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AQUATIC ASSESSMENT: Basic Assessment Report for the Gumeni to Bosloop 132kV Powerline

Submitted: October 2011 (Revised October 2012)

Technical Report: Baseline Aquatics Specialist Status Quo and Delineation Qualification Assessment

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Reviewer: Ntseketsi Lerotholi

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Signature

EXECUTIVE SUMMARY

This surface water assessment report was compiled in order to help decision-making regarding the onsite freshwater receiving environments of the proposed powerline development. Due to the client not wishing to seek a water use license for the proposed development, a validation and verification assessment of surface water resources crossed by the proposed development was undertaken, so as to serve the purpose of identifying the surface water resource development set-back areas associated with the proposed development of powerline surface structures, i,e. pylons/towers/poles.

This report contains a desktop review and situation assessment of the study site and area; as well as a validation and verification assessment of surface water resources cut across by the proposed development. In addition, outputs of this report are also presented from a Geographic Information System format (delineation drainage lines and development set-back points). These development set-back points identifies areas within the proposed development lines which must not be constructed on within 50m of any identified drainage line. Furthermore, considerations based on the findings of this report are produced to inform the Environmental Management Programme of the proposed development for implementation during the construction and operations phase.

The impacts associated to the proposed development is expected to be limited, due to the fact that the development constructions must take place outside the 1:100yr floodline and 32m NEMA listing notice setback. The following measures are recommended to mitigate likely impacts of the powerline construction:

Summary of the impacts of the proposed project and its alternatives

Impacts	Extent	Intensity	Duration	Probability	Weighting Factor	Significance rating	Mitigation efficiency	Mitigated aspects
Loss of wetland habitat/bank modification	Regional (**3**)	M (**3**)	Permanent (***5***)	Highly likely (***4***)	H (***5***)	M-H (***60***)	M/H (***0.4***)	L (***14.4***)
Water quality impairment	Local (***2***)	L (***1***)	Mid term (***3***)	Possible (***2***)	L/M (***2***)	L/M (***32***)	L/M (***0.7***)	L (***15***)
Flow modification	Local (***2***)	L (***1***)	Long term (***4***)	Possible (***2***)	M (***3***)	M (***45***)	M (***0.5***)	L/M (***19.5***)
Loss of biodiversity	International ***(5)***	M ***(3)***	Long term (***4***)	Highly likely (***4***)	M/H (***5***)	M/H (***80***)	H (***0.2***)	L/M ***(25)***

From the results of the aquatic status quo, the delineation assessment and the associated impact assessment, it is recommended that the powerline alternative option 1 (blue route) as a preferred option, with no development construction within any wetland areas found along this route. This implies the compliance to at least a 50m setback for all other identified aquatic features within this delineation assessment. The motivation for not supporting the southern proposed powerline routes are due to the fact that the proposed development options 2 and 3 crosses more significant water resources than development option 1.

The impact of the proposed development (preferred alternative) is expected to be limited, due to the proposed development being undertaken outside the wetland floodlines (power-lines can span at least 200m) and will encouraged adherence to the following mitigation measures:

- *The wetland buffer zone and development setback should be established in the identified mapped area, where no construction vehicles should dredge and/or work within 50m of wetland edges for all identified water features.*
- *If possible, the undertaking of construction should take place during the dry season when development activities are near the rivers and associated wetlands.*
- *The rehabilitation and re-vegetation of disturbed areas must take place concurrently and/or pre-construction of the proposed development. Only appropriate indigenous riparian vegetation may be used for rehabilitation and re-vegetation within the study area and wetland buffer areas (preferably indigenous plants representative of the region).*
- *Clearing or felling of all alien invasive trees should take place during construction*
- *If clearing of woody debris and hard rubble on site and in the wetland buffer should be undertaken, it should be carried-out without significantly altering the condition and health of the associated water feature*
- *The intensity of storm water run-off should be reduced where possible through encouraging paving and surfaces that allow for greater infiltration.*
- *Any structure within the wetland buffer should as far as possible not disturb the aquatic habitat or alter the flow patterns in the stream. Approval should be obtained from the Department of Water and Environmental Affairs for any such activities*
- *Activities that lead to elevated levels of turbidity must be minimised. Bulldozing and the use of other mechanical machinery in the wetland buffer zone should also be prevented within the wetland zones as far as possible.*

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1 PROJECT DESCRIPTION

1.1 Background

The Water Specialist Environmental Consulting Service of SSI Engineering and Environmental Consulting was authorized to undertake wetland delineation and wetland related impact assessments to determine the significant of aquatic resources potentially impacted by the proposed construction of ESKOM Distribution Northern Region 132kV Kingbird powerline from Bosloop Substation to the Gumeni Main Transmission Station (MTS), as well as a feeder bay at Gumeni MTS and Bosloop Substation, Mpumalanga (hereafter referred to as the proposed development). In addition, maintenance impacts and recommendations for potential impacts related to the construction of the proposed development will be identified, assessed and discussed. Three potential development routes were provided by the client as development alternatives and will be evaluated to determine a preferred development route in relation to a “minimum” potential impact reference state for aquatics health resources within the proposed development footprint.

Water resource features, the focus of this report, found on and in the vicinity of the proposed development belt, as per client request, will be investigated to provide a reference in terms of broad surface water resource status quo’s, its extent delineations and its relation to the proposed development, in line with the National Environmental Management Act (1998), Environmental Impact Assessment Regulations (2006 and 2010) and the National Water Act (1998). As a result this report serves the basis of qualifying surface water resources in relation to the proposed development belts.

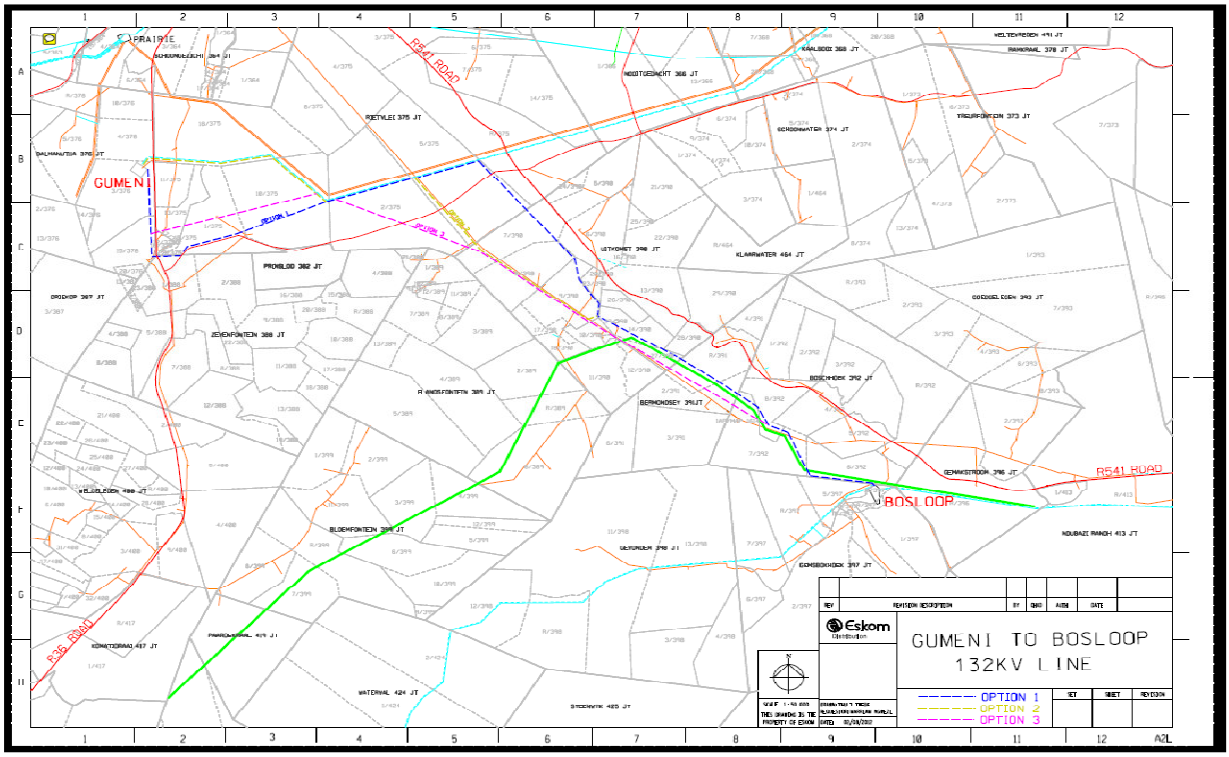


Figure 1: Locality map of the proposed Gumeni to Bosloop 132kV Line

1.2 Terms of Reference

The client requires the identification of all surface water resources crossed by the proposed development in the study area, so as to serve the purpose of providing a basis for the proposed development implementation plans surface water set-backs for the construction of pylons/towers/poles associated with the proposed development. The client does not wish to undertake section 21 c&i water uses and aims to undertake all surface construction outside the riparian habitat zone (construction occurs outside the watercourse or outside of 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line). As a result, this surface water assessment report was compiled in order to help decision-making regarding the onsite freshwater receiving environments of the proposed development. The agreed upon work programme was divided into the following tasks:

- Conduct a desktop review and situation assessment based on existing information for the study scope, site and area.
- Validate and verify surface water resources cut across by the proposed development
- Undertake a surface water delineation assessment in order to register these surface water resource findings in a GIS format for processing as part of the proposed development implementation plan and/or environmental management programme (EMPr)
- Contextualise the studies in relation to the proposed developments authorisation application and provide management consideration for input into an EMPr
- Write up findings and recommendations in a comprehensive report format so as to facilitate environmental authorisation requirements related to the scope of water management (i.e. ROD).

1.3 Assumptions and limitations

Limitations and uncertainties often exist within the various techniques adopted to assess the condition of ecosystems. The following limitations apply to the techniques and methodology utilized to undertake this study:

- Analysis of the freshwater ecosystems was undertaken according to nationally developed methodologies as defined by DWA (Department of Water Affairs) and/or DEA (Department of Environmental Affairs).
- Recommendations are based on professional opinion and best practise guidelines within South Africa.
- Limited project budget didn't allow for comprehensive ground-truth investigations and was supplemented by informed literature of the project area
- Should the client undertake the proposed development activities within the identified surface water resources banks and beds, then a Section 21 c&i Water Use Application and Authorisation will be needed from the Department of Water Affairs (DWA).

1.4 Report Use

This report reflects the professional judgment of its author. The full and unedited content of this should be presented to the client for processing in line with the scope of the report. Any summary of these findings should only be produced in consultation with the author. This report does not serve the purpose of processing a water use license.

2 LEGISLATIVE AND REGULATORY REQUIREMENTS

2.1.1 National Environmental Management Act (107 of 1998) and the Environmental Impact Assessment Regulations (2010)

In terms of undertaking an EIA process and in terms of compliance with NEMA, any proposed activity, whether serving a maintenance purpose or for development, needs to be checked for 'listed activities', as defined by NEMA (Listed activities are activities), which may have potentially detrimental impact on the environment and therefore require environmental authorisation from the relevant authorising body.

In terms of the proposed development, a specialist review from a surface water resource viewpoint is needed due to the nature of the proposed development being a servitude (servitudes are likely to cross surface water resources). As a result, a qualification assessment is required to contextualise the status quo of the receiving environment's surface water resources as well as to provide a guideline to related to best practise for the proposed development (i.e. if the potential development can impact a water resource, an appropriate mitigation measure needs to be put in place to negate the potential impact, as far as possible).

2.1.2 National Water Act, 1998 (Act No. 36 of 1998)

The National Water Act guides the management of water in South Africa. The Act aims to regulate the use of water and activities that may impact on water resources through the categorisation of 'listed water uses' encompassing water extraction and flow attenuation within catchments as well as the potential contamination of water resources, where the Department of Water Affairs (DWA) is the administering body in this regard.

In terms of the proposed development and its nature, a specialist assessment is needed to provide DWA with the necessary qualification information related to the proposed development site's potentially affected surface water resources (wetlands and river status quo's). Should a Section 21 c & i water use be in fact undertaken, i.e. development within the floodlines of a water resource, then a Water Use Licence Authorisation will be required (not the intention of the client).

2.1.3 National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)

The National Environmental Management: Biodiversity Act is a subsidiary of NEMA and relates to:

- The management and conservation of biological diversity within South Africa, and of the components of such biological diversity;
- The use of indigenous biological resources in a sustainable manner; and
- The fair and equitable sharing among stakeholders of benefits arising from bioprospecting involving indigenous biological resources.

In terms of the scope of this assessment, consideration will be identified where relevant in accordance with this Act.

2.1.4 Other Acts and Policies

- Development Facilitation Act (No. 67 of 1995)
- Mpumalanga Biodiversity Conservation Plan Handbook (2007)

3 SURFACE WATER RESOURCE SCREENING ASSESSMENT

3.1 Visual

The study area is located in the Northern Mpumalanga Lowveld region. The powerline being considered for the project falls within rural areas, largely characterised by intensive commercial agricultural and pastoral land uses. The area is situated close to a small mining town of Machadadorp approximately 17km to the north, with Nelspruit situated approximately 75km to the northwest. There are two main roads that allow general access to the study area and these are R541 and the R36. The need for ESKOMS proposed development has been identified by the low voltage service experienced in the 132kV ring supplied from Witkloof substation due to the loss of either Witkloof Holnek 132kV line or Witkloof Wintershoek 132kV line voltages during the transmission and distribution.

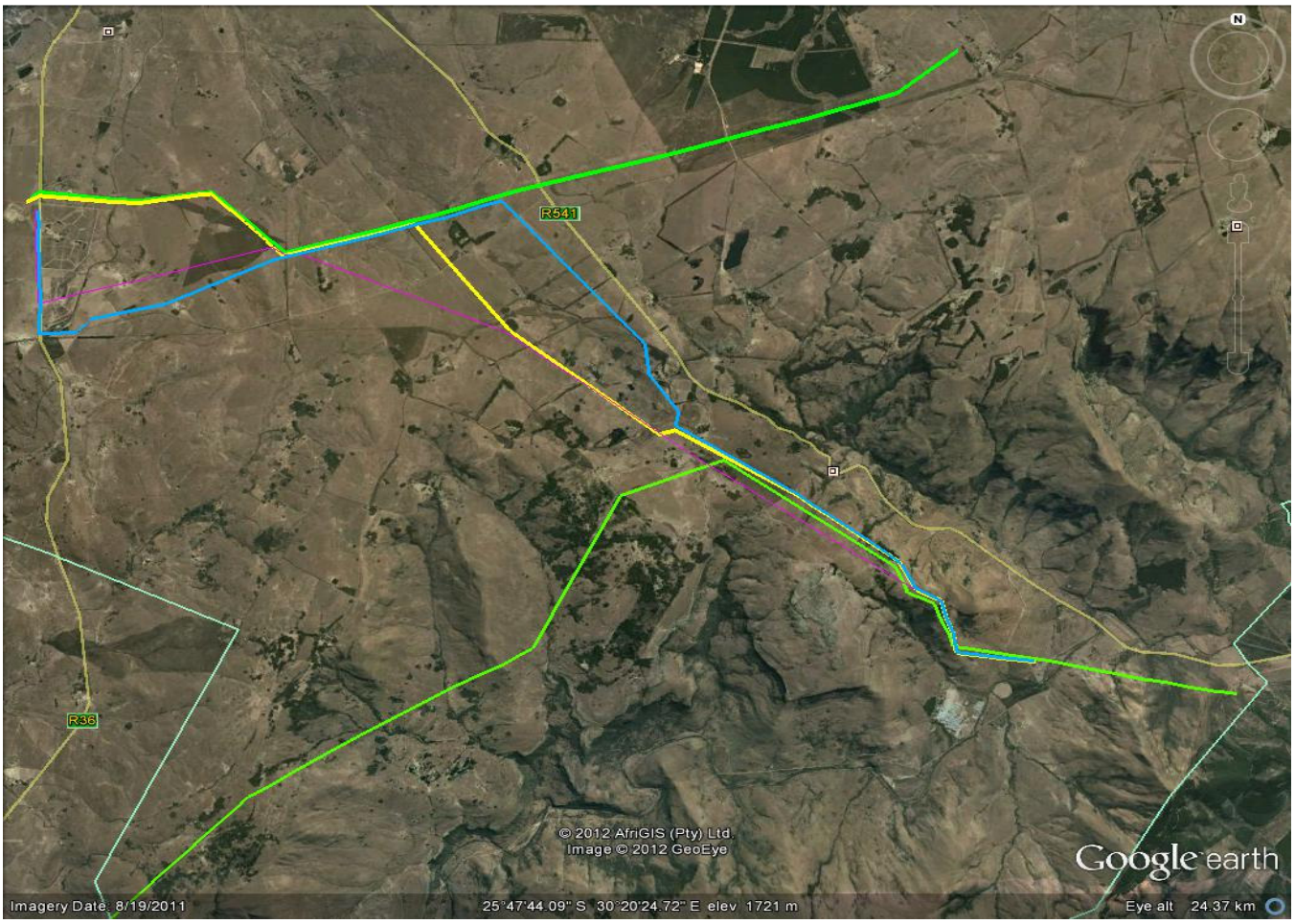


Figure 2: Digitised Satellite image of the study area (Google Earth, 2012). The green lines indicates the existing ESKOM lines with proposed development alternatives 1: blue, 2: yellow and 3: pink.

Figure 3: Visual characteristics of the study area

3.2 Climate

The monthly distribution of average daily maximum temperatures shows that the average midday temperatures for Mpumalanga range from 20.6°C in June to 26.5°C in February (Graph A) and is the coldest during July 7.1°C during the night (Graph B). Annual Rainfall averages at 610mm, with most rainfall occurring during mid summer (Graph C).

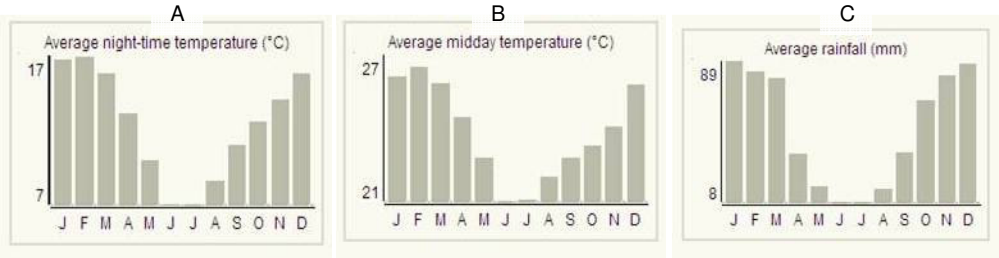


Figure 4: Climate of the Mpumalanga region (SA Explorer, 2012)

3.3 Geology

The geology of the study site can be described as sandstone, mudstone and basalt, with biotite granite outcroppings around koppies. Soils classes are catorgorised as follows: Red and yellow soils with low to medium base status; Greyish, sandy soils; and soils with minimal development, usually shallow, on hard or weathering rock, with or without intermittent diverse soils. In general, the low base status, restricted soil depth, excessive or imperfect drainage status of these soils implies high erodibility and sensitivity to change. Sources of organic material loading are related to alien invasive vegetation and land-use disturbance pressures (SANBI BGIS 2012).

3.4 Flora & fauna

The general vegetation type within the region falls within the Grassland biome. The proposed development area and its surroundings are dominated by the Mesic Highveld Grassland, as well as KaNgwane Montane Grassland and Lyden Motane Grassland. Endangered Eastern Highveld Grassland is found to the west and east of the study area, but not in the proposed development area (only the Lydenburg Montane Grassland is in the development area and is classed as Vulnerable and poorly protected).

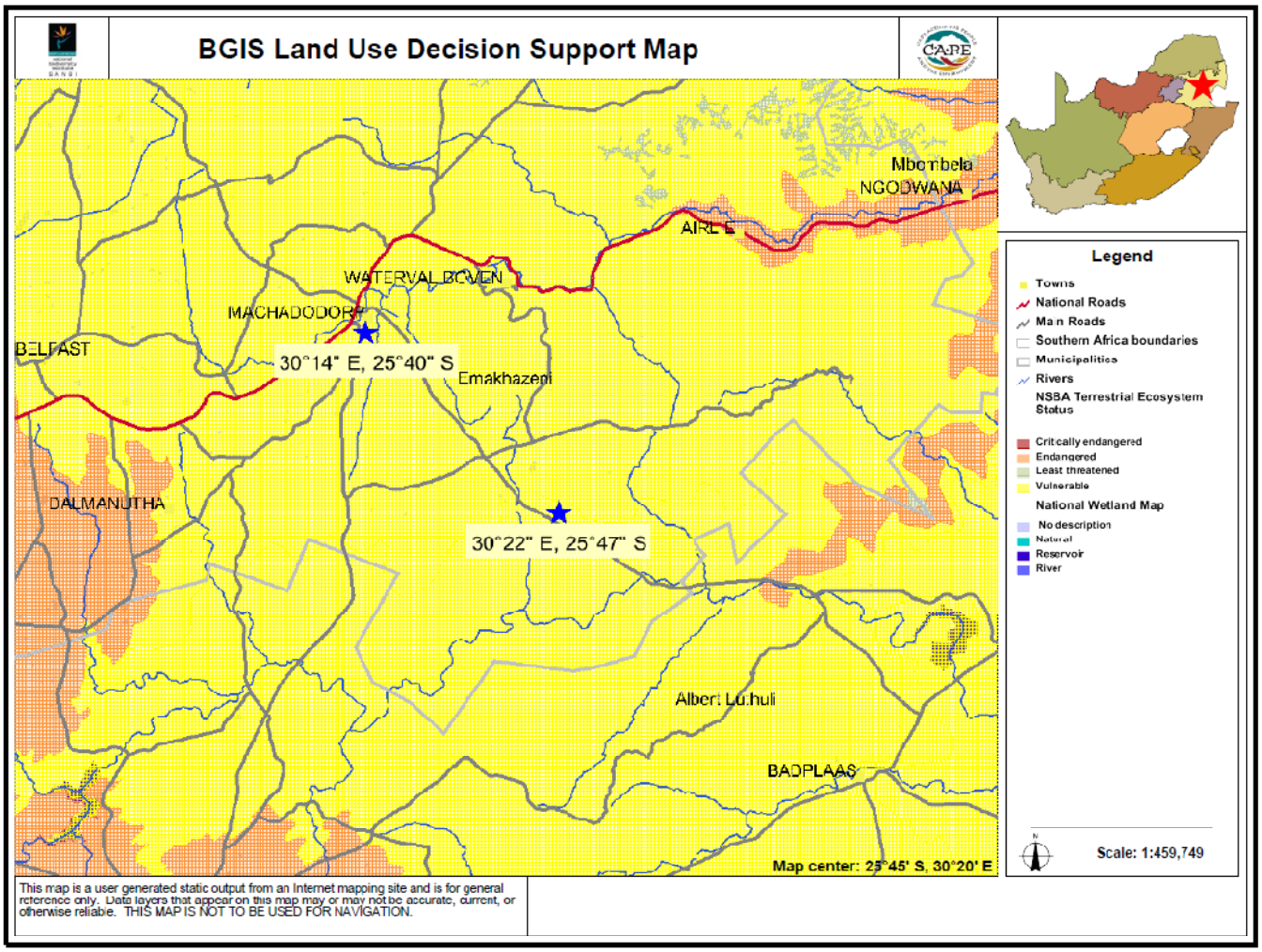


Figure 5: National Spatial Biodiversity Assessment Map of the study area (SANBI BGIS, 2012)

3.5 Aquatic features

The study area falls within the Inkomati Water Management Area, ecoregion 4.01 – ecoregions with high altitude, moderate to high relief, greater variation in mean annual temperature (12-22°C) and mean annual rainfall (600 to 1 200 mm) and grassland vegetation types. The geology of these ecoregions' are diverse, with some conglomerates and gneiss, and patches of sometimes leached mature soils.

The Leeuspruit River and Bankspruit River are the major rivers found within the proposed development footprint, which are tributaries of the Elands River Catchment (the major tributary of the Crocodile River Catchment). Agriculture and forestry are the dominant land-use activities. In-stream habitat modifications are the results of inundation by weirs as well as water quality deterioration due to trout farming activities and urban development (Machadodorp). Encroachment by alien trees, especially wattles, poplars and eucalypts also account for riparian habitat modification (RHP 2001)

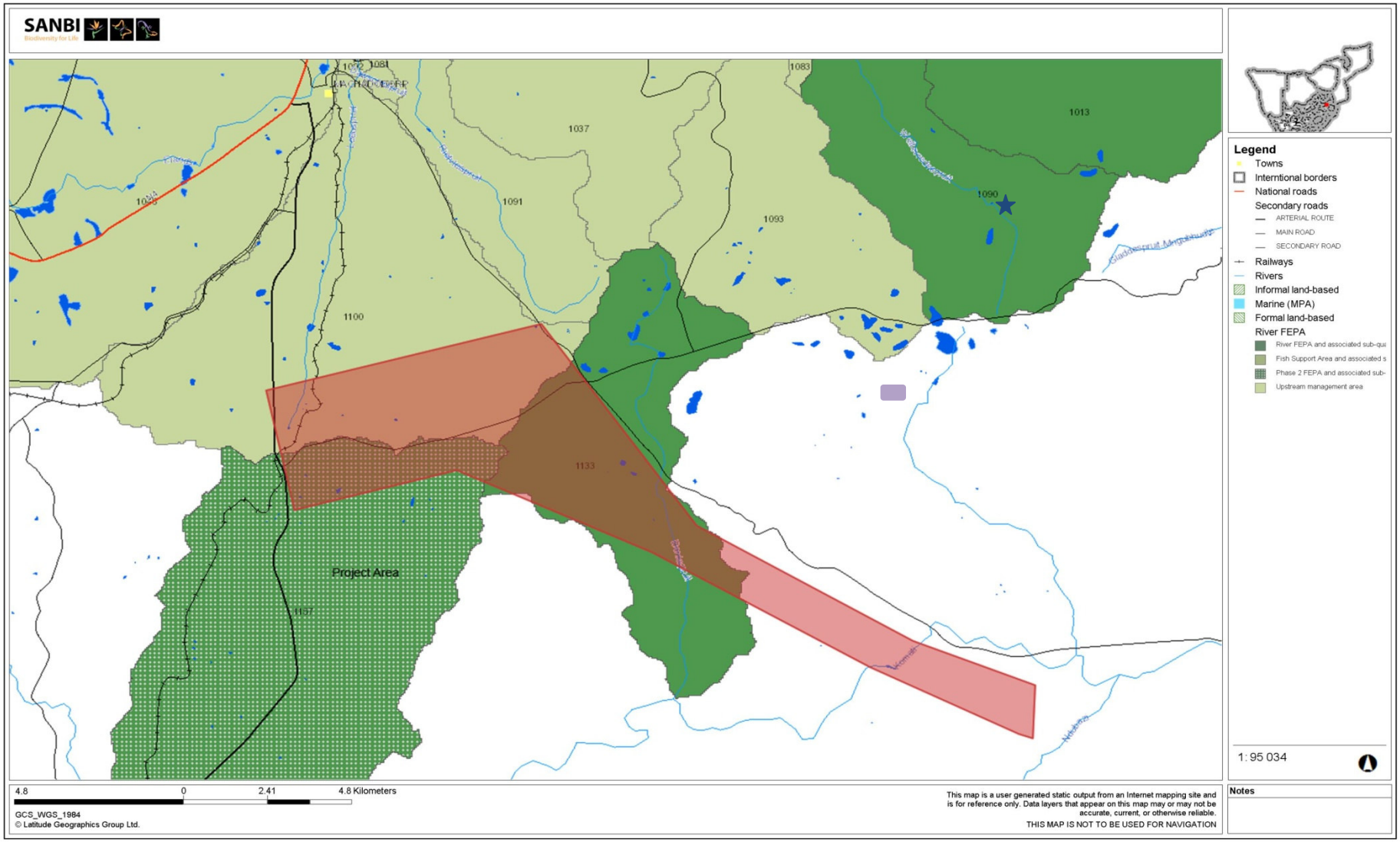


Figure 6: National Freshwater Ecosystem Priority Areas of the study area (SANBI BGIS 2012)

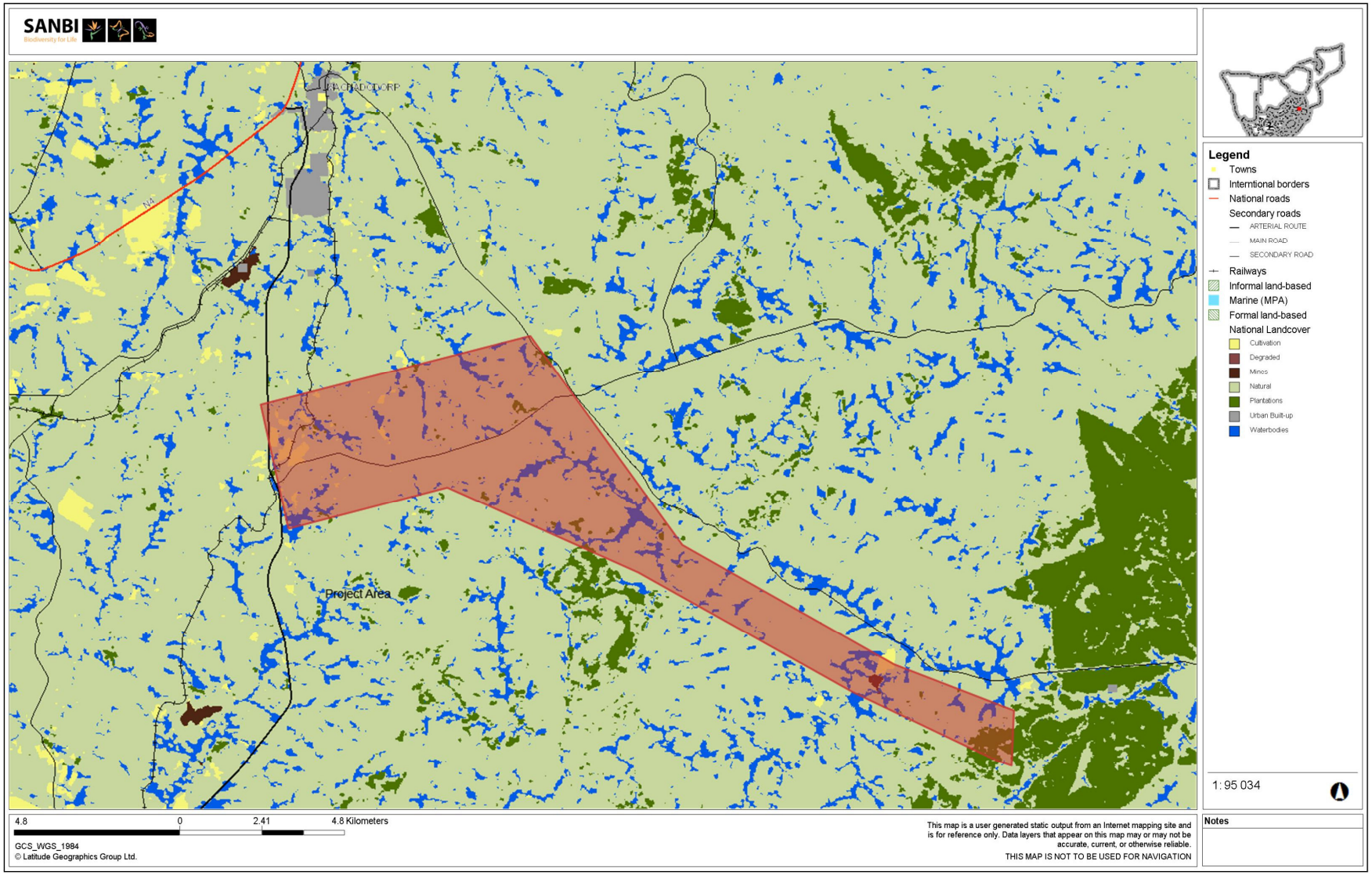


Figure 7: Landcover map of the study area (SANBI BGIS 2012)

4 INVESTIGATIVE ASSESSMENTS OF STUDY AREAS WATER FEATURES

4.1 Site Characterisation and Delineation

For the purpose of the development type in this Basic Assessment, a full specialist investigation into the proposed development area was not undertaken as the desktop assessment proved informative enough for decision making purposes. From the desktop assessment, enough information was sourced to undertake a mapping delineation of wetlands (rivers and wetlands) in the study area. Geographic Information System (GIS) maps sourced from the South African National Biodiversity Institute as well as the Department of Environmental Affairs and the Department of Water Affairs provided comprehensive information on the status of these wetland resources: wetland classes, types, nature (artificial vs natural; National Freshwater Ecosystem Priority Areas) and present ecological state (PES). As a result, during this investigative phase of the assessment, a buffer area map was constructed from this GIS analysis to provide a guideline for the proposed development in terms of where the development footprint crosses significant water resources. In addition, a desktop wetlands health assessment was undertaken to provide weighting to the value of the water resources in the study area. Herewithin follows the contexualised aquatics assessments.

Table 1. Geomorphological and Physical features of aquatic features found in the study site.

Facet	Description
Valley Form	Mountain Headwaters and Hillslope onto Foothill plains
Significant natural water resources	Leeuspruit River (north-west); Bankspruit (north-east)
Lateral mobility or entrenchment	Confined
Channel form	Simple
Channel type	Transported sands on weathered bedrock
Channel Habitats	Runs and Riffles
Water level	Low to medium (above basal flow)
Channel modification	Low-medium (channel and flow modifications by farm road crossings, cattle use and surrounding agricultural activities)
Associated Wetland Systems	Wetlands are limited to terrace drainage lines (channelled and unchannelled hillslope

	systems) as well as artificial depressions (farm dams)
Riparian zone (river vegetation bank)	30m per bank (riparian vegetation is limited to hardy cosmopolitan types with a high level of alien vegetation invasion.)
Estimated river buffer area	20m from riparian Zone edge (either side)
Estimated development setback	50m from river and wetland edge
General Aquatic Habitat	2-riparian types – transformed instream weeds and good cosmopolitan riparian vegetation shrubs and trees 2-wetland types – transformed agriculture and stock use as well as good wetland grassland types

DWA Wetland delineation techniques utilises a four wetland indicator processes to provide an estimate of the class, character and extent of a wetland. They are: landscape position (must be perched, flat or depressed), vegetation (must be hydrophilic), soil form (must compliment an existing wetland type) and soil wetness (water table must be within 50cm of soil profile and active mottling must be high). As part of the GIS and literature review of existing data, enough of these requirements were met to provide a good desktop assessment of significant water resources related to the proposed development considerations from an environmental impact perspective. The proposed development will impact directly to water resources where the proposed development belt crosses the water resources (highlighted in red polygons in the figure below). However, because the direct development impact is limited to the crossings, it is not considered to investigate issues related to the broader ecology and water quantity and quality on a comprehensive basis.

Although some of the wetlands surveyed may have had artificial origins, the wetland classification conditions were considered in the previous sections and the extent of the two-wetland types (artificial wetlands and linked channelled/unchannelled hill-slope drainage into valley bottoms).

In terms of NEMA's EIA Regulations and the National Water Act, any development within the 1:50year floodline and 32m from the stream margin will trigger the authorisation need of a water licence as well as a basic assessment or full environmental impact assessment. This wetlands delineation will provide a reference to wetland features which may be potentially impacted by the proposed development and also provide a reference for development implementation so as to minimise and negate development impacts and to recommend an environmentally sound guideline for the processing of this Basic Assessment.

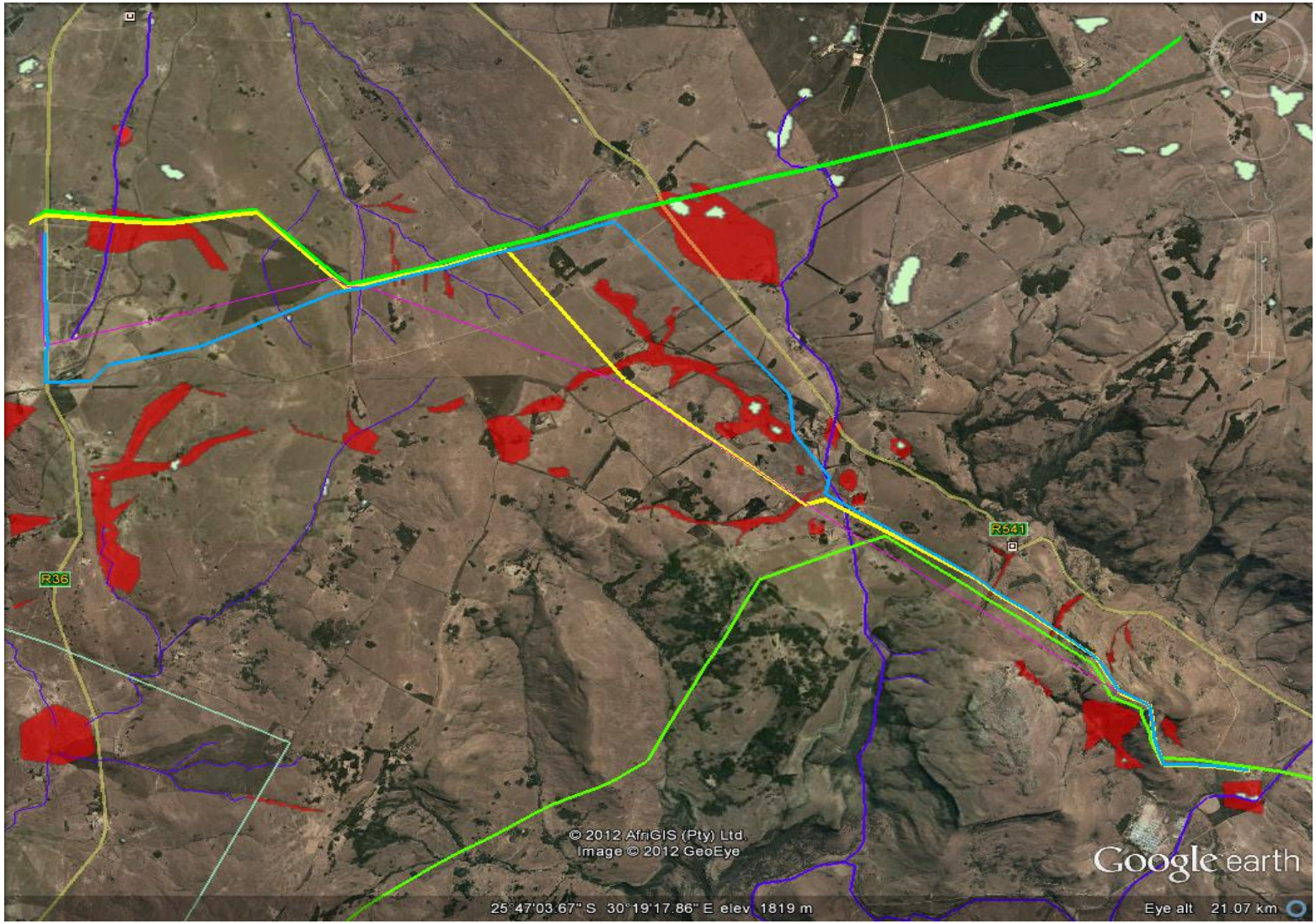
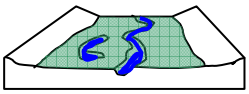
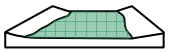
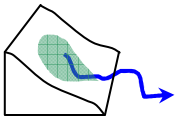


Figure 8: Digitised Earth Google map depicting defined surface drainage lines (blue), wetland polygons (red) potentially affected by the proposed development

4.2 Wetland Health

Table 2. Wetland hydro-geomorphic types typically supporting inland wetlands in South Africa

HYDRO-GEOMORPHIC TYPES	DESCRIPTION	SOURCE OF WATER MAINTAINING THE WETLAND[1]	
		SURFACE	SUB-SURFACE
Floodplain 	Valley bottom areas with a well defined stream channel, gently sloped and characterized by floodplain features such as oxbow depressions and natural levees and the alluvial (by water) transport and deposition of sediment, usually leading to a net accumulation of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*
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.	***	*/ ***
Valley bottom without a channel 	Valley bottom areas with no clearly defined stream channel, usually gently sloped and characterized by alluvial sediment deposition, generally leading to a net accumulation of sediment. Water inputs mainly from channel entering the wetland and also from adjacent slopes.	***	*/ ***
Hillslope seepage linked to a stream channel 	Slopes on hillsides, which are characterized by the colluvial (transported by gravity) movement of materials. Water inputs are mainly from sub-surface flow and outflow is usually via a well defined stream channel connecting the area directly to a stream channel.	*	***
Isolated Hillslope seepage 	Slopes on hillsides, which are characterized by the colluvial (transported by gravity) movement of materials. Water inputs mainly from sub-surface flow and outflow either very limited or through diffuse sub-surface and/or surface flow but with no direct surface water connection to a stream channel.	*	***
Depression (includes Pans) 	A basin shaped area with a closed elevation contour that allows for the accumulation of surface water (i.e. it is inward draining). It may also receive sub-surface water. An outlet is usually absent, and therefore this type is usually isolated from the stream channel network.	*/ ***	*/ ***

[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

4.2.1 Wetland Habitat Integrity

The Present Ecological Status (PES) Method (DWAF 2005) was used to establish the integrity of the wetlands in the study area and was based on the modified Habitat Integrity approach developed by Kleynhans (DWAF, 1999; Kotze *et al*, 2005). The table below displays the criteria and results from the assessment of the habitat integrity of the wetlands. These criteria were selected based on the assumption that anthropogenic modification of the criteria and attributes listed under each selected criterion can generally be regarded as the primary causes of the ecological integrity of a wetland. The habitat integrity assessment confirms modifications to the system and results in a moderately modified **C-classed assessment** for modification impacts on the artificial systems and a largely natural **B-classed assessment** for the hillslope linked valley-bottom systems in the study area.

Table 3. Habitat integrity assessment criteria for palustrine wetlands (Kotze *et al*, 2005)

CRITERIA & ATTRIBUTES	RELEVANCE
Hydrologic	
Flow Modification	Consequence of abstraction, regulation by impoundments or increased runoff from human settlements or agricultural land. Changes in flow regime (timing, duration, frequency), volumes, velocity which affect inundation of wetland habitats resulting in floralistic changes or incorrect cues to biota. Abstraction of groundwater flows to the wetland.
Permanent Inundation	Consequence of impoundment resulting in destruction of natural wetland habitat and cues for wetland biota.
Water Quality	
Water Quality Modification	From point or diffuse sources. Measure directly by laboratory analysis or assessed indirectly from upstream agricultural activities, human settlements and industrial activities. Aggravated by volumetric decrease in flow delivered to the wetland.
Sediment Load Modification	Consequence of reduction due to entrapment by impoundments or increase due to land use practices such as overgrazing. Cause of unnatural rates of erosion, accretion or infilling of wetlands and change in habitats.
Hydraulic/Geomorphic	
Canalisation	Results in desiccation or changes to inundation patterns of wetland and thus changes in habitats. River diversions or drainage.
Topographic Alteration	Consequence of infilling, ploughing, dykes, trampling, bridges, roads, railway lines and other substrate disruptive activities that reduce or change wetland habitat directly in inundation patterns.
Biota	
Terrestrial Encroachment	Consequence of desiccation of wetland and encroachment of terrestrial plant species due to changes in hydrology or geomorphology. Change from wetland to terrestrial habitat and loss of wetland functions.
Indigenous Vegetation	Direct destruction of habitat through farming activities, grazing or firewood collection affecting wildlife habitat and flow attenuation functions, organic matter

Removal	inputs and increases potential for erosion.
Invasive Plant Encroachment	Affects habitat characteristics through changes in community structure and water quality changes (oxygen reduction and shading).
Alien Fauna	Presence of alien fauna affecting faunal community structure.
Over utilisation of Biota	Overgrazing, over fishing, etc.

Table 4: Wetland habitat integrity assessment (score of 0=critically modified to 5=unmodified)

CRITERIA & ATTRIBUTES	Linked Hillslope Valley-bottoms	Artificial Wetlands
Hydrologic		
Flow Modification	**4**	**3**
Permanent Inundation	**2**	**3**
Water Quality		
Water Quality Modification	**4**	**2**
Sediment Load Modification	**4**	**3**
Hydraulic/Geomorphic		
Canalisation	**4.5**	**3.5**
Topographic Alteration	**4.5**	**3**
Biota		
Terrestrial Encroachment	**2**	**3**
Indigenous Vegetation Removal	**2**	**3**
Invasive Plant Encroachment	**2.5**	**2.5**
Alien Fauna	**3**	**3**
Over utilisation of Biota	**4**	**2**
Total Mean	**3.32**	**2.82**
Category	**B**	**C**

Table 5: Relation between scores given and ecological categories

SCORING GUIDELINES PER ATTRIBUTE*	INTERPRETATION OF MEAN* OF SCORES FOR ALL ATTRIBUTES: RATING OF PRESENT ECOLOGICAL STATUS CATEGORY (PESC)
Natural, unmodified - score=5.	Within general acceptable range
	CATEGORY A
	>4; Unmodified, or approximates natural condition.
Largely natural - score=4.	CATEGORY B
	>3 and ≤4; Largely natural with few modifications, but with some loss of natural habitats.
Moderately modified- score=3.	CATEGORY C
	>2 and ≤3; moderately modified, but with some loss of natural habitats.
Largely modified - score=2.	CATEGORY D
	≤2; largely modified. A large loss of natural habitats and basic ecosystem functions has occurred.
	OUTSIDE GENERALLY ACCEPTABLE RANGE
Seriously modified – rating=1.	CATEGORY E
	>0 and <2; seriously modified. The losses of natural habitats and basic ecosystem functions are extensive.
Critically modified – rating=0.	CLASS F
	0; critically modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat.

4.2.2 Ecosystem Services

The assessment of the ecosystem services supplied by the identified wetlands was conducted according to the guidelines as described by Kotze *et* al (2005). The characteristics scored for this wetland according to the general levels of services provided is notably important and requires management to the wetlands to ensure that they can continue to provide the valued goods and services:

Table 6: GOODS AND SERVICES ASSESSMENT RESULTS FOR WETLANDS

GOODS AND SERVICES	Linked Hillslope Valley-bottoms	Artificial Wetlands
Flood attenuation	3.5	4
Stream flow regulation	3	3.5
Sediment trapping	2.5	4
Phosphate trapping	3	4
Nitrate removal	3	3
Toxicant removal	2.5	3
Erosion control	3	3
Carbon storage	2	3
Maintenance of biodiversity	4	1.5
Water supply for human use	2	4
Natural resources	3.5	2
Cultivated foods	3	4
Cultural significance	4	1
Tourism and recreation	3.5	3.5
Education and research	4	1

Table 7: level of service ratings

SERVICE RATING	SCORE
Low	0
Moderately low	1
Intermediate	2
Moderately high	3
High	4

4.2.3 Summary

1. The study area falls within three identified National Freshwater Prioroty Area's (FEPA's); with the Bankspruit River FEPA is the most significant freshwater priority area in the study footprint and is regarded as sensitive to development.
2. The natural hillslope and associated valley bottom wetlands of the study area are in a fairly modified ecosystem state with moderate ecosystem services.
3. Human use artificial wetlands such as farm dams are classed as moderately modified with a fairly high level of ecosystem services.
4. Alien invasion, agriculture and stock farming practise are the highest disturbance pressures within the study area related to the sites water resources. Other disturbance pressures are related to land-uses such as mining and hard-surface development (roads and infrastructure).
5. From a goods and services point of view, all the wetlands are regarded as important refugia for biota, with significant biodiversity corridors, such as the Bankspruit and Leeuspruit Rivers (tributary of the Elands River). However, the artificial wetland systems were found to provide a better human use service than the natural wetlands.
6. From a delineation point of view, development around any surface water resource (wetlands, rivers, farm dams) should only be implemented with an authorised water use licence. As a result, a 50m development setback to all delineated water resources must adhere to with an approved constructed Environmental Management Programme providing "duty of care" within the construction cycle of the proposed development. This implies that no surface development must take place within wetland and drainage crossing areas and that the proposed powerlines should rather span the water resources (pylons can be placed 50m outside of surface water resource edges).

5 ASSESSMENT OF IMPACTS AND RECOMMENDED ACTIONS

5.1 Legislative and regulatory requirements

This development aims to be in alignment with the guidelines and principals of the National Spatial Development Perspective, the Development Facilitation Act, the Comprehensive Rural Development Programme Framework, the Water Services Information Reference Framework, the National Water Act and the National Environmental Management Acts.

NEMA and Environmental Impact Assessment Regulations

In terms of undertaking an EIA process and in terms of compliance with NEMA, the proposed development may involve 'listed activities', as defined by NEMA (Listed activities are activities, which may have potentially detrimental impacts on the environment and therefore require environmental authorisation from the relevant authorising body) as the proposed development can fall within 32 meters of the River and wetland margins. The developer must make sure that this does not take-place without an endorsed water use license and associated management plan.

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

The National Water Act guides the management of water in South Africa as a common resource. The Act aims to regulate the use of water and activities, which may impact on water resources through the categorisation of 'listed water uses' encompassing water extraction and flow attenuation within catchments as well as the potential contamination of water resources, where the Department of Water Affairs (DWA) is the administering body in this regard.

In terms of the definitions provided by the NWA, activities potentially triggered under this proposed development included under Sections 21c (impeding or diverting the flow of water in a watercourse) and Section 21i (altering the bed, bank, course or characteristics of a watercourse). Infilling of floodplains is also considered by DWA to be a Section 21(i) activity although we would contend that this is not necessarily the case and depends on the definition of "bed", "banks" and "watercourse". Listed activities require the approval of DWA in the form of a Water Use Licence application. Obtaining a Water Use License can be a lengthy process taking 12 to 18 months to complete.

Section 22(3) of the National Water Act allows for a responsible authority (DWA) to dispense with the requirement for a Water Use Licence if it is satisfied that the purpose of the Act will be met by the grant of a license, permit or authorisation under any other law. This provision is rarely used but should be discussed with DWA and provincial environmental Officials to ascertain whether compliance is necessitated, as the proposed development does fall within the 1:50yr or 1:100 floodlines.

5.2 Description of impacts

This section provides an assessment of the impacts to freshwater ecosystems that are likely to be associated with proposed development as described above.

- **Impact - loss of wetland habitat and bed/bank modification:** The loss of wetland habitat is unlikely to occur, but some modification to the bed or banks of freshwater system is likely to occur as part of the construction phase of the proposed development (general direct disturbance, loss of buffer vegetation).

  Significance of impacts without mitigation: high negative impact – Localised loss of wetland habitat and bed/bank modification is not a favorable impact. In addition, activities during and after the construction, will provide an opportunity for invasive alien plants to proliferate in areas that are already in a disturbed condition and possibly cause pollution to the freshwater system outside the development belt. It is recommended that development take place precautious and outside the recommended wetland system buffers.

  Proposed mitigation: A buffer refers to an area around an aquatic feature such as the wetland. Buffers serve to reduce the levels of sediment and pollutants directly entering the wetland. A buffer zone of at least 32m should therefore be adopted for all identified "Elands/Komati Tributaries". Furthermore, all wetlands associated with the Elands River catchment found along the proposed development corridor must not be developed.

  Significance of impacts after mitigation: Low to medium impact

- **Impact - water quality impairment:** There is a potential associated with the development for impairment of the stormwater quality to occur, namely sedimentation and construction related effluent disturbance during the construction phase.

  Significance of impacts without mitigation: medium impact

  Proposed mitigation: The water quality impacts during the construction phase in particular should be addressed through the Environmental Management Programme, which is implemented by an on-site Environmental Officer. Runoff from the construction site, is proposed to be prevented from directly entering wetlands and associated water features (except where gradient is not feasible). Wetland buffer areas should be maintained to reduce the impact of runoff from the developed site's activities after the construction phases of the development.

  Significance of impacts after mitigation: low negative to limited.

- **Impact - flow modification:** This impact relates to that already discussed under habitat loss above.

  Significance of impacts without mitigation: high negative impact

  Proposed mitigation: The hydrological impacts on the wetland, is negated if constructing outside of floodlines.

  Significance of impacts after mitigation: Low negative impact

- **Loss of terrestrial and wetland biodiversity:** The loss of terrestrial and wetland biodiversity is expected to occur in localised areas (especially during the construction phase). The natural vegetation around the wetland areas impacted by the development is expected to recover in the mid term as a result of the small development footprint of the proposed development.

  Significance of impacts without mitigation: highly negative impact

  Proposed mitigation: The construction of the development must not utilise heavy construction vehicles where possible in proximity to the wetlands. All alien vegetation should be cleared off the development belt and landscaping using the closest representative reserves plant species is encouraged. It is believed

that this area will naturally recover from the direct (dust, pollution) and indirect (change in passive infiltration of the vicinity) disturbances. The trimming of bulrush and reeds should be aloud if densities are too high.

Significance of impacts after mitigation: Low impact

- **Cumulative impacts**

  With effective implementation of the recommended mitigation measures, the condition of the wetlands and rivers found within the proposed development footprint should be maintained at an acceptable level.

Table 8: Summary of the impacts of the proposed project and its alternatives

IMPACTS	EXTENT	INTENSITY	DURATION	PROBABILITY	WEIGHTING FACTOR	SIGNIFICANCE RATING	MITIGATION EFFICIENCY	MITIGATED ASPECTS
Loss of wetland habitat and bed/bank modification	Regional (**3**)	M (**3**)	Permanent (***5***)	Highly likely (***4***)	H (***5***)	M-H (***60***)	M/H (***0.4***)	L (***14.4***)
Water quality impairment	Local (***2***)	L (***1***)	Mid term (***3***)	Possible (***2***)	L/M (***2***)	L/M (***32***)	L/M (***0.7***)	L (***15***)
Flow modification	Local (***2***)	L (***1***)	Long term (***4***)	Possible (***2***)	M (***3***)	M (***45***)	M (***0.5***)	L/M (***19.5***)
Loss of biodiversity	International ***(5)***	M ***(3)***	Long term (***4***)	Highly likely (***4***)	M/H (***5***)	M/H (***80***)	H (***0.2***)	L/M ***(25)***

Where: (H= high, M= medium , L= low)

Significance Rating (WOM) = (Extent + Duration + Intensity + Probability) * Weighting Factor

Significance Rating (WM) = (Significance Rating Without Mitigation) * Mitigation Efficiency

Extent	Duration	Intensity	Probability	Weighting Factor (WF)	Significance Rating (SR)	Mitigation Efficiency (ME)	Mitigated Aspects (MA)
Footprint 1	Short term 1	Low 1	Probable 1	Low 1	Low 0-19	High 0,2	Low 0-19
Site 2	Short to medium 2		Possible 2	Low to medium 2	Low to medium 20-39	Medium to high 0,4	Low to medium 20-39
Regional 3	Medium term 3	Medium 3	Likely 3	Medium 3	Medium 40-59	Medium 0,6	Medium 40-59
National 4	Long term 4		Highly Likely 4	Medium to high 4	Medium to high 60-79	Low to medium 0,8	Medium to high 60-79
International 5	Permanent 5	High 5	Definite 5	High 5	High 80-100	Low 1,0	High 80-100

Figure 9: Description of assessment parameters with their respective weightings

With the effective implementation of an EMPr and the recommended mitigation measures, the condition of the wetlands and rivers found within the proposed development footprint should not be disturbed significantly.

6 DEVELOPMENT CONSIDERATIONS

From the viewpoint of the facts of this report, servitude developments, should be undertaken very carefully within the drainage lines of the study area; and will require an authorisation from DWA related to water use defined in the NWA Section 21 (c) & (i). In the absence of such an authorisation, as well as the relevant ROD related to compliance with NEMA, it is recommended that no hard surface development take-place within the defined surface water resource scope provided in GIS format as part of this report (no pillon/tower/poles within defined surface drainage lines). Due to the nature of the proposed development being a powerline servitude, the client is able to comply with this recommendation (powerlines can span more than 100m between poles).

In terms of rating the 3 provided alternatives:

- Route option 1 (blue line) is recommended as the least impacting alternative as a result of it crossing the least amount of significant identified surface water resources.
- Route option's 2 and 3 (yellow and pink line) is recommended as the most impacting alternatives provided as a result of it crossing more significant water resources than option 1 as well as because it is located further away from a maintenance route (roads and servitudes)

In general, an as input to the production of an EMPr, the following conditions apply for the construction and operational phases of the proposed development should it be approved:

- No construction vehicles should be allowed to construct within 50m of any identified surface drainage line, except for those authorised to undertake activities applied for under section 21 c & i of the National Water Act (Act 36 of 1998) and/or within the context of an endorsed Water-Use License. Limited disturbance should be allowed within this buffer zone and as far as possible the disturbed areas should be rehabilitated with vegetation characteristic of the area's biodiversity.
- Where the powerline route crosses the drainage lines, there should be minimal use of machinery and disturbance within these areas.
- The rehabilitation and re-vegetation of disturbed areas must take place during or immediately after construction is complete. Only appropriate indigenous riparian vegetation may be used for rehabilitation and re-vegetation within the disturbed area.
- Clearing or felling of all alien invasive trees should take place along the approved development route.
- Colonisation by alien invasive vegetation must be removed as soon as noted.
- Clearing of debris and hard rubble associated with the construction activities should be undertaken daily at an accredited/approved waste handler (if not daily then needs to be stored appropriately within the construction site camps so as to cause no pollution to any soil of groundwater reserves).
- Stormwater associated with the construction activities must be prevented from entering all drainage features as far as possible.
- In the event that any of the identified drainage lines become active, then activities that may lead to elevated levels of turbidity must be minimised (such as dust). Contaminated run-off from the construction site should be prevented from entering the wetland areas and drainage systems. If possible construction activities should take place during the low rainfall months when run off volumes will also be low.

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