Terrestrial Ecological Assessment for the Proposed Gas to Power Project, Richard's Bay, KZN.

Prepared by

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(M.Sc., Pri. Sci. Nat)

For

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THIS REPORT SHOULD BE CITED AS

de Wet, L (2022). Terrestrial Ecological Assessment for the proposed Gas to Power Project, Richard's Bay, KZN. For Triplo4.

APPOINTMENT OF SPECIALIST

Leigh-Ann de Wet was commissioned by Triplo4 to undertake an Ecological Impact Assessment for the land-based infrastructure in Richard's Bay, KZN. Terms of reference were to produce an Impact Assessment Report based on the results of a desktop assessment and associated site visit.

EXPERTISE OF THE SPECIALIST

- M.Sc. in Botany from Rhodes University.
- Registered Professional Natural Scientist with the South African Council for Natural Scientific Professionals (Ecological Science: 400233/12).
- Ecological Consultant since 2009.
- Conducted, or have been involved in over 2000 Ecological Impact Assessments, Baseline surveys, Biodiversity Action Plans and Offset Plans.
- Areas of work include all nine provinces of South Africa, Southern Africa (Mozambique, Malawi and Zambia), Madagascar, Central Africa (Democratic Republic of the Congo) and West Africa (Liberia and Guinea).
- Published four scientific papers, two popular articles and have three scientific papers in preparation.
- Presented 7 international conference presentations, and at two Botanical Society meetings.
- Lectured methods for specialist assessment for the Rhodes University short course on EIA.

INDEPENDENCE

Leigh-Ann de Wet has no connection with the Gas to Power project and is not a subsidiary of any kind of the developer. The remuneration for services by Triplo4 in relation to this report and associated studies is unrelated to approval by decision-making authorities responsible for authorization of any proposed activity.

SCOPE AND PURPOSE OF REPORT

The scope and purpose of the report is described in the section on Terms and Reference within this report.

Executive Summary

Site description

The proposed project involves the establishment of a Powership that converts gas to power. From the ship, electricity will be evacuated via a 132kV transmission line over a distance of approximately 3.6km, 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 Bayside substation, which feeds electricity into the national grid. As only the transmission lines will be constructed on land, the ecological assessment looks at the route options for placement of transmission lines and land-based ancillary infrastructure only.

The study area falls within a CBA listed as irreplaceable which encompasses all areas that are currently in a natural or near natural state. The planned layout is located almost entirely in an Irreplaceable CBA. Richards Bay Game Reserve, which is also an Important Bird Area lies less than 1km to the southwest of the site, and the Enseleni Nature Reserve is located approximately 10km to the north of the site.

According to Mucina and Rutherford, there are two vegetation types within the Karpowership site: Subtropical Alluvial Vegetation (Aza 7) and Maputaland Coastal Belt (CB1) and indicates that Swamp Forest and Mangrove Forest occur adjacent to the Karpowership site. Vegetation of the site comprises a mix of all four of these vegetation types, with the routes traversing areas of completely transformed and degraded vegetation, as well as areas of Critically Endangered Swamp Forest and Mangrove Forest. Several protected species were found on site, as well as several alien invasive plant species.

The preferred route is located from the powership directly across modified habitat and some wetlands and then is aligned with existing infrastructure. The majority of the preferred route is located in areas of low to moderate sensitivity with limited areas possibly traversing very high sensitive swamp forest. Overall, the preferred route is located in low sensitivity areas, mainly due to its location in transformed areas or in highly degraded areas adjacent to transformed areas. Construction facilities including laydown area, site office and stringing yard are all located in transformed areas or modified habitat.

The alternative route traverses large areas of mangrove forests prior to aligning with existing infrastructure. Although the alternative route does traverse some areas of low sensitivity where it is located adjacent to existing infrastructure, this proposed transmission line traverses two Critically Endangered vegetation types: Mangrove Forest and Swamp Forest. These have extremely high sensitivity and constitutes a fatal flaw for this route.

The alternative route is not to be considered as an option, and impact ratings are for the preferred route, laydown area, site office, stringing yard and switching station.

Impacts

The site is mostly of low sensitivity due to the wide distribution of modified and degraded habitats and the alignment of the transmission line route with existing infrastructure. This places the route primarily within transformed or modified habitat, resulting in little overall loss of indigenous vegetation. Impacts are medium to medium-low and can be reduced to low with the recommended mitigation measures. The summary of impacts associated with the development can be seen in Table 1.

Table 1: Summary of impacts associated with the Karpowership transmission line, and ancillary infrastructure.

Impact	Without Mitigation	With mitigation
Construction phase		
Issue 1: Loss of vegetation communities		
1: Loss of modified habitat	Medium-Low	Low
2: Loss of reed beds	Medium	Low
3: Loss of bushveld	Medium-Low	Low
Issue 2: Loss of Species of Special Concern and Biodiversity		
4: Loss of flora SCC	Medium	Low
5: Loss of fauna SCC	Medium	Low
6: Loss of biodiversity in general	Medium-Low	Low
Issue 3: Ecosystem function and process		
7: Fragmentation	Medium-Low	Low
8: Invasion of alien species	High	Low
Operational phase		
Issue 1: Loss of vegetation communities		
1: Loss of modified habitat	Medium-Low	Low
2: Loss of reed beds	Medium-Low	Low
3: Loss of bushveld	Medium-Low	Low
Issue 2: Loss of Species of Special Concern and Biodiversity		
4: Loss of flora SCC	Medium-Low	Low
5: Loss of fauna SCC	Medium-Low	Low
6: Loss of biodiversity in general	Medium-Low	Low
Issue 3: Ecosystem function and process		
7: Fragmentation	Medium-Low	Low
8: Invasion of alien species	High	Low

Mitigation and management

- In areas of modified habitat, construction using excavation and backfilling is acceptable however, this method of construction cannot be used in any other areas (except modified areas).
- No construction or storing of materials will be located outside of the defined layout area. These areas should be demarcated prior to any activities commencing and personnel instructed of the rules to stay out of these areas (unless clearing alien

invasive plants).

- Development and implementation of an alien invasive plant species management plan, which would remove and control the alien vegetation within and bordering the site.
- Keep the construction footprint as small as possible.
- No use of the surrounding vegetation must be allowed. This includes use as a toilet facility, for hunting, harvesting of indigenous plants, making fires etc.
- Karpowership should, in conjunction with Transnet, develop and implement a rehabilitation plan for the modified habitat areas where these will be left natural in the future even after planned port expansion.
- In wetland areas construction measures must consist of the least impactful individual erection of monopole structures. No linear 3m footprints should be cleared of vegetation in these areas but individual drilled foundations used.
- In natural areas, the construction of an excavated linear footprint must be avoided wherever possible. Construction measures must consist of the least impactful individual erection of monopole structures. No linear 3m footprints should be cleared of vegetation in these areas but individual drilled foundations used.
- A full site walk-through must be conducted in the summer prior to any construction activities to list all SSC and associated permits should be obtained for their removal or transplantation. This was completed in 2021 permits were applied for.
- Areas of indigenous vegetation must be incorporated into the open space management plan of the Port/ Harbour Zone in conjunction with Transnet where practicable.
- The land beneath the transmission line, and any other areas required for construction, but not for the operational phase, must be rehabilitated with indigenous species to retain connectivity within the system.
- A qualified specialist must be on site during construction to safely remove all slow-moving (chameleons and tortoises) and burrowing (moles, lizards and snakes) species from the path of the excavator and relocated to a conservation area or to an area outside the development corridor.

Specialist Opinion

It is the opinion of the specialist that the proposed development go ahead, provided the mitigation measures are put into place. The following conditions should also be met:

- A walk through of the site prior to any construction to determine the presence of any Species of Conservation Concern.
- Application for permits for removal of any SCC where required (this was completed in 2021 permits were applied for).
- The development of a rehabilitation plan in line with TNPAs rehabilitation plans, if no such plan exists, Karpowership should have input into the overall plan for the TNPA area.
- The development of an alien invasive plant management plan in line with the plan and implementation protocol of the TNPA. If no such plan exists, Karpowership should have input into such a plan for the overall TNPA area.

Contents

List of Figures

List of Tables

1 Introduction

1.1 Project outline

LD Biodiversity was appointed to undertake a terrestrial ecological assessment as part of the environmental authorisation (EA) process for the proposed Karpowership project.

The National Web based Environmental Screening Tool has characterised the Terrestrial Biodiversity Combined Sensitivity of the project area as "Very High". Accordingly, this assessment was conducted in accordance with the amendments to the Environmental Impact Assessment Regulations. 2014 (GNR 326, 7 April 2017) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). The approach has taken cognisance of the recently published Government Notices (GN) 320 (20 March 2020) and GN 1150 (30 October 2020): "Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation" (Reporting Criteria). See Appendix A for the protocol checklist and where they can be found within the report.

Karpowership SA (Pty) Ltd (KSA) requires an Environmental Authorisation (in terms of the National Environmental Management Act 107 of 1998) and an Atmospheric Emissions Licence (AEL) (in terms of the National Environmental Management: Air Quality Act 39 of 2004) before it can commence with its proposed activities and generate electricity from its Powership at the Port of Richards Bay, at UMhlathuze Local Municipality, King Cetshwayo District, KwaZulu-Natal (the "Project").

Triplo4 Sustainable Solutions (Triplo4) is the appointed Independent Environmental Assessment Practitioner (EAP) to undertake an integrated Environmental Impact Assessment (EIA) process for the Environmental Authorisation and an Atmospheric Emissions Licence (AEL).

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 3.6km, 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.

The proposed project is situated within the Port of Richard's Bay, and in proximity to the Richard's Bay Industrial Development Zone (RBIDZ), which was designated Special Economic Zone (SEZ) status in July 2017 in terms of the Special Economic Zones Act 16 of 2014.

The Richard's Bay Port was identified as a preferred location as it meets the technical requirements for the Project, the Project specifications, port planning and operational requirements.

As only the transmission lines will be constructed on land, the ecological assessment looks at the route options for placement of overhead transmission lines and associated infrastructure only. A corridor of 50m was assessed for the placement of the transmission lines.

1.2 Construction of the transmission lines

The transmission lines will be strung from steel monopole structures (two options) as per Figure 1-2 and Figure 1-3.

There are two different proposed construction methods for the transmission line, depending on the sensitivity of the terrestrial habitat in which each of the structures is constructed. These two methods include:

1) Excavation and backfilling
2) Construction of piled/augered foundations (Figure 1-1)

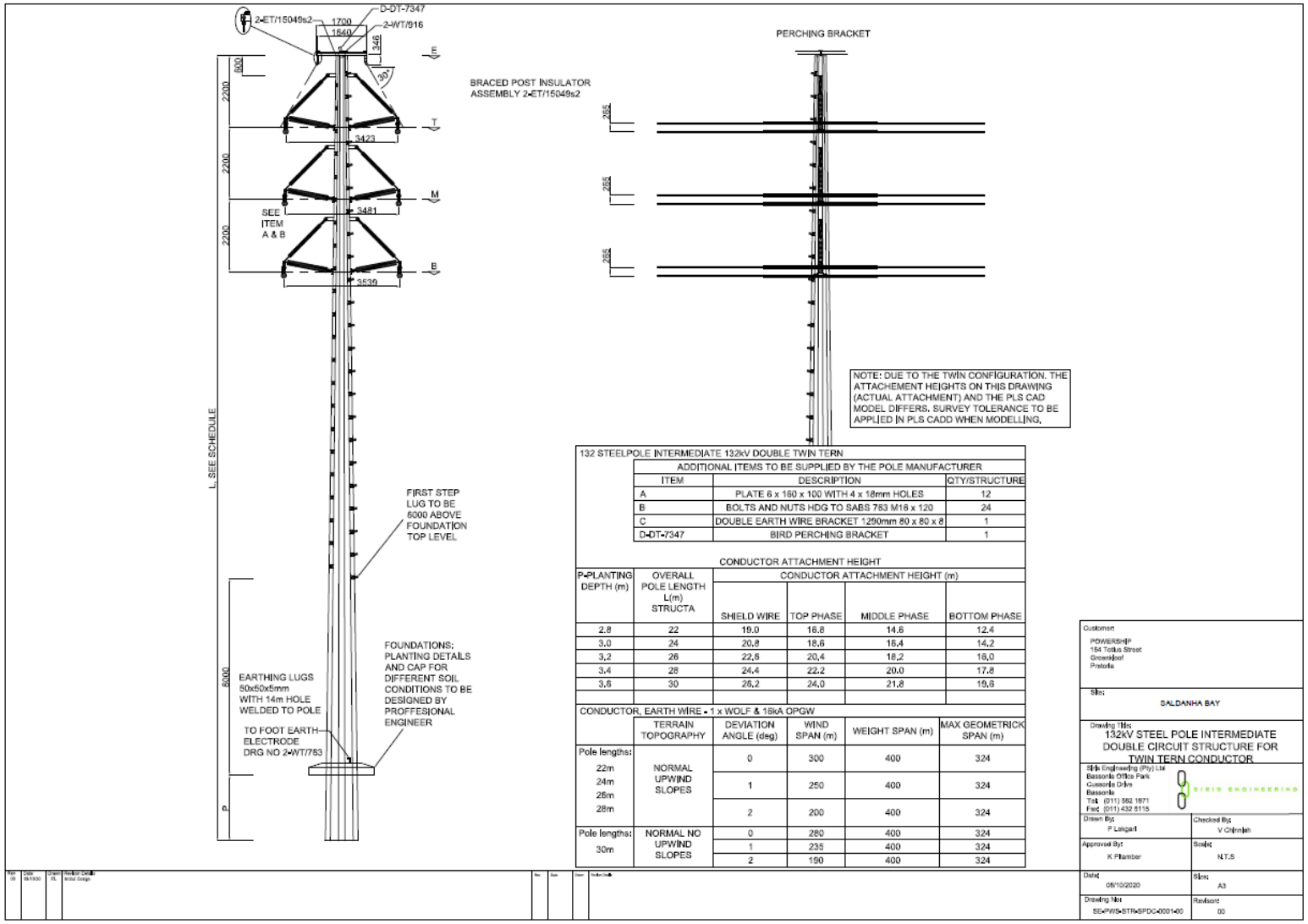
The method for excavation and backfilling comprises excavation of the transmission line footprint including removal of all vegetation in the area, as well as associated dumping of excavated material at a specific location. Backfilling of area excavated will then be done and the area cleared of waste.

Construction of piled/augured foundations allows for micro siting of specific monopole structures, with excavation associated with the foundations required for the single monopole, rather than a full linear footprint. This reduction in the overall impact allows for the maintenance of areas of sensitive indigenous vegetation and faunal habitats between monopole structures. Existing tracks will be used to access the site wherever possible, or new tracks made only for access and then rehabilitated or allowed to recover post construction.

For the purposes of this assessment, it is assumed that the standard excavation and backfilling method will be used, unless mitigation measures specifically determine that the piled foundations are required to reduce impacts on sensitive vegetation and habitats.

Construction of the transmission line will be done within a 31 working corridor, with the cleared footprint in reality approximately 3m wide. In instances where drilled foundations must be constructed, no linear clearing should be done.

Figure 1-1: A: Piled hole, B: Piling equipment and C: Traditional excavation.



132 STEELPOLE INTERMEDIATE 132kV DOUBLE TWIN TERN

ADDITIONAL ITEMS TO BE SUPPLIED BY THE POLE MANUFACTURER

ITEM	DESCRIPTION	QTY/STRUCTURE
A	PLATE 6 x 160 x 100 WITH 4 x 18mm HOLES	12
B	BOLTS AND NUTS HDG TO SABS 763 M16 x 120	24
C	DOUBLE EARTH WIRE BRACKET 1250mm 80 x 80 x 8	1
D-DT-7347	BIRD PERCHING BRACKET	1

CONDUCTOR ATTACHMENT HEIGHT

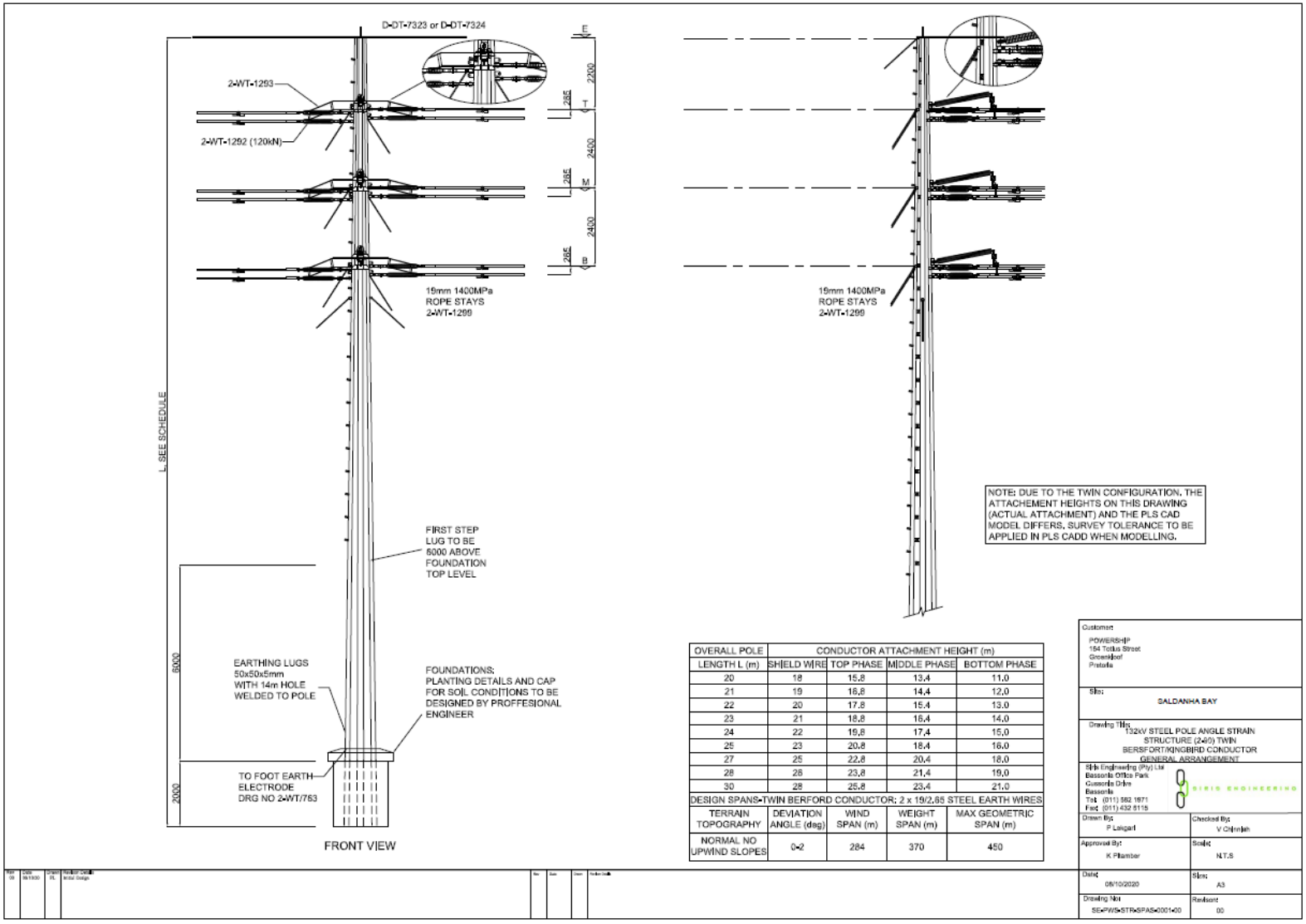
P-PLANTING DEPTH (m)	OVERALL POLE LENGTH L(m) STRUCTA	CONDUCTOR ATTACHMENT HEIGHT (m)			
		SHIELD WIRE	TOP PHASE	MIDDLE PHASE	BOTTOM PHASE
2.8	22	19.0	16.8	14.6	12.4
3.0	24	20.8	18.6	16.4	14.2
3.2	26	22.6	20.4	18.2	16.0
3.4	28	24.4	22.2	20.0	17.8
3.6	30	26.2	24.0	21.8	19.6

CONDUCTOR, EARTH WIRE - 1 x WOLF & 16kA OPGW

	TERRAIN TOPOGRAPHY	DEVIATION ANGLE (deg)	WIND SPAN (m)	WEIGHT SPAN (m)	MAX GEOMETRICK SPAN (m)
Pole lengths: 22m 24m 26m 28m	NORMAL UPWIND SLOPES	0	300	400	324
		1	250	400	324
		2	200	400	324
Pole lengths: 30m	NORMAL NO UPWIND SLOPES	0	280	400	324
		1	235	400	324
		2	190	400	324

Customer: POWERSHIP, 154 Totius Street, Groenkloof, Pretoria
Site: SALDANHA BAY
Drawing Title: 132kV STEEL POLE INTERMEDIATE DOUBLE CIRCUIT STRUCTURE FOR TWIN TERN CONDUCTOR
Sibis Engineering (Pty) Ltd, Bassonia Office Park, Cussonia Drive, Bassonia, Tel (011) 582 1671, Fax (011) 432 5115
Drawn By: P Leigart
Checked By: V Chinnian
Approved By: K Plumber
Scale: N.T.S
Date: 08/10/2020
Size: A3
Drawing No: SE-PWS-STR-SPDC-0001-00
Revision: 00

Figure 1-2: Monopole structure 1.



OVERALL POLE LENGTH L (m)	CONDUCTOR ATTACHMENT HEIGHT (m) SHIELD WIRE	TOP PHASE	MIDDLE PHASE	BOTTOM PHASE
20	18	15.8	13.4	11.0
21	19	16.8	14.4	12.0
22	20	17.8	15.4	13.0
23	21	18.8	16.4	14.0
24	22	19.8	17.4	15.0
25	23	20.8	18.4	16.0
27	25	22.8	20.4	18.0
28	26	23.8	21.4	19.0
30	28	25.8	23.4	21.0

DESIGN SPANS-TWIN BERFORD CONDUCTOR: 2 x 19/2.65 STEEL EARTH WIRES

TERRAIN TOPOGRAPHY	DEVIATION ANGLE (deg)	WIND SPAN (m)	WEIGHT SPAN (m)	MAX GEOMETRIC SPAN (m)
NORMAL NO UPWIND SLOPES	0-2	284	370	450

Figure 1-3: Monopole structure 2.

1.3 Terms of Reference

The Terms of Reference (ToR) for the study are as follows:

- Identify and map the vegetation communities.
- Determine the type of vegetation within the study site and place it in context for the wider area.
- Identify and record the main plant species that occur within the project area.
- Where possible identify any flora species of specific concern (SSC)
- Record any animal species encountered through opportunistic sightings and active searching.
- Where possible identify any animal species of conservation concern
- Assess the extent of alien plant species over the site, and associated risks of alien invasion as a result of any proposed development.
- Identify any significant landscape features or rare or important vegetation/faunal associations such as wetlands or rocky areas that might support rare or important vegetation/faunal associations.
- Place the project area within the biodiversity context of the wider area in terms of vegetation, conservation areas and Critical Biodiversity Areas as mapped by existing guidelines both nationally and provincially.
- Determine and map the sensitivity of the site.
- Determine and rate the likely impacts associated with the proposed development; and
- Recommend mitigation measures that can be used to reduce negative impacts of the proposed development.

1.4 Assumptions and limitations

- The field work was conducted over two days in the wet season: the 23rd of September 2020 and the 4th of February 2021. An additional site visit to investigate ancillary infrastructure was conducted on the 23rd of September 2022.
- A drone survey was done on the 29th of September 2022.
- A 50m corridor for the transmission lines was assessed.
- The site assessment was conducted in summer and does constitute a summer site visit (November to April) as per the guidelines for KwaZulu-Natal as per Ezemvelo KwaZulu-Natal Wildlife.
- A site visit at this time is sufficient to record trees, forests and associated species assemblages, as well as flowering grasses, but may miss some winter flowering plants.
- The GPS used for the assessment is accurate to 5 meters and therefore any spatial features may be offset by this distance.
- Information related to project activities, spatial data and infrastructure locations for the proposed development was obtained from information provided by the client. The potential impacts and recommendations described in this report apply specifically to the provided information.

- The Project Area of Influence (PAOI) is defined as being a 1km buffer surrounding the powerships and a 300m buffer surrounding land-based infrastructure.
- Some areas of the transmission line route were inaccessible due to impenetrable vegetation. In these cases, a sample of the vegetation of the area was taken from where it was accessible. Further, a drone was used to confirm vegetation calssifications.
- The timing and risks (mainly of theft and anthropogenic disturbance to traps) of the surveys precluded complex trapping (camera, drift-net arrays and Sherman trapping) for fauna. Faunal surveys were based on opportunistic sightings in addition to tracks and signs.
- Avifauna is presented in a separate report and is not dealt with in this ecological report.

1.5 Key legislative requirements

The legislation, policies and guidelines listed below in Table 1-1 are applicable to the current project in terms of biodiversity and ecological support systems. The list below, although extensive, may not be complete and other legislation, policies and guidelines may apply in addition to those listed below.

Table 1-1 A list of key legislative requirements relevant to biodiversity and conservation in the Western Cape

Region	Legislation
International	Convention on Biological Diversity (CBD, 1993)
	The Convention on Wetlands (RAMSAR Convention, 1971)
	The United Nations Framework Convention on Climate Change (UNFCC,1994)
	The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973)
	The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979)
National	Constitution of the Republic of South Africa (Act No. 108 of 2006)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998)
	The National Environmental Management Protected Areas Act (Act No. 57 of 2003)
	The National Environmental Management Biodiversity Act (Act No. 10 of 2004)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998) Section 24 , No 42946 (January 2020)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998) Section 24 , No 43110 (March 2020)
	The National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
	The Environment Conservation Act (Act No. 73 of 1989) and associated EIA Regulations
	National Protected Areas Expansion Strategy (NPAES)
	Environmental Conservation Act (Act No. 73 of 1983)
	Natural Scientific Professions Act (Act No. 27 of 2003)
	National Biodiversity Framework (NBF, 2009)
	National Forest Act (Act No. 84 of 1998)

	National Veld and Forest Fire Act (101 of 1998)
	National Spatial Biodiversity Assessment (NSBA)
	World Heritage Convention Act (Act No. 49 of 1999)
	National Heritage Resources Act, 1999 (Act 25 of 1999)
	Municipal Systems Act (Act No. 32 of 2000)
	Alien and Invasive Species Regulations, 2014
	South Africa's National Biodiversity Strategy and Action Plan (NBSAP)
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)
	Sustainable Utilisation of Agricultural Resources (Draft Legislation).
	White Paper on Biodiversity
Provincial	KwaZulu-Natal Environmental, Biodiversity and Protected Areas Management Bill, 2014 (Draft)
	KwaZulu-Natal Nature Conservation Management Act no. 9 of 1997
	Natal Nature Conservation Ordinance 15 of 1974 (updated to Provincial Gazette No. 5265 dated 26 March 1998)
	KwaZulu-Nature Conservation Act, 1992
	KwaZulu-Natal Biodiversity Sector Plan, 2016
	KwaZulu-Natal Environmental, Biodiversity and Protected Areas Management Bill, 2014 (Draft)

2 The study area

2.1 Locality

The project is located in the KwaZulu-Natal province, in the Port of Richards Bay (Figure 2-1). This in turn is located in Ward 2 of the uMhlathuze Local Municipality and the King Cetshwayo District Municipality. This report deals with the transmission line running from the ship to the substation. There are two proposed route options for the transmission line (Figure 2-2), both of which are assessed however, the alternative option is not supported as it runs through Critically Endangered mangrove forest systems as was not further assessed herein.

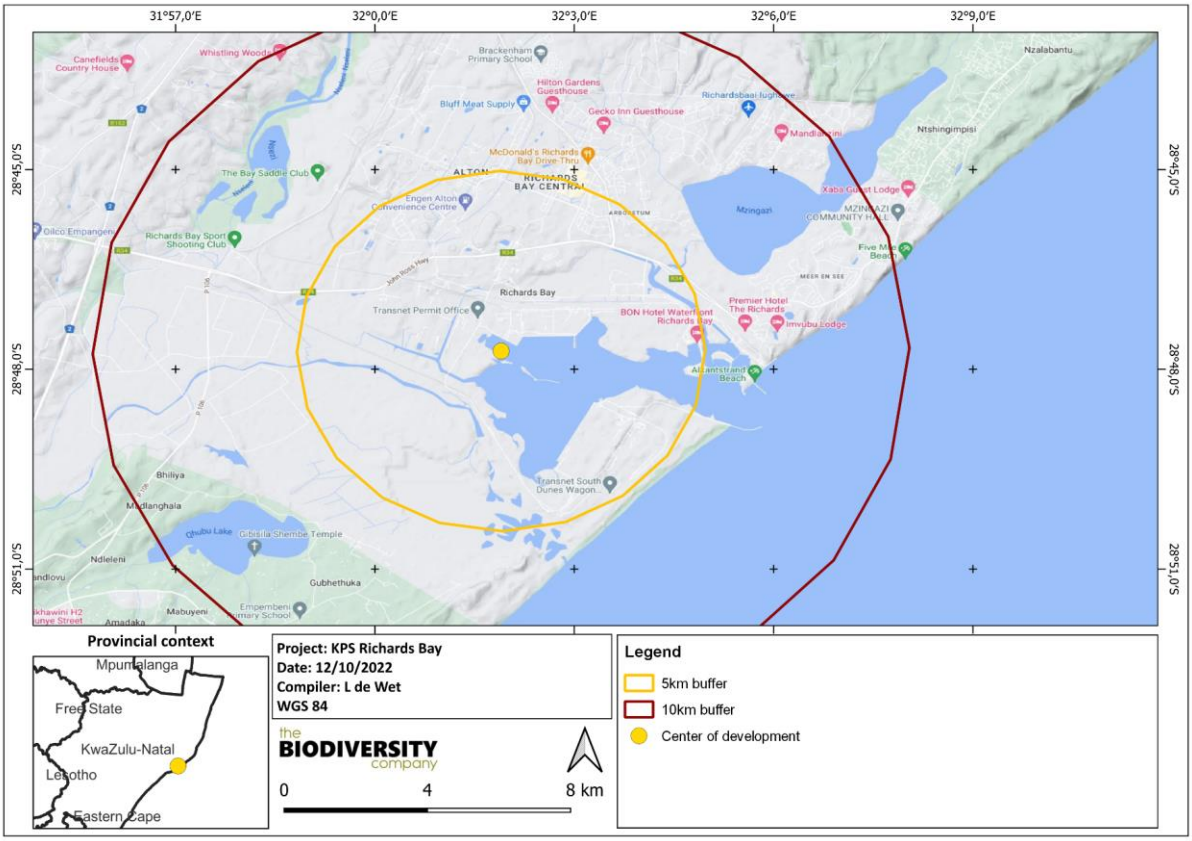


Figure 2-1: Locality map of the Richards Bay Powership site.

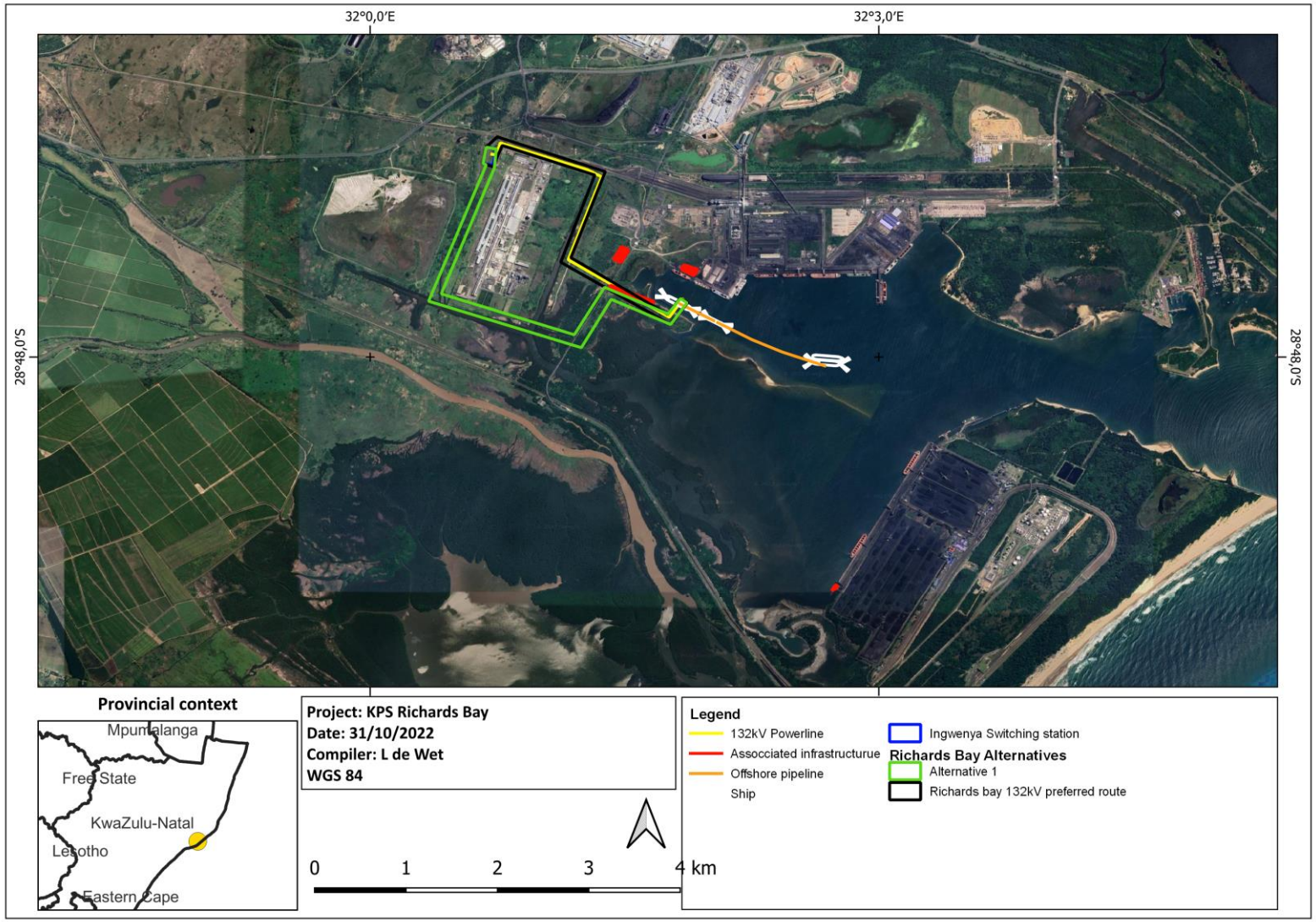


Figure 2-2: Layout of transmission line options, and the switching station and laydown areas.

3 Methodology

The methodology for this assessment is based on analyses of available desktop information, a site visit and a resultant Site Ecological Importance (SEI) and impact assessment. The methods of each of these study components are outlined below.

3.1 Desktop Assessment

Available desktop information was assessed to contextualize the site, and several databases and mapping tools were checked. These included the following:

- Google earth imagery was used to determine the current vegetation cover of the site.
- The National Vegetation Map developed by Mucina and Rutherford (2018) was consulted to determine the expected vegetation type.
- The Plants of South Africa (POSA) database was consulted for a list of plant species previously recorded from the general area including the site.
- Conservation Planning Tools such as the List of Ecosystems that are Threatened and in Need of Protection, Wetlands datasets (NFEPA) and the KwaZulu-Natal Biodiversity Plan were mapped for the study site.
- A list of possible invasive species was extracted from the POSA list of plants recorded from the Westville area and surrounds.
- A list of Possible Species of Conservation Concern (SCC) was extracted from the POSA list of plants recorded from the Richards Bay area and surrounds though checking the list of recorded species against the following lists:
    - The National Red List for Plants (redlist.sanbi.org, as given by POSA)
    - The National Red Data List for Mammals[1]
    - The National Red Data List for Reptiles[2]
    - The National Red Data List for Amphibians[3]
- A list of Protecetd species (these are species that are protected provincially or nationally and required permits for their destruction, but are not considered of conservation importance) was developed through checking the list of recorded species against the following lists:
    - National Protected Tree List (Government Gazette Vol. 593, 21 November 2014, No. 38215)
    - Provincial Protected Species List (Nature Conservation Ordinance No 15 of 1974)
    - National Protected Species List or TOPS (R 1187 of 2007)

[1] Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. 2016. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.
[2] Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland. 2014. Edited by Michael F. Bates, William R. Branch, Aaron M. Bauer, Marius Burger, Johan Marais, Graham J. Alexander & Marienne S. de Villiers. SANBI, Pretoria.
[3] Minter LR, Burger M, Harrison JA, Braack HH, Bishop PJ & Kloepfer D (eds). 2004. Atlas and Red Data book of the frogs of South Africa, Lesotho and Swaziland. SI/MAB Series no. 9. Smithsonian Institution, Washington, D.C.

3.2 Field Assessment

The site was surveyed based on Google Earth imagery. The site was divided into areas of specific vegetation communities as per stratified random sampling methodology. Each of these vegetation communities were then surveyed in the field, with adaptive field techniques applied where in-field conditions required. For sampling of both fauna and flora, timed meanders were used. Where possible, these were centred around the transmission route options and associated infrastructure. Where this was not possible, the meanders were performed in vegetation similar, and adjacent to the proposed transmission line routes.

The field work was conducted over two days in the wet season: the 23rd of September 2020 and the 4th of February 2021. An additional site visit to investigate ancillary infrastructure was conducted on the 23rd of September 2022. The site assessment was conducted in summer and does constitute a summer site visit (November to April) as per the guidelines for KwaZulu-Natal as per Ezemvelo KwaZulu-Natal Wildlife.

3.2.1 Vegetation and Flora

The study area was explored on foot, and different habitats identified using on-the-ground views in addition to google earth imagery. Habitats included areas such as mangroves, swamp forests, disturbed areas, and bushveld areas. All dominant, invasive and conservation important species for each of the habitats were noted and photographed. Where possible, the transmission line route itself was walked. Timed meanders were employed as a vegetation classification and species listing technique as per standard best practice. A timed meander comprised of a 30 minute walk in one particular habitat where all species are recorded as they are encountered. If, after 30 minutes, species are still being added to the list at a rate of >1 per 1 minute, the meander is extended for 5 minutes. Once no new species have been recorded for the meander after 5 minutes, the sample is considered complete. In areas where few species were noted, timed meanders were cute short after no new species are recorded for 5 minutes.

Where species cannot be identified in field, these were photographed to be identified later using field guides and botanical texts or requested from experts where necessary. In addition, all species encountered in the field are uploaded into an iNaturalist project, which can be accessed here: https://www.inaturalist.org/projects/richard-s-bay-port-area-terrestrial-ecology .

3.2.2 Fauna

The focus of this study is on vegetation. Results of the vegetation analysis and hence, faunal habitat, in conjunction with a survey of the existing anthropogenic impacts may be used to infer the presence of faunal species and populations. Anthropogenic impacts may include activities such as:

- encroachment of development (in this case Port/ Harbour zone infrastructure) into natural areas,
- the influx of alien invasive plant species,
- hunting,
- collection of plants for trade and traditional medicine, and
- the influx of non-natural animals such as cattle, goats, domestic dogs and domestic cats, all of which have moderate to severe impacts on both flora and fauna of the surrounding area.

Traditional methodology for assessments of faunal taxa include timed meanders, walking transects and the use of traps (camera traps, drift net arrays and Sherman traps). In sites such as Richards Bay, the use of such traps is not practical for several reasons, primarily among them the presence of a large human population making use of the areas that require assessment. This human presence makes the risks for trap setting too high to make use of such methods. Risks include the removal of traps by humans, stealing of equipment (especially camera traps), the skewing of data associated with the vandalism of traps, removal of traps or release of trapped animals by humans within the site. As such, opportunistic sightings are best used in these scenarios. In addition, experience in the area, as well as reports of fauna occurring in the region and literature allows for a accurate picture of the fauna that will be present on site.

For the purposes of this study, any opportunistic sightings of faunal species as well as tracks and signs were recorded and photographed wherever possible. Further, the presence of any habitat available for each of the possible species in the region was recorded.

3.3 Site Ecological Importance (SEI)

The different habitat types within the assessment area were delineated and identified based on observations during the field assessment as well as available satellite imagery and drone surveys. These habitat types were assigned Ecological Importance (EI) categories based on their ecological integrity, conservation value, the presence of species of conservation concern and their ecosystem processes.

Site Ecological Importance (SEI) is a function of the Biodiversity Importance (BI) of the receptor (e.g., SCC, the vegetation/fauna community or habitat type present on the site) and Receptor Resilience (RR) (its resilience to impacts) as follows.

BI is a function of Conservation Importance (CI) and the Functional Integrity (FI) of the receptor as follows. The criteria for the CI and FI ratings are provided in Table 3-1 and Table 3-2, respectively.

Table 3-1 Summary of Conservation Importance (CI) criteria

Conservation Importance	Fulfilling Criteria
Very High	Confirmed or highly likely occurrence of CR, EN, VU or Extremely Rare or Critically Rare species that have a global EOO of < 10 km^2.

Conservation Importance	Fulfilling Criteria
	Any area of natural habitat of a CR ecosystem type or large area (> 0.1% of the total ecosystem type extent) of natural habitat of an EN ecosystem type. Globally significant populations of congregatory species (> 10% of global population).
High	Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km^2. IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A. If listed as threatened only under Criterion A, include if there are less than 10 locations or < 10 000 mature individuals remaining. Small area (> 0.01% but < 0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (> 0.1%) of natural habitat of VU ecosystem type. Presence of Rare species. Globally significant populations of congregatory species (> 1% but < 10% of global population).
Medium	Confirmed or highly likely occurrence of populations of NT species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals. Any area of natural habitat of threatened ecosystem type with status of VU. Presence of range-restricted species. > 50% of receptor contains natural habitat with potential to support SCC.
Low	No confirmed or highly likely populations of SCC. No confirmed or highly likely populations of range-restricted species. < 50% of receptor contains natural habitat with limited potential to support SCC.
Very Low	No confirmed and highly unlikely populations of SCC. No confirmed and highly unlikely populations of range-restricted species. No natural habitat remaining.

Table 3-2 Summary of Functional Integrity (FI) criteria

Functional Integrity	Fulfilling Criteria
Very High	Very large (> 100 ha) intact area for any conservation status of ecosystem type or > 5 ha for CR ecosystem types. High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches. No or minimal current negative ecological impacts with no signs of major past disturbance.
High	Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type or > 10 ha for EN ecosystem types. Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches.

Functional Integrity	Fulfilling Criteria
	Only minor current negative ecological impacts with no signs of major past disturbance and good rehabilitation potential.
Medium	Medium (> 5 ha but < 20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types. Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches. Mostly minor current negative ecological impacts with some major impacts and a few signs of minor past disturbance. Moderate rehabilitation potential.
Low	Small (> 1 ha but < 5 ha) area. Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area. Low rehabilitation potential. Several minor and major current negative ecological impacts.
Very Low	Very small (< 1 ha) area. No habitat connectivity except for flying species or flora with wind-dispersed seeds. Several major current negative ecological impacts.

BI can be derived from a simple matrix of CI and FI as provided in Table 3-3

Table 3-3 Matrix used to derive Biodiversity Importance (BI) from Functional Integrity (FI) and Conservation Importance (CI)

Biodiversity Importance (BI)		Conservation Importance (CI)				
		Very High	High	Medium	Low	Very Low
Functional Integrity (FI)	Very High	Very High	Very High	High	Medium	Low
	High	Very High	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very Low
	Low	Medium	Medium	Low	Low	Very Low
	Very Low	Medium	Low	Very Low	Very Low	Very Low

The fulfilling criteria to evaluate RR are based on the estimated recovery time required to restore an appreciable portion of functionality to the receptor as summarised in Table 3-4.

Table 3-4 Summary of Resource Resilience (RR) criteria

Resilience	Fulfilling Criteria
Very High	Habitat that can recover rapidly (~ less than 5 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a very high likelihood of remaining at a site even

Resilience	Fulfilling Criteria
	when a disturbance or impact is occurring, or species that have a very high likelihood of returning to a site once the disturbance or impact has been removed.
High	Habitat that can recover relatively quickly (~ 5–10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a high likelihood of returning to a site once the disturbance or impact has been removed.
Medium	Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a moderate likelihood of returning to a site once the disturbance or impact has been removed.
Low	Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~ less than 50% of the original species composition and functionality of the receptor functionality, or species that have a low likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a low likelihood of returning to a site once the disturbance or impact has been removed.
Very Low	Habitat that is unable to recover from major impacts, or species that are unlikely to remain at a site even when a disturbance or impact is occurring, or species that are unlikely to return to a site once the disturbance or impact has been removed.

Subsequent to the determination of the BI and RR, the SEI can be ascertained using the matrix as provided in Table 3-5.

Table 3-5 Matrix used to derive Site Ecological Importance (SEI) from Receptor Resilience (RR) and Biodiversity Importance (BI)

Site Ecological Importance (SEI)		Biodiversity Importance (BI)				
		Very High	High	Medium	Low	Very Low
Receptor Resilience (RR)	Very Low	Very High	Very High	High	Medium	Low
	Low	Very High	Very High	High	Medium	Very Low
	Medium	Very High	High	Medium	Low	Very Low
	High	High	Medium	Low	Very Low	Very Low
	Very High	Medium	Low	Very Low	Very Low	Very Low

Interpretation of the SEI in the context of the proposed development activities is provided in Table 3-6.

Table 3-6 Guidelines for interpreting Site Ecological Importance (SEI) in the context of the proposed development activities

Site Ecological Importance (SEI)	Interpretation in relation to proposed development activities
Very High	Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e., last remaining populations of species, last remaining good condition patches of ecosystems/unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted, limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.

Site Ecological Importance (SEI)	Interpretation in relation to proposed development activities
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities.
Very Low	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

The SEI evaluated for each taxon can be combined into a single multi-taxon evaluation of SEI for the assessment area. Either a combination of the maximum SEI for each receptor should be applied, or the SEI may be evaluated only once per receptor but for all necessary taxa simultaneously. For the latter, justification of the SEI for each receptor is based on the criteria that conforms to the highest CI and FI, and the lowest RR across all taxa.

3.4 Impact Assessment

2014 NEMA EIA Regulations (as amended), Appendix 3 (3) (1) (h)(v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts can be reversed; may cause irreplaceable loss of resources; and can be avoided, managed or mitigated; (vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks; viii) the possible mitigation measures that could be applied and level of residual risk.

This section describes the processes undertaken to identify impacts, to assess and rank the impacts and risks, to describe environmental impacts and risks identified during the EIA process, to assessment of the significance of each impact, risk and an indication of the extent to which the issue and risk can be avoided or addressed by the management actions, and any deviations from approved Scoping Report (including Plan of Study). Assumptions, uncertainties and gaps in knowledge relating to the assessment and mitigation proposed are also discussed. In the EIAR, the significance of the potential impacts are considered before and after identified mitigation is implemented, for direct, indirect, and cumulative impacts, in the short and long term, for all phases of the proposed project. The specialist studies are synthesised and integrated into the overall impact assessment and recommendations for mitigation are included in the EMPr.

Impact ratings were modified for the project in question in order to avoid skewing the impact ratings. This involved the amendment of the duration section top reflect that of the DEAT (2014) regulations (Guideline Documentation on EIA Regulation, Department of Environmental Affairs and Tourism, 2014).

The following criteria were considered for the assessment of each impact.

The **nature** of an impact is the type of effect that the activity will have on the environment. It includes what is being affected and how.

The **duration** of the impact is the period during which the impact is occurring. Inherent in this is the **reversibility** of the impact, meaning that if the duration of the impact is not permanent, then it can be reversed, i.e. the impact is reversible. Should an impact not be reversible, then this is explicitly stated.

The **irreplaceable loss of resources** has been assessed, but not explicitly stated as such. For example, a less severe impact will be insignificant or non-harmful and the resultant loss of resources can be replaced. In contrast, the loss of resources from disastrous or extremely harmful impacts cannot be satisfactorily replaced.

The **significance** of an impact is determined by a combination of its consequence and likelihood.

The table below (Table 3.7) describes the scoring of the impacts and how they determine the overall significance.

Table 3.7: Scoring of impacts

Scoring of Impacts	
Consequence	
Severity the degree to which the project affects or changes the environment	1 – Insignificant / Non-harmful 2 – Small / Potentially harmful 3 – Significant / Slightly harmful 4 – Great / Harmful 5 – Disastrous / Extremely harmful
Duration a measure of the lifetime that the impact will be present	1 – Brief: 0 – 1 years 2 – Short term: 2- 5 years 3 – Medium-term: 5 - 20 years 4 – Long term: > 20 years 5 – Permanent
Spatial Scale the extent / size of the area that may be affected	1 – Immediate, fully contained area / within the site 2 – Surrounding area (< 2km) 3 – Within farm / town / city 4 – Within municipal area 5 – Regional, National, International
Overall Consequence = (Severity + Duration + Extent) / 3	
Likelihood	
Frequency how often the impact will occur	1 – Once a year, or once or more during operation 2 – Once or more in 6 months 3 – Once or more a month 4 – Once or more a week 5 – Daily or hourly
Probability the likelihood or the chances that the impact will occur	1 – Almost never / almost impossible 2 – Very seldom / highly unlikely 3 – Infrequent / unlikely / seldom 4 – Often / regularly / likely / possible 5 – Daily / highly likely / definitely
Overall Likelihood = (Frequency + Probability) / 2	
Overall Environmental Significance = Overall Consequence X Overall Likelihood	
Overall Environmental Significance:	
0 - 2.9	Very Low
3 - 4.9	Low
5 - 6.9	Medium - Low
7 - 8.9	Medium

9 - 10.9	Medium - High
11 and above	High
Reversibility	
Reversibility degree to which the impact can be reversed	Reversible – the impact is reversible Irreversible – the impact is not reversible
Irreplaceable Loss of Resources	
Irreplaceable Loss of Resources degree to which the loss of resources can be replaced	Yes – the impact causes a loss of resources that cannot be replaced No – the impact causes a loss of resources that can be replaced
Fatal Flaw	
Fatal Flaw degree to which the impact is a fatal flaw	Yes – the impact results in a fatal flaw No – the impact does not result in a fatal flaw

Each impact was rated according to the tables and a table of impacts is produced for each of the identified impacts for the proposed development, with and without mitigation. An example of an impact table is provided in Table 3.8.

Table 3.8: Example of an impact table

Impact	Consequence							Likelihood					Total Score	Significance
	Severity		Duration		Spatial scale		TOTAL	Frequency		Probability		TOTAL		
Without mitigation	Significant	3	Long term	4	Surrounding area	2	3	Once or more a month	3	Likely	4	3.5	7	Medium
With mitigation	Small	2	Medium-term	3	Site	1	2	Once or more a month	3	Unlikely	3	3	6	Medium-Low

4 Conservation planning

There are several conservation planning tools that help with guiding proposed developments as well as assessing their ecological sensitivity, each of these was considered and assessed.

4.1 KwaZulu-Natal Biodiversity Plan

The KwaZulu-Natal Biodiversity Plan has been developed to guide development, protected areas expansion and conservation within the province (Ezemvelo Wildlife 2016). The plan identified areas as Critical Biodiversity Areas (CBAs) which cannot be lost if conservation goals are to be met, and Ecological Support Areas (ESAs) (Table 4-1), which are required to support the functioning of ecosystems and CBAs (Ezemvelo Wildlife 2016). Development guidelines for each category of CBA and ESA is outlined in Table 4-2.

The study area falls within a CBA listed as irreplaceable which encompasses all areas that are currently in a natural or near natural state (Figure 4-1). The planned layout is located almost entirely in an Irreplaceable CBA. These areas should be maintained as natural open space as CBAs are critical for maintaining biodiversity targets for the province.

Table 4-1: Subcategories of CBA and ESAs*.

Critical Biodiversity Areas (CBAs) – Crucial for supporting biodiversity features and ecosystem functioning and are required to meet biodiversity and/or process targets	
Critical Biodiversity Areas: Irreplaceable	Areas considered critical for meeting biodiversity targets and thresholds, and which are required to ensure the persistence of viable populations of species and the functionality of ecosystems.
Critical Biodiversity Areas: Optimal	Areas that represent an optimised solution to meet the required biodiversity conservation targets while avoiding high cost areas as much as possible (Category driven primarily by process but is informed by expert input).
Ecological Support Areas (ESAs) – Functional but not necessarily entirely natural areas that are required to ensure the persistence and maintenance of biodiversity patterns and ecological processes within Critical Biodiversity Areas.	
Ecological Support Areas	Functional but not necessarily entirely natural terrestrial or aquatic areas that are required to ensure the persistence and maintenance of biodiversity patterns and ecological processes within the Critical Biodiversity Areas. The area also contributes significantly to the maintenance of Ecosystem Services.
Ecological Support Areas: Species Specific	Terrestrial modified areas that provide a critical support function to a threatened or protected species, for example agricultural land or dams associated with nesting/roosting sites.
Ecological Support Areas: Buffers	Terrestrial areas identified as requiring land-use management guidance not necessarily due to biodiversity prioritisation, but in order to address other legislation/ agreements which the biodiversity sector is mandated to address, e.g. WHS Convention, Triggers Listing Notice criteria, etc.

*Taken from Ezemvelo KZN Wildlife, 2016)

Table 4-2: Land-Use objectives for the Terrestrial Conservation Categories*

Map Category	Guiding description of categories	Land-Use Management Objective
Protected Areas (PAs)	Protected areas as declaration under NEMPA	Maintain in a natural state with limited to no biodiversity loss
Critical Biodiversity Areas (CBAs)	Natural or near-natural landscapes that include terrestrial and aquatic areas that are considered critical for meeting biodiversity targets and thresholds, and which safeguard areas required to ensure the persistence of viable populations species, and the functionality of ecosystems and Ecological Infrastructure*.	Maintain in a natural state with limited to no biodiversity loss.
CBA: Irreplaceable	Areas which are required to meet biodiversity conservation targets, and where there are no alternative sites available. (Category driven by species and feature presence).	Maintain in a natural state with limited to no biodiversity loss.
CBA: Optimal	Areas that are the most optimal solution to meet the required biodiversity conservation targets while avoiding high cost areas as much as possible (Category driven primarily by process).	Maintain in a natural state with limited to no biodiversity loss
ESA: Buffers	Areas identified as influencing land-use management that are not derived based on biodiversity priorities alone, but also address other legislation/ agreements which the biodiversity sector is mandated to address, e.g. WHS Convention, triggers Listing Notice, etc.	Maintain or improve ecological and tourism functionality of a PA or WHS.
ESA: Protected Area Buffer	Unless otherwise stated, the represents an area extending 5km from the PAs or where applicable PA delineated buffers.	Maintain or improve ecological and tourism functionality of a PA.
ESA: World Heritage site Buffer	Unless otherwise stated, this represents an area extending 10km from the WHS or where applicable area specifically defined for WHS.	Maintain or improve ecological and tourism functionality of WHS.
Terrestrial Ecological Support Areas (ESAs)	Functional but not necessarily entirely natural terrestrial land that is largely required to ensure the persistence and maintenance of biodiversity patterns and ecological processes within the Critical Biodiversity Areas. The area also contributes significantly to Ecological Infrastructure.	Maintain ecosystem functionality and connectivity allowing for some loss of biodiversity.
Terrestrial Ecological Support Areas: Species specific	Modified but area is providing a support function to a threatened or protected species.	Maintain current land use or rehabilitate back to functional natural area.
Natural Biodiversity Areas	All natural areas not already included in the above categories	Maintain basic ecosystem functionality.
Modified	Areas with no significant natural vegetation remaining and therefore regarded as having a low biodiversity value (e.g. areas under cultivation).	Sustainable management.

*Ecological Infrastructure refers to functioning ecosystems that deliver valuable services to people and the environment. These areas were previously referred to as *Ecosystem Goods and Service Areas*.

4.2 Ecosystem Threat Status

The Ecosystem Threat Status is an indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition. According to the spatial dataset the proposed development is located within a LC as well as a small section in an Endangered ecosystem (Figure 4-2).

Table 4-3: Categories of Threatened Ecosystems[4]

Category	Abbreviation	Description
Critically Endangered	CR	Ecosystems that have undergone severe degradation of ecological structure, function or composition as a result of human intervention and are subject to an extremely high risk of irreversible transformation.
Endangered	EN	Ecosystems that have undergone degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems.
Vulnerable	VU	Ecosystems that have a high risk of undergoing significant degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems or endangered ecosystems.
Protected	-	Ecosystems that are of high conservation value or of high national or provincial importance, although they are not listed as critically endangered, endangered or vulnerable.

4.3 Ecosystem Protection Level

Indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. Not Protected, PP or MP ecosystem types are collectively referred to as under-protected ecosystems. The proposed development is located within a WP and MP ecosystem (Figure 4-3).

4.4 Protected Areas

Formal protected areas are those that are included in the National Environmental Management: Protected Areas Act (Act 57 of 2003) and include nature reserves, national parks and protected environments. Protected areas provide protection against climate change and aid in ecological sustainability (Government of South Africa, 2008). Proximity to protected areas is important, as sites close to these areas may be ecologically sensitive, and buffers around protected areas should be maintained to preserve biodiversity and connectivity According to the protected area spatial datasets from SAPAD (2021), the proposed development does not occur within any protected area (Figure 4-4). Richards Bay Game

[4] National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (G 34809, GoN 1002).

Reserve lies less than 1km to the southwest of the site, and the Enseleni Nature Reserve is located approximately 10km to the north of the site (Figure 4-4).

4.5 Important Bird Areas (IBAs)

Important Bird Areas (IBAs) are areas internationally recognized for their importance for birds, and thus internationally important for conservation. The Richards Bay Game Reserve is an IBA and is located less than 1km from the site (Figure 4-5). Birds are assessed in a separate avifauna impact assessment for the site.

4.6 Hydrological Setting

The proposed development is located within an estuarine system. The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was released with the National Biodiversity Assessment (NBA) 2018. Ecosystem threat status (ETS) of ecosystem types is based on the extent to which each river ecosystem type had been altered from its natural condition. Ecosystem types are categorised as CR, EN, VU or LT. Critically Endangered, EN and VU ecosystem types collectively referred to as 'threatened' (Van Deventer *et al*., 2019; Skowno *et al*., 2019). Several river systems, occur within the project area (Figure 4-6).

The National Freshwater Ecosystem Priority Areas (NFEPAs) (Driver *et al*., 2011) spatial data has been incorporated in the above mentioned SAIIAE spatial data set. They are included here as the database is intended to be conservation support tools and are envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act (NEM:BA) biodiversity goals (Nel *et al.,* 2011). The NFEPA spatial layer indicates that the wetlands do not intersect with a Ramsar site and are not within 500 m of an IUCN threatened frog point locality. No NFEPA wetlands or rivers are present within, or close to, the project area (Figure 4-6).

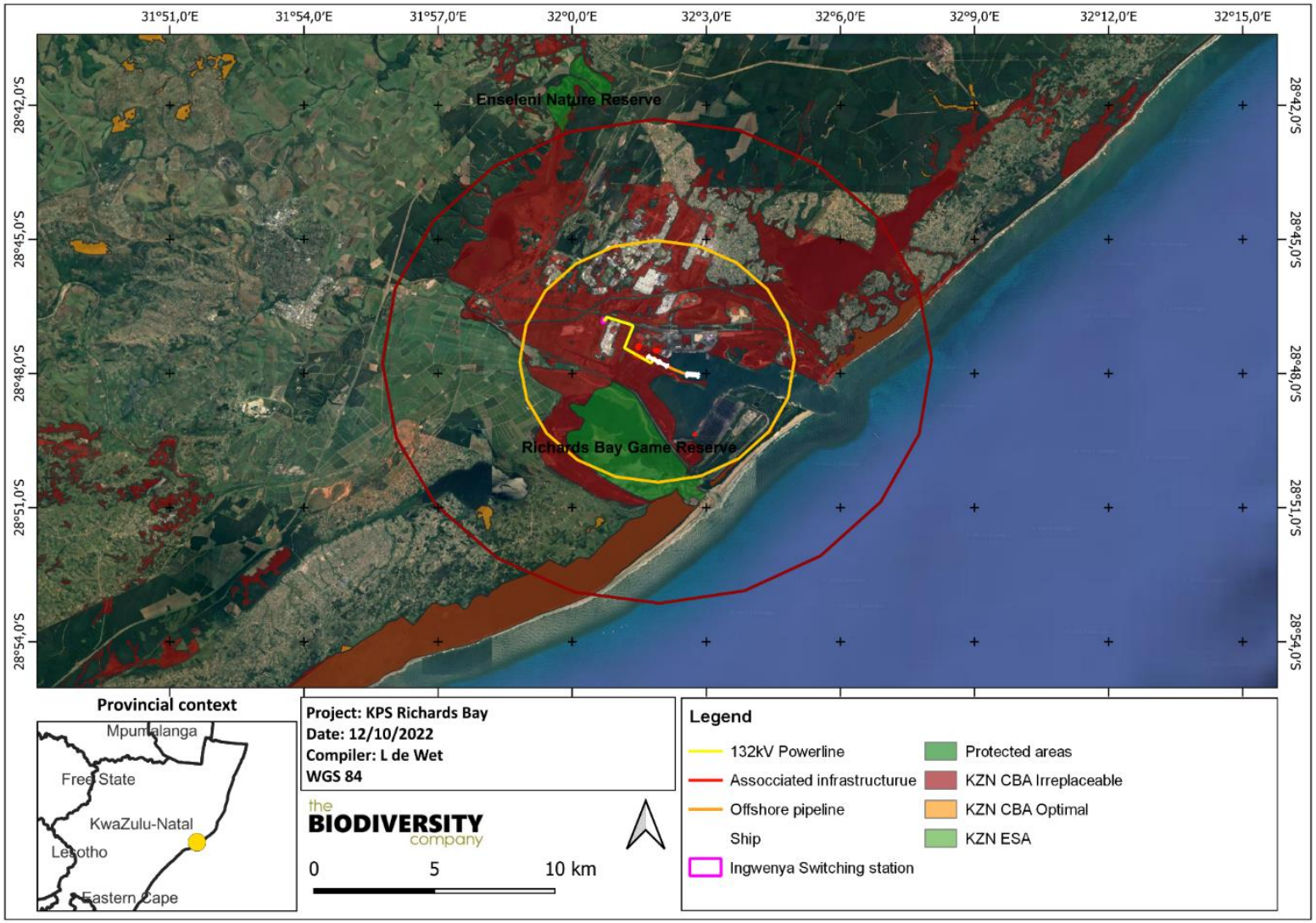


Figure 4-1: Critical Biodiversity Areas and Ecological Support Areas within and near to the Karpowership site.

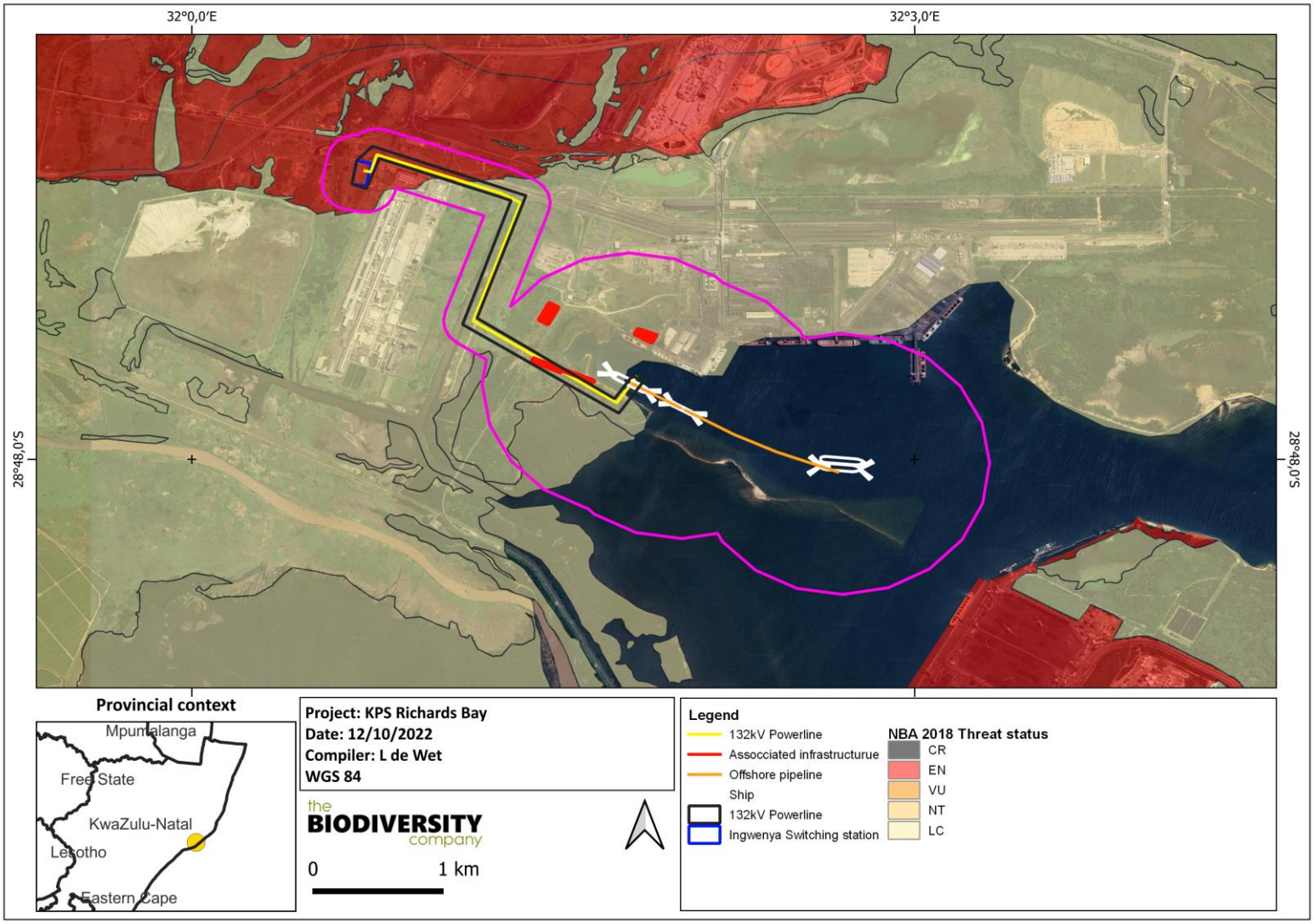


Figure 4-2: Ecosystem Threat Status.

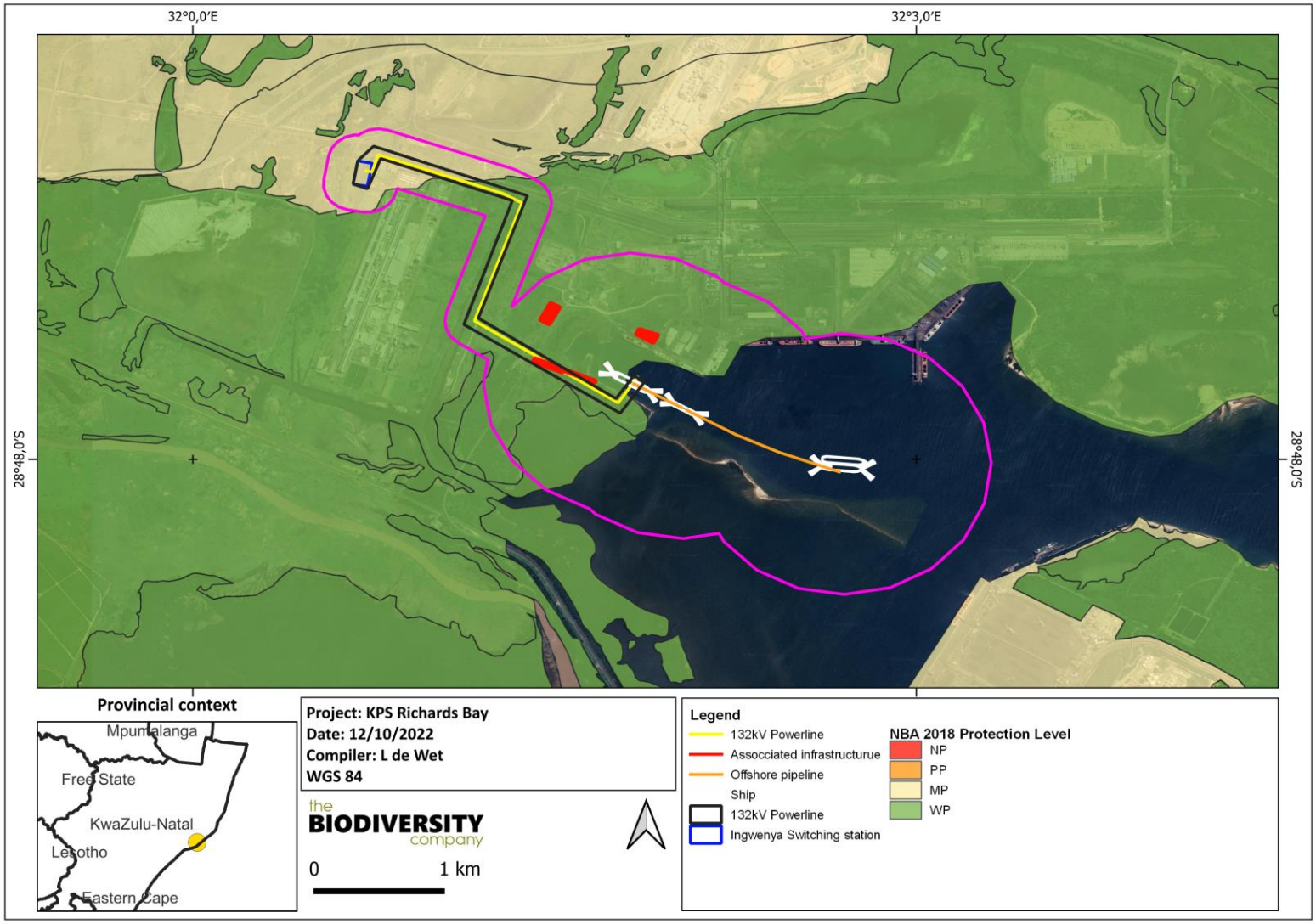


Figure 4-3: Ecosystem Protection level.

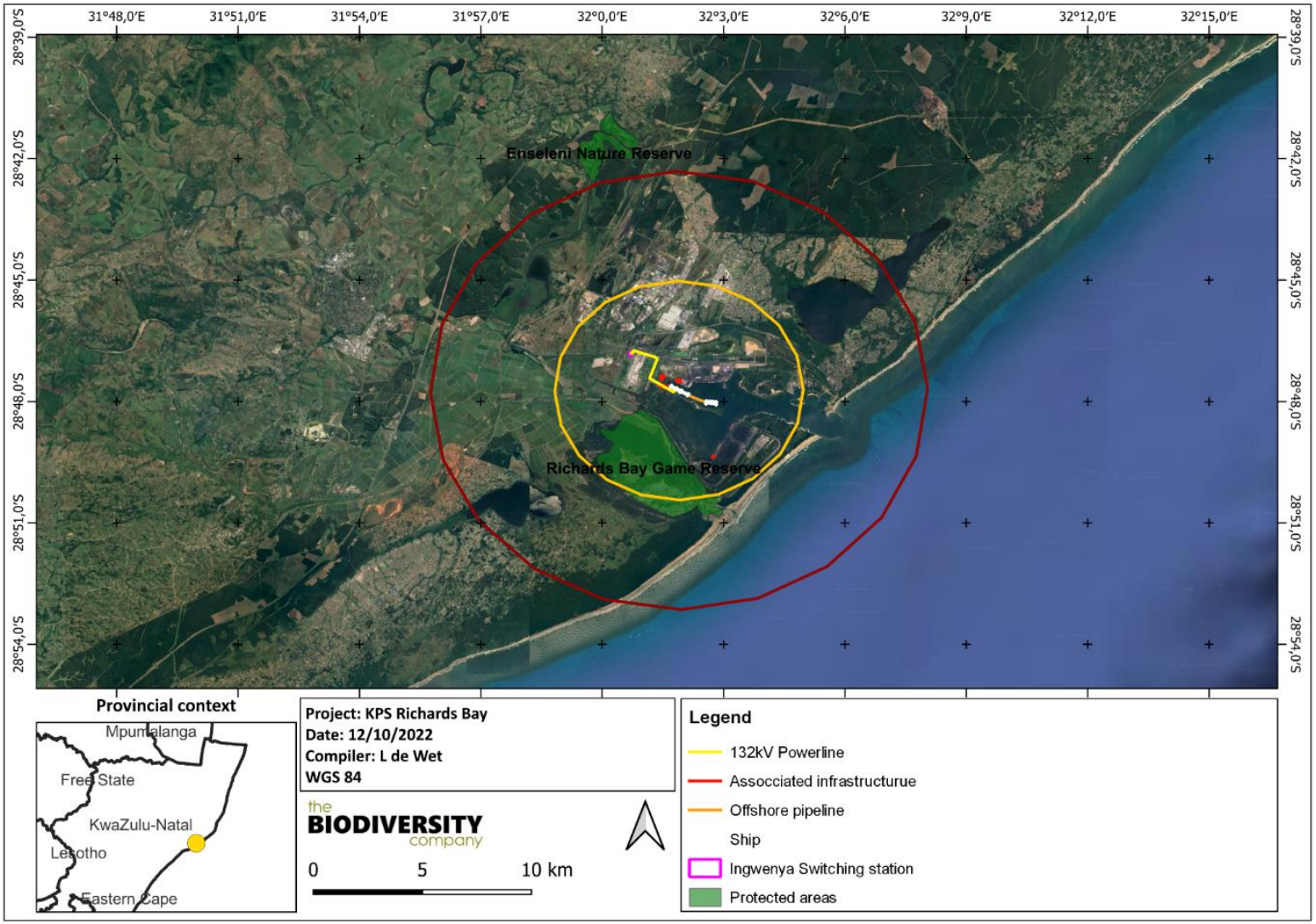


Figure 4-4: Protected areas proximal to the Karpowership site.

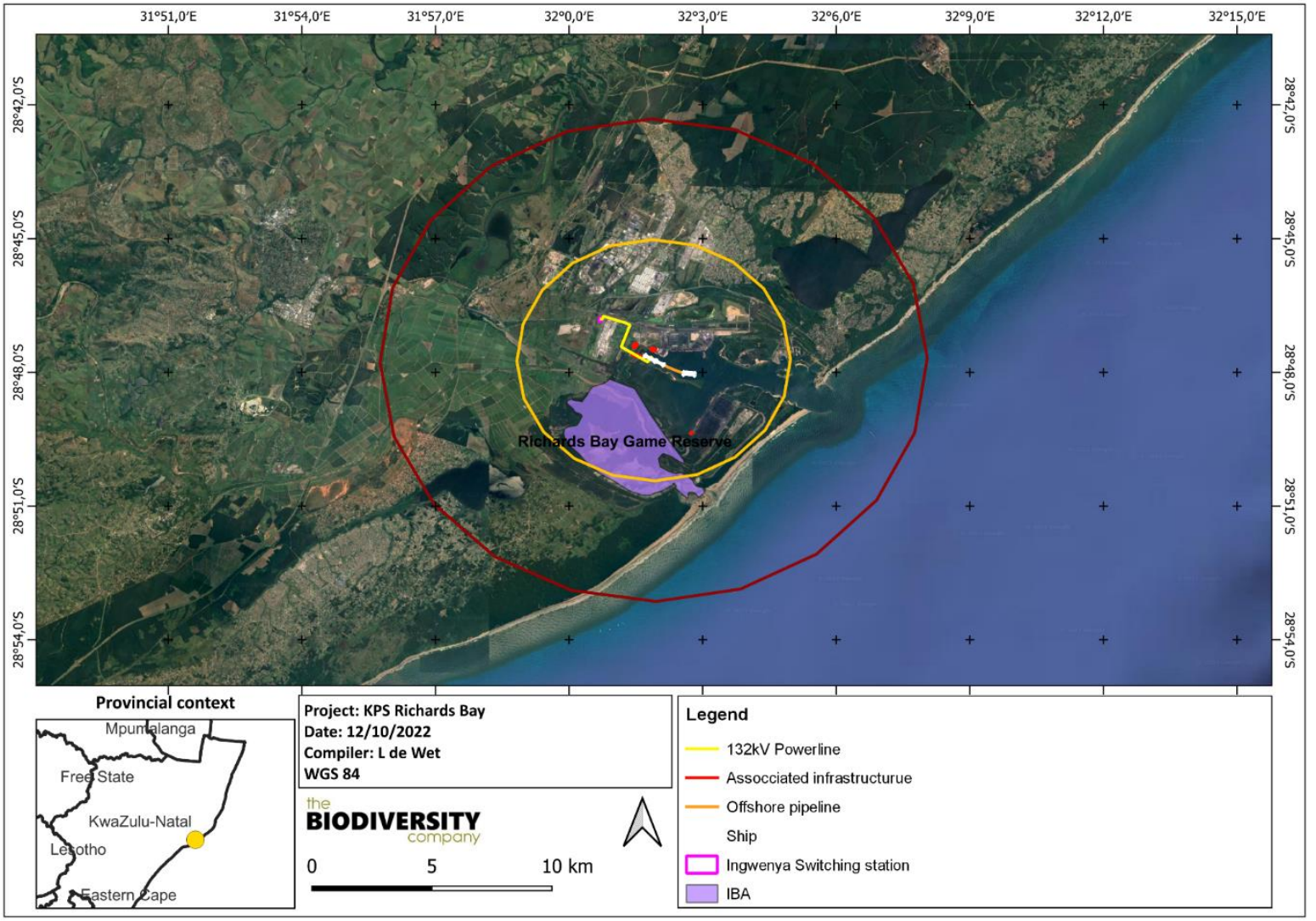


Figure 4-5: Important Bird Areas proximal to the Karpowership site.

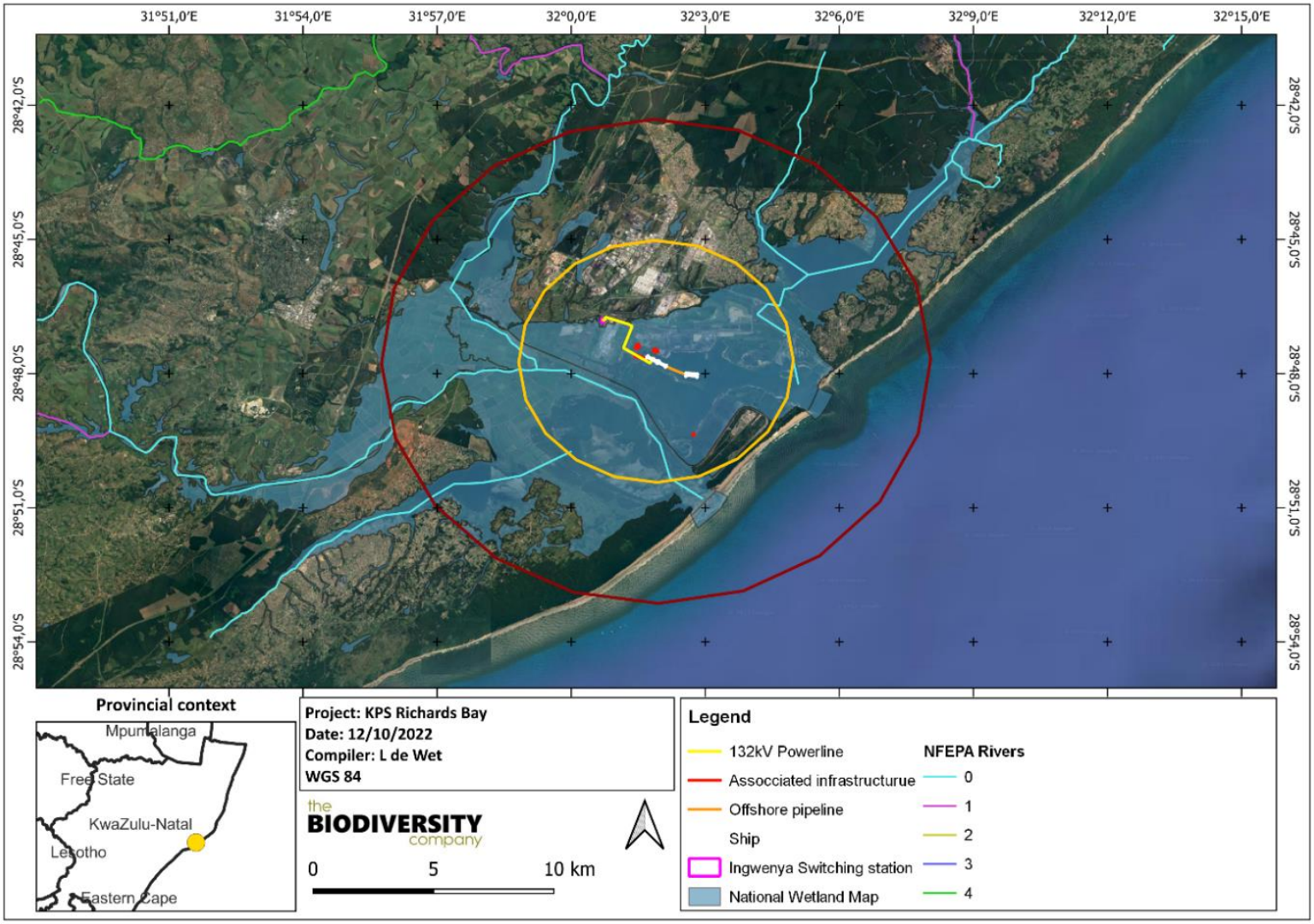


Figure 4-6: Inland water features associated with the project area

5 Biodiversity baseline

5.1 Vegetation

5.1.1 National Vegetation Map

According to Mucina and Rutherford (2006), there are two vegetation types within the Karpowership site: Subtropical Alluvial Vegetation (Aza 7) and Maputaland Coastal Belt (CB1) (Figure 5-5). This vegetation is mapped in the National Vegetation Map of 2018 (Mucina & Rutherford, 2018). The map indicates that Swamp Forest and Mangrove Forest occur adjacent to the Karpowership site. These vegetation types are thus discussed here as well.

Subtropical Alluvial Vegetation

This vegetation type is located in the Limpopo, Mpumalanga and KwaZulu-Natal provinces as well as in eSwatini and occurs on river alluvia and around river-fed pans. It comprises flat alluvial riverine terraces supporting a complex of macrophytic vegetation, marginal reed beds, flooded grasslands, ephemeral herblands and riverine thickets. Important taxa include *Vachellia natalitia, Vachellia robusta, Phoenic reclinata, Ziziphus mucronata, Euclea divinorum, Grewia bicolor, Eragrostis trichophora, Panicum maximum* and *Chloris virgata* among others. There is one endemic taxon occurring in flooded grasslands and herblands: *Crotalaria mollii*. This vegetation type has a conservation target of 31% with some statutorily conserved.

Maputaland Coastal Belt (CB1)

This vegetation type occurs in the KwaZulu-Natal Province and continues into southern Mozambique along the coast of the Indian ocean. It comprises a flat coastal plain that in its current state is composed of pockets of forest types, thickets, primary and secondary grasslands, timber plantations and cane fields. Important taxa include *Helichrysum kraussii, Tephrosia longipes, Syzigium cordatum, Vachellia natalitia, Anonna senegalensis, Phoenix reclinata, Smialx anceps, Diheteropogon amplectens, Themeda triandra* and *Trachypogon spicatus* among others. This vegetation type has several endemic taxa which include *Helichrysum adenocarpum* subsp. *ammophilum, Vahlia capensis* subsp. *vulgaris* var. *longifolia, Asclepias Gordon-grayae, Kniphofia leucocephala, Raphionacme lucens* and *Restio zuluensis*. This vegetation type is vulnerable with a conservation target of 25% and 15% statutorily conserved.

Mangrove Forest (FOa 3)

This vegetation type is located in KawZulu-Natal and the Eastern Cape provinces in coastal lagoons and estuaries. It is species poor and tends to be monospecific with low dense forests of mangroves with fringing thickets of *Hibisuc tiliaceus* and *Acrostichum aureum*. Species occurring in mangroves include *Avicennia marina, Bruguiera gymnorrhiza, Ceriops tagal, Lumnitzera racemosa, Rhizophora mucronata* and *Xylocarpus granatum.* This vegetation type is critically endangered with a conservation target of 100% and 72% statutorily conserved. Much of the original extent of mangroves in South Africa was cleared for harbour development.

Swamp Forest (FOa 2)

This vegetation type occurs in KwaZulu-Natal and Eastern Cape provinces in pockets and narrow belts along the Indian ocean coast. They comprise 12 – 15m tall forests with two main strata (canopy and shrub layers). Dominant species include *Ficus trichopoda, Barringtonia racemosa, Casearia gladiiformis, Cassipourea gummiflua, Syzigium cordatum, Phoenix reclinata,* and *Raphia australis*. Other species include the ferns *Microsorum punctatum* and *Nephrolepis biserrata*. *Raphia australis* is endemic. Swamp forests are critically endangered with a conservation target of 100% and approximately 66% statutorily conserved.

5.1.2 Vegetation of the study area

Vegetation types

The transmission line route and ancillary infrastructure was investigated on site. The site has been heavily modified in several areas, and as a result, there are several sections traversed by both the preferred and alternative routes that comprise ruderal and weedy vegetation with large numbers of alien invasive species. As the site is located within a Port/ Harbour zone, it is largely disturbed as expected. The majority of the preferred route runs alongside existing infrastructure, much of it comprising existing powerlines. The areas traversed by the transmission line options have been divided into several different vegetation types, the descriptions of which are outlined in Table 5-1.

The presence of the estuary, and several canals structured around the river provide a range of habitats for both plants and animals. There is thus a salinity gradient from the estuary inland of these flooded areas. The gradient allows for the presence of mangroves and associated mudflats with some salt marsh species close to the estuary, with a change to reed beds (dominated by *Phragmites australis*) as the water becomes fresher inland. On the edges of freshwater streams, canals and within permanent wetlands, swamp forest is present (indicated by the presence of *Ficus tricopoda*). Dry land allows for the development of *Vachellia*-dominated bushveld vegetation with scattered *Syzygium cordatum* trees.

The area is complex in its vegetation, and descriptions of the vegetation present can be seen in Table 5-1 with a map in Figure 5-6: Site specific vegetation map.

Table 5-1: Vegetation types of the Richards Bay transmission line options

Name	Description	Figure
Transformed	These are areas that have no natural vegetation remaining and comprise existing infrastructure or buildings	Figure 5-1
Modified	These areas comprise vegetation dominated by alien invasive plant species or ruderal indigenous species and shows indications that the substate is artificial in nature. These areas have been created due to dumping, earth moving activities or other large-scale disturbances that have altered the vegetation. These areas were further defined by the evidence of large-scale earth moving visible in Google Earth imagery for the area. The position of the laydown area and adjacent transmission lines fall into one such area and a description of the process can be seen in Section 5.1.2.2.	Figure 5-1
Degraded	These areas have been impacted by anthropogenic activities but still maintain their natural function. These include areas of wetlands that have been impacted by existing Port/ Harbour Zone infrastructure. Vegetation tends to be dominated by indigenous species, but also contains some alien invasive plant species.	Figure 5-1

Name	Description	Figure
Mangroves	Comprising primarily grey mangroves (*Avicennia marina*) but with Orange mangrove (*Bruguiera gymnorrhiza*) as well, these occur on the edge of the estuary and canals where salt water is present. Mangroves are Critically Endangered.	Figure 5-2
Reed beds	These are areas of wetlands that are dominated by reeds, primarily *Phragmites australis* but also large stands of papyrus (*Cyperus papyrus*). These areas can be defined by the vegetation present, but do not constitute a wetland delineation, which is provided in the specialist wetland report.	Figure 5-2
Swamp forest	Swamp forest occurs in wet areas where salinity is low and is dominated by *Ficus tricopoda* but also contains *Barringtonia racemose* as well as *Mimusops caffra* in places. Swamp forest is considered highly sensitive and Critically Endangered.	Figure 5-2
Bushveld	In some areas, outside of wetlands and the estuary (such as the switching station location), bushveld is present. This comprises several sand-alone trees, Usually *Vachellia* species but also often *Syzygium cordatum* as well as several grass species including *Melenis repens, Spropobolus pyramidalis, Digitaria natalensis* and others.	Figure 5-2

Special note – Zostera capensis

Mostert (2014) found there to be *Zosterna capensis* beds within the Mangrove swamp areas within the permanently inundated section of this isolated mangrove swamp. It is noted to be the first recorded instance of *Z. capensis* within Richards Bay in 30 years (Mostert 2014). The *Z. capensis* beds (which are of conservation importance) are located approximately 70m from the proposed laydown area and >70m from other proposed infrastructure (Figure 5-6). It should be noted that this wetland and associated area of mangroves and *Z. capensis* was formed artificially after the dredging of this section of the bay (the 600 series).

Attempts were made to confirm the presence of the *Zostera capensis* in this area but the mangroves surrounding the permanently inundated areas were dense and the centre inaccessible. In addition, a drone was used to attempt to access these areas and confirm the presence of *Zostera* however, the water was not clear and confirmation could not be made. It is assumed that the beds are still present. However, the location of the ancillary infrastructure is not expected to impact any *Zostera*.

The absence of any *Zostera capensis* beds surrounding the sandspit and beach adjacent to the berthing site of the powership were confirmed on the 15th of April 2021.

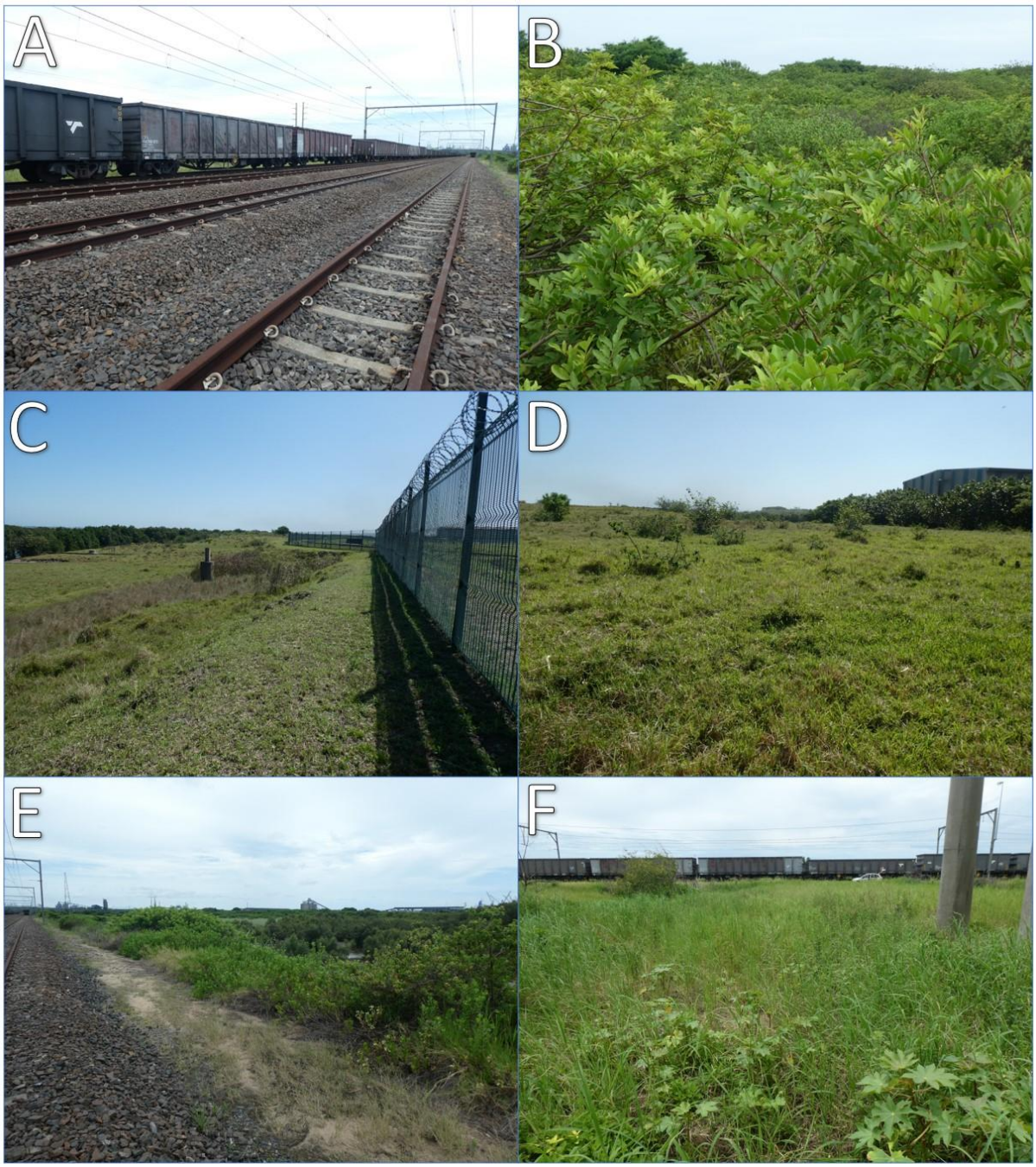


Figure 5-1: Types of transformed and modified habitat in the Richards Bay site area. A: some areas have been completely transformed for developments. B and C: Some areas have been completely transformed in the past, and as a result comprise no originally occurring vegetation but dense stands of aliens and indigenous ruderal species or lawn grass. D, E and F: Some areas comprise indigenous vegetation that has been degraded and has low species numbers dominated by ruderals.

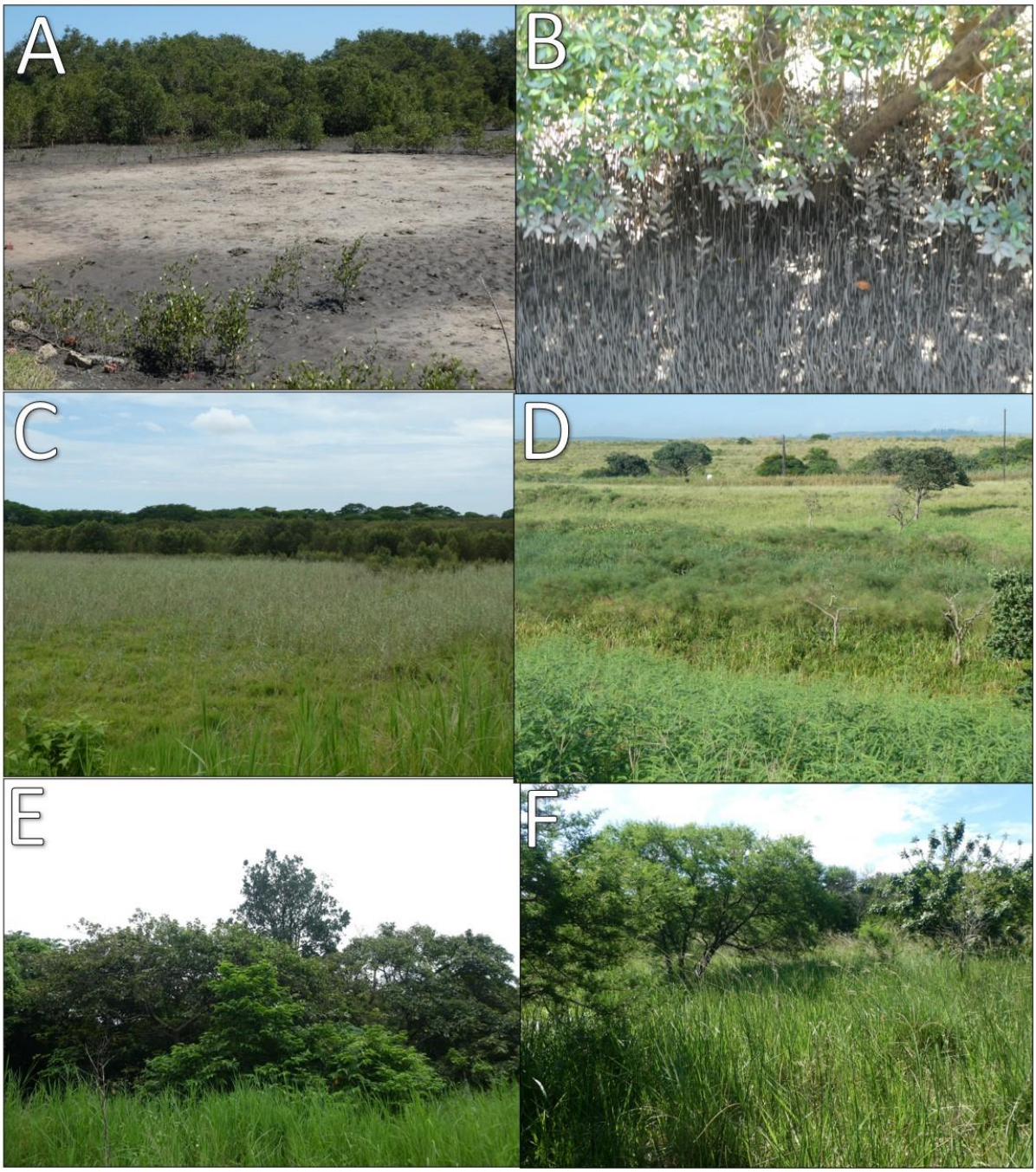


Figure 5-2: Types of natural vegetation occurring in the Richards Bay site including A and B: Mangroves, C and D: reedbeds (or freshwater wetlands), E: Swamp forest and F: Bushveld.

Modified habitat

As per Table 5-1, areas of the study site are comprised of modified habitat as these areas have been subject to earth-moving activities and heavy anthropogenic activities in the past. Then area adjacent to the powership berth where the transmission line will join to the ship as well as the location of the laydown areas is one such area.

It is clear that in the past, the majority of this area has been disturbed (Figure 5-3 and Figure 5-4). The area has been used as a dump site for building rubble and dredged material and is comprised of largely impenetrable dense bush of dominated almost entirely by the invasive *Schinus terebinthifolius* and the indigenous coastal shrub *Osteospermum moniliferum.* There are some mangrove forests to the south of the proposed transmission line routes.

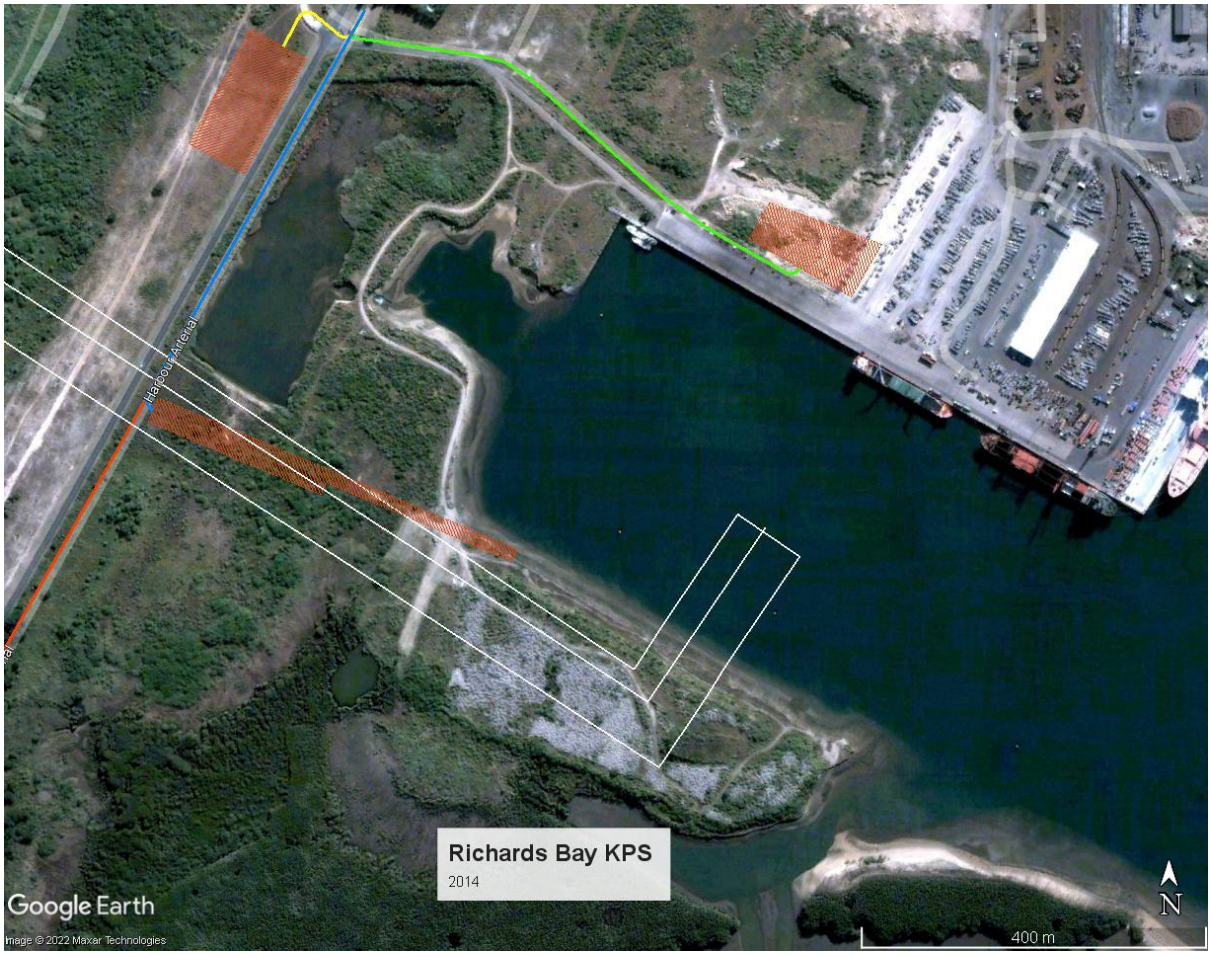


Figure 5-3: Imagery from 2004 indicated that the area of the transmission lines has been disturbed.

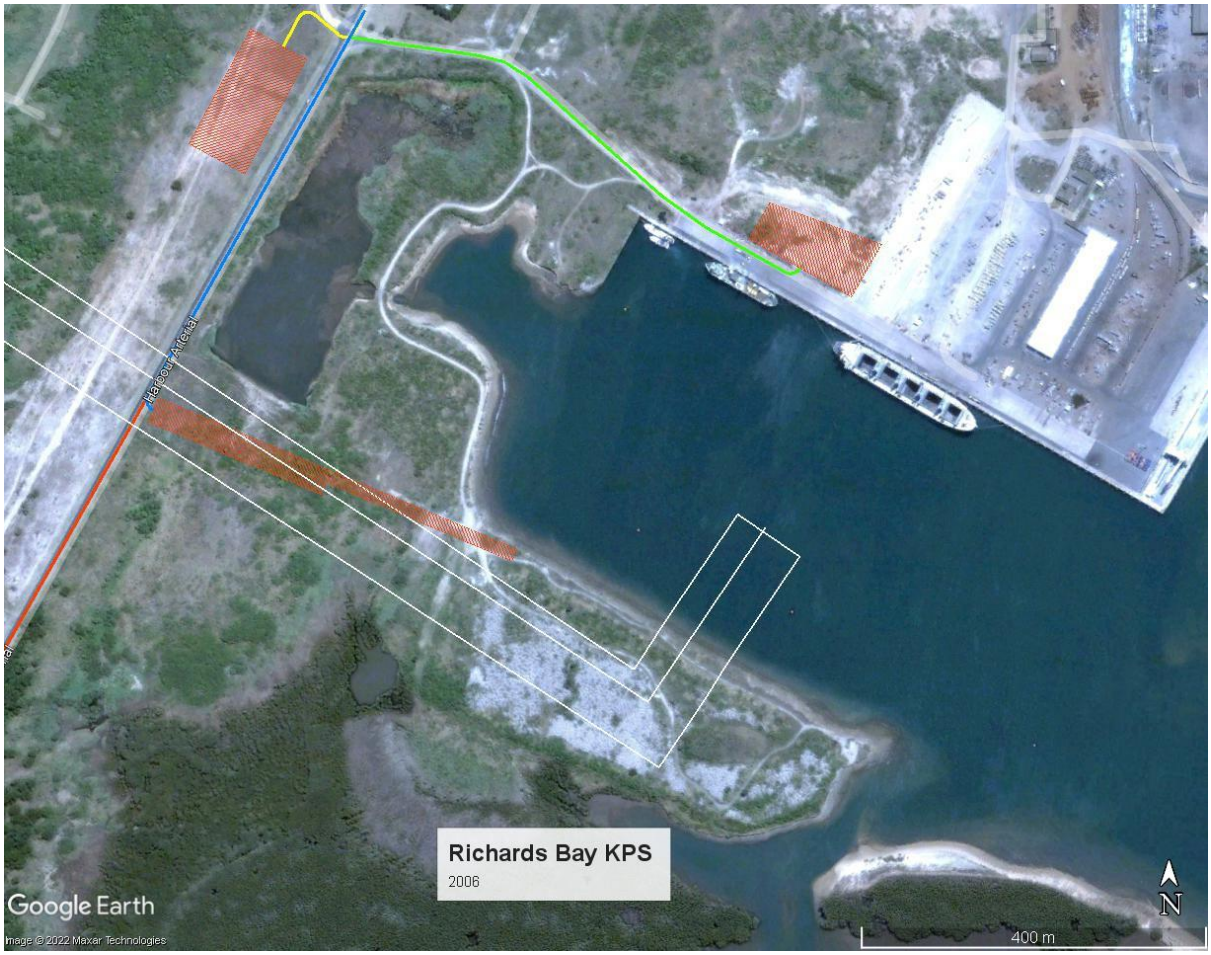


Figure 5-4: Imagery from 2006 indicated that the area of the transmission lines has been disturbed.

Preferred route

From the ship berth area, the preferred route traverses the modified habitat, then crosses Harbour Arterial Road. Thereafter it transects an area of wetlands dominated by reed beds with invasive *Schinus terebinthifolius* trees. It then crosses the existing railway line and runs adjacent to the existing powerline to the switching station area where it traverses primarily transformed and modified habitat as well as some small areas of reed beds and bushveld.

The area of vegetation beneath and adjacent to the existing powerlines comprises wetland vegetation adjacent to mangroves running along a canal. The existing pylons are constructed on berms covered in a mix of alien and indigenous ruderal vegetation. Provided the existing berms are utilised in this section, it is not anticipated that the construction will have large additional detrimental impacts to the wetlands and mangroves in this section.

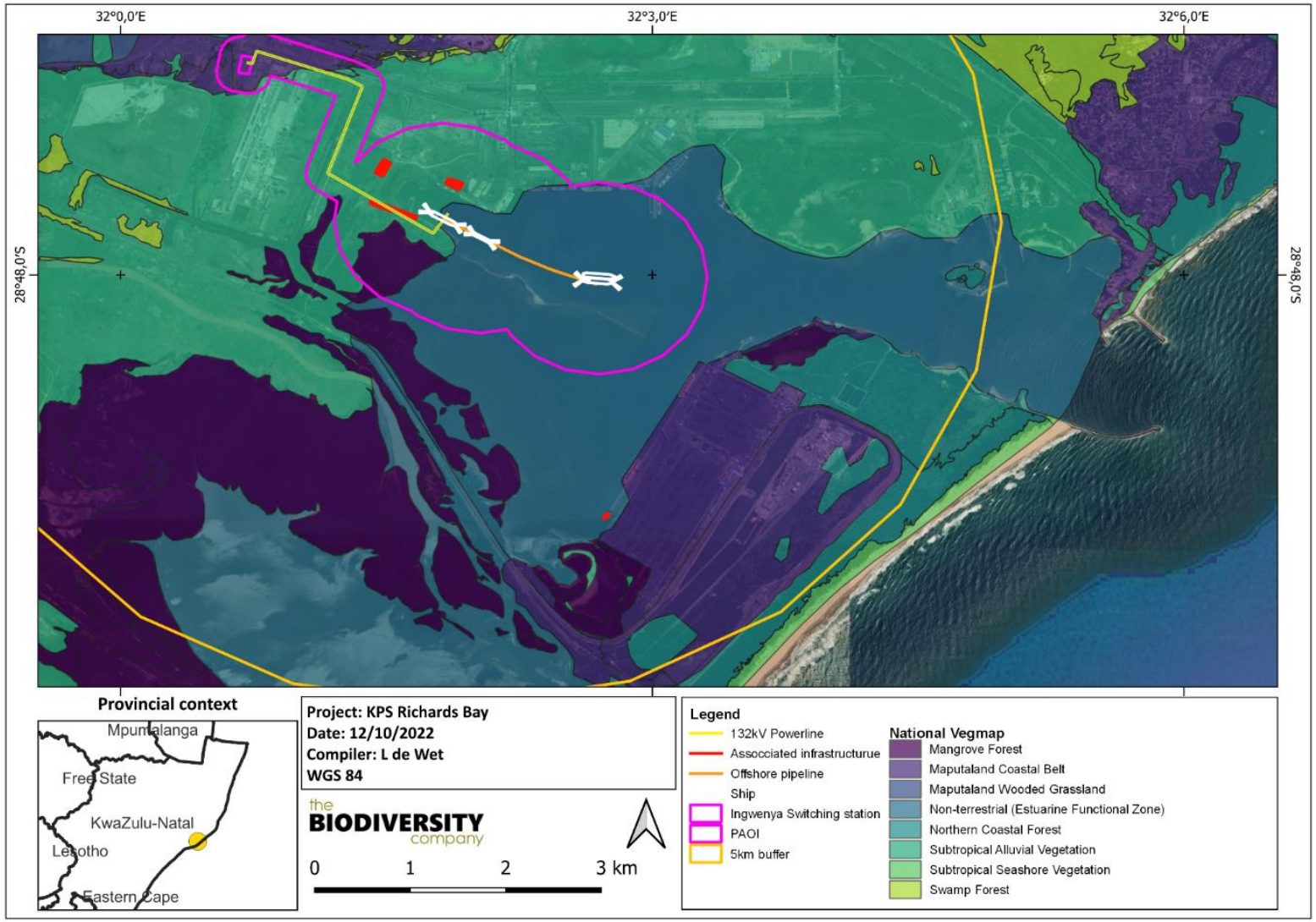


Figure 5-5: National Vegetation Map (Mucina & Rutherford, 2018) for the Karpowership site and surrounds.

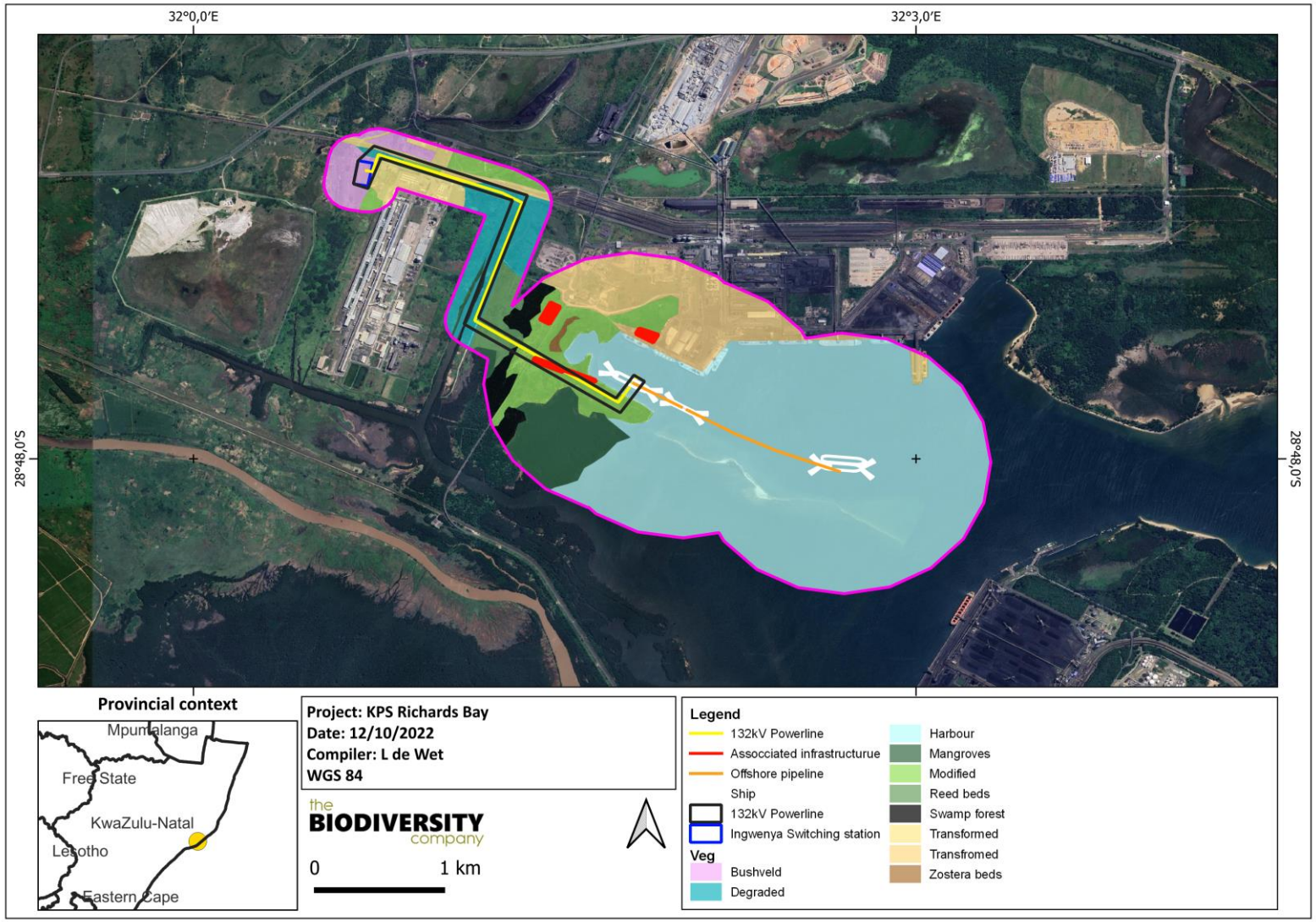


Figure 5-6: Site specific vegetation map.

6 Flora

Overall, the expected (POSA and Mucina and Rutherford) and recorded species list includes 546 species (Appendix A) that occur in the region of the study site. It is not possible for all of these species to occur in the relatively small area of the study site, and thus only a comparatively small percentage of species were recorded from the site (65 species). The most common families expected (not necessarily recorded) in the study area include:

- Poaceae (grass family) – 82 species
- Cyperaceae (sedge family) – 67 species
- Fabaceae (pea family) – 44 species
- Asteraceae (daisy family) – 43 species

Species recorded from the site include a variety of trees, shrubs, grasses and sedges typical of the region in disturbed areas. Some trees of conservation importance were recorded including mangroves. The area in general has a high number of alien invasive plant species and ruderal indigenous species due to its nature as a disturbed site.

6.1 Species of Conservation Concern

SSC include those species that are listed on The National Red List for Plants (redlist.sanbi.org, as given by POSA).

Overall, 7 species of Conservation Concern are expected from the study area (Table 6-1). Of these:

- One (1) (*Kniphofia leucocephala*) is listed as Critically Endangered on the South African Red Data List
- One (1) (*Nidorella tongensis*) is listed as Endangered on the South African Red Data List
- Three (3) are listed as Vulnerable on the South African Red Data List
- One (1) (*Silene burchellii* subsp. *burchellii*) is listed as Near Threatened on the South African Red Data List
- One (1) (*Sisyranthus franksiae*) is listed as Data Deficient on the South African Red Data List

No SSC were recorded from the site.

6.2 Protected Species

Protected Species include those species on one or more of the following lists:

- National Protected Tree List (Government Gazette Vol. 593, 21 November 2014, No. 38215);
- Provincial Protected Species List (Nature Conservation Ordinance No. 15 of 1974);

- National Protected Species List or TOPS (R 1187 of 2007); and

Overall, 22 species of Protected Species are expected and have been recorded from the study area (Table 6-1). Of these:

- None (0) are listed on the TOPs list
- Fifteen (15) are listed on Schedule 12 of the Provincial Conservation Ordinance
- Seven (7) are on the National List of Protected Trees

Some Protected Species recorded from the site include the Swamp Forest dominant tree *Ficus trichopoda*, as well as the mangrove trees (*Rhizophoramucronata*), all of which are on the National List of Protected Trees (Figure 6-1). *Sideroxylon inerme*, and *Mimusops caffra* also protected trees were also recorded from the site. If any of these trees are cut, damaged or removed, a permit must be obtained for each tree prior to doing so. In addition, some geophytic species from the Iridaceae family were recorded, these are protected in terms of the Provincial Conservation Ordinance. One orchid species, *Eulophia speciosa* was recorded from the severely degraded vegetation adjacent to the Port. Orchids are provincially protected and require a permit for their destruction from Ezemvelo KwaZulu-Natal Wildlife prior to any destruction.

It must be noted that applications for licences regarding protected trees and trees within a natural forest were submitted to the Department of Forestry in May 2021. The department will process the applications once an Environmental Authorisation is issued.

Table 6-1: Species of Conservation Concern Expected and recorded from the Richards Bay site.

Species	Rec[5]	Endemic[6]	RL[7]	TOPs[8]	Trees[9]	PCO[10]
Crinum campanulatum						Sch12
Crinum moorei						Sch12
Crinum paludosum						Sch12
Searsia nebulosa forma nebulosa		x	NE			
Sisyranthus franksiae		x	DD			
Wolffiella denticulata		x	VU			
Kniphofia leucocephala		x	CR			Sch12
Trachyandra saltii						Sch12
Nidorella linifolia		x	LC			
Nidorella tongensis			EN			
Heliophila subulata		x	LC			
Silene burchellii subsp. burchellii		x	NT			
Ficinia laciniata		x	LC			
Aspalathus gerrardii		x	VU			

[5] Recorded from the study site
[6] As per POSA or Mucina and Rutherford 2011
[7] As per the South African Red List http://redlist.sanbi.org/
[8] As per the National TOPs List
[9] As per the National List of Protected Trees
[10] As per the Provincial Conservation Ordinance

Species	Rec[5]	Endemic[6]	RL[7]	TOPs[8]	Trees[9]	PCO[10]
Philenoptera violacea					x	
Pelargonium grossularioides		x	LC			
Aristea compressa			LC			Sch12
Aristea torulosa			LC			Sch12
Freesia laxa subsp. azurea			VU			Sch12
Gladiolus longicollis subsp. platypetalus			LC			Sch12
Barringtonia racemosa					x	
Ficus trichopoda	x				x	
Nymphaea nouchali var. caerulea						Sch12
Chionanthus peglerae		x	LC			
Cheirostylis nuda			LC			Sch12
Eulophia angolensis						Sch12
Eulophia horsfallii						Sch12
Eulophia speciosa	x		LC			Sch12
Oeceoclades lonchophylla			LC			Sch12
Zeuxine africana						Sch12
Stipagrostis zeyheri subsp. barbata		x	LC			
Afrocarpus falcatus						
Bruguiera gymnorrhiza	x				x	
Ceriops tagal					x	
Rhizophora mucronata					x	
Mimmusops caffra	x				x	
Rhoicissus sessilifolia		x	LC			

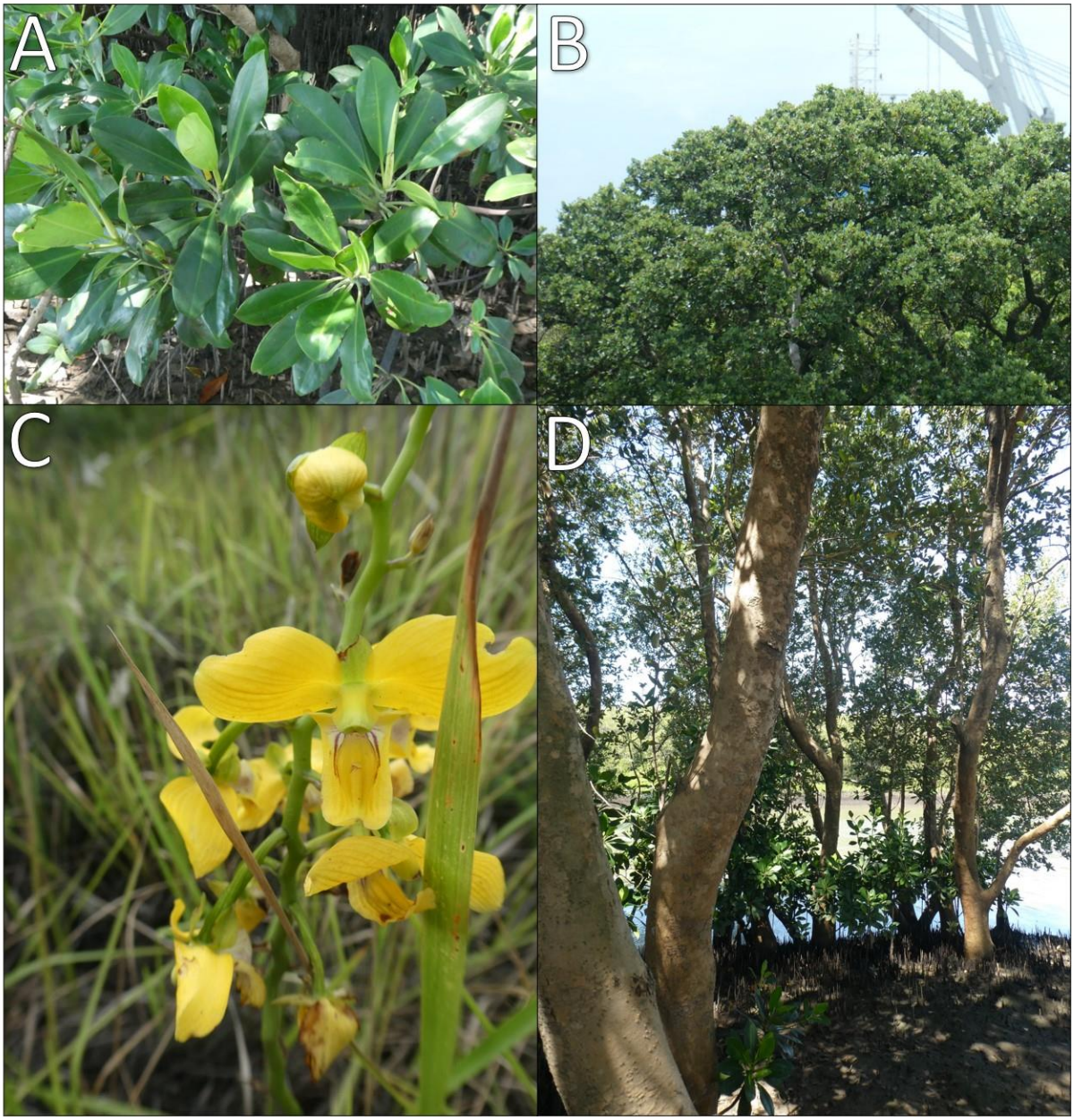


Figure 6-1: Protected plants recorded from the site. A: *Rhizophora mangle*, B: *Mimusops caffra*, C: *Eulophia speciosa* and D: *Avicennia marina*.

6.3 Alien Invasive Plants

Not all species recorded from the study area and surrounds are indigenous, some of these are not indigenous but have become naturalised. Other species are invasive in nature and legislated by CARA or NEM:BA (Table 6-2 and Table 6-3).

Table 6-2: Conservation of Agricultural Resources Act (CARA) legislation

Category	Restriction
1	Invader plants must be removed and destroyed immediately. No trade in these plants.
2	Invader plants may be grown under controlled conditions in permitted zones. No trade on these plants.
3	Invader plants may no longer be propagated or sold. Existing plants do not need to be removed.

Table 6-3: National Environmental Management: Biodiversity Act (NEM:BA) invasive species legislation.

Restriction	Category 1b	Category 2	Category 3
b. Having in possession or exercising physical control over any specimen of a listed invasive species.	Exempted	Permit required	Exempted
f. Spreading or allowing the spread of any specimen of a listed invasive species.	Prohibited	Permit required	Prohibited

Aliens occur throughout the site, primarily due to disturbance occurring as part of the Industrial Development of the area. Some recorded species include Brazilian pepper (*Schinus terebinthifolius*), Siam weed (*Chromolaena odorata*), Lantana (*Lantana camara*), and Guava (*Psidium guajava*) (Table 6-4 and Figure 6-2).

Table 6-4: Alien Invasive Plant Species Expected and recorded from the Richards Bay site.

Species	Common name	Recorded	CARA	NEM:BA
Schinus terebinthifolius	Brazilian pepper	x	1	1b
Nerium oleander	Oleander		1	1b
Ageratum houstonianum	Mexican ageratum	x	1	1b
Chromolaena odorata	Triffid weed	x	1	1b
Lepidium bonariense	Pepper		1	
Lepidium didymum	Pepper		1	
Lepidium virginicum	Pepper		1	
Canna indica	Indian shot	x	1	1b
Casuarina equisetifolia	Horsetail tree	x	2	2
Cuscuta campestris	Common dodder	x	1	1b
Ricinus communis	Castor-oil plant	x	2	2
Malvastrum coromandelianum	Prickly malvastrum			1b
Psidium guajava	Guava	x	2	3

Species	Common name	Recorded	CARA	NEM:BA
Passiflora edulis	Purple granadilla			2
Rivina humilis	Blood berry		1	1b
Pinus sp.	Pine	x	2	
Arundo donax	Spanish reed	x	1	1b
Grevillea banksii	Australian silver oak			1b
Cardiospermum grandiflorum	Balloon vine		1	1b
Lantana camara	Lantana	x	1	1b
Verbena bonariensis	Wild verbena	x		1b
Verbena brasiliensis	Brazilian verbena			1b

Figure 6-2: Alien invasive plants of the study area: A: *Lantana camara*, B: *Schinus terebinthifolius*, C: *Ricinus communis*, D: *Cuscuta campestris*, E: *Catharantgs roseus* and F: *Chromolaena odorata*..

7 Fauna

The data for the Quarter Degree Square in which the project area falls for each of the following groups was obtained from the Animal Demography Unit's Virtual Museum:

- Mammals (full list can be found in Appendix A)
- Reptiles (full list can be found in Appendix B)
- Amphibians (full list can be found in Appendix C)

Some of these species including tracks and signs can be seen in Figure 7-1. Avifauna have not been included here as they have been presented in a separate report.

7.1 Mammals

Mammal species recorded from the site (incidental encounters, scat, tracks and signs) include the following:

- Vervet monkey (*Chlorocebus pygerythrus*)
- Hippopotamus (*Hippopotamus amphibius*)
- Slender mongoose (*Herpestes sanguineus*)
- Cape Clawless Otter (*Aonyx capensis ssp. capensis*)

There is habitat available for several mammal species including small mammals. The probability pf occurrence of ADU Virtual Museum Species of Conservation Concern can be seen in Table 7-1. One of the SCC species was recorded on site: Hippopotamus (*Hippopotamus amphibius*).

Table 7-1: Mammal Species of Conservation Concern and Likelihood of Occurrence.

Scientific name	Common name	Red List	TOPS	Provincial	Likelihood of occurrence
Panthera pardus	Leopard	VU	VU	Sch3	Low
Hippopotamus amphibius	Common Hippopotamus	LC		Sch2	Definite (recorded)
Dasymys incomtus	Common Dasymys	NT			Moderate
Aonyx capensis	African Clawless Otter	NT	PR		Low

7.2 Reptiles

Reptile species recorded from the site include the common Stiped skink (*Trachylepis striata*), Southern tree agama (*Acanthocercus atricollis*) and Common tropical house gecko (*Hemidactylus mabouia*). Several snake species have been identified as located within the site and are encountered by people who work in the general port area. A list has been requested from Transnet. There is habitat available for several reptile species the most likely noted when

encountered include venomous snakes. The probability pf occurrence of ADU Virtual Museum Species of Conservation Concern can be seen in Table 7-2.

Table 7-2: Reptile Species of Conservation Concern and Likelihood of Occurrence.

Scientific name	Common name	Red list	Tops	KZN	Likelihood of Occurrence
Crocodylus niloticus	Nile Crocodile	VU	PR		Moderate
Lycophidion pygmaeum	Pygmy Wolf Snake	NT			Low
Python natalensis	Southern African Python	LC	PR		High

7.3 Amphibians

Two amphibians have been recorded from the site: Painted reed frog (*Hyperolius marmoratus)* and Water Lily Reed Frog (*Hyperolius pusillus*). The full ADU expected species list can be found in Appendix C. As frogs can be excellent indicators of habitat quality and disturbance, it is recommended that regular amphibian surveys be conducted as part of a monitoring plan for the Karpowership site and Transnet port area as a whole.

Only one SCC is listed in the ADU list for the site: African Bullfrog (*Pyxicephalus edulis*), with a high likelihood of occurrence.

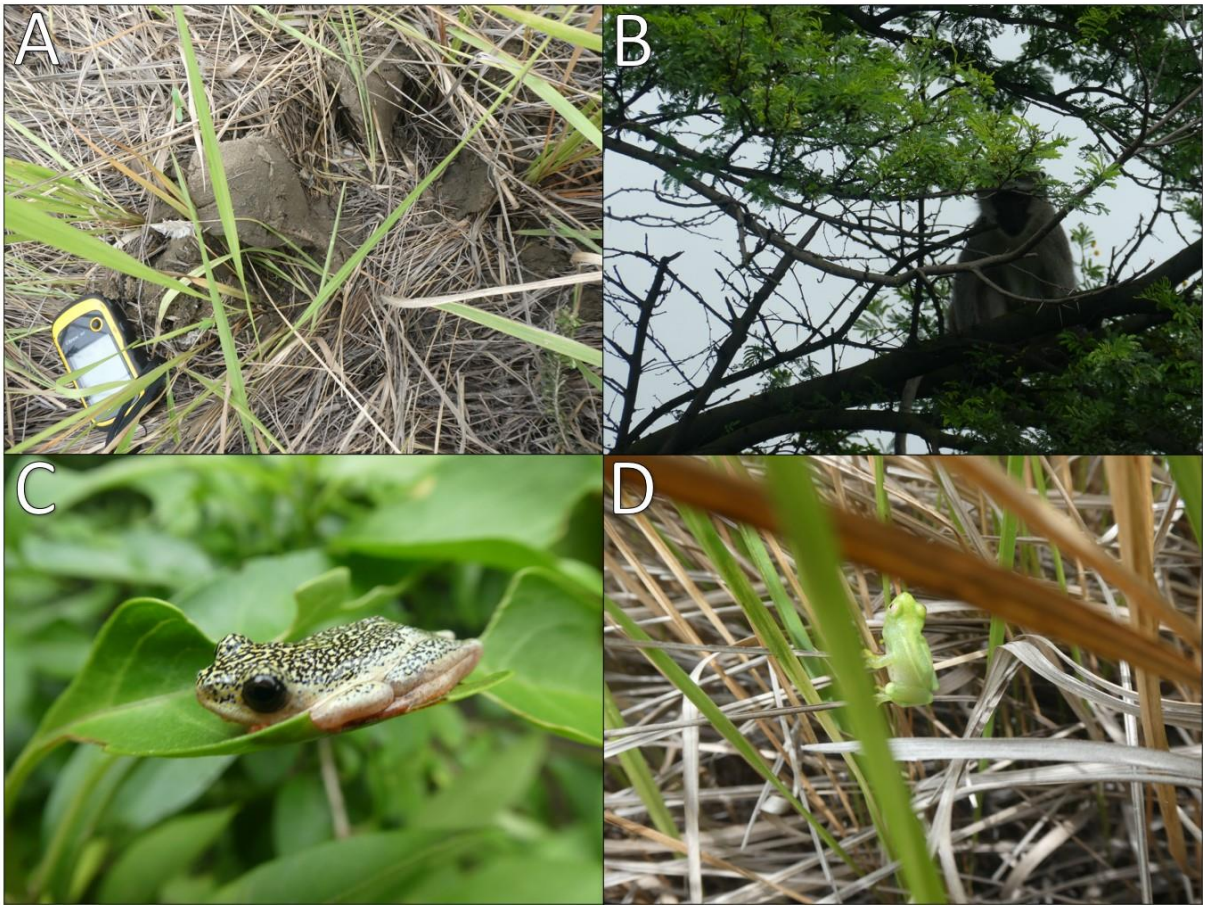


Figure 7-1: Some of the faunal species recorded from the Richard's Bay Karpowership site. A: Hippopotamus (*Hippopotamus amphibius*) spoor, B: Vervet monkey (*Chlorocebus pygerythrus*), C: Painted Reed Frog (*Hyperiolus marmoratus*) and D: Waterlily Reed Frog (*Hyperiolus pusillus*).

8 Sensitivity Assessment

The combined Terrestrial Biodiversity Theme Sensitivity for the assessment area was derived to be Very High as indicated in the National Environmental Screening Tool (Figure 8-1), it can be downloaded at (https://screening.environment.gov.za/screeningtool/#/pages/welcome).

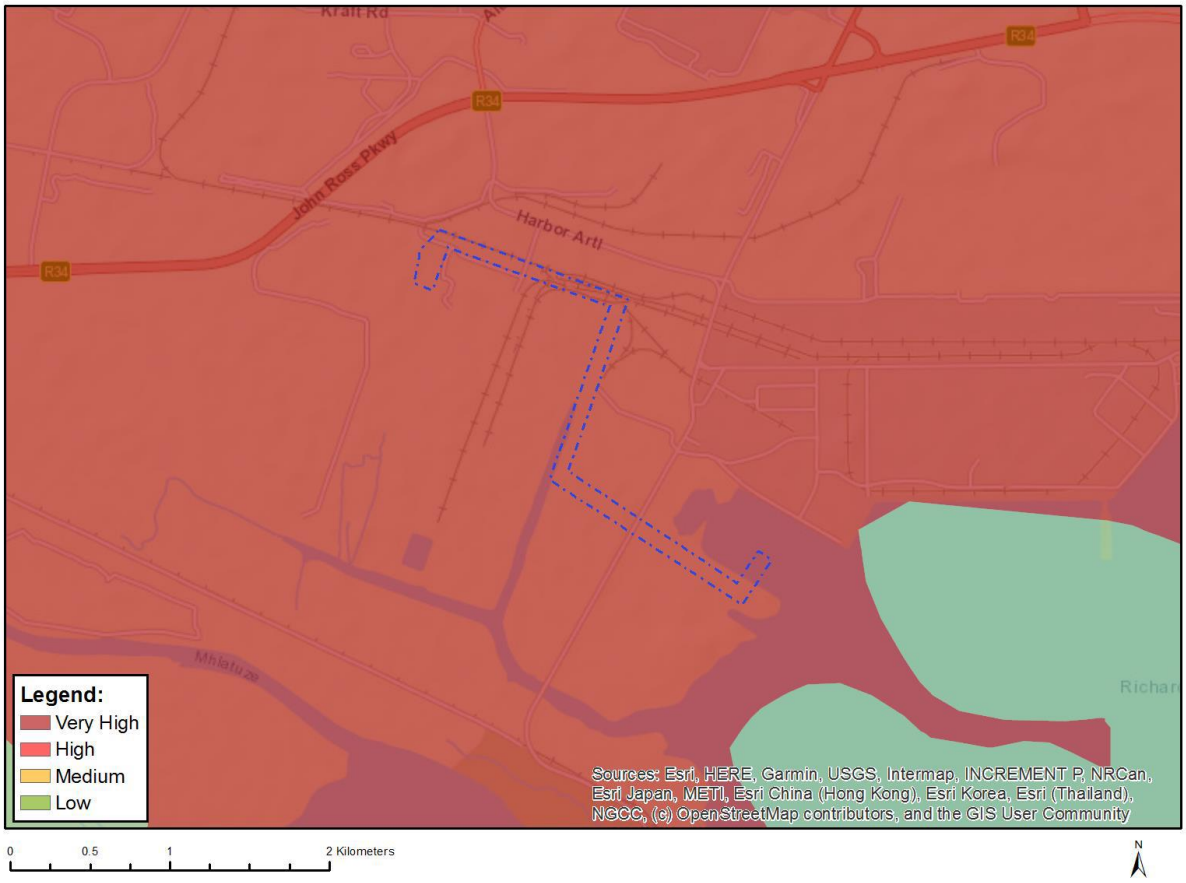


Figure 8-1 Combined Terrestrial Biodiversity Sensitivity of the assessment area

Seven (7) different habitat types were delineated within the assessment area (Table 8-1, Figure 8-2). All habitats within the project area of the proposed development were allocated a sensitivity category or SEI. The sensitivities of the habitat types delineated are illustrated in Figure 8-2. The interpretations of the categories can be found in Table 3-6.

Habitats categorised as Transformed consisted of buildings, roads, and cleared areas and were determined to be a 'Very Low' SEI.

Table 8-1 Summary of habitat types delineated within the field assessment area of the proposed development

Habitat	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Transformed	Very Low	Very low	Very Low	Very High	Very Low
	No natural habitat remaining.	Several major current negative ecological impacts.		Habitat that can recover rapidly (~ less than 5 years) to restore > 75% of the original species composition and functionality of the receptor functionality	
Modified	Very Low	Very low	Very Low	Very High	Very Low
	No confirmed and highly unlikely populations of SCC.	Several major current negative ecological impacts.		Habitat that can recover rapidly (~ less than 5 years) to restore > 75% of the original species composition and functionality of the receptor functionality	
Degraded	Low	Low	Low	High	Very Low
	< 50% of receptor contains natural habitat with limited potential to support SCC.	Several minor and major current negative ecological impacts.		Habitat that can recover relatively quickly (~ 5–10 years) to restore > 75% of the original species composition and functionality of the receptor functionality	
Mangroves	Very High	Very High	Very High	Low	Very High
	Any area of natural habitat of a CR ecosystem type or large area (> 0.1% of the total ecosystem type extent) of natural habitat of an EN ecosystem type.	Very large (> 100 ha) intact area for any conservation status of ecosystem type or > 5 ha for CR ecosystem types.		Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore	
Reed Beds	Medium	Low	Low	High	Very Low
	> 50% of receptor contains natural habitat with potential to support SCC.	Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy used road		Habitat that can recover relatively quickly (~ 5–10 years) to restore > 75% of the original species composition and functionality of the	

Habitat	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
		network surrounds the area. Several minor and major current negative ecological impacts.		receptor functionality	
Swamp Forest	Very High	Very High	Very High	Low	Very High
	Any area of natural habitat of a CR ecosystem type or large area (> 0.1% of the total ecosystem type extent) of natural habitat of an EN ecosystem type.	Very large (> 100 ha) intact area for any conservation status of ecosystem type or > 5 ha for CR ecosystem types.		Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore	
Bushveld	Medium	Low	Low	Medium	Low
	Confirmed or highly likely occurrence of populations of NT species	Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area. Several minor and major current negative ecological impacts.		Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality	

Interpretation of the SEI in the context of the proposed development activities is provided in Table 8-2.

Table 8-2 Guidelines for interpreting Site Ecological Importance in the context of the proposed development activities

Site Ecological Importance (SEI)	Interpretation in relation to proposed development activities
Very High	Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e., last remaining populations of species, last remaining good condition patches of ecosystems/unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.

Site Ecological Importance (SEI)	Interpretation in relation to proposed development activities
Low	Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities.
Very Low	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

The project area was split into 5 areas. The transformed area comprises industrial infrastructure as well as associated infrastructure such as roads and parking lots. These areas cannot be rehabilitated, and no longer comprise indigenous vegetation. Transformed areas have no real ecological importance.

Most of the area comprises secondary or modified vegetation with few intact natural areas remaining with an overall SEI of Very Low. It is important to note that the non-perennial river systems and other watercourses were delineated and assessed as part of the freshwater resource assessments.

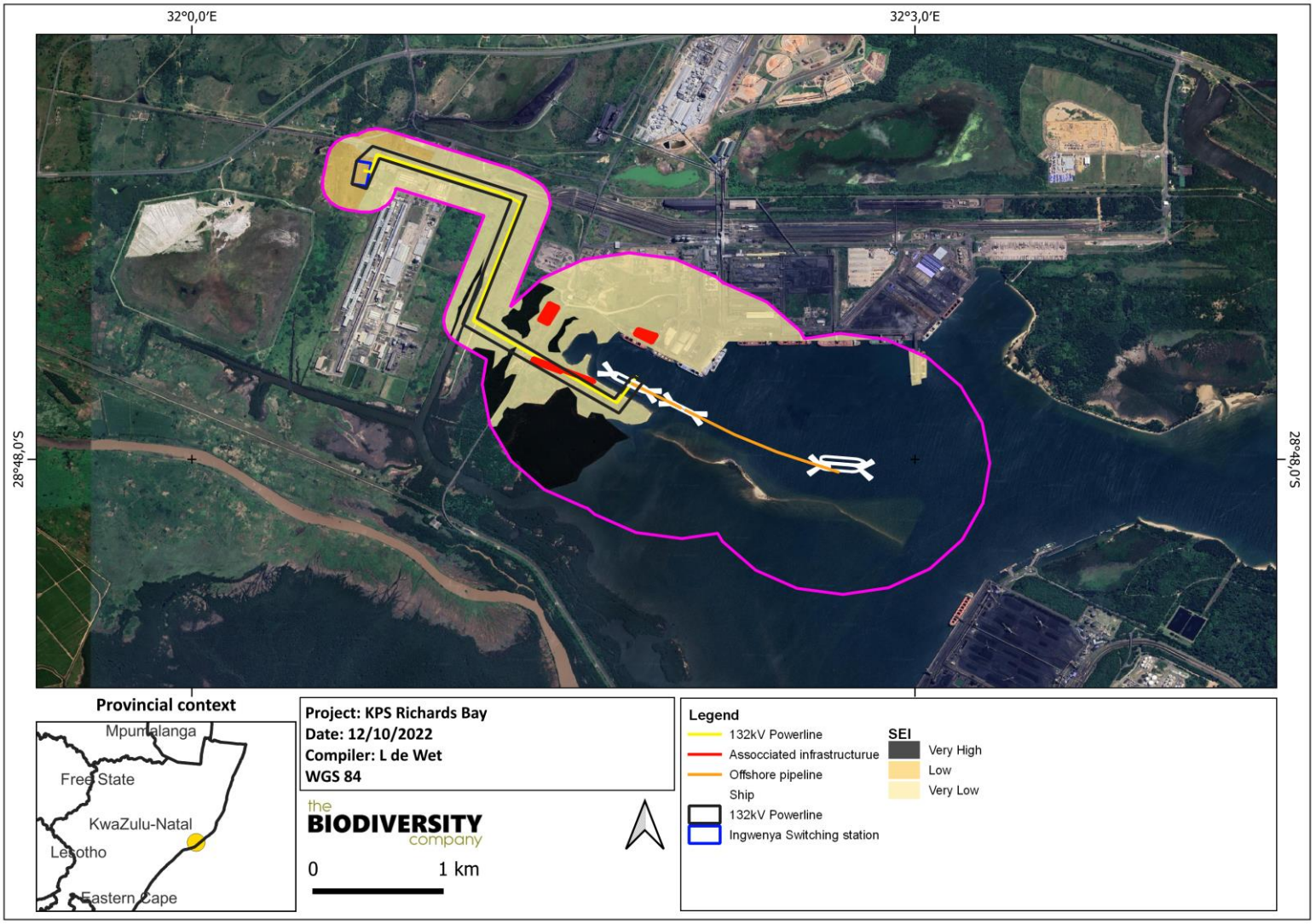


Figure 8-2 Site specific SEI

9 Impact Assessment

9.1 Alternatives considered

9.1.1 Powership location

Alternatives include two site options with associated infrastructure. Alternative 1 (Figure 9-1) is considered the preferred position from the engineering design perspective, as the powerships within the dead-end basin adjacent to the break bulk quay /multi-purpose terminal, and thus located closer to the first tower of the transmission line, positioned on the main land 'promontory' adjacent to the large mangrove stand, and positioned further away from the sensitive sand bank. This alternative position was approved by TNPA in Richards Bay for the power barges in the 2015 study, and thus in line with their port planning.

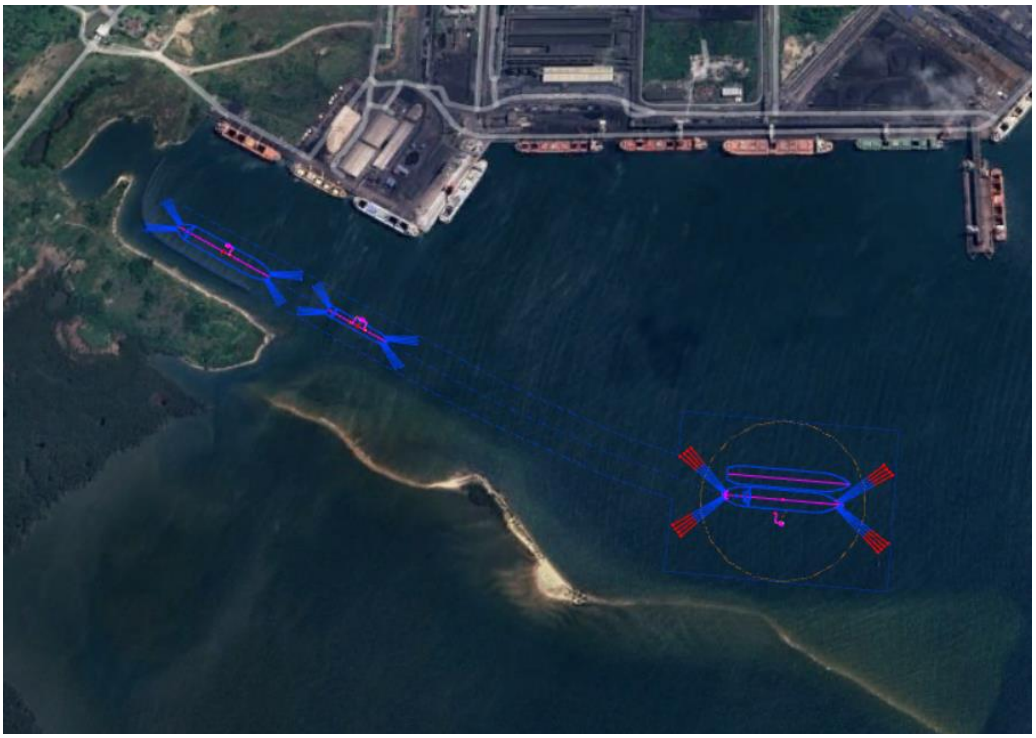


Figure 9-1 Alternative 1 for the position of the powerships.

Alternative 2 (Figure 9-2) is considered less suitable from an engineering perspective, as the Powerships and the FSRU are located too close together, and the Powerships and the mooring systems are placed closer to the sensitive sand bank.

This alternative is not preferred from an avifaunal perspective as all ships will be moored adjacent to the sensitive sandspit area, resulting in increased impacts to avifauna in these areas as opposed to the other option. Impacts associated with Alternative 1 are considered in this report.

Figure 9-2 Alternative 2 for the position of the powerships.

9.1.2 Gas Pipeline alternatives

Alternative 1, considered the preferred alternative is approx. 1500 meters in length, and is preferred from an engineering perspective, as it is in line with the preferred position (from an engineering design perspective) of the Powerships and the FSRU within the port, positioning the Powerships in closer proximity to the land and the transmission line.

Alternative 2 is approx. 500 meters in length, and it relates to the second alternative of the Powerships' positions (further from the shore) and the FSRU. Although this alternative presents a shorter gas pipeline, the position of the Powerships in relation to the shore is not supported from an engineering design perspective, and consequently the associated gas pipeline is not supported from the engineering design perspective, therefore making this alternative less feasible or preferred from a technical perspective.

Alternative 1 is assessed here as it corresponds with alternative 1 for the proposed powership location, which is the option with the least impacts on the avifauna associated with the sensitive sandspit area.

9.1.3 Laydown areas and other ancillary infrastructure (no alternatives)

Positions of the laydown area, site office and stringing yard can be seen in Figure 9-3 and Figure 9-4 and their locations are described in Table 9-1

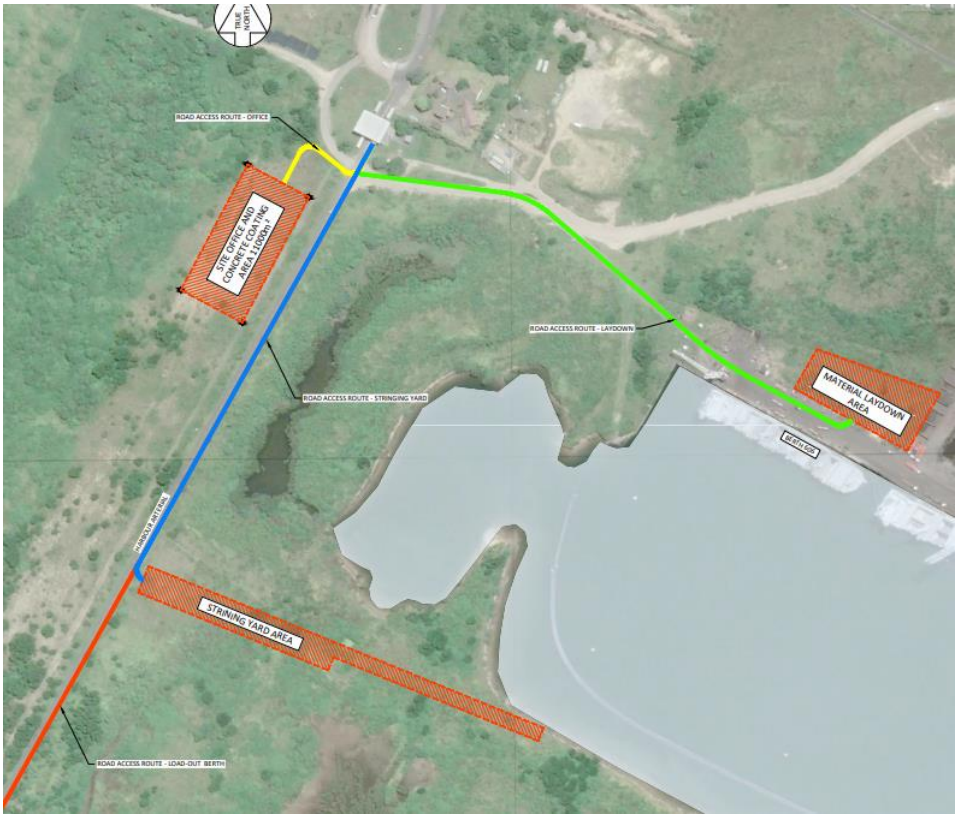


Figure 9-3 Locations of stringing yard, site offices and material laydown areas

Figure 9-4 Locations of load-out berth associated with the powership

Table 9-1 Locations and sizes of ancillary infrastructure

Description	Central Coordinates	Area (m2)
Stringing Yard	28 47' 37.81" S 32 01' 32.28" E	10 000
Material laydown	28 47' 29.11" S 32 01' 52.99" E	8 000
Site Office and concrete coating	28 47' 23.73" S 32 01' 28.88" E	11 000

9.1.4 Transmission line alternatives

Alternative 1 (Figure 9-5), considered the preferred alternative runs towards the existing Harbour arterial road, crossing the road and towards the existing powerline servitude to the west through crossing of an open grassland/scrubland and unchannelled valley bottom wetland, then running along the exiting servitude along Manzamnyama Canal, before heading north and finally in a westerly direction before reaching its end point.

The route is the preferred overhead transmission line from the Powerships to the proposed switching station, as it offers a shorter route to the end point (Approx. 3.6km, estimated 16 towers). The majority of the Alternative 1 route is located in areas of low to moderate ecological sensitivity, and will be traversing high sensitive wetland and swamp forest. The route was further refined following the scoping phase, to reduce the towers within the sensitive area (namely open grassland/scrubland and unchannelled valley bottom wetland) from two towers to one (tower 5).

The location of the route is in transformed areas or in highly degraded areas adjacent to transformed areas, and a large portion of this alternative follows the route of the existing powerline servitude.

The existing servitude will be used for access for the majority of this route, and an additional access / working servitude will be required for the construction of tower 5 between the port and the Manzamynama Canal (i.e. from the Harbour arterial road to Tower 6) as well as from the start point to the Harbour arterial road (towers 1 to 4).

Alternative 2 begins at the same start point, the route joins into the harbour arterial road, and before the lower Bhizolo Canal, it cuts west across the lower Manzamnyama Canal, passing through the mangroves, traversing the smelter site, before heading north through mixed mangrove and wetland habitat on the western boundary of this site. This alternative is not shown on the existing maps as it is considered a No-Go as it traverses sensitive mangrove habitat.

The route is approximately 4km long, requiring 19 towers. The alternative route traverses areas that have been historically transformed, however these areas are still considered highly sensitive due to the unique flora and fauna that resides within these environments. Furthermore, this proposed transmission line route is located to a large extent of its length within wetlands, and it traverses two Critically Endangered vegetation types: Mangrove Forest and Swamp Forest. These have extremely high sensitivity and as such, can be considered as a fatal flaw and therefore this alternative route is not supported.

Details of both alternatives are provided in Table 9-2.

Table 9-2 Details of the transmission line alternatives

Transmission Line Route Alternatives:	Size of the site/servitude:
Alternative A1 (preferred activity alternative)	3.6km with 31m working servitude = 111 600m²
Alternative A2 (not supported)	4km with 31m working servitude = 124 000m²

Figure 9-5 Locations of the preferred (blue) and alternative (red) for the transmission line

9.1.5 Switching station (no alternatives)

A switching station will be established with an approximate footprint of 179 m x 98 m with an area of 17 542 m2. The location of the switching station can be seen in Figure 9-6.

Figure 9-6 Switching Station

9.2 Biodiversity Impact Assessment

The impacts for the proposed development have been rated according to the methodology in Section 3.4. These impacts are based on the layout provided by the client. The current layout provides for the preferred route of the transmission line to be located as much as possible in the low sensitivity transformed, modified and degraded areas of the site. In addition, the location of the laydown area is in modified habitat, with the proposed switching station located in medium sensitivity bushveld vegetation. Some loss of moderate sensitivity areas will occur and is restricted to the loss of invaded reed beds within wetlands, the impacts of which are dealt with in more detail in the wetland specialist assessment. There are three issues and eight impacts overall, and mitigation measures are recommended for each of the impacts.

As any loss of mangrove and/or swamp forest is not acceptable, and the alternative route proposed for the transmission line traverses both, the alternative route is considered fatally flawed and will not be assessed here in more detail.

9.2.1 Issue 1: Loss of vegetation communities

Loss of vegetation communities will definitely occur as a result of the proposed transmission line route (preferred), vegetation lost will comprise mostly transformed, modified and degraded vegetation but does traverse some areas of reed beds as well as bushveld. The switching station is also located within bushveld vegetation. As the project is located within a Port/ Harbour Zone, and limited damage to indigenous habitat will occur, it is considered that this loss is acceptable for the preferred transmission line route and associated infrastructure and is within the limits of acceptable change. Impacts to vegetation are assessed for modified, degraded, and for each of the indigenous vegetation types affected by the proposed transmission line route and associated infrastructure.

Impact 1: Loss of modified habitat

Cause and comment: Modified habitat will be lost as a result of the construction of the proposed transmission line as well as the laydown areas planned for the development. This is located primarily adjacent to the ship berth site. This vegetation is currently growing on artificially constructed berms as well as dumped building rubble and dredge. It is comprised primarily of alien vegetation with a few indigenous ruderal species. As such, sensitivity is low.

This vegetation has no current conservation value in and of itself however, it does form transitional habitat, as well as foraging areas for fauna.

This impact is rated based on the construction methodology of excavating the area, as well as clearing a linear footprint approximately 3m wide and constructing foundations where necessary to host the poles of the transmission lines. It is assumed that this construction footprint will then be allowed to grow vegetation, which will be mowed on a continual basis to allow for access to the transmission lines.

Significance statement: The impact in the construction phase will be short-term, limited to the surrounding area and definite, with a small severity resulting in a medium-low negative overall significance. With mitigation measures, this impact can be reduced to a definite small impact over a brief term, with a significance of low negative.

In the operational phase, the impact will be small, long term and restricted to the surrounding area occurring once a year likely resulting in a medium-low impact. This can be reduced to a low impact with mitigation.

Reversibility: This impact is reversible, as rehabilitation with indigenous plants would result in the restoration of ecosystem services as well as biodiversity and would return these areas of modified habitat to one better than prior to the development.

Irreplaceable Loss of Resources
No, the impact causes a loss of resources that can be replaced.

	Consequence							Likelihood					Total Score	Significance
	Severity		Duration		Spatial scale		TOTAL	Frequency		Probability		TOTAL		
Impact 1: Loss of modified habitat														
Construction Phase														
Without mitigation	Small	2	Short term	2	Surrounding area	2	2	Once a year	1	Definitely	5	3	6	Medium-Low
With mitigation	Small	2	Brief	1	Immediate	1	1.3	Once a year	1	Definitely	5	3	3.9	Low
Operational Phase														
Without mitigation	Small	2	Long term	4	Surrounding area	2	2.6	Once a year	1	Likely	4	2.5	6.5	Medium-Low
With mitigation	Small	2	Long term	4	Immediate	1	2.3	Once a year	1	Unlikely	3	2	4.6	Low

Mitigation and Management:

- In areas of modified habitat, construction using excavation and backfilling is acceptable however, this method of construction must not be used in any other areas (except modified areas).
- No construction or storing of materials should be located outside of the defined layout area. These areas must be demarcated prior to any activities commencing and personnel instructed of the rules to stay out of these areas (unless clearing alien invasive plants).
- Development and implementation of an alien invasive plant species management plan, which would remove and control the alien vegetation within and bordering the site.
- Keep the construction footprint as small as possible.
- No use of the surrounding vegetation will be allowed. This includes use as a toilet facility, for hunting, harvesting of indigenous plants, making fires etc.
- Karpowership should, in conjunction with Transnet, develop and implement a rehabilitation plan for the modified habitat areas where these will be left natural in the future even after planned port expansion.

Impact 2: Loss of Reed beds

Cause and comment: It should be noted that this area, is effectively a wetland, and any recommendations made in the wetland assessment should overrule any made here. This impact deals with the loss of vegetation in particular, and not the loss of wetland functionality and changes in water regimes.

Reed beds will be lost as a result of the construction of the proposed transmission line where it crosses natural habitat between the harbour arterial road and the railway line. This vegetation is currently invaded with *Schinus terebinthifolius* among other invasive species but still serves as a wetland habitat with corresponding ecosystem services and faunal habitat provisions.

This impact is rated based on the construction methodology of excavating only foundations necessary for the erection of individual monopoles and a linear access footprint will not be excavated or constructed. It is assumed that berms are likely to be required in this section due to the wetland nature of the area, however, avoidance of berm construction should be investigated as a mitigation measure.

Significance statement: The impact in the construction phase will be great over the short term and restricted to the surrounding area, it will definitely occur once a year resulting in an overall significance of medium negative. Application of the mitigation measures will result in the reduction of the impact to a low negative.

In the operational phase, the impact will be significant over the long term and restricted to the surrounding area. It will occur once or more in 6 months and will be likely. This will result in an overall impact of medium-low which can be reduced to low with the application of mitigation measures..

Reversibility: This impact is reversible, as rehabilitation with indigenous plants and reeds within the wetland would result in the restoration of ecosystem services as well as biodiversity and would return these areas of degraded habitat to one better than prior to the development.

Irreplaceable Loss of Resources
No, the impact causes a loss of resources that can be replaced.

	Consequence							Likelihood					Total Score	Significance
	Severity		Duration		Spatial scale		TOTAL	Frequency		Probability		TOTAL		
Impact 2: Loss of Reed Beds														
Construction Phase														
Without mitigation	Great	4	Short term	2	Surrounding area	2	2.6	Once a year	1	Definitely	5	3	7.8	Medium
With mitigation	Significant	3	Brief	1	Immediate	1	1.6	Once a year	1	Possible	4	2.5	4.1	Low
Operational Phase														
Without mitigation	Significant	3	Long term	4	Surrounding area	2	2.3	Once or more in 6 months	2	Likely	4	3	6.9	Medium-Low
With mitigation	Significant	3	Medium term	3	Immediate	1	2.6	Once a year	1	Highly unlikely	2	1.5	3.9	Low

Mitigation and Management:

- In wetland areas including reed beds the construction measures must consist of the least impactful individual erection of monopole structures. No linear 3m footprints should be cleared of vegetation in these areas but individual drilled foundations used.
- No construction or storing of materials will be located outside of the defined construction area. These areas must be demarcated prior to any activities commencing and personnel instructed of the rules to stay out of these areas (unless clearing alien invasive plants).
- Development and implementation of an alien invasive plant species management plan, which would remove and control the alien vegetation within and bordering the site.
- Keep the construction footprint as small as possible.
- No use of the surrounding vegetation must be allowed. This includes use as a toilet facility, for hunting, harvesting of indigenous plants, making fires etc.
- Karpowership should, in conjunction with Transnet, develop and implement a rehabilitation plan for the degraded habitat areas where these will be left natural in the future even after planned port expansion.

Impact 3: Loss of Bushveld

Cause and comment: Bushveld will be lost as a direct result of the construction of the switching station facility. The bushveld area, though comprising habitat for both floral and faunal species is secondary in nature, with a corresponding moderate sensitivity.

Significance statement: The impact in the construction phase will be significant over the short term and restricted to the surrounding area. It will definitely occur once a year and results in an impact rating of medium-low. This can be reduced to low with mitigation measures.

In the operational phase, the impact will be insignificant over the long term and restricted to the immediate area. It will be unlikely and occur once or more over 6 moths resulting in an overall impact rating of medium-low which can be reduced to low with mitigation measures.

Reversibility: This impact is not reversible as the structure constructed will be permanent in nature.

Irreplaceable Loss of Resources

No, the impact causes a loss of resources that can be replaced.

	Consequence							Likelihood					Total Score	Significance
	Severity		Duration		Spatial scale		TOTAL	Frequency		Probability		TOTAL		
Impact 3: Loss of Bushveld														
Construction Phase														
Without mitigation	Significant	3	Short term	2	Surrounding area	2	2.3	Once a year	1	Definitely	5	3	6.9	Medium-low
With mitigation	Small	2	Brief	1	Immediate	1	1.3	Once a year	1	Definitely	5	3	3.9	Low
Operational Phase														
Without mitigation	Small	2	Long term	4	Surrounding area	2	2.6	Once or more in 6 months	2	Unlikely	3	2.5	6.5	Medium-Low
With mitigation	Insignificant	1	Long term	4	Immediate	1	2	Once a year	1	Highly unlikely	2	1.5	3	Low

Mitigation and Management:

- No construction or storing of materials should be located outside of the defined construction area. These areas must be demarcated prior to any activities commencing and personnel instructed of the rules to stay out of these areas (unless clearing alien invasive plants).
- Development and implementation of an alien invasive plant species management plan, which would remove and control the alien vegetation within and bordering the site.
- Keep the construction footprint as small as possible.
- No use of the surrounding vegetation will be allowed. This includes use as a toilet facility, for hunting, harvesting of indigenous plants, making fires etc.

9.2.2 Issue 2: Loss of flora Species of Conservation Concern

Impact 4: Loss of flora Species of Conservation Concern

Cause and comment: The construction of the transmission line, laydown area and switching station will possibly result in the loss of protected plants including, but not limited to some protected trees (no mangroves will be lost) and the orchid *Eulophia speciosa*. However, no SCC will be lost as none have been recorded from the site. The disturbance levels associated with the site make it unlikely that any SCC will be found on site. It is recommended that prior to any clearance of vegetation comprising indigenous elements, this be walked over by a qualified botanist to ensure no protected species are present. This must be done as removal or destruction of any protected species requires permits from the relevant authorities.

Significance statement: The impact in the construction phase will be small over the long term and restricted to the surrounding area. It will definitely occur once a year. The overall significance is a medium negative which can be reduced to low with the application of mitigation measures.

In the operational phase, the impact is small over the long term and is restricted to the surrounding area it will be unlikely and occur once or more over 6 months resulting in an overall impact of medium. This can be reduced to low with mitigation measures.

Reversibility: This impact is reversible no mangroves will be lost as a result of the proposed development, and most other tree species can be avoided. Where these can't be avoided, a minimum number will be destroyed. Any destroyed species will then be planted to recoup lost species numbers.

Irreplaceable Loss of Resources
No, the impact causes a loss of resources that can be replaced.

	Consequence							Likelihood					Total Score	Significance
	Severity		Duration		Spatial scale		TOTAL	Frequency		Probability		TOTAL		
Impact 4: Loss of Species of Conservation Concern and Biodiversity														
Construction Phase														
Without mitigation	Small	2	Long term	4	Surrounding area	2	2.6	Once a year	1	Definitely	5	3	7.8	Medium
With mitigation	Insignificant	1	1 month to 3 months	2	Immediate	1	1.3	Once a year	1	Definitely	5	3	3.9	Low
Operational Phase														
Without mitigation	Small	2	Long term	4	Surrounding area	2	2.6	Once or more in 6 months	2	Unlikely	3	2.5	6.5	Medium-Low
With mitigation	Insignificant	1	Long term	4	Immediate	1	2	Once a year	1	Highly Unlikely	2	2	3	Low

Mitigation and Management:

- Construction measures must consist of the least impactful individual erection of monopole structures and all protected species avoided where possible. No linear 3m footprints should be cleared of vegetation in these areas but individual drilled foundations used.
- No use of the surrounding vegetation will be allowed. This includes use as a toilet facility, for hunting, harvesting of indigenous plants, making fires etc.
- A full site walk-through should be conducted in the summer prior to any construction activities to list all protected species and associated permits should be obtained for their removal or transplantation. This was completed in 2021 permits were applied for.

Impact 5: Loss of fauna Species of Conservation Concern

Cause and comment: The construction of the transmission line, may possibly result in the loss of SSC, however, it is anticipated that the majority of the faunal species will be able to move out of the way of construction. A qualified ecological expert must be present during construction to relocate any slow-moving (such as chameleons or tortoises) or burrowing (moles, lizards and snakes) species should they occur.

The impacts associated with loss of SCC are associated primarily with the construction phase of the development.

Significance statement: The impact in the construction phase will be small over the long term and restricted to the surrounding area, it will definitely occur once a year resulting in an overall medium negative impact. This can be reduced to low with mitigation measures.

In the operational phase, the impact will be small over the long term and restricted to the surrounding area. It will be unlikely and occur once or more over 6 months resulting in an overall impact of moderate-low which can be reduced to low with mitigation measures.

Reversibility: This impact is reversible, as faunal SCC can be relocated to alternative habitat that is actively conserved, particularly the Richards Bay Game Reserve.

Irreplaceable Loss of Resources

No, the impact causes a loss of resources that can be replaced.

	Consequence							Likelihood					Total Score	Significance
	Severity		Duration		Spatial scale		TOTAL	Frequency		Probability		TOTAL		
Impact 5: Loss of faunal Species of Conservation Concern														
Construction Phase														
Without mitigation	Small	2	Long term	4	Surrounding area	2	2.6	Once a year	1	Definitely	5	3	7.8	Medium
With mitigation	Small	2	Brief	1	Immediate	1	1.3	Once a year	1	Likely	4	3	3.9	Low
Operational Phase														
Without mitigation	Small	2	Long term	4	Surrounding area	2	2.6	Once or more in 6 months	2	Unlikely	3	2.5	6.5	Medium-Low
With mitigation	Insignificant	1	Long term	4	Immediate	1	2	Once a year	1	Highly Unlikely	2	1.5	3	Low

Mitigation and Management:

- Construction measures must consist of the least impactful individual erection of monopole structures in areas of intact indigenous vegetation avoided where possible. No linear 3m footprints should be cleared of vegetation in these areas but individual drilled foundations used.
- No use of the surrounding vegetation will be allowed. This includes use as a toilet facility, for hunting, harvesting of indigenous plants, making fires etc.
- No hunting will be allowed.
- A qualified specialist should be on site during construction to safely remove all slow-moving (chameleons and tortoises) and burrowing (moles, lizards and snakes) species from the path of the excavator and relocated to a conservation area, should they occur.

Impact 6: Loss of biodiversity in general

Cause and comment: As the construction of the transmission line, laydown area and switching station will result in the loss of areas of habitat, this will result in a loss of the biodiversity within those habitats. This impact includes all species, both fauna and flora that will be lost as a result of the proposed development. As the site is largely modified, comparatively small amounts of biodiversity will be lost. However, it is important to note that the area in general was once rich in biodiversity prior to the construction of the port, and related infrastructure.

Significance statement: The impact in the construction phase will be small over the short term and restricted to the surrounding area. It will be likely and occur once a year. This will result in an overall impact of medium-low which can be reduced to low with mitigation.

In the operational phase, the impact will be small over the long term and restricted to the surrounding area. It will be unlikely and occur once or more in 6 months resulting in an overall significance of medium-low which can be reduced to low with mitigation.

Reversibility: This impact is reversible, as rehabilitation with indigenous plants would result in the reduction of erosion risk and maintenance and restoration of ecosystem services.

Irreplaceable Loss of Resources
No, the impact causes a loss of resources that can be replaced.

	Consequence							Likelihood					Total Score	Significance
	Severity		Duration		Spatial scale		TOTAL	Frequency		Probability		TOTAL		
Impact 6: Loss of biodiversity in general														
Construction Phase														
Without mitigation	Small	2	Short term	2	Surrounding area	2	2	Once a year	1	Likely	4	2.5	5	Medium-Low
With mitigation	Small	2	Brief	1	Immediate	1	1.3	Once a year	1	Likely	4	2.5	3.25	Low
Operational Phase														
Without mitigation	Small	2	Long term	4	Surrounding area	2	2.6	Once or more in 6 months	2	unlikely	3	2.5	6.5	Medium-Low
With mitigation	Insignificant	1	Long term	4	Immediate	1	2	Once a year	1	Highly unlikely	2	1.5	3	Low

Mitigation and Management:

- Boundaries must be strictly maintained, and impacts retained within the boundary of the site.
- Alien species must be controlled.
- Areas of indigenous vegetation should be incorporated into the open space management plan of the Port/ Harbour Zone in conjunction with Transnet where practicable.

9.2.3 Issue 3: Ecosystem function and Process

Impact 7: Fragmentation

Cause and comment: This site is prone to fragmentation due to its location within the Port/ Harbour zone and the range of habitats present on site. Its location within a CBA also means that fragmentation is detrimental. As such, the loss of the vegetation will result in fragmentation of this already partially fragmented system, ameliorated somewhat by the dominance of alien species in some areas of the site (disturbed areas). The allowance for open space corridors reduces fragmentation risk, and thus, the impact due to fragmentation. Fragmentation can result in the loss of biodiversity due to loss of dispersal, pollination and gene issues, among other considerations. It should be avoided where possible. Where possible, Karpowership should work with Transnet to establish and manage open space within the Port/ Harbour zone to reduce overall fragmentation. The nature of the transmission line is such that if habitats are allowed to recover beneath the line, the majority of fragmentation can be avoided.

Significance statement: The impact in the construction phase will be small over the short term and restricted to the surrounding area. It will be definite and occur once a year resulting in an overall significance of medium-low which can be reduced to low with mitigation.

In the operational phase, the impact will be significant and permanent over the surrounding area and be unlikely to occur once a year resulting in an overall significance of medium-low which can be reduced to low with mitigation measures .

Reversibility: This impact is reversible, as rehabilitation with indigenous plants would result in the reduction of erosion risk and maintenance and restoration of ecosystem services.

Irreplaceable Loss of Resources
No, the impact causes a loss of resources that can be replaced.

	Consequence							Likelihood					Total Score	Significance
	Severity		Duration		Spatial scale		TOTAL	Frequency		Probability		TOTAL		
Impact 7: Fragmentation														
Construction Phase														
Without mitigation	Small	2	Short term	2	Surrounding area	2	2	Once a year	1	Definitely	5	3	6	Medium-Low
With mitigation	Small	2	Brief	1	Immediate	1	1.3	Once a year	1	Likely	4	2.5	3.25	Low
Operational Phase														
Without mitigation	Significant	3	Permanent	5	Surrounding area	2	3.3	Once a year	1	Unlikely	3	2	6.6	Medium-Low
With mitigation	Small	2	Long term	4	Immediate	1	2.3	Once a year	1	Highly Unlikely	2	1.5	3.45	Low

Mitigation and Management:

- The majority of the indigenous vegetation should be maintained as a part of the open space and managed for conservation if possible, in partnership with Transnet and the Port/ Harbour zone.
- Boundaries of the site must be adhered to, and no additional loss of vegetation should occur.
- Alien species within the site must be controlled.
- The land beneath the transmission line, and any other areas required for construction, but not for the operational phase, must be rehabilitated with indigenous species to retain connectivity within the system.

Impact 8: Invasion of alien species

Cause and comment: The development of the proposed transmission line and ancillary infrastructure will result in the influx of seeds and disturbance of existing seedbanks of alien invasive species. Considering the number of alien species already recorded from the site, this impact will occur and must be managed.

Significance statement: The impact in the construction phase will be great, permanent and restricted to the surrounding area. It will be definite and occur once or more in 6 months resulting in an overall significance of high which can be reduced to low with mitigation.

In the operational phase, the impact will be permanent, great and restricted to the surrounding area. It will be definite and occur once or more in 6 months resulting in an overall significance of high negative which can be reduced to low with mitigation measures.

Reversibility: This impact is reversible, if the site is continually managed for the removal of existing and new alien invasive species.

Irreplaceable Loss of Resources

No, the impact causes a loss of resources that can be replaced.

	Consequence							Likelihood					Total Score	Significance
	Severity		Duration		Spatial scale		TOTAL	Frequency		Probability		TOTAL		
Impact 8: Invasion of alien species														
Construction Phase														
Without mitigation	Great	4	Permanent	5	Surrounding area	2	3.6	Once or more in 6 months	2	Definitely	5	3.5	12.6	High
With mitigation	Insignificant	1	Brief	1	Immediate	1	1	Once a year	1	Definitely	5	3	3	Low
Operational Phase														
Without mitigation	Great	4	Permanent	5	Surrounding area	2	3.6	Once or more in 6 months	2	Definitely	5	3.5	12.6	High
With mitigation	Insignificant	1	Brief	1	Immediate	1	1	Once a year	1	Definitely	5	3	3	Low

Mitigation and Management:

- The area of construction and operation must be demarcated, and personnel not allowed to use the surrounding natural vegetation.
- Any existing and new alien species must be removed as soon as possible after emergence.
- An alien vegetation management plan must be applied to the site to maintain the site free of alien invasions throughout the construction and operational phase of the development.

9.3 Cumulative impacts

Cumulative impacts are assessed in context of the extent of the proposed project area; other developments in the area; and general habitat loss and transformation resulting from other activities in the area.

The impacts of projects are often assessed by comparing the post-project situation to a pre-existing baseline. Where projects can be considered in isolation this provides a good method of assessing a project's impact. However, in areas where baselines have already been affected, or where future development will continue to add to the impacts in an area or region, it is appropriate to consider the cumulative effects of development. This is similar to the concept of shifting baselines, which describes how the environmental baseline at a point in time may represent a significant change from the original state of the system. This section describes the potential impacts of the project that are cumulative for fauna and flora. Localised cumulative impacts include the cumulative effects from operations that are close enough to potentially cause additive effects on the environment or sensitive receivers, dust deposition, noise and vibration, disruption of corridors or habitat, groundwater drawdown, groundwater and surface water quality, and transport.

Several projects are currently underway, or in the environmental authorisation phase and include those listed in Table 9-3.

Table 9-3 Projects considered for cumulative impacts

Project name and description	Applicant	Status
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	Environmental Authorisation was granted, and NGOs are challenging the decision
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 2000m³ each for on-site fuel storage. EAP - Savannah Environmental	Richards Bay Gas Power (Pty) Ltd	Received EA in 2016, applying for amendment in 2020 and an AEL
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	EA not granted but appeals ongoing

Project name and description	Applicant	Status
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	EA granted

Port expansion is planned for 10 to 20 years in the future which will result in the conversion of terrestrial areas into marine areas. The cumulative impacts of increased port development prior to this expansion will result in continued loss of the terrestrial ecosystems. However, currently there is no evidence of management of the terrestrial systems within the port area. Threats include destruction of swamp and mangrove forests, both Critically Endangered ecosystems as well as the loss of the remaining natural vegetation (the majority of the site is transformed or secondary).

Protection of existing mangroves and swamp forest is critical, and these should in no way be harmed by any planned future development within the port area.

Cumulative impacts without mitigation are expected to be High.

A joint venture including TNPA and all port users (including current and future users, including Karpowership) should ideally be actioned as soon as possible to allow for the following (critical management systems) to take place:

- Management and control of alien and invasive plants
- Definition and maintenance of a Conservation and/or Open Space Management Plan
- Development and implementation of a rehabilitation plan.

Each of these aspects cannot be taken on by one individual user, as overall management is critical to such an important ecosystem and management in isolation will be ineffective.

9.4 Unplanned events

The planned activities will have anticipated impacts as discussed; however, unplanned events may occur on any project and may have potential impacts which will need management. Table 9-4 is a summary of the findings of an unplanned event assessment from a terrestrial ecology perspective. Note, not all potential unplanned events may be captured herein, and this must therefore be managed throughout all phases according to recorded events.

Table 9-4 Summary of unplanned events for terrestrial biodiversity

Unplanned Event	Potential Impact	Mitigation
Spills into the surrounding environment	Contamination of habitat as well as water resources associated with a spillage.	A spill response kit must be available at all times. The incident must be reported on and if necessary, a biodiversity specialist must investigate the extent of the impact and provide rehabilitation recommendations.
Fire	Uncontrolled/unmanaged fire that spreads to the surrounding natural vegetation..	An appropriate/adequate fire management plan needs to be implemented.

10 Conclusions and Recommendations

The site comprises a mix of both transformed areas as well as modified and degraded habitat largely dominated by alien invasive species as well as some ruderal indigenous species. There are some areas of indigenous vegetation ranging from the Alluvial vegetation typical of the region to the Critically Endangered mangroves and Swamp Forests on site. The preferred route traverses primarily transformed and modified habitat, with small sections of indigenous vegetation. The proposed switching station is located in indigenous vegetation. Wetlands are of high importance for this site, and the wetland specialist report should be consulted with regards to wetland recommendations.

10.1 Impacts

The site is mostly of low sensitivity due to the wide distribution of modified and degraded habitats and the alignment of the transmission line route with existing infrastructure. This places the route primarily within transformed or modified habitat, resulting in little overall loss of indigenous vegetation. Impacts are medium to medium-low and can be reduced to low with the recommended mitigation measures. The summary of impacts associated with the development can be seen in Table 10-1.

Table 10-1: Summary of impacts associated with the Karpowership transmission line, and ancillary infrastructure

Impact	Without Mitigation	With mitigation
Construction phase		
Issue 1: Loss of vegetation communities		
1: Loss of modified habitat	Medium-Low	Low
2: Loss of reed beds	Medium	Low
3: Loss of bushveld	Medium-Low	Low
Issue 2: Loss of Species of Special Concern and Biodiversity		
4: Loss of flora SCC	Medium	Low
5: Loss of fauna SCC	Medium	Low
6: Loss of biodiversity in general	Medium-Low	Low
Issue 3: Ecosystem function and process		
7: Fragmentation	Medium-Low	Low
8: Invasion of alien species	High	Low
Operational phase		
Issue 1: Loss of vegetation communities		
1: Loss of modified habitat	Medium-Low	Low
2: Loss of reed beds	Medium-Low	Low
3: Loss of bushveld	Medium-Low	Low
Issue 2: Loss of Species of Special Concern and Biodiversity		
4: Loss of flora SCC	Medium-Low	Low
5: Loss of fauna SCC	Medium-Low	Low
6: Loss of biodiversity in general	Medium-Low	Low
Issue 3: Ecosystem function and process		
7: Fragmentation	Medium-Low	Low

Impact	Without Mitigation	With mitigation
8: Invasion of alien species	High	Low

10.2 Mitigation and management

- In areas of modified habitat, construction using excavation and backfilling is acceptable however, this method of construction must not be used in any other areas (except modified areas).
- No construction or storing of materials should be located outside of the defined layout area. These areas must be demarcated prior to any activities commencing and personnel instructed of the rules to stay out of these areas (unless clearing alien invasive plants).
- Development and implementation of an alien invasive plant species management plan, which would remove and control the alien vegetation within and bordering the site.
- Keep the construction footprint as small as possible.
- No use of the surrounding vegetation is to be allowed. This includes use as a toilet facility, for hunting, harvesting of indigenous plants, making fires etc.
- Karpowership should, in conjunction with Transnet, develop and implement a rehabilitation plan for the modified habitat areas where these will be left natural in the future even after planned port expansion.
- In wetland areas including reed beds, the construction measures must consist of the least impactful individual erection of monopole structures. No linear 3m footprints should be cleared of vegetation in these areas but individual drilled foundations used.
- In natural areas, the construction of a linear footprint cleared of vegetation and excavated must be avoided wherever possible. Construction measures must consist of the least impactful individual erection of monopole structures. No linear 3m footprints should be cleared of vegetation in these areas but individual drilled foundations used.
- A full site walk-through must be conducted in the summer prior to any construction activities to list all Protected Species and associated permits should be obtained for their removal or transplantation. This was completed in 2021 permits were applied for.
- Areas of indigenous vegetation should be incorporated into the open space management plan of the Port/ Harbour zone in conjunction with Transnet where practicable.
- The land beneath the transmission line, and any other areas required for construction, but not for the operational phase, must be rehabilitated with indigenous species to retain connectivity within the system.
- A qualified specialist must be on site during construction to safely remove all slow-moving (chameleons and tortoises) and burrowing (moles, lizards and snakes) species from the path of the excavator and relocated to a conservation area.

10.3 Impact Statement

It is the opinion of the specialist that the proposed development go ahead, provided the mitigation measures are put into place. The following conditions should also be met:

- A walk through of the site prior to any construction to determine the presence of any Protected Species.
- Application for permits for removal of any Protected Species where required (this was completed in 2021 permits were applied for).
- The development of a rehabilitation plan in line with TNPAs rehabilitation plans, if no such plan exists, Karpowership should have input into the overall plan for the TNPA area.
- The development of an alien invasive plant management plan in line with the plan and implementation protocol of the TNPA. If no such plan exists, Karpowership should have input into such a plan for the overall TNPA area.

11 References

Escott, B, Livingtone, T-C, Nxele, B, Harris, J and Jewitt, D. (2012). Draft document describing the Conservation Planning Terms for the EKZNW Spatial Planning Products. Ezemvelo KZN Wildlife.

eThekwini Municipality (2011). Durban Metropolitan Open Space System (D'MOSS). http://www.durban.gov.za/City_Services/development_planning_management/environmental_planning_climate_protection/Durban_Open_Space/Pages/-What-is-the-Durban-Metropolitan-Open-Space-System.aspx. Accessed 6 December 2018.

Ezemvelo KZN Wildlife (2016) KZN Biodiversity Spatial Planning Terms and Processes, Version 3.3 Unpublished Report, Biodiversity Spatial Planning and Information Division, Ezemvelo KZN Wildlife, P. O. Box 13053, Cascades, Pietermaritzburg, 3202.

Government of South Africa (2008). National Protected Area Expansion Strategy for South Africa 2008: Priorities for expanding the protected area network for ecological sustainability and climate change adaptation. Government of South Africa, Pretoria. 2010. ISBN 978-1-919976-55-6.

Hawthorne and Marshall (2016). A Manual for rapid botanic survey (RBS) and measurement of vegetation bioquality. Published online, June 2016. Department of Plant Sciences, University of Oxford, U.K.

Kambaj, O.K., Sershen, Govender, Y. & Ramdhani, S., 2018, 'A floristic comparison of three Northern Coastal Forests differing in disturbance history', Bothalia 48(1), a2262. https://doi.org/10.4102/abc. v48i1.2262

KZN Wildlife (2013). Guideline: Biodiversity Impact Assessment in KwaZulu Natal.

Mucina, L. and Rutherford, MC. (eds). (Reprint 2011). The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

Nel, JL., Murray, KM., Maherry, AM, CP Peterson, CP. Roux, DJ, Driver, A., Hill, L., van Deventer, H., Funke, N., Swartz, ER., Smith-Adao, LB., Mbona, N., Downsborough, L and Nieaber, S. (2011). Technical Report for the National Freshwater Ecosystem Priority Areas project. Water Research Commission. WRC Report No. 1801/2/11 ISBN: 978-1-4312-0149-5.

SANBI (2018). http://biodiversityadvisor.sanbi.org/planning-and-assessment/environmental-assessments/orientation/working-with-threatened-ecosystems/threatened-ecosystems/. Accessed 23 September 2018.

12 APPENDIX A: List of expected and recorded plant species

Family	Species	Rec [11]	POSA [12]	M&R [13]	En [14]	RL [15]	TOPs [16]	Tr[17]	PCO [18]	CARA [19]	NEM:BA [20]
Acanthaceae	*Asystasia gangetica*	x									
	Hygrophila schulli			x							
	Hypoestes aristata var. aristata		x			LC					
	Justicia flava			x							
	Pseuderanthemum subviscosum		x			LC					
	Ruellia patula			x							
Agavaceae	*Chlorophytum comosum*		x			LC					
Aizoaceae	*Carpobrotus dimidiatus*	x									
Alismataceae	*Limnophyton obtusifolius*			x							
Amaranthaceae	*Achyranthes aspera*			x							
	Alternanthera sessilis		x	x							
	Amaranthus praetermissus			x							
	Amaranthus viridis		x								
	Hermbstaedtia odorata var. aurantiaca			x							
	Pupalia lappacea			x							
	Salicornia pachystachya		x			LC					

[11] Recorded from the site
[12] As per http://posa.sanbi.org/sanbi/Explore for the study area and surrounds
[13] As per Mucina and Rutherford (2011) species lists for site vegetation
[14] As listed on POSA or Mucina and Rutherford
[15] As per http://redlist.sanbi.org/
[16] As per The National Tops List
[17] As per the National List of Protected Trees
[18] As per the Provincial Conservation Ordinance
[19] As per the Conservation of Agricultural Resources Act
[20] As per the 2020 list of invasive species according to the National Environmental Management: Biodiversity Act

Family	Species	Rec [11]	POSA [12]	M&R [13]	En [14]	RL [15]	TOPs [16]	Tr[17]	PCO [18]	CARA [19]	NEM:BA [20]
	Salicornia perrieri		x			LC					
	Sarcocornia natalensis var. affinis		x			LC					
	Sarcocornia natalensis var. natalensis		x			LC					
Amaryllidaceae	*Crinum campanulatum*			x					Sch12		
	Crinum moorei			x					Sch12		
	Crinum paludosum			x					Sch12		
Anacardiaceae	*Ozoroa obovata*			x							
	Schinus terebinthifolius	x	x			NE				1	1b
	Searsia kwazuluana			x							
	Searsia natalensis		x	x		LC					
	Searsia nebulosa			x							
	Searsia nebulosa forma nebulosa		x		x	NE					
Annonaceae	*Annona senegalensis*			x							
Apiaceae	*Centella asiatica*	x		x							
	Centella coriacea			x							
	Sium repandum			x							
Apocynaceae	*Asclepias gordon-grayae*			x							
	Cascabela thevetia		x								
	Gomphocarpus physocarpus	x	x			LC					
	Nerium oleander		x			NE				1	1b
	Orbea longidens			x							
	Raphionacme lucens			x							
	Rauvolfia caffra			x							
	Secamone filiformis		x			LC					
	Sisyranthus franksiae		x		x	DD					
	Tabernaemontana elegans		x			LC					

Family	Species	Rec [11]	POSA [12]	M&R [13]	En [14]	RL [15]	TOPs [16]	Tr[17]	PCO [18]	CARA [19]	NEM:BA [20]
	Tacazzea apiculata		x			LC					
	Voacanga thouarsii			x							
Aponogetonaceae	*Aponogeton desertorum*			x							
	Aponogeton natalensis			x							
	Aponogeton rehmannii			x							
Araceae	*Pistia stratiotes*			x							
	Wolffiella denticulata		x		x	VU					
Araliaceae	*Hydrocotyle bonariensis*		x			LC					
	Hydrocotyle ranunculoides			x							
	Schefflera umbellifera			x							
Arecaceae	*Hyphaene coriacea*	x	x	x		LC					
	Phoenix reclinata	x		x							
	Raphia australis			x							
Asphodelaceae	*Kniphofia leucocephala*		x	x	x	CR			Sch12		
	Trachyandra saltii			x					Sch12		
Aspleniaceae	*Asplenium prionitis*		x			LC					
Asteraceae	*Acanthospermum australe*		x								
	Acmella caulirhiza		x			LC					
	Ageratum houstonianum	x	x							1	1b
	Ambrosia artemisiifolia		x								
	Berkheya setifera	x									
	Bidens pilosa	x									
	Brachylaena discolor	x									
	Chromolaena odorata	x								1	1b
	Conyza ulmifolia		x								
	Doellia cafra		x			LC					
	Eclipta prostrata			x							

Family	Species	Rec [11]	POSA [12]	M&R [13]	En [14]	RL [15]	TOPs [16]	Tr[17]	PCO [18]	CARA [19]	NEM:BA [20]
	Epaltes gariepina			x							
	Erigeron canadensis		x								
	Erigeron sumatrensis		x								
	Ethulia conyzoides			x							
	Ethulia conyzoides subsp. conyzoides		x								
	Helichrysopsis septentrionalis			x							
	Helichrysum adenocarpum subsp. ammophilum			x							
	Helichrysum argyrosphaerum		x			LC					
	Helichrysum asperum var. albidulum		x			LC					
	Helichrysum aureonitens	x									
	Helichrysum candolleanum		x			LC					
	Helichrysum cymosum subsp. cymosum			x							
	Helichrysum decorum		x			LC					
	Helichrysum krausii	x									
	Helichrysum tongense			x							
	Hypochaeris brasiliensis		x								
	Hypochaeris microcephala var. albiflora		x								
	Hypochaeris radicata		x								
	Launaea sarmentosa		x			LC					
	Nidorella auriculata		x			LC					
	Nidorella linifolia		x		x	LC					
	Nidorella tongensis		x	x		EN					
	Osteospermum moniliferum	x		x							
	Pulicaria scabra		x			LC					
	Senecio bryoniifolius		x			LC					
	Senecio madagascariensis		x			LC					
	Senecio ngoyanus			x							
	Senecio polyanthemoides		x			LC					
	Senecio sandersonii		x			LC					

Family	Species	Rec [11]	POSA [12]	M&R [13]	En [14]	RL [15]	TOPs [16]	Tr[17]	PCO [18]	CARA [19]	NEM:BA [20]
	Vernonia centaureoides			x							
	Vernonia natalensis			x							
	Vernonia oligocephala			x							
Avicenniaceae	*Avicennia marina*	x		x							
Azollaceae	*Azolla pinnata var. africana*			x							
Blechnaceae	*Stenochlaena tenuifolia*			x							
Boraginaceae	*Heliotropium ovalifolium*			x							
Brachytheciaceae	*Rhynchostegium brachypterum*		x								
Brassicaceae	*Heliophila subulata*		x		x	LC					
	Lepidium africanum subsp. africanum		x			LC					
	Lepidium bonariense		x							1	
	Lepidium didymum		x							1	
	Lepidium suluense		x			LC					
	Lepidium virginicum		x							1	
	Rorippa madagascariensis			x							
Burmanniaceae	*Burmannia madagascariensis*			x							
Burseraceae	*Commiphora glandulosa*			x							
	Commiphora pyracanthoides			x							
Cabombaceae	*Brasenia schreberi*			x							
Campanulaceae	*Wahlenbergia abyssinica subsp. abyssinica*		x			LC					
	Wahlenbergia undulata		x			LC					
Cannabaceae	*Trema orientalis*	x	x			LC					
Cannaceae	*Canna indica*	x								1	1b
Capparaceae	*Boscia foetida subsp. rehmanniana*			x							
Caryophyllaceae	*Silene burchellii subsp. burchellii*		x		x	NT					
	Silene burchellii subsp. multiflora		x			LC					
Casurinaceae	*Casuarina equisetifolia*	x								2	2
Celastraceae	*Gymnosporia senegalensis*			x							
	Mystroxylon aethiopicum subsp. schlechteri		x			LC					

Family	Species	Rec [11]	POSA [12]	M&R [13]	En [14]	RL [15]	TOPs [16]	Tr[17]	PCO [18]	CARA [19]	NEM:BA [20]
	Salacia kraussii		x			LC					
Ceratophyllaceae	*adenopodia spicata*			x							
	Ceratophyllum muricatum			x							
Chenopidiaceae	*Salicornia pachystachya*			x							
Chrysobalanaceae	*Parinari capensis subsp. capensis*		x			LC					
	Parinari capensis subsp. incohata		x			LC					
Clusiaceae	*Garcinia livingstonei*		x			LC					
Combretaceae	*Combretum erythrophyllum*			x							
	Combretum hereroense			x							
	Lumnitzera racemosa			x							
Commelinaceae	*Coleotrype natalensis*		x			LC					
	Commelina benghalensis	x		x							
	Commelina diffusa			x							
	Floscopa glomerata		x	x		LC					
Convolvulaceae	*Astripomoea malvacea*		x								
	Convolvulus mauritanicus			x							
	Cuscuta campestris	x								1	1b
	Hewittia malabarica		x			LC					
	Ipomoea aquatica			x							
	Ipomoea indica			x							
	Ipomoea mauritiana			x							
	Ipomoea pes-caprae subsp. brasiliensis		x			LC					
Cucurbitaceae	*Citrullus lanatus*		x			LC					
	Coccinia mackenii		x			LC					
	Cucumis maderaspatanus		x			LC					
	Cucumis zeyheri			x							
	Kedrostis foetidissima		x			LC					
Cymodoceaceae	*Thalassodendron ciliatum*		x			LC					
Cyperaceae	*Bolboschoenus glaucus*			x							

Family	Species	Rec [11]	POSA [12]	M&R [13]	En [14]	RL [15]	TOPs [16]	Tr[17]	PCO [18]	CARA [19]	NEM:BA [20]
	Bulbostylis contexta		x			LC					
	Bulbostylis hispidula		x								
	Bulbostylis hispidula subsp. pyriformis		x			LC					
	Cladium mariscus subsp. jamaicense		x	x		LC					
	Courtoisia cyperoides			x							
	Cyperus albostriatus		x			LC					
	Cyperus alopecuroides			x							
	Cyperus articulatus		x	x		LC					
	Cyperus brevis		x			LC					
	Cyperus congestus		x			LC					
	Cyperus corymbosus			x							
	Cyperus difformis			x							
	Cyperus digitatus			x							
	Cyperus distans			x							
	Cyperus dives			x							
	Cyperus dubius		x								
	Cyperus dubius var. dubius		x								
	Cyperus esculentus	x									
	Cyperus fastigiatus			x							
	Cyperus immensus			x							
	Cyperus involucratus		x			LC					
	Cyperus laevigatus		x			LC					
	Cyperus latifolius			x							
	Cyperus macrocarpus		x			LC					
	Cyperus natalensis		x			LC					
	Cyperus papyrus	x		x							
	Cyperus pectinatus			x							
	Cyperus procerus			x							
	Cyperus prolifer		x	x		LC					

Family	Species	Rec [11]	POSA [12]	M&R [13]	En [14]	RL [15]	TOPs [16]	Tr[17]	PCO [18]	CARA [19]	NEM:BA [20]
	Cyperus rotundus subsp. rotundus		x			LC					
	Cyperus rotundus subsp. tuberosus		x			LC					
	Cyperus rubicundus		x			LC					
	Cyperus sensilis			x							
	Cyperus sexangularis			x							
	Cyperus solidus		x			LC					
	Cyperus sphaerospermus		x			LC					
	Eleocharis dulcis			x							
	Eleocharis limosa		x			LC					
	Eloecharis limosa	x									
	Ficinia laciniata		x		x	LC					
	Fimbristylis bisumbellata			x							
	Fimbristylis complanata	x	x			LC					
	Fimbristylis cymosa		x								
	Fimbristylis dichotoma		x								
	Fimbristylis dichotoma subsp. dichotoma		x			LC					
	Fimbristylis ferruginea		x			LC					
	Fimbristylis obtusifolia			x							
	Fuirena ciliaris			x							
	Fuirena ecklonii			x							
	Fuirena hirsuta		x			LC					
	Fuirena obcordata		x			LC					
	Isolepis prolifera		x			LC					
	Oxycaryum cubense			x							
	Pycreus mundii		x	x		LC					
	Pycreus nitidus		x			LC					
	Pycreus pelophilus			x							
	Pycreus polystachyos			x							
	Pycreus rehmannianus		x			LC					

Family	Species	Rec [11]	POSA [12]	M&R [13]	En [14]	RL [15]	TOPs [16]	Tr[17]	PCO [18]	CARA [19]	NEM:BA [20]
	Pycreus unioloides		x			LC					
	Rhynchospora brownii		x			LC					
	Rhynchospora perrieri		x			LC					
	Schoenoplectus corymbosus			x							
	Schoenoplectus scirpoides			x							
	Scleria achtenii		x			LC					
	Scleria angusta			x							
	Scleria poiformis			x							
Davalliaceae	*Davallia chaerophylloides*		x			LC					
Dracaenaceae	*Dracaena mannii*			x							
Ebenaceae	*Diospyros galpinii*			x							
	Euclea divinorum			x							
	Euclea natalensis subsp. natalensis			x							
Elatinaceae	*Bergia salaria*			x							
Eriocaulaceae	*Eriocaulon abyssinicum*			x							
Euphorbiaceae	*Acalypha indica*			x							
	Dalechampia scandens var. natalensis		x			LC					
	Euphorbia hirta		x			NE					
	Euphorbia hypericifolia		x								
	Macaranga capensis			x							
	Ricinus communis	x								2	2
	Sclerocroton integerrimum			x							
	Shirakiopsis elliptica			x							
Fabaceae	*Abrus precatorius subsp. africanus*			x							
	Acacia luederitzii			x							
	Acacia natalitia			x							
	Acacia nebrownii			x							
	Acacia nigrescens			x							
	Acacia robusta			x							

Family	Species	Rec [11]	POSA [12]	M&R [13]	En [14]	RL [15]	TOPs [16]	Tr[17]	PCO [18]	CARA [19]	NEM:BA [20]
	Acacia tortilis			x							
	Acacia xanthophloea			x							
	Adenopodia spicata			x							
	Aspalathus gerrardii		x		x	VU					
	Chamaecrista mimosoides		x			LC					
	Chamaecrista plumosa			x							
	Chamaecrista plumosa var. plumosa		x			LC					
	Colophospermum mopane			x							
	Crotalaria mollii			x							
	Crotalaria pallida var. pallida		x			LC					
	Crotalaria virgulata subsp. Grantiana		x			LC					
	Dalbergia obovata			x							
	Desmodium dregeanum		x	x		LC					
	Desmodium incanum	x									
	Eriosema psoraleoides	x	x			LC					
	Guilandina bonduc		x								
	Indigofera charlieriana subsp. sessilis var. scaberrima		x								
	Indigofera charlieriana var. charlieriana		x			LC					
	Indigofera sp.	x									
	Indigofera spicata		x								
	Indigofera williamsonii			x							
	Macrotyloma axillare var. axillare		x			LC					
	Medicago polymorpha		x			NE					
	Melilotus albus		x			NE					
	Melilotus indicus		x			NE					
	Neptunia oleracea			x							
	Philenoptera violacea			x				Sch A			

Family	Species	Rec [11]	POSA [12]	M&R [13]	En [14]	RL [15]	TOPs [16]	Tr[17]	PCO [18]	CARA [19]	NEM:BA [20]
	Sesbania bispinosa var. bispinosa		x			NE					
	Stylosanthes fruticosa			x							
	Tephrosia kraussiana		x			LC					
	Tephrosia longipes			x							
	Tephrosia polystachya var. hirta		x			LC					
	Tephrosia polystachya var. polystachya		x			LC					
	Tephrosia shiluwanensis		x			LC					
	Vachellia karroo	x	x			LC					
	Vachellia nilotica subsp. kraussiana	x	x			LC					
	Vachellia sp.	x									
	Zornia capensis subsp. capensis		x			LC					
Geraniaceae	*Pelargonium grossularioides*		x		x	LC					
Hydrocharitaceae	*Lagarosiphon crispus*			x							
	Najas marina subsp. armata		x			LC					
	Ottelia exserta			x							
Icacinaceae	*Apodytes dimidiata*			x							
	Apodytes dimidiata subsp. dimidiata		x			LC					
Iridaceae	*Aristea compressa*		x			LC			Sch12		
	Aristea torulosa		x			LC			Sch12		
	Freesia laxa subsp. azurea		x			VU			Sch12		
	Gladiolus longicollis subsp. platypetalus		x			LC			Sch12		
Isoetaceae	*Isoetes wormaldii*			x							
Juncaceae	*Juncus kraussii subsp. kraussii*	x	x			LC					
Lamiaceae	*Ocimum canum*			x							
	Plectranthus verticillatus		x			LC					
	Scutellaria racemosa			x							

Family	Species	Rec [11]	POSA [12]	M&R [13]	En [14]	RL [15]	TOPs [16]	Tr[17]	PCO [18]	CARA [19]	NEM:BA [20]
Lauraceae	*Cassytha filiformis*		x			NE					
Lecythidaceae	*Barringtonia racemosa*			x				Sch A			
Lemnaceae	*Lemna minor*			x							
	Spirodela polyrhiza			x							
	Spirodela punctata			x							
	Wolffia arrhiza			x							
	Wolffia globosa			x							
	Wolffiella denticulata			x							
	Wolffiella welwitschii			x							
Lentibulariaceae	*Utricularia australis*		x			LC					
	Utricularia foliosa		x			LC					
	Utricularia gibba subsp. exoleta			x							
	Utricularia inflexa			x							
	Utricularia subulata			x							
Lobeliaceae	*Grammatotheca bergiana*			x							
	Lobelia anceps		x			LC					
	Lobelia angolensis			x							
Lomariopsidaceae	*Acrostichum aureum*			x							
	Bolbitis heudelotii			x							
Lythraceae	*Nesaea tolypobotrys*		x			LC					
Malvaceae	*Abutilon austro-africanum*			x							
	Corchorus trilocularis		x			NE					
	Grewia bicolor			x							
	Hibiscus tiliaceus	x		x							
	Malvastrum coromandelianum		x								1b
	Sida cordifolia	x	x								
	Sida rhombifolia subsp. rhombifolia		x			LC					
	Triumfetta rhomboidea var. rhomboidea		x			LC					

Family	Species	Rec [11]	POSA [12]	M&R [13]	En [14]	RL [15]	TOPs [16]	Tr[17]	PCO [18]	CARA [19]	NEM:BA [20]
	Waltheria indica		x			LC					
Marsileaceae	*Marsilea apposita*			x							
	Marsilea coromandelina			x							
	Marsilea ephippiocarpa			x							
	Marsilea macrocarpa			x							
	Marsilea minuta			x							
	Marsilea villifolia			x							
Meliaceae	*Ekebergia capensis*		x			LC					
	Trichilia dregeana	x	x			LC					
	Xylocarpus granatum			x							
Melianthaceae	*Bersama tysoniana*		x			LC					
Menyanthaceae	*Nymphoides indica subsp. occidentalis*			x							
	Nymphoides rautanenii			x							
Molluginaceae	*Glinus lotoides*			x							
Moraceae	*Ficus burtt-davyi*			x							
	Ficus lutea			x							
	Ficus natalensis subsp. natalensis		x			LC					
	Ficus sur	x									
	Ficus trichopoda	x		x				x			
	Ficus verruculosa			x							
Myricaceae	*Morella serrata*			x							
Myrtaceae	*Eugenia capensis subsp capensis*		x			LC					
	Psidium guajava	x								2	3
	Syzygium cordatum	x	x	x							
Najadaceae	*Najas marina subsp. delilei*			x							
	Najas pectinata			x							
Nephrolepidaceae	*Nephrolepis biserrata*		x	x		LC					
Nyctaginaceae	*Boerhavia coccinea var. coccinea*		x			LC					
	Boerhavia diffusa var. diffusa		x								

Family	Species	Rec [11]	POSA [12]	M&R [13]	En [14]	RL [15]	TOPs [16]	Tr[17]	PCO [18]	CARA [19]	NEM:BA [20]
	Boerhavia erecta			x							
	Commicarpus chinensis subsp. natalensis		x			LC					
	Commicarpus fallacissimus			x							
Nymphaeaceae	*Nymphaea nouchali var. caerulea*			x					Sch12		
Oleaceae	*Chionanthus peglerae*		x		x	LC					
	Olea woodiana		x								
Onagraceae	*Ludwigia adscendens subsp. diffusa*			x							
	Ludwigia leptocarpa			x							
	Ludwigia octovalvis			x							
	Ludwigia palustris			x							
	Oenothera affinis		x								
	Oenothera indecora		x								
Orchidaceae	*Cheirostylis nuda*		x			LC			Sch12		
	Eulophia angolensis			x					Sch12		
	Eulophia horsfallii			x					Sch12		
	Eulophia speciosa	x	x			LC			Sch12		
	Oeceoclades lonchophylla		x			LC			Sch12		
	Zeuxine africana			x					Sch12		
Orobanchaceae	*Buchnera longespicata*			x							
	Striga bilabiata subsp. bilabiata		x			LC					
	Striga gesnerioides		x			LC					
	Striga junodii			x							
Parkeriaceae	*Ceratopteris cornuta*			x							

Family	Species	Rec [11]	POSA [12]	M&R [13]	En [14]	RL [15]	TOPs [16]	Tr[17]	PCO [18]	CARA [19]	NEM:BA [20]
Passifloraceae	*Passiflora edulis*		x								2
Petiveriaceae	*Rivina humilis*		x							1	1b
Phyllanthaceae	*Bridelia cathartica*			x							
	Bridelia cathartica subsp. cathartica		x			LC					
	Bridelia micrantha			x							
Pinaceae	*Pinus sp.*	x								2	
Piperaceae	*Peperomia blanda*		x			LC					
Plantaginaceae	*Plantago lanceolata*	x									
	Scoparia dulcis		x			NE					
Poaceae	*Acroceras macrum*		x			LC					
	Andropogon eucomus		x			LC					
	Andropogon huillensis		x			LC					
	Aristida bipartita		x			LC					
	Aristida junciformis subsp. junciformis		x			LC					
	Aristida stipitata subsp. graciliflora			x							
	Arundo donax	x	x			NE				1	1b
	Brachiaria humidicola		x			LC					
	Cenchrus brownii		x			NE					
	Chloris mossambicensis			x							
	Chloris virgata			x							
	Cymbopogon nardus		x			LC					
	Cymbopogon pospischilii			x							
	Cymbopogon sp.	x									
	Cynodon dactylon	x	x	x		LC					
	Dactyloctenium aegyptium			x							
	Dactyloctenium australe		x			LC					
	Dactyloctenium giganteum		x			LC					
	Digitaria longiflora		x			LC					
	Digitaria natalensis	x		x							

Family	Species	Rec [11]	POSA [12]	M&R [13]	En [14]	RL [15]	TOPs [16]	Tr[17]	PCO [18]	CARA [19]	NEM:BA [20]
	Digitaria scalarum		x			LC					
	Diheteropogon amplectens			x							
	Diplachne fusca			x							
	Echinochloa colona		x			LC					
	Echinochloa crus-pavonis		x			LC					
	Echinochloa pyramidalis		x	x		LC					
	Echinochloa stagnina			x							
	Eleusine coracana subsp. africana		x			LC					
	Elionurus muticus			x							
	Enneapogon cenchroides			x							
	Eragrostis chapelieri			x							
	Eragrostis curvula	x									
	Eragrostis inamoena		x	x		LC					
	Eragrostis lappula			x							
	Eragrostis sclerantha			x							
	Eragrostis tenuifolia		x			LC					
	Eragrostis trichophora			x							
	Eriochloa meyeriana			x							
	Hemarthria altissima			x							
	Hyparrhenia cymbaria		x			LC					
	Hyparrhenia filipendula var. filipendula		x			LC					
	Hyparrhenia hirta		x			LC					
	Imperata cylindrica	x		x							
	Ischaemum afrum			x							
	Ischaemum arcuatum			x							
	Ischaemum fasciculatum			x							
	Leersia hexandra			x							
	Megastachya mucronata		x			LC					
	Melenis repens	x									

Family	Species	Rec [11]	POSA [12]	M&R [13]	En [14]	RL [15]	TOPs [16]	Tr[17]	PCO [18]	CARA [19]	NEM:BA [20]
	Monocymbium ceresiiforme			x							
	Panicum dregeanum		x			LC					
	Panicum maximum	x		x							
	Paspalidium obtusifolium			x							
	Paspalum commersonii			x							
	Paspalum dilatatum		x			NE					
	Paspalum scrobiculatum		x			LC					
	Paspalum vaginatum		x			LC					
	Pennisetum clandestinum	x									
	Phragmites australis	x		x							
	Phragmites mauritianus			x							
	Sacciolepis curvata		x			LC					
	Setaria incrassata			x							
	Setaria sphacelata			x							
	Sporoblis pyrimidalis	x									
	Sporobolus consimilis			x							
	Sporobolus fimbriatus			x							
	Sporobolus ioclados			x							
	Sporobolus natalensis		x			LC					
	Sporobolus nitens			x							
	Sporobolus pyramidalis		x			LC					
	Sporobolus smutsii			x							
	Sporobolus subulatus			x							
	Sporobolus virginicus		x			LC					
	Stenotaphrum secundatum		x			LC					
	Stipagrostis zeyheri subsp. barbata		x		x	LC					
	Themeda triandra			x							
	Trachypogon spicatus			x							
	Trichoneura grandiglumis			x							

Family	Species	Rec [11]	POSA [12]	M&R [13]	En [14]	RL [15]	TOPs [16]	Tr[17]	PCO [18]	CARA [19]	NEM:BA [20]
	Tristachya leucothrix			x							
	Urelytrum agropyroides			x							
	Urochloa mosambicensis			x							
	Urochloa stolonifera			x							
Podocarpaceae	*Afrocarpus falcatus*		x					Sch A			
Polygonaceae	*Oxygonum sinuatum*			x							
	Persicaria attenuata subsp. africana			x							
	Persicaria hystricula			x							
	Persicaria madagascariensis		x								
	Persicaria senegalensis			x							
Polypodiaceae	*Microsorum punctatum*			x							
	Microsorum scolopendria		x			LC					
Portulacaceae	*Portulaca quadrifida*			x							
Potamogetonaceae	*Potamogeton crispus*			x							
	Potamogeton pectinatus		x	x		LC					
	Potamogeton schweinfurthii		x	x		LC					
Prioniaceae	*Prionium serratum*			x							
Proteaceae	*Grevillea banksii*		x								1b
Pteridaceae	*Achrostichum aureum*	x									
	Pteris vittata		x			LC					
Restionaceae	*Restio zuluensis*			x							
Rhamnaceae	*Scutia myrtina*		x			LC					
	Ziziphus mucronata			x							
Rhizophoraceae	*Bruguiera gymnorrhiza*	x		x				Sch A			
	Cassipourea gummiflua			x							
	Ceriops tagal			x				Sch A			

Family	Species	Rec [11]	POSA [12]	M&R [13]	En [14]	RL [15]	TOPs [16]	Tr[17]	PCO [18]	CARA [19]	NEM:BA [20]
	Rhizophora mucronata			x				Sch A			
Rosaceae	*Rubus cuneifolius*	x									
Rubiaceae	*Agathisanthemum bojeri*			x							
	Burchellia bubalina			x							
	Canthium inerme			x							
	Kraussia floribunda			x							
	Oldenlandia cephalotes		x			LC					
	Pentodon pentandrus			x							
	Psychotria capensis			x							
	Psydrax obovata subsp. obovata		x			LC					
	Richardia brasiliensis	x									
	Richardia scabra		x			NE					
	Tarenna pavettoides subsp. pavettoides		x	x		LC					
Ruppiaceae	*Ruppia cirrhosa*		x			LC					
	Ruppia maritima		x			LC					
Salicaceae	*Pseudoscolopia polyantha*			x							
	Salix mucronata subsp. woodii			x							
	Scolopia mundii		x			LC					
	Scolopia stolzii			x							
	Scolopia zeyheri		x			LC					
Salvadoraceae	*Salvadora angustifolia*			x							
Salviniaceae	*Azolla pinnata subsp. africana*		x			LC					
Santalaceae	*Colpoon compressum*		x			LC					
	Thesium resedoides		x			LC					
Sapindaceae	*Allophylus dregeanus*			x							
	Cardiospermum grandiflorum		x							1	1b
	Deinbollia oblongifolia		x			LC					
Sapotaceae	*Manilkara concolor*		x			LC					

Family	Species	Rec [11]	POSA [12]	M&R [13]	En [14]	RL [15]	TOPs [16]	Tr[17]	PCO [18]	CARA [19]	NEM:BA [20]
	Manilkara discolor		x			LC					
	Mimmusops caffra	x						x			
	Mimusops obovata		x			LC					
Scrophulariaceae	*Hebenstretia comosa*		x			LC					
	Manulea parviflora var. parviflora		x			LC					
Smilacaceae	*Smilax anceps*	x	x	x		LC					
Solanaceae	*Physalis angulata*		x								
	Physalis viscosa		x								
	Solanum lycopersicum		x								
	Solanum nigrum		x								
	Solanum sp.	x									
Strelitziaceae	*Strelitzia nicolai*	x		x							
Strychnaceae	*Strychnos spinosa*			x							
Thelypteridaceae	*Ampelopteris prolifera*		x			LC					
	Cyclosorus interruptus		x			LC					
Thymelaeaceae	*Synaptolepis kirkii*			x							
Thyphaceae	*Typha capensis*	x		x							
Trapaceae	*Trapa natans var. bispinosa*			x							
Urticaceae	*Pilea microphylla*		x								
	Urera trinervis		x			LC					
Vahliaceae	*Vahlia capensis*			x							
	Vahlia capensis subsp. vulgaris var. longifolia			x							
Verbenaceae	*Glandularia aristigera*		x								
	Lantana camara	x	x							1	1b
	Phyla nodiflora var. nodiflora		x								
	Verbena bonariensis	x	x								1b
	Verbena brasiliensis		x								1b
Vitaceae	*Rhoicissus sessilifolia*		x		x	LC					
Zosteraceae	*Zostera capensis*		x			LC					

13 APPENDIX B: List of expected and recorded mammal species

Family	Scientific name	Common name	Red List	TOPS	KZN	Recorded
Cercopithecidae	*Chlorocebus pygerythrus*	Vervet Monkey	LC			x
	Chlorocebus pygerythrus pygerythrus	Vervet Monkey (subspecies pygerythrus)	LC			
Felidae	*Panthera pardus*	Leopard	VU	VU	Sch3	
Galagidae	*Galago moholi*	Mohol Bushbaby	LC			
	Otolemur crassicaudatus	Brown Greater Galago	LC			
Herpestidae	*Atilax paludinosus*	Marsh Mongoose	LC			x
	Herpestes sanguineus	Slender Mongoose	LC			x
	Mungos mungo	Banded Mongoose	LC			
Hippopotamidae	*Hippopotamus amphibius*	Common Hippopotamus	LC		Sch2	x
Molossidae	*Mops (Mops) condylurus*	Angolan Free-tailed Bat	LC			
Muridae	*Dasymys incomtus*	Common Dasymys	NT			
	Gerbilliscus brantsii	Highveld Gerbil	LC			
	Mastomys natalensis	Natal Mastomys	LC			
	Mus (Nannomys) minutoides	Southern African Pygmy Mouse	LC			
	Otomys angoniensis	Angoni Vlei Rat	LC			
Mustelidae	*Aonyx capensis*	African Clawless Otter	NT	PR		x
Nesomyidae	*Saccostomus campestris*	Southern African Pouched Mouse	LC			
Pteropodidae	*Epomophorus sp.*	Epauletted Fruit Bats				
Soricidae	*Crocidura cyanea*	Reddish-gray Musk Shrew	LC			
Thryonomyidae	*Thryonomys swinderianus*	Greater Cane Rat	LC			
Viverridae	*Genetta tigrina*	Cape Genet (Cape Large-spotted Genet)	LC			

14 APPENDIX C: List of expected and recorded reptile species

Family	Scientific name	Common name	Red list	Tops	Provincial	Recorded
Agamidae	*Acanthocercus atricollis*	Southern Tree Agama	LC			x
Amphisbaenidae	*Zygaspis arenicola*	Maputoland Dwarf Worm Lizard				
Chamaeleonidae	*Bradypodion setaroi*	Setaro's Dwarf Chameleon	LC			
	Chamaeleo dilepis	Common Flap-neck Chameleon	LC			
Colubridae	*Crotaphopeltis hotamboeia*	Red-lipped Snake	LC			
	Dasypeltis inornata	Southern Brown Egg-eater	LC			
	Dipsadoboa aulica	Marbled Tree Snake	LC			
	Philothamnus hoplogaster	South Eastern Green Snake	LC			
	Philothamnus natalensis	Eastern Natal Green Snake	LC			
	Thelotornis capensis capensis	Southern Twig Snake	LC			
Crocodylidae	*Crocodylus niloticus*	Nile Crocodile	VU	PR		
Elapidae	*Naja annulifera*	Snouted Cobra	LC			
	Naja subfulva	Brown Forest Cobra				
Gekkonidae	*Hemidactylus mabouia*	Common Tropical House Gecko	LC			x
	Lygodactylus capensis	Common Dwarf Gecko	LC			
Lamprophiidae	*Amblyodipsas concolor*	Natal Purple-glossed Snake	LC			
	Boaedon capensis	Brown House Snake	LC			
	Duberria lutrix lutrix	South African Slug-eater	LC			
	Duberria variegata	Variegated Slug-eater	LC			
	Gracililima nyassae	Black File Snake	LC			
	Lycodonomorphus inornatus	Olive House Snake	LC			
	Lycodonomorphus rufulus	Brown Water Snake	LC			
	Lycophidion capense capense	Cape Wolf Snake	LC			
	Lycophidion pygmaeum	Pygmy Wolf Snake	NT			

Family	Scientific name	Common name	Red list	Tops	Provincial	Recorded
	Psammophis mossambicus	Olive Grass Snake	LC			
Pythonidae	*Python natalensis*	Southern African Python	LC	PR		
Scincidae	*Acontias plumbeus*	Giant Legless Skink	LC			
	Panaspis wahlbergii	Wahlberg's Snake-eyed Skink	LC			
	Trachylepis depressa	Eastern Coastal Skink	LC			
	Trachylepis striata	Striped Skink	LC			x
Testudinidae	*Kinixys zombensis*	Eastern Hinged Tortoise	LC			
Varanidae	*Varanus niloticus*	Water Monitor	LC			
Viperidae	*Bitis arietans arietans*	Puff Adder	LC			
	Causus rhombeatus	Rhombic Night Adder	LC			

15 APPENDIX D: List of expected and recorded amphibian species

Family	Scientific name	Common name	Red List	TOPs	Provincial	Recorded
Arthroleptidae	*Arthroleptis stenodactylus*	Shovel-footed Squeaker	LC			
	Arthroleptis wahlbergi	Bush Squeaker	LC			
	Leptopelis mossambicus	Brownbacked Tree Frog	LC			
	Leptopelis natalensis	Forest Tree Frog	LC			
Brevicepitidae	*Breviceps mossambicus*	Mozambique Rain Frog	LC			
Bufonidae	*Sclerophrys garmani*	Olive Toad	LC			
	Sclerophrys gutturalis	Guttural Toad	LC			
Hyperoliidae	*Afrixalus aureus*	Golden Leaf-folding Frog	LC			
	Afrixalus delicatus	Delicate Leaf-folding Frog	LC			
	Afrixalus fornasinii	Greater Leaf-folding Frog	LC			
	Afrixalus spinifrons	Natal Leaf-folding Frog	LC			
	Hyperolius argus	Argus Reed Frog	LC			
	Hyperolius marmoratus	Painted Reed Frog	LC			x
	Hyperolius marmoratus marmoratus	Painted Reed Frog (subsp. marmoratus)	LC			
	Hyperolius marmoratus taeniatus	Painted Reed Frog (subsp. taeniatus)	LC			
	Hyperolius microps	Sharp-headed Long Reed Frog	LC			
	Hyperolius pusillus	Water Lily Frog	LC			x
	Hyperolius semidiscus	Yellowstriped Reed Frog	LC			
	Hyperolius tuberilinguis	Tinker Reed Frog	LC			
	Kassina senegalensis	Bubbling Kassina	LC			
	Phlyctimantis maculatus	Redlegged Kassina	LC			
Phrynobatrachidae	*Phrynobatrachus mababiensis*	Dwarf Puddle Frog	LC			
	Phrynobatrachus natalensis	Snoring Puddle Frog	LC			
Pipidae	*Xenopus laevis*	Common Platanna	LC			

Family	Scientific name	Common name	Red List	TOPs	Provincial	Recorded
Ptychadenidae	*Ptychadena mascareniensis*	Mascarene Grass Frog	LC			
	Ptychadena nilotica	Nile Grass Frog	LC			
	Ptychadena oxyrhynchus	Sharpnosed Grass Frog	LC			
	Ptychadena porosissima	Striped Grass Frog	LC			
	Ptychadena taenioscelis	Dwarf Grass Frog	LC			
Pyxicephalidae	*Amietia delalandii*	Delalande's River Frog	LC			
	Cacosternum nanum	Bronze Caco	LC			
	Pyxicephalus edulis	African Bull Frog	LC	PR		
	Strongylopus fasciatus	Striped Stream Frog	LC			
	Tomopterna natalensis	Natal Sand Frog	LC			

16 APPENDIX E: Specialist CV

6 Kinloch Crescent
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KZN

Leigh-Ann de Wet
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Biodiversity Specialist

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Profile

A biodiversity specialist with a history in botanical research, biodiversity assessments and associated planning in developing countries. Possesses experience in classification of ecosystems and development of management and monitoring plans for a variety of ecosystems from the spiny thicket of Madagascar to the Rainforests of West and Central Africa. Experience also includes Biodiversity Assessments (comprising classification and mapping of ecosystems and habitats) of ecosystems and vegetation types throughout Southern Africa including grasslands, forests, thicket, bushveld and fynbos with associated conservation and management recommendations.

Key Expertise

Ecological research methodology development	Report and paper writing
Ecological research	Synthesis of specialist work into integrated assessments
Habitat and vegetation mapping	Ecological statistics
Habitat and vegetation classification	Environmental Management and Monitoring

Education

2005 - 2007	**MSc** in Botany – Rhodes University
2005	**BSc Honours** in Botany (with Distinction) – Rhodes University
2001 - 2004	**BSc** (Botany and Entomology) – Rhodes University

Courses

2013	Wetland Management: Introduction to Law – University of the Free State
2013	Wetland Management: Introduction and Delineation Short Course – University of the Free State
2011	Land Degradation Short Course – Rhodes University
2009	EIA Short Course – Rhodes University and Coastal and Environmental Services

Membership

2012 – Present	Professional Natural Scientist with SACNASP: Ecological Science (No. 400233/12)
2012 – 2018	High Conservation Value Assessor (plants) with the Round Table of Sustainable Palm Oil.
2013 – Present	South African Association of Botanists
2013 – Present	Botanical Society of South Africa

2013 – Present	Wildlife and Environment Society of South Africa
2013	Grasslands Society of Southern Africa

Professional experience

2014 - Current Independent Biodiversity Specialist

Started own company (Sole Proprietor) to focus on Ecological Assessments including baseline assessments (habitat and ecosystem classification) as well as Management and Monitoring for large projects. Responsibilities include:

- Ecological Surveys including Baseline Assessments, Biodiversity Management and Monitoring Plans and Spatial Planning for biodiversity goals to meet international standards
- Offset design
- Strategic Environmental Planning
- Mapping (QGIS)
- Research
- Financial Management

2012 - 2014 Digby Wells Environmental – Unity Manager: Biophysical

Management of the Biophysical Department, specifically Flora and Fauna although included the overseeing and review of both Freshwater Ecology and Wetlands as well. Responsibilities included:

- Conducting and management of Ecological Baseline and Impact Assessments to meet international standards
- Biodiversity Management and Monitoring Plans
- Management of a team of between four and seven colleagues and specialists

2009 – 2012 Coastal and Environmental Services – Senior Environmental Consultant and Ecological Specialist

Ecological specialist responsible for conducting ecological assessments including baseline and impact assessments for Fauna and Flora. Later in this time for overseeing junior ecologists and training. Key responsibilities included:

- Conducting Ecological Baseline and Impact Assessments to international standards
- Strategic environmental planning
- Managing teams of specialists
- Mapping (Arc)
- Research

2007 - 2009 Rhodes University (South Africa) and Sheffield University (England) – NERC Research Assistant

Design and conducting of a large common or garden experiment looking at the effects of global climate change on grassland composition. Key responsibilities included:

- Experimental design
- Experiment implementation

- Data analyses

Awards

2005	Best Young Botanist second prize for a presentation entitled: "Population biology and effects of harvesting on *Pelargonoium reniforme* (Geraniaceae) in Grahamstown and surrounding areas" at the SAAB conference. Dean's list, Academic Colours, Masters Scholarship.
2004	Putterill Prize for conservation in the Eastern Cape, Dean's list, Academic Half Colours, Honours Scholarship.
2001 - 2003	Dean's List

Publications

de Wet, L., Downsborough, L., Reimers, B., and Weah, C. (in prep). Traditional ecological knowledge and social survey as a proxy for large mammal scientific survey in Liberia.

de Wet, L., Downsborough, L., Reimers, B., and Weah, C (in prep). Traditional ecological knowledge and presence of large mammals in Liberia: a case study.

de Wet, L., and Downsborough, L. (in prep). A case for using traditional knowledge for community managed multiple use conservation areas in Liberia.

Taylor, S, Ripley, B, Martin, T, **de Wet, L,** Woodward, I and Osborne, C (2014.) Physiological advantages of C4 grasses in the field: a comparative experiment demonstrating the importance of drought. Global Change Biology – in Press.

Ripley BS, **de Wet, L** and Hill MP (2008). Herbivory-induced reduction in photosynthetic productivity of water hyacinth, *Eichhornia crassipes* (Martius) Solms-Laubach (Pontederiaceae), is not directly related to reduction in photosynthetic leaf area. African Entomology 16(1): 140-142.

de Wet LR, Barker NP and Peter CI (2008). The long and the short of gene flow and reproductive isolation: Inter-Simple Sequence Repeat (ISSR) markers support the recognition of two floral forms in *Pelargonium reniforme* (Geraniaceae). Biochemical Systematics and Ecology 36: 684-690.

de Wet L, NP Barker and CI Peter (2006). Beetles and Bobartia: an interesting herbivore-plant relationship. Veld & flora. September: 150 – 151.

de Wet LR and Botha CEJ (2007). Resistance or tolerance: An examination of aphid (*Sitobion yakini*) phloem feeding on Betta and Betta-Dn wheat (*Triticum aestivum* L.). South African Journal of Botany 73(1): 35-39.

de Wet L (2005). Is *Pelargonium reniforme* in danger? The effects of harvesting on *Pelargonium reniforme*. Veld & Flora. December: 182-184.

Presentations

2013 **LR de Wet** – Biodiversity Actions Plans for existing mines: Making them Work for Grassland Conservation - Grassland Society of Southern Africa Congress, Limpopo

2011 **LR de Wet** - Finding Ecological Benefits of Windfarms – Thicket Forum, Grahamstown

2010 Lubke, RA, N Davenport, **LR de Wet** and C Fordham – The ecology and distribution of endorheic pans in the subtropical thicket vegetation near Port Elizabeth, Eastern Cape, South Africa – International Association for Vegetation Science, 53rd Annual Symposium, Ensenada, Mexico.

2006 **LR de Wet,** Barker, N and Peter, C – Pollinator-mediated selection in *Pelargonium reniforme* as described by Inter Simple Sequence Repeat markers. – South African Association of Botanists (SAAB) conference.

2006 **LR de Wet**, Barker, N and Peter, C– Pollinator-mediated selection of *Pelargonium reniforme* and two floral morphs described by inter simple sequence repeat markers – Southern African Society for Systematic Biology (SASSB) conference.

2005 **LR de Wet** and Vetter, S – Population biology and effects of harvesting on *Pelargonium reniforme* (Geraniaceae) in Grahamstown and surrounding areas, Eastern Cape, South Africa – South African Association of Botanists (SAAB) conference.

2005 **LR de Wet** and Vetter, S – Harvesting of *Pelargonium reniforme* in Grahamstown; what are the implications for populations of the plant? – Thicket Forum

2005 **LR de Wet** – Harvesting of *Pelargonium reniforme* in Grahamstown; what are the implications for populations of the plant? – Annual general meeting. Botanical Society of South Africa, Albany Branch.

2004 **LR de Wet** – Population biology of *Pelargonium reniforme* – Annual general meeting. Botanical Society of South Africa, Albany Branch.

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:	The Biodiversity Company			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	2	Percentage Procurement recognition	
Specialist name:	Leigh-Ann de Wet			
Specialist Qualifications:	MSc			
Professional affiliation/registration:	SACNASP (400233/12)			
Physical address:	12 Sunningdale Avenue, Howick			
Postal address:	12 Sunningdale Avenue, Howick			
Postal code:	3290	Cell:	0833521936	
Telephone:	0833521936	Fax:		
E-mail:	Leigh-ann@thebiodiversitycompany.com			

2. DECLARATION BY THE SPECIALIST

I, ____Leigh-Ann de Wet_____, 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

The Biodiversity Company

Name of Company:

27/10/2022

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, ____Leigh-Ann de Wet_____, 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

The Biodiversity Company

Name of Company

Date

Signature of the Commissioner of Oaths

13:30 27/10/2022.

Date

CERTIFIED TRUE COPY
I Certify that this document is a true copy of the original which was examined by me and that, from my observations, that there are no indications that the original document has been altered by unauthorised persons

SIGN _____ DATE 27/10/22 TIME 13:30

EX-OFFICIO COMMISSIONER OF OATHS (RSA)
SEAN GORDON TOPPER
PRINCIPAL
ST NICHOLAS DIOCESAN SCHOOL
34 JABU NDLOVU STREET, PIETERMARITZBURG
TEL 033 345 1566
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