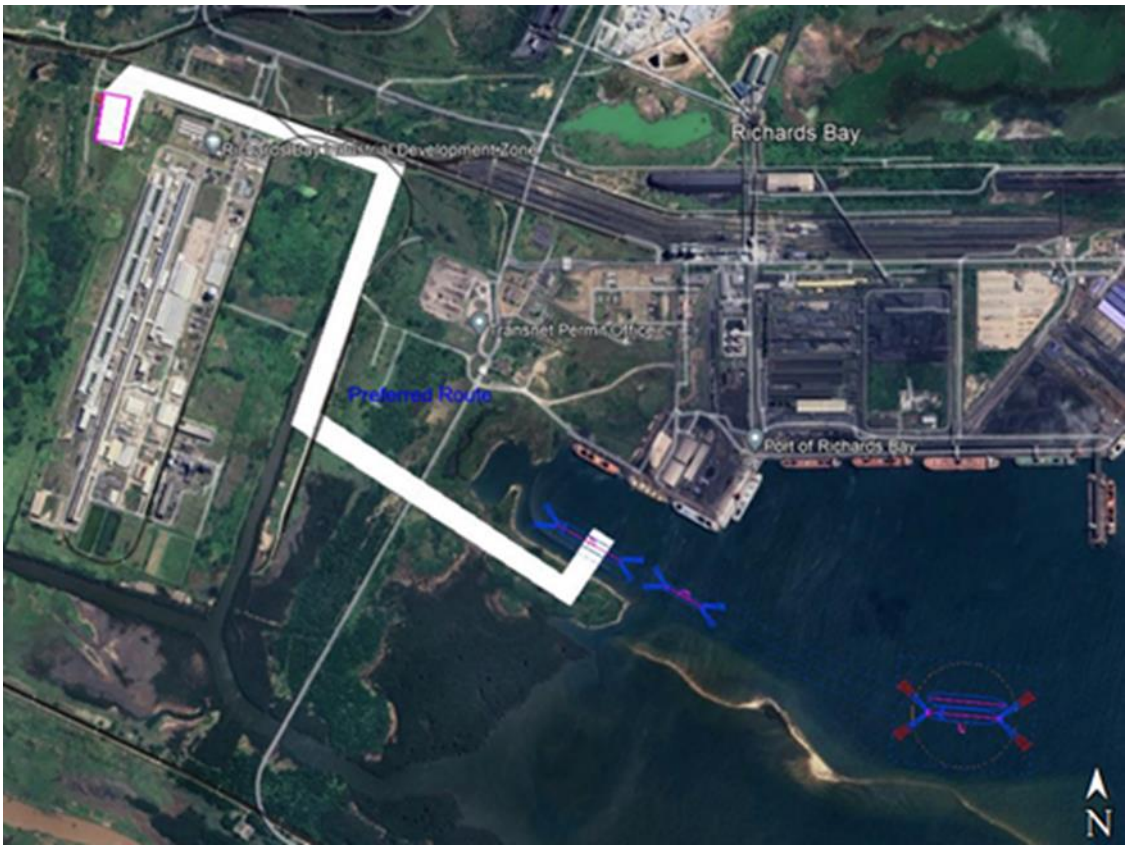

Figure 1-1: Proposed transmission line route from KPS to the national grid

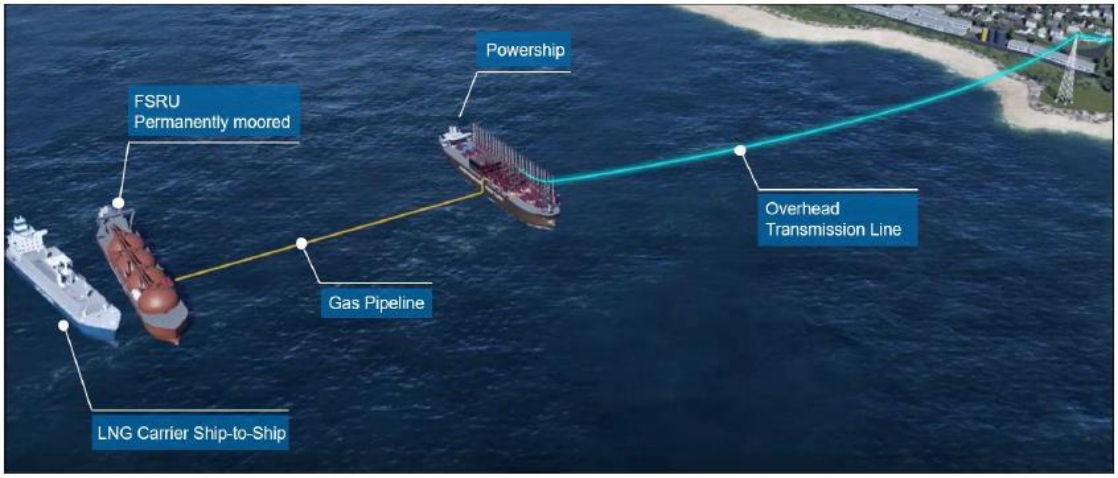

Figure 1-2: Generic Project Concept (Triplo4, 2022)

1.1 Study objectives

The aquatic study focussed on the freshwater environment and therefore only the transmission lines forming a part of the whole project were assessed. The Powership will be constructed offsite and therefore will not have any impact on the surrounding freshwater features of the study area and thus was not included in this assessment.

The aim of the assessment is as follows:

- To characterise the biotic integrity of the aquatic ecosystems at selected aquatic assessment sites associated with the proposed transmission lines at Richards Bay Port (Figure 1-4);
- To evaluate the extent of site-related effects in terms of selected ecological indicators; and
- To identify impacts (whether positive and/or negative), associated with the proposed transmission lines , as well as provide mitigation measures and recommendations.

1.2 Legislative requirements

1.2.1 National Environmental Management Act (Act No. 107 of 1998)

The National Environmental Management Act (Act 107 of 1998) and the associated Regulations (Listing No R. 324, No R. 325 and R. 327) as amended in June 2017, states that prior to any development taking place within a wetland or riparian area, an environmental authorisation process needs to be followed. This could follow either the Basic Assessment process or the Environmental Impact Assessment (EIA) process depending on the nature of the activity and scale of the impact.

1.2.2 National Water Act (Act No. 36 of 1998)

The National Water Act (Act No. 36 of 1998) (NWA) allows for the protection of water resources and recognises that the entire ecosystem and not just the water itself, and any given water resource constitutes the resource and as such needs to be conserved.

No activity may therefore take place within a watercourse unless it is authorised by the DWS. Any area within a wetland or riparian zone is therefore excluded from development unless authorisation is obtained from the DWS in terms of Section 21 (c) and (i).

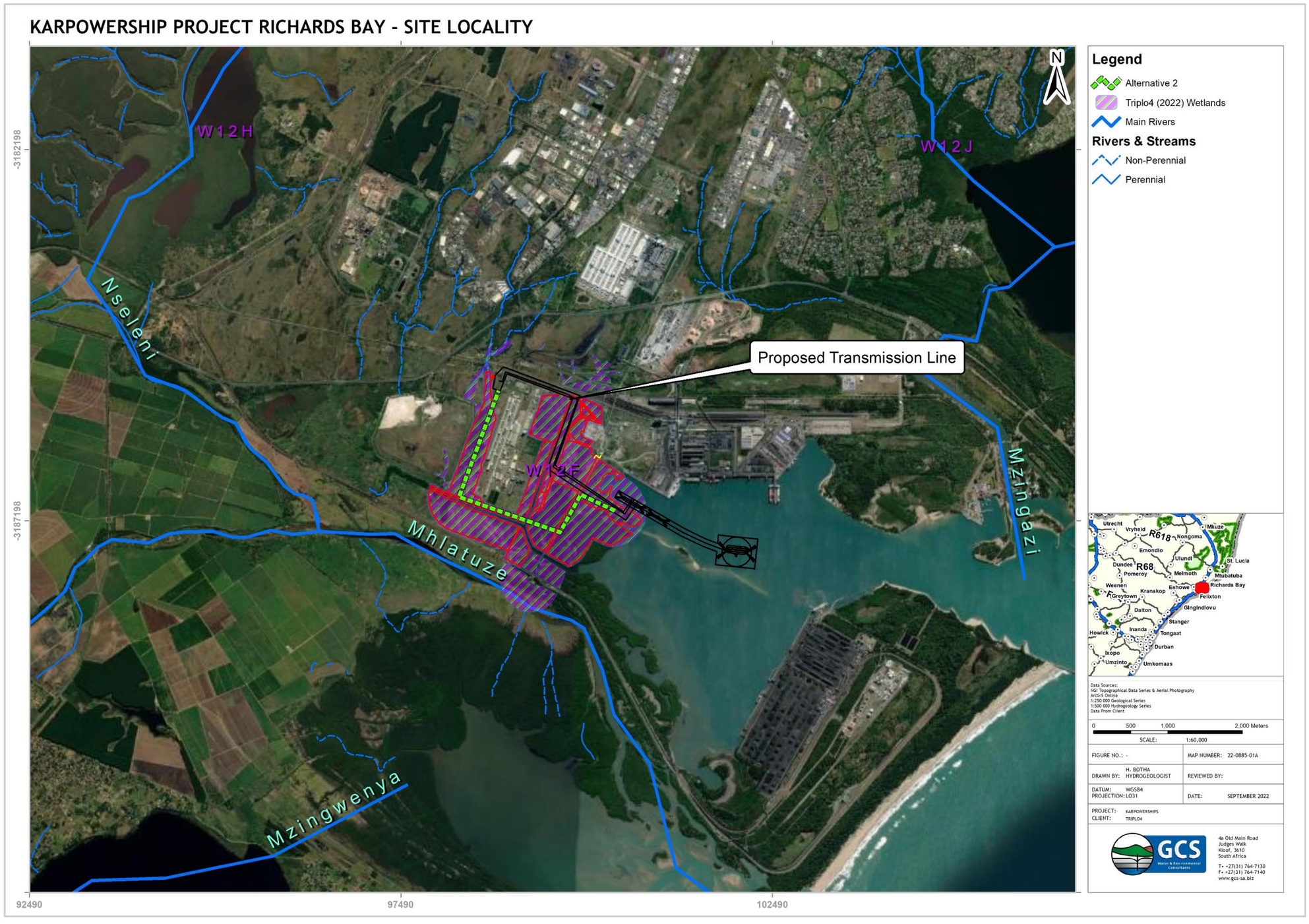

Figure 1-3: Locality of the Richards Bay Port

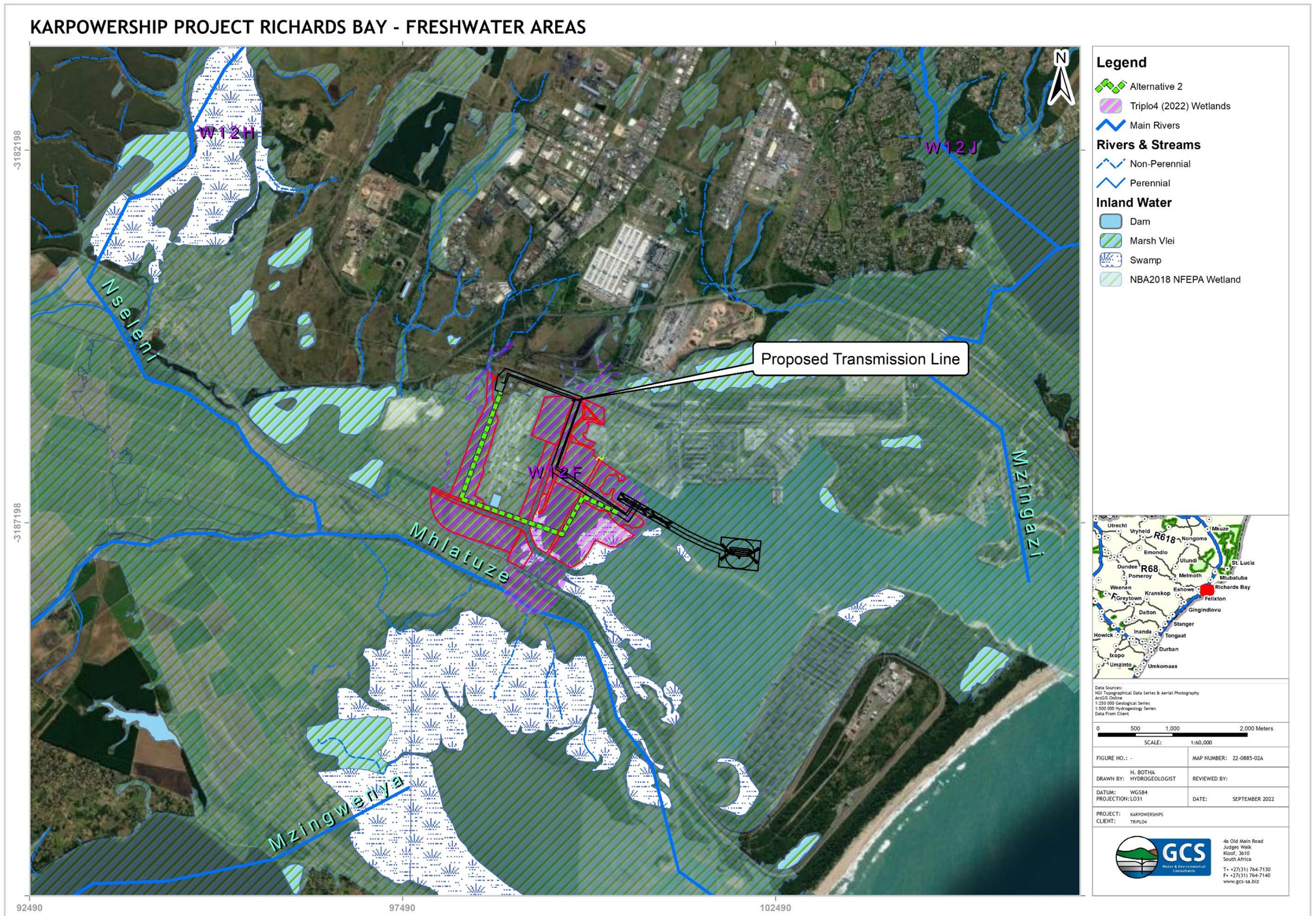

Figure 1-4: Freshwater characteristics associated with the proposed Transmission lines for the Proposed Gas to Power Powership Project at the Port of Richards Bay

2 SCOPE OF WORK

The aim of the aquatic assessment was to ascertain, by means of rapid biomonitoring methods, the Present Ecological State (PES) of the various streams or drainage lines potentially impacted by the proposed 132kV transmission lines.

The scope of work for the aquatic assessment entailed the following:

- Measuring in situ water quality variables at the time of sampling;
- Establishing the integrity of the aquatic habitat using the Invertebrate Habitat Assessment System (IHAS), Index of Habitat Integrity Assessment (IHIA) and visual assessment;
- Assessing the health of the watercourse(s) according to the aquatic macro-invertebrates present by using the SASS5 Protocol;
- Identify impacts (whether positive and/or negative), associated with the construction and operation of instream dams, as well as provide recommendations and mitigation measures.

2.1 Limitations and Assumptions

Limitations and uncertainties often exist within the various methods adopted to assess the condition of ecosystems. The following assumptions and limitations apply to the study area and assessment methods utilised to undertake the assessment:

- Analysis of the ecological state of selected aquatic assessment sites potentially affected by the proposed transmission lines at Richards Bay Port was undertaken using aquatic macroinvertebrates (adapted from Dickens & Graham, 2002) as a response indicator;
- The SASS5 biomonitoring protocol should be limited to appropriate sites, that being, in flowing rivers (except in flood conditions) and where suitable habitats are present (Dickens & Graham, 2002). Strictly speaking, the SASS protocol and several supporting tools cannot be applied where stagnant conditions prevail;
- The findings and recommendations of this report are based on site characteristics results, and also on the data and resources available at the time of the survey;
- This report is based on a single site assessment, therefore temporal trends could not be calculated;
- The report is based on a single survey and assessment methods, that are limited by time relevant to the type and level of investigation undertaken; and
- Recommendations are based on professional opinion.

3 METHODS OF INVESTIGATION

The following section describes the methods and tools that were used to assess the aquatic integrity of the assessment sites.

3.1 Water Quality

Water quality refers to the general appearance, physical, chemical, and biological characteristics of a water resource (DWAF, 1996b). In situ water quality measurements were taken to provide a "snapshot" of the living conditions present at the time of sampling.

On site in situ testing of the water quality variables of pH, Temperature, Total Dissolved Solids (TDS), Electrical Conductivity (EC), and Dissolved Oxygen (DO) was undertaken using a Hanna HI 98139 EC and pH meter and a HI 9147 Dissolved Oxygen and Temperature Meter.

The in situ water quality results were discussed in relation to the Target Water Quality Range (TWQRs) as set out by the Department of Water and Forestry (DWAF) now the Department of Water and Sanitation (DWS) for Aquatic Ecosystems volume 7 (DWAF, 1996b).

3.1.1 pH

The pH of natural waters is determined by both geological and atmospheric influences, as well as by biological activities. Most fresh waters are usually relatively well buffered with a pH range from 6 to 8 (Day and Davies, 1998) and are slightly alkaline due to the presence of bicarbonates of the alkali and alkaline earth metals (DWAF, 1996b). The pH target for fish health should range between 6.5 and 9.0, as most species will tolerate and reproduce successfully within this pH range (Alabaster and Lloyd, 1982). A pH value of > 9.0 can indicate eutrophic conditions (nutrient enrichment) (Davies and Day, 1998). The nutrient loads that cause eutrophication are usually a consequence of human activities and may come from runoff from farms, industrial, urban, and animal waste.

According to the South African Water Quality Guidelines (SAWQG) for Aquatic Ecosystems (DWAF, 1996b), pH values should not be allowed to vary from the range of the background pH values for a specific site and time of day (spatial variation) by more than 0.5 of a pH unit, or by more than 5%, and should be assessed by whichever estimate is the more conservative. However, in all cases, local background conditions should be determined (including diel and seasonal variability where appropriate) when establishing before a water quality objective for a particular aquatic ecosystem is set (DWAF, 1996b).

3.1.2 Temperature

Water temperature plays an important role in aquatic ecosystems by affecting the rates of chemical reactions and therefore also the metabolic rates of organisms (Davies and Day, 1998). Temperature affects the rate of development, reproductive periods, and the emergence time of organisms (Davies and Day, 1998). Temperature varies with season and the life cycles of many aquatic macro-invertebrates are cued to temperature (Davies and Day, 1998).

Aquatic organisms have upper and lower thermal tolerance limits, an optimal temperature for growth, a preferred temperature range in thermal gradients, and temperature limitations for migration, spawning, and egg incubation. Therefore, rapid temperature changes may severely affect aquatic organisms and lead to mass mortality. Less severe temperature changes in water bodies may have sub-lethal effects or lead to an alteration in the existing aquatic community (Davies and Day, 1998).

3.1.3 Total Dissolved Solids & Electrical Conductivity

Electrical conductivity (EC) is a measure of the ability of water to conduct an electrical current (DWAF, 1996b). This ability is a result of the presence of ions such as carbonate, bicarbonate, chloride, sulphate, nitrate, sodium, potassium, calcium, and magnesium, all of which carry an electrical charge (DWAF, 1996b). Many organic compounds that dissolve in water do not dissociate into ions (ionise), and consequently, they do not affect the EC (DWAF, 1996b). Electrical conductivity is a rapid and useful surrogate measure of the Total Dissolved Solids (TDS) concentration of water with low organic content (DWAF, 1996b).

If more accurate estimates of the TDS concentration from EC measurements are required then the conversion factor should be experimentally determined for each specific site and specific runoff events (DWAF, 1996b). According to Davies & Day (1998), freshwater organisms usually occur where TDS values are less than 3000 mg/l. Most of the macro-invertebrates taxa that occur in streams and rivers are sensitive to salinity, with toxic effects likely to occur in sensitive species at salinities greater than 1000 mg/ℓ (DWAF 1996b).

According to the SAWQG for Aquatic Ecosystems (DWAF, 1996b), TDS concentrations should not change by > 15 % from the normal cycles of the water body under un-impacted conditions at any time of the year. It is important to note that the effect on aquatic organisms depends more on the rate of change than absolute changes in concentrations of salts.

3.1.4 Dissolved Oxygen

The maintenance of adequate Dissolved Oxygen (DO) is critical for the survival and functioning of aquatic biota as it is required for the respiration of all aerobic organisms. Therefore, the DO concentration provides a useful measure of the health of an ecosystem (DWAF, 1996b). DO levels fluctuate seasonally and diurnally over a 24-hour period and vary with water temperature and altitude (DWAF, 1996). The South African Water Quality Guidelines (1996), state that the TWQR for DO to protect aquatic biota through most life stages is 80% - 120% of saturation, and that saturation levels below 40% would be lethal.

3.2 Habitat Assessment

Habitat integrity is a critical component of river ecology as it governs the suitability of a river for inhabitation by aquatic organisms. Knowledge of the existing habitats and their quality is therefore important in evaluations of riverine health. Habitat integrity can be assessed in terms of ecosystem impacts and habitat conditions at each site and is useful for the interpretation of the biological community data collected.

3.2.1 Index of Habitat Integrity Assessment

The Index of Habitat Integrity (IHI) Version 2 assessment (Kleynhans, 1996), takes into account the impacts on the riparian and the instream habitats and describes their Present Ecological State (PES). The severity of each impact is ranked using a six-point scale with 0 (no impact), 1 to 5 (small impact), 6 to 10 (moderate impact), 11 to 15 (large impact), 16 to 20 (serious impact), and 21 to 25 (critical impact). The estimated impact of each criterion is calculated as follows:

Rating for the criterion/maximum value (25) x weight (percent)

The estimated impacts of all criteria calculated in this way are summed, expressed as a percentage, and subtracted from 100 to arrive at an assessment of habitat integrity for the instream and riparian components respectively. However, in cases where riparian zone criteria and the water abstraction, flow, bed and channel modification, water quality, and inundation criteria of the instream component exceeded ratings of large, serious, or critical, an additional negative weight was applied. The aim of this was to accommodate the possible cumulative (and integrated) negative effects of such impacts. The method classifies habitat integrity into one of six classes, ranging from unmodified/natural (Class A), to critically modified (Class F) (Table 3:1) (Kleynhans, 1996).

Table 3-1. Habitat Integrity categories for instream and riparian zone habitats (Kleynhans, 1996; cited in Dallas, 2005).

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

3.2.2 Invertebrate Habitat Assessment System

The Integrated Habitat Assessment System Version 2 (IHAS V2) (McMillan, 1998), is used to assess the specific habitat suitability of aquatic sites for the survival of aquatic macro-invertebrates and aid in the interpretation of the SASS5 results. The habitat scoring system is based on 100 points (or percentage) and is split into two sections, namely the sampling habitat (comprising 55% of the total score) and the general stream characteristics (comprising 45% of the total score). The summation of the scores obtained for the two sections will provide an overall habitat percentage.

The IHAS, was developed specifically for use with the SASS5 protocol in South Africa (McMillan, 1998). Scores for the IHAS index are interpreted according to these guidelines:

- >75%: habitat diversity and structure is highly suited for supporting a diverse aquatic macroinvertebrate community.
- 65%-75%: habitat diversity and structure is adequate for supporting a diverse aquatic macroinvertebrate community.
- <65%: habitat diversity and structure is inadequate for supporting a diverse aquatic macroinvertebrate community.

Table 3-2 describes the classification system for the IHAS v2 (McMillan, 1998).

Table 3-2: Interpretation guidelines for the IHAS index

IHAS Score	Description
>75% (Good)	Habitat diversity and structure is highly suited for supporting a diverse aquatic macroinvertebrate community
65% - 75% (Adequate/ Fair)	Habitat diversity and structure is adequate for supporting a diverse aquatic macroinvertebrate community
<65% (Poor)	Habitat diversity and structure is inadequate for supporting a diverse aquatic macroinvertebrate community

Source: McMillan, 1998

3.3 Aquatic Macroinvertebrate Assessment

Aquatic sampling of river benthic (bottom dwelling) macroinvertebrates is undertaken according to the DWS-endorsed SASS5 sampling methodology (Dickens & Graham, 2002), where suitable habitat conditions and safe accessibility prevail. The method utilises a semi-quantitative sampling approach, were the relative abundances of stipulated aquatic invertebrate taxa are recorded within a specific time limits.

- The monitoring of the macroinvertebrate community of an aquatic ecosystem forms an integral component of monitoring the ecological integrity of the system for the following reasons:

- The relatively sedentary nature of the organisms that enables the detection of localised disturbances;
- The relatively long life-cycles of ±1 year that allows for the integration of pollution effects over time;
- The ease with which field sampling is carried out; and
- The heterogeneity of the community allows for several phyla to be represented, and therefore responses to environmental impacts are detectable in terms of the community as a whole (Hellawell, 1977).

Sampling where possible is undertaken by an accredited SASS5 practitioner when a suitable site(s) is identified. All three biotypes (GSM, Stones, and Vegetation), if available, are sampled at each site. The SASS score and Average Score Per Taxon (ASPT) (SASS Score divided by the number of taxa) are then calculated for each site and used to plot the PES, with the use of biological bands developed by Dallas, 2007. The assessment sites associated with the proposed 132kV transmission lines and associated infrastructure falls within the Natal Coastal Plain ecoregion (lower zone) (Dallas, 2007). All SASS5 and ASPT scores are compared with the SASS5 Data Interpretation Guidelines (Dallas, 2007) for the Natal Coastal Figure 3-1.

At present, it is not possible to establish an ecological class with the use of the Dallas (2007) biological bands. Therefore variation calculations were done using the total number of expected aquatic macro-invertebrates as established by DWS 2013.

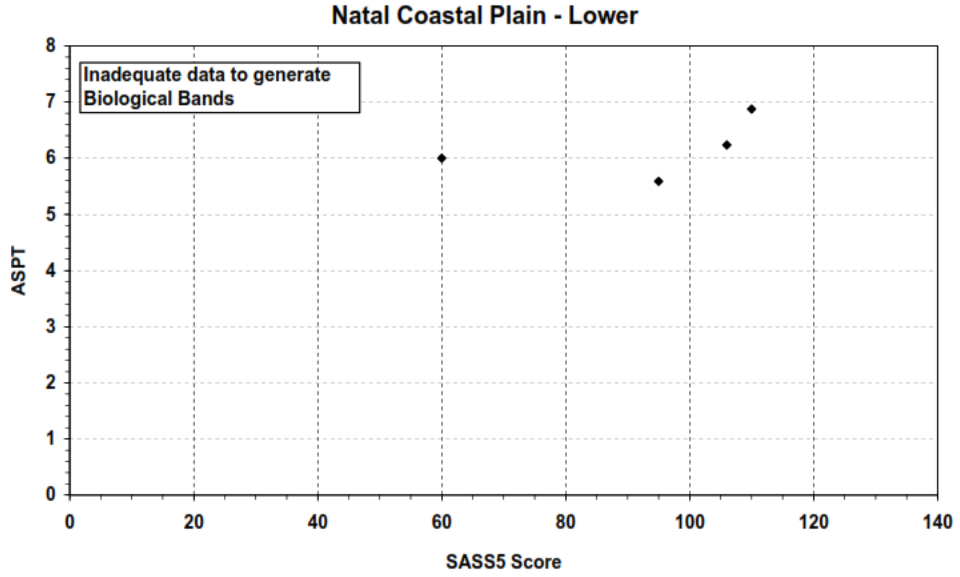

Figure 3-1: Guidelines used for the interpretation and classification of the SASS5 scores (Dallas. 2007)

3.4 Macroinvertebrate Response Assessment Index (MIRAI)

The MIRAI was used to determine the ecological category of macroinvertebrates through integrating the ecological requirements of the macroinvertebrate taxa in a community and their response to modified habitat conditions relative to the reference conditions for the Sub-Quaternary Catchment (SQR) (Thirion, 2007). The four major components of a riverine system that determine productivity for aquatic macroinvertebrates are as follows:

- Flow regime,
- Physical habitat structure;
- Water Quality; and
- Energy inputs from the watershed riparian vegetation assessment.

The results produced by the MIRAI provide an indication of the current ecological category and would therefore assist in the determination of the PES.

3.5 Risk assessment

The anticipated risks and their significance for the construction and operational phase for the proposed 132kV transmission lines and associated infrastructure are listed in 5.6. The risk rating methodology is discussed in Appendix 1

3.5.1 Polycentric integrative approach to assessment

A polycentric approach to the proposed project requires the holistic consideration of all relevant factors, inclusive of potential impacts that the proposed Project could have on the local as well as the broader community. Section 2(4)(b) of NEMA states that Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated, and it must take into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option. Sustainable development as per NEMA requires the integration of social, economic, and environmental factors in the planning, implementation, and evaluation of proposed projects, to ensure that development serves the needs of present and future generations.

This specialist assessment considered both the positive and negative impacts of actual and potential impacts on the geographical, physical, biological, social, economic, and cultural aspects of the environment in a polycentric and holistic approach:

- To ensure that all aspects are weighed up against each other;
- To identify the risks and consequences of alternatives and options for mitigation of activities, to minimise negative impacts, maximise benefits, and promote compliance with the principles of environmental management as set out in section 2 of NEMA.

A specialist integrative workshop and weekly meetings were held during the EIA process where specialists raised matters to be considered by the specialist team and also verified technical information to prevent any discrepancies and where relevant, to coordinate approaches.

This approach ensured that there are no gaps contained between the various specialist reports and provides a holistic picture of the project and allows a polycentric assessment of environmental and socio-economic impacts and the identification of appropriate mitigations and recommendations for potential negative impacts and the maximisation of positive impacts and the value of the project to society.

3.5.1.1 Polycentric integrated specialist reports considered in the assessment

For this investigation, the following specialist reports were considered to verify potential cumulative impacts and sources in the receiving surface-groundwater environments.

- GCS (2022) Hydropedology Assessment;
- GCS (2022) Hydrological Assessment;
- GCS (2022) Geohydrology Assessment; and
- Triplo4 (2022) Wetland Delineation & Functional Assessment for the Proposed Transmission Lines from the Port of Richards Bay to the proposed Switching Station, uMhlathuze Local and Uthungulu District Municipalities, KwaZulu-Natal.

It was found that the sources and receivers as identified in this investigation, align with those of the reports reviewed and information brought forward weekly meetings held during the EIA process. The wetland report provided input in terms of verified wetland units that may be at risk, as indicated in the wetland and recognised water courses section of this report.

3.5.1.2 Polycentric approach to the recommendations and conclusions

The following specialists considered the hydropedology findings and recommendations and internalised these within their reports to ensure a polycentric integrative approach to evaluations, assessment and recommendations:

- Geohydrology Assessment;
- Hydrology Assessment;
- Hydropedology Assessment; and
- Wetland Assessment.

3.6 Sampling Sites

Sampling sites were selected using a preliminary desktop survey based on the following criteria:

- Position relative to the study area boundaries;
- Location concerning proposed and existing dams;
- Nature of rivers;
- Accessibility; and
- Suitable habitat conditions for SASS5 application.

The location of the aquatic sampling sites investigated is summarised in Table 3-3 and presented in Figure 3-2. Photographs and descriptions of the sampled sites are provided in Section 5.1.

Table 3-3: 132kV transmission Lines Aquatic Assessment Sites

Site	Description	Co-ordinates		Sampling status
		Latitude	Longitude	
RB1	This site is located approximately 4 kilometres (km) upstream of the proposed transmission line dam on the Mhlatuze River.	28°48'0.00"S	31°57'52.12"E	Stagnant
RB2	This site is located approximately 4 km upstream of the proposed transmission line dam on the Nseleni River.	28°46'51.94"S	31°57'59.51"E	Stagnant
RB3	This site is located on the Mhlatuze River below the confluence with the Nseleni River and within the estuarine functional zone (EFZ).	28°47'54.21"S	31°59'19.31"E	Stagnant
RB4	This site is located on an unnamed non-perennial drainage line upstream of the proposed transmission line.	28°46'46.93"S	32° 0'38.26"E	Assessed: In situ water quality; and SASS5
RB5	This site is located on an unnamed non-perennial drainage line upstream of the proposed transmission line.	28°46'41.24"S	32° 1'26.25"E	Dry
RB6	This site is located on an unnamed non-perennial drainage line upstream of the proposed transmission line.	28°46'50.58"S	31°59'53.03"E	Dry

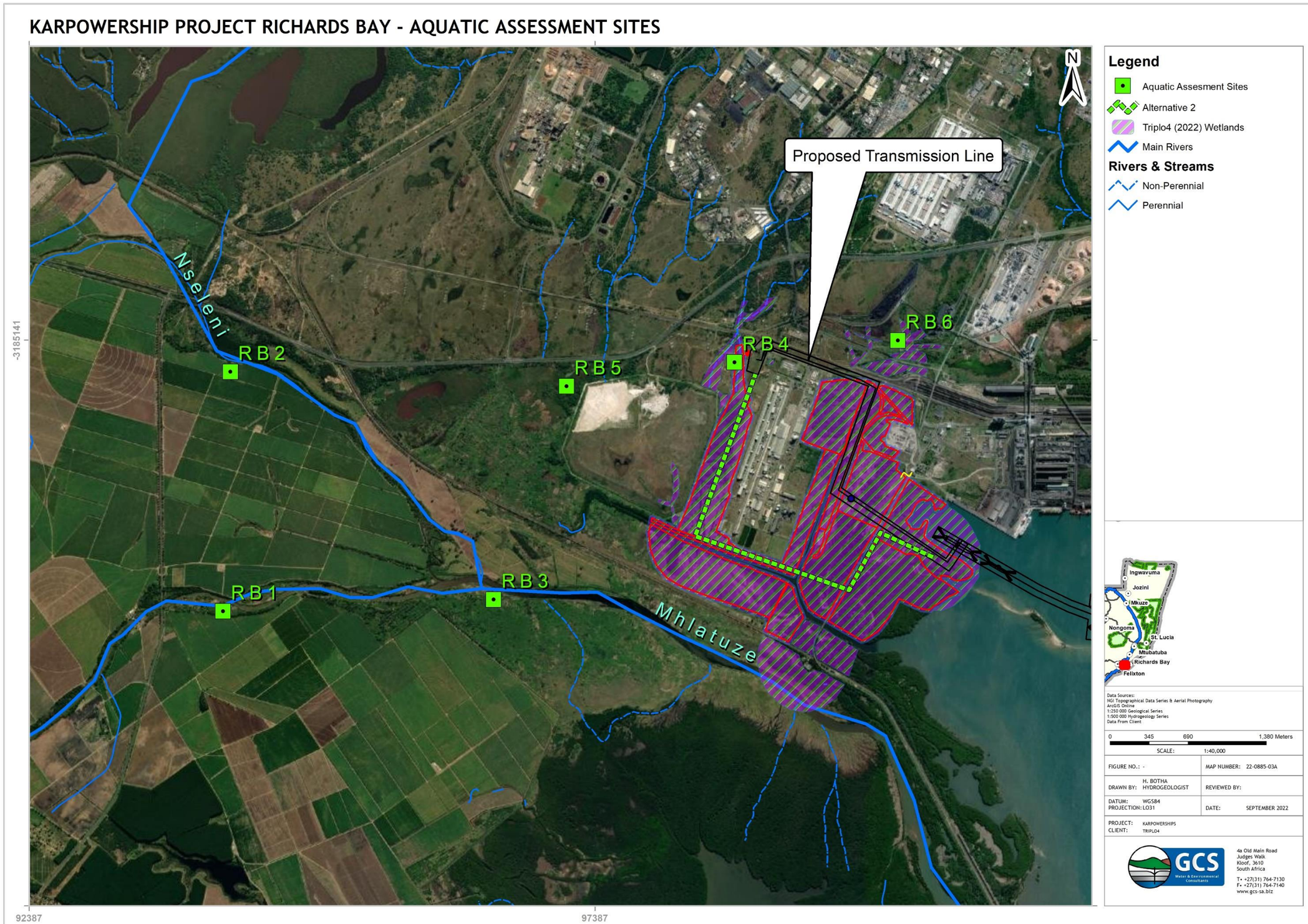

Figure 3-2: Aquatic assessment sites in relation to the Proposed Transmission Lines

4 ENVIRONMENTAL ATTRIBUTES OF STUDY AREA

4.1 Ecoregion

Ecoregions refer to modeled physiographic areas that are selected on pre-defined regional characteristics, including rainfall, topography, and vegetation. An ecoregion is an area with similar physical characteristics (Kleynhans, 2005) and is expected to support a unique combination of flora and fauna. The study area falls within the Natal Coastal Plain (Ecoregion 13) (Figure 4-1) The characteristics of the study area are described in more detail in the sections below.

4.2 Landscape Features and Land Use

The study area lies within the Port of Richards Bay. The study area extends across the Subtropical Alluvial Vegetation unit (Scott-Shaw and Escott 2011).

4.3 Climate and Rainfall

The climate of Richards Bay is classified as warm and temperate. This climate is considered to be Cfa according to the Köppen-Geiger climate classification. The average annual temperature is 21.9°C. The annual rainfall is 1123 mm. (Climate-data.org, 2020).

4.4 Water Resources, Drainage and NFEPA context

The site is situated in Quaternary Catchment W12F of the Pongola -Mtamvuna (DWS, 2016) Water Management Area (WMA 4).

The Atlas of Freshwater Ecosystem Priority Areas (FEPA) in South Africa (Nel et al., 2011), which represents the culmination of the National Freshwater Ecosystem Priority Areas project (NFEPA), provides a series of maps detailing strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting the sustainable use of water resources. Freshwater Ecosystem Priority Areas (FEPAs) were identified through a systematic biodiversity planning approach that incorporated a range of biodiversity aspects such as ecoregion, the current condition of habitat, the presence of threatened vegetation, fish, frogs, and birds, and importance in terms of maintaining downstream habitat (South African National Biodiversity Institute [SANBI], 2011). River FEPAs achieve biodiversity targets for river ecosystems and threatened/near-threatened fish species that were identified in rivers that are currently in good condition (A or B ecological category).

No Freshwater NFEPA's were identified within the study area. However, an estuary FEPA is located within the study area and included reaches of the estuarine functional zone. These areas need to be managed to maintain the surrounding land use in good conditions (Nel, 2011).

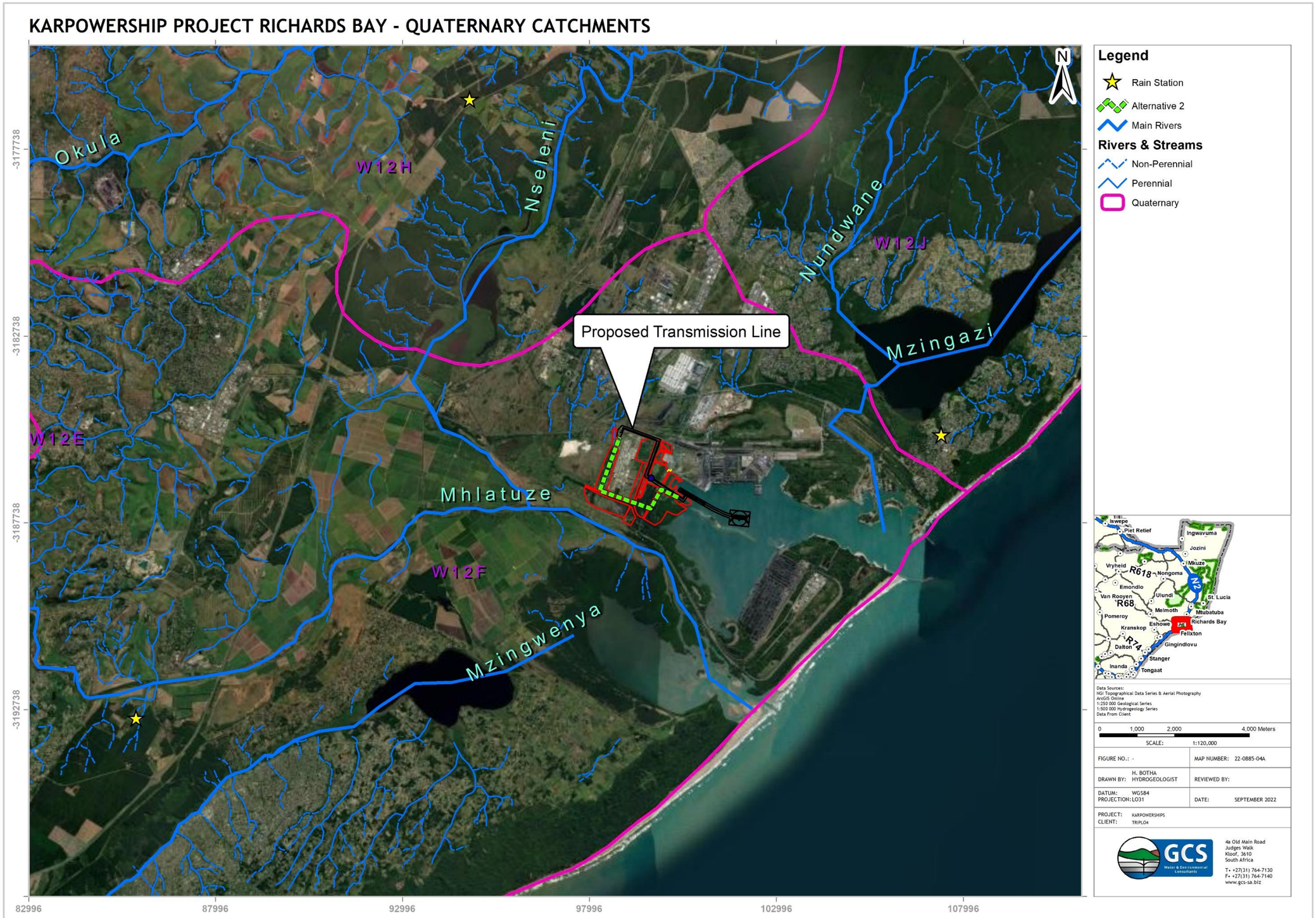

Figure 4-1: Quaternary Catchment in association with the proposed project

4.5 Status of Sub-Quaternary Reach

Desktop information was obtained from DWAF (2013), for the sub quaternary reach (SQR) W12H-3459 on the Nseleni River system, which may potentially be affected by the proposed development. The reach spans 14.74 km. The state of the reach is attributed to small impacts to instream habitat, moderate wetland and riparian zone continuity modifications, and small potential impacts to physico-chemical conditions (water quality). Please refer to Table 4-1.

Table 4-1: Present Ecological Status for the Nseleni River SQR W12H-3459

Synopsis for SQR W12H-3459 (Nseleni River)					
Present Ecological State		**Ecological Importance**		**Ecological Sensitivity**	
D (Largely Modified)		**High**		**Very High**	
Variable	**Status**	**Variable**	**Status**	**Variable**	**Status**
Modifications to Instream Habitat Continuity	Large	Fish species per sub quaternary catchment	27	Fish Physicochemical sensitivity description	Very High
Modifications to Riparian/Wetland Zone Continuity	Moderate	Invertebrate taxa per sub quaternary catchment	65	Fish No-flow sensitivity description	High
Modifications to Riparian/Wetland Zones	Small	Habitat Diversity Class	Very Low	Invertebrate Physicochemical sensitivity	Very High
Potential instream Modifications	Large	Instream Migration Link Class	Moderate	Invertebrate velocity sensitivity	Very High
Potential Flow Modifications	Serious	Riparian-Wetland Zone Migration Link	High	Stream size sensitive to modified flow/water level changes description	Low
Potential Physicochemical Modifications	Large	Instream Habitat Integrity Class	Moderate	Riparian-wetland Vegetation intolerance to water level changes description	Very High

5 FINDINGS OF ASSESSMENT

5.1 Assessed sites

A site visit was undertaken on the 22nd to the 23 of September 2020. Six (6) sites were investigated to determine their suitability for the application of the SASS5 protocol. The following section will describe the physical attributes at each of the assessed sites.

5.2 Assessment Site Characteristics

The site descriptions detailed below are based on the prevailing conditions at the time of sampling (Table 5-1).

Table 5-1 Physical characteristics of the assessed sites

RB1	
Upstream	**Downstream**
	
Description:	
Situated upstream of the proposed development, the site is located on the Mhlatuze River.. The riverbanks well densely vegetated with reed species although removal of riparian vegetation was observed. The surrounding land use comprised primarily of sugar cane agriculture; evidence of subsistence farming was observed on site. Due to the stagnant nature and depth associated with the reach no sampling could be undertaken.	
RB2	
Upstream	**Downstream**
	
Description:	
Situated approximately 4km upstream of the proposed development on the Nseleni River. The river channel was almost completely overgrown by reeds likely due to increased nutrient inputs. The riparian vegetation consisted of large woody forms. A stormwater channel was observed leading into the river channel. This site	

was not suitable for SASS5 sampling. The dominant surrounding land use associated with the reach is sugar cane agriculture. Due to the stagnant nature and depth associated with the reach no sampling could be undertaken.	
RB3	
Upstream	**Downstream**
	
Description:	
Situated downstream of the confluence with the Nseleni River and the Mhlatuze River. The reach falls within the estuarine functional zone (EFZ) of the Richards Bay estuary. Due to the stagnant nature and depth associated with the reach no sampling could be undertaken.	
RB4	
Upstream	**Downstream**
	
Description:	
This site is located on an unnamed drainage line located northwest of the proposed development. The site consisted of a well-defined stream channel with moderate flow. The water depth was between 10 to 30cm and the river channel was 1 to 2m wide. Upstream was characterised by trees (Milkwood) and downstream by grasses. GSM and marginal vegetation were abundant. However, the stones biotope was absent. A slight sewage odour was present and black, anoxic sediment was observed. The surrounding land use associated with the reach is electrical powerlines and port infrastructure.	
IHAS	**Inadequate**

RB5	
Upstream	**Downstream**
	
Description:	
This site is located on an unnamed drainage line located north of the proposed development. It is characterised by a very wide U-Shaped channel and well vegetated by grass species, indigenous trees, and fern species. A minor proliferation of *Bidens Palosa* (Black Jack) was observed. There was no water present at this site. Surrounding land use consist of the Grindrod terminals and coal stockpiles.	
RB6	
Upstream	**Downstream**
	
Description:	
This site is located on an unnamed drainage line located west of the proposed development. The drainage channel is completely overgrown by reeds and grass species. There was no water present at this site. Surrounding land use consist of a gypsum dam.	

5.3 Water Quality

The in situ water quality measurements collected during the survey for all the sites are presented below in Table 5-2. A concise summary follows of observed water quality compared to the Target Water Quality Ranges as set out by the Department of Water and Sanitation (DWS) for Aquatic Ecosystems Volume 7 (DWAF, 1996b)

Table 5-2: In situ water quality measurements for aquatic sampling sites

Parameter	pH	Temp (°C)	EC (mS/m)	DO (mg/l)	DO Sat (%)
DWAF Aquatic Ecosystem TWQR	6.5-9.0	5-30	<5%	>5.00	80 - 120 % Sat.
RB1	6.2	24.7	0.8	11.7	121.5
	8.11	25.4	86.7	6.5	82.3
RB2	6.9	24.3	0.8	8.3	99.4
	8.09	24.5	87.6	8.5	86.4
RB3	6.6	23.5	0.8	7.9	85.3
	8.50	25.2	86.4	8.1	83.4
RB4	6.3	19.4	0.9	6.1	72.9
	8.18	24.7	51.2	6.5	81.2

No exceedances of the recommended target water quality ranges were observed during the 2022 assessment. Based on In situ variables water quality is not a limiting factor to aquatic biota at the time of sampling.

During the 2020 assessment, the in situ water quality associated with the upstream assessment site (RB4) located in the unnamed drainage line indicated that one parameter fell below the TWQR as set out by the DWS (DWAF,1996b). Slightly lower levels of Dissolved Oxygen Saturation (%) was observed at site RB4, although slight deviations are known to appear seasonally due to depth and flow, prolonged exposure to low DO saturations will have a limiting impact on aquatic biota leading to reduced osmoregulation (DWAF, 1996b). This deviation is no cause for concern at present.

No exceedances in TWQR as set out by the DWS (DWAF, 1996b), were observed for the RB1, RB2, and RB3 assessment sites, indicating no adverse impacts on the reaches at present from the established surrounding agricultural and industrial activities.

5.4 Aquatic Macroinvertebrates

Below follows the aquatic macroinvertebrate community analysis observed at the time of the assessment (Table 5-3). Variance from the expected macro-invertebrates assemblage used to appropriately compare results for the dry season of the Natal Coastal Plain were included and discussed below. Detailed SASS and MIRAI sheets are listed in **Appendix 2.**

Table 5-3: Aquatic Macroinvertebrate Community Analysis

Assessment site	SASS5 Score	Number of Taxa	ASPT	MIRAI	Variation from SQR (%)
RB4	16	3	5.3	D	-95%

*: Variance calculations were determined using the data set out for the Nseleni SQR expected invertebrate taxa (W12F-3459): **65**

The aquatic macroinvertebrate community assessment using the SASS5 methodology indicated a SASS5 score of 16 and ASPT of 5.3. Only 3 taxa were observed which is primarily due to the limited available biotopes present within the reach. The stones biotope was completely absent. The presence of marginal vegetation and GSM resulted in a macro-invertebrate assemblage of semi-intolerant and tolerant taxa with lower sensitivities. Thus, as a result of poor habitat availability, low diversity of macro-invertebrates can be expected.

The MIRAI assessment indicated that the macro-invertebrate assemblage was in a largely modified state. With better habitat, a higher assemblage may be observed. A large deviation from the ecoregion reference conditions is evident at this site, this is mainly due to the associated river characteristics and not an indication of impaired water quality.

5.5 Habitat Characterisation

5.5.1 Index of Habitat Integrity

The Index of Habitat Integrity (IHI) Version 2 (Kleynhans, 1996) differs from the IHAS in that it provides an assessment of the perceived impacts and modifications to the stretch of the river under investigation. This index considers impacts to the riparian zone as well as the instream aquatic habitat for the associated Sub Quaternary Reach (SQR).

Based on the assessment the Instream and Riparian IHI of the SQR was rated Largely (Category D) and Largely to Seriously Modified (Category D/E) respectively (Table 5-4). The main impacts to the instream and riparian areas of the SQR are channel, flow, and bed modifications. This is mainly due to land use that consists of sugarcane agriculture, subsistence farming, and industrial infrastructure.

Table 5-4: Results for the IHI-1996-2 Assessment

River /Reach	Component	IHI value %	Ecological Category
Nseleni River Reach (W12F-03459)	Instream Habitat	54	D
	Riparian Habitat	41	D/E

5.6 Risk Assessment

Based on the available development layout plans the following will likely contribute to impacts of the aquatic environment:

Construction phase

- Site preparation, including placement of contractor laydown areas and storage (i.e. temporary stockpiles, bunded areas etc.) facilities;
- Soil compaction, leading to increase runoff flow potential;
- Soil & surface water contamination and sedimentation from the following activities:
    - Leakages from vehicles, machines, and building materials.
    - Erosion and sedimentation of watercourses if excavations are left open due to unforeseen circumstances (i.e. bad weather); and

- Alteration of the hydrological regime i.e. changes in natural drainage lines which may lead to ponding or increased runoff patterns (i.e. may cause stagnant water levels or increase erosion).
- Vegetation loss. It should be noted that the milkwood tree, although not endangered, is a protected species according to the National Environmental Management : Biodiversity Act (Act 10 of 2004) and should not be disturbed;
- The proliferation of alien invasive species; and
- Impaired water quality (surface and groundwater).

Operational phase

- Soil & surface water contamination from the following activities:
    - Oil & fuel leakages from maintenance and service vehicles.
    - Spillages from transformers associated with the project.

Closure / decommission phase:

The 132kV line may be disassembled as it is an own-build project with Eskom, similar impacts as per the construction/preparation phase are anticipated.

The construction and operation of the proposed 132kV Transmission Lines pose a risk ranging from Medium to Low Please refer to Table 5-6 for the impacts associated with the proposed project.

Impact rating for the construction phase range from medium to low pre-mitigation. Impacts to vegetation during the operational phase are medium pre-mitigation, a result of earthworks leading to the removal of vegetation within the riparian areas. This will create an ideal opportunity for alien invasive species to establish within the disturbed areas and require strict management.

The hydrological regime will be adversely impacted during the construction regime, the clearing of vegetation and increase sediment input, and the hardened surface will result in increased runoff patterns into the drainage lines. Impacts on water quality may be medium pre-mitigation as outlined previously although this can be managed with due care.

The construction phase is likely to impact on the associated aquatic biota due to changes in water quality and flow regimes but is expected to be of low significance.

As outlined in the operational phase impacts water quality will be low and can be reduced further with the recommended mitigation measures as outlined in the section below.

5.6.1 Cumulative impacts associated with similar projects

The following similar projects are known to occur/are proposed within a 30 km radius of the study area (refer to Table 5-5).

Table 5-5: Similar projects within a 30km radius

Project name and description	Applicant
320MW Emergency Risk Mitigation Power Plant (RMPP) and associated infrastructure near Richards Bay. The Project site is to be located in Alton, near the Richards Bay Industrial Development Zone (IDZ). The facility will have an installed generating capacity of 320MW, to operate with liquified petroleum gas (LPG) or naphtha as an initial source and will convert to utilising natural gas once this is available in Richards Bay. EAP - Savannah Environmental	Phinda Power Producers (Pty) Ltd
RBGP2 400MW gas to power project at the RBIDZ 1F (proposed amendments to the existing Environmental Authorisation and EMPr). The scope includes 6 gas turbines for mid-merit/peaking plant power provision, with 2 steam turbines utilizing the heat from the engineers in a separate steam cycle, as well as 3 fuel tanks of 2000m^3 each for on-site fuel storage. EAP - Savannah Environmental	Richards Bay Gas Power (Pty) Ltd
Nseleni Independent Floating Power Plant - Port/ old Bayside complex. Floating gas powered power station made up of floating Combined Cycle Gas Turbine (CCGT) power plants and associated infrastructure for the evacuation of power from the NIFPP to the National Grid, in the Port of Richards Bay. Four Floating Power Barges generating a nominal 700 MW per barge resulting in 2 800 MW generation capacity. EAP – SE Solutions	Nseleni Power Corporation (Pty) Ltd and Anchor Energy (Pty) Ltd
Eskom 3000 MV CCPP and associated infrastructure on Portion 2 of Erf 11376 and Portion 4 of Erf 11376 within the RBIDZ Zone 1D. The facility will operate with natural gas as the main fuel resource and diesel as a back-up resource. EAP - Savannah Environmental.	Eskom Holdings SoC Limited

Based on available information for the above-mentioned projects, and in terms of the potential contributing impact on the aquatic environment after consideration of this project, it is concluded that the contributing aquatic impact to other similar projects in the area will be very low, refer to Table 5-6.

Table 5-6: Estimated aquatic risks (Construction and Operation Phase)

ASPECT	PHASE	SUMMARY OF POTENTIAL IMPACT	POTENTIAL ENVIRONMENTAL IMPACT	APPLICABLE AREA	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION							ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION						
						M	D	S	P	TOTAL	STATUS	SP	M	D	S	P	TOTAL	STATUS	SP
Vegetation	Construction	**Riparian vegetation**	Removal of riparian vegetation and habitat impacting bank stability.	Surrounding unnamed drainage lines	Earthworks, Vegetation clearing	6	2	1	4	36	-	M	2	2	1	3	15	-	L
			Disturbance of the natural soil profile resulting in the proliferation of invasive alien plant species		Earthworks and Vegetation clearing	8	2	1	4	44	-	M	2	2	1	3	15	-	L
		Instream vegetation	Loss of aquatic vegetation and habitat.		Earthworks and Vegetation clearing Sedimentation	6	2	1	4	36	-	M	2	2	1	3	15	-	L
Hydrological Regime	Construction	**Changes in surface flow dynamics**	Changes in natural drainage lines which may lead to ponding or increased runoff patterns.	Surrounding unnamed drainage lines	Earthworks, soil compaction.	8	2	1	3	33	-	M	2	2	1	2	10	-	L
Water Quality	Construction	**Changes in Water quality parameters and nutrient availability**	Leakages from vehicles and machines. Oil & fuel spills from vehicles installing the transmission and gas pipelines.	Surrounding unnamed drainage lines	Mechanised machinery & seepage/runoff from building materials.	8	2	1	3	33	-	M	6	2	1	2	18	-	L
	Operational	**Changes in Water quality parameters and nutrient availability**	Oil & fuel spills from vehicles conducting maintenance of the transmission lines.	Surrounding unnamed drainage lines	Net result of development.	8	1	1	2	20	-	L	6	1	1	1	8	-	L
Biota	Construction	**Change in species diversity**	Change in species composition due to loss of aquatic habitat, water quality changes.	Surrounding unnamed drainage lines	Changes in the natural flow regime. Altered water quality.	6	2	1	3	27	-	L	4	2	1	2	14	-	L
Cumulative impacts		**Cumulative impact on Water Quality**	Physiochemical changes in water quality.	Surrounding unnamed drainage lines	Similar LNG gas to power projects proposed in the study area	2	4	1	2	14	-	L	2	4	1	1	7	-	L

5.6.2 Proposed mitigation measures

- Mitigation during construction
- Construction within and in the nearby vicinity of all watercourses or wetlands must proceed mainly during the dry, winter months where possible in order to minimize soil erosion linked to high runoff rates;
- Temporary and permanent erosion control methods may include silt fences, flotation silt curtains, retention basins, detention ponds, interceptor ditches, seeding and sodding, riprap of exposed embankments, erosion mats, and mulching;
- Remove only the vegetation where essential for construction and do not allow any disturbance to the adjoining natural vegetation cover;
- The milkwood trees must be marked using danger tape so ensure no accidental disturbance or removal of this species;
- Temporary stormwater channels and preferential flow paths should be filled with aggregate and/or logs (branches included) to dissipate and slow flows limiting erosion;
- Prevent uncontrolled access of vehicles through watercourses that can cause a significant adverse impact on the hydrology and alluvial soil structure of these areas
- The construction footprint should be kept to a minimum and construction vehicles and machinery must make use of existing access routes as much as possible;
- Laydown yards, camps, and storage areas must be beyond the aquatic areas;
- Stockpiles (including building rubble) are to be located outside aquatic areas;
- All chemicals and toxicants to be used for the construction must be stored outside aquatic areas and in a bunded storage;
- The contractors used for the project should have spill kits available to ensure that any fuel or oil spills are clean-up and discarded correctly;
- Maintenance of construction vehicles/equipment should not take place within the watercourse or watercourse buffer;
- All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks, and general good “housekeeping”;
- Provision of adequate sanitation facilities located outside of the watercourse/riparian area or its associated buffer zone;
- If long periods of flow obstruction may be required, during periods of flow, intermitted releases of water, for a few hours every few days should be allowed for;
- Monitoring should be done to ensure that sediment pollution is timeously addressed; and

- An alien invasive plant management plan needs to be compiled and implemented post rehabilitation to control current invaded areas and prevent the growth of invasive plants on cleared areas.

5.6.2.1 Mitigation during operation

- Vehicles use to service transmission lines and transformers must be well maintained and no service vehicles repairs must take place on site; and
- Monitoring plan of alien invasive plants must be implemented to prevent streamflow reduction on the Mhlatuze River.

6 CONCLUSION AND RECOMMENDATIONS

GCS was appointed by Triplo4 to undertake a Baseline Aquatic Assessment for the proposed development of a 132kV transmission line, associated with the Proposed Gas to Power Powership Project at the Port of Richards Bay, KZN.

Six assessment sites were investigated, to assess the possible impacts associated with the proposed project. Only one site on an unnamed non-perennial drainage line (RB4) presented flowing water in which SASS5 sampling could be undertaken. A downstream assessment site could not be assessed due to the presence of the estuary functional zone.

One exceedance of DWS Target Water Quality Guidelines was observed at the time of the assessment. Slightly lower levels of Dissolved Oxygen Saturation (%) were observed at the upstream assessment site in the unnamed drainage line (RB4), although this is no concern at present as the deviation is minimal, where seasonal variations are known to occur due to flow.

The aquatic macroinvertebrate community assessment of the unnamed drainage line could not be classed using the Dallas (2007) biological bands due to insufficient information for the Natal Coastal Plan Ecoregion. However, a variance calculation based on the expected number of taxa for the SQR was revealed to be high. The absence of taxa is considered to be impacted primarily by inadequate habitat availability. The MIRAI assessment indicated that the macro-invertebrate assemblage was in a largely modified state with an ecological category of D.

The impact of the proposed project ranges from medium to low pre mitigation and impacts can be further reduced with appropriate mitigation. The proposed project is located within an SQR that is already within a modified state. Thus, considering the project type which is linear and that impacts are of low significance with mitigation measures applied the project can be considered for approval.

The purpose of a monitoring program is to directly measure, assess, and report on the status and trends of the applicable environment. The objective of such a program will be to identify potential impacts emanating from the operational activities on the receiving aquatic ecosystems from the dams. However, the construction and associated impacts of the transmission lines will be once off, and the operational phase will have no further inputs or impacts on the receiving environment. It is therefore not believed necessary to implement a biomonitoring plan in regard to the proposed project.

It is recommended that:

- An estuarine impact assessment is undertaken;
- It is recommended that mitigation measures, as described in Section 5.6.1 be implemented during the construction and operational phase of this project; and
- The Department of Environmental Affairs (DEA) published a generic Environmental Management Plan (EMP) for substations and powerlines (22 March 2019). It is proposed that the mitigation and monitoring plan presented in this report be further supplemented by the generic EMP document.

7 REFERENCES

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APPENDIX 1: RISK ASSESSMENT METHODOLOGY

The methodology used to rate all potential and identified environmental impacts: Impact risk or significance was determined using a quantitative ranking technique, and ultimately expressed as a Low (0-6.9), Moderate (7-12.9) or High (13-18) significance. The predicted impacts are rated before and after mitigation measures are applied. Regarding the cases where mitigation requires time to establish, the consequential impact is based on the situation after establishment of the mitigation measures.

Each impact identified was assessed in terms of the following aspects:

- Status of the Impact (i.e. positive or negative).
- Probability of the Impact;
- Spatial Extent of the Impact;
- Magnitude of the impact; and
- Duration of the Impact.

The significance of the impact upon each environmental factor is rated according to its quantitative evaluation (Table 7-2). This rating, however, is not a reflection of the environmental risk or severity of impact. In certain instances a specific factor may have been permanently altered, but the impact of that factor on the environment (natural, cultural, social) is marginal or even inconsequential. It is therefore important to analyse the entire scope of the impact and its context and not assess it entirely on the significance of the rating alone.

Impact Assessment Scoring

Status of Impact	
+: Positive (A benefit to the receiving environment)	
N: Neutral (No cost or benefit to the receiving environment)	
-: Negative (A cost to the receiving environment)	
Magnitude:=M	***Duration:=D***
10: Very high/don't know	5: Permanent
8: High	4: Long-term (ceases with the operational life)
6: Moderate	3: Medium-term (5-15 years)
4: Low	2: Short-term (0-5 years)
2: Minor	1: Immediate
0: Not applicable/none/negligible	0: Not applicable/none/negligible
Scale:=S	***Probability:=P***
5: International	5: Definite/don't know
4: National	4: Highly probable
3: Regional	3: Medium probability
2: Local	2: Low probability

1: Site only
0: Not applicable/none/negligible

1: Improbable
0: Not applicable/none/negligible

Significance	*Environmental Significance Points*	*Colour Code*
High (positive)	>60	H
Medium (positive)	30 to 60	M
Low (positive)	<30	L
Neutral	0	N
Low (negative)	>-30	L
Medium (negative)	-30 to -60	M
High (negative)	<-60	H

APPENDIX 2: AQUATIC METRICES

South African Scoring System Datasheets

SASS5 results for the Assessment Sites

Taxon	Sensitivity	RB4
ODONATA (Dragonflies & Damselflies)		
Aeshnidae (Hawkers and Emperors)	8	1
Gomphidae (Clubtails)	6	A
DIPTERA (Flies)		
Chironomidae (Midges)	2	C
	SASS	16
	Number of Taxa	3
	ASPT	5.3

* airbreathers
A = 2-10 individuals
B = 11-100 individuals
C = 101- 1000 individuals

APPENDIX 3: SPECIALIST CV

Jacobus Johannes du Plessis

Pr. Sci. Nat 118234
B.Sc Hons (Zoology)

Cell: : +278 386 22035
Email: dupjj01@gmail.com
Identity Number: 9108075288086
South African National

PROFILE SUMMARY

- Baseline Biodiversity Assessments (Aquatic and Fauna);
- Providing aquatic ecological expertise for the assessment and management of freshwater systems;
- Conducted training at the South African Wildlife College for the Department of Rural development and African Field Ranger Training Services (AFRTS); and
- Sales: Lenton Scientific.

KEY EXPERIENCE

- Baseline biodiversity studies (terrestrial & aquatic ecosystems);
- Impact Assessments (terrestrial & aquatic ecosystems);
- Aquatic bio-monitoring; and
- Sales,

COUNTRIES OF WORK

- South Africa;
- Namibia;
- Uganda;
- Liberia; and
- Malawi.

Qualifications

- B. Hons. Zoology (University of Johannesburg) 2017;
- BSc (University of South Africa) – Zoology and Botany 2015.

Skills

- Aquatic macroinvertebrate and fish community studies;
- Risk assessment for proposed developments;
- Recommending appropriate mitigations to reduce environmental impacts;
- Conducting aquatic biomonitoring;
- Small mammal and herpetofauna field surveys including the use of various traps (camera, sherman and pitfall);
- Sales
- Basic GIS mapping using ARC GIS; and • Equipment maintenance and manufacture.

PREVIOUS EMPLOYMENT

- Independent consultant October 2019 - Present
- Sales representative at Lenton Scientific (January 2020- March 2021);
- Ecologist at Scientific Aquatic Services October 2018 – October 2019;

- Head of Aquatics at Environmental Assurance (ENVASS) – October 2017-October 2018;
- Intern at The Biodiversity Company January 2016 to June 2017; and
- Assessor/trainer at the South African Wildlife College for several short term contracts 2012-2014.

ACHIEVEMENTS

Placed top 3 with research project of honours class, gaining access to an international student exchange program with the Hong Kong University 2016.

ACADEMIC QUALIFICATIONS

- B.Sc Hons in Zoology (University of Johannesburg) 2016; and
- B.Sc Zoology and Botany (University of South Africa) 2014.

ACCREDITATIONS AND COURSES

- Professional Scientist (Aquatic Science): 118234
- SASS5 accredited;
- Venomous snake handling (Africa Snakebite Institute) 2017;
- Fish Identification course with Roger Bills 2016;
- FGASA level 1;
- Assessors certification (CATHSSETA);
- Trails guide (Theory);
- Use of a Semi-automatic Carbine for Business purposes – NSN shooting Academy 2018; and
- Grade E PSIRA registration – Inkwe Training Services 2018.

PUBLICATIONS

TS Bengu, J du Plessis, LS Modley & JC van Dyk (2017)
Health effects in fish from the polluted Orlando Dam and Klipspruit wetland system, Soweto, South Africa. African Journal of Aquatic Science.

GENERAL SKILLS

Literacy	Read, write and speak English fluently. High level in Afrikaans.
Generic	Microsoft Office and basic mapping using ARC GIS

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

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

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/14/12/16/3/3/2007
Date Received:	02 November 2020

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

PROJECT TITLE

The Proposed Gas to Power Powership Project at the Port of Richards Bay, Umhlathuze Local Municipality, King Cetshwayo District, Kwazulu-Natal.

Kindly note the following:

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

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	GCS (pty) Ltd			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	100%
Specialist name:	Hendrik Johannes Botha			
Specialist Qualifications:	MSc. Geohydrology and Geochemistry			
Professional affiliation/registration:	SACNASP Professional Natural Scientist (400139/17)			
Physical address:	74 Victoria Road Newcastle			
Postal address:	PO BOX 819 Gillits			
Postal code:	3603	Cell:	0711023819	
Telephone:	031 764 7130	Fax:	031 764 7140	
E-mail:	hendrikb@gcs-sa.biz			

2. DECLARATION BY THE SPECIALIST

I, Hendrik Johannes Botha , declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

GCS (pty) Ltd

Name of Company:

12/10/2022

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

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

Signature of the Specialist

GCS.

Name of Company

27-10-2022

Date

DATE AND SIGNATURE:

LEON PIETER BOTHA, MARRIAGE OFFICER AND
COMMISSIONER OF OATHS, REG NO: BD 44601
CALEB MINISTRIES TRUST, TRUST: IT 4106/2009

Signature of the Commissioner of Oaths

2022-10-27

Date