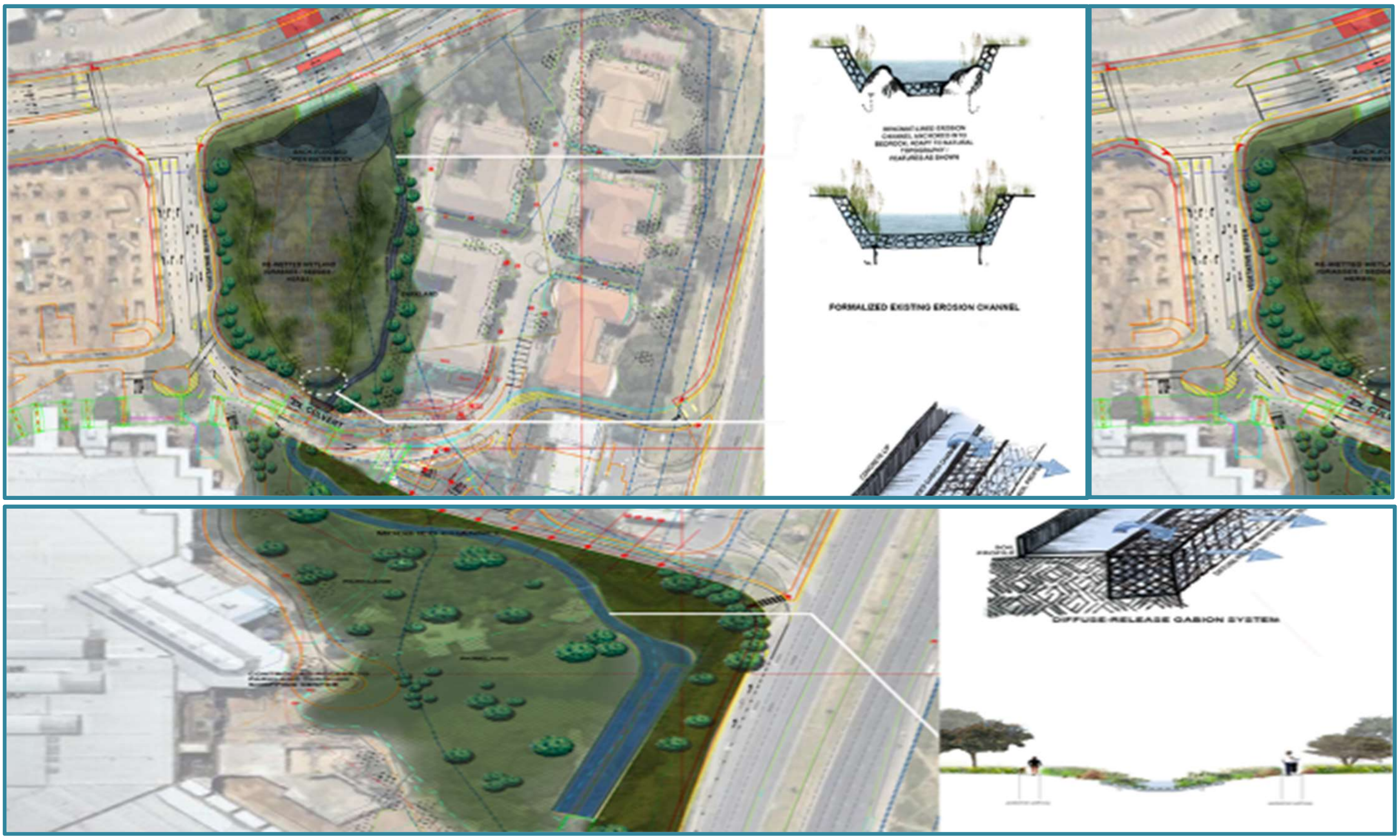
ROOIKOP ESKOM RELOCATION:
Wetland Assessment and RAM Report

Prepared for:

NSOVO ENVIRONMENTAL CONSULTING

Prepared by:

WaterMakers



May 2024

Declaration of Independence by Specialist

I, **WILLEM LUBBE**, in my capacity as a specialist consultant, hereby declare that I -

- act as an independent consultant;
- 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;
- declare that there are no circumstances that may compromise my objectivity in performing such work;
- do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- have no, and will not engage in, conflicting interests in the undertaking of the activity;
- undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- have expertise in conducting the specialist report relevant to this application, including knowledge of the National Environmental Management Act, 1998 (Act No. 107 of 1998), regulations and any guidelines that have relevance to the proposed activity;
- based on information provided to me by the project proponent and in addition to information obtained during the course of this study, have presented the results and conclusion within the associated document to the best of my professional ability;
- undertake to have my work peer reviewed on a regular basis by a competent specialist in the field of study for which I am registered; and
- as a registered member of the South African Council for Natural Scientific Professions, will undertake my profession in accordance with the Code of Conduct of the Council, as well as any other societies to which I am a member.

04/04/2024

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Date

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Willem Lubbe Pr.Sci.Nat
Wetland Principle Specialist
SACNASP Reg. No. 004750

EXECUTIVE SUMMARY

Nsovo Environmental Consulting was contracted to review the area and conduct the necessary environmental assessments for the relocation of Eskom Related Infrastructure at Rooikop. Subsequently, WaterMakers was appointed by Nsoo Environmental Consulting as independent specialists to conduct the relevant wetland-related studies in order to facilitate the required environmental authorisation and water use licence processes. The present study represents the baseline, impact and DWS Risk Assessment of the study and aims to inform responsible decision making with regards to the project.

The Eskom Germiston South / SAR Rooikop powerline is a 1.96KM 88kV powerline that feeds the SAR Rooikop 88KV Traction Substation, from the Germiston South 88/33kV Substation. The proposed deviation is approximately 485.05 meters for the 88KV powerline, and it will involve the following:

- Servitude acquisition along the perimeter of the wetland, from structure 3 to SAR Rooikop substation.
- Dismantle conductors and structures, from structure 1 to structure 3 (access to the wetland is required. CNC confirmed this will be foot access).
- Scrap the dismantled material on site.
- Install 2 x 20 m Steel Monopole structures, along the new servitude.
- Install 14 stays.
- String Panther conductors from structure 3 to SAR Rooikop substation (use a helicopter to string Panther conductors from structure 3, along the new servitude and monopole structures, to structure 1.)

One hydro-geomorphic wetland types were identified and delineated within the study area during the present study and classified into one hydro-geomorphic (HGM) unit, HGM 1, a channelled valley bottom wetland that has subsequently been modified through various anthropogenic activities. Historic imagery indicates that the extend of HGM 1 has been historically considerably modified through the construction of several linear infrastructure including railway and road embankment. In addition, artificial input in relation to hydrology is deemed significant in the system. Artificial hydrological input included water delivered by transfer schemes, clean and dirty water inputs for industry, major dewatering from mining operations as well as formalised and informal sewage spills and leaks. The channelled valley bottom wetland (Natalspruit and Elsburgspruit) has undergone drastic hydrological, chemical, and biological alteration due to the historical mining associated and urban activities. The channelled valley bottom wetland PES was classified as a category F (critically modified). The watercourse has been altered significantly physically and chemically through more than 90 years of mining and urban related developments and activities. It should be emphasised that the benchmark or historic extend of the valley bottom was several fold smaller than the current extend. Considering the benchmark condition, the existing and proposed infrastructure would have fallen well outside of the historic channelled valley bottom wetland

Hydrological and Functional Importance for HGM 1 was considered to be moderate as a result of the important bio-geochemical processes that the valley bottom wetland renders within a stressed catchment.

Direct human benefits were regarded as moderate as HGM 1 is likely utilised for reeds and informal hunting purposes.

The DWS Risk Assessment Matrix, in terms of GA 509, calculated the significance of perceived impacts on the key drivers and receptors (hydrology, water quality, geomorphology, habitat and biota) of the freshwater resources assessed that is situated within 500m from the proposed development. By assessing the severity, spatial scale, duration and frequency of the proposed ESKOM infrastructure relocation, the risk to the potentially affected resource quality was determined to be low for all aspects during the construction and operational phases. The low risk identified was based on all recommended mitigation measures being implemented as outlined within this report.

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ACRONYMS

CSIR	Council for Scientific and Industrial Research
DEA	Department of Environmental Affairs
DWA	Department of Water and Sanitation
DWS	Department of Water and Sanitation
EC	Ecological Category
FEPA	Freshwater Ecosystem Priority Area
GPS	Global Positioning System
HGM	Hydrogeomorphic
NBA	National Biodiversity Assessment
NFEPA	National Freshwater Ecosystem Priority Areas project
NWRS	National Water Resource Strategy
PES	Present Ecological State
SAIAB	South African Institute for Aquatic Biodiversity
SANBI	South African National Biodiversity Institute
SANParks	South African National Parks
VEGRAI	Vegetation Reponses Assessment Index
WMA	Water Management Areas
WRC	Water Research Commission
WWF	Worldwide Fund for Nature

1. INTRODUCTION

1.1 Project Description

Nsovo Environmental Consulting was contracted to review the area and conduct the necessary environmental assessments for the relocation of Eskom Related Infrastructure at Rooikop. Subsequently, WaterMakers was appointed by Nsoo Environmental Consulting as independent specialists to conduct the relevant wetland-related studies in order to facilitate the required environmental authorisation and water use licence processes. The present study represents the baseline, impact and DWS Risk Assessment of the study and aims to inform responsible decision making with regards to the project.

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1.2 Assumptions and Limitations

During the course of the present study, the following limitations were experienced:

- In order to obtain definitive data regarding the biodiversity, hydrology and functioning of particular wetlands, studies should ideally be conducted over a number of seasons and over a number of years.;
- Wetland and riparian areas within transformed landscapes, such as urban and/or agricultural settings, or mining areas with existing infrastructure, are often affected by disturbances that restrict the use of available wetland indicators, such as hydrophytic vegetation or soil indicators (e.g. as a result of dense stands of alien vegetation, dumping, sedimentation, infrastructure encroachment and infilling).;
- Wetland and riparian assessments are based on a selection of available techniques that have been developed through the Department of Water and Sanitation (DWS). These methods are, however, largely qualitative in nature with associated limitations due to the range of interdisciplinary aspects that have to be taken into consideration. Current and historic anthropogenic disturbance within and surrounding the study area has resulted in soil profile disturbances as well as successional changes in species composition in relation to its original /expected benchmark condition;
- Delineations of wetland areas were largely dependent on the extrapolation of field indicator data obtained during field surveys, 5m contour data for the study area, and from interpretation of geo-referenced orthophotos and satellite imagery as well as historic aerial imagery data sets received

from the National Department of Rural Development and Land Reform. As such, inherent ortho-rectification errors associated with data capture and transfer to electronic format are likely to decrease the accuracy of wetland boundaries in many instances; and

- Wetlands outside of the study area boundary was extrapolated using aerial imagery, although some sampling was done outside of the study boundaries in order to confirm findings and better interpret hydropedological characterisation of the study area.

2. GENERAL CHARACTERISTICS

2.1 Location

The proposed Rooikop deviation is situated next to an informal settlement on the northern edge of Klippoortjie / Wadville in southern Johannesburg, Ekurhuleni Metropolitan Municipality, Gauteng province. (Figure 2).

2.2 Biophysical Attributes

2.2.1 Climate

The climate for the study area was derived from recorded data (en.climate-data.org and worldweatheronline.com) for Germiston. The area receives seasonal summer rainfall with winters being generally very dry. Long term average rainfall ranged from 620 – 800 mm, with the long term average between around 700 mm. Most rains could be expected between November and March, peaking between December and February. Summer day temperatures fluctuated daily on average between 14°C and 27°C in January, but may go above 33°C. The coldest daily winter temperatures, in July, fluctuated on average between 3°C and 18°C. Incidence of frost was frequent, which would restrict the growth of high shrubs and trees under *natural* conditions, enabling grasslands to persist

2.2.2 Historic vegetation overview

Gauteng lies within the Grassland biome, in which natural dominance of high shrubs and/or trees is largely prevented by frequent frost occurrences (and other factors) during winter, which tufted perennial grasses are better adapted to survive. A multitude of species that resprout during early summer from an underground storage organ after their winter dormancy, contribute to the exceptionally high plant diversity of South African Grasslands. The grassland biome is made up of a mosaic of many different vegetation types, which vary according to the prevailing abiotic conditions (GIBB, 2016).

According to the delineation of these vegetation types, as described and mapped for South Africa (in Mucina and Rutherford, 2006 and updated 2012 maps), the study area was historically covered with Carltonville Dolomite Grassland towards the periphery but dominated by Eastern Temperate Freshwater Wetlands.

Eastern Temperate Freshwater Wetlands are found on flat or gently undulating landscapes or shallow depressions filled with (temporary) water bodies such as pans, periodically flooded vleis, and edges of calmly flowing rivers that support zoned systems of aquatic and hygrophilous vegetation where grasslands are temporarily flooded. Dominant Taxa that can be expected in the different zones in wetlands include:

Marshes:

<u>Graminoids</u>: *Cyperus congestus, Agrostis lachnantha, Carex acutiformis, Eleocharis palustris, Eragrostis plana, E. planiculmis, Fuirena pubescens, Helictotrichon turgidulum, Hemarthria altissima, Imperata cylindrica, Leersia hexandra, Paspalum dilatatum, P. urvillei, Pennisetum thunbergii, Schoenoplectus decipiens, Scleria dieterlenii, Setaria sphacelata, Andropogon appendiculatus, A. eucomus*.

Herbs: *Centella asiatica, Ranunculus multifidus, Berkheya radula, B. speciosa, Berula erecta subsp. thunbergii, Centella coriacea, Chironia palustris, Equisetum ramosissimum, Falckia oblonga, Haplocarpha lyrata, Helichrysum difficile, H. dregeanum, H. mundtii, Hydrocotyle sibthorpioides, H. verticillata, Lindernia conferta, Lobelia angolensis, L. flaccida, Mentha aquatica, Monopsis decipiens, Pulicaria scabra, Pycnostachys reticulata, Rorippa fluviatilis var. fluviatilis, Rumex lanceolatus, Senecio inornatus, S. microglossus, Sium repandum, Thelypteris confluens, Wahlenbergia banksiana.*

Geophytes: *Cordylogyne globosa, Crinum bulbispermum, Gladiolus papilio, Kniphofia ensifolia, K. fluviatilis, K. linearifolia, Neobolusia tysonii, Satyrium hallackii* subsp. *hallackii.*

Reed and sedge beds:

<u>Graminoids</u>: *Phragmites australis, Schoenoplectus corymbosus, Typha capensis, Cyperus immensus. Carex rhodesiaca.*

Water bodies:

<u>Aquatic Herbs</u>: *Aponogeton junceus, Ceratophyllum demersum, Lagarosiphon major, L. muscoides, Marsilea capensis, Myriophyllum spicatum, Nymphaea lotus, N. nouchali var. caerulea, Nymphoides thunbergiana, Potamogeton thunbergii.*

<u>Carnivorous Herb</u>: *Utricularia inflexa.*

<u>Herb</u>: *Marsilea farinosa* subsp. *farinosa*. (Mucina & Rutherford, 2006).

2.2.3 Geology

The 1:250,000 Geological map for the study area (2628 Eastrand; Department of Mines – Geological Survey) indicated that the study area is situated on Malmani dolomites of the Chunipoort formation as well as Alluvium (Figure 1).

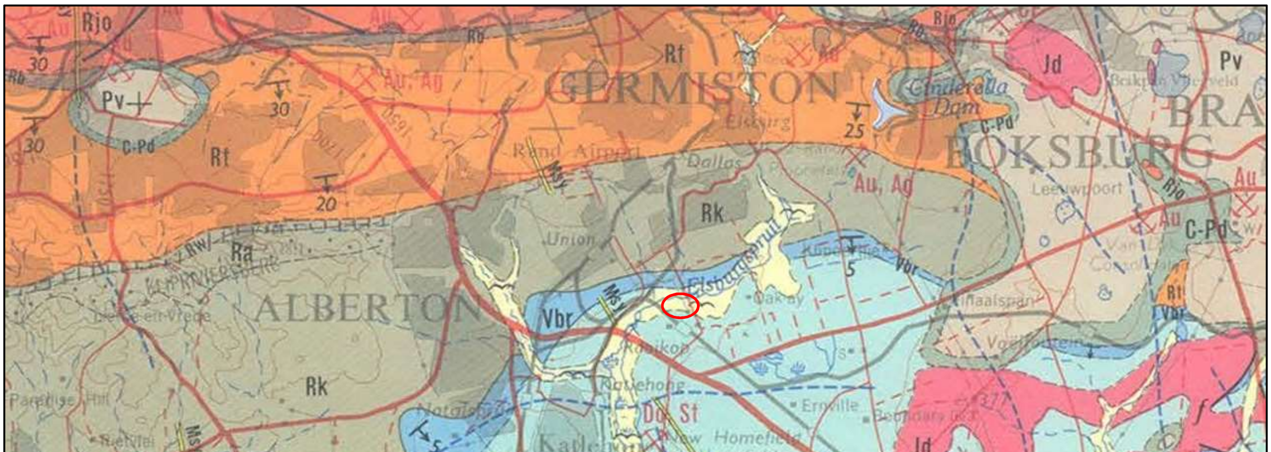


Figure 1: Geology of the study area (2628 Eastrand 1:250 000; Dep. of Mines – Geological Survey), red polygon

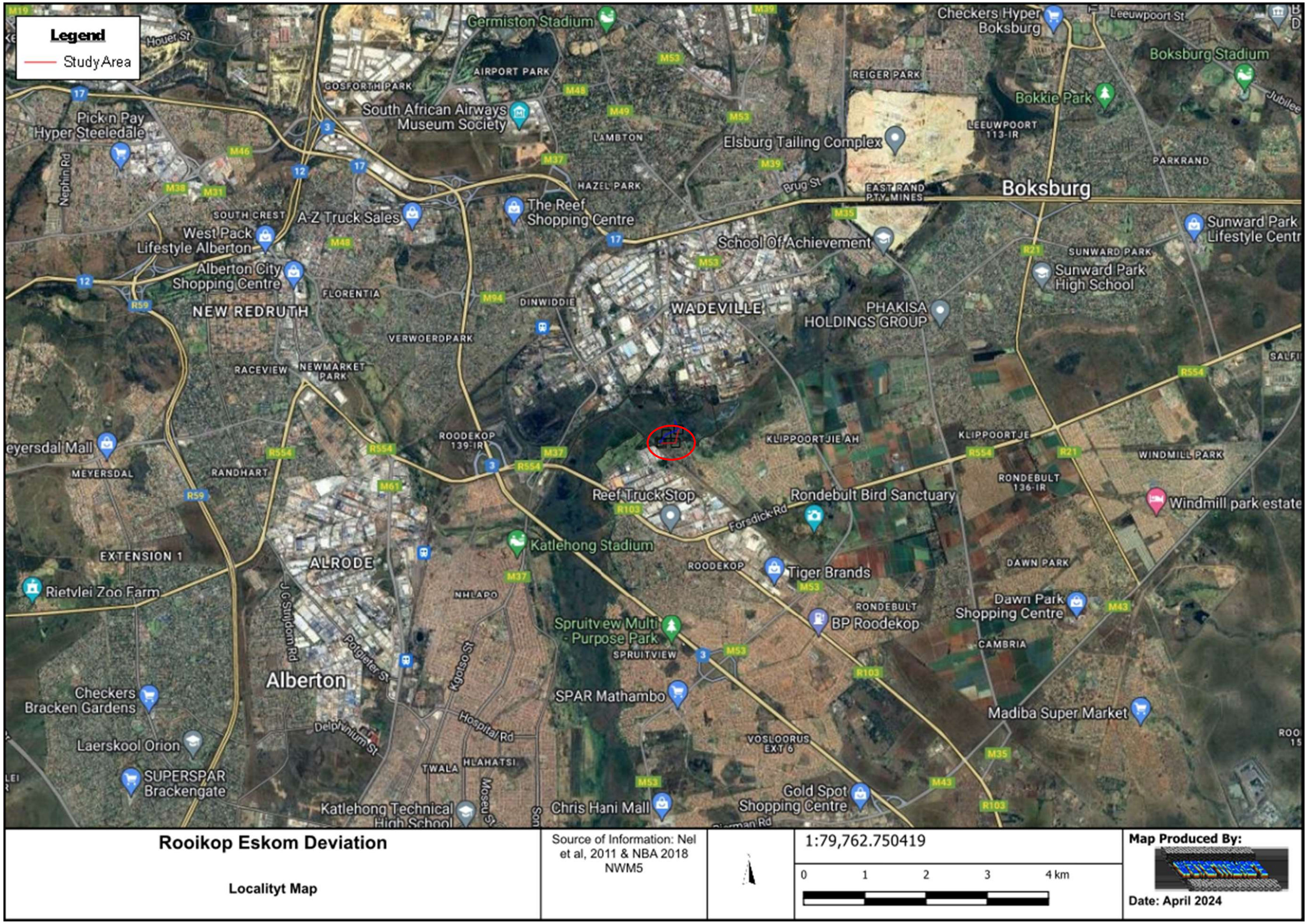


Figure 2: Locality map for the study area

2.2.4 Associated Aquatic Ecosystems and Drainage

The present study area forms part of the quaternary catchment C22B which is located within the Upper Vaal Water Management Area. Run-off and stormwater in the vicinity drains into the Elsburgspruit and Natalspruit River, subsequently joining the Rietspruit River before joining the Vaal River.

2.2.5 National Freshwater Ecosystem Priority Areas

The National Freshwater Ecosystem Priority Areas (NFEPA) project represents a multi-partner project between the Council for Scientific and Industrial Research (CSIR), South African National Biodiversity Institute (SANBI), Water Research Commission (WRC), Department of Water Affairs (DWA; now Department of Water and Sanitation, or DWS), Department of Environmental Affairs (DEA), Worldwide Fund for Nature (WWF),

South African Institute of Aquatic Biodiversity (SAIAB) and South African National Parks (SANParks). More specifically, the NFEPA project aims to:

- Identify Freshwater Ecosystem Priority Areas (hereafter referred to as 'FEPAs') to meet national biodiversity goals for freshwater ecosystems; and
- Develop a basis for enabling effective implementation of measures to protect FEPAs, including free-flowing rivers.

The first aim uses systematic biodiversity planning to identify priorities for conserving South Africa's freshwater biodiversity, within the context of equitable social and economic development. The second aim comprises a national and sub-national component. The national component aims to align DWS and DEA policy mechanisms and tools for managing and conserving freshwater ecosystems. The sub-national component aims to use three case study areas to demonstrate how NFEPA products should be implemented to influence land and water resource decision-making processes at a sub-national level (Driver et al., 2011). The project further aims to maximize synergies and alignment with other national level initiatives such as the National Biodiversity Assessment (NBA) and the Cross-Sector Policy Objectives for Inland Water Conservation.

Based on current outputs of the NFEPA project (Nel et al., 2011; Figure 3), no FEPA wetlands or wetland clusters were located within the study area or within several kilometres from the study area. (Figure 3).

2.2.6 Wetland Vegetation Group

According to the National Biodiversity Assessment's Freshwater Component (Nel et al., 2011), the study area falls within the Mesic Highveld Group 3 and Dry Highveld Grassland Group 5 wetland vegetation groups. According to the wetland vegetation group ecosystem threat status, wetlands within the Mesic Highveld Group 3 vegetation group is regarded as Critically Endangered with the Dry Highveld Grassland Group 5 wetland vegetation group regarded as being least concern (Nel et al., 2011).

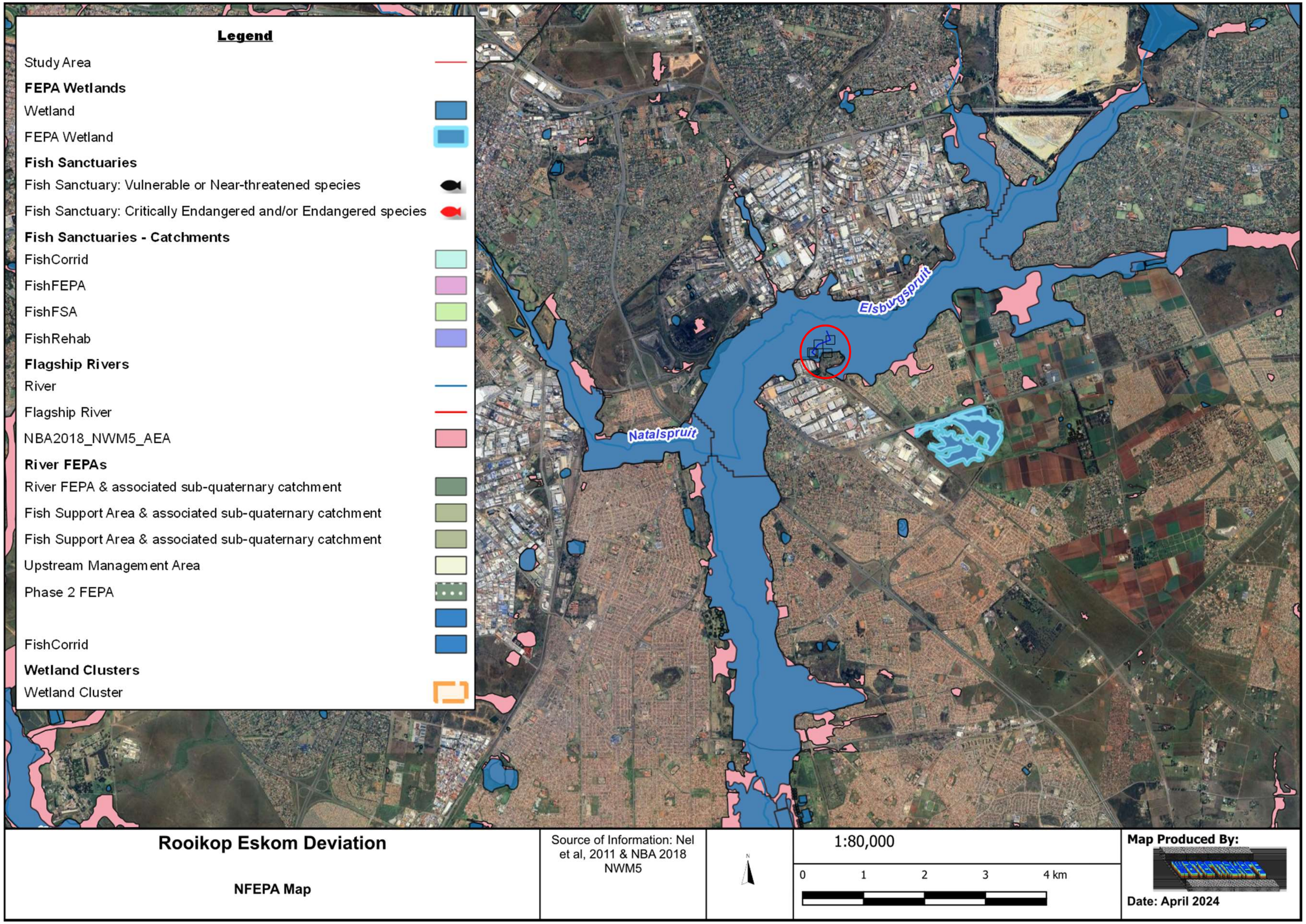


Figure 3: NFEPA map indicating lack of FEPA features in relation to the study area

3. ASSOCIATED WETLANDS

3.1 Wetlands Soils

According to the Department of Water Affairs and Forestry (2005), the permanent zone of a wetland will always have either Champagne, Katspruit, Willowbrook or Rensburg soil forms present, as defined by the Soil Classification Working Group (1991). The seasonal and temporary zones of the wetlands will have one or more of the following soil forms present (signs of wetness incorporated at the form level): Kroonstad, Longlands, Wasbank, Lamotte, Estcourt, Klapmuts, Vilafontes, Kinkelbos, Cartref, Fernwood, Westleigh, Dresden, Avalon, Glencoe, Pinedene, Bainsvlei, Bloemdal, Witfontein, Sepane, Tukulu, Montagu. Alternatively, the seasonal and temporary zones will have one or more of the following soil forms present (signs of wetness incorporated at the family level): Inhoek, Tsitsikamma, Houwhoek, Molopo, Kimberley, Jonkersberg, Groenkop, Etosha, Addo, Brandvlei, Glenrosa, Dundee (Department of Water Affairs and Forestry, 2005). Hydric soil forms identified within the study area included the soil forms Avalon, Bainsvlei, Bloemdal, Dresden, Glencoe, Glenrosa, Katspruit, Rensburg, Longlands, Westleighs, Tukula, Kroonstad, Sepane and Wasbank.

Wetland soils observed within the study area included the Katpsruit soil form associated with permanent wetland zonation. However, the study area and more specifically the large valley bottom wetland associated with the study area has been dramatically modified over more than a hundred years, especially through industrial and mining activities. The new Soil Classification working Group (2018) classification system has incorporated several changes to the previous soil classification Soil Classification Working Group (1991). The new open classification system allows for the classification of whole-soil profiles which potentially enhances studies of water flows in river basins where soil morphology is recognised as an important hydrological indicator of water flow paths and storage mechanisms in hillslopes. The new Soil Classification working Group (2018) soil classification system's open classification structure also allows "natural soils" and "anthropogenic materials" to be separated at the highest category with their respective criteria and structures. This was particularly relevant as the study area itself which were dominated by historic cut and infill processes while the valley bottom has also been topographically manipulated through the construction of several interconnected dams. Physically disturbed anthrosols identified within the study area included Grabouw 1000, Grabouw 2000 and Grabouw 3000, whereas transported technosols included Witbank 1100, Witbank 1200, Witbank 2100; hydric technosols included Stilfontein 1100, Stilfontein 1200 and possibly Stilfontein 2100 *cf* as well as Stilfontein 2200 *cf.*

According to the DWAF (2005), soil wetness indicators (i.e. identification of redoximorphic features) are the most important indicator of wetland occurrence due to the fact that soil wetness indicators remain in wetland soils in most instances, even if they are degraded or desiccated. It is important to note that the presence or absence of redoximorphic features within the upper 500mm of the soil profile alone is sufficient to identify the soil as being hydric (a wetland soil), or non-hydric (non-wetland soil) (Collins, 2005). Some redoximorphic features were present within soil profiles of the disturbed valley bottom wetland, including black, orange and red mottles, rhizospheres and gleyed.

Redoximorphic features are the result of the reduction, translocation and oxidation (precipitation) of iron and manganese oxides that occur when soils are saturated for sufficiently long periods of time to become anaerobic. Redoximorphic features typically occur in three types (Collins, 2005):

- **A reduced matrix** - i.e. an *in situ* low chroma (soil colour), resulting from the absence of Fe^{3+} ions which are characterised by "grey" colours of the soil matrix.
- **Redox depletions** - the "grey" (low chroma) bodies within the soil where Fe - Mn oxides have been stripped out, or where both Fe-Mn oxides and clay have been stripped. Iron depletions and clay depletions can occur.
- **Redox concentrations** - Accumulation of iron and manganese oxides (also called mottles). These can occur as:
  - Concretions - harder, regular shaped bodies;
  - Mottles - soft bodies of varying size, mostly within the matrix, with variable shape appearing as blotches or spots of high chroma colours; and,
  - Pore linings – zones of accumulation that may be either coatings on a pore surface, or impregnations of the matrix adjacent to the pore. They are recognised as high chroma colours that follow the route of plant roots, and are also referred to as oxidised rhizospheres

3.2 Wetlands Vegetation

According to the Department of Water Affairs and Forestry (2005), vegetation is regarded as a key component to be used in the delineation procedure for wetlands. Vegetation also forms a central part of the wetland definition in the National Water Act (Act 36 of 1998). Using vegetation as a primary wetland indicator however, requires undisturbed conditions (Department of Water Affairs and Forestry, 2005). A cautionary approach must therefore be taken as vegetation alone cannot be used to delineate a wetland, as several species, while common in wetlands, can occur extensively outside of wetlands. When examining plants within a wetland, a distinction between hydrophilic (vegetation adapted to life in saturated conditions) and upland species must be kept in mind.

There is typically a well-defined 'wetness' gradient that occurs from the centre of a wetland to its edge that is characterized by a change in species composition between hydrophilic plants that dominate within the wetland to upland species that dominate on the edges of, and outside the wetland (Department of Water Affairs and Forestry, 2005). It is important to identify the vegetative indicators which determine the three wetness zones (temporary, seasonal and permanent) which characterize wetlands. Each zone is characterized by different plant species which are uniquely suited to the soil wetness within that zone.

The wetness gradient on site and within the surrounding environment was heavily disturbed as a result of current and historic anthropogenic activities particularly through mining, industrial, residential and associated infrastructure development as well as through historic agriculture. Permanent wetland areas in the study area were dominated by *Phragmites australis* but also included *Typha capensis, Fuirena sp, Cyperaceae spp, Schoenoplectus corymbosus* and *Persicaria* sp., with a mixture of facultative and terrestrial species (mostly graminoids and weeds) dominating the seasonal and temporary wetland areas, including species such as *Sporobolus fimbriatus, Paspalum dilatatum, Agrostis lachnantha, Verbena bonariensis, Eragrostis plana, Hyparrhenia tamba, Cynodon dactylon, Helichrysum rugulosum, Hemarthria altissima, Pycereus* sp. and *Centella asiatica.* Several exotic species were also prominent in disturbed areas and included species such as *Pennisetum clandestinum, Cortaderia selloana, Bidens pilosa, Conyza sumatrensis, Richardia brasiliensis* and *Populus* sp. The temporary and seasonal areas only occupied a very thin margin along the dominant artificial main body of permanent water supporting Phragmites (Figure 4; Figure 5).

Figure 4: Modified valley bottom wetland with existing Eskom infrastructure in background

Figure 5: Modified valley bottom wetland with existing Eskom infrastructure in background

3.3 Delineated Wetland Areas

According to the National Water Act (Act no 36 of 1998), a wetland is defined as, "*land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil*." Wetlands typically occur on the interface between aquatic and terrestrial habitats and therefore display a gradient of wetness – from permanent, to seasonal, to temporary zones of wetness - which is represented in their plant species composition, as well as their soil characteristics. It is important to take cognisance of the fact that not all wetlands have visible surface water. An area which has a high water table at or just below the surface of the soil is as much a wetland as a pan that only contains water for a few weeks during the year.

Hydrophytes and hydric soils are subsequently used as the two main wetland indicators. The presence of these two indicators is symptomatic of an area that has sufficient saturation to classify the area as a wetland. Terrain unit, which is another indicator of wetland areas, refers to the land unit in which the wetland is found.

In practice all indicators should be used in any wetland assessment/delineation exercise, the presence of redoximorphic features being most important, with the other indicators being confirmatory. An understanding of the hydrological processes active within the area is also considered important when undertaking a wetland assessment. Indicators should be 'combined' to determine whether an area is a wetland and to delineate the boundary of a wetland. According to Department of Water Affairs and Forestry (2005), the more wetland indicators that are present the higher the confidence of the delineation. In assessing whether an area is a wetland, the boundary of a wetland or a non- wetland area should be considered to be the point where indicators are no longer present. Classification for the purpose of the current project therefore focused on classifying watercourses according to the most dominant hydrological and geomorphological drivers, especially in terms of relating potential impacts of the potential development on especially the watercourses associated with the study area.

One hydro-geomorphic wetland types were identified and delineated within the study area during the present study and classified into one hydro-geomorphic (HGM) unit, HGM 1, a channelled valley bottom wetland that has subsequently been modified through various anthropogenic activities (Figure 8). Historic imagery indicates that the extend of HGM 1 has been historically considerably modified through the construction of several linear infrastructure including railway and road embankment. In addition, artificial input in relation to hydrology is deemed significant in the system. Artificial hydrological input included water delivered by transfer schemes, clean and dirty water inputs for industry, major dewatering from mining operations as well as formalised and informal sewage spills and leaks.

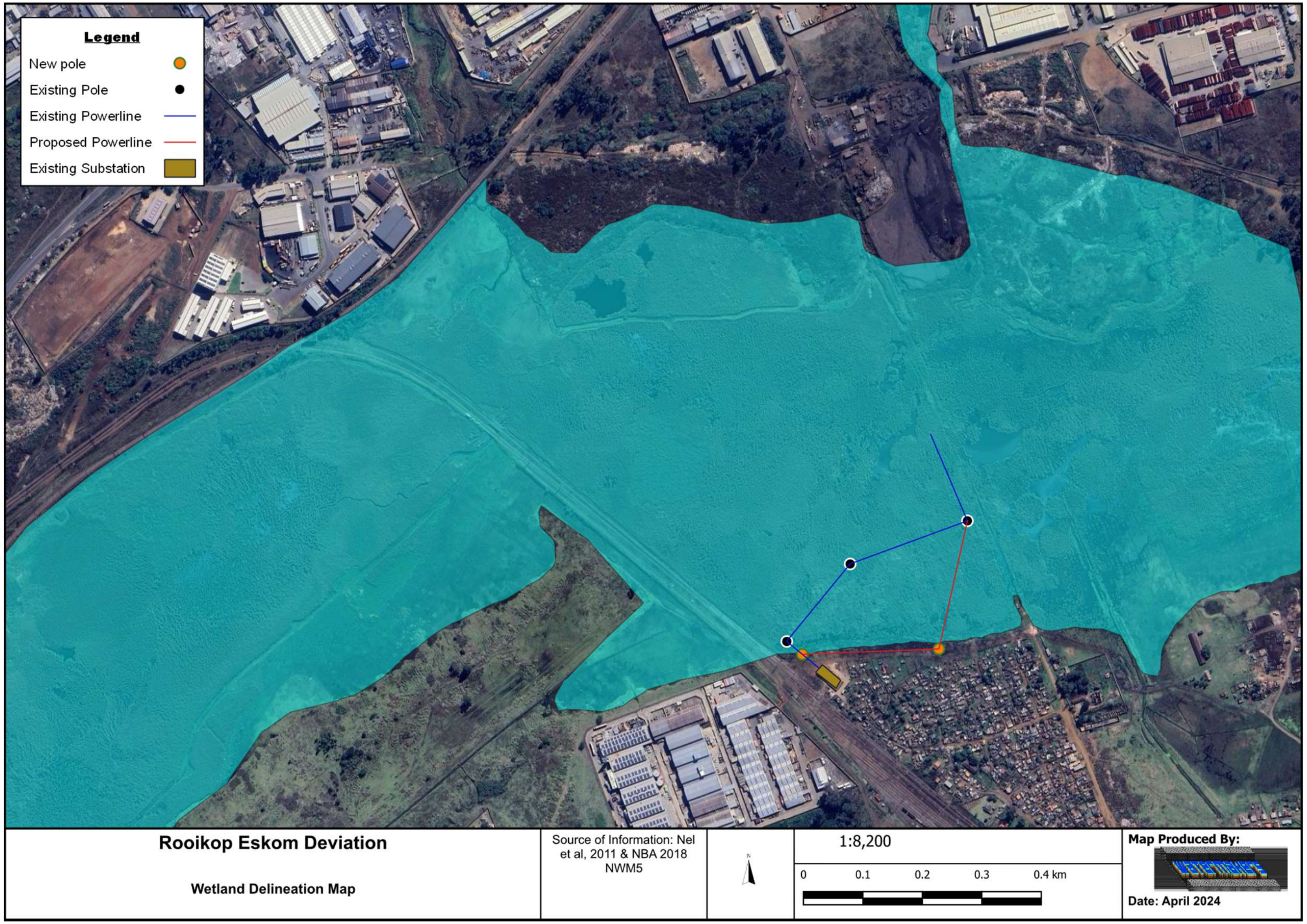


Figure 6: Wetland delineation based on current wetland indicators, note this delineation does not depict the true benchmark state of the channelled valley bottom wetland that existed historically

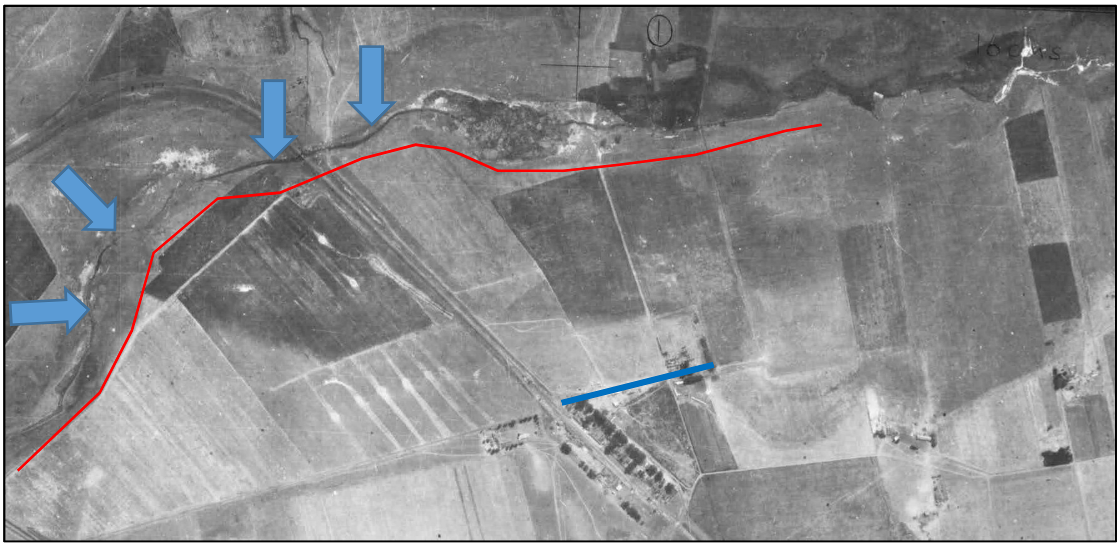


Figure 7: Historic imagery from 1938 indicating the channelled nature (blue arrows) and much smaller extend of the Elsburgspruit and Natal spruit (approximate red line), especially compared to the current extend of the wetland in the study area indicated by blue line (approximate)

HGM units encompass three key elements (Kotze et al., 2008):

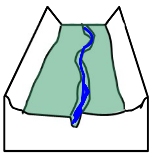
(1) Geomorphic setting. This refers to the landform, its position in the landscape and how it evolved (e.g. through the deposition of river borne sediment);

(2) Water source. There are usually several sources, although their relative contributions will vary amongst wetlands, including precipitation, groundwater flow, stream flow, etc.; and

(3) Hydrodynamics, which refers to how water moves through the wetland.

Table 1 describes the characteristics that form the basis for the classification of the HGM units within the study area. The disturbance caused by anthropogenic impacts and resulting vegetation changes made the use of vegetation indicators complex in various circumstances, especially on the temporary boundaries of wetlands. Therefore, identifying wetland features on site was primarily done by identifying terrain unit, soil forms and soil wetness features such as the presence of mottling, a gleyed matrix and/or Fe and Mg concretions. However, vegetation indicators did confirm to delineated boundaries and wetness zonation in many instances. Further, the exact extent of hydrological features could not always be determined due to various disturbances and the high degree of transformation within various sections of the associated catchments and within the wetlands.

Table 1: Wetland hydro-geomorphic types typically supporting inland wetlands in South Africa within the study area (adapted from Kotze et al., 2008)

Hydro-geomorphic types	**Description**	**Source of water maintaining the wetland[1]**	
		Surface	**Sub-surface**
Valley bottom with a channel 	Valley bottom areas with a well defined stream channel but lacking characteristic floodplain features. May be gently sloped and characterized by the net accumulation of alluvial deposits or may have steeper slopes and be characterized by the net loss of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*/ ***

[1] Precipitation is an important water source and evapotranspiration an important output in all of the above settings

Water source: * Contribution usually small

*** Contribution usually large

*/ *** Contribution may be small or important depending on the local circumstances

Wetland

3.4 Wetland PES and EIS

Wetlands within the study area serve to improve habitat within and potentially downstream of the study area through the provision of various ecosystem services. Many of these functional benefits therefore contribute directly or indirectly to increase biodiversity within the transformed study area as well as downstream of the study area through provision and maintenance of appropriate habitat and associated ecological processes (Table 2).

Hydro-geomorphic units are inherently associated with hydrological characteristics related to their form, structure and particularly their position in the landscape. This, together with the biotic and abiotic character (or biophysical environment) of wetlands in the study area, means that these wetlands are able to contribute better to some ecosystem services than to others (Kotze et al., 2008). The determined Present Ecological State and wetland ecosystem services provided by HGM 1 are discussed in more detail below.

Table 2: Potential wetland services and functions in study area

Function	Aspect
Water balance	Streamflow regulation
	Flood attenuation
	Groundwater recharge
Water purification	Nitrogen removal
	Phosphate removal
	Toxicant removal
	Water quality
Sediment trapping	Particle assimilation
Harvesting of natural resources	Reeds, Hunting, etc.
Livestock usage	Water for livestock
	Grazing for livestock
Crop farming	Irrigation

According Terrasoils (2016) cited in Bokamosa (2017) the channelled valley bottom wetland (Natalspruit and Elsburgspruit) has undergone drastic hydrological, chemical, and biological alteration due to the historical mining associated and urban activities. The channelled valley bottom wetland PES was classified as a category F (critically modified). The watercourse has been altered significantly physically and chemically through more than 90 years of mining and urban related developments and activities. The wetland vegetation upstream from the study area is indicative of significant tailings and urban runoff derived sediment deposition. With the increase in sediment the inflow area has been levelled and it is now functioning as an unchannelled valley bottom wetland (Terrasoils, 2016 cited in Bokamosa, 2017).

Historic imagery from 1938 already indicates serious and critical impacts on watercourses associated with especially gold mining operations. Note the large disposal facility in Figure 3 below. The Elsburgspruit and Natalspruit was conservatively classed as having a moderate Ecological Importance and Sensitivity (EIS) The Elsburgspruit and Natalspruit represents a highly modified system with a high percentage of alien invasive infestation rates, however, the polluted nature of the catchment increases its importance in terms of biogeochemical cycling processes.

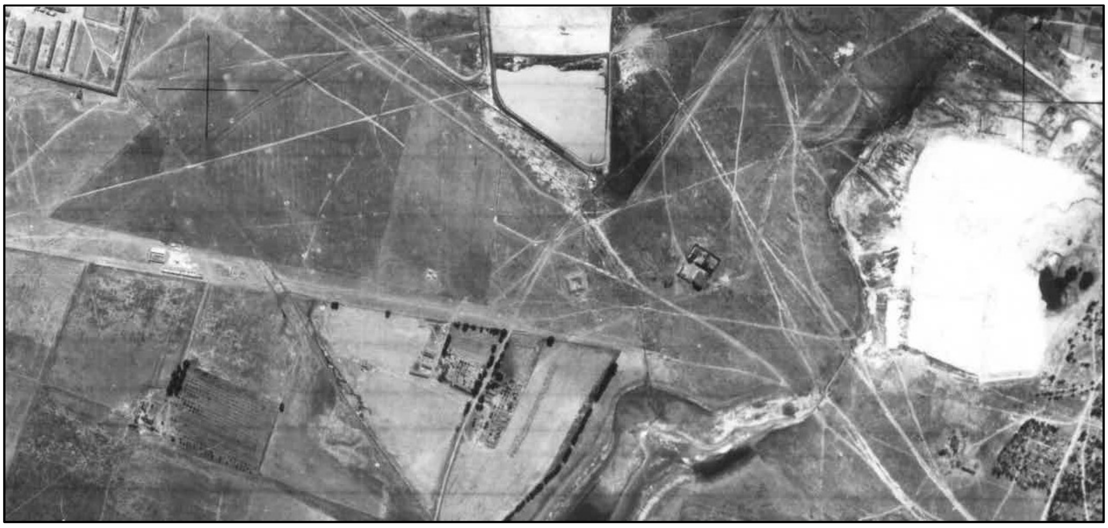


Figure 8: Historic aerial imagery from 1938 indicating large gold mining activities upstream from the study area

All wetlands, rivers, their flood zones and their riparian areas are protected by law and no development is allowed to negatively impact on rivers and river vegetation. The vegetation in and around rivers and drainage lines play an important role in water catchments, assimilation of phosphates, nitrates and toxins as well as flood attenuation. Quality, quantity and sustainability of water resources are fully dependent on good land management practices within the catchment. All flood lines, riparian zones and wetlands along with corresponding buffer zones must be designated as sensitive.

The Ecological Importance and Sensitivity (EIS) assessment was undertaken to rank water resources in terms of:

- Provision of goods and service or valuable ecosystem functions which benefit people;
- biodiversity support and ecological value; and
- Reliance of subsistence users (especially basic human needs uses).

Water resources which have high values for one or more of these criteria may thus be prioritised and managed with greater care due to their ecological importance (for instance, due to biodiversity support for endangered species), hydrological functional importance (where water resources provide critical functions upon which people may be dependent, such as water quality improvement) or their role in providing direct human benefits (Rountree et al., 2013). Ecological Importance and Sensitivity results for HGM 1 identified to be associated with the study area are listed in Table 5.

Table 5: Ecological Importance and Sensitivity scores for wetland complexes

Wetland Complex	Parameter	Rating (0 -4)	Confidence (1 – 5)
HGM 1 (Channelled valley bottom wetland)	**Ecological Importance & Sensitivity**	**Moderate** (2.0)	2.0
	Hydrological / Functional Importance	**Moderate** (2.1)	2.5
	Direct Human Benefits	**Moderate** (2.1)	2.5

Hydrological and Functional Importance for HGM 1 was considered to be moderate as a result of the important bio-geochemical processes that the valley bottom wetland renders within a stressed catchment. Direct human benefits were regarded as moderate as HGM 1 is likely utilised for reeds and informal hunting purposes.

4. ASSESSMENT OF IMPACTS

Potential impacts of the proposed activity on the associated freshwater ecosystem were assessed in terms of a formalised method whereby a typical risk assessment process was undertaken in order to determine the significance of the potential impacts without the application of mitigation/management measures (i.e. without mitigation measures, or WOMM). Once the significance of the impacts without the application of mitigation/management measures was known, the impacts were then re-evaluated, taking cognisance of proposed mitigation/management measures provided in order to reduce the impact (i.e. with mitigation measures, or WMM), thus enabling an understanding of the overall impact after the implementation of mitigation/management measures.

In order to assess these impacts, the proposed development has been divided into two project phases, namely the construction phase and the operational phase. The criteria against which these activities were assessed are discussed below.

Nature of the Impact

This is an appraisal of the type of effect the project would have on the environment. This description includes what would be affected and how and whether the impact is expected to be positive or negative.

Extent of the Impact

A description of whether the impact will be local, limited to the study area and its immediate surroundings, regional, or on a national scale.

Duration of the Impact

This provides an indication of whether the lifespan of the impact would be short term (0-5 years), medium term (6-10 years), long term (>10 years) or permanent.

Intensity

This indicates the degree to which the impact would change the conditions or quality of the environment. This was qualified as low, medium or high.

Probability of Occurrence

This describes the probability of the impact actually occurring. This is rated as improbable (low likelihood), probable (distinct possibility), highly probable (most likely) or definite (impact will occur regardless of any prevention measures).

Degree of Confidence

This describes the degree of confidence for the predicted impact based on the available information and level of knowledge and expertise. It has been divided into low, medium or high.

The following risk assessment was used to determine the significance of impacts:

Significance = (Magnitude + Duration + Scale) x Probability

The maximum potential value for significance of an impact is 100 points. Environmental impacts can thus be rated as high, medium or low significance on the following basis:

- High environmental significance 60 – 100 points
- Medium environmental significance 30 – 59 points
- Low environmental significance 0 – 29 points

Table 3 illustrates the scale used to determine the overall ranking.

Table 3: Scale used to determine significance ranking

Magnitude (M)		**Duration (D)**	
Description	**Numerical value**	**Description**	**Numerical value**
Very high	10	Permanent	5
High	8	Long-term (ceases at end of operation)	4
Moderate	6	Medium-term	3
Low	4	Short-term	2
Minor	2	Immediate	1
Scale (S)		**Probability (P)**	
Description	**Numerical value**	**Description**	**Numerical value**
International	5	Definite (or unknown)	5
National	4	High	4
Regional	3	Medium	3
Local	2	Low	2
Site	1	Improbable	1
None	0	None	0

4.1 Impact Assessment

Development within the study area is proposed to constitute the relocation of existing ESKOM infrastructure that was situated within HGM1 (Elsburgspruit and Natalspruit) (Figure 9). Note that the two new pylons will be positioned outside of the modified wetland. A helicopter will be utilised to span the new cable across the wetland to one of the existing pylons. The new servitude will be outside of the wetland which is an improvement as the amount of Eskom infrastructure inside the wetland will be reduced. The complete works methodology is stipulated below.

The Eskom Germiston South / SAR Rooikop powerline is a 1.96KM 88kV powerline that feeds the SAR Rooikop 88KV Traction Substation, from the Germiston South 88/33kV Substation. The proposed deviation is approximately 485.05 meters for the 88KV powerline, and it will involve the following:

- Servitude acquisition along the perimeter of the wetland, from structure 3 to SAR Rooikop substation.
- Dismantle conductors and structures, from structure 1 to structure 3 (access to the wetland is required. CNC confirmed this will be foot access).
- Scrap the dismantled material on site.
- Install 2 x 20 m Steel Monopole structures, along the new servitude.
- Install 14 stays.
- String Panther conductors from structure 3 to SAR Rooikop substation (use a helicopter to string Panther conductors from structure 3, along the new servitude and monopole structures, to structure 1.)

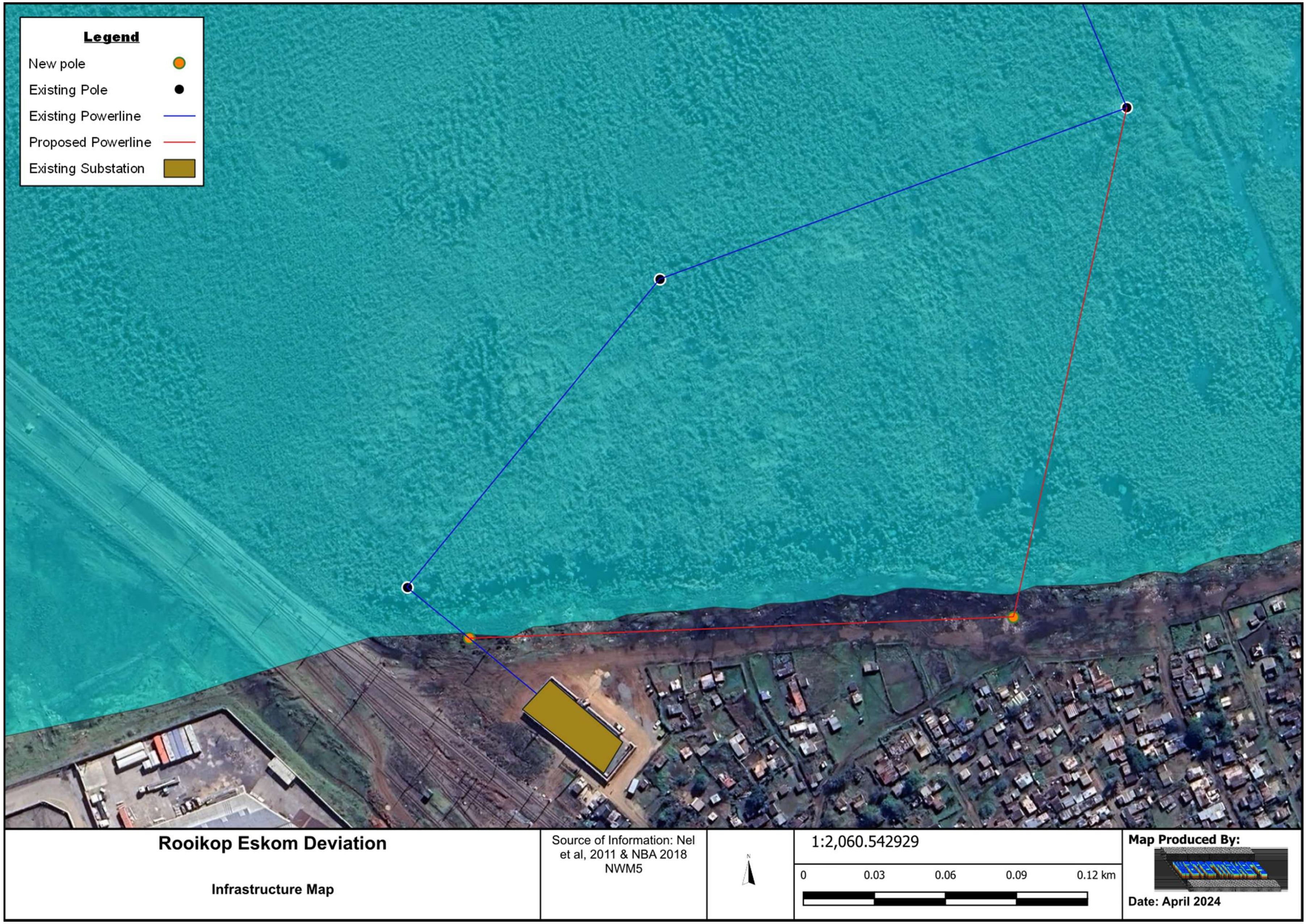


Figure 9: Layout map with proposed and existing ESKOM infrastructure

Assessment Criteria

The environmental impacts are assessed with mitigation measures (WMM) and without mitigation measures (WOMM) and the results presented in impact tables which summarise the assessment. Mitigation and management actions are also recommended with the aim of enhancing positive impacts and minimising negative impacts.

In order to assess these impacts, the proposed development has been divided into two project phases, namely the construction and operation phase. The criteria against which these activities were assessed are discussed below.

Nature of the Impact

This is an appraisal of the type of effect the project would have on the environment. This description includes what would be affected and how and whether the impact is expected to be positive or negative.

Extent of the Impact

A description of whether the impact will be local (extending only as far as the servitude), limited to the study area and its immediate surroundings, regional, or on a national scale.

Duration of the Impact

This provides an indication of whether the lifespan of the impact would be short term (0-5 years), medium term (6-10 years), long term (>10 years) or permanent.

Intensity

This indicates the degree to which the impact would change the conditions or quality of the environment. This was qualified as low, medium or high.

Probability of Occurrence

This describes the probability of the impact actually occurring. This is rated as improbable (low likelihood), probable (distinct possibility), highly probable (most likely) or definite (impact will occur regardless of any prevention measures).

Degree of Confidence

This describes the degree of confidence for the predicted impact based on the available information and level of knowledge and expertise. It has been divided into low, medium or high.

The possible impacts of the proposed project on the delineated wetland within the study area during the various phases are presented below. Table 19, Table 20 and Table 21 list a summary of the possible risks that could occur within the construction phase, the operational phase and the decommissioning phase, respectively. In determining the applicability of measures to be undertaken to limit impacts on the associated wetlands, it is recommended that the environmental impact hierarchy to be adhered to should follow:

- Avoidance of impact – the design and route planning of the new powerline took into consideration the environmental sensitivities of the site and undertake to avoid impacts wherever possible (HGM 1 is approach by foot or helicopter).
- Minimisation of impact – most impacts to the wetland are avoidable by following mitigation measures in this report, the route design and infrastructure design must be undertaken in such a way as to minimise the impacts associated with their activities; and

- Mitigation of impact – once all possible impacts have been avoided and minimised as far as possible, the remaining significant impacts must be mitigated on site. This can be undertaken through control measures during construction and maintenance of the powerline, and through effective rehabilitation measures if necessitated.
- Off-set mitigation – where avoidance, minimisation and mitigation measures fail or are not possible, an appropriate off-set approach should be followed. This is not a consideration currently for the project since all significant impacts are avoidable.

Table 4: Primary impacts arising during construction phase relating to the associated wetland ecosystems

Possible impact	Source of impact
Sedimentation of wetlands	Runoff from construction activities and clearing of natural and secondary vegetation
Destruction of wetland habitat and associated loss of wetland functionality	Destruction of hydric soils and hydrophytic vegetation
Changes to surface and sub-surface flow regimes	Excavations of pits / trenches, channelling as a result of large machinery, removal and disturbances to vegetation.

Table 5: Primary impacts arising during operation phase relating to the associated wetland ecosystems

Possible impact	Source of impact
Destruction of wetland habitat and associated loss of wetland functionality	Maintenance crews working in wetlands

Table 6: Primary impacts arising during closure phase relating to the associated wetland ecosystems

Possible impact	Source of impact
Decrease in wetland functionality	Dependant on closure approach.

<u>Construction Phase</u>

Sedimentation of watercourse

Extent	Duration	Intensity	Probability of occurrence	Significance		Confidence
				WOMM	WMM	
Local	Short	Medium	Medium Probability	Medium	Low	High

Description of Impact

The clearing of natural vegetation and the stripping of topsoil and sub-soils for placing pylons will potentially result in increased runoff of sediment from the site into watercourses associated with the study area. Considering the nature of the operation to be undertaken and the proposed work procedure, the proposed impact will likely not be significant.

Mitigation Measures

- The layout of pylons should take cognisance of the delineated wetland boundaries. Approach to the working site should be designed to effectively avoid wetland habitat as far as possible
- Develop soil management measures for the construction sites which will prevent runoff of sediment into the associated watercourses, e.g. scheduling the construction phase during low rainfall periods, installing soil curtains and use of swales to capture run-off water and settle suspended materials etc. Avoiding the possibility of sediment ending up in watercourses.
- A wetland monitoring program must be in place to pro-actively detect threats to wetlands before it can cause damage through an adaptive management approach, e.g. the initiation of new concentrated drainage pathways and erosion processes as a result of new access roads etc. It is recommended that a wetland specialist (preferential) or ecologist have at least one visit during the construction process and one visit after construction is completed. The wetland specialist needs to ensure that no negative impacts on wetlands have occurred or that processes have been initiated that could harm wetlands in the future, e.g. preferential flow paths or erosion.

Destruction of wetland habitat and associated loss of wetland functionality

Extent	**Duration**	**Intensity**	**Probability of occurrence**	**Significance**		**Confidence**
				WOMM	WMM	
Local	Short	High	Medium Probability	Medium	Low	High

Description of Impact

The footprint of new infrastructure and construction activities could infringe or destroy wetland habitat and associated biota through removal of hydrophytic vegetation and or hydric soils. Activities are also likely to negatively affect supporting hydrological sources of wetlands.

Mitigation Measures

- Avoid construction activities in wetlands as far as possible through proper planning, demarcation and appropriate environmental awareness training. Appropriate no-go areas must be assigned in particular next to the valley-bottom wetland. Keeping work as far a possible upslope from the wetland, e.g place soil stockpiles upslope from the excavations and installing soil curtains and or swales to capture any possible run-off.

- All construction staff must be informed of the need to be vigilant against any practice that will have a harmful effect on wetlands e.g. Do not take short-cuts through valley bottoms (wetlands) but use existing road infrastructure.
- Any proclaimed weed or alien species that germinate during the construction and operational period shall be cleared.
- Caution must be taken to ensure building materials are not dumped or stored within the delineated wetland zones
- Emergency plans must be in place in case of spillages.
- Littering and contamination of water sources during construction must be mitigated by effective construction camp management.
- All construction materials including fuels and oil should be stored in a demarcated area that is contained within a bunded impermeable surface to avoid spread of any contamination (outside of wetlands or wetland buffer zones).
- Cement and plaster should only be mixed within mixing trays. Washing and cleaning of equipment should also be done within a bermed area, in order to trap any cement or plaster and avoid excessive soil erosion. These sites must be rehabilitated prior to commencing the operational phase.

Changes to surface and sub-surface flow regimes of wetlands

Extent	**Duration**	**Intensity**	**Probability of occurrence**	**Significance**		**Confidence**
				WOMM	WMM	
Local	Short	Med	High Probability	Med-Low	Low	High

Description of Impact

Linear construction activities, excavations, removal and disturbances to vegetation could create preferential flow paths and/or cut off existing flow paths on the surface as well as sub-surface. Hydrology is an important driver of wetlands and changes thereto could have various negative impacts on wetlands and their associated functionality. Considering the small extent of infrastructure relocation, significant changes in sub-surface flow regime is highly unlikely. Care should be taken with regards to access roads to not concentrate surface flows down the slope towards the wetland

Mitigation Measures

- Avoid construction activities in wetlands or preferential hydrological pathways supporting wetlands through proper planning, appropriate design and minimising the construction footprint as per previous impacts discussed. Site selection should be sensitive towards preferential flow paths supporting wetlands. Especially stormwater design should ensure that wetlands do not received concentrated flows, but should be spread diffusely well outside the wetland boundaries and buffers where possible. For example, access roads should have berms intermittently installed with flow diffusers to avoid concentrating flows down the slope towards the wetland.

- Soils should be replaced in the same order as removed.
- Where it is absolutely necessary for the use of machinery, limit the footprint of impact to a minimum through appropriate planning, e.g. keeping turning circles outside of the wetland. Where vehicle tracks have formed rehabilitate immediately by levelling (where possible by hand)
- Re-vegetation of the affected areas should be done as priority.
- Hassian netting to protect newly rehabilitated vegetation in combination with silt curtains to be installed where necessary (slope >1%).

<u>Operational Phase</u>

Destruction of wetland habitat and associated loss of wetland functionality

Extent	Duration	Intensity	Probability of occurrence	Significance		Confidence
				WOMM	WMM	
Local	Short	Medium	Low Probability	Low	Low	High

<u>Description of Impact</u>

Maintenance activities are likely to have a lower impact than construction activities, except for worst case scenarios where sections of the powerline might have to be reconstructed. Wetland habitat could be impacted on or be destroyed through maintenance operations e.g. through removal of hydrophytic vegetation and or hydric soils and access roads concentrating flows towards wetlands.

<u>Mitigation Measures</u>

- Mitigation measures for worst case scenarios would be the same as for the construction phase

<u>Decommissioning Phase</u>

Loss of wetland functionality during removal operations

Extent	Duration	Intensity	Probability of occurrence	Significance		Confidence
				WOMM	WMM	
Local	Short Term	Medium	High Probability	Medium	Low	High

The assumed life expectancy of the powerline is likely to be long term with an unforeseen closure date. An appropriate closure and rehabilitation plan should be designed and implemented if decommissioning is to take place however.

4.2 Risk Matrix Assessment (Based on DWS 2023 publication: Section 21 c and I water use Risk Assessment Protocol)

In addition to the approach presented above, a further assessment of potential risks associated with the various activities on the receiving aquatic ecosystem was done in accordance with Department of Water and Sanitation Notice 509 of 2016. The risk matrix for impacts associated with the proposed development, as required by DWS, is presented in Appendix B. It should be borne in mind that when assessing the impact significance following the DWS Risk Assessment Matrix, determination of the significance of the impact assumes that mitigation measures as listed within the present report are feasible and will be implemented, and as such does not take into consideration significance before implementation of mitigation measures. Accordingly, should proposed mitigation measures not be deemed feasible, a re-evaluation of the impact significance may be required.

The DWS Risk Assessment Matrix, in terms of GA 509, calculated the significance of perceived impacts on the key drivers and receptors (hydrology, water quality, geomorphology, habitat and biota) of the freshwater resources assessed that is situated within 500m from the proposed development. By assessing the severity, spatial scale, duration and frequency of the proposed ESKOM infrastructure relocation, the risk to the potentially affected resource quality was determined to be low for all aspects during the construction and operational phases. The low risk identified was based on all recommended mitigation measures being implemented as outlined within this report.

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APPENDIX B – DWS RISK ASSESSMENT MATRIX (SECT 21 C & I)

PROJECT: Eskom Pole Relocation

RISK ASSESSMENT MATRIX for Section 21 (c) and (i) Water Use activities - Version 2.0

Name of Assessor: Willem Lubbe **Signature:**

SACNASP Registration Number: 4750 **Date:** 10/04/2024

Risk to be scored for all relevant phases of the project (factoring in specified control measures). MUST BE COMPLETED BY SACNASP PROFESSIONAL MEMBER REGISTERED IN AN APPROPRIATE FIELD OF EXPERTISE.

Phase	Activity	Impact	Potentially affected watercourses			Intensity of Impact on Resource Quality					Overall Intensity (max = 10)	Spatial scale (max = 5)	Duration (max = 5)	Severity (max = 20)	Importance rating (max = 5)	Consequence (max = 100)	Likelihood (Probability) of impact	Significance (max = 100)	Risk Rating
			Name/s	PES	Ecological Importance	Abiotic Habitat (Drivers)			Biota (Responses)										
						Hydrology	Water Quality	Geomorph	Vegetation	Fauna									
CONSTRUCTION	<1>Site preparation and typical construction activities: Vegetation clearing, temporary access road	Decreased Water Quality, especialy through increased sedimentaion loads, but other potential sources as well. E.g. hydrocarbons	HGM 1	C	Moderate	1	1	0	1	0	2	1	1	4	3	12	40%	4.8	L
		<1b>Increased peak flow dicharges received by HGM 1	HGM 1	C	Moderate	0	0	0	1	1	2	1	1	4	3	12	20%	2.4	L
		<1c>Increased alien invasive vegetation infestation	HGM 1	C	Moderate	0	0	1	2	1	4	1	1	6	3	18	40%	7.2	L
OPERATIONAL	<1>Maintenance work Access road	<1a> Altered hydrological regime,access road concentrate sheet flow down towards wetland habitat	HGM 1	C	Moderate	1	1	0	1	1	2	1	1	4	3	12	20%	2.4	L
		<1b> Deteriorated water quality	HGM 1	C	Moderate	1	1	0	1	1	2	1	1	4	3	12	20%	2.4	L
		<1c> Spread of alien vegetation	HGM 1	C	Moderate	1	1	0	2	2	4	1	1	6	3	18	20%	3.6	L