

2.2. TERMS OF REFERENCE

The specialist study must include the following:

Site Sensitivity Verification Report (SSVR):

- Site sensitivity verification assessment which references the DFFE Screening Tool outcomes and the specialist verification on the site sensitivity.
- Identification of sensitive features on-site and any no-go areas that may be applicable. Provide Google Earth files of all sensitive features identified. Sensitivity zones must be clearly defined in terms of what infrastructure may be developed in each zone.

Scoping phase:

- Preliminary Impact Assessment for construction, operation and decommissioning phases based on the project description detailed below. The supplied methodology must be used.
- Provide potential mitigation measures for each impact.
- Ensure that reference is made to the applicable specialist protocol that was followed.
- Include a table of the relevant Protocol or Appendix 6 requirements with relevant report cross references.
- Update the sensitive features on-site and any no-go areas post detailed studies (if necessary).
- Include a short statement regarding the no-go alternative.
- Include a short statement regarding cumulative impacts.
- Include Plan of Study for EIA.

EIA Phase:

- Impact Assessment for construction, operation and decommissioning phases based on the project description detailed below. The methodology supplied must be used.
- Provide site-specific mitigation measures for each impact
- Include any recommendations for the EMPr or conditions to be included in the Environmental Authorisation.
- Ensure that reference is made to the applicable specialist protocol that was followed.
- Include a table of the Protocol or Appendix 6 requirements (as applicable) in the report with relevant report cross references.
- Include the site sensitivity verification as an Appendix to your study – update if required.
- Update the sensitive features on-site and any no-go areas post detailed studies (if necessary). Please send updated Google Earth files if required.
- Assessment of the alternatives provided.

- Assess the cumulative impact based on the projects identified. The impact assessment methodology must be applied.
- Include a concluding impact statement on whether the proposed project should go ahead.
- Include any recommendations that should be included as EA conditions.

This report is the SSVR deliverable for aquatic ecosystems at the site.

2.3. METHODOLOGY AND LIMITATIONS OF THE STUDY

Input into this report was informed by a desktop assessment for the study area as well as field verification that was undertaken on 26 January 2024. The timing of the site visit was deemed suitable for the assessment as the area has a summer rainfall and the visit was within the rainfall period.

The 1 in 50 000 topographical river cover was used as a basis for the aquatic constraints mapping and refined based on knowledge of the aquatic features in the area as well as Satellite imagery. The SANBI Biodiversity GIS, Cape Farm Mapper, Freshwater Biodiversity Information System and iNaturalist websites were consulted to identify any aquatic constraints in terms of features of aquatic biodiversity conservation importance within the area. This information/data was used to inform the resource protection-related recommendations.

2.4. USE OF THIS REPORT

This report reflects the professional judgment of its author. The full and unedited content of this should be presented to the regulatory authority. Any summary of these findings should only be produced in consultation with the author.

3. DESCRIPTION OF THE STUDY AREA

3.1. GENERAL OVERVIEW

The site is situated within the Savanna Biome, characterized by low hills and valleys interspersed with tributaries and wetland areas of the Suikerbosrant/Blesboskspruit River System. The primary drainage direction is towards the west where the Suikerbosrant River drains into the Vaal River. The Blesboskspruit River originates in Benoni to the east of Johannesburg and flows in a southerly direction past Nigel and Heidelberg to join the Suikerbosrant River to the west of the site. The Suikerbosrant River arises near Leandra and Impumelo to the northeast of the site and flows for approximately 70 to its confluence with the Blesboskspruit River and then another 35km south-westwards to its confluence with the Vaal River.

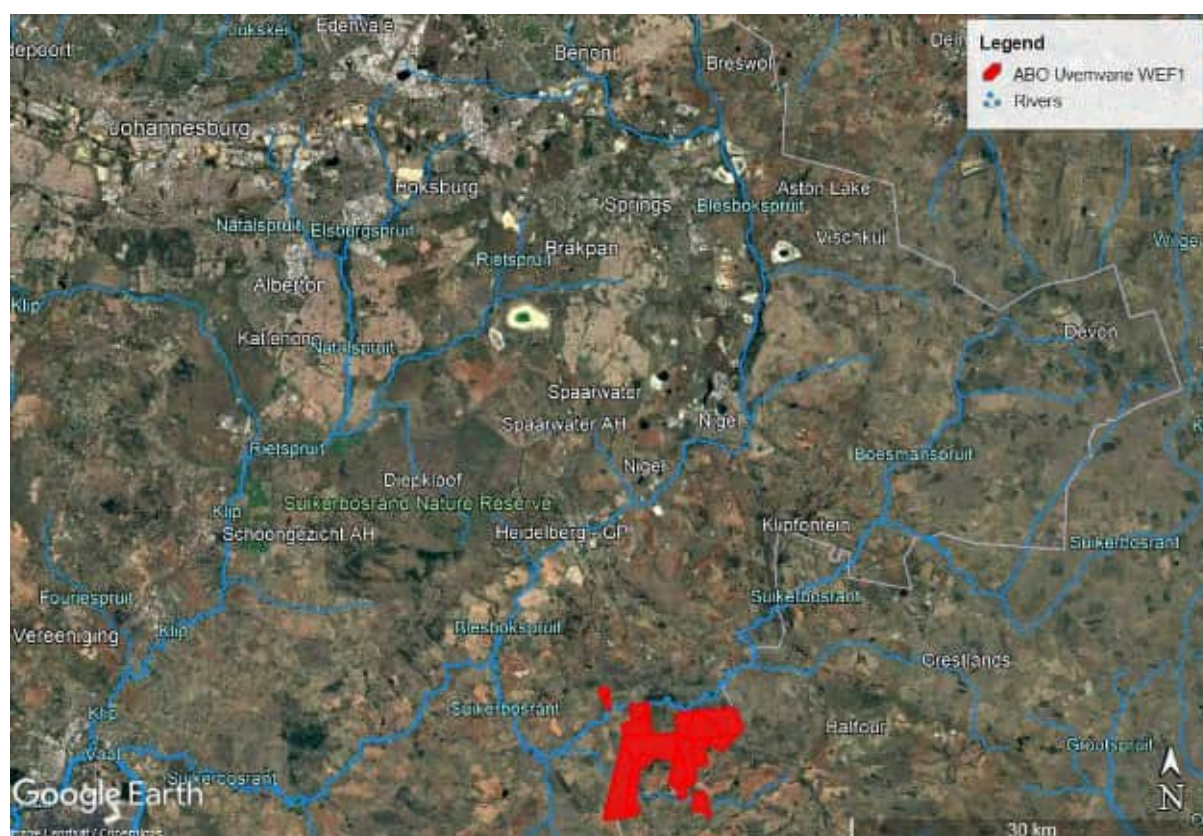


Figure 3. Rivers map for study site (red polygon represents the study boundaries overlaid on a 2016 Orthophotograph of the area)

The area normally receives about 678mm of rain per year, mostly during summer. Typically, very little to no rain falls between May and September and the highest rainfall (112mm) occurs in January (Figure 4). As a result of the very low rainfall in winter, the smaller watercourses at the site are, under natural conditions, seasonally flowing rivers.

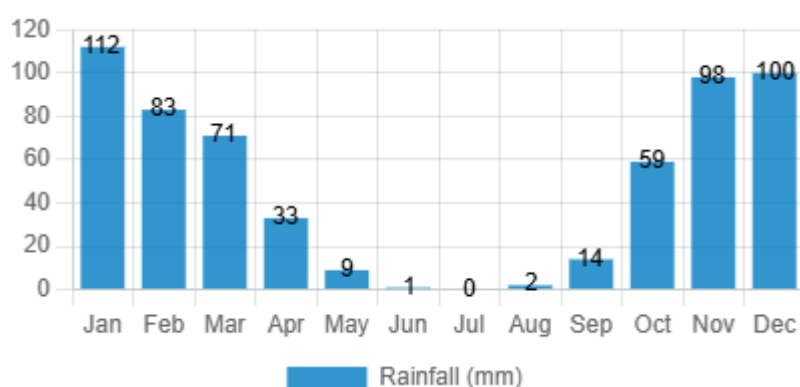


Figure 4. Average monthly rainfall for the area (SA Atlas of Climatology and Agrohydrology, R.E. Schulze, 2009 – obtained from CapeFarmMapper, 2022)

As mentioned, the area does not lie in a strategic water source area for ground or surface water. A minor fractured aquifer occurs within the wider area, with the water table typically occurring at depths of about 10 m below ground level with a yield of between 0.5 and 2 litres a second. The surface and groundwater quality tend to be very good, with natural electrical conductivity concentrations of less than 70 mS/m. The recharge of the aquifer is good and estimated to be about 45 mm/a. The aquifer has a medium to high susceptibility and vulnerability to contamination.

The geology for most of the site is characterised by tholeiitic basalt of the Kliprivierberg Group (Randian Ventersdorp Supergroup), while the central higher-lying area comprises quartzite and conglomerate of the Turfontein and Johannesburg Subgroups (Randian Witwatersrand Supergroup). Weathering of these basalt gives rise to shallow, rocky, clayey soils of mainly Mispah and Glenrosa soil forms. Soils in the higher-lying areas are shallow, gravel lithosols.

The natural vegetation of the study area is mapped as comprising Andesite and Gold Reef Mountain Bushveld on the higher-lying northeastern portion of the site while Soweto Highveld and Tsakane Clay Grasslands occur on the lower-lying southern and western extents. The bushveld vegetation types are still largely intact and well protected that they are of Least Concern conservation status while the grassland vegetation is more impacted and impacted by cultivation and urban sprawl such that they are considered to be Endangered vegetation types. The typical land cover comprises a mix of open natural bushveld, grassland, wetlands and cultivated areas. Several dams have been constructed in the watercourses within the project area of influence.

Dominant plant species in the bushveld and grassland areas include common buffalo thorn (*Ziziphus mucronata*), current-rhus (*Searsia pyroides*), ribbed kunirhus (*Searsia pallens*), ouhout (*Leucosidea sericea*), African boxwood (*Myrsine africana*), gwarrie (*Euclea crispa*), shiny leaf (*Rhamnus prinoides*), mountain cabbage tree (*Cussonia paniculata*), grassveld bitterbush (*Selago densiflora*), and natal grass (*Melinis repens*). Within the wetter areas, Orange River swamp lily (*Crinum bulbospermum*), pennywort (*Centella asiatica*), arum lilies (*Zantedeschia albomaculata*), sedges such as *Cyperus congestus*, common reeds (*Phragmites australis*) and bulrushes (*Typha capensis*) occur. Invasive alien plants occur in the disturbed areas such as silver wattle (*Acacia dealbata*), prickly pear (*Opuntia ficus-indica*) and pampas grass (*Cortaderia selloana*). A vegetation assessment has been undertaken for the site and more detail on the terrestrial vegetation cover is included in that specialist assessment.

Amphibian species occurring in the wider area are the Giant African bullfrog (*Pyxicephalus adspersus*), African red toad (*Schismaderma carens*), Raucous toad (*Sclerophrys capensis*), guttural toad (*Sclerophrys gutturalis*), striped stream frog (*Strongylopus fasciatus*), common river frog (*Amietia delalandii*), Senegal running frog (*Kassina senegalensis*), Bowettger's dainty frog (*Cacosternum boettgeri*), and the African clawed frog or platanna (*Xenopus laevis*). Nearly all amphibian species are listed by the International Union for the Conservation of Nature as being of Least concern. Many of the amphibians are widespread and found in many different habitats, including grasslands, shrublands, wetlands and artificial environments and breeds in temporary and permanent sources of water. Platannas are aquatic amphibians and only leave the water when they need to migrate to new water bodies during droughts or because of other disturbances. The Giant African bullfrog (although listed as Least Concern) is of concern due to its declining population associated with loss of habitat.

3.2. CONSERVATION VALUE OF AQUATIC FEATURES

Three sets of conservation mapping at a national, provincial and local scale are of relevance to the identification of aquatic features of ecological and biodiversity conservation importance. These are the National Freshwater Ecosystem Priority Areas (FEPA) map, the National Wetland Map version 5 (NWMv5), and the provincial Conservation Plans for Gauteng and Mpumalanga.

National FEPAs are intended to provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting the sustainable use of water resources. FEPAs were determined through a process of systematic biodiversity planning and were identified using a range of criteria for serving ecosystems and associated biodiversity of rivers, wetlands and estuaries. The river and wetland FEPAs are required to be maintained in a largely natural ecological state, while Fish Support Areas should not be allowed to degrade from their existing ecological condition. In terms of Freshwater Ecosystem Biodiversity Areas mapped within the study area, the site does not lie within a FEPA River Sub-catchment. Some mapped FEPA wetland areas occur within

or adjacent to the site and are mostly associated with dams. The only natural wetlands are in the southwestern extent of the site, which are depression wetlands (Figure 5).

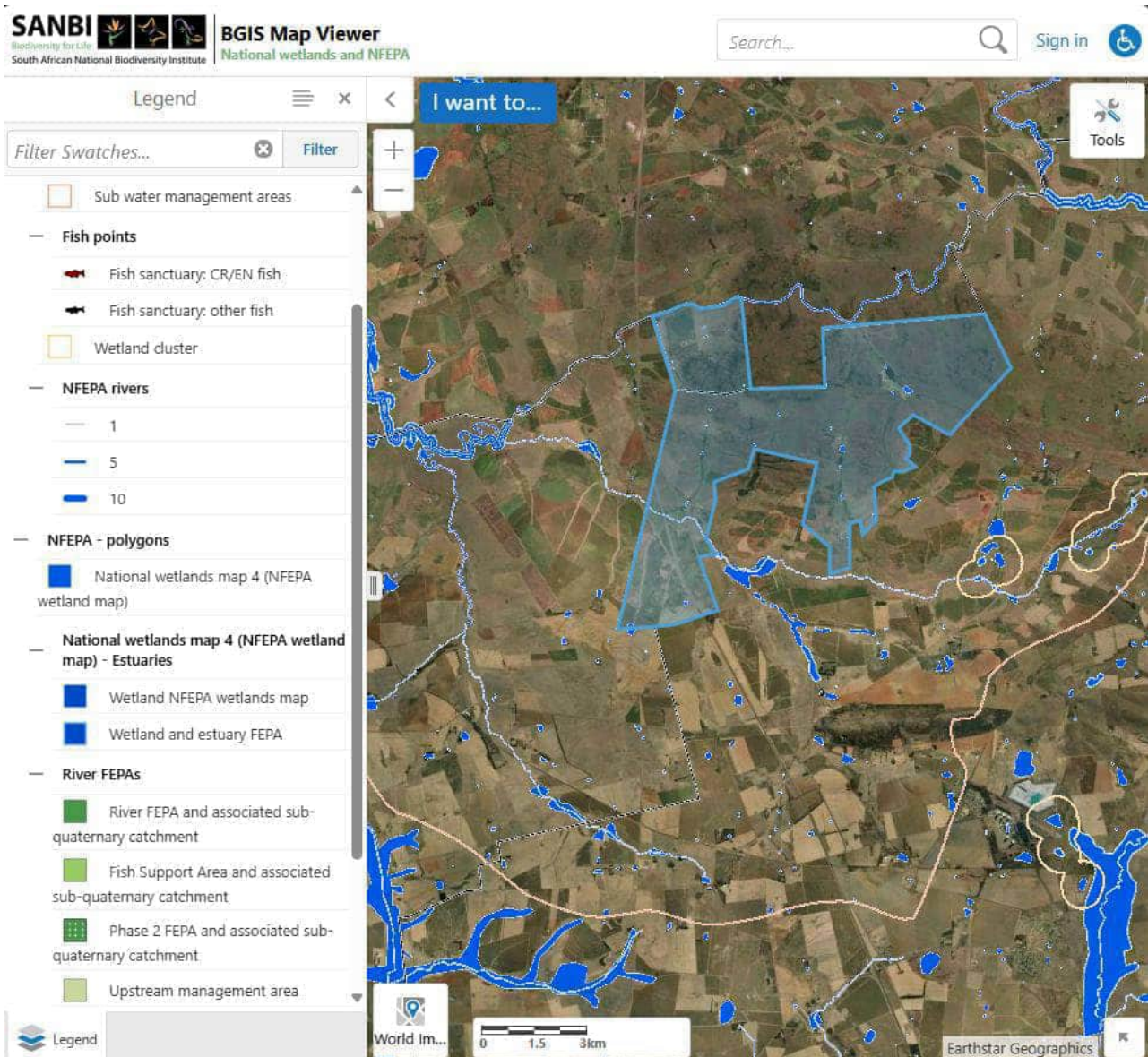


Figure 5. National Freshwater Ecosystem Priority Areas for the study sites (SANBI Biodiversity GIS, 2024)

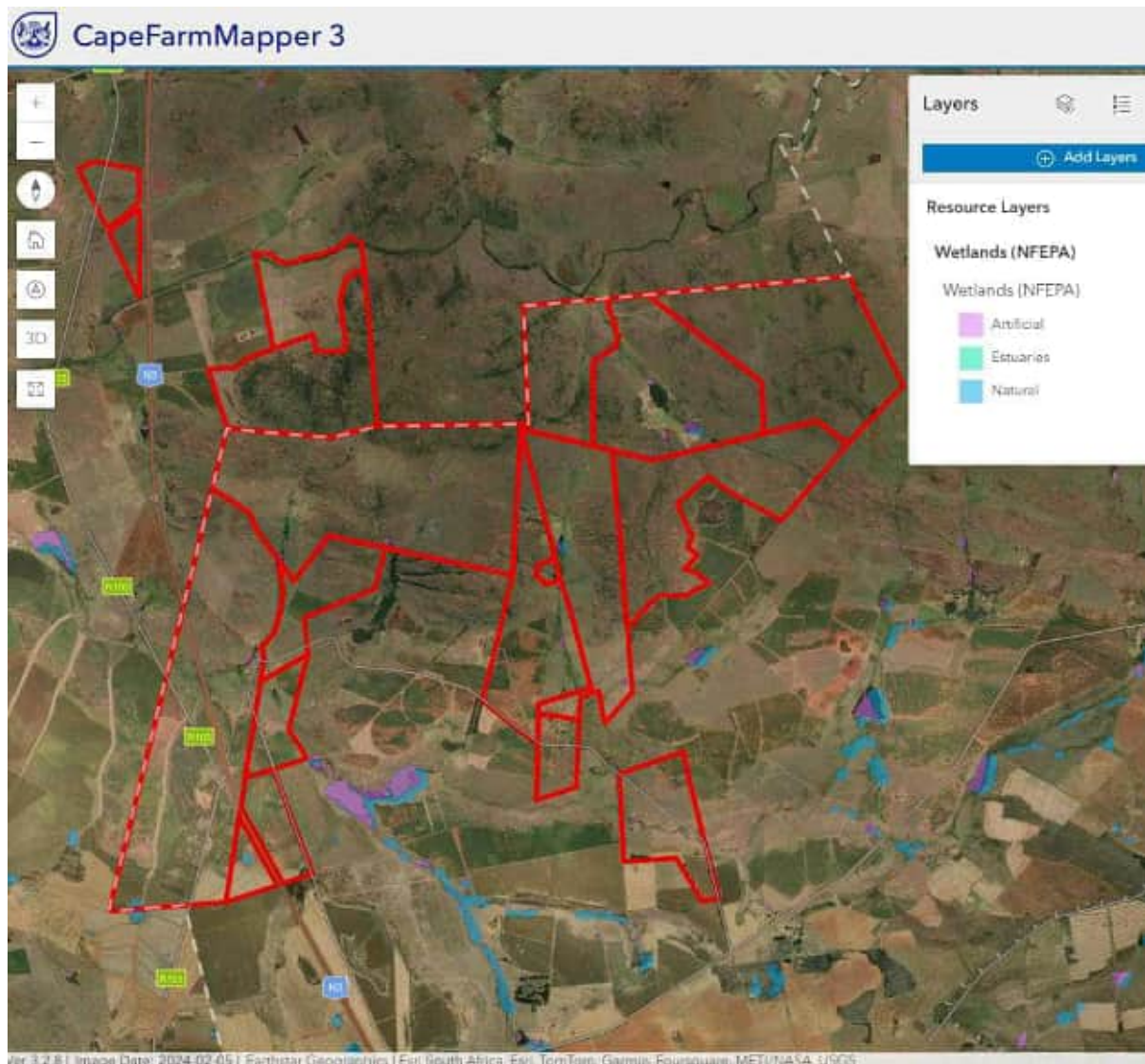


Figure 6. National Freshwater Ecosystem Priority Areas map for the study site where the red polygon indicates the study boundaries (CapeFarmMapper, 2024)

In the NWMv5, there are several wetland features mapped within and adjacent to the site which are listed below and shown in Figure 7:

- Riverine wetland (light blue/white areas in Figure 7) associated with the Suikerbosrant River that drains through the northern portion of the site;
- Unchanneled valley bottom wetland (light green area) associated with a minor tributary of the Suikerbosrant River that drains into the river from the north; and
- Seeps (upper reaches – orange areas), channelled valley bottom (middle reaches – blue areas) and floodplain (lower reaches – dark green areas) wetland areas associated with tributaries of the Suikerbosrant River that drain into the river from the south.

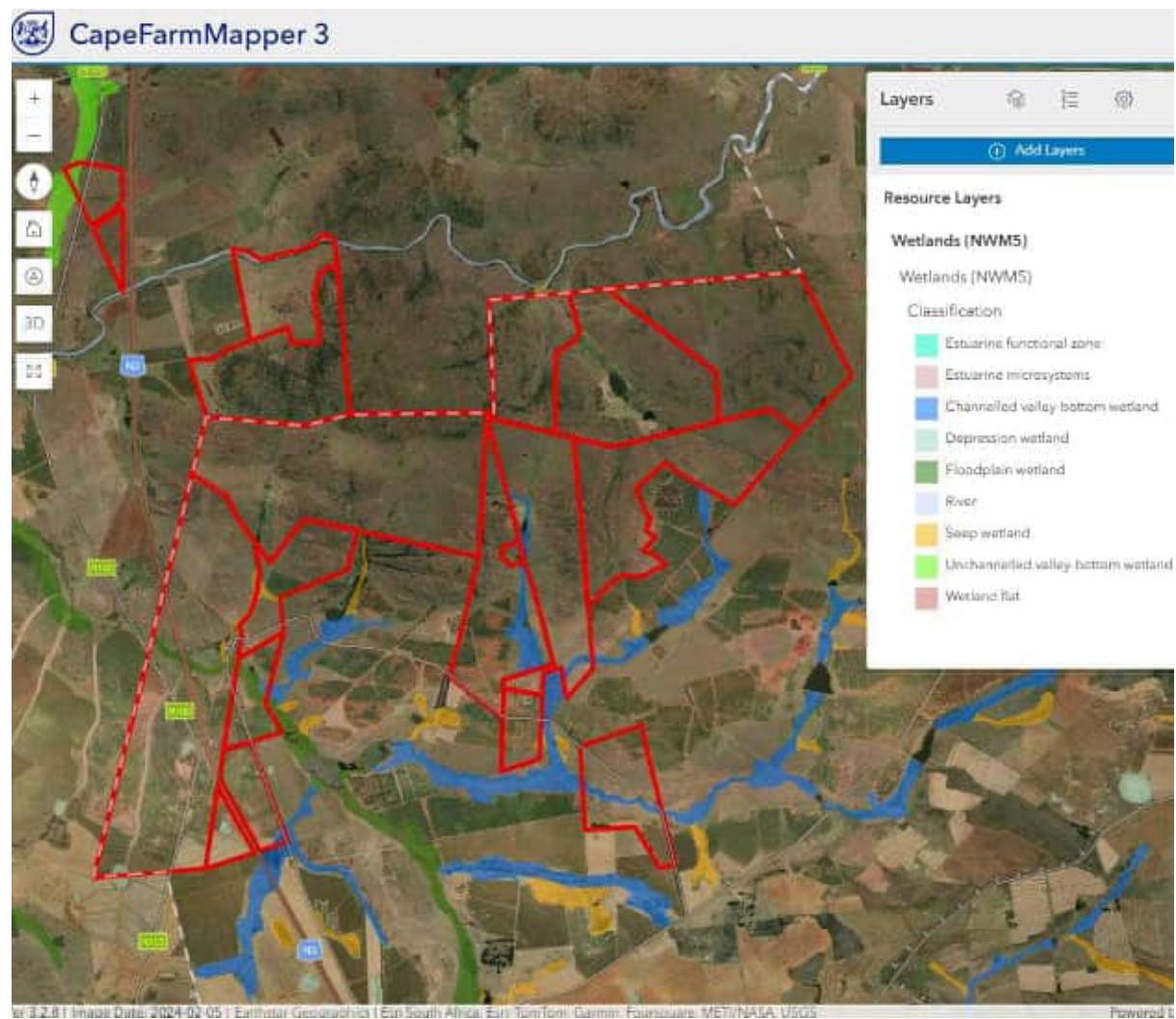


Figure 7. National Wetland map and National Freshwater Ecosystem Priority Areas map for the study site where the red polygon indicates the study boundaries (CapeFarmMapper, 2024)

In the 2014 Mpumalanga Biodiversity Sector Plan the FEPA wetland mapping has been applied to the aquatic features within the area (Figure 8), with the natural FEPA wetlands mapped as aquatic Ecological Support Areas. The surrounding terrestrial areas comprise a mix of transformed and natural areas.

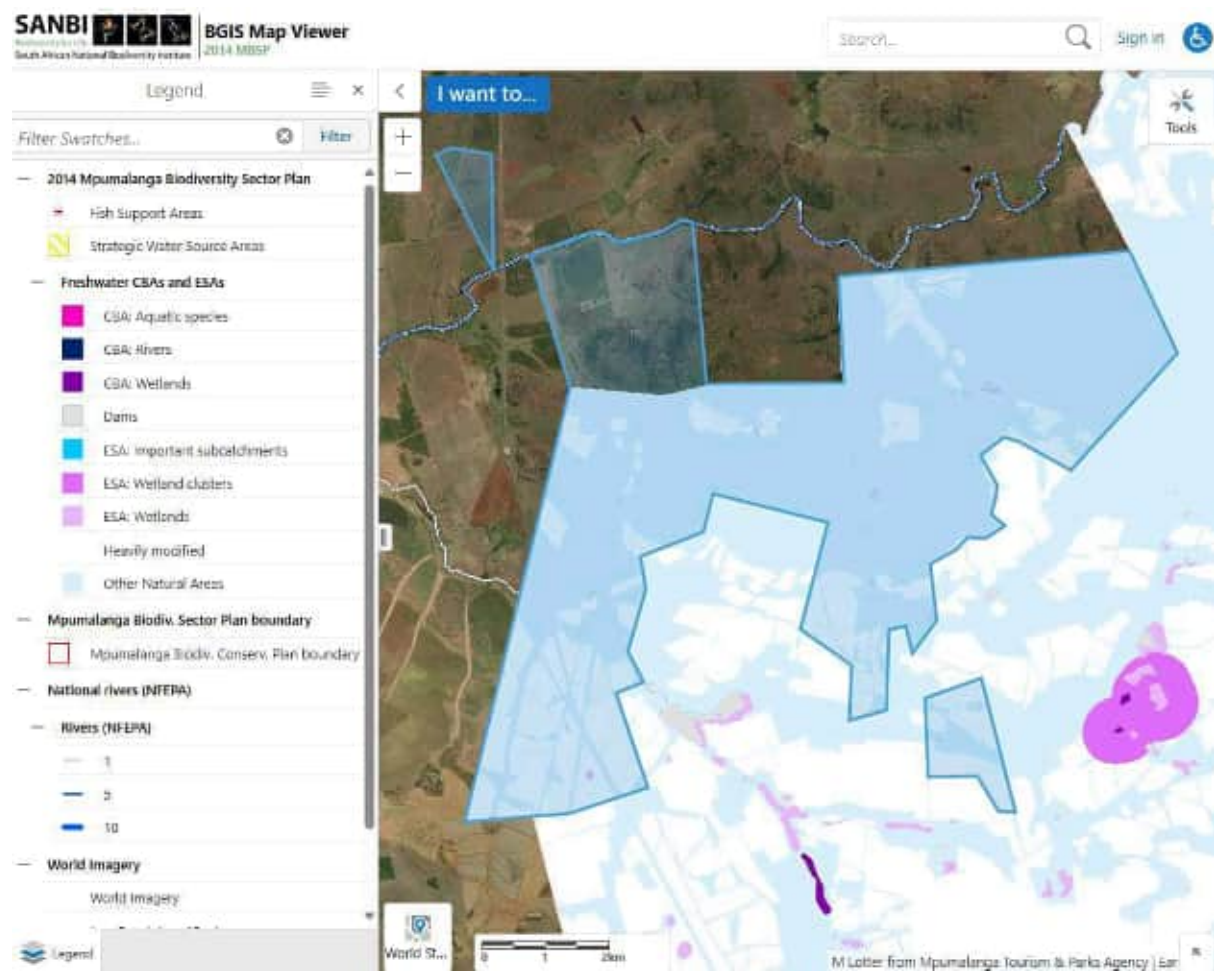


Figure 8. 2014 Mpumalanga Biodiversity Sector Plan for the study site (SANBI Biodiversity GIS, 2024)

The 2014 Highveld wetlands mapping (Figure 9) is similar to the National Wetland Map showing the wider seep, valley bottom and floodplain wetlands along the watercourses. This mapping is similar to the aquatic biodiversity sensitivity mapping as per the DFFE Screening Tool.

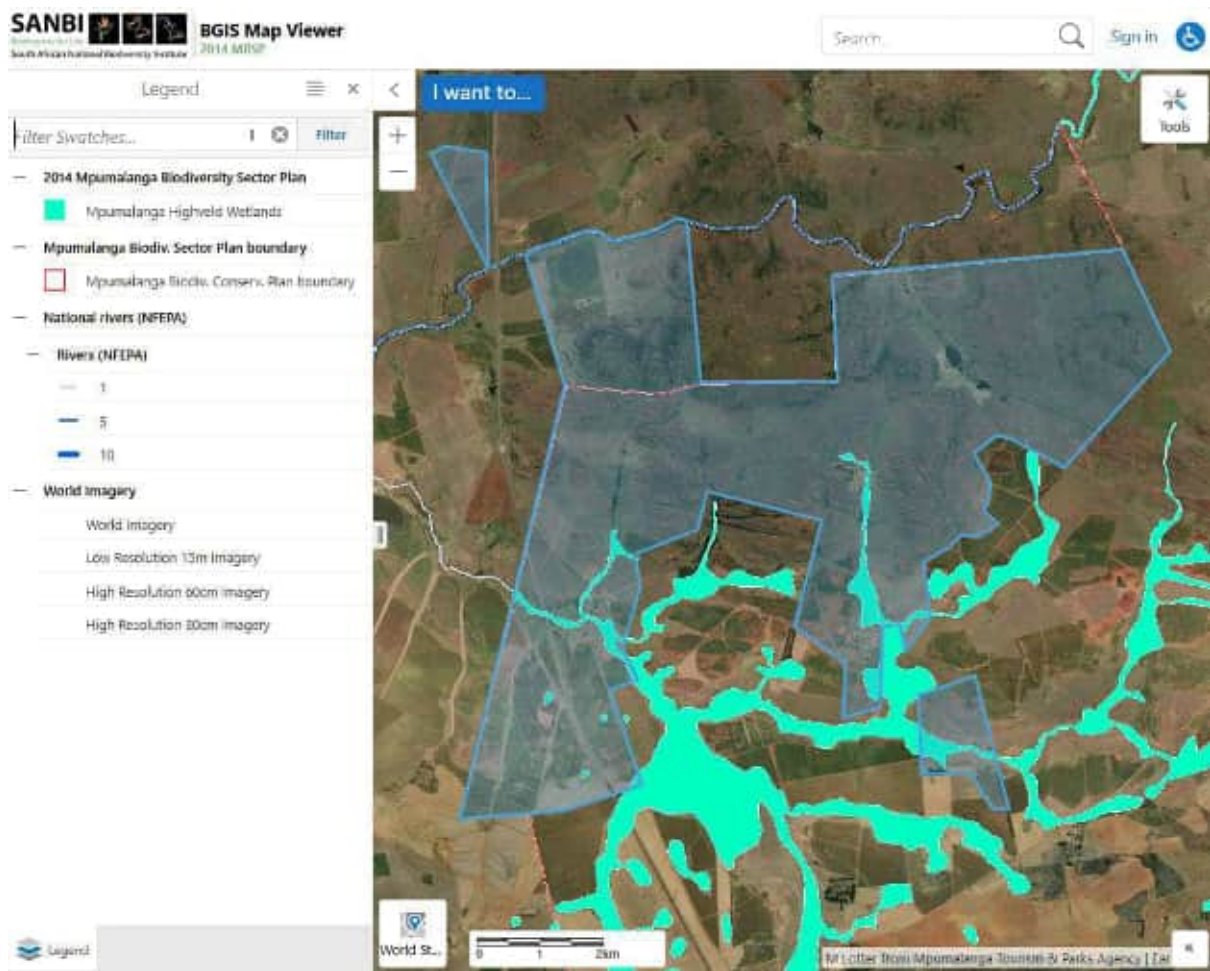


Figure 9. 2014 Mpumalanga Highveld Wetland mapping for the study site (SANBI Biodiversity GIS, 2024)

The 2011 Gauteng C Plan is only applicable to the northwestern corner of the site (Figure 10). The mapping reflects mostly the terrestrial biodiversity planning and comprises terrestrial Critical Biodiversity Areas and Ecological Support Areas that are not aligned with aquatic habitats.

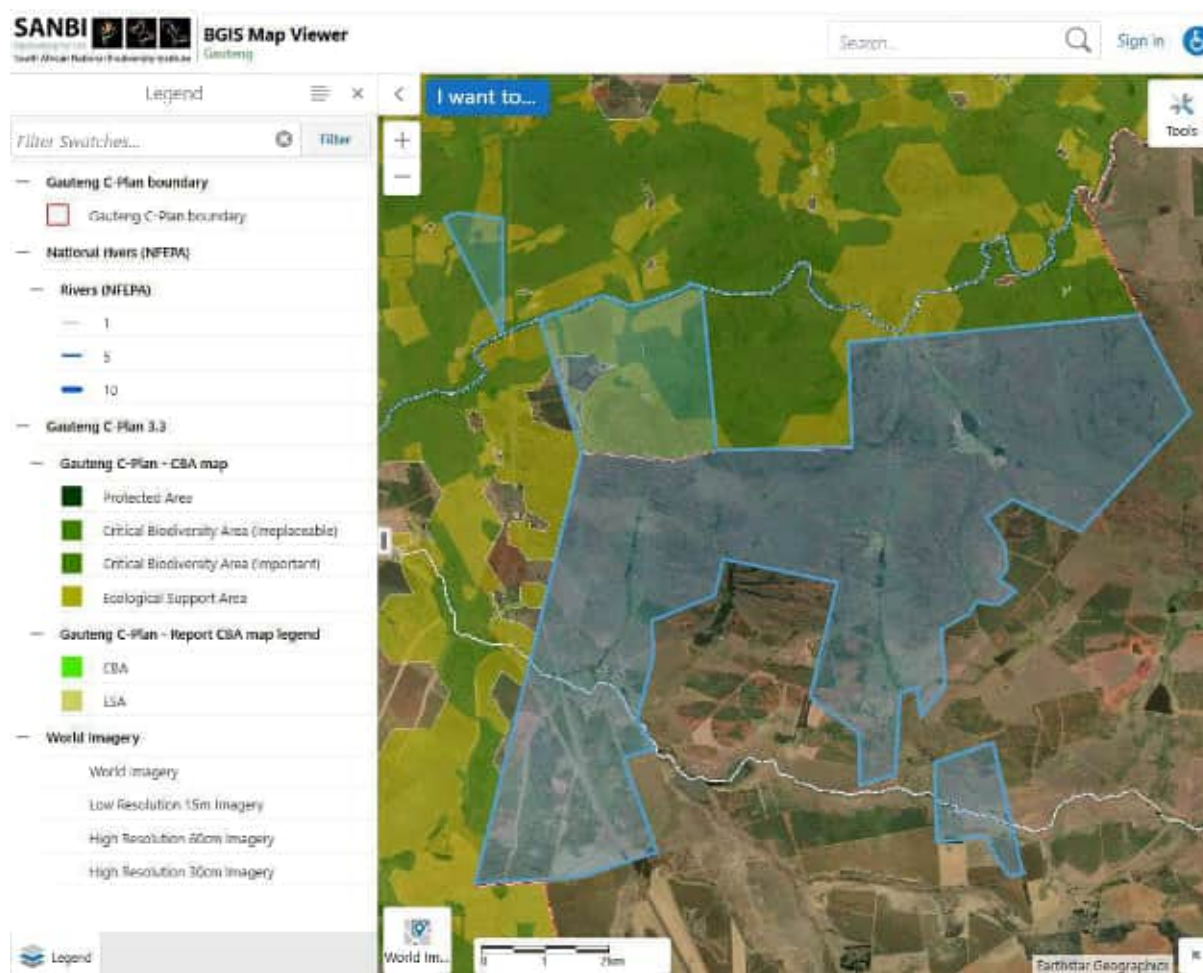


Figure 10. Gauteng Conservation Plan for the study site (SANBI Biodiversity GIS, 2024)

4. SITE VERIFICATION OUTCOMES

The aquatic features occurring within the site are the Suikerbosrant tributary of the Vaal River and its associated tributaries and wetland areas. These watercourses range from being largely natural on the higher-lying areas of the site to being moderately to largely modified ecological condition in their middle and lower reaches. The watercourses have moderate ecological importance but are of high sensitivity. They provide corridors for the movement of water and biota through the site and are particularly sensitive to flow, water quality and habitat modification due to the associated wetland habitat along many of the watercourses.

A buffer of 50m is recommended for the watercourses while the associated wetland habitats should be protected by a 100m buffer. Services could be placed through these aquatic habitats and buffer areas but must be kept to a minimum and adequately mitigated.

The findings of this assessment thus largely agree with the DFFE screening tool for aquatic biodiversity sensitivity mapping in that most of the site is of low aquatic sensitivity. The watercourses are however considered to be of high sensitivity and should be avoided by the proposed WEF facilities, as recommended above.

If the above-recommended buffers and the proposed mitigation measures in the impact assessment are implemented, the risk to the aquatic ecosystems is likely to be low such that the General Authorisations for Section 21(c) and (i) water uses under the National Water Act (Act 36 of 1998) would apply.



Figure 11. Views of Suikerbosrant River upstream (top) and downstream (bottom) of the site



Figure 12. Views of some of the tributaries of the Suikerbosrant River within the site.

5. AQUATIC CONSTRAINTS MAPPING AND AQUATIC SENSITIVITY

In the aquatic sensitivity mapping, the watercourses have been mapped as being of high sensitivity, with restrictions as mentioned for infrastructure components. In addition, to protect the aquatic habitats, the buffer zones of 50m on either side of the watercourses and 100m from the wetland areas have been mapped as being of medium sensitivity. Figure 13 shows the mapped aquatic features together with the recommended buffers for the 3 proposed sites and Figure 14 shows the sensitivity mapping within the site.

The potential aquatic ecosystem impacts of the proposed solar facilities will be assessed further in the environmental impact assessment report for the project. Most of the impacts are however likely to take place during the construction phase.

The potential aquatic ecosystem impacts of the proposed activities during construction include:

- Disturbance and possibly loss of aquatic habitats within the watercourses with the associated impact on sensitive aquatic biota;
- The removal of indigenous riparian and instream vegetation that has the potential to reduce the ecological integrity and functionality of the watercourses;
- Demand for water for construction could place stress on the existing available water resources;
- Road crossing structures, if not adequately designed, could impede flow in the watercourses;
- Alien vegetation infestation within the aquatic features due to disturbance; and
- Increased sedimentation and risks of contamination of surface water runoff during construction.

During the operational phase for all the proposed works, the potential impacts would include:

- Ongoing disturbance of aquatic features and associated vegetation along access roads or adjacent to the infrastructure that needs to be maintained;
- Modified runoff characteristics from hardened surfaces that have the potential to result in erosion of the watercourses; and
- Possible increase in water consumption and potential for water quality impacts (such as contamination from sewage generated onsite) as a result of the operation of the site.

During the decommissioning phase, the potential impacts would largely be associated with an increased disturbance of aquatic habitat due to the increased activity on the site. Increased sedimentation and risks of contamination of surface water runoff may also occur.

By implementing suitable buffers (50m along the watercourses and 100m adjacent to the wetlands) and minimising the works within the river/stream corridors, the impact of the proposed project activities would be low and unlikely to impact the integrity of the aquatic ecosystems. The recommended buffers are deemed adequate, irrespective of the proposed infrastructure.

Linear infrastructure (road and powerlines) would be able to cross aquatic habitats and their buffers if adequately mitigated, although it is recommended that areas of high sensitivity be avoided.

The other structures/infrastructure should avoid the aquatic habitats and buffer areas. Where unavoidable structures could be placed in the areas of medium sensitivity, with adequate mitigation.



Figure 13. Mapped aquatic features within the project area (red polygons), shown in Google Earth. The recommended buffer or development setback areas are indicated by the yellow areas.

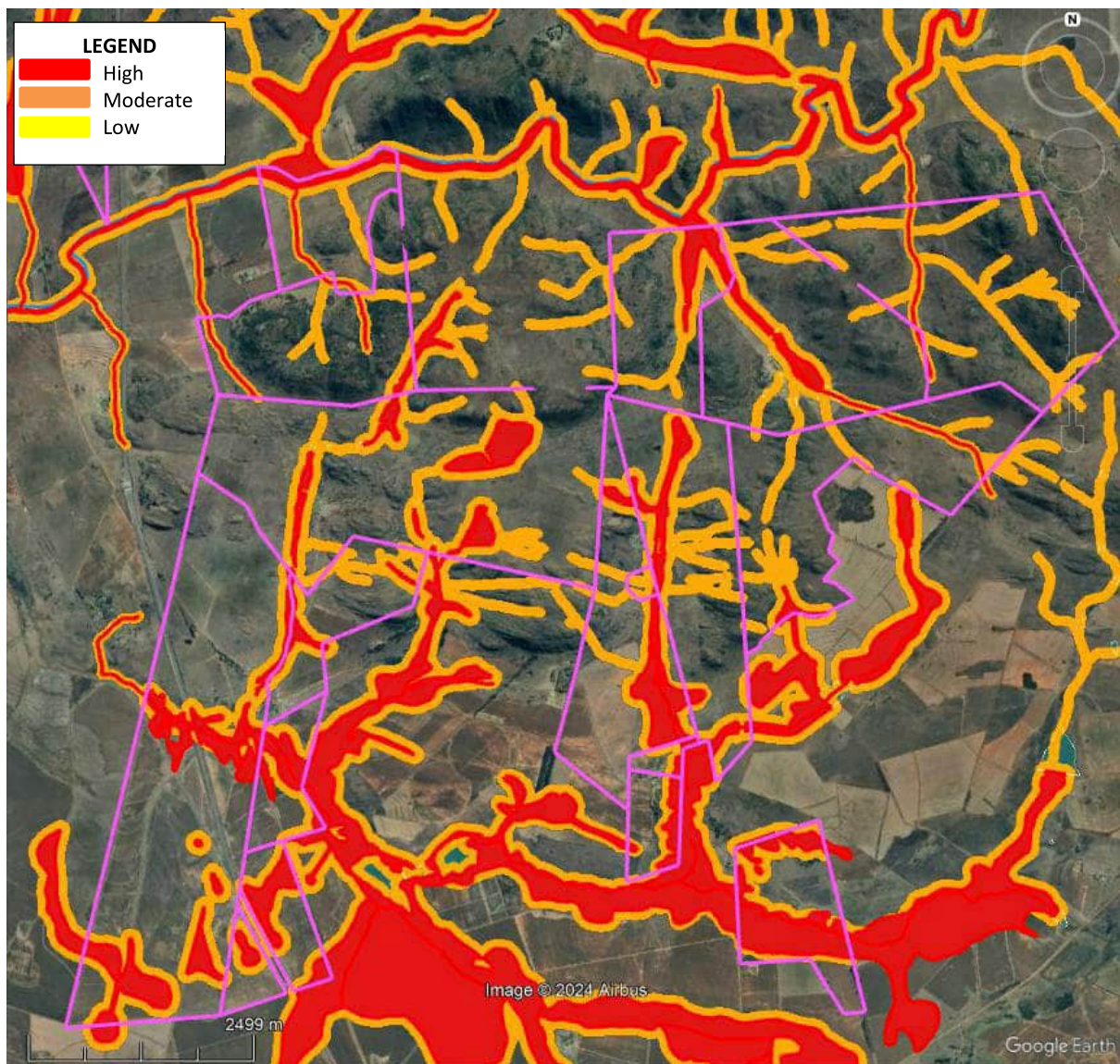


Figure 14. Mapped sensitivity of aquatic features within the project area (pink polygon), shown in Google Earth.

6. CONCLUDING STATEMENT REGARDING AQUATIC SENSITIVITY OF SITES

The following table summarises the findings of the site verification assessment in terms of aquatic ecosystem sensitivity:

Sensitivity Theme: Aquatic		
Screening Tool Site Sensitivity	Specialist Site Sensitivity	Reasons why the Screening Tool Sensitivity is disputed / confirmed
Most of the site comprises low Aquatic Biodiversity Sensitivity in terms of the DFFE screening tool mapping with the watercourses and wetlands within the site being of very high sensitivity. The site does not lie within a National FEPA River Sub catchment or a SWSA. The wetlands are mapped in the National Wetland Mapv5 and the 2014 Mpumalanga Highveld Wetlands Map.	Low for the widespread area and High for the watercourses and wetlands within the site. A medium sensitivity has been applied to the adjacent buffers.	The Screening Tool indicated the site to be in an area mapped as being of Low Aquatic Biodiversity Sensitivity but with the aquatic features mapped as very high sensitivity. This assessment found the watercourses and wetlands on the site to be of high sensitivity. Buffer zones of 50m on either side of the watercourses and 100m from the wetlands are deemed sufficient to protect these aquatic ecosystems from any impact arising from the proposed WEF.

AQUATIC SITE SENSITIVITY ANALYSIS REPORT FOR THE PROPOSED ABO UVEMVANE WIND ENERGY FACILITY 2 (WEF2) AND ASSOCIATED GRID CONNECTION NEAR HEIDELBERG IN THE GAUTENG PROVINCE

DECEMBER 2024



Prepared By:

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1. SPECIALIST DETAILS, EXPERTISE AND DECLARATION

1.1. QUALIFICATIONS OF SPECIALIST CONSULTANT

Name: Antonia Belcher
Contact details: 53 Dummer St, Somerset West, 7130; Phone: 082 883 8055;
 Email: toni@bluescience.co.za
Profession: Aquatic Scientist (P. Sci. Nat. 400040/10)
Fields of Expertise: Specialist in freshwater assessments, monitoring and reporting
Years in Profession: 30+ years

Toni Belcher worked for the Department of Water Affairs and Forestry for more than 17 years. During this period she worked for the Directorate Water Quality Management, the Institute for Water Quality Studies and the Western Cape Regional Office and has built up a wide skills base on water resource management and water resource quality for rivers, estuaries and the coastal marine environment. Since leaving the Department in 2007, she has been working in her private capacity and was co-owner of BlueScience (Pty) Ltd, working in the field of water resource management and has been involved in more than 500 aquatic ecosystem assessments for environmental impact assessment and water use authorisation purposes. In 2006 she was awarded a Woman in Water award for Environmental Education and was a runner up for the Woman in Water prize for Water Research.

Professional Qualifications:

1984 Matriculation Lawson Brown High School
 1987 B.Sc. – Mathematics, Applied Mathematics University of Port Elizabeth
 1989 B.Sc. (Hons) – Oceanography University of Port Elizabeth
 1998 M.Sc. – Environmental Management (cum laude) Potchefstroom University

Key Skills: Areas of specialisation: Aquatic ecosystem assessments, Monitoring and evaluation of water resources, Water resource legislation and authorisations, River classification and Resource Quality Objectives, River Reserve determination and implementation, Water Quality Assessments, Biomonitoring, River and Wetland Rehabilitation Plans, Catchment management, River maintenance management, Water education.

Summary of Experience:

1987 – 1988	Part-time field researcher, Department of Oceanography, University of Port Elizabeth
1989 – 1990	Mathematics tutor and administrator, Master Maths, Randburg and Braamfontein Colleges, Johannesburg
1991 – 1995	Water Pollution Control Officer, Water Quality Management, Department of Water Affairs, Pretoria
1995 – 1999	Hydrologist and Assistant Director, Institute for Water Quality Studies, Department of Water Affairs and Forestry, Pretoria
1999 – 2007	Assistant and Deputy Director, Water Resource Protection, Western Cape Regional Office, Department of Water Affairs, Cape Town
2007 – 2012	Self-employed – Aquatic Specialist
2013 – 2020	Senior Aquatic Specialist and part-owner, BlueScience
2020 – present	Self-employed – Aquatic Specialist

1.2. DECLARATION OF INDEPENDENCE

I, **Antonia Belcher**, as the appointed specialist hereby declare/affirm the correctness of the information provided or to be provided as part of the application, and that I:

- in terms of the general requirement to be independent:
 - other than fair remuneration for work performed/to be performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity; or
 - ~~am not independent, but another specialist that meets the general requirements set out in Regulation 13 of GN No. 326 have been appointed to review my work (Note: a declaration by the review specialist must be submitted);~~
- in terms of the remainder of the general requirements for a specialist, am fully aware of and meet all of the requirements and that failure to comply with any the requirements may result in disqualification;
- have disclosed/will disclose, to the Applicant, the Department and registered interested and affected parties, all material information that have or may have the potential to influence the decision of the Department or the objectivity of any report, plan or document prepared or to be prepared as part of the application;
- have ensured/will ensure that information containing all relevant facts in respect of the application was/will be distributed or was/will be made available to interested and affected parties and the public and that participation was/will be facilitated in such a manner that all interested and affected parties were/will be provided with a reasonable opportunity to participate and to provide comments;
- have ensured/will ensure that the comments of all interested and affected parties were/will be considered, recorded and submitted to the Department in respect of the application; and
- am aware that a false declaration is an offence in terms of Regulation 48 of the NEMA EIA Regulations, 2014 (as amended).

Date: 8 December 2024

Name of company: -

Signature of the specialists:



2. INTRODUCTION

2.1. SCOPE OF STUDY

This aquatic site sensitivity verification report comprises an aquatic ecosystem constraints assessment of the proposed wind energy farm and associated infrastructure referred to as the ABO Uvemvane Wind Energy Facility 2 (WEF2). The assessment is based on a desktop analysis of existing data and mapping available for the area as well as a site visit and field assessment undertaken on 26 January 2024. The development is proposed to consist of a WEF of up to 180 MWc and its associated grid connection. The entire site's extent of approximately 3400ha was included in this assessment. The properties are located approximately 10 km to the southeast of the town of Heidelberg and 12 km west of Balfour.

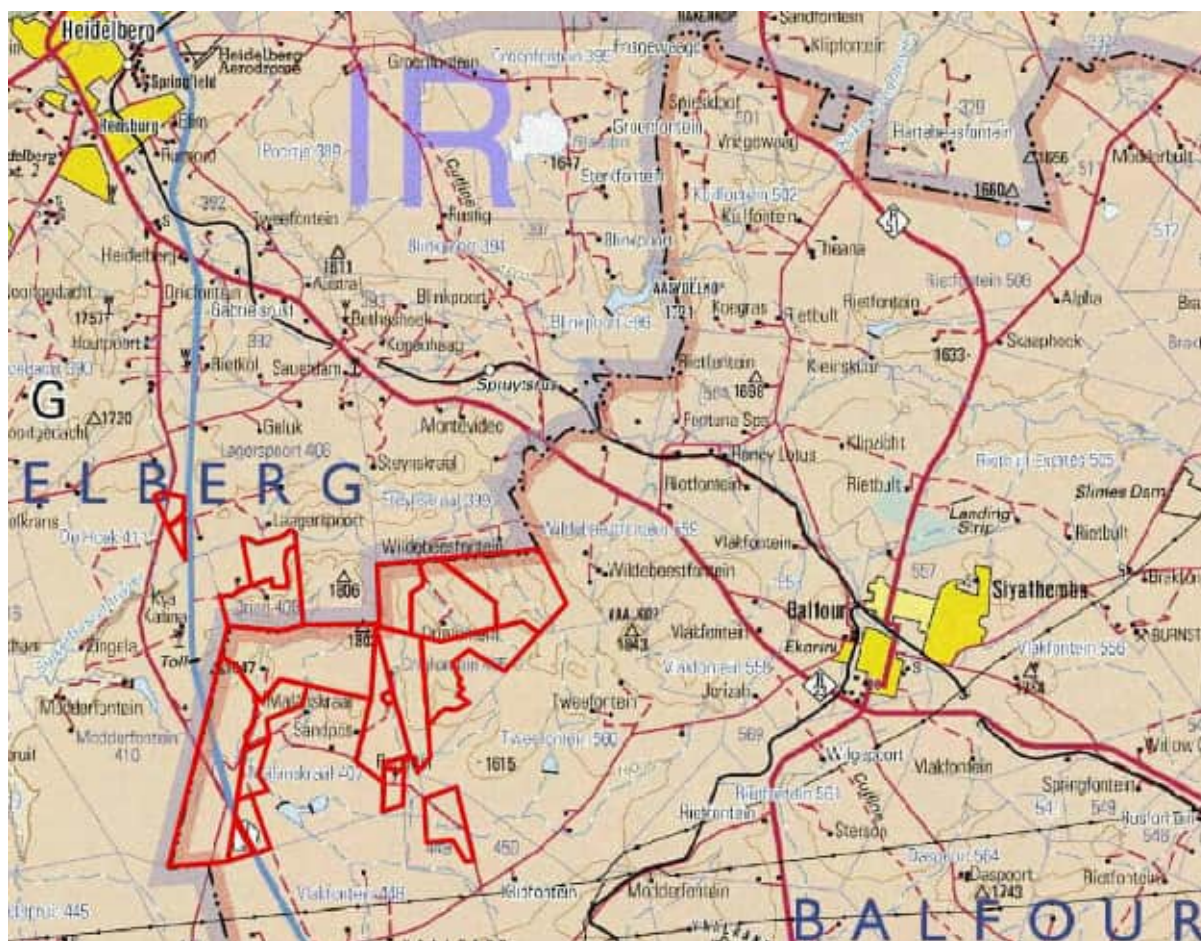


Figure 1. A topographical map of the study area, indicating the locality of the site (red polygon)

The area lies in the Suikerbosrant River Catchment in the larger Vaal-Orange River System. Details of the watercourses at the site are provided in Table 1.

Table 1. Water resource information related to the site assessed

Descriptor	Name / Details	Notes
Water Management Area	Vaal-Orange	
Catchment Area	Suikerbosrant Tributary	Tributary of the Vaal River
Quaternary Catchment	C21C	
Present Ecological State	Suikerbosrant Tributary: B Category (largely natural)	DWA 2012
Ecological Importance and Ecological Sensitivity	High Ecological Importance and Moderate Ecological Sensitivity	

The DFFE screening tool mapping (Figure 2) indicates the study site to be located within an area considered of Low Aquatic Biodiversity Sensitivity with areas of very high sensitivity associated with watercourses and wetlands within the site. The site does not lie within a National Freshwater Ecosystem Priority Area (FEPA) River Sub catchment or Strategic Water Source Areas for groundwater or surface water. The Suikerbosrant riverine wetlands and some seep and valley bottom wetlands are mapped in the National Wetland Map. The aquatic conservation mapping is discussed in Section 3.2 of this report.

MAP OF RELATIVE AQUATIC BIODIVERSITY THEME SENSITIVITY

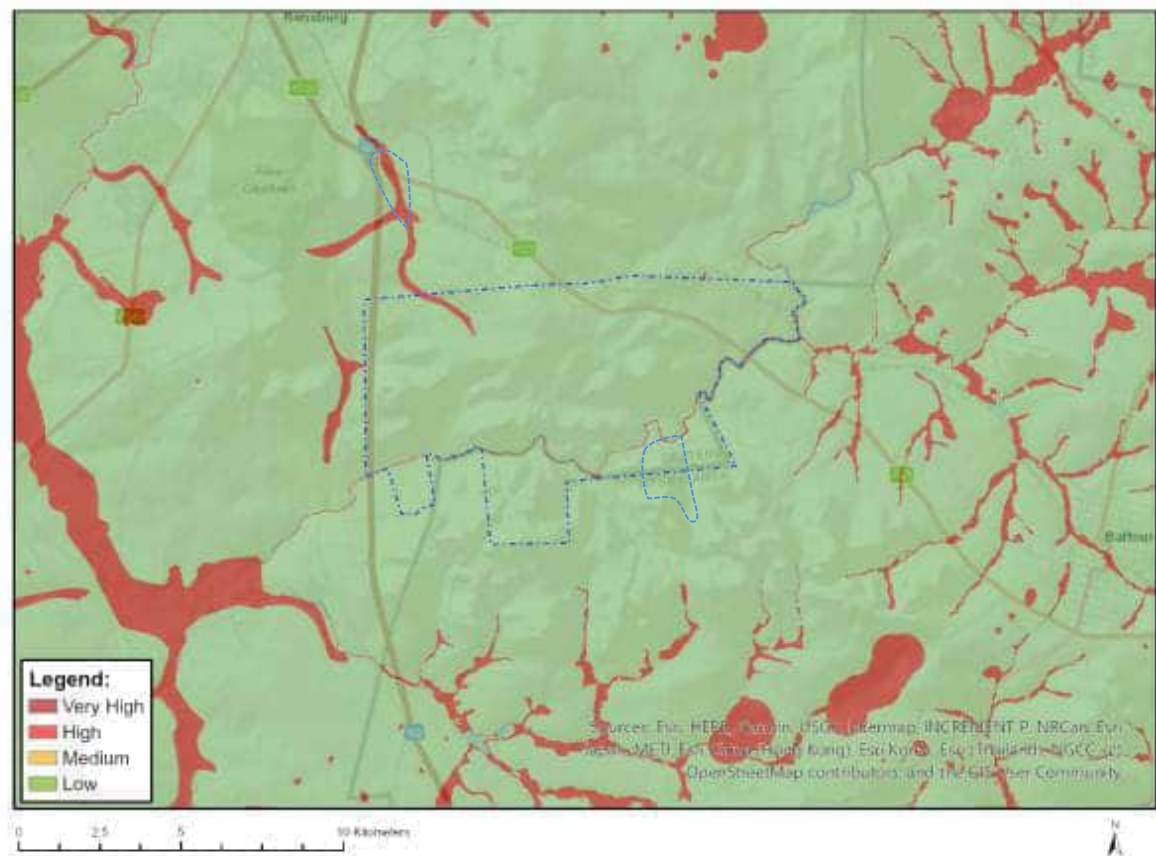


Figure 2. DFFE Screening Map for the area in terms of Aquatic Biodiversity Combined Sensitivity

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low sensitivity
Very High	Rivers_C
Very High	Wetlands_(River)
Very High	Wetlands_Central Bushveld Bioregion (Seep)
Very High	Wetlands_Central Bushveld Bioregion (Valley-bottom)

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Input into this report was informed by a desktop assessment for the study area as well as field verification that was undertaken on 26 January 2024. The timing of the site visit was deemed suitable for the assessment as the area has a summer rainfall and the visit was within the rainfall period.

The 1 in 50 000 topographical river cover was used as a basis for the aquatic constraints mapping and refined based on knowledge of the aquatic features in the area as well as Satellite imagery. The SANBI Biodiversity GIS, Cape Farm Mapper, Freshwater Biodiversity Information System and iNaturalist websites were consulted to identify any aquatic constraints in terms of features of aquatic biodiversity conservation importance within the area. This information/data was used to inform the resource protection-related recommendations.

2.4. USE OF THIS REPORT

This report reflects the professional judgment of its author. The full and unedited content of this should be presented to the regulatory authority. Any summary of these findings should only be produced in consultation with the author.

3. DESCRIPTION OF THE STUDY AREA

3.1. GENERAL OVERVIEW

The site is situated within the Savanna Biome, characterized by low hills and valleys interspersed with tributaries and wetland areas of the Suikerbosrant/Blesboskspruit River System. The primary drainage direction is towards the west where the Suikerbosrant River drains into the Vaal River. The Blesboskspruit River originates to the north of the site in Benoni, east of Johannesburg, and flows in a southerly direction past Nigel and Heidelberg to join the Suikerbosrant River to the west of the site. The Suikerbosrant River arises near Leandra and Impumelo to the northeast of the site and flows for approximately 70 to its confluence with the Blesboskspruit River and then another 35km south-westwards to its confluence with the Vaal River.

As mentioned, the area does not lie in a strategic water source area for ground or surface water. A minor fractured aquifer occurs within the wider area, with the water table typically occurring at depths of about 10 m below ground level with a yield of between 0.5 and 2 litres a second. The surface and groundwater quality tend to be very good, with natural electrical conductivity concentrations of less than 70 mS/m. The recharge of the aquifer is good and estimated to be about 45 mm/a. The aquifer has a medium to high susceptibility and vulnerability to contamination.

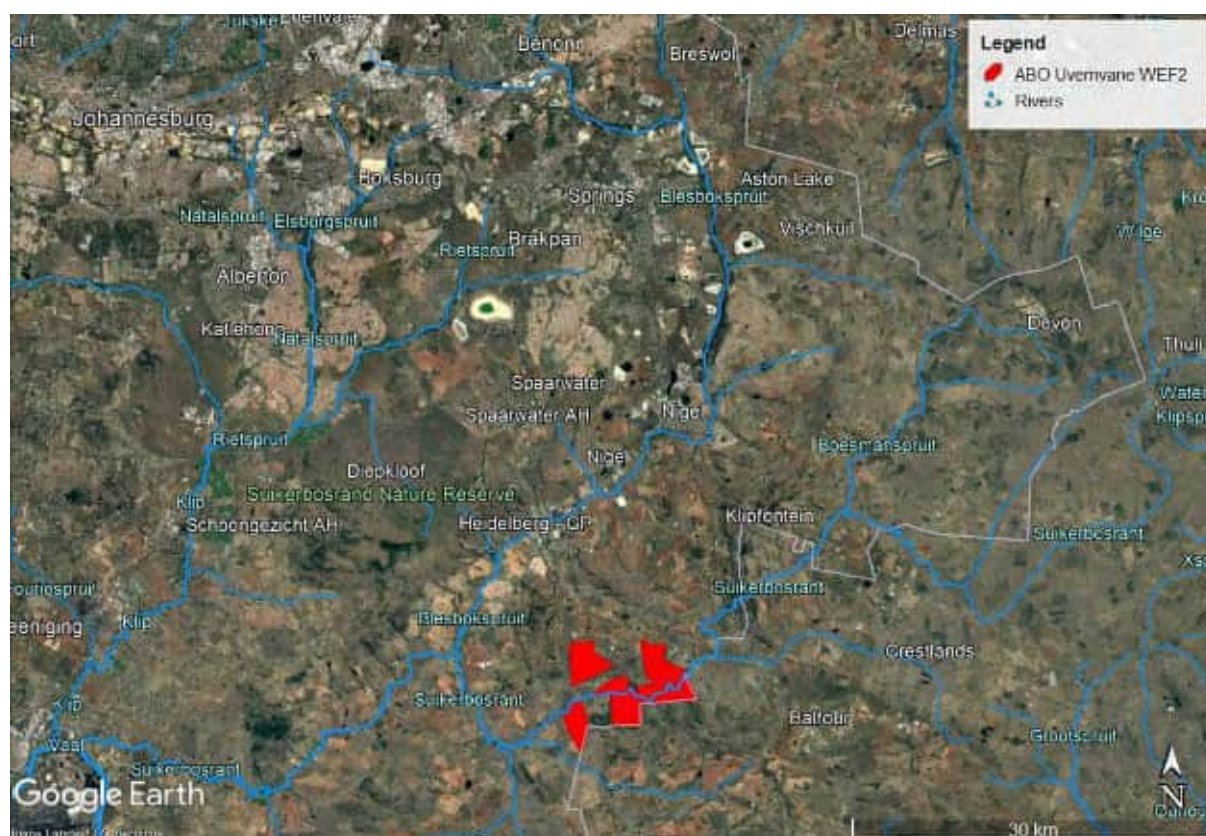


Figure 3. Rivers map for study site (red polygon represents the study boundaries overlaid on a 2016 Orthophotograph of the area)

The area normally receives about 678mm of rain per year, mostly during summer. Typically, very little to no rain falls between May and September and the highest rainfall (112mm) occurs in January (Figure 4). As a result of the very low rainfall in winter, the smaller watercourses at the site are, under natural conditions, seasonally flowing rivers.

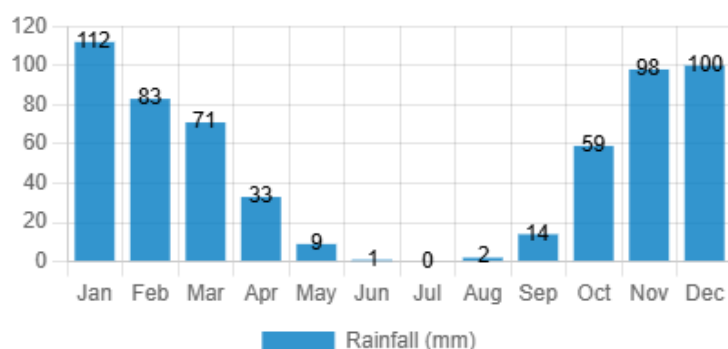


Figure 4. Average monthly rainfall for the area (SA Atlas of Climatology and Agrohydrology, R.E. Schulze, 2009 – obtained from CapeFarmMapper, 2022)

The geology for most of the site is characterised by tholeitic basalt of the Kliprivierberg Group (Randian Ventersdorp Supergroup), while the central higher-lying area comprises quartzite and conglomerate of the Turfontein and Johannesburg Subgroups (Randian Witwatersrand Supergroup). Weathering of these basalt gives rise to shallow, rocky, clayey soils of mainly Mispah and Glenrosa soil forms. Soils in the higher-lying areas are shallow, gravel lithosols.

The natural vegetation of the study area is mapped as comprising Andesite and Gold Reef Mountain Bushveld on the higher-lying northeastern portion of the site while Soweto Highveld and Tsakane Clay Grasslands occur

on the lower-lying southern and western extents. The bushveld vegetation types are still largely intact and well protected that they are of Least Concern conservation status while the grassland vegetation is more impacted and impacted by cultivation and urban sprawl such that they are considered to be Endangered vegetation types. The typical land cover comprises a mix of open natural bushveld, grassland, wetlands and cultivated areas. Several dams have been constructed in the watercourses within the project area of influence.

Dominant plant species in the bushveld and grassland areas include common buffalo thorn (*Ziziphus mucronata*), current-rhus (*Searsia pyroides*), ribbed kunirhus (*Searsia pallens*), ouhout (*Leucosidea sericea*), African boxwood (*Myrsine africana*), gwarrie (*Euclea crispa*), shiny leaf (*Rhamnus prinoides*), mountain cabbage tree (*Cussonia paniculata*), grassveld bitterbush (*Selago densiflora*), and natal grass (*Melinis repens*). Within the wetter areas, Orange River swamp lily (*Crinum bulbospermum*), pennywort (*Centella asiatica*), arum lilies (*Zantedeschia albomaculata*), sedges such as *Cyperus congestus*, common reeds (*Phragmites australis*) and bulrushes (*Typha capensis*) occur. Invasive alien plants occur in the disturbed areas such as silver wattle (*Acacia dealbata*), prickly pear (*Opuntia ficus-indica*) and pampas grass (*Cortaderia selloana*). A vegetation assessment has been undertaken for the site and more detail on the terrestrial vegetation cover is included in that specialist assessment.

Amphibian species occurring in the wider area are the Giant African bullfrog (*Pyxicephalus adspersus*), African red toad (*Schismaderma carens*), Raucous toad (*Sclerophrys capensis*), guttural toad (*Sclerophrys gutturalis*), striped stream frog (*Strongylopus fasciatus*), common river frog (*Amietia delalandii*), Senegal running frog (*Kassina senegalensis*), Bowettger's dainty frog (*Cacosternum boettgeri*), and the African clawed frog or platanna (*Xenopus laevis*). Nearly all amphibian species are listed by the International Union for the Conservation of Nature as being of Least concern. Many of the amphibians are widespread and found in many different habitats, including grasslands, shrublands, wetlands and artificial environments and breeds in temporary and permanent sources of water. Platannas are aquatic amphibians and only leave the water when they need to migrate to new water bodies during droughts or because of other disturbances. The Giant African bullfrog (although listed as Least Concern) is of concern due to its declining population associated with loss of habitat.

3.2. CONSERVATION VALUE OF AQUATIC FEATURES

Three sets of conservation mapping at a national, provincial and local scale are of relevance to the identification of aquatic features of ecological and biodiversity conservation importance. These are the National Freshwater Ecosystem Priority Areas (FEPA) map, the National Wetland Map version 5 (NWMv5), and the provincial Conservation Plan for Gauteng.

National FEPAs are intended to provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting the sustainable use of water resources. FEPAs were determined through a process of systematic biodiversity planning and were identified using a range of criteria for serving ecosystems and associated biodiversity of rivers, wetlands and estuaries. The river and wetland FEPAs are required to be maintained in a largely natural ecological state, while Fish Support Areas should not be allowed to degrade from their existing ecological condition. In terms of Freshwater Ecosystem Biodiversity Areas mapped within the study area, the site does not lie within a FEPA River Sub-catchment. A few mapped FEPA wetland areas occur within or adjacent to the site and are mostly associated with dams (Figure 5).

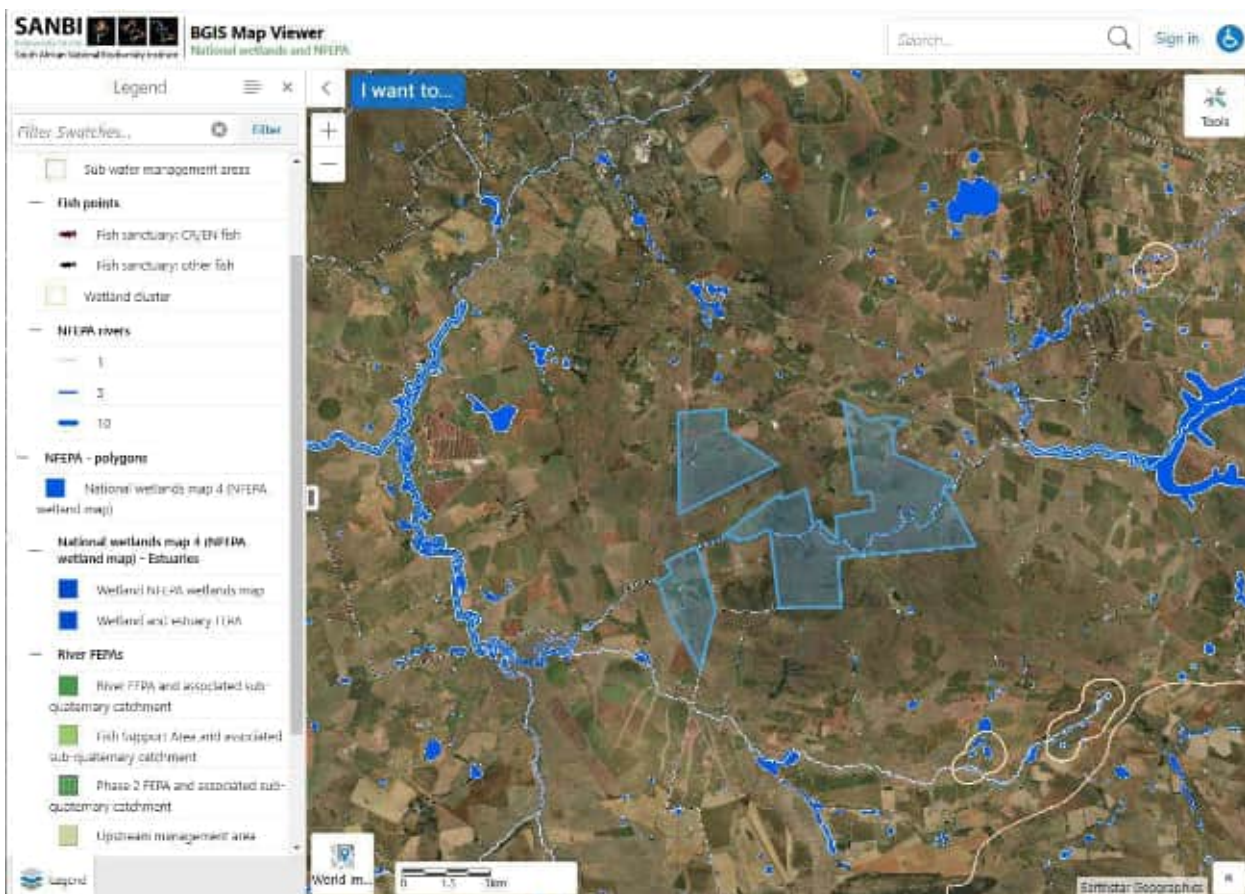


Figure 5. National Freshwater Ecosystem Priority Areas for the study sites (SANBI Biodiversity GIS, 2024)

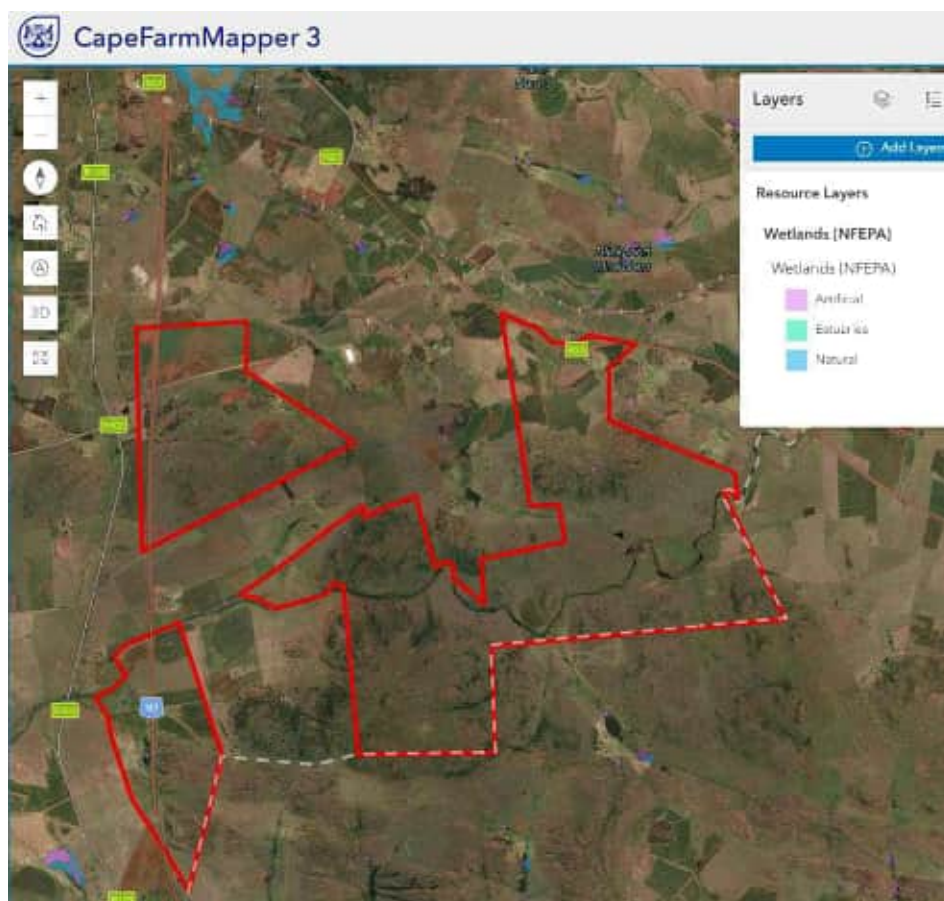


Figure 6. National Freshwater Ecosystem Priority Areas map for the study site where the red polygon indicates the study boundaries (CapeFarmMapper, 2024)

In the NWMv5, there are some wetland features mapped within and adjacent to the site which are listed below and shown in Figure 7:

- Riverine wetland (light blue/white areas in Figure 7) associated with the Suikerbosrant River that drains through the site; and
- Unchanneled valley bottom wetland (light green area) associated with a minor tributary of the Suikerbosrant River that drains into the river from the north.

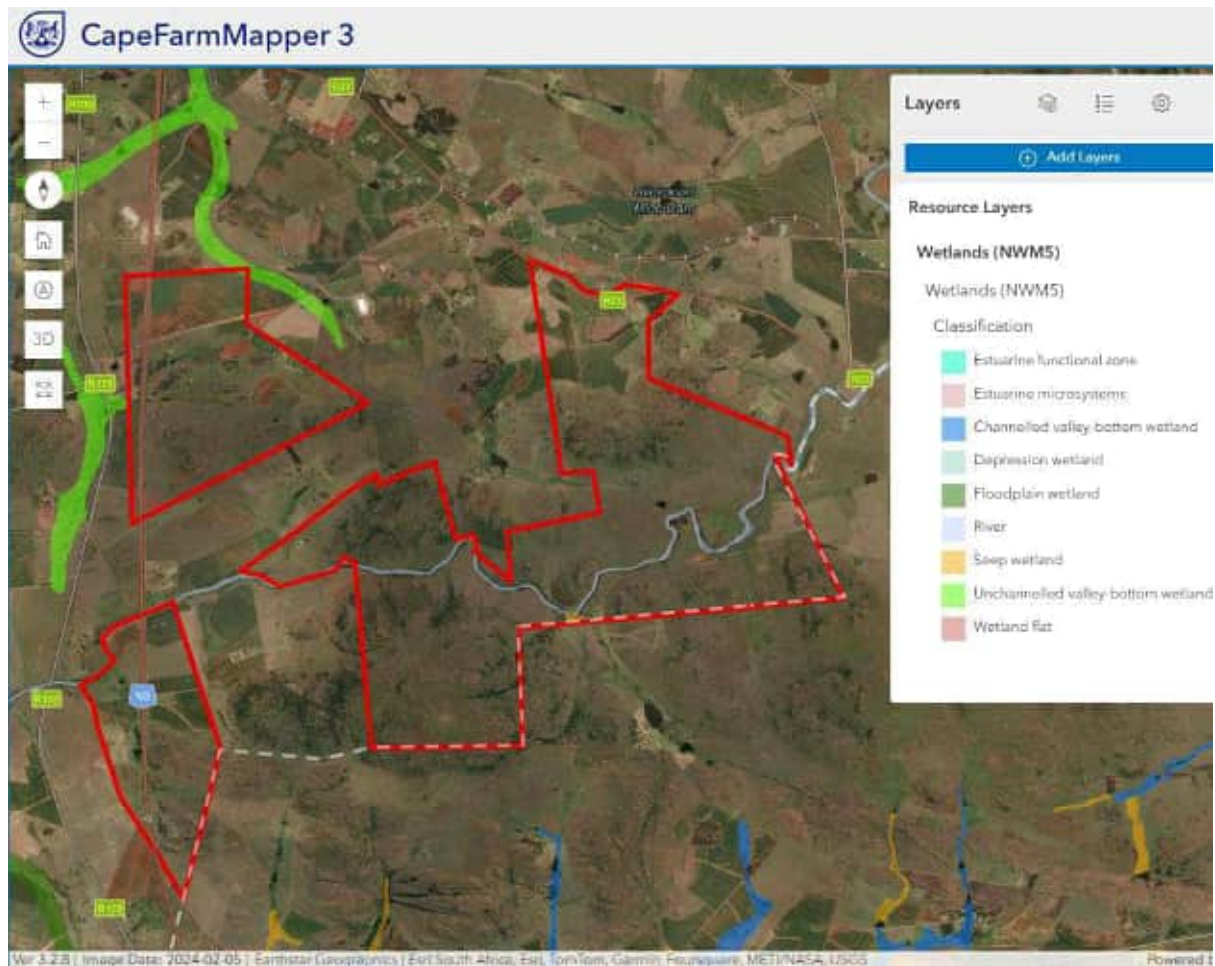


Figure 7. National Wetland map and National Freshwater Ecosystem Priority Areas map for the study site where the red polygon indicates the study boundaries (CapeFarmMapper, 2024)

The 2011 Gauteng C Plan is only applicable to the northwestern corner of the site (Figure 8). The mapping reflects mostly the terrestrial biodiversity planning and comprises terrestrial Critical Biodiversity Areas and Ecological Support Areas that are not aligned with aquatic habitats.

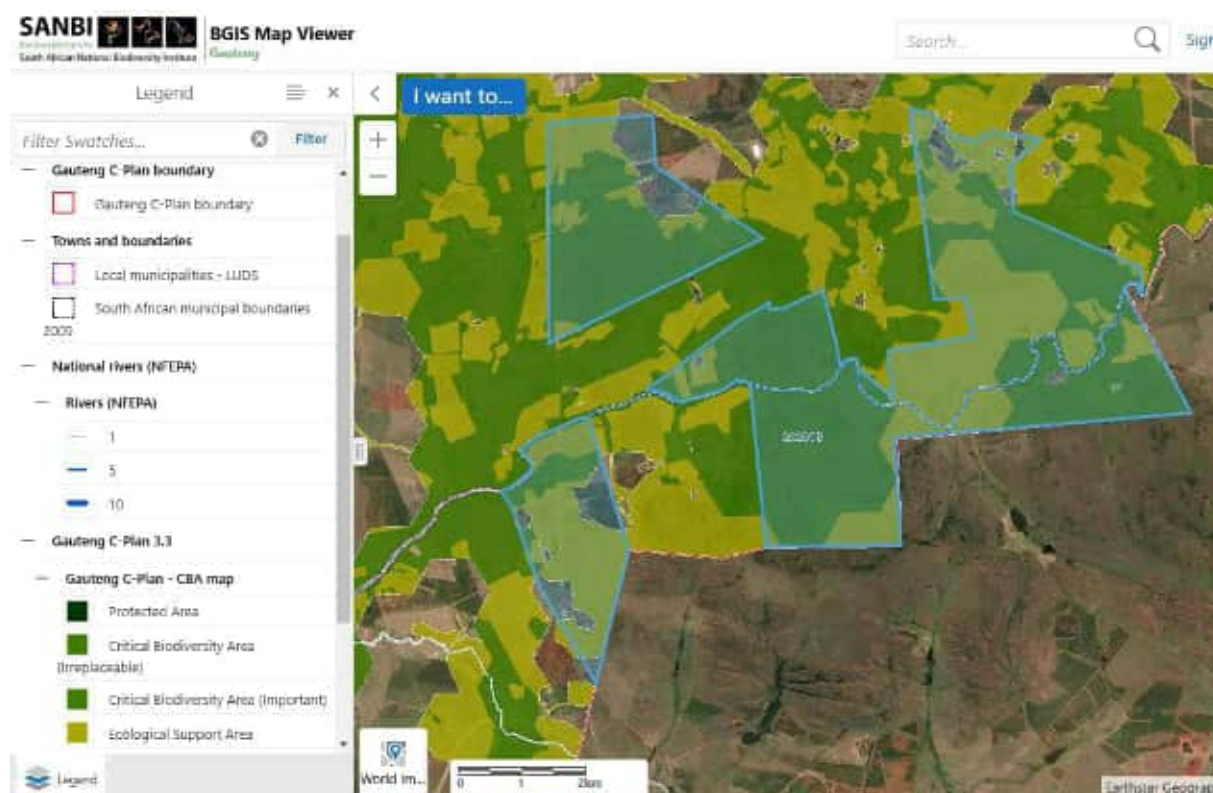


Figure 8. Gauteng Conservation Plan for the study site (SANBI Biodiversity GIS, 2024)

4. SITE VERIFICATION OUTCOMES

The aquatic features occurring within the site are the Suikerbosrant tributary of the Vaal River and its associated tributaries and wetland areas. These watercourses range from being largely natural on the higher-lying areas of the site to being moderately to largely modified ecological condition in their middle and lower reaches. The watercourses have moderate ecological importance but are of high sensitivity. They provide corridors for the movement of water and biota through the site and are particularly sensitive to flow, water quality and habitat modification due to the associated wetland habitat along many of the watercourses.

A buffer of 50m is recommended for the watercourses while the associated wetland habitats should be protected by a 100m buffer. Services could be placed through these aquatic habitats and buffer areas but must be kept to a minimum and adequately mitigated.

The findings of this assessment thus largely agree with the DFFE screening tool for aquatic biodiversity sensitivity mapping in that most of the site is of low aquatic sensitivity. The watercourses are however considered to be of high sensitivity and should be avoided by the proposed WEF facilities, as recommended above.

If the above-recommended buffers and the proposed mitigation measures in the impact assessment are implemented, the risk to the aquatic ecosystems is likely to be low such that the General Authorisations for Section 21(c) and (i) water uses under the National Water Act (Act 36 of 1998) would apply.



Figure 9. Views of Suikerbosrant River upstream (top) and downstream (bottom) of the site



Figure 10. Views of some of the tributaries and valley bottom wetlands associated with the Suikerbosrant River within the site.

5. AQUATIC CONSTRAINTS MAPPING AND AQUATIC SENSITIVITY

In the aquatic sensitivity mapping, the watercourses have been mapped as being of high sensitivity, with restrictions as mentioned for infrastructure components. In addition, to protect the aquatic habitats, the buffer zones of 50m on either side of the watercourses and 100m from the wetland areas have been mapped as being of medium sensitivity. Figure 11 shows the mapped aquatic features together with the recommended buffers for the 3 proposed sites and Figure 12 shows the sensitivity mapping within the site.

The potential aquatic ecosystem impacts of the proposed solar facilities will be assessed further in the environmental impact assessment report for the project. Most of the impacts are however likely to take place during the construction phase.

The potential aquatic ecosystem impacts of the proposed activities during construction include:

- Disturbance and possibly loss of aquatic habitats within the watercourses with the associated impact on sensitive aquatic biota;
- The removal of indigenous riparian and instream vegetation that has the potential to reduce the ecological integrity and functionality of the watercourses;
- Demand for water for construction could place stress on the existing available water resources;
- Road crossing structures, if not adequately designed, could impede flow in the watercourses;
- Alien vegetation infestation within the aquatic features due to disturbance; and
- Increased sedimentation and risks of contamination of surface water runoff during construction.

During the operational phase for all the proposed works, the potential impacts would include:

- Ongoing disturbance of aquatic features and associated vegetation along access roads or adjacent to the infrastructure that needs to be maintained;
- Modified runoff characteristics from hardened surfaces that have the potential to result in erosion of the watercourses; and
- Possible increase in water consumption and potential for water quality impacts (such as contamination from sewage generated onsite) as a result of the operation of the site.

During the decommissioning phase, the potential impacts would largely be associated with an increased disturbance of aquatic habitat due to the increased activity on the site. Increased sedimentation and risks of contamination of surface water runoff may also occur.

By implementing suitable buffers (50m along the watercourses and 100m adjacent to the wetlands) and minimising the works within the river/stream corridors, the impact of the proposed project activities would be low and unlikely to impact the integrity of the aquatic ecosystems. The recommended buffers are deemed adequate, irrespective of the proposed infrastructure.

Linear infrastructure (road and powerlines) would be able to cross aquatic habitats and their buffers if adequately mitigated, although it is recommended that areas of high sensitivity be avoided.

The other structures/infrastructure should avoid the aquatic habitats and buffer areas. Where unavoidable structures could be placed in the areas of medium sensitivity, with adequate mitigation.

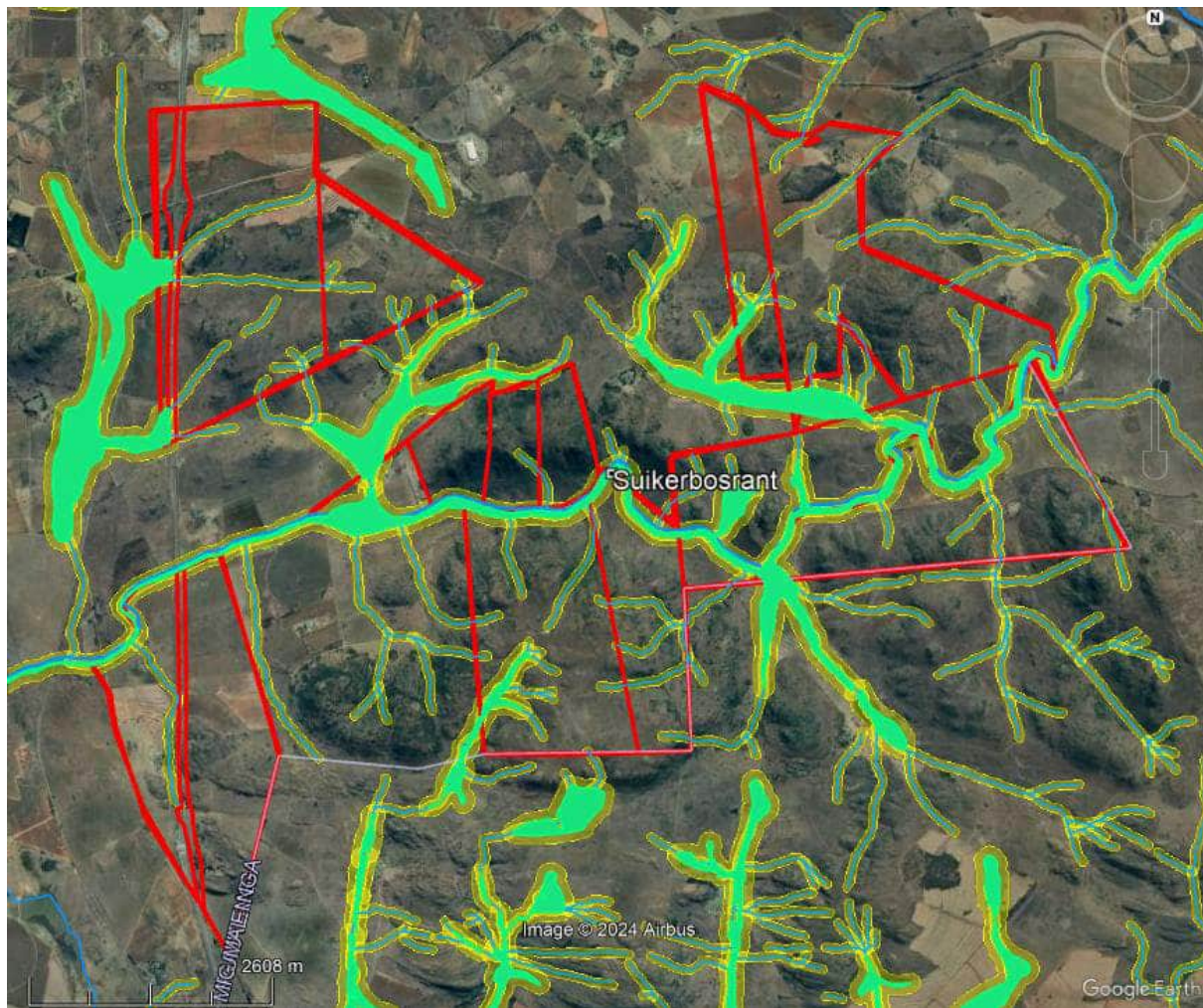


Figure 11. Mapped aquatic features within the project area (red polygons), shown in Google Earth. The recommended buffer or development setback areas are indicated by the yellow areas.

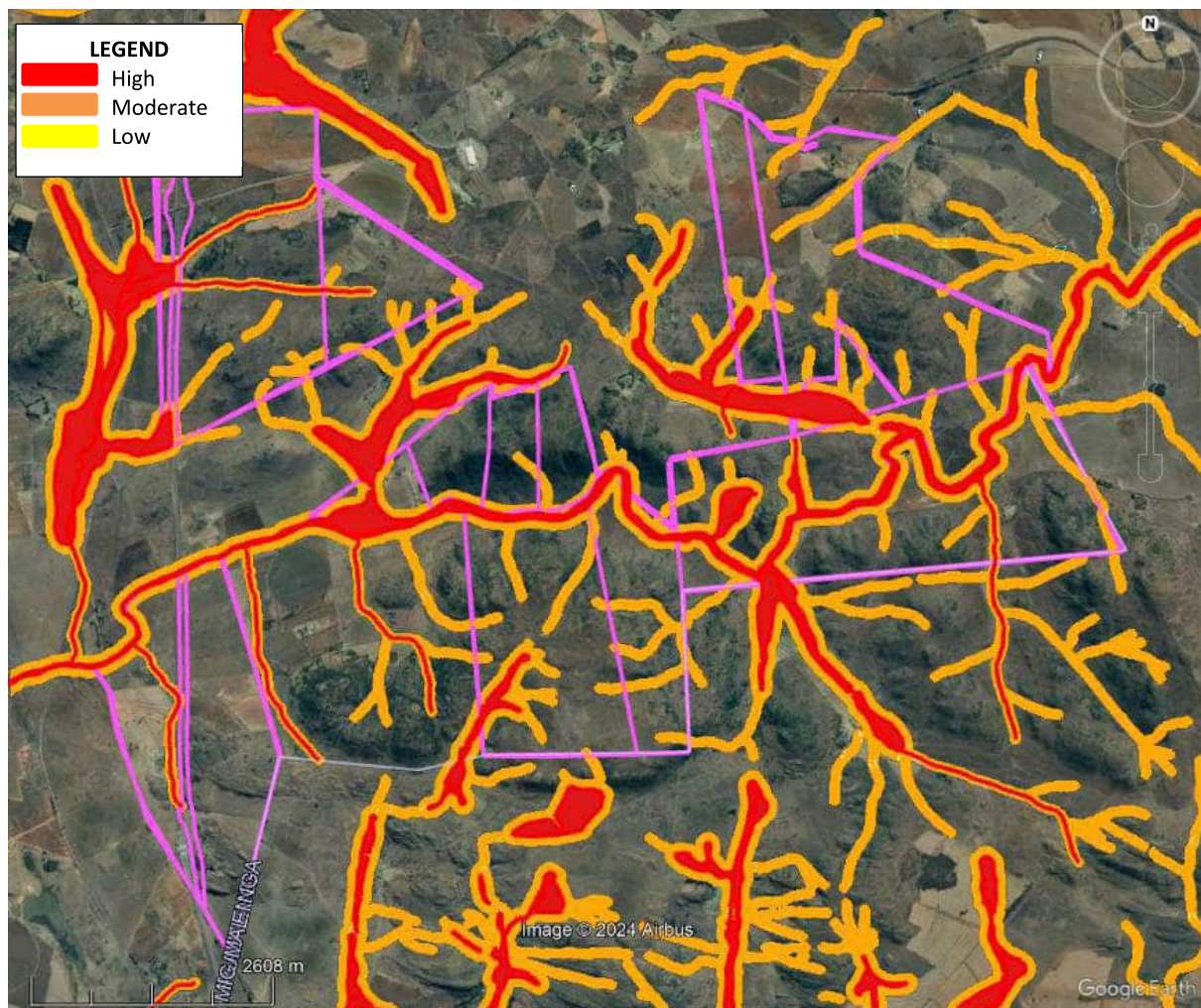


Figure 12. Mapped sensitivity of aquatic features within the project area (pink polygon), shown in Google Earth.

6. CONCLUDING STATEMENT REGARDING AQUATIC SENSITIVITY OF SITES

The following table summarises the findings of the site verification assessment in terms of aquatic ecosystem sensitivity:

Sensitivity Theme: Aquatic		
Screening Tool Site Sensitivity	Specialist Site Sensitivity	Reasons why the Screening Tool Sensitivity is disputed / confirmed
Most of the site comprises low Aquatic Biodiversity Sensitivity in terms of the DFFE screening tool mapping with the watercourses and wetlands within the site being of very high sensitivity. The site does not lie within a National FEPA River Sub catchment or a SWSA. The wetlands are mapped in the National Wetland Mapv5.	Low for the widespread area and High for the watercourses and wetlands within the site. A medium sensitivity has been applied to the adjacent buffers.	The Screening Tool indicated the site to be in an area mapped as being of Low Aquatic Biodiversity Sensitivity but with the aquatic features mapped as very high sensitivity. This assessment found the watercourses and wetlands on the site to be of high sensitivity. Buffer zones of 50m on either side of the watercourses and 100m from the wetlands are deemed sufficient to protect these aquatic ecosystems from any impact arising from the proposed WEF.

Appendix C.4

ARCHAEOLOGICAL, CULTURAL HERITAGE AND PALAEONTOLOGICAL SSVR





SITE SENSITIVITY VERIFICATION CULTURAL HERITAGE, ARCHAEOLOGY AND PALAEOLOGY THEME (IN TERMS OF PART A OF THE ASSESSMENT PROTOCOLS PUBLISHED IN GN 320 ON 20 MARCH 2020)

1 Introduction

CTS Heritage was appointed by ABO Energy South Africa (Pty) Ltd to undertake a Site Verification and Sensitivity analysis as part of the application for Environmental Authorisation (EA) for the proposed development of the ABO Uvemvane Wind Energy Facility 1 near Balfour in the Mpumalanga Province and Heidelberg in the Gauteng Province.

ABO Uvemvane Wind Energy Facility 1 (Pty) Ltd proposes the development of ABO Uvemvane Wind Energy Facility 1 (WEF 1), a commercial wind energy generation facility comprising up to 33 turbines and with a total generation capacity of up to 240 MWac in capacity, as well as associated infrastructure. The proposed WEF would be located approximately 9km west of the town of Balfour in the Mpumalanga Province in the Dipaleseng Local Municipality within the Gert Sibande District Municipality and approximately 14km south-east of the town Heidelberg in the Gauteng Province in the Lesedi Local Municipality within the Sedibeng District Municipality.

As per the DFFE Screening Tool results, various on-site specialist verifications are required to be undertaken to determine the site sensitivity and the associated Environmental Authorisation process to be followed for the proposed Wind Energy Facility and associated grid infrastructure.

2 Site sensitivity verification

The site sensitivity verification was undertaken as follows:

- o A Desktop Study was conducted of relevant reports previously written (please see the reference list for the age and nature of the reports used) including known palaeontological sensitivities. These sources remain relevant for the purposes of sensitivity identification.
- o An archaeologist conducted a field survey of the site and its environs from 12 to 16 November 2024 to determine what archaeological resources are likely to be impacted by the proposed development of the WEF.
- o Seasonality has no impact on the verification of heritage and archaeological sensitivities



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- o A palaeontologist conducted a desktop study of the site and its environs to determine what palaeontological resources are likely to be impacted by the proposed development of the WEF.
- o No-development buffers are recommended. In the context of this report, no-development means no disturbance of that area whatsoever including disturbance associated with road upgrades and grid infrastructure unless otherwise specified.

A Heritage Impact Assessment (HIA) process has been undertaken and is reported on in a separate HIA report that will be submitted to the South African Heritage Resources Agency (SAHRA) as is required in terms of Section 38(8) of the National Heritage Resources Act (NHRA).

Constraints & Limitations

The terrain assessed in the WEF Cluster varies widely from flat, level terrain around the boundaries of the WEF's central area, to extremely rugged, mountainous terrain in the centre, especially either side of the valley cut by the Suikerbosrandrivier. The vegetation is well-established and dense in the mountainous areas as these have not previously been ploughed due to the rugged terrain. The lowlands also varied where cattle grazing had not recently taken place and surface visibility was low due to the dense grass cover. The survey relied heavily on the use of historical satellite imagery obtained from the NGI (NGI aerial photographs 1944) and the historic satellite imagery from 2009 and 2011 from GoogleEarth to locate possible areas for Iron Age enclosures and historical settlements before returning to the field to verify these sites in the field. The combination of the two methods worked very well and a great number of sites were located using this method.

3 Outcome

In terms of site sensitivity with specific consideration of heritage resources, clarity on the broader context and its cultural value is important to understand overall heritage sensitivity and in order to contextualise site specific findings. Please find both contextual information as well as site specific information below.

Cultural Landscape

The landscape in which the proposed development is located is mountainous with the Suikerbosrandrivier running through the middle. There are several farm werfs located within the proposed development area. Some of these have associated historical cemeteries indicated on the first edition 1:50 000 topo map. Although the N3 has diverged from historical routes, the R23 still follows along a historical route that might be impacted by the proposed development.

According to Doucakis (2021), one of the farms, Laagerspoort (also known as Lagerspoort) used to be known as Onderstepoort. This was the location of Voortrekker Hendrik Potgieter's lager during the three day campaign (28-30 November 1837). Further details of this conflict is found in Fourie (2016), "*A commando of*



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330 Voortrekkers and a small group of Barolong under the command of Andries Hendrik Potgieter and Piet Uys attacked the Khumalo Ndebele of Mzilikazi in the vicinity of the Marico River. Of interest for this study is that they departed Lagerspoort near present-day Heidelberg and travelled via the present-day farm of Deelkraal ... to the Matabele settlements near the Marico River. During the attack some 500 Matabele were killed and 3000 cows taken by the Voortrekker commando. On their way back, the cows were divided amongst the members of the commando on the property today known as Deelkraal (Bergh, 1999).” The exact location of the lager could not be confirmed, but Doucakis quotes Reverend N. Roberts “ Lat. 26 . 37’ 30” S. & Long. 28 . 25’ E. on the farm LAGERSPOORT 310 [406 IR], situated at the foot of a steep and high mountain, on the right [north] bank of the Sugar Bush River where it emerges from the hills to the North-East of the Heidelberg-Villiers road. From information gathered on the spot it appears that the lager [sic] stood close to the house now occupied by Mr. van Breda.”

Most of the nearby sites from SAHRIS are structures associated with the development of railway lines. They have been identified and recorded as part of a project called Footsteps Along the Tracks (FAT). This includes the site identification, documentation and assessment of extant built structures, originally constructed by the Netherlands South African Railway Company (Nederlandsche Zuid-Afrikaansche Spoorwegmaatschappij - NZASM). Although these sites have been graded as having very high levels of regional significance on SAHRIS (Grade II), none of these sites have been formally protected through the publication of a gazette notice in terms of section 27 of the NHRA. Furthermore, the actual cultural value of these sites is likely to be of high or moderate local significance (Grade IIIA or IIIB). Due to the location of these structures being located outside of the area proposed for development, no impact to these resources is anticipated from this proposed development.

Although the N3 has diverged from historical routes, the R23 still follows a historical route. The field assessment noted the scenic and historic value of the R23 and the R103 and as such, a no development buffer of 1km is recommended on either side of these historic scenic routes for turbines, and a 500m buffer on either side for associated WEF infrastructure. Unlike the R23 and the R103, the N3 has lower levels of scenic and historic value and as such, a no development buffer of 500m is recommended on either side of the N3 for turbines and a 250m buffer on either side for associated WEF infrastructure.

Further, in order to avoid a canyon effect, it is recommended that turbines are proposed for only one side of the R103 and N3. It is therefore recommended that turbines are therefore limited to the eastern side of these roads.

Lessons from existing WEFs in similar contexts have revealed that, while the impact of the turbines themselves on the landscape is significant, far more significant is the impact resulting from the associated logistical infrastructure for development in these contexts. This includes the blasting associated with the creation of turbine platforms and the construction of access roads between the turbines. Based on the current



information available about how wind farms and their associated infrastructure are constructed, these impacts cannot be mitigated and cannot be rehabilitated once the life of the project is over. These impacts will permanently scar the significant mountain landscape which has existed in its current state for millions of years. As per the SEA Guidelines published by the CSIR (2018), no WEF development is supported on slopes exceeding 1:10.

Principles

These principles are derived from international best practice as contained in various International Charters on Conservation and a number of local adaptations, and apply to this cultural landscape assessment.

- Landscape significance - acknowledge the overall natural and cultural landscape, and the layered pattern of settlements in response to the natural landscape over time.
- Landscape integrity - retain the essential character and intactness of wilderness, rural and urban areas in the face of fragmentation through unstructured urbanisation and commercial agriculture.
- Landscape connectivity - retain the continuity and interconnectedness of wilderness and agricultural landscapes, including ecological corridors and green linkages.
- Landscape setting - maintain the role of the natural landscape as a “container” within which settlements are embedded, the landscape providing the dominant setting or backdrop.
- The logic of landscape - recognise the intrinsic characteristics and suitability of the landscape and its influence on land use, settlement and movement patterns, in response to geology, topography, water, soil types and microclimate.

Principles applied to the proposed development site:

1. Although the proposed site is located within a RED Zone. To address concerns about the cumulative impact of RE facilities within the greater Karoo region, a cautious approach is required in terms of assessing the desirability of such development from a cultural landscape perspective.
2. The proposed site is located adjacent to an existing infrastructural corridor associated with the national grid, which suggests a level of suitability of RE facilities which can link in with the grid. As such, new grid connection infrastructure should cluster with the existing alignments and not form new linear elements within the landscape.
3. Notwithstanding the existing infrastructure, the placement of WE turbines must take cognisance of the very high visual impact on a relatively intact and representative cultural landscape, and the extremely limited ability to visually screen this infrastructural development, particularly in the case of the wind turbines.

WEF Turbine placement - position (“where”):

The indicators are to be aligned with the visual sensitivity analysis and to include the following:

- Setback from transport corridors by at least 1000m on either side.
- Avoid steep or elevated topography, ridgelines or koppies.



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- Setback from graded resources and farmstead settlements IIIA, IIIB (by 1000m) and IIIC (by 500m).
- Setback from farmsteads forming part of the settlement pattern by at least 500m
- Prioritise placement on the slopes of ridges and low-lying areas
- Concentrate placement in proximity to the existing infrastructure.

Turbine placement - principles ("how"):

The following general principles apply to the turbine layout:

- Avoid an orthogonal pattern in favour of a more organic pattern.
- Turbines should be clustered or read as single elements in the landscape, as opposed to being aligned in a row in visual spatial proximity of each other.
- Avoid continuous or unbroken swathes of infrastructural interventions
- Avoid a stacking effect of the alignment of turbines. A staggered setback line is preferable.

Table 1: Best Practice Cultural Landscape Sensitivities (Winter and Wilson, 2021)

Heritage Resource	High Sensitivity/ No-Go	Medium Sensitivity	Low Sensitivity
Cultural landscapes including natural reserves - formally protected or worthy of formal protection (NA)	0-3km	3-5km	5-10km
Settlements (towns, villages and hamlets) - formally protected or worthy of formal heritage protection (NA)	0-2km	2-5km	5-10km
Historic scenic linkage routes such as the R103	WEF - 1km	1-3km 500m-2km	3-10km 2-5km
Heritage structures worthy of Grade I, II and IIIA heritage status	0-1km	1-2.5km	2.5-5km
Heritage structures worthy of grade IIIB and IIIC heritage status such as Lagerspoort and Malanskraal	0-500m	500m-1km	1-2km
Burial grounds and graves	0-100m	100m-250m	250m-500m
Water features (rivers, wetlands and dams)	0-250m	250m-500m	500m-1km
Topographical features (ridgelines, peaks, scarps)	0-250m from apex	250m-500m	>500m
Steep slopes	>1:10 slopes	>1:10 slopes	<1:10 slopes



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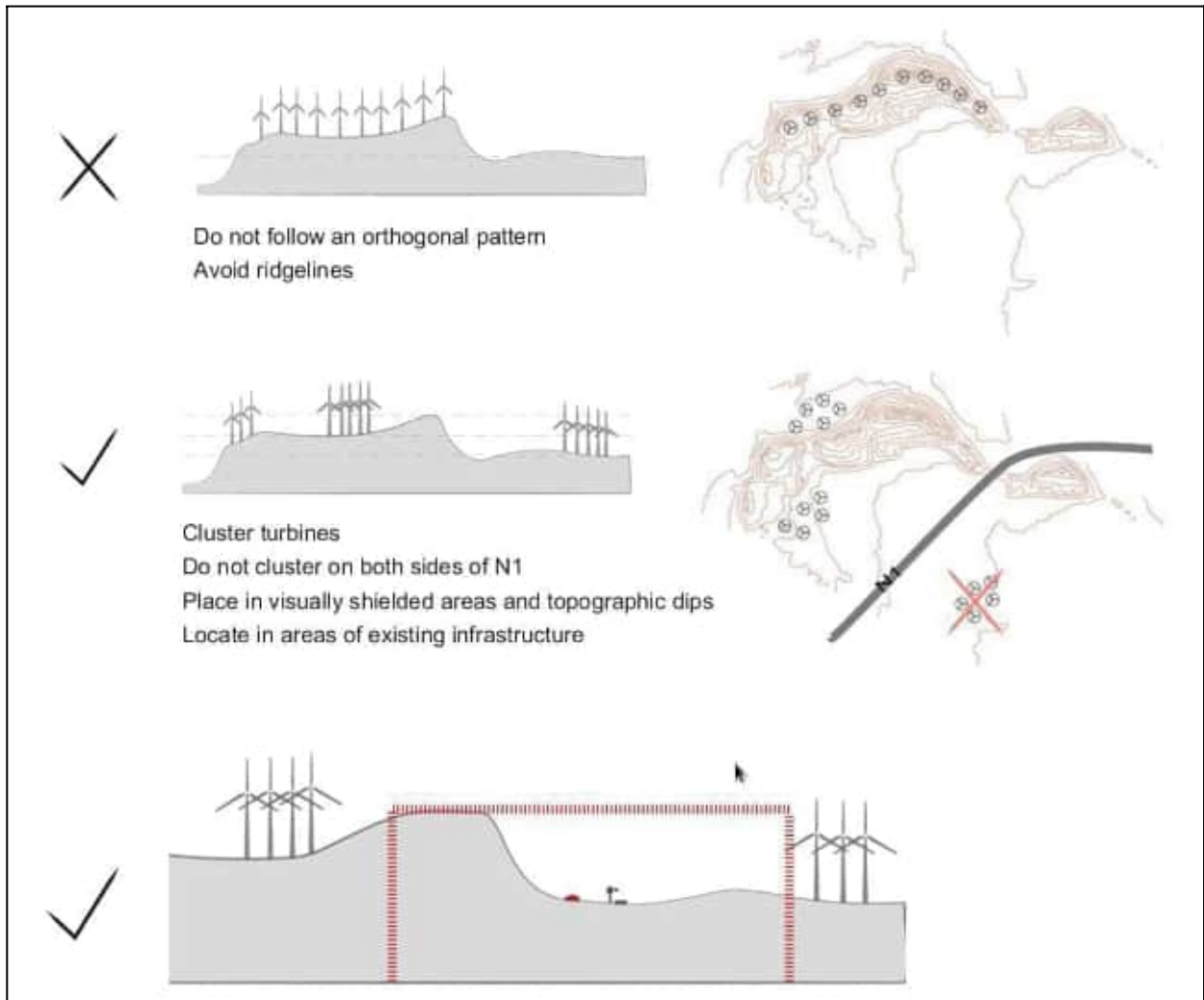


Figure A: Image indicating appropriate layout approaches (Winter and Wilson, 2021)



Archaeology

Previous archaeological assessments completed in the area, and referenced above, have identified the archaeological sensitivity of the area proposed for development. This very high archaeological sensitivity was verified by the archaeological field assessment completed for this project. This field assessment identified a number of different kinds of heritage resources located within the area proposed for development, ranging from Early Stone Age artefacts dated to more than 200 000 years ago through to the ruins of historic farm werfs and farmworkers cottages from the recent past.

The most dominant archaeological signature within this landscape (over 100 observations noted) relates to the Iron Age occupation of this landscape and the remnants of Iron Age settlements. These sites represent the ruins of stone-walled structures and central kraals that conform to a particular pattern of Iron Age settlement. While the sites mapped in this report reflect the visible evidence of these settlements on the landscape, it is certain that these observations are not discrete but are related and as such, it is very likely that there is buried archaeology associated with these settlements throughout this landscape. The age of these settlements is unknown at this stage, however the scientific value of the buried archaeological material associated with these settlements is high and is therefore graded IIIA. As such, a no development buffer of 100m is recommended around each observed feature. Most of these Iron Age settlement observations are associated with the mountains located within the development area. This association is likely due to the landmark significance of these topographic features in the landscape. Also, due to the steep topography associated with these mountainous areas, these areas have not been subjected to cultivation activities associated with the historic agricultural occupation of the area. While it is possible that iron age settlements extended across the agricultural land in the past, this signature has been disrupted by agricultural activities. This signature remains clear within the mountainous areas.

Due to their landmark value within this cultivated landscape, it is recommended that the higher elevations of these mountains are not suitable for the construction of turbines, and more significantly, the construction of the large-scale roads required to construct these turbines. These areas must be considered as very high sensitivity in the sensitivity maps below. Due to the combined sensitivity from cultural landscape impacts and impacts to buried archaeology, development within this VERY HIGH sensitivity landscape will need to be limited to have minimal impact and align with visual impacts, and carefully considered in terms of micro-siting to prevent impacts to burial archaeology. It is preferred if no new infrastructure development takes place within this very high sensitivity area.

The field assessment identified a significant number of burial grounds and graves located within the area proposed for development. Some of these burials are more formal whereas others are marked only by sandstone cairns or are associated with the Iron Age settlement observations described above. Due to their high local levels of social and spiritual value, these sites are graded IIIA. A no development buffer of 100m is



recommended around each of these sites in order to ensure that the sense of place associated with these burials is retained, and to ensure that no nearby unmarked burials are accidentally impacted by excavations associated with this proposed development.

A number of modern agricultural structures were identified along with the ruins of some historic structures. These sites have no cultural value and as such are determined to be Not Conservation-Worthy (NCW). No further mitigation is recommended for these observations.

The field assessment identified a number of 20th Century farm werfs that have historic contextual value and are graded IIIC. These sites include the Steynskraal farm werf, the Klipplaatdrift farm werf, the Laagerspoort farm werf (see the background section for more information) and the Driefontein farm werf. The Malanskraal farm werf is represented by two site recordings. The Malanskraal structures located at Site 065 have higher levels of historic value and as such are graded IIIB. In order to retain the sense of place associated with these historic farm werfs, a no development buffer of 500m is recommended around each of these sites.

The field assessment also identified a number of historic structures and ruins of structures that have been determined to have lower levels of historic contextual value. These observations include the ruins of historical farm werfs and a number of stone kraals. All of these sites with contextual historic value are graded IIIC and as such, a no development buffer of 50m is recommended around each of these sites. This buffer is recommended in order to ensure that no buried archaeology associated with these resources are accidentally impacted by construction activities associated with this proposed development.

Table 2: Observations noted during the field assessment - the colour of the rows indicates grading

POINT ID	Description	Type	Period	Co-ordinates		Grading	Mitigation
40	IA enclosure under trees	Ruin	Iron Age	-26,646802	28,402908	IIIA	100m Buffer
41	Laagerspoort werf, stone buildings, late 19th century	Structure	Historic	-26,646211	28,403572	IIIC	500m Buffer
42	IA enclosures	Ruin	Iron Age	-26,644855	28,405545	IIIA	100m Buffer
43	Laagerspoort werf, early 20th century buildings and some older fabric	Structure	Historic	-26,643009	28,402389	IIIC	500m Buffer
44	IA walling, linear	Ruin	Iron Age	-26,645223	28,416805	IIIA	100m Buffer
45	IA enclosure	Ruin	Iron Age	-26,643796	28,417387	IIIA	100m Buffer
65	Malanskraal werf, green corrugated iron roofs, early 20th and late 19th c.	Structure	Historic	-26,685623	28,403859	IIIB	500m Buffer



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66	About 30 farmworkers' graves, circa 1970s	Graves/ Burial Grounds	Modern	-26,68306	28,407224	IIIA	100m Buffer
67	Historical cemetery, late 19th and early 20th century, Gouws, Bekker, about 16 graves	Graves/ Burial Grounds	Historic	-26,6679	28,410266	IIIA	100m Buffer
68	IA enclosures on hill	Ruin	Iron Age	-26,662643	28,413806	IIIA	100m Buffer
69	IA enclosures	Ruin	Iron Age	-26,657033	28,405666	IIIA	100m Buffer
70	IA enclosures	Ruin	Iron Age	-26,655986	28,42854	IIIA	100m Buffer
71	Ruined historical werf, sandstone foundations	Ruin	Historic	-26,668156	28,419551	IIIC	50m Buffer
72	IA enclosure	Ruin	Iron Age	-26,668928	28,419409	IIIA	100m Buffer
78	Driefontein ruins, historical	Ruin	Historic	-26,653229	28,4591	IIIC	50m Buffer
79	Driefontein werf, mostly modern buildings, some older stone walled kraals	Structure	Historic, Modern	-26,654118	28,460801	IIIC	500m Buffer
80	IA enclosure	Ruin	Iron Age	-26,655754	28,453869	IIIA	100m Buffer
81	IA enclosures	Ruin	Iron Age	-26,662841	28,458797	IIIA	100m Buffer
83	IA enclosure	Ruin	Iron Age	-26,673662	28,461662	IIIA	100m Buffer
84	Old gold mining shaft, historical	Ruin	Historic	-26,674611	28,462071	IIIA	100m Buffer
85	IA enclosures	Ruin	Iron Age	-26,676558	28,458638	IIIA	100m Buffer
87	IA enclosures	Ruin	Iron Age	-26,65716	28,495579	IIIA	100m Buffer
88	About 25 farmworkers' graves marked by stone cairns, 20th c.	Graves/ Burial Grounds	Modern, Historic	-26,658761	28,481473	IIIA	100m Buffer
89	Ruined sandstone historical buildings and kraal	Ruin	Historic	-26,659982	28,479951	IIIC	50m Buffer
91	IA enclosure	Ruin	Iron Age	-26,662419	28,481208	IIIA	100m Buffer
92	IA enclosures	Ruin	Iron Age	-26,666569	28,482643	IIIA	100m Buffer
94	Ntaopane family graves early 20th c. 14 graves	Graves/ Burial Grounds	Historic	-26,689895	28,455334	IIIA	100m Buffer
96	Zandhoek ruins, werf, kraals, later brick ruins too	Ruin	Historic	-26,698223	28,454265	IIIC	50m Buffer



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97	Zandhoek ruins, early 20th c corrugated iron roof ruin, sandstone ruins	Ruin	Historic	-26,700918	28,455601	IIIC	50m Buffer
98	Ruined sandstone building	Ruin	Historic	-26,70596	28,464307	IIIC	50m Buffer
99	Ruined werf with mostly 20th c brick buildings, one sandstone building	Ruin	Historic, Modern	-26,715055	28,471408	IIIC	50m Buffer
100	Weltevreden farm cemetery, werf 20th century	Graves/ Burial Grounds	Modern, Historic	-26,701417	28,456496	IIIA	100m Buffer
102	Goosen family graves, 1890s, at least 5 graves	Graves/ Burial Grounds	Historic	-26,674524	28,447016	IIIA	100m Buffer
103	Malanskraal, historical kraal. 2 sandstone ruins	Ruin	Historic	-26,672805	28,447128	IIIC	50m Buffer
104	Malanskraal historical werf, stone walled kraals, silos, Cape Revival gables on main farmhouse, corrugated iron roof	Structure	Historic, Modern	-26,667854	28,446656	IIIC	500m Buffer
105	Sandstone ruins, historical near clump of gum trees	Ruin	Historic	-26,661011	28,449313	IIIC	50m Buffer
106	Historical stone walling against outcrop	Ruin	Historic	-26,659722	28,449971	IIIC	50m Buffer
107	IA enclosures	Ruin	Iron Age	-26,658518	28,44011	IIIA	100m Buffer
108	Farmworkers' graves, over 60 here. 20th c. 1960s, 1980s	Graves/ Burial Grounds	Modern, Historic	-26,67873	28,396049	IIIA	100m Buffer
109	Farmworker's grave, 1972, in road reserve	Graves/ Burial Grounds	Modern	-26,719862	28,472479	IIIA	100m Buffer



Palaeontology

According to the SAHRIS Palaeosensitivity Map, the proposed development is mostly underlain by sediments of Low palaeontological sensitivity, with some small areas underlain with Moderate to Very High fossil sensitivity. According to the extract from the Council of GeoScience Map CGS 2628 East Rand Geology Map the development area is underlain by sediments from Pv: Vryheid Formation in the Eccca Group, Ra: Alberton, and Rw: Westonaria, both in the Rk: Klipriviersberg Group, Rb: Booysens, Rjo: Johannesburg, and Rt: Turffontein Formations in the Central Rand Group, Rg: Government, and Rj: Jeppestown Formations in the West Rand Group, Q-a: Quaternary Alluvium and V-di: Diabase.

Most of the proposed development is underlain by the Klipriviersberg Group (Rk), and the Turffontein Formation (Rt) in the Central Rand Group. According to the Palaeotechnic report of Gauteng (Groenewald and Groenewald, 2014), the **Klipriviersberg Group**, which also contains the **Ra: Alberton, and Rw: Westonaria Formations**, has **Low** palaeontological sensitivity, with no fossils recorded. **Turffontein Formation** (Rt) in the Central Rand Group falls in the Witwatersrand Supergroup Which, according to the SAHRIS Fossil Heritage Browser, has **Insignificant or Zero** palaeontological sensitivity.

Other underlying sediments with **Insignificant/ Zero** palaeontological sensitivity, belong to the Witwatersrand SuperGroup: Rb: Booysens, and Rjo: Johannesburg Formations in the Central Rand Group, Rg: Government, and Rj: Jeppestown Formations in the West Rand Group.

The sediments marked as having Moderate sensitivity on the SAHRIS Palaeosensitivity Map, are **Quaternary Alluvium**. Groenewald and Groenewald (2014) note that “*Superficial deposits of Quaternary and Tertiary age can contain important fossils. Most notable are fossils associated with, for example, the Tswaing Impact Crater north of Pretoria (Johnson et al, 2006). The superficial deposits are allocated a moderate palaeontological sensitivity due to the fact that many fossiliferous rocks might be covered in a thin layer of soil, where fossils are only found where the topsoil has been removed by erosion.*” The Alluvial deposits, however, have **Low** palaeontological sensitivity, being “*Recent sandy and clayey deposits along water courses*” These sediments are known to contain a “*wide range of fossils possible, including mammalian bones and teeth, tortoise remains, ostrich egg etc.*”

The **Vryheid Formation** in the Eccca Group is the formation that has **Very High** palaeontological sensitivity. These deltaic sandstones, shales and coals, with minor conglomerates date to the Early to Middle Permian. It is known for its rich assemblages of plant fossils (Glossopteris Flora), including tree trunks, stumps and roots, palynomorphs, rare insects, conchostracans, and low diversity trace fossil assemblages. There are very rich and historically important plant fossil collections from the Vryheid Formation at Vereeniging. In a desktop PIA by Groenewald located approximately 15 km southeast of the proposed development (2014, SAHRIS NID 164647) the following was noted regarding the Vryheid Formation: “*The Vryheid Formation is well-known for the occurrence of coal beds that resulted from the accumulation of plant material over long periods of time. Plant fossils described by Bamford (2011) from the Vryheid Formation are; Azaniodendron fertile, Cyclodendron leslii,*